



Clean Air Status and Trends Network Quality Assurance Report

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MACTEC Project No.:	6064079000
Reporting Period:	Fourth Quarter 2007 (October – December) with 2007 Annual Summary

Summary of Quarterly Operations

Introduction

This quarterly report summarizes results from the Clean Air Status and Trends Network (CASTNET) quality assurance/quality control (QA/QC) program for data collected during fourth quarter 2007. The results presented for filter pack data collection and field calibrations are generated from data extracted from the CASTNET Data Management Center (DMC) database using the CASTNET Data Management System Application (CDMSA). The various QA/QC criteria and policies are documented in the CASTNET Quality Assurance Project Plan (QAPP). The QAPP is comprehensive and includes standards and policies for all components of project operation from site selection through final data reporting.

Collocated filter pack precision data and completeness data for meteorological measurements are presented for data validated to Level 3 during the quarter/year. Table 1 lists the quarters of data that were validated to Level 3 during 2007 by site calibration group. Table 2 lists the sites in each calibration group along with the calibration schedule.

Table 3 presents the measurement criteria for continuous field measurements. These criteria apply to the instrument challenges performed during site calibrations. Table 4 presents the measurement criteria for laboratory filter pack measurements. These criteria apply to the QC samples listed in the following section of this report.

Significant Events for 2007

During first quarter 2007, all data loggers were reprogrammed to eliminate the frequent assignment of “I” flags to ozone zero/span/precision (z/s/p) data. The “I” flags were assigned when the system was in calibration mode for more than 25 percent of a given hour. The “C” flags assigned by the data logger indicating that the system is in calibration mode are now being passed through to the final database. Also during first quarter, a revised review process, similar to that used for project deliverables, was implemented for laboratory submissions to intercomparison studies. Additionally, an independent audit of CASTNET data operations was conducted by an outside consultant hired by MACTEC and consisted of both a performance evaluation and a technical systems evaluation. The results were satisfactory with

recommendations that included: (1) the establishment of a database to document client deliverables; (2) the creation of stand-alone standard operating procedures (SOP) for Level 3 data validation and daily data review, which would expand upon protocols currently documented in the QAPP; and (3) greater standardization of report preparation and review.

During second quarter 2007, the CASTNET QAPP Revision 4.0 was approved for distribution by the Environmental Protection Agency (EPA). Copies were distributed during June 2007. Also during second quarter 2007, a new EPA-sponsored CASTNET site was added to the network, and an established site was closed. The new site at Palo Duro Canyon State Park, TX (PAL190) began operation on April 24, 2007. The site at Lye Brook, VT (LYE145) officially stopped operating as of May 31, 2007 primarily due to ongoing data collection problems.

Third quarter 2007 QA activities included EPA approval of the key personnel substitution of William Imbur as the new CASTNET QA Supervisor, development of an acceptable procedure to extend the timeframe between complete certifications of the transfer standards used for calibration of field equipment from three months to six months with specific pre-deployment operational checks covering the dynamic range of each transfer standard between the complete certifications, and a drop in the “per box” acceptance testing requirement for Teflon[®] filters from 7 percent to 4 percent. Also during third quarter 2007, the CASTNET analytical laboratory implemented the revised reporting limits for analyses using the inductively coupled plasma atomic emission spectrometer (ICP-AES) as listed in the latest revision (Revision 4.0) of the CASTNET QAPP. The reporting limits for calcium and potassium were revised to 0.006 milligrams per liter (mg/L) from 0.003 mg/L and 0.005 mg/L, respectively. The revised reporting limits were not implemented until September 26, 2007, just prior to the end of third quarter 2007.

During fourth quarter 2007, the CASTNET QAPP was updated during annual review. Since only minor revisions were needed, the revised QAPP was designated Revision 4.1. The revised QAPP was submitted to EPA for review and approval on October 31, 2007. Additionally, QA/QC procedures were finalized and implemented for the monthly data submittals, and the primary standard for the ozone analyzers was upgraded from a Thermo Fisher Scientific, Inc. (Thermo) Model 49C-PS to a Thermo Model 49i-PS.

Quality Control Analysis Count

The QC sample statistics presented in this report are for reference standards (RF) and continuing calibration verification spikes (CCV) used to assess accuracy and for replicate sample analyses (RP) used to assess “in-run” precision. In addition, laboratory method blanks (MB) containing reagents without a filter; laboratory blanks (LB) containing reagents and a new, unexposed filter; and field blanks (FB) containing reagents and an unexposed filter that was loaded into a filter pack assembly and shipped to and from the monitoring site while remaining in sealed packaging

are also included. Tables 5 through 8 present the number of analyses in each category that were performed during each quarter of 2007.

Sample Receipt Statistics

For the current CASTNET project, which began on July 30, 2003, EPA requires that 95 percent of field samples from EPA-sponsored sites must be received by the CASTNET laboratory in Gainesville, FL no later than 14 days after removal from the sampling tower. Table 9 presents the relevant sample receipt statistics for each of the four quarters of 2007 together with an annual summary for each category.

Data Quality Indicator (DQI) Results

Figures 1 through 3 present the results of RF, CCV, and RP QC sample analyses for fourth quarter 2007. All results were within the criteria listed in Table 4 with the exception of several individual RP results. However, these are considered reasonable since higher relative percent differences generally correlate with lower sample concentrations. Table 10 presents the percent recoveries and standard deviations for RF, CCV, and RP QC sample analyses for 2007. Annual averages were all within criteria.

Table 11 presents quarterly collocated filter pack precision results for data validated to Level 3 during the year. The majority of site-parameters were outside of criterion. Overall results were not as good as those presented in 2006. MCK131/231, KY were two of several sites with flow problems in late 2006 to early 2007 stemming from the Balston[®] in-line filters, located downstream from the filter pack. Investigations determined that a subset of installed Balston[®] filters was the source of some flow restriction. The lowered flow rates were accurate as recorded. ROM406/206, CO results reflected results presented in previous quarters. Lower precision for these sites is largely due to the low sample concentrations routinely recorded.

Figure 4 presents completeness statistics for continuous measurements validated to Level 3 during the year. All parameters met the 90 percent criterion.

Laboratory Control Sample Analyses

The laboratory control sample (LCS) is a reagent blank spiked with the target analytes from the established analytical methods and carried through the same extraction process that field samples must undergo. The LCS is not required by the CASTNET QA/QC program. LCS analyses are performed by the laboratory to monitor for potential sample handling artifacts and provide a means to identify possible analyte loss from extraction to extraction. The current action limits for LCS recovery are 80 percent and 120 percent. These limits may change as data are collected and analyzed. Figure 5 presents LCS analysis results for fourth quarter 2007.

Blank Results

Figures 6 through 8 present the results of MB, LB, and FB QC sample analyses for fourth quarter 2007. All results were within criteria (two times the detection limit) listed in Table 4 with the exception of a few cellulose filter FB results. All values were less than three times the detection limit. Table 12 summarizes the record of filter blanks and filter acceptance testing results for 2007.

Suspect/Invalid Filter Pack Samples

Filter pack samples that were flagged as suspect or invalid during each of the four quarters of 2007 are listed in Table 13. This table also includes associated site identification and a brief description of the reason the sample was flagged. During fourth quarter, four filter pack samples were invalidated due to insufficient flow volume.

