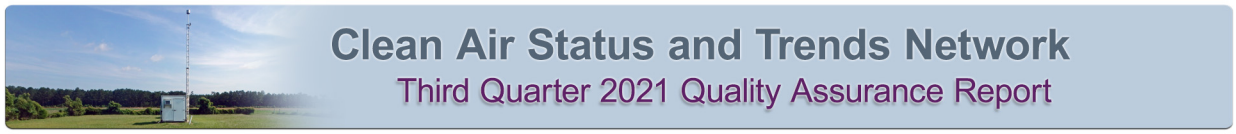


Summary of Quarterly Operations (July through September)

EPA Contract No. 68HERH21D0006

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 third quarter 2021. The various QA/QC criteria and policies are documented in the CASTNET Quality Assurance Project Plan (QAPP; Wood, 2021). 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 signature page for the final version of the CASTNET Quality Assurance Project Plan (QAPP) Revision 9.4 was completed by all signatories in early July 2021. Wood resubmitted the QAPP to EPA, and it was uploaded by EPA to the EPA CASTNET website.

Wood compiled the updated "Field Operators Manual" for site operators based on the approved QAPP Revision 9.4. This manual consolidates all site operator-specific standard operating procedures and checklists from the latest version of the QAPP into one smaller, site operator-specific volume. The QA Manager then verified that all materials were included before it was released to the site operators.

Wood continued the process of transitioning from hardcopy to electronic documentation. During July, the new Site Status Report Form (SSRF) dashboard began being tested in iCASTNET. Only two fields on the hard copy SSRF will require double entry in the new dashboard.

The CASTNET QA Manager held the meeting to discuss the annual management review summary presentation as required to maintain International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17025:2017 accreditation by the American Association for Laboratory Accreditation (A2LA). The meeting attendees included the CASTNET management team, Wood's Florida Regional Manager, and Wood's East US QA Lead.

Wood continued looking for new suppliers of the K_2CO_3 used in the impregnation solution for the cellulose filters. Wood had enough K_2CO_3 from J.T. Baker, its usual supplier, to impregnate filters through August 2021. During July, Wood conducted a field study to confirm the performance of the K_2CO_3 that passed acceptance testing from four vendors. The study included filters exposed to active and passive flow, laboratory blanks, and field blanks. Wood was looking for K_2CO_3 that not only passed acceptance and field testing but was also the most comparable with J.T. Baker's performance. After all test results were reviewed, Wood selected Fisher as the one vendor to use (see Attachment 1). Wood began using Fisher K_2CO_3 in the solution used to impregnate the cellulose filters for September 2021 sampling activities. When J.T Baker has K_2CO_3 in stock again, Wood will acceptance test and field test their new product before switching back.

Currently, the pressure of the gas cylinders used for trace-level gas sites is not checked prior to shipping a cylinder to a site because of the risk of contamination. The CASTNET QA Manager began working with field personnel to develop a detailed procedure for checking the pressure of gas cylinders while minimizing the risk of contamination. Recently, Wood has found empty or nearly empty cylinders in inventory with the manufacturer's seal still intact. A procedure to check pressure without causing contamination will help Wood maintain an adequate number of cylinders ready to go to the sites. Gas cylinders have a long lead-time to delivery.

Wood began evaluating how changes to the new Ozone Technical Assistance Document (TAD; EPA, 2020) will affect ozone criteria and reporting for CASTNET sites. Wood had multiple meetings with EPA, NPS, and ARS to discuss the changes proposed as they pertain to CASTNET. Wood provided comments and observations to EPA CAMD regarding the new TAD worksheet/spreadsheets.

Work continued to review and update the CASTNET QAPP. Revision 9.5 will be submitted to EPA on November 1, 2021.

The inter-laboratory comparison samples sent to Wood by the US Geological Survey (USGS) in August 2021 were acknowledged by FedEx as lost in shipping. USGS ships samples every other month. The next set of samples will be shipped to Wood in October 2021.

Table 1 lists the quarters of data that were validated to Level 3 during third quarter 2021 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 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 third quarter 2021.

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 third quarter 2021. Since 2020, filter packs have been delivered to Wood by the postal service at a slower rate. As of October 1, 2021, the USPS is slowing down mail delivery further to attempt to reduce its costs. Wood is aware that sometimes late filter packs may have volatilization affecting NH_4^+, NO_3^-, and HNO_3. Wood is considering adding an automated comment code based on the length of time between the sample shipping date and the

sample receipt date as recorded on the SSRF. The comment code would affect analytes from two filters but would not affect data validity. The amount of time to be used to trigger the comment code has yet to be determined.

Data Quality Indicator (DQI) Results

The gaps in cellulose DQI figures (Figures 1 through 7) are due to solution comparison testing being performed using that instrument during July and repairs required during August/September.

Figures 1 through 3 present the results of RF, CCV, and RP QC sample analyses for third quarter 2021. All results were within the criteria listed in Table 3. The two nylon sulfate RP samples slightly over 20 percent were less than five times the reporting limit with absolute differences less than the reporting limit.

Table 8 presents summary statistics of critical criteria measurements at ozone sites collected during third quarter 2021. 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 effect 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 third quarter 2021. 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 effect on ambient data collection, and passing results still meet frequency criteria. During third quarter, no values exceeded documented criteria or were otherwise notable. The enhanced NO_y system at the DUK008, NC site was re-installed during late July. The NO_y cylinder shipped to the site for installation had leaked. The long lead time to delivery of a new cylinder resulted in the site only reporting one QC check at the end of September for third quarter.

Laboratory Control Sample Analysis

The 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 third quarter 2021. All recovery values were between 85.3 percent and 109.5 percent.

Blank Results

Figures 5 through 7 present the results of MB, LB, and FB QC sample analyses for third quarter 2021. All third quarter results were within criteria (two times the reporting limit) listed in Table 3.

Suspect/Invalid Filter Pack Samples

Filter pack samples that were flagged as suspect or invalid during third quarter 2021 are listed in Table 11. This table also includes associated site identification and a brief description of the reason the sample was flagged. During third quarter, seven filter pack samples were invalidated.

Field Problem Count

Table 12 presents counts of field problems affecting continuous data collection for more than one day for third quarter 2021. 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

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). 2020. Title 40 *Code of Federal Regulations* Part 58, "Appendix A to Part 58 – Quality Assurance Requirements for Monitors used in Evaluations of National Ambient Air Quality Standards."

U.S. Environmental Protection Agency (EPA). 2020. *Transfer Standards for Calibration of Air Monitoring Analyzers for Ozone.* Technical Assistance Document, Final Draft – July 2020.

Wood Environment & Infrastructure Solutions, Inc. (Wood). 2021. *Clean Air Status and Trends Network (CASTNET) Quality Assurance Project Plan* (QAPP) Revision 9.4. Prepared for U.S. Environmental Protection Agency (EPA), Office of Air and Radiation, Clean Air Markets Division, Washington, DC. Contract No. 68HERH21D0006. Gainesville, FL. https://java.epa.gov/castnet/documents.do.

