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Proficiency Test Final Report AQA 21-07 PFAS in Soil and Water

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I would like to thank the management and staff of the participating laboratories for supporting the study. It is only through widespread participation that we can provide an effective service to laboratories.

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SUMMARY

This report presents the results of the proficiency test AQA 21-07 PFAS in Soil and Water. This study is focused on the measurement of 34 per- and polyfluorinated alkyl substances (PFAS): PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFUdS, PFDoS, PFTTrDS, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUdA, PFDoA, PFTTrDA, PFTTeDA, PFOSA, MeFOSA, EtFOSA, MeFOSAA, MeFOSE, 6:2 FTS, 8:2 FTS, GenX, ADONA, 9Cl-PF3ONS and 11Cl-PF3OUdS in soil and water. The measurement of PFOS total and PFOS linear (PFOS_L) as well as of PFHxS total and PFHxS linear (PFHxS_L) were also included in the program.

Thirty-three laboratories participated and all submitted results.

Four test samples were prepared at the NMI North Ryde laboratory and consisted of:

- two soil samples: Sample S1 with incurred PFAS contaminants, and Sample S2 spiked with 22 individual PFAS components; and
- two water samples: Sample S3 with incurred PFAS contaminants, and Sample S4 spiked with 26 individual PFAS components.

The assigned values were the robust averages of participants' results. The associated uncertainties were estimated from the robust standard deviations of the participants' results.

The outcomes of the study were assessed against the aims as follows, to:

- i. *compare the performances of participant laboratories and to assess their accuracy in the measurement of PFAS in soil and water;*

Laboratory performance was assessed using both z-scores and E_n -scores.

Of 1818 z-scores, 1654 (91%) returned $|z| \leq 2.0$, indicating a satisfactory performance.

Of 1818 E_n -scores, 1461 (80%) returned $|E_n| \leq 1.0$, indicating agreement of the participant's result with the assigned value within their respective expanded uncertainties.

Laboratory 25 received satisfactory z-scores for all of the analytes for which z-scores were calculated (71). Laboratory 12 returned 70 satisfactory z-scores out of the 71. All results reported by laboratories 8 (68), 24 (67), 3 (65), 27 (64), 15 (52), 11 (27) and 33 (4) returned satisfactory z-scores.

Laboratory 25 had the highest number of satisfactory E_n -scores (71 out of 71). Laboratories 27, 15 and 33 returned satisfactory E_n -scores for all analytes reported.

- ii. *evaluate the laboratories' methods for PFAS in soil and water analysis;*

Five laboratories reported at least one PFAS analyte that was not spiked into the test samples by the study coordinator.

PFDS presented analytical difficulty to participating laboratories in both matrices.

A limited number of laboratories have the capability to measure PFUdS, PFDoS and PFTTrDS in water.

Due to the limited amount of data and wide variety of analytical methods used, no significant trends in extraction and sample preparation could be identified.

- iii. *compare the performance of participant laboratories with their past performance;*

Over the last 7 years, laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the results reported were compatible with each other. Over this period, the average proportion of satisfactory scores was 88% for z-scores and 76% for E_n -scores.

- iv. *develop the practical application of traceability and measurement uncertainty and provide participants with information that will be useful in assessing their uncertainty estimates.*

Of 1962 results, 1908 were reported with an associated estimate of expanded measurement uncertainty. The magnitude of the reported expanded uncertainties was within the range 0% to 727% of the reported value

- v. *produce materials that can be used in method validation and as control samples.*

Surplus test samples from the present study are available for sale. The samples are homogeneous and well characterised, both by in-house testing and from the results of the proficiency round.

A reference material for PFAS analytes in soil (MX019) is also available for sale from NMI.

1 INTRODUCTION

1.1 NMI Proficiency Testing Program

The National Measurement Institute (NMI) is responsible for Australia's national measurement infrastructure, providing a range of services including a chemical proficiency testing program.

Proficiency testing (PT) is the: 'evaluation of participant performance against pre-established criteria by means of interlaboratory comparison.'¹ NMI PT studies target chemical testing in areas of high public significance such as trade, environment, law enforcement and food safety. NMI offers studies in:

- pesticide residues in fruit and vegetables, soil and water;
- petroleum hydrocarbons in soil and water;
- PFAS in soil, water, biota and food;
- inorganic analytes in soil, water, food and pharmaceuticals;
- controlled drug assay; and
- allergens in food.