Field Problem Count

Table 14 presents the number of field problems affecting continuous data collection for more than one day for each quarter of 2007. The problem counts are sorted by a 30-, 60-, or 90-day time period to resolution. A category for unresolved problems is also included. Time to resolution indicates the period taken to implement corrective action. The time period does not correlate with the quantity of data affected. For example, if a 5-hour block of missing data takes 60 days to replace, it will show up in the 60 day category. By the same token, a site missing 200 hours of data due to the damage caused by a lightning strike will show up in the 30 day category if the site is repaired within 30 days, even though the data cannot be replaced.

Field Calibration Results

A summary of field calibration failures by parameter for each quarter of 2007 is listed in Table 15. Calibrations were performed at 25 sites during fourth quarter 2007. For fourth quarter, all sites and parameters were within the criteria listed in Table 3 with the exception of the parameters at the nine sites that are listed in Table 15. Overall, 2007 results are improved over 2006 with 43 sites showing calibration failures in 2007 versus 50 sites in 2006.

Table 16 presents field accuracy results for 2007 based on instrument challenges performed using independent reference standards during site calibration visits. Each parameter was within its criterion with at least 90 percent frequency with the exception of relative humidity 85 percent, solar radiation, and wind direction north at 88.2, 89.1 and 88.0 percent, respectively. However, this did not adversely affect data collection because data are not considered invalid unless criteria are exceeded by more than two times the criterion. Using the two times standard, relative humidity >85 percent, solar radiation, and wind direction north passed with 95.0, 96.4 and 97.4 percent frequency, respectively.

Tables and Figures

Table 1. Level 3 Validated Data Available as of January 2008

Calibration Group*	Months Available	Number of Months	Complete Quarters**	Number of Quarters
1	July 2006 – June 2007	12	Quarter 3 2006 – Quarter 2 2007	4
2	August 2006 – July 2007	12	Quarter 4 2006 – Quarter 2 2007	3
3 [†]	September 2006 – August 2007	12	Quarter 4 2006 – Quarter 2 2007	3
4	October 2006 – September 2007	12	Quarter 4 2006 – Quarter 3 2007	4
5 [‡]	May 2006 – April 2007	12	Quarter 3 2006 – Quarter 1 2007	3

Note: * The sites contained in each calibration group are listed in Table 2.
 ** This column does not include Level 3 validated months that comprise only partial calendar quarters. This information is included primarily as a reference for Table 11.
[†] Contains MCK131/231, KY
[‡] Contains ROM206 of the ROM406/206 collocated pair

Table 2. Field Calibration Schedule

Calibration Group Number	Months Calibrated	Sites Calibrated			
1	January/July	SND152, AL GAS153, GA CDZ171, KY	BFT142, NC CND125, NC COW137, NC	PNF126, NC ESP127, TN SPD111, TN	PED108, VA VPI120, VA
2	February/August	CAD150, AR IRL141, FL SUM156, FL	BEL116, MD BWR139, MD CVL151, MS	WSP144, NJ CTH110, NY CHE185, OK	ARE128, PA PSU106, PA ALC188, TX
3	March/September	ALH157, IL BVL130, IL STK138, IL	VIN140, IN KNZ184, KS CKT136, KY	MCK131, KY MCK231, KY SAN189, NE	DCP114, OH OXF122, OH PRK134, WI
4	April/October	ABT147, CT SAL133, IN ASH135, ME HOW132, ME	ANA115, MI HOX148, MI UVL124, MI WST109, NH	CAT175, NY HWF187, NY LYK123, OH	EGB181, ON LYE145, VT*
5	May/November	CON186, CA ROM206, CO GTH161, CO	QAK172, OH KEF112, PA LRL117, PA	MKG113, PA PAL190, TX [†] CDR119, WV	PAR107, WV CNT169, WY PND165, WY

Note: * Site closed May 2007
[†] New site began sampling April 2007

Table 3. Data Quality Indicators for CASTNET Continuous Measurements

Measurement		Criteria*	
Parameter	Method	Precision	Accuracy
Wind Speed	Anemometer	± 0.5 m/s	The greater of ± 0.5 m/s for winds < 5 m/s or ± 5% for winds ≥ 5 m/s
Wind Direction	Wind Vane	± 5°	± 5°
Sigma Theta	Wind Vane	Undefined	Undefined
Relative Humidity	Thin Film Capacitor	± 10% (of full scale)	± 5%, rel. hum. > 85% ± 20%, rel. hum. ≤ 85%
Solar Radiation	Pyranometer	± 10% (of reading taken at local noon)	± 10%
Precipitation	Tipping Bucket Rain Gauge	± 10% (of reading)	± 0.05 inch [†]
Ambient Temperature	Platinum RTD	± 1.0°C	± 0.5°C
Delta Temperature	Platinum RTD	± 0.5°C	± 0.5°C
O ₃	UV Absorbance	± 10% (of reading)	± 10%
Filter Pack Flow	Mass Flow Controller	± 10%	± 5%
Surface Wetness	Conductivity Bridge	Undefined	Undefined

Note: °C = degrees Celsius
 m/s = meters per second
 rel. hum. = relative humidity
 RTD = resistance-temperature device
 UV = ultraviolet

* Precision criteria apply to collocated instruments, and accuracy criteria apply to calibration of instruments

† For target value of 0.50 inch

Table 4. Data Quality Indicators for CASTNET Laboratory Measurements

Analyte	Medium	Method	Precision ¹ (MARPD)	Accuracy ² (%)	Nominal Reporting Limits	
					mg/L	µg/Filter
Ammonium (NH ₄ ⁺)	F	AC	10	90 - 110	0.020 *	0.5
Sodium (Na ⁺)	F	ICP-AES	5	95 - 105	0.005	0.125
Potassium (K ⁺)	F	ICP-AES	5	95 - 105	0.006 †	0.125
Magnesium (Mg ²⁺)	F	ICP-AES	5	95 - 105	0.003	0.075
Calcium (Ca ²⁺)	F	ICP-AES	5	95 - 105	0.006 †	0.075
Chloride (Cl ⁻)	F	IC	5	95 - 105	0.020	0.5
Nitrate (NO ₃ ⁻)	F	IC	5	95 - 105	0.008 *	0.2
Sulfate (SO ₄ ²⁻)	F	IC	5	95 - 105	0.040	1.0

Note: ¹ This column lists precision goals for both network precision calculated from collocated filter samples and laboratory precision based on replicate samples. The goal for the ICP-AES precision RPD criterion changed from 10 percent to 5 percent at the onset of the new contract beginning on July 30, 2003. The precision criterion is applied as described below:

QC conditions: (v1 = initial response; v2 = replicate response; RL = nominal reporting limit)

Condition 1: if (v1 or v2 < RL and the absolute value of (v1 - v2) < RL) = OK

Condition 2: if (v1-v2) < RL and v1 < 5 x RL) = OK

Condition 3: if (v1 > 5*RL and RPD < 5%) = OK

Status: one of the conditions is OK = Precision QC Passes

² This column lists laboratory accuracy goals based on reference standards and continuing calibration verification spikes. The goal for the ICP-AES accuracy criterion changed from 90 – 110 percent to 95 – 105 percent for continuing calibration verification spikes at the onset of the new contract beginning on July 30, 2003. The criterion remains 90 – 110 percent for ICP-AES reference standards.