Table 1 Data Validated to Level 3 during Third Quarter 2021

Calibration Group*	Months Available	Number of Months	Complete Quarters	Number of Quarters
E-3/W-10†	November 2020 – April 2021	6	Quarter 1 2021	1
SE-4/MW-6‡	January 2021 – June 2021	6	Quarter 1 2021 – Quarter 2 2021	2

Notes: * The sites contained in each calibration group are listed in Table 2.
† Contains ROM206 of the ROM406/ROM206 co-located pair
‡ Contains MCK131/231 co-located pair

Table 2 Field Calibration Schedule for 2021

Calibration Group	Months Calibrated	Sites Calibrated				
Eastern Sites (22 Total)						
E-1 (8 Sites)	February/August	BEL116, MD BWR139, MD	WSP144, NJ CTH110, NY	ARE128, PA PSU106, PA	PED108, VA VPI120, VA	
E-2 (9 Sites)	April/October	ABT147, CT ASH135, ME	WST109, NH CAT175, NY	HWF187, NY[1] NIC001, 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	COW137, NC DUK008, NC[1]	SPD111, TN	
SE-5 (4 Sites)	February/August	CAD150, AR IRL141, FL	SUM156, FL CVL151, MS			
Midwestern Sites (19 Total)						
MW-6 (6 Sites)	January/July	CDZ171, KY CKT136, KY	MCK131, KY MCK231, KY	PNF126, NC[1] ESP127, TN		
MW-7 (9 Sites)	March/September	ALH157, IL BVL130, IL[2]	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 (12 Total)						
W-9 (5 Sites)	March/September	KNZ184, KS KIC003, KS	CHE185, OK SAN189, NE	ALC188, TX		
W-10 (7 Sites)	May/November	GTH161, CO ROM206, CO[3]	NPT006, ID PAL190, TX	UMA009, WA CNT169, WY	PND165, WY[3]	

Notes: [1] Trace-level gas calibrations are performed quarterly in January, April, July, and October.
[2] Trace-level gas calibrations are performed quarterly in March, June, September, and December.
[3] Trace-level gas calibrations are performed quarterly in February, May, August, and November.

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 co-located filter samples and laboratory precision based on replicate samples for samples > five times the reporting limit. The criterion is ± the reporting limit if the sample is ≤ five times the reporting limit.

[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.

[3] The reporting limit for sulfate on cellulose filters is 0.080 mg/L (2.0 µg/filter).

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, (Wood, 2021).

Table 4 Ozone Critical Criteria*

Type of Check	Analyzer Response
Zero	Less than ± 3.1 parts per billion (ppb)
Span	Less than ± 7.1 percent between supplied and observed concentrations
Single Point QC	Less than ± 7.1 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, 2020). 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 ± 1.51 ppb	Less than ± 10.1 percent between supplied and observed concentrations
NO_y	Less than ± 1.51 ppb	
CO	Less than ± 30.1 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, 2020). 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).

SO_2 = sulfur dioxide
NO_y = total reactive oxides of nitrogen
CO = carbon monoxide
ppb = parts per billion

Table 6 QC Analysis Count for Third Quarter 2021

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-}	63	182	74	15	24	47
	NO_3^-	63	182	74	15	24	47
	NH_4^+	30	141	71	15	22	47
	Cl^-	63	182	74	15	24	47
	Ca^{2+}	30	161	71	15	22	47
	Mg^{2+}	30	161	71	15	22	47
	Na^+	30	161	71	15	22	47
	K^+	30	161	71	15	22	47
Nylon	SO_4^{2-}	45	178	75	15	24	47
	NO_3^-	45	178	75	15	24	47
Cellulose	SO_4^{2-}	53	171	74	16	22	47

Table 7 Filter Pack Receipt Summary for Third Quarter 2021

Count of samples received more than 14 days after removal from tower:	38
Count of all samples received:	685
Fraction of samples received within 14 days:	0.945
Average interval in days:	7.409
First receipt date:	07/01/2021
Last receipt date:	09/14/2021

Note: Sample shipments for the Egbert, Ontario site (EGB181) are in groups of four. Samples associated with EGB181 are excluded from this statistic.

Table 8 Ozone QC Summary for Third Quarter 2021 (1 of 2)

Site ID	% Span Pass[1]	Span |%D|[2]	% Single Point QC Pass[1]	Single Point QC |%D|[2]	% Zero Pass[1]	Zero Average (ppb)[2]
ABT147, CT	100.00	1.01	100.00	0.98	98.77	0.45
ALC188, TX	100.00	4.30	100.00	3.08	100.00	0.46
ALH157, IL	100.00	1.40	100.00	1.81	100.00	0.23
ANA115, MI	86.67	14.62	85.39	28.44	100.00	0.27
ARE128, PA	100.00	1.65	100.00	1.85	100.00	0.46
ASH135, ME	100.00	3.57	98.77	3.65	100.00	0.24
BEL116, MD	98.91	2.90	100.00	1.93	100.00	0.77
BFT142, NC	100.00	1.50	100.00	1.38	100.00	0.47
BVL130, IL	100.00	1.83	98.94	1.87	100.00	0.70
BWR139, MD	100.00	1.17	100.00	1.53	98.89	0.53
CAD150, AR	100.00	2.01	100.00	2.37	100.00	0.29
CDR119, WV	100.00	2.05	100.00	1.91	100.00	0.24
CDZ171, KY	100.00	0.61	100.00	0.72	100.00	0.21
CKT136, KY	100.00	0.33	100.00	0.34	100.00	0.12
CND125, NC	100.00	0.56	100.00	1.55	98.95	1.12
CNT169, WY	100.00	0.45	100.00	0.69	100.00	0.30
COW137, NC	100.00	0.89	100.00	1.05	100.00	0.60
CTH110, NY	100.00	3.08	100.00	3.30	100.00	0.13
CVL151, MS	100.00	1.49	100.00	1.06	100.00	0.42
DCP114, OH	100.00	2.13	100.00	3.54	100.00	0.88
DUK008, NC	100.00	1.20	98.91	1.46	98.90	0.33
ESP127, TN	100.00	1.45	100.00	0.89	100.00	0.22
GAS153, GA	100.00	2.16	100.00	3.13	100.00	0.87
GTH161, CO	100.00	0.88	100.00	1.16	100.00	0.19

Table 8 Ozone QC Summary for Third Quarter 2021 (2 of 2)

