



Summary of Quarterly Operations (January through March)

EPA Contract No. EP-W-15-003

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 first quarter 2016. The various QA/QC criteria and policies are documented in the CASTNET Quality Assurance Project Plan (QAPP; Amec Foster Wheeler, 2014). The QAPP is comprehensive and includes standards and policies for all components of project operation from site selection through final data reporting. It is reviewed annually and updated as warranted.

Quarterly Summary

The annual management review meeting in support of maintaining International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17025:2005 accreditation by the American Association for Laboratory Accreditation (A2LA) was held in early January 2016. The meeting participants discussed the annual management review report distributed to the management group in December 2015. The agenda covered discussion of the status of the program as well as program goals for 2015 and 2016.

During review of third quarter 2015 filter pack sulfur dioxide (SO₂) concentrations in January 2016, as part of the preparation of the CASTNET Third Quarter 2015 Data Report, it became apparent that aggregates of the SO₂ data for the eastern reference sites were not reasonable when compared with long-term third quarter time series. Amec Foster Wheeler immediately began evaluating possible causes of the anomalous measurements. The EPA Contract-level Project Officer was notified as per ISO 17025 management system protocol. After this discussion, Amec Foster Wheeler removed the SO₂-related discussions from the third quarter report and worked with EPA to remove these data from the publicly available database. The cause of the anomalous measurements correlates with the laboratory's change to a different supplier of the reagent used to prepare the cellulose filter impregnation solution. This supplier was used for filter pack samples that ran from mid-May through December 2015. The prepared impregnation solutions passed acceptance testing prior to use. The cellulose filter extracts were tested for elevated

nitrate (NO_3^-) concentrations as well as sulfate (SO_4^{2-}) concentrations to see if something was enhancing conductivity responses for detected analytes. Amec Foster Wheeler's laboratory re-analyzed previously exposed samples from selected eastern and northeastern CASTNET sites. Samples from June through September show higher NO_3^- , which was not seen in previously exposed samples that used reagent from the usual supplier. Amec Foster Wheeler began running statistical analyses for further evaluation of the Teflon and nylon filter SO_4^{2-} concentrations. While some of these tests seem to indicate a suspect reagent, they are not conclusive. The investigation to determine root cause is, therefore, ongoing. Amec Foster Wheeler is also evaluating additional acceptance procedures for new suppliers and screening procedures to facilitate early identification of results that are anomalous in comparison with historical trends.

Data from the 9-meter temperature sensor at the CKT136, KY site were suspect for 6 to 12 months. Amec Foster Wheeler reviewed data from the site and determined that six months of data need to be invalidated. The remaining six months can be rescaled.

Amec Foster Wheeler received final results for analyses submitted for proficiency test (PT) study 0107 for Rain and Soft Waters from the National Laboratory of Environmental Testing (NLET), a branch of the National Water Research Institute (NWRI) with Environment Canada that provides quality assurance services. One ammonia sample was flagged "warning high." Ammonia and sulfate results were "biased high." These ratings require no formal corrective actions under the requirements of accreditation¹. All other results were rated as "ideal." Amec Foster Wheeler's overall laboratory rating remains "very good."

During first quarter 2016, two subcontractors were subject to corrective action for their failure to properly verify operation of site equipment (erroneous entry of temperature calibration factors at CKT136, KY and failure to maintain specified operating temperatures during ozone instrument reverification at CVL151, MS).

Table 1 lists the quarters of data that were validated to Level 3 during first quarter 2016 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 laboratory filter pack measurements. These criteria apply to the QC samples listed in the following section of this report. Table 4

¹ Formal corrective actions are required for:

- ◆ Individual test results that are greater than 3σ from the assigned value.
- ◆ Youden average rank for a parameter outside of the 95 percent confidence interval of the overall rank with a bias percent slope greater than an absolute value of 5.
- ◆ Consecutive study results for the same parameter with Youden average rank outside of the 95 percent confidence interval of the overall rank without regard to bias percent slope.
- ◆ Three or more parameters with Youden average rank outside of the 95 percent confidence interval of the overall rank in a single study without regard to bias percent slope.

presents the critical criteria for ozone monitoring. Table 5 presents the critical criteria for trace-level gas monitoring.

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. Table 6 presents the number of analyses in each category that were performed during first quarter 2016.

Sample Receipt Statistics

Ninety-five 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 7 presents the relevant sample receipt statistics for first quarter 2016.

Data Quality Indicator (DQI) Results

Figures 1 through 3 present the results of RF, CCV, and RP QC sample analyses for first quarter 2016. All results were within the criteria listed in Table 3².

Table 8 presents summary statistics of critical criteria measurements at ozone sites collected during first quarter 2016. The statistics presented contain data validated at Level 2 and Level 3. All data associated with QC checks that fail to meet the criteria listed in Table 4 were or will be invalidated unless the cause of failure has no affect on ambient data collection, and passing results still meet frequency criteria. Results in shaded cells either exceed documented criteria or are otherwise notable. Table 9 presents observations associated with the shaded cell results in Table 8.

Table 10 presents summary statistics of critical criteria measurements at trace-level gas monitoring sites collected during first quarter 2016. The statistics presented contain data validated at Level 2 and Level 3. All data associated with QC checks that fail to meet the criteria listed in Table 5 were or will be invalidated unless the cause of failure has no affect on ambient data collection, and passing results still meet frequency criteria. Results in shaded cells either exceed documented criteria or are otherwise notable. Table 11 presents observations associated with the shaded cell results in Table 10.

² The highest value depicted in Figure 3 is 20.4 percent. This is within criteria per the established rounding rules.

Laboratory Control Sample Analysis

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. Figure 4 presents LCS analysis results for first quarter 2016. All recovery values were between 85 percent and 120 percent.

Blank Results

Figures 5 through 7 present the results of MB, LB, and FB QC sample analyses for first quarter 2016. All first quarter results were within criteria (two times the reporting limit) listed in Table 3 with the exception of one Teflon FB sample with potassium at 16 times the reporting limit. All other QC results associated with this sample were within criteria. Sample results from THR422, ND, the associated site, were within the expected range for the site and season.