1.2 Study Aims

The aims of the study were to:

- compare the performances of participant laboratories and assess their accuracy in the measurement of PFAS in soil and water matrices;
- evaluate the laboratories' test methods;
- develop the practical application of traceability and measurement uncertainty and provide participants with information that will be useful in assessing their uncertainty estimates; and
- produce materials that can be used in method validation and as control samples.

1.3 Study Conduct

The conduct of NMI proficiency tests is described in the NMI Study Protocol for Proficiency Testing.² The statistical methods used are described in the NMI Chemical Proficiency Testing Statistical Manual.³ These documents have been prepared with reference to ISO/IEC 17043¹ and The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories.⁴

NMI is accredited by the National Association of Testing Authorities, Australia (NATA) to ISO/IEC 17043 as a provider of proficiency testing schemes. This study falls within the scope of NMI's accreditation.

2 STUDY INFORMATION

2.1 Study Timetable

The timetable of the study was:

Invitation issued	5 July 2021
Samples dispatched	3 August 2021
Results due	8 October 2021
Interim report issued	18 October 2021

2.2 Participation

Thirty-three laboratories participated in this study, and all submitted results. The laboratory with the Lab code 1 cancelled its participation.

2.3 Test Material Preparation

Four test samples were provided for analysis.

- Two soil samples S1 and S2 each containing 20 g:
 - Sample S1 containing incurred PFAS contaminants; and
 - Sample S2 spiked with 22 individual PFAS components.
- Two water samples S3 and S4 each containing 2 x 50 mL:
 - Sample S3 containing incurred PFAS contaminants; and
 - Sample S4 autoclaved milli-Q water spiked with 26 individual PFAS components.

The bulk water sample S4 was spiked with 18 analytes using a composite solution that was then mixed and dispensed into 65 mL HDPE bottles. Each bottle was then further spiked with a composite solution containing PFUdA, PFDoA, PFTrDA, PFTeDA, PFUdS, PFDoS, PFTrDS and PFOSA, with the aim of minimising the loss of these analytes during preparation (see details in Appendix 1).

Four PFAS analytes, PFUdS, PFDoS, PFTrDS and 11Cl-PF3OUdS, were introduced for the first time in this PT study.

The analytical standards used for spiking these samples were purchased from HPC Standards GmbH, Toronto Research Chemicals, and Wellington Laboratories Canada.

Details of the spiked analytes and levels are presented in Table 1 and sample preparation details in Appendix 1.

Table 1 Formulated concentrations of test samples

PFAS	S2 Soil (Spiked) µg/kg	S4 Water (Spiked) µg/L
PFBS	20.0	0.0700
PFPeS	23.4	0.0328
PFHxS	18.9	0.0284
PFHxS_L	18.9	0.0284
PFHpS	2.01	0.00500
PFOS	4.78	0.0143
PFOS_L	4.78	0.0143
PFDS	Not Spiked	0.0645
PFUdS	Not Spiked	0.0966
PFDoS	Not Spiked	0.0387
PFTrDS	Not Spiked	0.0582
PFBA	5.02	0.0556
PFPeA	10.1	0.0645
PFHxA	8.97	0.0251
PFHpA	2.99	0.00783
PFOA	12.1	0.0302
PFNA	6.06	0.0700
PFDA	19.9	0.0400
PFUdA	Not Spiked	0.101
PFDoA	Not Spiked	0.0206

PFAS	S2 Soil (Spiked) µg/kg	S4 Water (Spiked) µg/L
PFTTrDA	Not Spiked	0.0394
PFTeDA	Not Spiked	0.0801
PFOSA	4.96	0.0713
MeFOSA	6.92	Not Spiked
EtFOSA	10.0	Not Spiked
MeFOSAA	15.0	Not Spiked
MeFOSE	8.08	Not Spiked
6:2 FTS	Not Spiked	0.0142
8:2 FTS	9.58	Not Spiked
GenX	15.0	0.0698
ADONA	47.1	0.0659
9Cl-PF3ONS	37.3	0.0839
11Cl-PF3OUdS	58.1	0.0565

2.4 Test Material Homogeneity and Stability Testing

The preparation of the study samples is described in Appendix 1. No homogeneity or stability testing was conducted on soil and water samples. These samples were prepared and packaged using a process that has been demonstrated to produce homogeneous and stable samples in previous NMI PFAS PTs. Participants' results gave no reason to question the homogeneity and stability of the previously used analytes. However, there were stability issues in this study with regards to GenX in S2. Possible reasons for the instability of these analytes are presented in section 6.7. A reasonable consensus was found between participants' results and consequently an assigned value was set for these tests.