Site ID	% Span Pass[1]	Span |%D|[2]	% Single Point QC Pass[1]	Single Point QC |%D|[2]	% Zero Pass[1]	Zero Average (ppb)[2]
HOX148, MI	100.00	1.94	100.00	1.78	100.00	0.25
HWF187, NY	98.94	3.64	98.94	3.30	100.00	0.52
IRL141, FL	98.97	2.62	98.97	2.72	98.97	0.70
KEF112, PA	100.00	1.71	100.00	1.54	100.00	0.27
LRL117, PA	100.00	3.22	95.92	3.17	98.98	0.42
MCK131, KY	97.94	2.46	97.94	2.58	100.00	0.20
MCK231, KY	100.00	0.85	98.94	0.64	100.00	0.17
MKG113, PA	100.00	0.94	100.00	2.11	100.00	0.32
NPT006, ID	100.00	1.16	100.00	2.85	100.00	0.25
OXF122, OH	98.94	3.17	98.94	2.86	98.94	0.70
PAL190, TX	100.00	0.38	100.00	0.81	100.00	0.39
PAR107, WV	100.00	2.22	100.00	2.57	100.00	0.36
PED108, VA	100.00	1.54	100.00	1.53	100.00	0.57
PND165, WY	100.00	0.84	100.00	0.88	100.00	0.23
PNF126, NC	91.75	8.98	91.75	9.01	100.00	0.43
PRK134, WI	100.00	1.83	98.92	1.89	100.00	0.43
PSU106, PA	100.00	1.25	100.00	1.59	100.00	0.13
QAK172, OH	100.00	0.67	100.00	0.98	100.00	0.36
ROM206, CO	100.00	0.58	100.00	1.02	100.00	0.25
SAL133, IN	100.00	0.58	100.00	0.50	100.00	0.26
SAN189, NE	97.98	5.56	91.92	5.28	97.98	1.24
SND152, AL	100.00	0.74	100.00	0.87	100.00	0.37
SPD111, TN	98.91	1.36	100.00	1.47	97.83	0.54
STK138, IL	98.81	2.48	100.00	2.25	100.00	0.60
SUM156, FL	100.00	2.31	100.00	1.64	100.00	0.23
UVL124, MI	90.20	4.60	92.16	2.78	100.00	0.63
VIN140, IN	100.00	0.90	100.00	1.19	100.00	0.43
VPI120, VA	100.00	2.29	97.94	2.49	100.00	0.31
WSP144, NJ	100.00	1.90	100.00	1.69	100.00	0.38
WST109, NH	97.09	5.20	90.29	5.69	99.03	0.56

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.

%D = percent difference

ppb = parts per billion

Table 9 Ozone QC Observations for Third Quarter 2021

Site ID	QC Criterion	Comments
ANA115, MI	% Span Pass Span |%D| % Single Point QC Pass Single Point QC |%D|	The analyzer pump failed on 8/25/2021 and was replaced on 8/31/2021.
PNF126, NC	Span |%D| Single Point QC |%D|	The analyzer pump failed 8/29/2021 and was replaced on 9/2/2021.

Note: %D = percent difference

Table 10 Trace-level Gas QC Summary for Third Quarter 2021

Parameter	% Span Pass[1]	Span |%D|[2]	% Single Point QC Pass[1]	Single Point QC |%D|[2]	% Zero Pass[1]	Zero Average (ppb)[2]
BVL130, IL						
SO_2	100.00	1.35	100.00	2.83	100.00	0.30
NO_y	100.00	2.44	100.00	3.36	100.00	0.66
CO	100.00	0.74	91.30	5.69	91.30	14.88
DUK008, NC[3]						
NO_y	100.00	1.21	100.00	0.93	100.00	0.65
HWF187, NY						
NO_y	100.00	2.22	100.00	1.98	100.00	0.61
PND165, WY						
NO_y	100.00	2.70	100.00	3.22	97.50	0.74
PNF126, NC						
NO_y	100.00	2.15	95.74	4.88	100.00	0.27
ROM206, CO						
NO_y	100.00	0.93	100.00	1.99	100.00	0.40

Notes: [1]Percentage of comparisons that pass the criteria listed in Table 5.

[2]Absolute value of the average percent differences between the supplied and observed concentrations.

[3]Represents only one QC check during third quarter.

%D = percent difference
ppb = parts per billion

Table 11 Filter Packs Flagged as Suspect or Invalid during Third Quarter 2021

Site ID	Sample No.	Reason
CAD150, AR	2129001-10	Filter pack was invalidated for suspect data.
CDR119, WV	2128001-12 2129001-12	Particles were observed on filters downstream from the Teflon filter.
FOR605, WY	2128005-03	Power failure
JOT403, CA	2131003-12	Polling issue: data may be recovered.
PIN414, CA	2130003-17	Flow data were flagged as invalid by ARS.
QAK172, OH	2128001-44	The site sustained storm damage.

Table 12 Field Problems Affecting Data Collection

Days to Resolution	Problem Count
30	463
60	1
90	2
Unresolved by End of Quarter	4

Figure 1 Reference Standard Results for Third Quarter 2021 (percent recovery)