Suspect/Invalid Filter Pack Samples

Filter pack samples that were flagged as suspect or invalid during first quarter 2016 are listed in Table 12. This table also includes associated site identification and a brief description of the reason the sample was flagged. During first quarter, 21 filter pack samples were invalidated.

Field Problem Count

Table 13 presents counts of field problems affecting continuous data collection for more than one day for first quarter 2016. 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.

References

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler). 2014. *Clean Air Status and Trends Network (CASTNET) Quality Assurance Project Plan (QAPP) Revision 8.2*. Prepared for U.S. Environmental Protection Agency (EPA), Office of Air and Radiation, Clean Air Markets Division, Washington, DC. Contract No. EP-W-15-003. Gainesville, FL. <https://java.epa.gov/castnet/documents.do>.

American Society for Testing and Materials (ASTM). 2008. *ASTM E29-08, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*. ASTM International, West Conshohocken, PA, DOI:10.1520/E0029-08. www.astm.org.

U.S. Environmental Protection Agency (EPA). 2015. Appendix A to Part 58 – Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS), Special Purpose Monitors (SPMs), and Prevention of Significant Deterioration (PSD) Air Monitoring. 40 *CFR* Part 58.

Table 1 Data Validated to Level 3 during First Quarter 2016

Calibration Group*	Months Available	Number of Months	Complete Quarters	Number of Quarters
E-3/W-10 [†]	May 2015 – October 2015	6	Quarter 3 2015	1
SE-4/MW-6 [‡]	July 2015 – December 2015	6	Quarter 3 2015 – Quarter 4 2015	2

Notes:* The sites contained in each calibration group are listed in Table 2.

[†] Contains ROM206 of the ROM406/ROM206 collocated pair

[‡] Contains MCK131/231 collocated pair

Table 2 Field Calibration Schedule for 2016

Calibration Group	Months Calibrated	Sites Calibrated			
Eastern Sites (24 Total)					
E-1 (8 Sites)	February/August	BEL116, MD BWR139, MD	WSP144, NJ CTH110, NY	ARE 128, PA PSU106, PA	PED108, VA VPI120, VA
E-2 (11 Sites)	April/October	ABT147, CT ASH135, ME HOW191, ME	WST109, NH CAT175, NY HWF187, NY	NIC001, NY WFM007, NY WFM105, NY	EGB181, ON UND002, VT
E-3 (5 Sites)	May/November	KEF112, PA MKG113, PA	LRL117, PA PAR107, WV	CDR119, WV	
Southeastern Sites (11 Total)					
SE-4 (7 Sites)	January/July	SND152, AL GAS153, GA	BFT142, NC CND125, NC	COW005, NC COW137, NC	SPD111, TN
SE-5 (4 Sites)	February/August	CAD150, AR CVL151, MS	IRL141, FL SUM156, FL		
Midwestern Sites (19 Total)					
MW-6 (6 Sites)	January/July	CDZ171, KY CKT136, KY	MCK131, KY MCK231, KY	PNF126, NC ESP127, TN	
MW-7 (9 Sites)	March/September	ALH157, IL BVL130, IL STK138, IL	VIN140, IN RED004, MN DCP114, OH	OXF122, OH QAK172, OH PRK134, WI	
MW-8 (4 Sites)	April/October	SAL133, IN HOX148, MI	ANA115, MI UVL124, MI		
Western Sites (11 Total)					
W-9 (5 Sites)	March/September	KNZ184, KS KIC003, KS	CHE185, OK SAN189, NE	ALC188, TX	
W-10 (6 Sites)	May/November	GTH161, CO ROM206, CO	NPT006, ID CNT169, WY	PND165, WY PAL190, TX	

Table 3 Data Quality Indicators for CASTNET Laboratory Measurements

Analyte	Method	Precision ¹ (MARPD)	Accuracy ² (%)	Nominal Reporting Limits	
				mg/L	µg/Filter
Ammonium (NH ₄ ⁺)	AC	20	90 – 110	0.020*	0.5
Sodium (Na ⁺)	ICP-OES	20	95 – 105	0.005	0.125
Potassium (K ⁺)	ICP-OES	20	95 – 105	0.006	0.15
Magnesium (Mg ²⁺)	ICP-OES	20	95 – 105	0.003	0.075
Calcium (Ca ²⁺)	ICP-OES	20	95 – 105	0.006	0.15
Chloride (Cl ⁻)	IC	20	95 – 105	0.020	0.5
Nitrate (NO ₃ ⁻)	IC	20	95 – 105	0.008*	0.2
Sulfate (SO ₄ ²⁻)	IC	20	95 – 105	0.040	1.0

Notes: ¹ This column lists precision goals for both network precision calculated from collocated filter samples and laboratory precision based on replicate samples.

² This column lists laboratory accuracy goals based on reference standards and continuing calibration verification spikes. The criterion is 90–110 percent for ICP-OES reference standards.

AC = automated colorimetry
 IC = ion chromatography
 ICP-OES = inductively coupled plasma-optical emission spectrometry
 MARPD = mean absolute relative percent difference
 mg/L = milligrams per liter
 µg/Filter = micrograms per filter
 * = as nitrogen

Values are rounded according to American Society for Testing and Materials (ASTM) E29-08, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (ASTM, 2008).

For more information on analytical methods and associated precision and accuracy criteria, see the CASTNET QAPP, (Amec Foster Wheeler, 2014).

Table 4 Ozone Critical Criteria*

Type of Check	Analyzer Response
Zero	Less than ± 3 parts per billion (ppb)
Span	Less than or equal to ± 7 percent between supplied and observed concentrations
Single Point QC	Less than or equal to ± 7 percent between supplied and observed concentrations

Notes: * Applies to CASTNET sites that are configured and operated in accordance with Part 58 of Title 40 of the Code of Federal Regulations (EPA, 2015). The minimum frequency for these checks is once every two weeks.

Values are rounded according to ASTM E29-08, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications (ASTM, 2008).