2.5 Sample Storage, Dispatch and Receipt

Prior to dispatch, soil and water samples were refrigerated at 4°C.

Participants were sent 20 g soil in Greiner tubes for each of Samples S1 and S2, and two 50 mL water in HDPE bottles for each of Samples S3 and S4. The samples were packed in a foam box with a cooler brick and sent by courier on 03 August 2021.

The following items were packaged with the samples:

- a covering letter which included a description of the test samples and instructions for participants; and
- a form for participants to confirm the receipt and condition of the samples.

An Excel spreadsheet for the electronic reporting of results was e-mailed to participants.

2.6 Instructions to Participants

Participants were instructed as follows:

- Quantitatively analyse the samples using your routine test method.
- Report results in units of µg/kg on an as received basis for PFAS in soil samples S1 and S2, and in units of µg/L for PFAS water samples.
- For water samples S3 and S4, use the entire content of the bottle for analysis. The second bottle is provided for repeat analysis.
- For PFAS analytes that contain linear and branched isomers, report TOTAL – the sum of linear and branched.

- For PFOS and PFHxS you are asked to report TOTAL (the sum of linear and branched isomers) and LINEAR (the linear isomers only).
- The analytes range for PFAS in S1 is 0-2000 µg/kg, in S2 is 0-200 µg/kg, in S3 is 0-500 µg/L, and in S4 is 0-50 µg/L.
- Report results using the electronic results sheet emailed to you.
- For each analyte, report a single result expressed as if reporting to a client (i.e. corrected for recovery or not, according to your standard procedure, but state if results are corrected on the result sheet). This figure will be used in all statistical analysis in the study report.
- For each analyte report the associated expanded measurement uncertainty (e.g. 0.50 ± 0.02 µg/kg), if determined.
- No limit of reporting has been set for this study. Report results as you would to a client, applying the limit of reporting of the method used for analysis.
- Report any listed analyte not tested as NT.
- Please complete the method details and report the basis of your uncertainty estimates as required by the results sheet.
- If determined, report your internal standard percentage recovery. This will be presented in the report for information only.
- Return the completed results sheet by e-mail (proficiency@measurement.gov.au) by 10 September 2021. Late results may not be included in the study report.

Due to the exceptional international circumstances occurring over the course of this study, the results due date was extended to 08 October 2021 for all participants.

2.7 Interim Report

An interim report was emailed to all participants on 18 October 2021.

3 PARTICIPANT LABORATORY INFORMATION

3.1 Test Methods Reported by Participants

Participants were requested to provide methodology information. Responses are presented in Appendix 5 for soil and Appendix 6 for water. The study coordinator thanks participants for completing the questionnaire.

3.2 Basis of Participants' Measurement Uncertainty Estimates

Participants were requested to provide information about their basis of measurement uncertainty (MU). Responses are presented in Tables 2 and 3.

Table 2 Basis of Participants' Uncertainty Estimate

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
2	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS	Recoveries of SS	NATA GAG Estimating and Reporting MU
3	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS	Recoveries of SS	Eurachem/CITAC Guide
4	Top Down - precision and estimates of the method and laboratory bias	Control samples - CRM Duplicate analysis Instrument calibration	Recoveries of SS	ISO/GUM
5 ^a	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - SS	Recoveries of SS	USEPA SW-846
6	Bottom Up (ISO/GUM, fish bone/cause and effect diagram)	Control samples - RM	CRM Laboratory bias from PT studies Recoveries of SS	Nordtest Report TR537
7	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	CRM Instrument calibration Standard purity	NATA GAG Estimating and Reporting MU
8	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	CRM Recoveries of SS	NATA GAG Estimating and Reporting MU
9 ^a	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
10	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - SS Duplicate analysis Instrument calibration	Instrument calibration Recoveries of SS	NATA GAG Estimating and Reporting MU
11	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis Instrument calibration	Instrument calibration Recoveries of SS Standard purity	NATA GAG Estimating and Reporting MU
12	Control Charts	Control samples - CRM Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS	