F = filter pack samples

AC = automated colorimetry

ICP-AES = inductively coupled plasma-atomic emission spectrometry

IC = ion chromatography

MARPD = mean absolute relative percent difference

* = as nitrogen

† = Effective September 26, 2007 changed to 0.006 mg/L from 0.003 mg/L for calcium and 0.005 mg/L for potassium.

For more information on analytical methods and associated precision and accuracy criteria, see the CASTNET QAPP, Revision 4.0 (MACTEC, 2007).

Table 5. QC Analysis Count for First Quarter 2007

Filter Type	Parameter	RF Sample Count	CCV Sample Count	RP Sample Count	MB Sample Count	LB Sample Count	FB Sample Count
Teflon®	SO ₄ ²⁻	44	188	81	17	16	43
	NO ₃ ⁻	44	188	81	17	16	43
	NH ₄ ⁺	38	181	87	19	20	43
	Cl ⁻	44	188	81	17	16	42
	Ca ²⁺	34	178	82	17	16	42
	Mg ²⁺	34	178	82	17	16	42
	Na ⁺	34	178	82	17	16	42
	K ⁺	34	178	82	17	16	43
Nylon	SO ₄ ²⁻	38	169	79	19	16	43
	NO ₃ ⁻	38	169	79	19	16	43
Cellulose	SO ₄ ²⁻	46	176	68	23	18	61

Table 6. QC Analysis Count for Second Quarter 2007

Filter Type	Parameter	RF Sample Count	CCV Sample Count	RP Sample Count	MB Sample Count	LB Sample Count	FB Sample Count
Teflon®	SO ₄ ²⁻	32	165	75	16	18	84
	NO ₃ ⁻	32	165	75	16	18	84
	NH ₄ ⁺	32	160	73	16	18	84
	Cl ⁻	32	165	75	16	18	84
	Ca ²⁺	32	166	77	16	18	84
	Mg ²⁺	32	166	77	16	18	84
	Na ⁺	32	166	77	16	18	84
	K ⁺	32	166	77	16	18	84
Nylon	SO ₄ ²⁻	31	156	70	15	22	84
	NO ₃ ⁻	31	156	70	15	22	84
Cellulose	SO ₄ ²⁻	42	160	61	21	22	84

Table 7. QC Analysis Count for Third Quarter 2007

Filter Type	Parameter	RF Sample Count	CCV Sample Count	RP Sample Count	MB Sample Count	LB Sample Count	FB Sample Count
Teflon®	SO ₄ ²⁻	37	183	84	18	24	84
	NO ₃ ⁻	37	183	84	18	24	84
	NH ₄ ⁺	36	185	79	18	24	86
	Cl ⁻	37	183	84	18	24	84
	Ca ²⁺	36	186	83	18	24	84
	Mg ²⁺	36	186	83	18	24	84
	Na ⁺	36	186	83	18	24	84
	K ⁺	36	186	83	18	24	84
Nylon	SO ₄ ²⁻	38	191	87	19	26	87
	NO ₃ ⁻	38	191	87	19	26	87
Cellulose	SO ₄ ²⁻	49	190	72	25	26	87

Table 8. QC Analysis Count for Fourth Quarter 2007

Filter Type	Parameter	RF Sample Count	CCV Sample Count	RP Sample Count	MB Sample Count	LB Sample Count	FB Sample Count
Teflon®	SO ₄ ²⁻	35	170	77	16	26	85
	NO ₃ ⁻	35	170	77	16	26	85
	NH ₄ ⁺	32	163	69	16	26	84
	Cl ⁻	35	170	77	16	26	85
	Ca ²⁺	32	172	77	16	26	85
	Mg ²⁺	32	172	77	16	26	85
	Na ⁺	32	172	77	16	26	85
	K ⁺	32	172	77	16	26	85
Nylon	SO ₄ ²⁻	38	178	81	19	26	85
	NO ₃ ⁻	38	178	81	19	26	85
Cellulose	SO ₄ ²⁻	44	171	66	22	24	86

Table 9. Filter Pack Receipt Summary (2007)

Description	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Summary
Count of samples received more than 14 days after removal from tower:	28	13	10	16	67
Count of all samples received:	793	783	719	750	3,045
Fraction of samples received within 14 days:	0.965	0.983	0.986	0.979	*0.978
Average interval in days:	5.74	5.06	5.22	5.51	*5.38
First receipt date:	01/03/2007	04/02/2007	07/02/2007	10/01/2007	01/03/2007
Last receipt date:	03/30/2007	06/29/2007	09/28/2007	12/31/2007	12/31/2007

Note: *annual average

Table 10. Filter Pack QC Summary for 2007

Filter Type	Parameter	Reference Sample ¹ Recovery (%R)			Continuing Calibration Verification Samples (%R)			In-Run Replicate ² (RPD)		
		Mean	Std. Dev.	Count ³	Mean	Std. Dev.	Count ³	Mean	Std. Dev.	Count ³
		Teflon [®]	SO ₄ ²⁻	99.79	1.64	154	100.11	1.07	809	0.60
	NO ₃ ⁻	101.71	1.40	154	99.68	1.14	809	1.20	1.98	332
	NH ₄ ⁺	100.08	2.41	118	99.82	2.09	649	0.63	1.04	269
	Ca ²⁺	100.42	2.91	140	100.75	1.28	805	2.02	3.33	334
	Mg ²⁺	100.70	1.16	140	99.99	0.89	805	1.99	2.11	334
	Na ⁺	97.01	2.11	140	100.12	1.15	805	1.59	2.02	334
	K ⁺	98.04	2.91	140	100.21	1.09	805	3.09	3.79	334
	Cl ⁻	100.82	1.50	154	99.83	2.19	809	1.31	1.91	332
Nylon	SO ₄ ²⁻	100.61	1.32	151	98.90	2.11	798	1.27	1.65	331
	NO ₃ ⁻	99.47	1.73	151	98.76	2.50	798	0.80	1.45	331
Cellulose	SO ₄ ²⁻	101.64	1.51	187	99.28	1.71	809	3.16	5.33	274

Note: % R = percent recovery
RPD = relative percent difference

- ¹ Results of reference sample analyses provide accuracy estimates
- ² Results of replicate analyses provide precision estimates
- ³ Number of QC Samples

Table 11. Precision Results for Third Quarter 2006 through Second Quarter 2007

Site Pairs	SO ₄ ²⁻	NO ₃ ⁻	NH ₄ ⁺	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Cl ⁻	HNO ₃	SO ₂	Total NO ₃ ⁻
MCK 131/231, KY											
2006 Q4	1.96	6.30	4.03	8.33	6.61	4.00	5.09	5.05	2.74	2.86	2.89
2007 Q1	3.76	7.24	6.19	12.72	9.04	8.77	6.57	20.70	5.43	3.31	5.78
2007 Q2	1.67	8.71	1.94	6.15	6.85	3.34	8.37	2.13	3.59	1.39	4.17
Average	2.46	7.42	4.05	9.07	7.50	5.37	6.68	9.29	3.92	2.52	4.28
ROM 406/206, CO											
2006 Q3	11.15	17.62	9.06	14.99	13.89	17.67	14.56	2.90	8.82	18.85	8.00
2006 Q4	9.61	13.16	20.30	10.71	11.77	14.26	16.27	2.98	13.59	16.40	10.72
2007 Q1	7.96	9.15	4.64	6.38	5.82	4.42	12.94	16.64	3.44	10.70	4.22
Average	9.57	13.31	11.33	10.69	10.49	12.12	14.59	7.51	8.62	15.32	7.65

Note: 40 site-quarter-parameters were outside criterion when results were rounded to whole numbers.