Table 5 Trace-level Gas Monitoring Critical Criteria*

Parameter	Analyzer Response	
	Zero Check	Span Check / Single Point QC Check
SO ₂	Less than ± 3 ppb	Less than or equal to ± 10 percent between supplied and observed concentrations
NO _y	Less than ± 3 ppb	
CO	Less than ± 40 ppb	

Notes: *Applies to CASTNET sites that are configured and operated in accordance with Part 58 of Title 40 of the Code of Federal Regulations (EPA, 2015). The minimum frequency for these checks is once every two weeks.

Values are rounded according to ASTM E29-08, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications E29 (ASTM, 2008).

SO₂ = sulfur dioxide

NO_y = total reactive oxides of nitrogen

CO = carbon monoxide

ppb = parts per billion

Table 6 QC Analysis Count for First Quarter 2016

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⁻	60	226	96	20	30	91
	NO ₃ ⁻	60	226	96	20	30	91
	NH ₄ ⁺	40	204	96	20	30	91
	Cl ⁻	60	226	96	20	30	91
	Ca ²⁺	40	208	96	20	30	91
	Mg ²⁺	40	208	96	20	30	91
	Na ⁺	40	208	96	20	30	91
	K ⁺	40	208	96	20	30	91
Nylon	SO ₄ ²⁻	39	190	85	20	28	91
	NO ₃ ⁻	43	194	87	22	28	93
Cellulose	SO ₄ ²⁻	43	200	85	19	28	91

Table 7 Filter Pack Receipt Summary for First Quarter 2016

Count of samples received more than 14 days after removal from tower:	15
Count of all samples received:	837
Fraction of samples received within 14 days:	0.982
Average interval in days:	5.373
First receipt date:	01/04/2016
Last receipt date:	03/30/2016

Table 8 Ozone QC Summary for First Quarter 2016 (1 of 2)

Site ID	% Span Pass ¹	Span %D ²	% Single Point QC Pass ¹	Single Point QC %D ²	Single Point QC CL ³	% Zero Pass ¹	Zero Average (ppb) ²
ABT147, CT	100.00	0.72	100.00	0.69	0.06	100.00	0.17
ALC188, TX	100.00	1.19	100.00	1.23	0.18	100.00	0.27
ALH157, IL	100.00	1.06	100.00	0.81	0.11	100.00	0.15
ANA115, MI	100.00	0.65	100.00	0.75	0.09	100.00	0.41
ARE128, PA	100.00	0.99	100.00	1.01	0.15	100.00	0.27
ASH135, ME	98.75	1.41	100.00	0.62	0.08	100.00	0.15
BEL116, MD	100.00	0.47	100.00	0.45	0.07	100.00	0.18
BFT142, NC	100.00	1.62	100.00	1.72	0.15	100.00	0.14
BVL130, IL	100.00	1.10	100.00	2.09	0.08	100.00	0.45
BWR139, MD	100.00	2.03	100.00	2.19	0.27	96.70	0.40
CAD150, AR	100.00	0.95	100.00	0.76	0.10	100.00	0.27
CDR119, WV	100.00	1.30	100.00	1.57	0.13	100.00	0.29
CDZ171, KY	100.00	0.49	100.00	0.71	0.07	100.00	0.14
CKT136, KY	100.00	0.52	100.00	0.88	0.10	100.00	0.16
CND125, NC	98.92	0.78	100.00	0.63	0.12	100.00	0.21
CNT169, WY	100.00	2.34	100.00	1.31	0.16	100.00	0.75
COW137, NC	100.00	1.65	100.00	2.07	0.11	100.00	0.19
CTH110, NY	100.00	0.77	100.00	0.94	0.12	100.00	0.34
CVL151, MS	100.00	0.88	100.00	0.81	0.15	100.00	0.24
DCP114, OH	100.00	0.60	100.00	0.73	0.13	100.00	0.11
ESP127, TN	100.00	0.70	100.00	0.64	0.12	100.00	0.20
GAS153, GA	83.00	8.70	85.86	8.77	4.08	100.00	0.30
GTH161, CO	85.15	4.58	89.11	4.57	0.38	100.00	0.17

Table 8 Ozone QC Summary for First Quarter 2016 (2 of 2)

Site ID	% Span Pass ¹	Span %D ²	% Single Point QC Pass ¹	Single Point QC %D ²	Single Point QC CL ³	% Zero Pass ¹	Zero Average (ppb) ²
HOX148, MI	100.00	0.29	100.00	0.77	0.09	100.00	0.62
HWF187, NY	100.00	0.91	100.00	0.84	0.07	100.00	0.11
IRL141, FL	100.00	1.19	100.00	1.14	0.16	100.00	0.33
KEF112, PA	96.25	3.38	93.75	3.64	0.53	100.00	0.23
LRL117, PA	100.00	0.20	100.00	0.60	0.07	100.00	0.22
MCK131, KY	100.00	0.49	100.00	0.58	0.11	100.00	0.25
MCK231, KY	100.00	0.64	100.00	0.61	0.13	100.00	0.19
MKG113, PA	100.00	0.63	100.00	0.58	0.06	100.00	0.15
OXF122, OH	100.00	0.78	100.00	1.02	0.14	98.89	0.68
PAL190, TX	100.00	0.87	100.00	1.04	0.11	100.00	0.18
PAR107, WV	100.00	2.38	100.00	1.86	0.21	100.00	0.25
PED108, VA	83.67	9.44	83.67	9.53	3.09	100.00	0.19
PND165, WY	100.00	1.11	100.00	2.63	0.13	100.00	0.57
PNF126, NC	100.00	2.05	100.00	2.38	0.08	100.00	0.23
PRK134, WI	97.92	4.42	92.63	4.87	0.36	100.00	0.44
PSU106, PA	100.00	1.58	100.00	1.65	0.22	100.00	0.26
QAK172, OH	100.00	0.65	100.00	0.43	0.08	100.00	0.14
ROM206, CO	98.84	1.41	100.00	0.53	0.09	100.00	0.14
SAL133, IN	100.00	0.76	100.00	0.77	0.10	100.00	0.26
SAN189, NE	87.88	12.32	87.88	12.73	5.38	100.00	0.16
SND152, AL	100.00	1.07	100.00	1.33	0.14	100.00	0.22
SPD111, TN	100.00	0.83	100.00	0.76	0.18	100.00	0.27
STK138, IL	100.00	0.70	100.00	0.52	0.08	100.00	0.61
SUM156, FL	100.00	0.78	98.94	1.10	0.32	98.94	0.50
UVL124, MI	100.00	0.96	100.00	0.97	0.07	100.00	0.17
VIN140, IN	100.00	2.19	100.00	2.37	0.21	100.00	0.26
VPI120, VA	100.00	0.61	100.00	0.89	0.10	100.00	0.30
WSP144, NJ	98.91	0.82	98.91	0.85	0.20	100.00	0.38
WST109, NH	95.74	4.47	95.79	4.59	3.40	100.00	0.13