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
13	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis Instrument calibration	CRM	NATA GAG Estimating and Reporting MU
14 ^a	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
15 ^a	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS Standard purity	NATA GAG Estimating and Reporting MU
16	Standard deviation of replicate analyses multiplied by 2 or 3			NATA GAG Estimating and Reporting MU (replaced Technical Note 33)
17 ^a	Standard deviation of replicate analyses multiplied by 2 or 3	Standard deviation from PT studies only		Eurachem/CITAC Guide
		Control samples - SS Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS	
18	Standard deviation of replicate analyses multiplied by 2 or 3	Duplicate analysis	Recoveries of SS	NMI Uncertainty Course
19	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS	Recoveries of SS	NATA GAG Estimating and Reporting MU
20	Bottom Up (ISO/GUM, fish bone/cause and effect diagram)	Control samples - SS	CRM Instrument calibration Recoveries of SS Standard purity	ISO/GUM
21 ^a	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - Spiked blank matrix (LCS)	Recoveries of SS	SW846
22	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	CRM Recoveries of SS Standard purity	Eurachem/CITAC Guide
23	Bottom Up (ISO/GUM, fish bone/cause and effect diagram)	Duplicate analysis Instrument calibration	Instrument calibration Standard purity	ISO/GUM
24 ^a	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - SS		
25	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results.
26	Top Down - precision and estimates of the method and laboratory bias	Control samples - RM Duplicate analysis Instrument calibration	Recoveries of SS	Eurachem/CITAC Guide

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
27	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results.
28 ^a	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
29	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis	Instrument calibration Recoveries of SS	ISO/GUM
30	Top Down - precision and estimates of the method and laboratory bias	Control samples - SS Duplicate analysis Instrument calibration	Laboratory bias from PT studies Recoveries of SS	NATA GAG Estimating and Reporting MU
31	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - CRM	CRM	ISO/GUM
32	Professional judgment	Control samples - RM Duplicate analysis Instrument calibration	Instrument calibration Laboratory bias from PT studies Recoveries of SS	
33	Top Down - precision and estimates of the method and laboratory bias	Control samples - Spare samples of AQA19-11 Duplicate analysis	Recoveries of SS Standard purity	Eurachem/CITAC Guide
34	Top Down - precision and estimates of the method and laboratory bias	Duplicate analysis Instrument calibration	Instrument calibration Recoveries of SS Standard purity	NATA GAG Estimating and Reporting MU

*SS = Spiked Samples, RM = Reference Material, CRM = Certified Reference Material. ^aAdditional Information in Table 3

Table 3 Uncertainty Estimate Comments

Lab Code	Approach to Estimating MU
5	Standard Practice for laboratories utilizing US EPA's SW-846 document.
9	MU is calculated based on historic QC data
14	MU is calculated based on historic QC data
15	Recovery and uncertainty data given for analytes at method limit of reporting.
17	Soil samples were extracted alongside both spiked soil and reference soil. Uncertainty calculated as 3 x SD of replicate analysis.
21	Standard practice for laboratories utilizing US EPA's SW-846 document.
24	Measurement Uncertainty (U) estimated from the standard deviation (u) of replicate recovery samples using the expression $U = 2 \times u$. Procedure as set out in Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition
28	MU is calculated based historic QC data

3.3 Participants' Comments

Participants were invited to make comments for this PT study. Such feedback allows for the improvement of future studies. Participants' comments are presented in Table 4, along with the study coordinator's response where appropriate.

Table 4 Participants' Comments

Lab Code	Participants' Comments	Study manager's response
14	Suggest considering proficiency trial for leachable PFAS (ASLP/TCLP).	Thank you for your suggestions. The other participants are invited to comment.