Table 12. Summary of Filter Blanks for 2007 (page 1 of 2)

Parameter Name	Detection Limit Total µg	Total Number	Number > Detection Limit	Average Total µg	Average Absolute Deviation	Maximum Total µg
FIELD BLANKS						
Teflon [®] -NH ₄ ⁺ -N	0.50	341	1	0.754	0.000	0.515
Teflon [®] - NO ₃ ⁻ -N	0.20	340	13	0.203	0.006	0.423
Teflon [®] - SO ₄ ²⁻	1.00	340	0	1.000	0.000	1.000
Cl ⁻	0.50	340	1	0.507	0.013	2.790
*Ca ²⁺	0.075	340	26	0.106	0.037	0.251
Mg ²⁺	0.075	340	0	0.075	0.000	0.075
Na ⁺	0.125	340	4	0.130	0.009	1.230
*K ⁺	0.125	340	4	0.135	0.012	0.177
Nylon- NO ₃ ⁻ -N	0.20	342	0	0.200	0.000	0.200
Nylon - SO ₄ ²⁻	1.00	342	33	1.012	0.021	2.000
Cellulose - SO ₄ ²⁻	2.00	358	138	2.313	0.405	4.550
LABORATORY BLANKS						
Teflon [®] -NH ₄ ⁺ -N	0.50	96	0	0.792	0.000	0.500
Teflon [®] - NO ₃ ⁻ -N	0.20	92	3	0.205	0.010	0.468
Teflon [®] - SO ₄ ²⁻	1.00	92	0	1.000	0.000	1.000
Cl ⁻	0.50	92	0	0.500	0.000	0.500
*Ca ²⁺	0.075	92	3	0.101	0.037	0.520
Mg ²⁺	0.075	92	0	0.075	0.000	0.075
Na ⁺	0.125	92	0	0.125	0.000	0.125
*K ⁺	0.125	92	0	0.132	0.010	0.150
Nylon- NO ₃ ⁻ -N	0.20	96	0	0.200	0.000	0.500
Nylon -SO ₄ ²⁻	1.00	96	3	1.006	0.012	1.300
Cellulose -SO ₄ ²⁻	2.00	96	32	2.250	0.344	4.050
METHOD BLANKS						
Teflon [®] -NH ₄ ⁺ -N	0.50	72	0	0.500	0	0.500
Teflon [®] - NO ₃ ⁻ -N	0.20	70	0	0.200	0	0.200
Teflon [®] - SO ₄ ²⁻	1.00	70	0	1.000	0	1.000
Cl ⁻	0.50	70	0	0.500	0	0.500
*Ca ²⁺	0.075	70	0	0.093	0	0.150
Mg ²⁺	0.075	70	0	0.075	0	0.075
Na ⁺	0.125	70	0	0.125	0	0.125
*K ⁺	0.125	70	0	0.131	0	0.150
Nylon- NO ₃ ⁻ -N	0.20	75	0	0.200	0	0.200
Nylon -SO ₄ ²⁻	1.00	75	0	1.000	0	1.000
Cellulose -SO ₄ ²⁻	2.00	94	0	2.000	0	2.000

Table 12. Summary of Filter Blanks for 2007 (page 2 of 2)

Parameter Name	Detection Limit Total µg	Total Number	Number > Detection Limit	Average Total µg	Average Absolute Deviation	Maximum Total µg
ACCEPTANCE TEST VALUES						
Teflon®-NH ₄ ⁺ -N	0.50	426	0	0.500	0	0.500
Teflon® - NO ₃ -N	0.20	426	6	0.201	0	0.350
Teflon® - SO ₄ ²⁻	1.00	426	0	1.000	0	1.000
Cl ⁻	0.50	426	0	0.500	0	0.500
* Ca ²⁺	0.075	426	3	0.084	0	0.150
Mg ²⁺	0.075	426	0	0.075	0	0.075
Na ⁺	0.125	426	0	0.125	0	0.723
* K ⁺	0.125	426	0	0.128	0	0.150
Nylon- NO ₃ -N	0.20	285	0	0.200	0	0.200
Nylon -SO ₄ ²⁻	1.00	285	1	1.000	0	1.000
Cellulose -SO ₄ ²⁻	2.00	377	19	2.102	0	2.000

Note: Cellulose filters are not analyzed for ambient NO₃⁻. The blank results are used only for QC.

* = Effective September 26, 2007 changed to 0.006 mg/L from 0.003 mg/L for calcium and 0.005 mg/L for potassium. This affects average and maximum values.

Table 13. Filter Packs Flagged as Suspect or Invalid

Site ID	Sample	Flag	Reason
First Quarter 2007			
ALH157, IL	0703001-04	Invalid	Insufficient flow volume
CTH110, NY	0710001-25	Invalid	Insufficient flow volume
IRL141, FL	0702001-44	Invalid	Insufficient flow volume
	0710001-44	Invalid	Insufficient flow volume
KEF112, PA	0711001-46	Invalid	Insufficient flow volume
LYE145, VT	0701001-50	Invalid	Insufficient flow volume
	0706001-50	Invalid	Insufficient flow volume
PNF126, NC	0705001-65	Invalid	Insufficient flow volume
SAN189, NE	0710001-88	Invalid	Insufficient flow volume
SUM156, FL	0706001-77	Invalid	Insufficient flow volume
VPI120, VA	0709001-82	Invalid	Insufficient flow volume
Second Quarter 2007			
COW137, NC	0721007-24	Invalid	Insufficient flow volume
EGB181, ON	0717001-30	Invalid	Insufficient flow volume
	0718001-30	Invalid	Insufficient flow volume
	0719001-30	Invalid	Insufficient flow volume
OXF122, OH	0714001-59	Invalid	Insufficient flow volume
SPD111, TN	0714001-75	Invalid	Insufficient flow volume
Third Quarter 2007			
CKT136, KY	07290001-20	Invalid	Insufficient flow volume
	07330001-20	Invalid	Insufficient flow volume
EGB181, ON	07290001-30	Invalid	Data logger problem
	07300001-30	Invalid	Data logger problem
	07320001-30	Invalid	Data logger problem
SUM156, FL	07320001-77	Invalid	Insufficient flow volume
	07330001-77	Invalid	Insufficient flow volume
Fourth Quarter 2007			
CAT175, NY	0746001-15	Invalid	Insufficient flow volume
PRK134, WI	0741001-66	Invalid	Insufficient flow volume
WSP144, NJ	0743001-84	Invalid	Insufficient flow volume
VPI120, VA	0743001-82	Invalid	Insufficient flow volume

Table 14. Field Problems Affecting Data Collection

Days to Resolution	Problem Count
First Quarter 2007	
30	94
60	19
90	6
Unresolved by End of Quarter	22
Second Quarter 2007	
30	122
60	26
90	3
Unresolved by End of Quarter	8
Third Quarter 2007	
30	115
60	8
90	0
Unresolved by End of Quarter	3
Fourth Quarter 2007	
30	102
60	14
90	0
Unresolved by Date of Publication	10