Notes: ¹ Percentage of comparisons that pass the criteria listed in Table 4. Values falling below 90 percent are addressed in Table 9.

² Absolute value of the average percent differences between the on-site transfer standard and the site monitor. Values exceeding the criteria listed in Table 4 are addressed in Table 9.

³ 90 percent confidence limit of the coefficient of variation. This should be less than or equal to the 7 percent single point QC check critical criterion. Values exceeding this criterion are addressed in Table 9.

%D = percent difference

CL = confidence limit

ppb = parts per billion

Table 9 Ozone QC Observations for First Quarter 2016

Site ID	QC Criterion	Comments
GAS153, GA	% Span Pass Span %D % Single Point QC Pass Single Point QC %D	QC failures occurred due to a leak in the sample lines from 1/27/16 to 1/30/16. Associated data were invalidated.
GTH161, CO	% Span Pass % Single Point QC Pass	Intermittent QC failures occurred in late January. Associated data were invalidated.
PED108, VA	% Span Pass Span %D % Single Point QC Pass Single Point QC %D	The sample pump failed on 1/7/16 and was replaced 1/14/16. Associated data were invalidated.
SAN189, NE	% Span Pass Span %D % Single Point QC Pass Single Point QC %D	The sample pump failed on 2/11/16 and was replaced on 2/17/16. Associated data were invalidated.

Note: %D = percent difference

Table 10 Trace-level Gas QC Summary for First Quarter 2016

Parameter	% Span Pass ¹	Span %D ²	% Single Point QC Pass ¹	Single Point QC %D ²	Single Point QC CL ³	% Zero Pass ¹	Zero Average (ppb) ²
BEL116, MD							
SO ₂	88.37	12.89	86.05	14.26	8.17	100.00	0.59
NO _y	78.57	6.12	79.31	5.83	1.93	96.55	3.48
BVL130, IL							
SO ₂	100.00	2.10	100.00	4.26	0.52	100.00	0.75
NO _y	100.00	3.91	100.00	4.30	0.49	100.00	1.01
CO	100.00	0.76	78.72	6.87	1.03	97.96	12.59
HWF187, NY							
NO _y	100.00	1.29	100.00	1.74	0.39	100.00	0.21
PND165, WY							
NO _y	100.00	1.39	100.00	3.62	0.52	100.00	0.13
PNF126, NC							
NO _y	97.78	3.57	100.00	4.53	0.71	100.00	0.64
ROM206, CO							
NO _y	100.00	1.34	100.00	2.48	0.27	100.00	0.44

Notes: ¹ Percentage of comparisons that pass the criteria listed in Table 5. Values falling below 90 percent are addressed in Table 11.

² Absolute value of the average percent differences between the supplied and observed concentrations. Values exceeding the criteria listed in Table 5 are addressed in Table 11.

³ 90 percent confidence limit of the coefficient of variation. This should be less than or equal to the 10 percent single point QC check critical criterion. Values exceeding this criterion are addressed in Table 11.

%D = percent difference

CL = confidence limit

ppb = parts per billion

Table 11 Trace-level Gas QC Observations for First Quarter 2016

Site ID	Parameter	QC Criterion	Comments
BEL116, MD	SO ₂	% Span Pass Span %D % Single Point QC Pass Single Point QC %D	The analyzer malfunctioned 3/11/16. Repairs were completed and calibration verified on 3/23/16. Associated data were invalidated.
BEL116, MD	NO _y	% Span Pass % Single Point QC Pass Zero Average	The analyzer drifted out of calibration 1/7/16 and was recalibrated on 1/21/16. Associated data were invalidated.
BVL130, IL	CO	% Single Point QC Pass	The analyzer drifted out of calibration 2/28/16 and was recalibrated on 3/18/16. Associated data were invalidated.

Notes: %D = percent difference

CL = confidence limit

Table 12 Filter Packs Flagged as Suspect or Invalid during First Quarter 2016

Site ID	Sample No.	Reason
BEL116, MD	1609001-06	Insufficient flow data due to problems with telemetry
BFT142, NC	1605001-07	Insufficient flow volume
CHE185, OK	1611004-02	Insufficient flow data due to problems with telemetry
COW005, NC	1602003-01	Insufficient flow volume
CTH110, NY	1602001-24	Insufficient flow volume due to power failure
DCP114, OH	1611001-21 1612001-21	Insufficient flow data due to problems with telemetry
DIN431, UT	1602001-28 1604003-06 1605003-06	Insufficient flow volume due to a leak in the flow system
GAS153, GA	1602001-32 1608001-24	“Calibrator onsite” flags applied in error for 1602001-32. Flow data should be recoverable for this sample. Insufficient flow data due to problems with telemetry for sample 1608001-24.
NIC001, NY	1602001-53	Insufficient flow volume due to power failure
PRK134, WI	1612001-43	Insufficient flow volume
ROM406, CO	1602001-67	Insufficient flow volume due to a leak in the flow system
SPD111, TN	1603001-49 1611001-49	Insufficient flow volume for both samples. Problems with telemetry for sample 1611001-49.
WNC429, SD	1604003-23	Insufficient flow volume
YOS404, CA	1604003-25 1609003-25 1611003-25	Insufficient flow volume due to a malfunctioning flow pump.