4 PRESENTATION OF RESULTS AND STATISTICAL ANALYSIS

4.1 Results Summary

Participant results are listed in Tables 5 to 85 with resultant summary statistics: robust average, median, maximum, minimum, robust standard deviation (SDrob) and robust coefficient of variation (CVrob). Bar charts of results and performance scores are presented in Figures 2 to 82. An example chart with interpretation guide is shown in **Error! Reference source not found..**

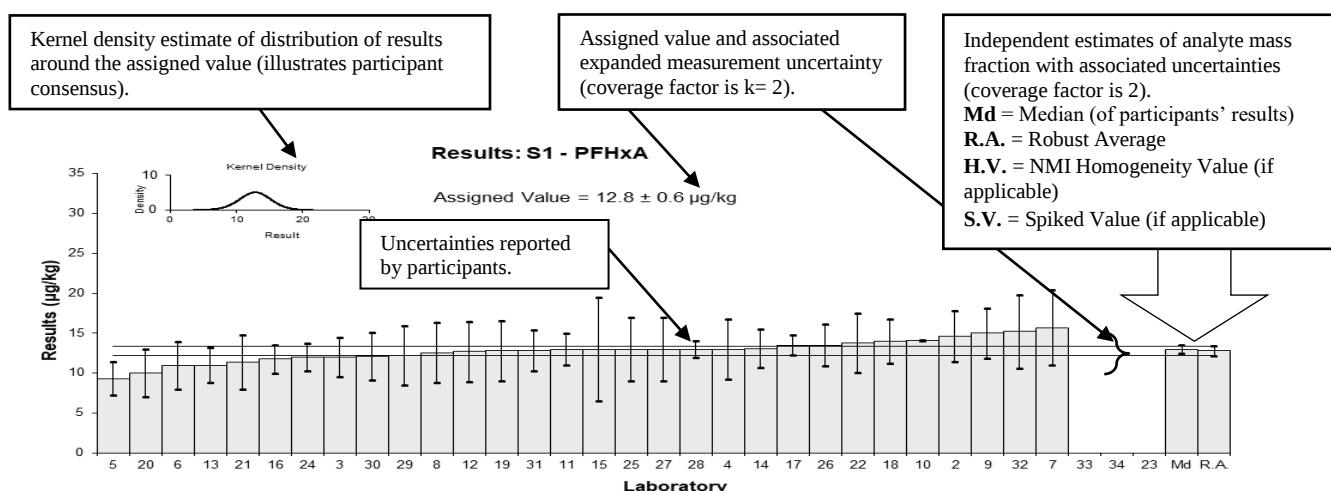


Figure 1 Guide to Presentation of Results

4.2 Outliers and Extreme Outliers

Outliers were results less than 50% and greater than 150% of the robust average and were removed before assigned value calculation. Extreme outliers were obvious blunders, such as those with incorrect units, decimal errors, or results from a different proficiency test item (gross errors) and were removed for calculation of summary statistics.^{3, 4}

4.3 Assigned Value

An example of the assigned value calculation using data from the present study is given in Appendix 2. The assigned value is defined as: ‘the value attributed to a particular property of a proficiency test item’.¹ In this study the property is the mass concentration of analyte. Assigned values were the robust average of participants’ results; the expanded uncertainties were estimated from the associated robust standard deviations.^{4, 5}

4.4 Robust Average and Robust Between-Laboratory Coefficient of Variation

The robust averages and associated expanded measurement uncertainties were calculated using the procedure described in ‘Statistical methods for use in proficiency testing by interlaboratory comparisons, ISO13528:2015(E)’.⁵

4.5 Target Standard Deviation for Proficiency Assessment

The target standard deviation for proficiency assessment (σ) is the product of the assigned value (X) and the performance coefficient of variation (PCV). This value is used for calculation of participant z-score and provides scaling for laboratory deviation from the assigned value.

$$\sigma = (X) \times \text{PCV} \quad \text{Equation 1}$$

It is important to note that the PCV is a fixed value and is not the standard deviation of participants’ results. The fixed value set for PCV is based on the existing regulation, the acceptance criteria indicated by the methods, the matrix, the concentration level of analyte

and/or on experience from previous studies. It is backed up by mathematical models such as Thompson Horwitz equation.⁶

4.6 z-Score

An example of z-score calculation using data from the present study is given in Appendix 2.

For each participant's result a z-score is calculated according to Equation 2 below:

$$z = \frac{(\chi - X)}{\sigma} \quad \text{Equation 2}$$

where:

- z is z-score;
- χ is a participant's result;
- X is the assigned value;
- σ is the target standard deviation.