Table 15. Field Calibration Failures by Parameter for 2007

Site ID	Parameter(s)
First Quarter 2007	
ARE128, PA	Ozone
BEL116, MD	Flow Rate
CDZ171, KY	Temperature Solar Radiation Wind Direction
CHE185, OK	Solar Radiation
CND125, NC	Solar Radiation
COW137, NC	Relative Humidity Solar Radiation
GAS153, GA	Wind Direction
PNF126, NC	Relative Humidity Solar Radiation Wind Direction
SPD111, TN	Relative Humidity
SUM156, FL	Solar Radiation
VPI120, VA	Temperature
Second Quarter 2007	
ANA115, MI	Wind Direction
CNT169, WY	Temperature
EGB181, ON	Relative Humidity
HOW132, ME	Relative Humidity
HWF187, NY	Solar Radiation
LYE145, VT	Wind Direction
LYK123, OH	Wind Direction
QAK172, OH	Solar Radiation
SAL133, IN	Wind Direction
Third Quarter 2007	
ALC188, TX	Wind Direction
BEL116, MD	Relative Humidity
BFT142, NC	Flow Rate
BWR139, MD	Wind Direction
CND125, NC	Precipitation
COW137, NC	Precipitation
CTH110, NY	Wind Direction
GAS153, GA	Ozone Relative Humidity Wind Direction

Site ID	Parameter(s)
Third Quarter 2007 (continued)	
PNF126, NC	Flow Rate Wind Direction
PSU106, PA	Vector Wind Speed Scalar Wind Speed
SND152, AL	Relative Humidity Wind Direction
SPD111, TN	Delta Temperature Temperature
SUM156, FL	Relative Humidity
WSP144, NJ	Relative Humidity
Fourth Quarter 2007	
ANA115, MI	Ozone
ASH135, ME	Wind Direction
CAT175, NY	Solar Radiation
HOW132, ME	Wind Direction
HOX148, MI	Relative Humidity
KEF112, PA	Wind Direction
ROM206, CO	Wind Direction
UVL124, MI	Wind Direction Scalar Wind Speed
WST109, NH	Wind Direction

Note: Per CASTNET project protocols, data are flagged as “suspect” (S) but still considered valid if the calibration criterion is not exceeded by more than its magnitude (i.e., if within 2x the criterion). If ozone or flow calibrations fall within 2x the criteria, these data are adjusted per approved protocol described in the CASTNET QAPP, Revision 4.0 (MACTEC, 2007).

Table 16. Accuracy Results for 2007 Field Measurements

Parameter	Percent Within Criterion
Temperature (0°C)	98.3 percent
Temperature (ambient)	97.4 percent
Delta Temperature (0°C)	99.1 percent
Delta Temperature (ambient)	98.0 percent
*Relative Humidity > 85%	88.2 percent
Relative Humidity ≤ 50%	98.3 percent
*Solar Radiation	89.1 percent
*Wind Direction North	88.0 percent
Wind Direction South	95.7 percent
Wind Speed < 5 m/s	100.0 percent
Wind Speed ≥ 5 m/s	94.8 percent
Precipitation	100.0 percent
Wetness (w/in 0.5 volts)	100.0 percent
Ozone Slope	98.1 percent
Ozone Intercept	99.1 percent
Flow Rate	95.8 percent

Note: °C = degrees Celsius.
 m/s = meters per second.
 * = Per CASTNET project protocols, data are flagged as “suspect” (S) but still considered valid if the calibration criterion is not exceeded by more than its magnitude (i.e., if within 2x the criterion). The percentages within 2x criterion for relative humidity > 85% , Solar Radiation and Wind Direction North were 95.0 percent, 96.4 percent and 97.4 percent, respectively.

Figure 1. Reference Standard Results for Fourth Quarter 2007 (percent recovery)

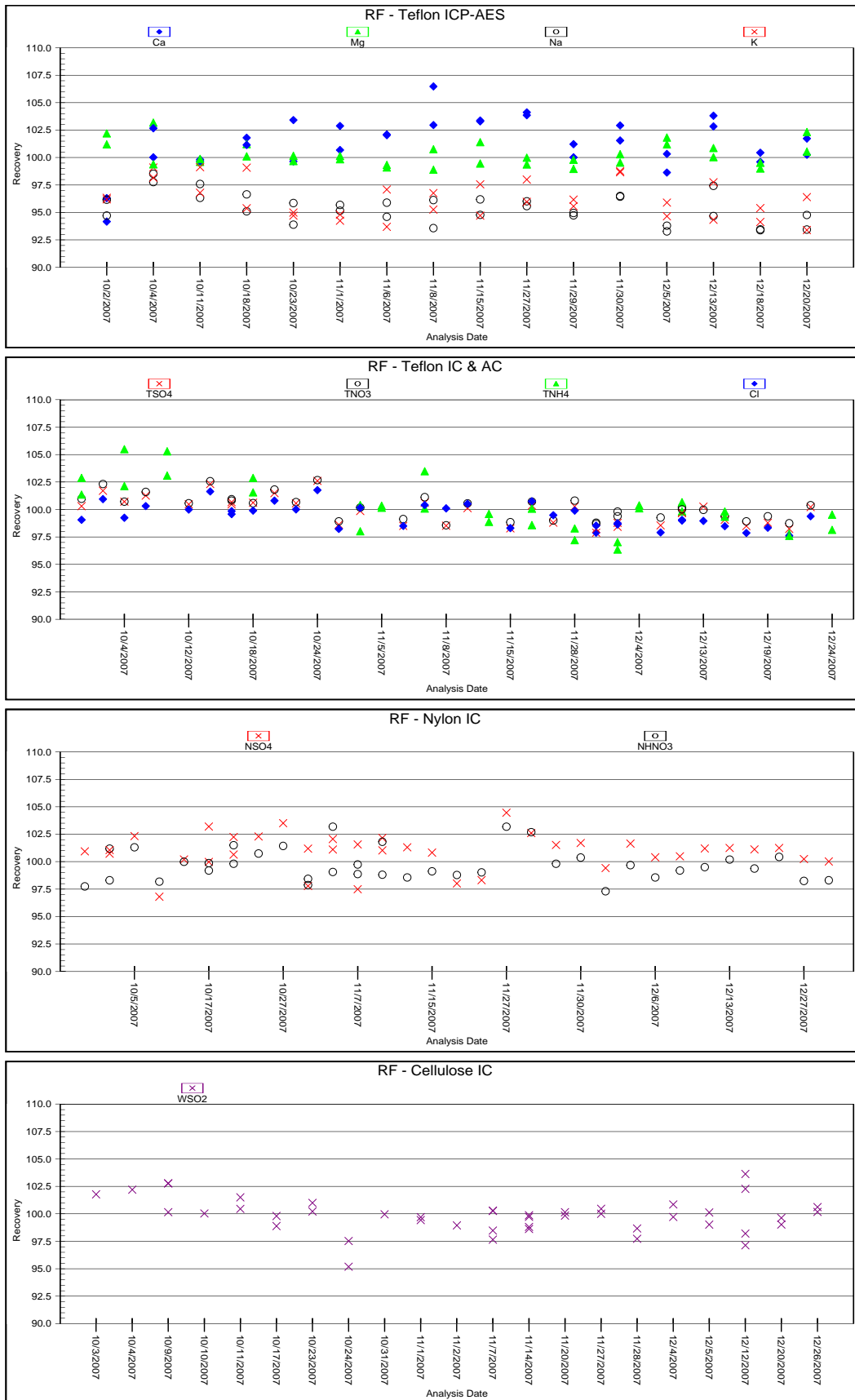


Figure 2. Continuing Calibration Spike Results for Fourth Quarter 2007 (percent recovery)