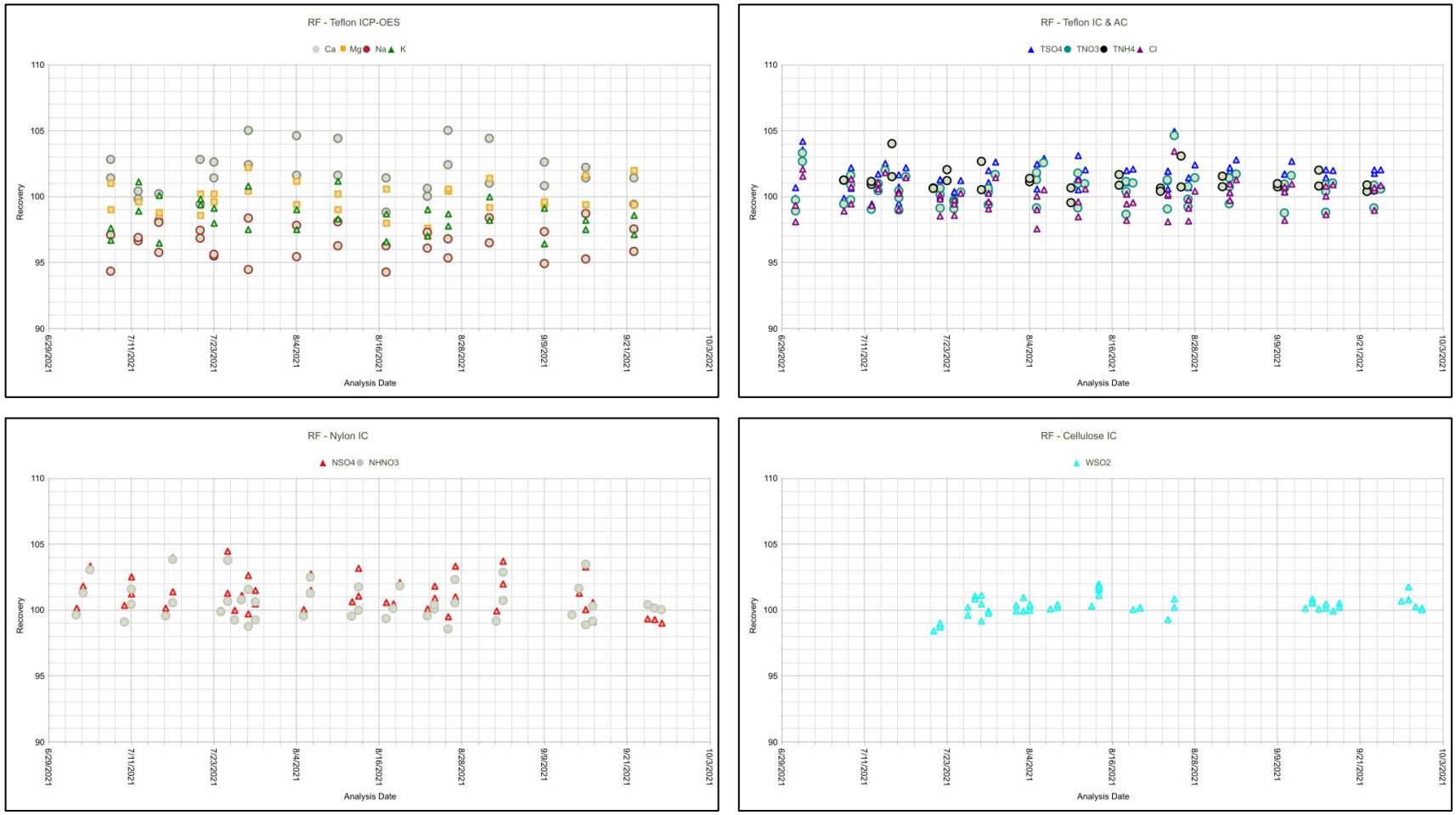


Figure 2 Continuing Calibration Spike Results for Third Quarter 2021 (percent recovery)

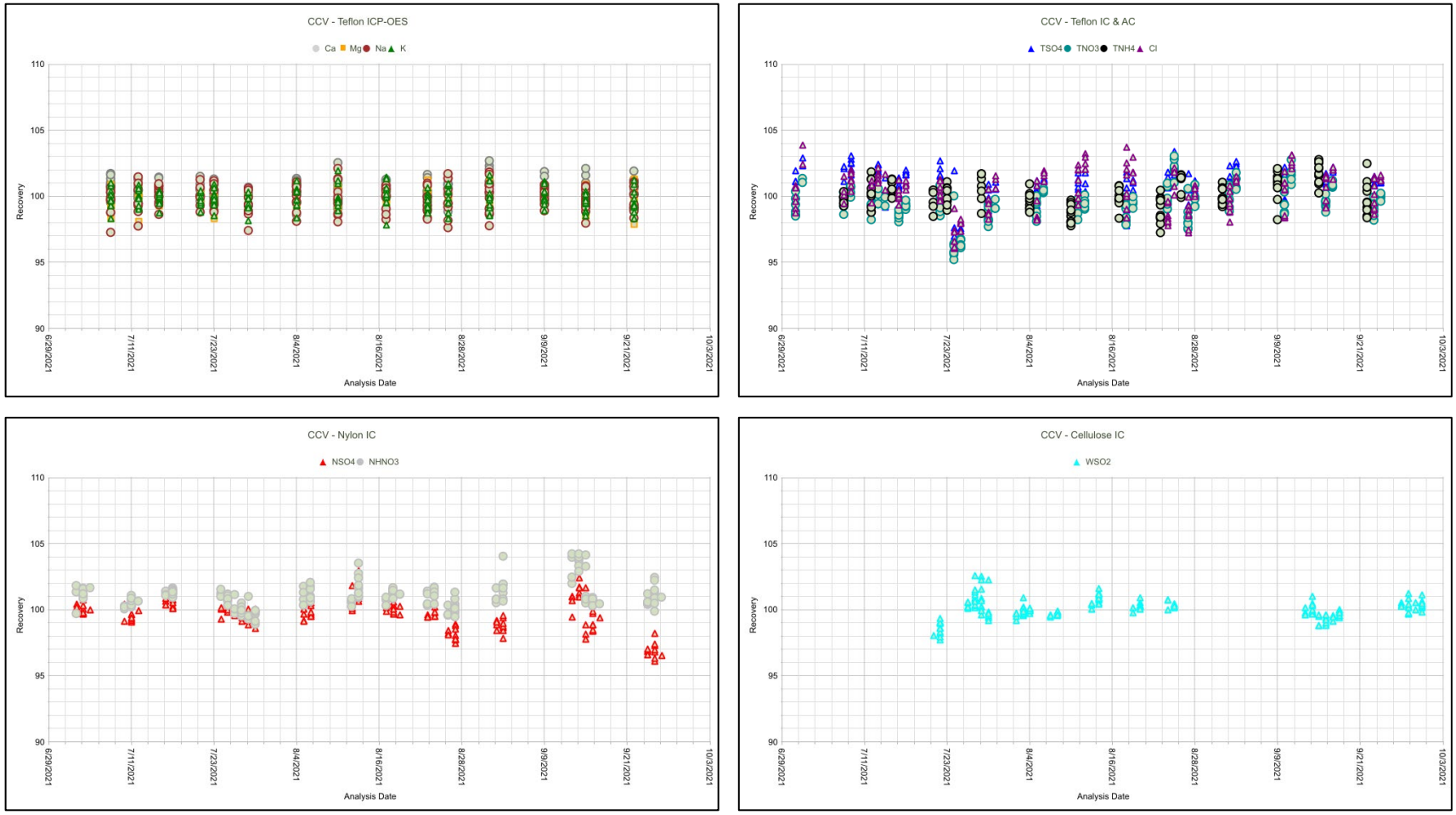


Figure 3 Replicate Sample Analysis Results for Third Quarter 2021 (percent difference)