A z-score with absolute value ($|z|$):

- $|z| \leq 2.0$ is satisfactory;
- $2.0 < |z| < 3.0$ is questionable;
- $|z| \geq 3.0$ is unsatisfactory.

To account for potential low bias in the consensus value due to inefficient methodologies, a number of scores were adjusted for a 'maximum acceptable concentration'. Results lower than the maximum acceptable concentration but with a z-score greater than 2.0 had their z-score adjusted to 2.0. Additional information is given in Section 6.4.

4.7 E_n-Score

An example of E_n-score calculation using data from the present study is given in Appendix 2.

The E_n-score is complementary to the z-score in assessment of laboratory performance.

E_n-score includes measurement uncertainty and is calculated according to Equation 3 below:

$$E_n = \frac{(\chi - X)}{\sqrt{U_\chi^2 + U_X^2}} \quad \text{Equation 3}$$

where:

- E_n is E_n-score;
- χ is a participant's result;
- X is the assigned value;
- U_χ is the expanded uncertainty of the participant's result;
- U_X is the expanded uncertainty of the assigned value.

An E_n-score with absolute value ($|E_n|$):

- $|E_n| \leq 1.0$ is satisfactory;
- $|E_n| > 1.0$ is unsatisfactory.

4.8 Traceability and Measurement Uncertainty

Laboratories accredited to ISO/IEC Standard 17025:2018⁷ must establish and demonstrate the traceability and measurement uncertainty associated with their test results. Guidelines for quantifying uncertainty in analytical measurement are described in the Eurachem/CITAC Guide.⁸

5 TABLES AND FIGURES

Table 5

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFBS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	En-Score
2	4.01	0.68	141	0.26	0.28
3	3.3	0.73	NR	-0.67	-0.67
4	4.6	1.4	83	1.04	0.56
5	17.2	1.7	79	17.57	7.82
6	4.092	1.10484	>80	0.37	0.25
7	<5	1.5	NR		
8	3.206	0.962	86	-0.79	-0.61
9	4.0	0.8	114	0.25	0.23
10	5.52	0.028	112	2.24	8.07
11	3.0	0.7	124	-1.06	-1.11
12	3.64	1	105	-0.22	-0.17
13	3.6	0.72	99	-0.28	-0.28
14	3.4	0.65	116	-0.54	-0.60
15	3.7	1.9	82	-0.14	-0.06
16	5.092	1.211	100.1	1.68	1.04
17	3.8	0.17	91	-0.01	-0.04
18	4.6	0.9	NR	1.04	0.85
19	4.3	1.3	NR	0.64	0.37
20	3.1	0.6	97	-0.93	-1.12
21	3.56	1.07	99	-0.33	-0.23
22	3.9	1.1	102	0.12	0.08
23	NT	NT	NT		
24	3.9	0.43	118	0.12	0.19
25	3.8	1	107	-0.01	-0.01
26	3.62	0.89	107	-0.25	-0.21
27	3.6	1	105	-0.28	-0.21
28	4.0	0.3	94	0.25	0.52
29	3.688	1.1064	98.18	-0.16	-0.11
30	3.66	0.91	77	-0.20	-0.16
31	3.93	0.79	109.3	0.16	0.15
32	3.81	1.14	73.4	0.00	0.00
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	3.81	0.21
Spike	Not Spiked	
Robust Average	3.85	0.24
Median	3.80	0.11
Mean	4.33	
N	29	
Max.	17.2	
Min.	3	
Robust SD	0.51	
Robust CV	13%	

*Robust Average excluding laboratory 5.