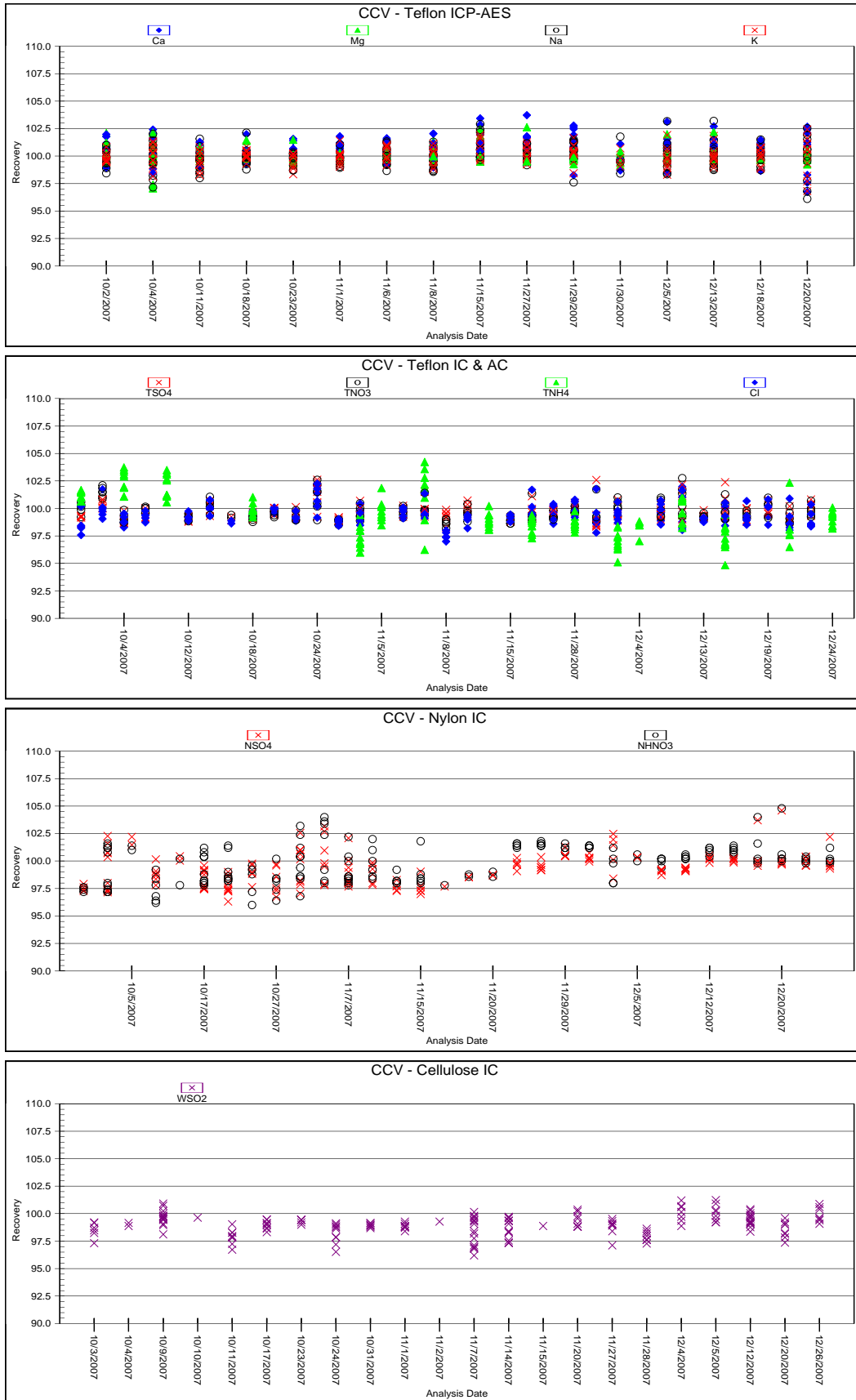


Figure 3. Replicate Sample Analysis Results for Fourth Quarter 2007 (total micrograms)

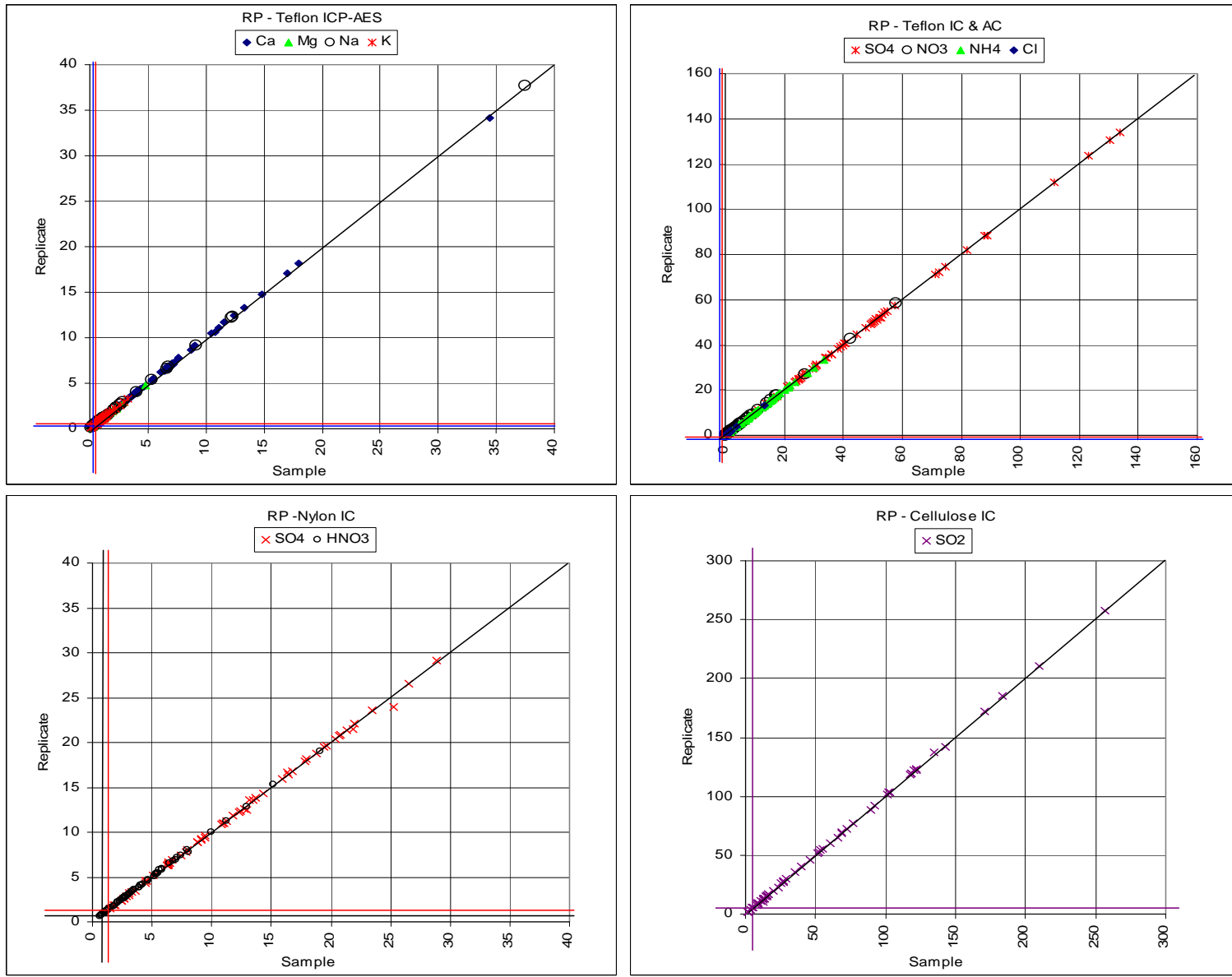
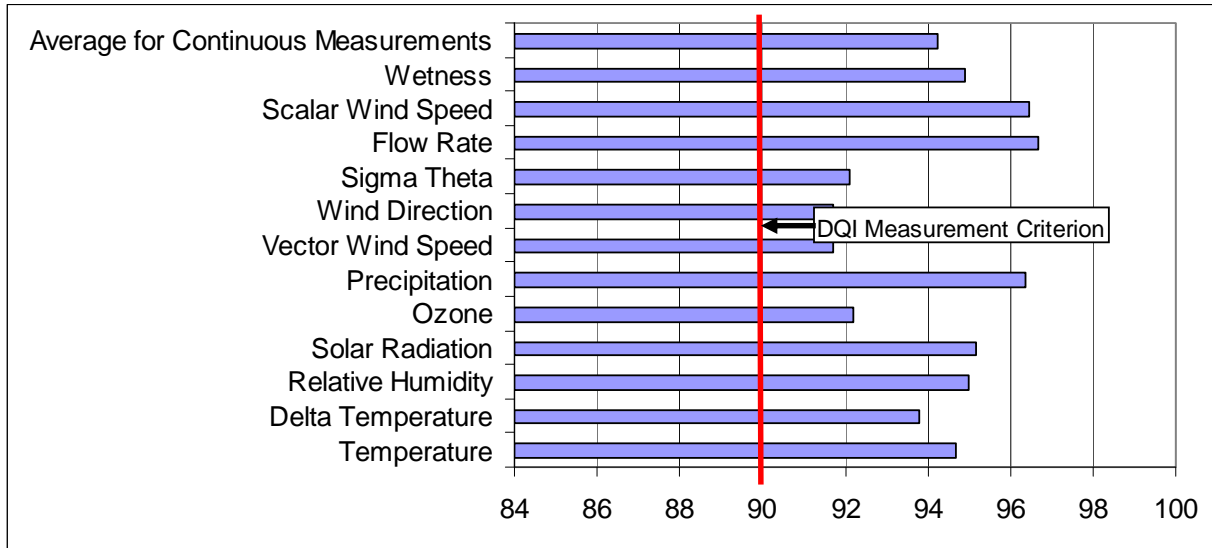