Table 13 Field Problems Affecting Data Collection

Days to Resolution	Problem Count
30	244
60	3
90	0
Unresolved by End of Quarter	5

Figure 1 Reference Standard Results for First Quarter 2016 (percent recovery)

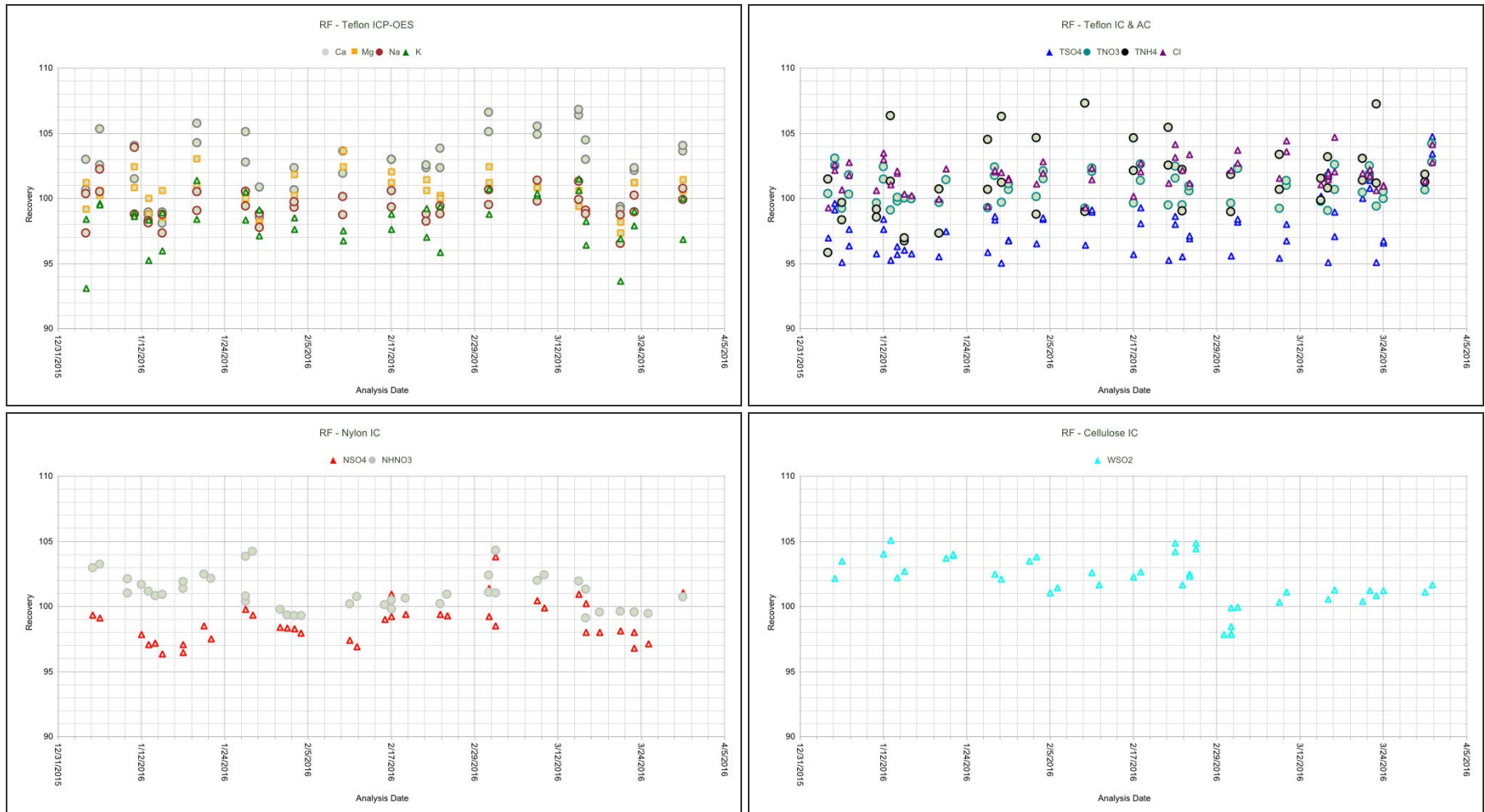


Figure 2 Continuing Calibration Spike Results for First Quarter 2016 (percent recovery)