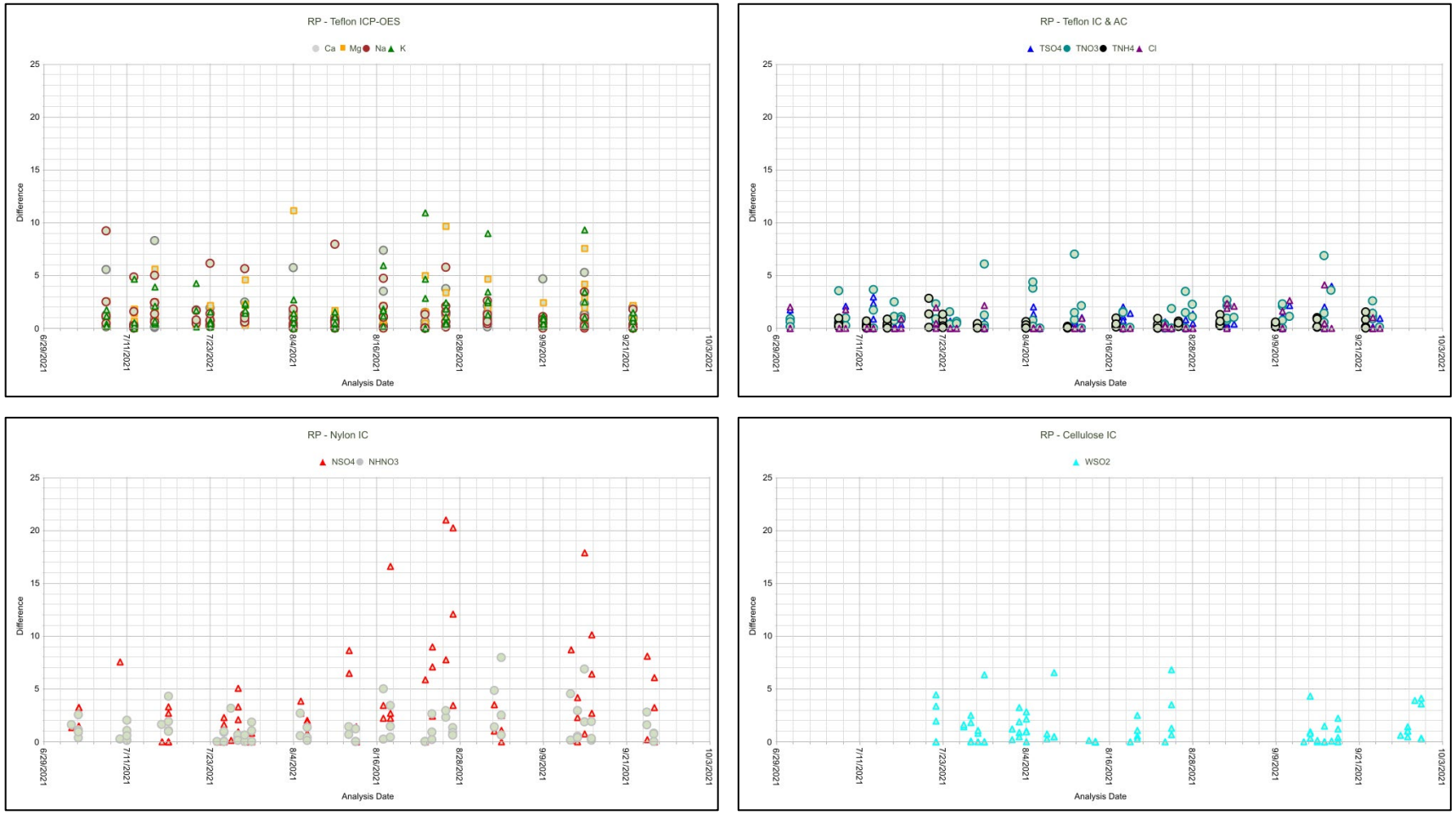


Figure 4 Laboratory Control Sample Results for Third Quarter 2021 (percent recovery)

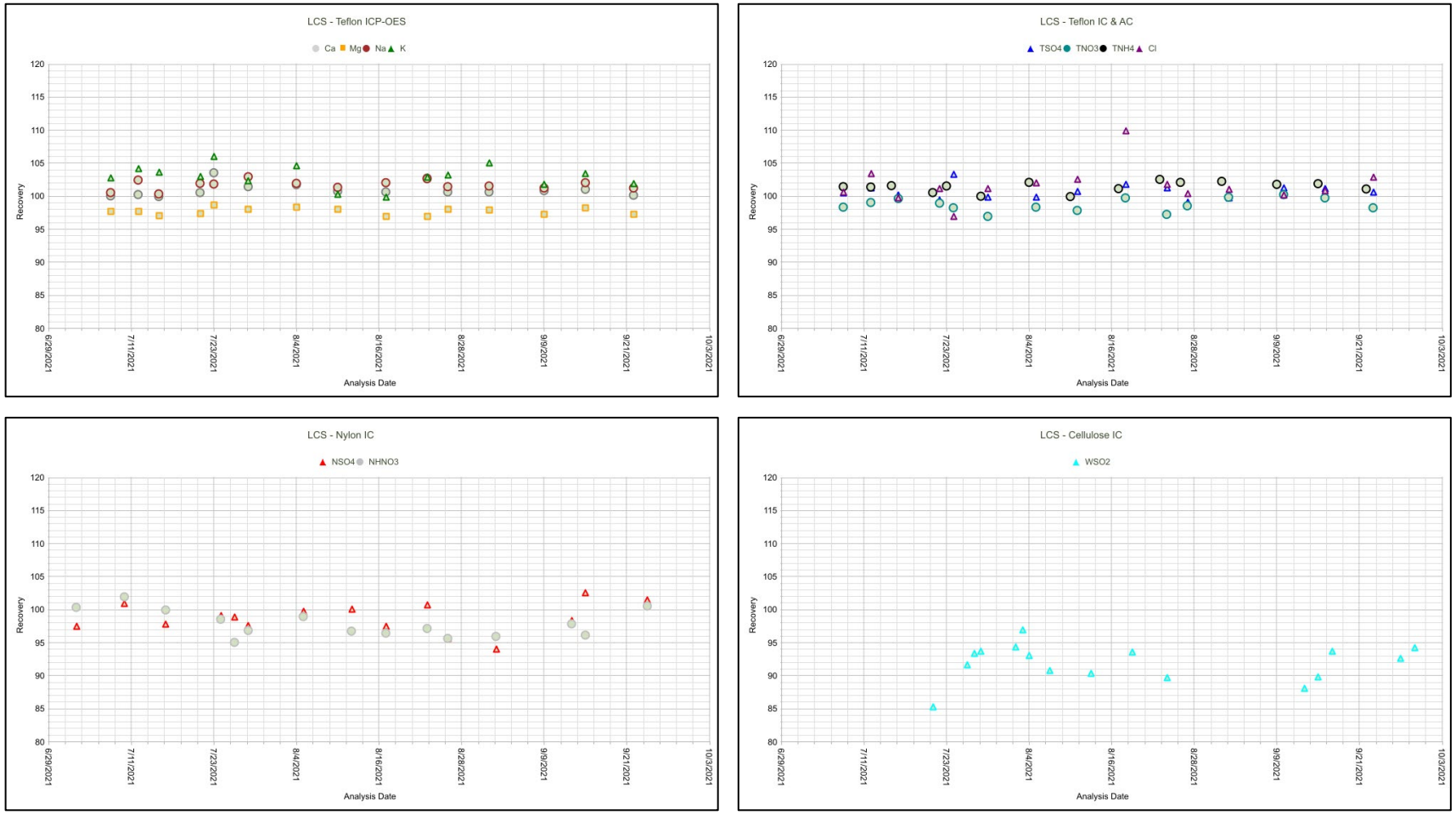


Figure 5 Method Blank Analysis Results for Third Quarter 2021 (total micrograms)