Figure 4. Percent Completeness of Measurements for Third Quarter 2006 through Third Quarter 2007*



Note: *Presents Level 3 data available during the 2007 calendar year.

Figure 5. Laboratory Control Sample Results for Fourth Quarter 2007 (percent recovery)

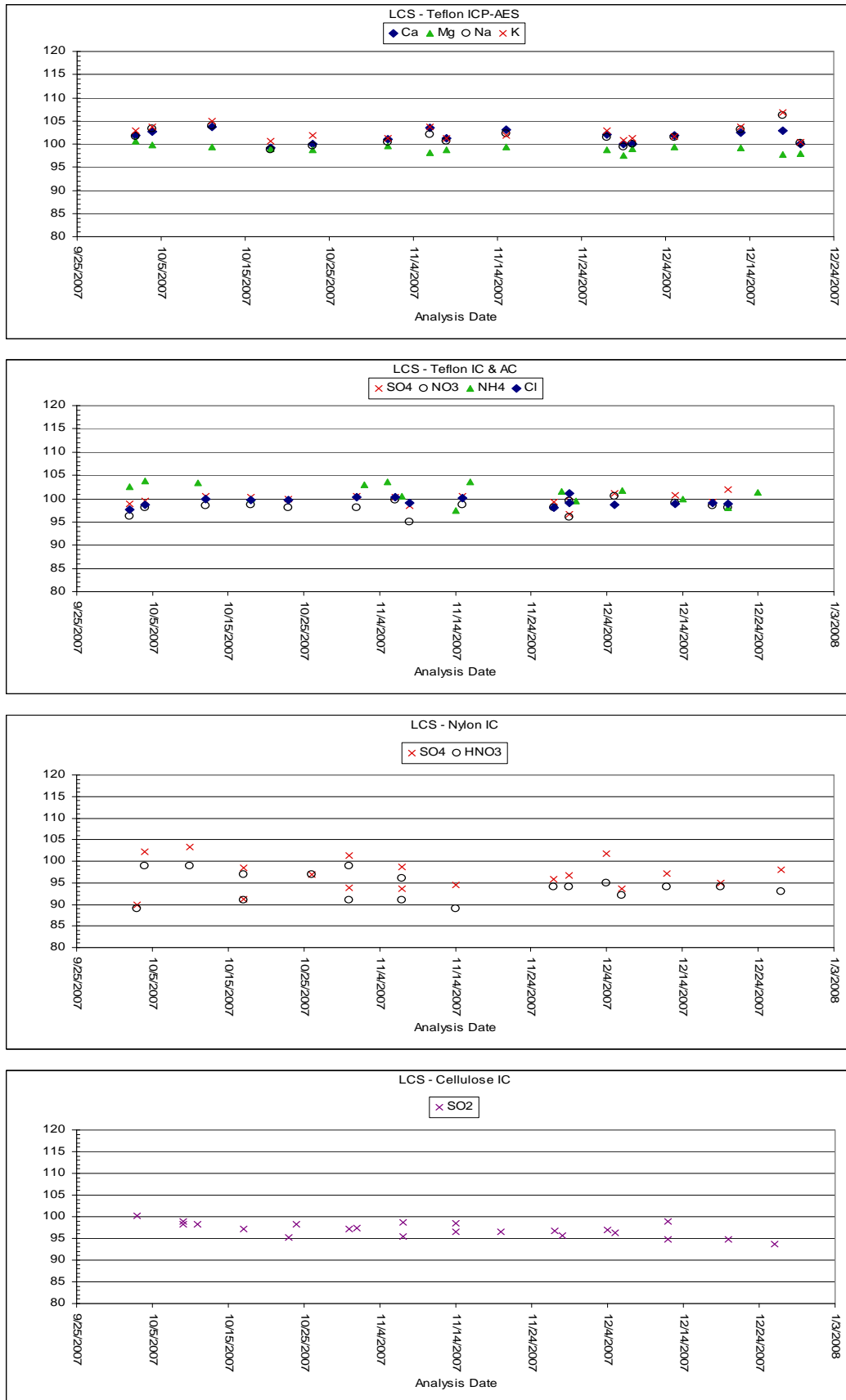


Figure 6. Method Blank Analysis Results for Fourth Quarter 2007 (total micrograms)