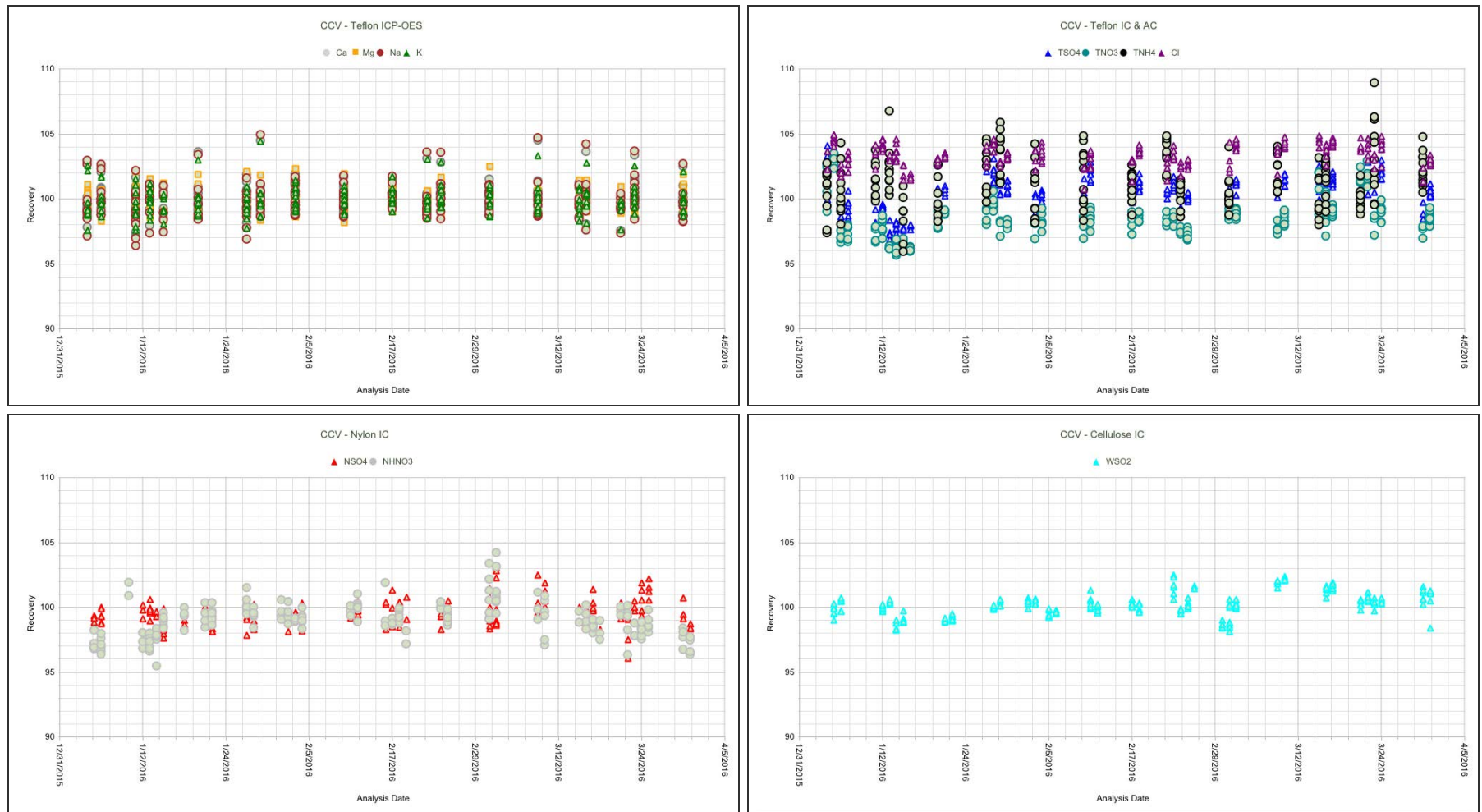


Figure 3 Replicate Sample Analysis Results for First Quarter 2016 (percent difference)

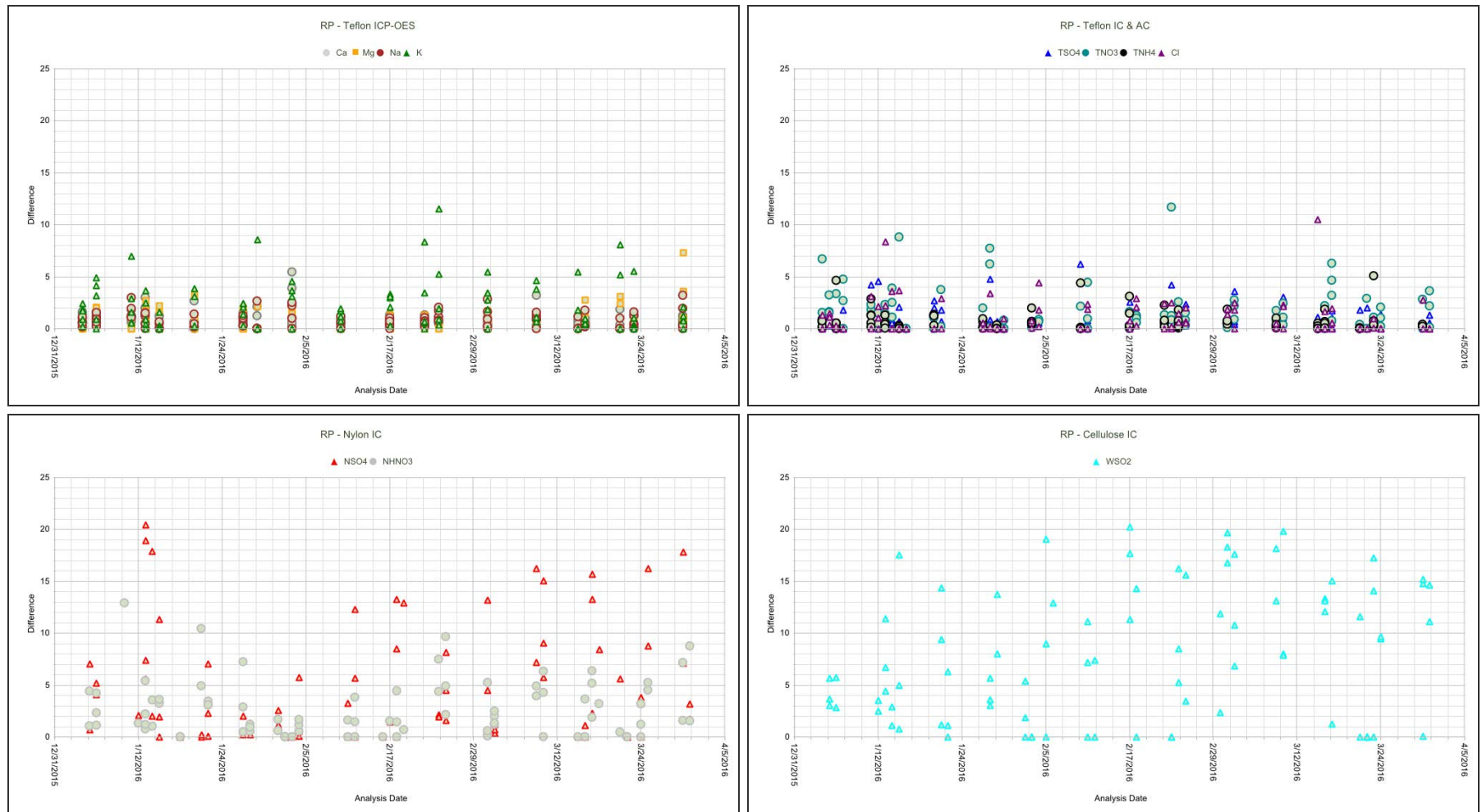


Figure 4 Laboratory Control Sample Results for First Quarter 2016 (percent recovery)