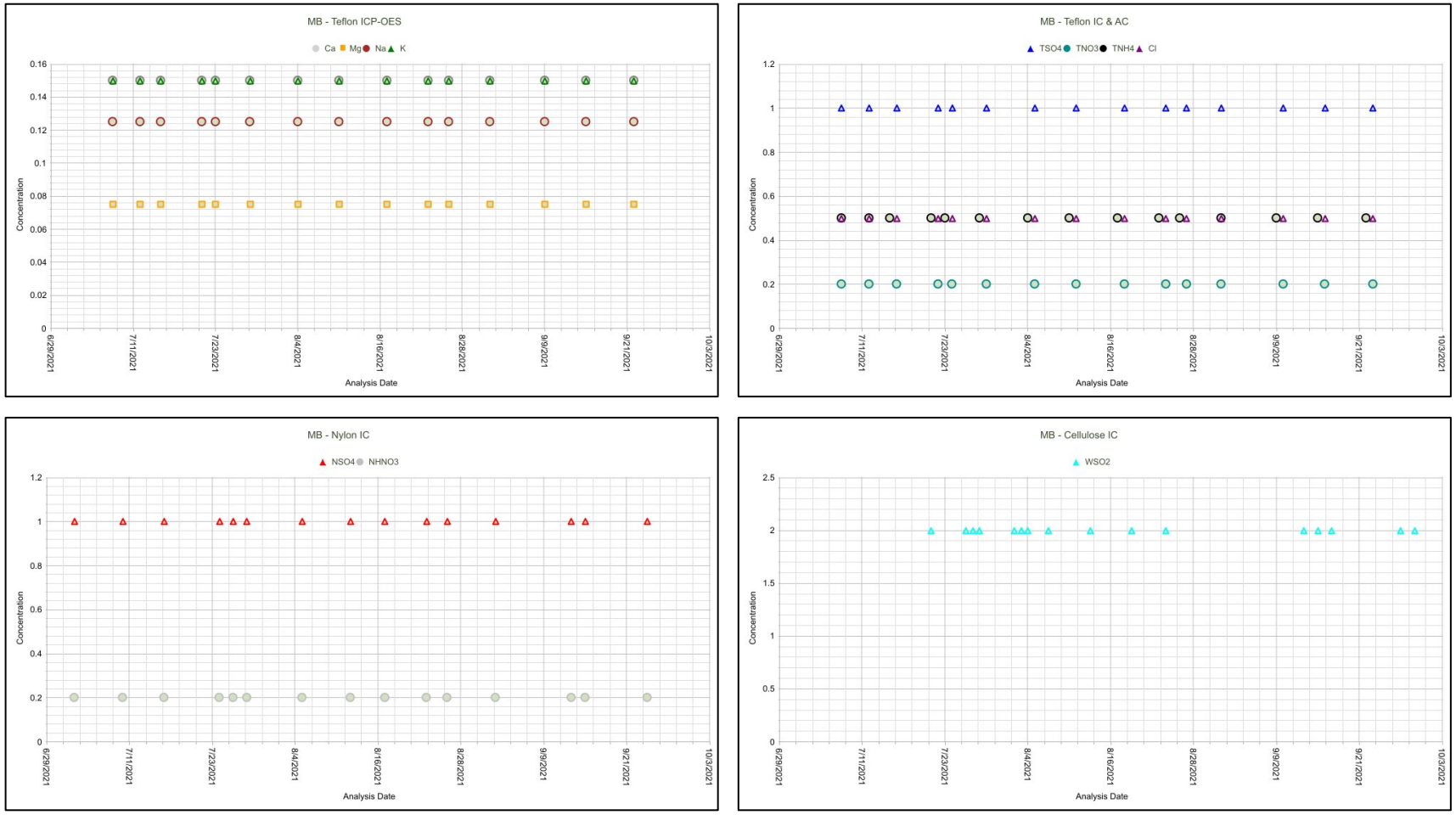


Figure 6 Laboratory Blank Analysis Results for Third Quarter 2021 (total micrograms)