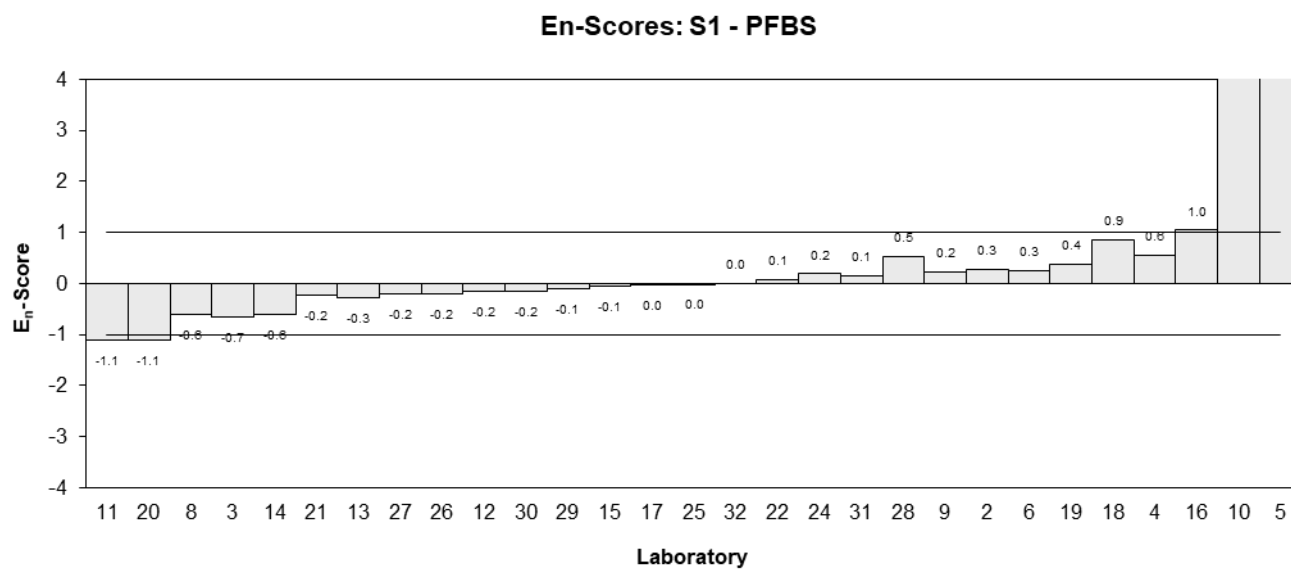
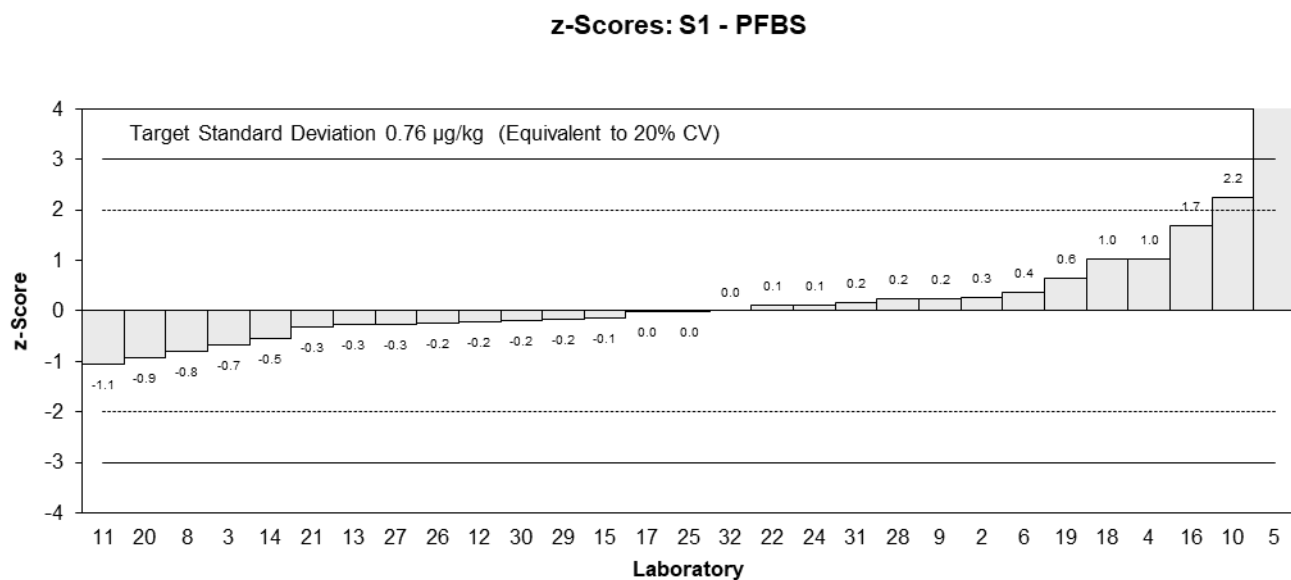
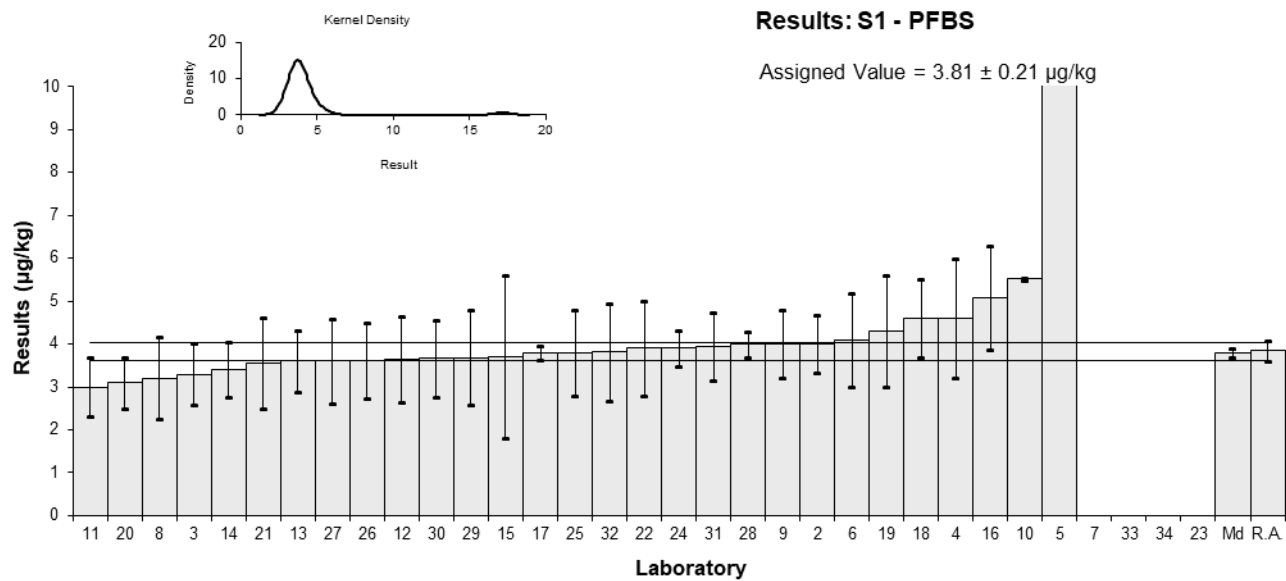