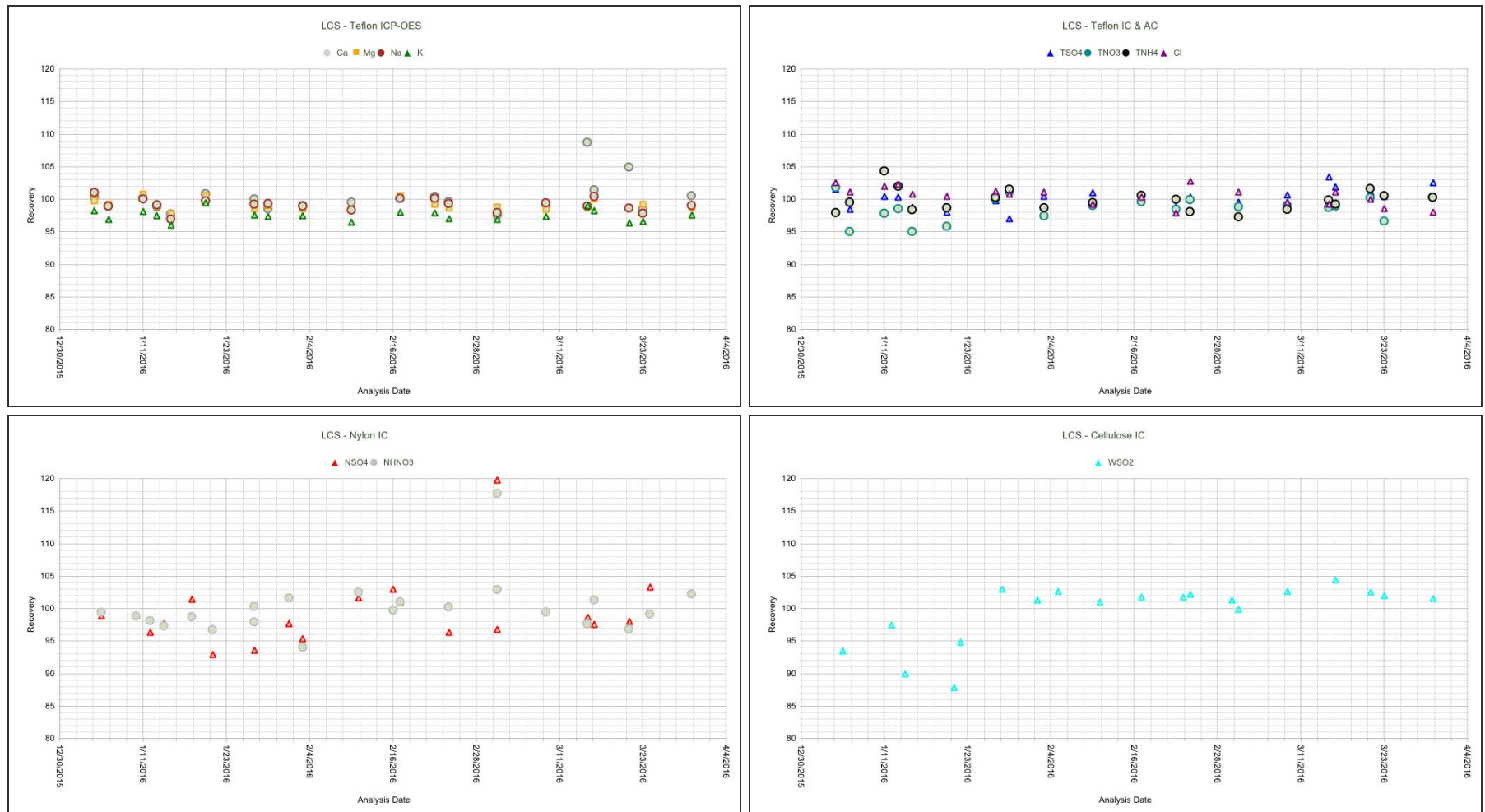


Figure 5 Method Blank Analysis Results for First Quarter 2016 (total micrograms)