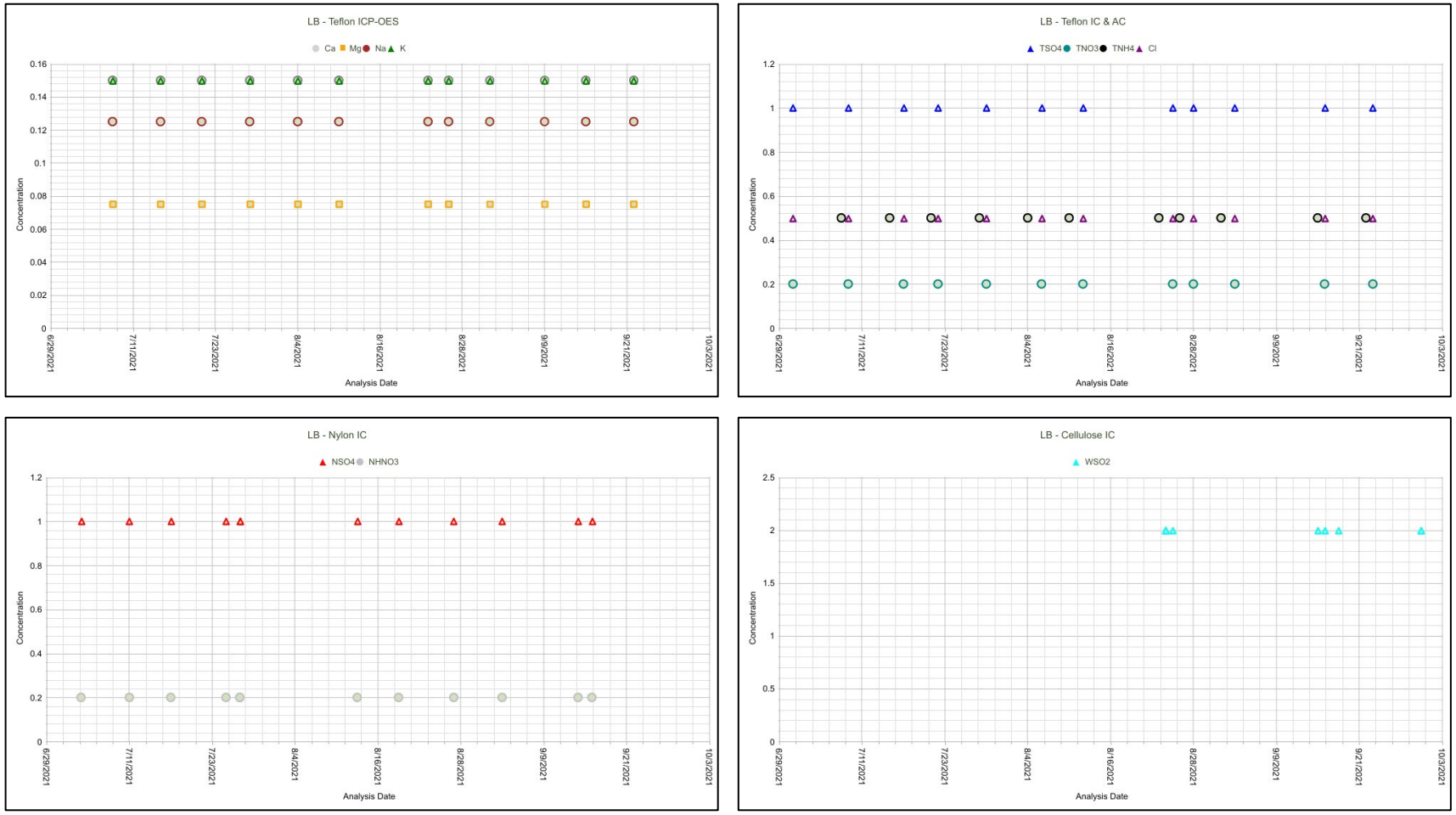
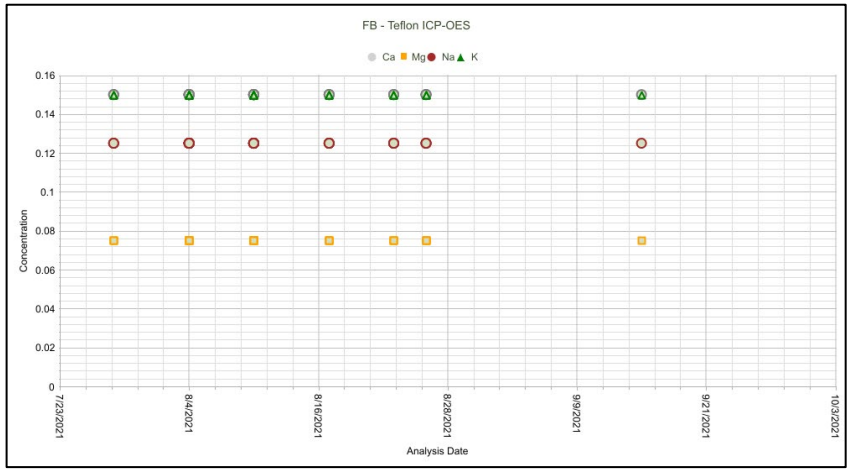
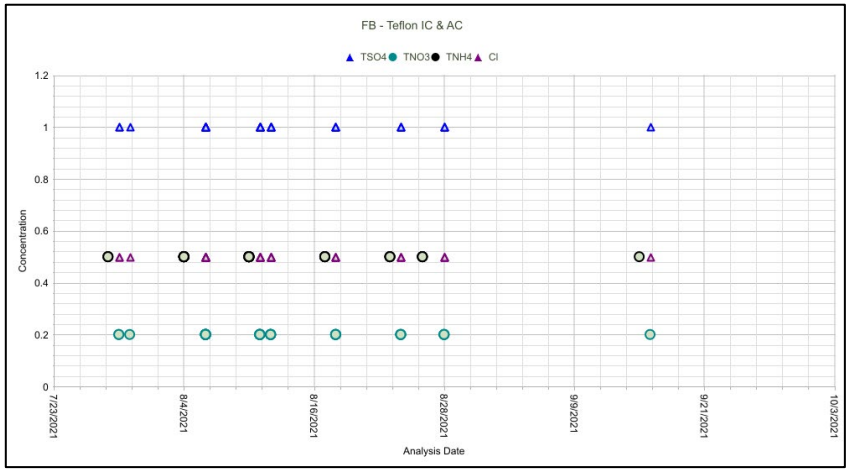
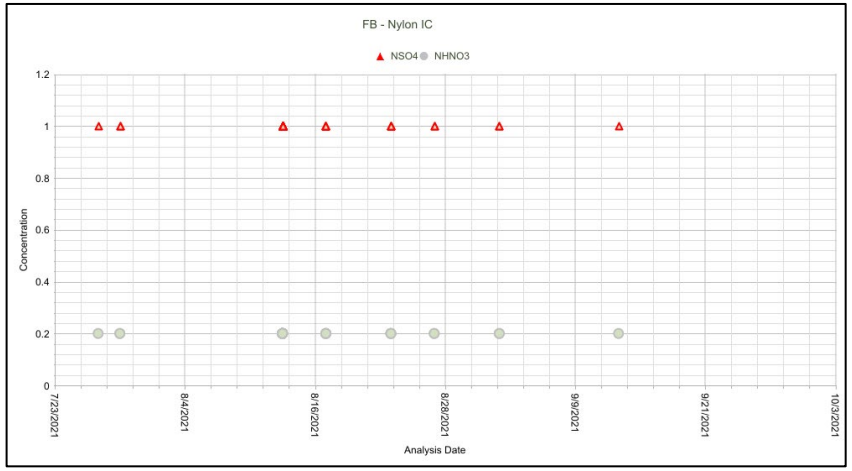
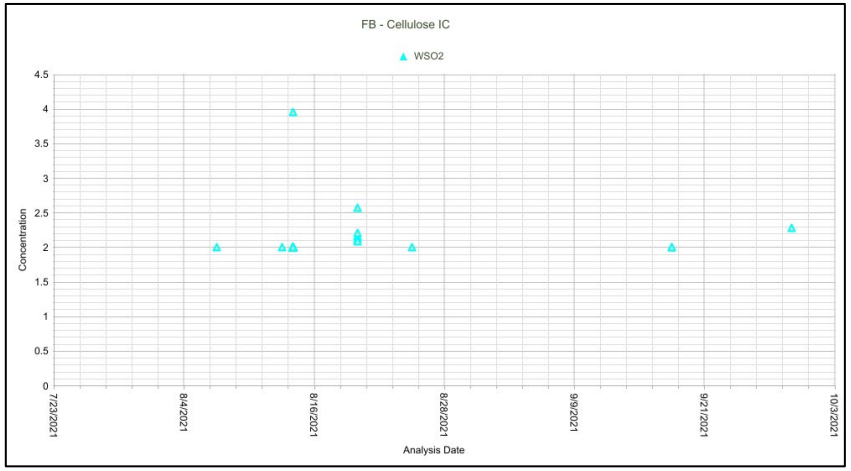


Figure 7 Field Blank Analysis Results for Third Quarter 2021 (total micrograms)









Attachment 1: CASTNET Impregnation Solution Testing

(Revision 1)

Introduction

In early June of this year, J.T. Baker, Wood's usual supplier, informed Wood that the potassium carbonate used to impregnate the cellulose filters was backordered until October 2021. This was later updated to early 2022. Wood had a supply sufficient only through August 2021. Wood began acceptance testing potassium carbonate from four other suppliers (Acros, Fisher, Spectrum, and VWR). Potassium carbonate that passed acceptance testing was then scheduled for field testing at the Gainesville test site. Wood selected a new potassium carbonate supplier (Fisher) based on the product that passed acceptance testing and field testing with performance that most closely compared with J.T. Baker's solution. Additionally, Wood verified that the supplier routinely maintains a sufficient quantity to ensure availability. [Note: Revision 1 of this document was revised to add Table 1 and text describing reasons for rejecting candidate solutions.]

Field Testing

Two sets of filter packs were prepared as follows – one set was prepared with filters impregnated with reagent from the candidate vendor, and the other set was prepared with filters impregnated with reagent from the current approved vendor: Three standard three-stage filter packs, three passive filter packs and three field blanks (FB) were prepared as per established CASTNET procedures. In addition, three lab blanks (LB) were prepared.