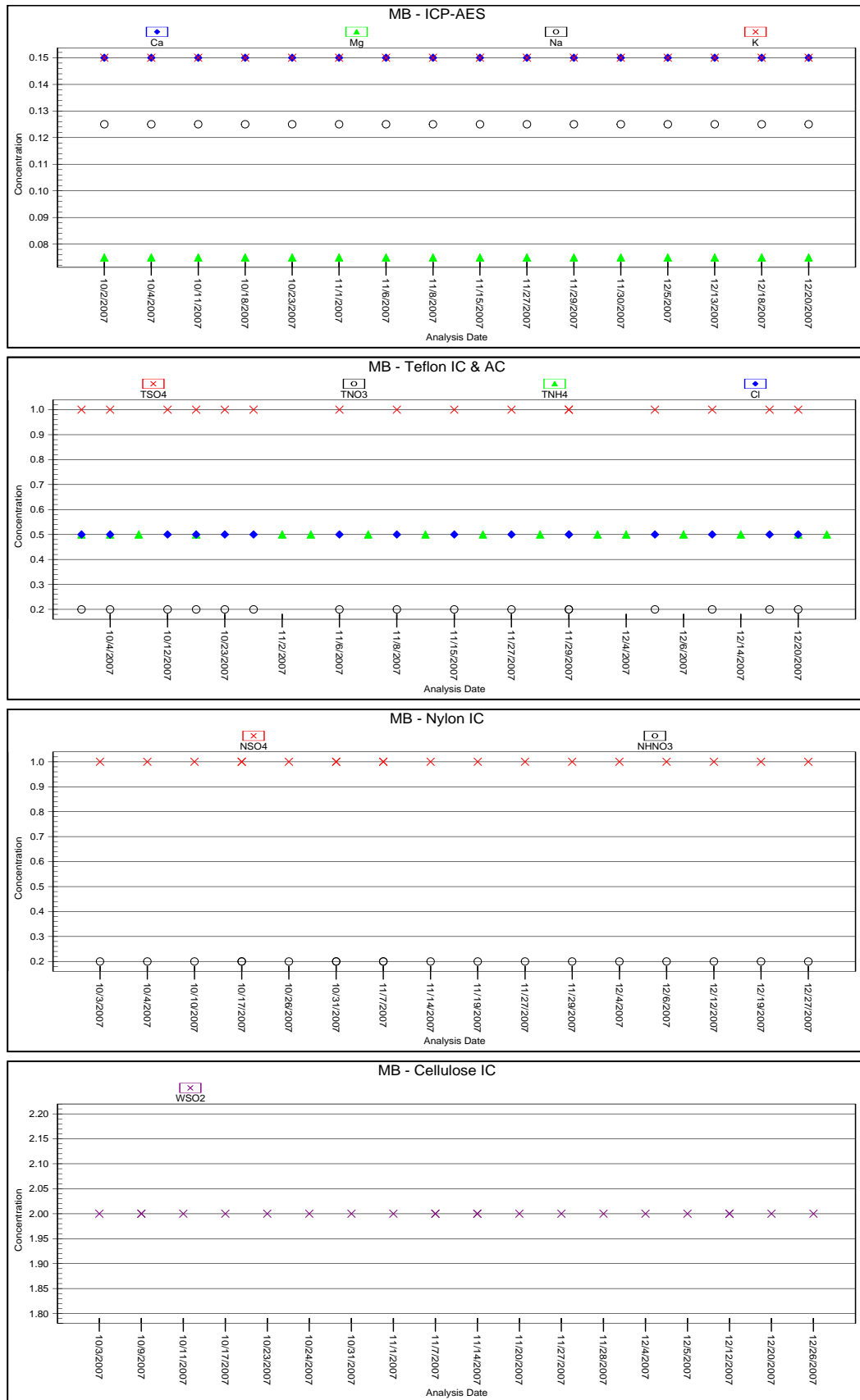


Figure 7. Laboratory Blank Analysis Results for Fourth Quarter 2007 (total micrograms)

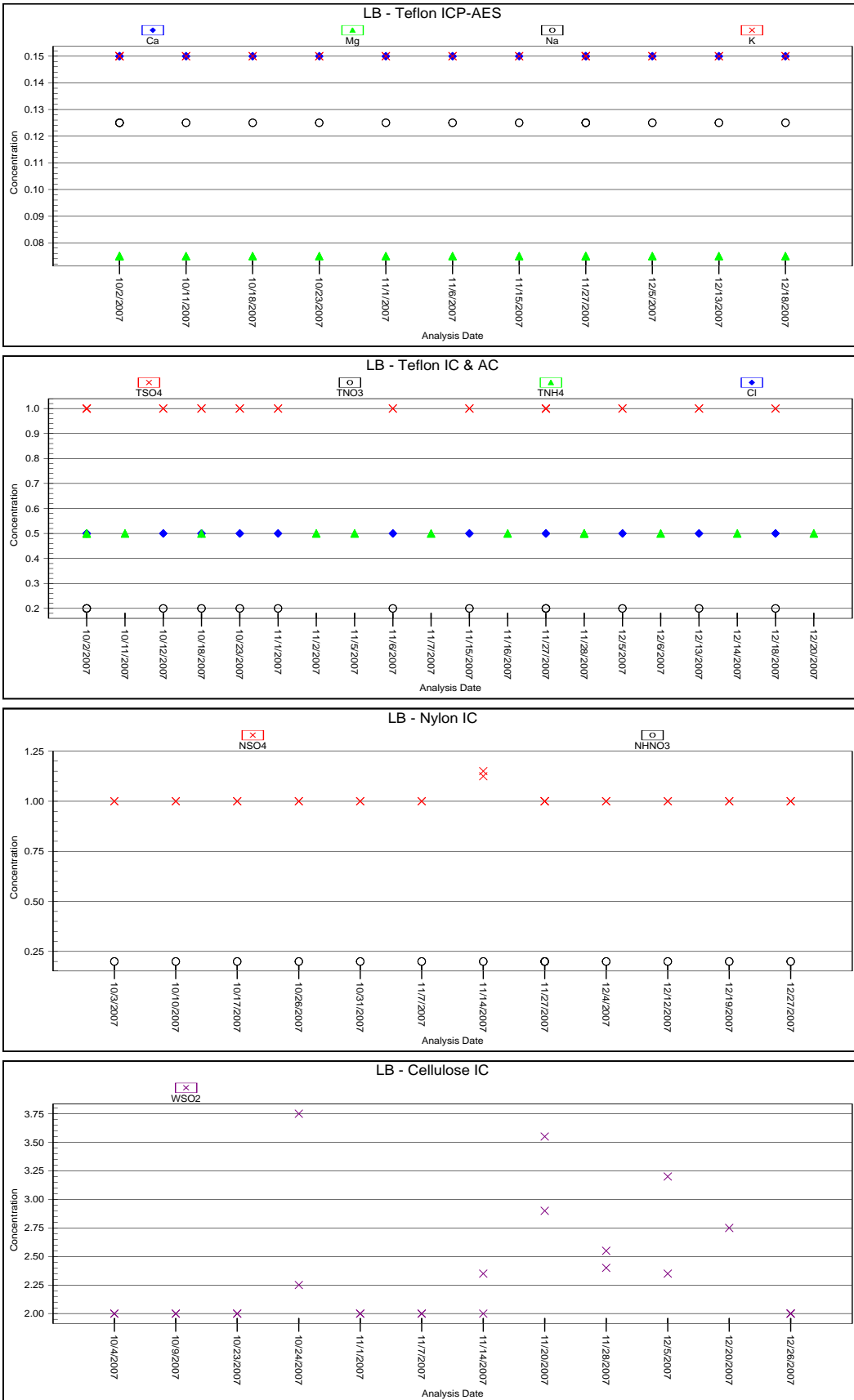


Figure 8. Field Blank Analysis Results for Fourth Quarter 2007 (total micrograms)