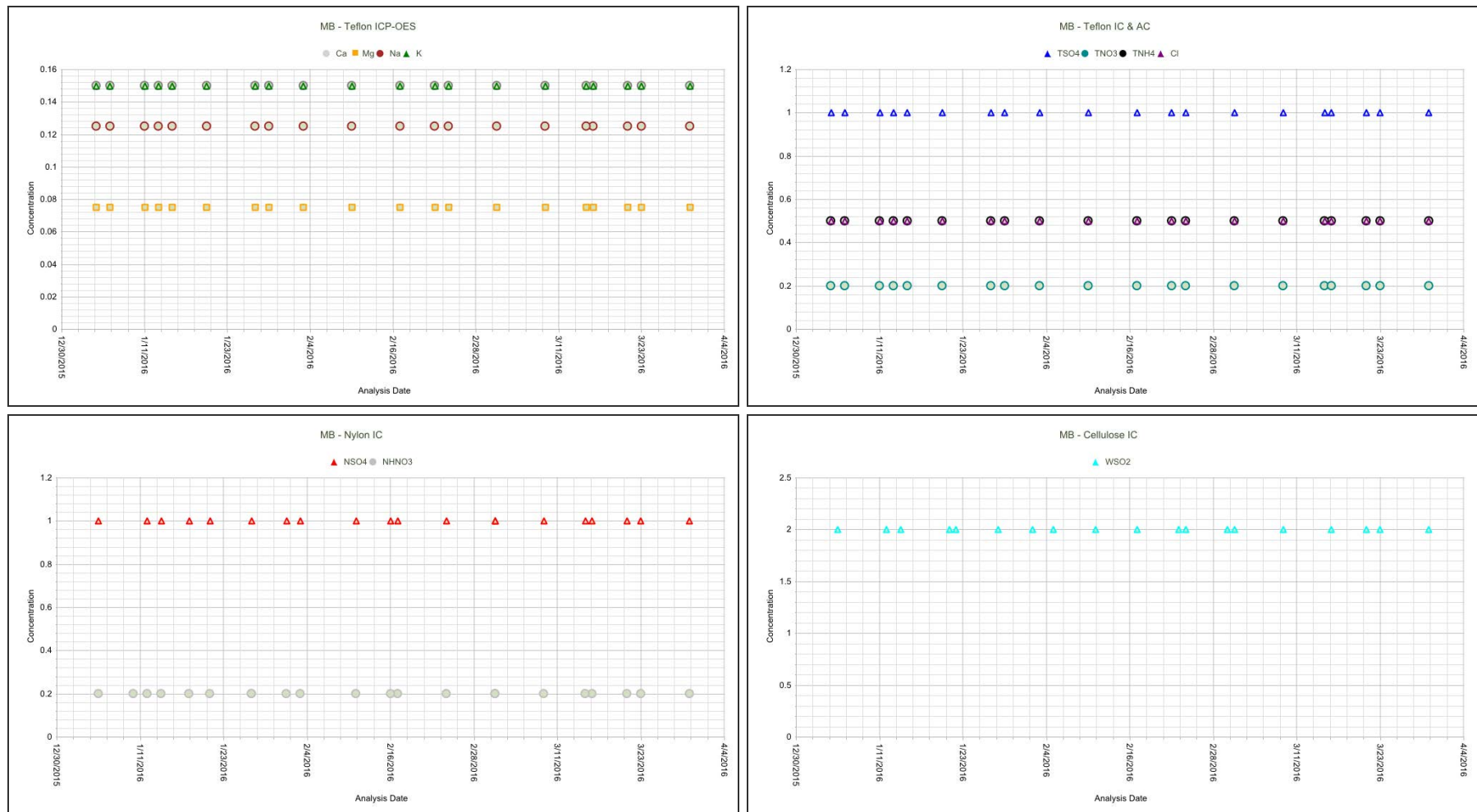


Figure 6 Laboratory Blank Analysis Results for First Quarter 2016 (total micrograms)

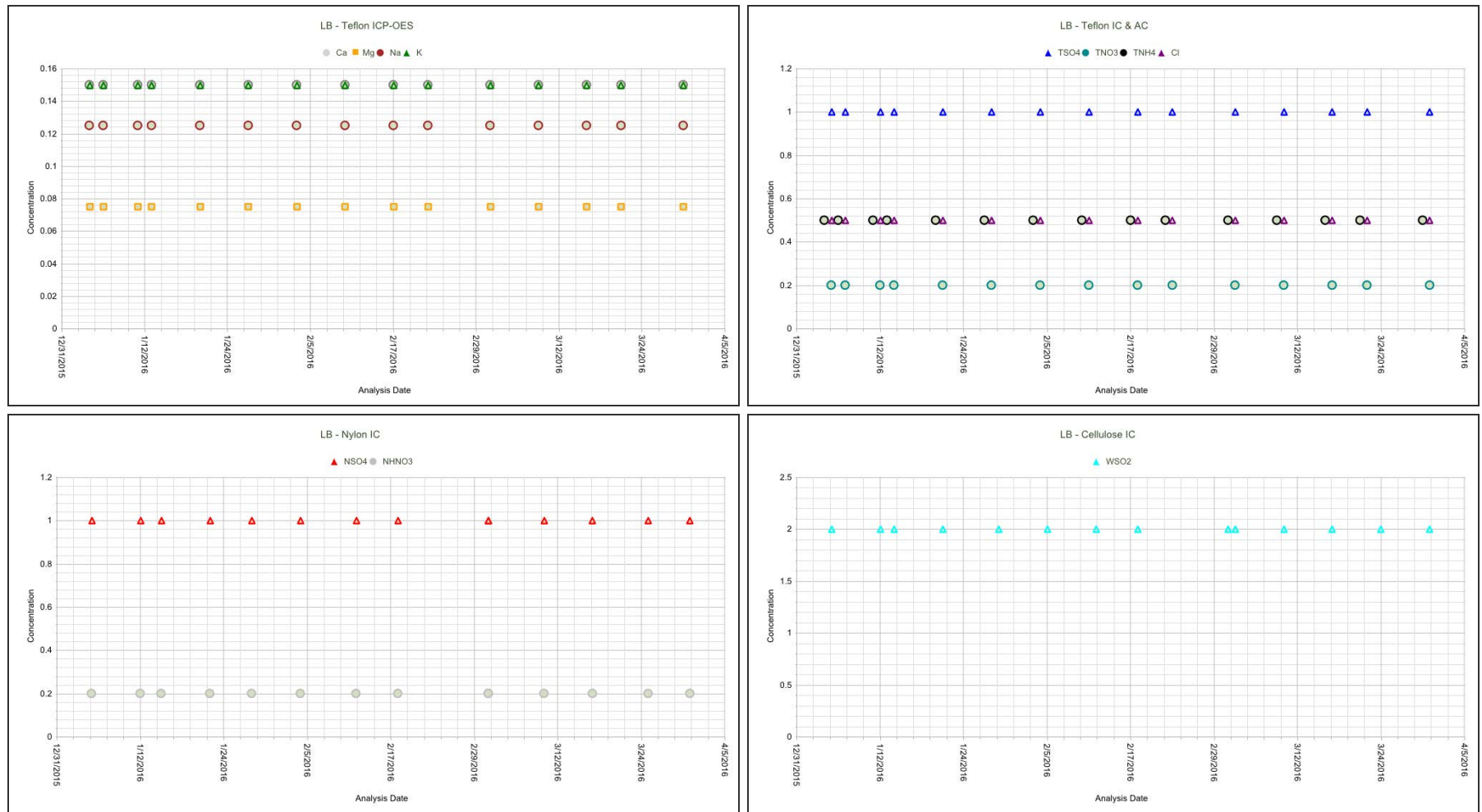


Figure 7 Field Blank Analysis Results for First Quarter 2016 (total micrograms)