The filter packs were transferred to the Wood on-site sampling station for exposure. Field blanks remained capped and enclosed in resealable plastic bags in the shelter until returned to the laboratory with the exposed filter packs for processing. Filter packs were then processed as per established CASTNET procedures. Samples were required to pass established quality control (QC) criteria for blanks and replicates[1]. Candidate solutions with passing QC results were rated more highly if they compared more closely with the J.T. Baker results.

Summary of Test Results

The Fisher results compared well with J.T. Baker and demonstrated blank results below the 0.040 µg/mL reporting limit (RL) with the exception of a single LB value at 0.047 µg/mL. No other candidate solution performed as well. Fisher is the vendor of the potassium carbonate used by the Cary Institute.

Candidate potassium carbonate solutions were eliminated for poor comparisons with J.T. Baker for passives, LB, and FB while showing consistently higher values than J.T. Baker.

Figure 1 shows initial (7/23/21) and confirmation (8/10/21) runs of the Fisher solution where:

[1] Blank Criteria: ±2xRL for blank values
Replicate Criteria: ±20 percent for replicate concentrations >5xRL, ±RL for concentrations less than 5xRL

Standard three-stage filter packs = JT Baker, Fisher
Passive filter packs = JT BakerPass, FisherPass
Field blanks = JT BakerFB, FisherFB
Lab blanks = JT BakerLB, FisherLB

There was an issue with mass flow controller drift in on set of standard filter pack samples in the 7/23/21 test run.

Figure 1. Field Test Results

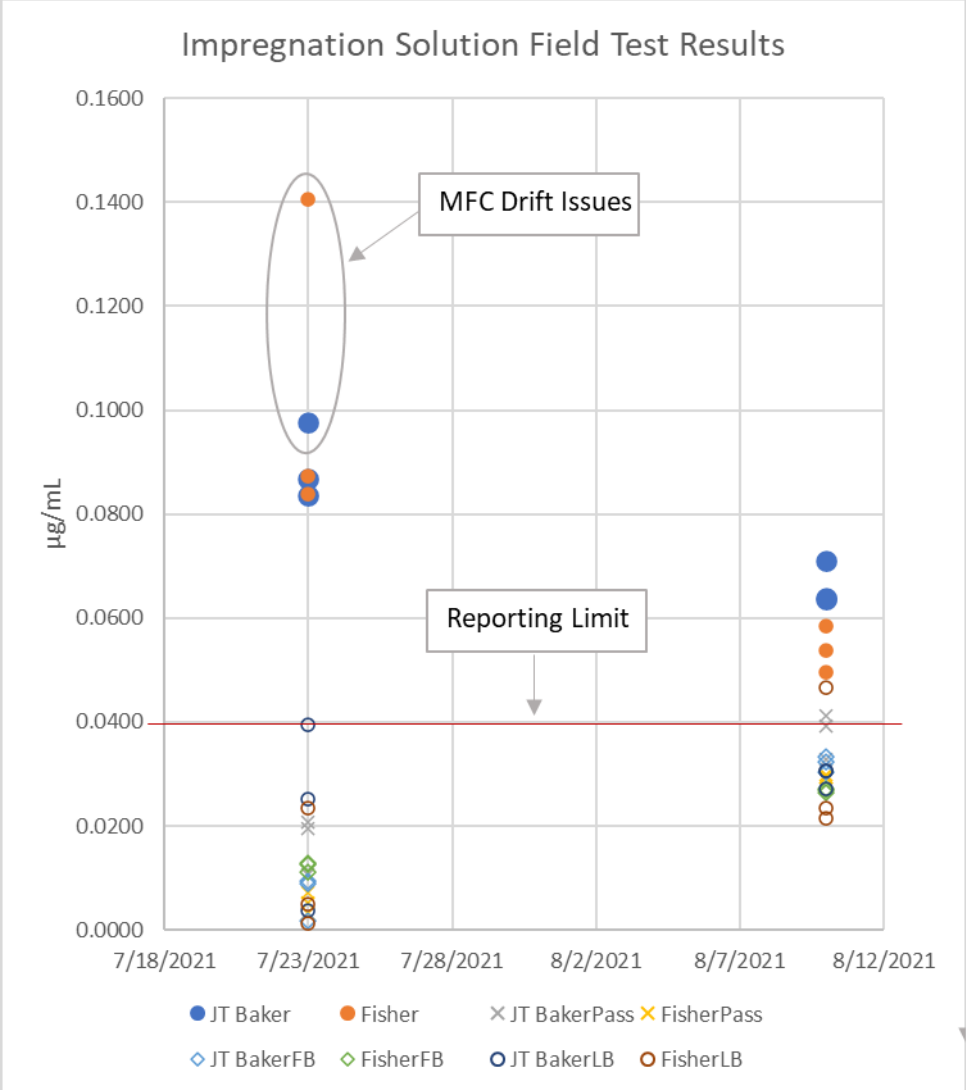


Table 1 lists the comparison of the Fisher solution with J. T. Baker. The Diff columns show the concentration difference (Fisher minus J.T. Baker) in µg/mL. The differences are all below the method detection limit (MDL) and have no consistent positive or negative bias.

Table 1. Field Test Results

	Standard			Avg	Diff	RPD	Passive			Avg	Diff	RPD	FB			Avg	Diff	RPD	LB			Avg	Diff	RPD
23-Jul																								
JT Baker	0.0977	0.0837	0.0869	0.0894			0.0207	0.0194	0.0106	0.0169			0.0017	0.0095	0.0089	0.0067			0.0252	0.0037	0.0394	0.0228		
Fisher	0.1406	0.0873	0.0839	0.1039	**0.0145**	**15.00**	0.0071	0.0031	0.0052	0.0051	**-0.0118**	**106.81**	0.0127	0.0128	0.0110	0.0122	**0.0055**	**57.95**	0.0235	0.0013	0.0049	0.0099	**-0.0129**	**78.78**
10-Aug																								
JT Baker	0.0710	0.0637	0.0640	0.0662			0.0413	0.0391	0.0328	0.0377			0.0333	0.0324	0.0303	0.0320			0.0271	0.0306	0.0307	0.0295		
Fisher	0.0495	0.0584	0.0537	0.0539	**-0.0124**	**20.59**	0.0299	0.0293	0.0294	0.0295	**-0.0082**	**24.38**	0.0263	0.0272	0.0268	0.0268	**-0.0052**	**17.81**	0.0235	0.0214	0.0466	0.0305	**0.0010**	**3.45**

Notes: RL = 0.0400 µg/mL
MDL = 0.016 µg/mL

Supplier Inventory

The Wood laboratory manager verified with Fisher that inventory equivalent to a one-year supply of impregnation solution is routinely maintained. When solution is available once again from J.T. Baker, their solution will be subject to the same field testing protocol before it is approved for use due to the extended period of time the product was out of production.