Figure 2

Table 6

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFPeS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	5.18	1.39	NR	0.25	0.17
3	4.3	0.94	NR	-0.64	-0.63
4	4.8	1.4	NR	-0.13	-0.09
5	21.0	5.7	83	16.30	2.81
6	4.956	1.338	>80	0.03	0.02
7	6.60	1.98	NR	1.69	0.83
8	4.273	1.282	95	-0.67	-0.49
9	6.2	1.2	91.2	1.29	1.02
10	5.54	0.069	NR	0.62	1.71
11	NT	NT	NT		
12	5.36	1.6	NR	0.44	0.26
13	4.4	0.88	99	-0.54	-0.56
14	4.4	1.24	117	-0.54	-0.41
15	4.8	2.4	NR	-0.13	-0.05
16	4.070	1.207	NR	-0.87	-0.68
17	8.2	0.70	83	3.32	4.18
18	NT	NT	NT		
19	4.7	1.4	NR	-0.23	-0.16
20	4.6	1.0	116	-0.33	-0.31
21	4.12	1.24	93	-0.82	-0.63
22	4.3	1.2	NR	-0.64	-0.50
23	NT	NT	NT		
24	4.4	0.60	117	-0.54	-0.76
25	5.2	1	99	0.27	0.25
26	5.78	1.34	107	0.86	0.61
27	4.9	1	101	-0.03	-0.03
28	5.3	0.4	89	0.38	0.70
29	6.3456	1.9037	NR	1.44	0.73
30	5.37	1.3	72	0.45	0.33
31	5.49	1.1	NR	0.57	0.49
32	4.03	1.21	73.4	-0.91	-0.71
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	4.93	0.35
Spike	Not Spiked	
Robust Average	5.07	0.41
Median	4.93	0.31
Mean	5.66	
N	28	
Max.	21	
Min.	4.03	
Robust SD	0.87	
Robust CV	17%	

*Robust Average excluding laboratories 5 and 17.

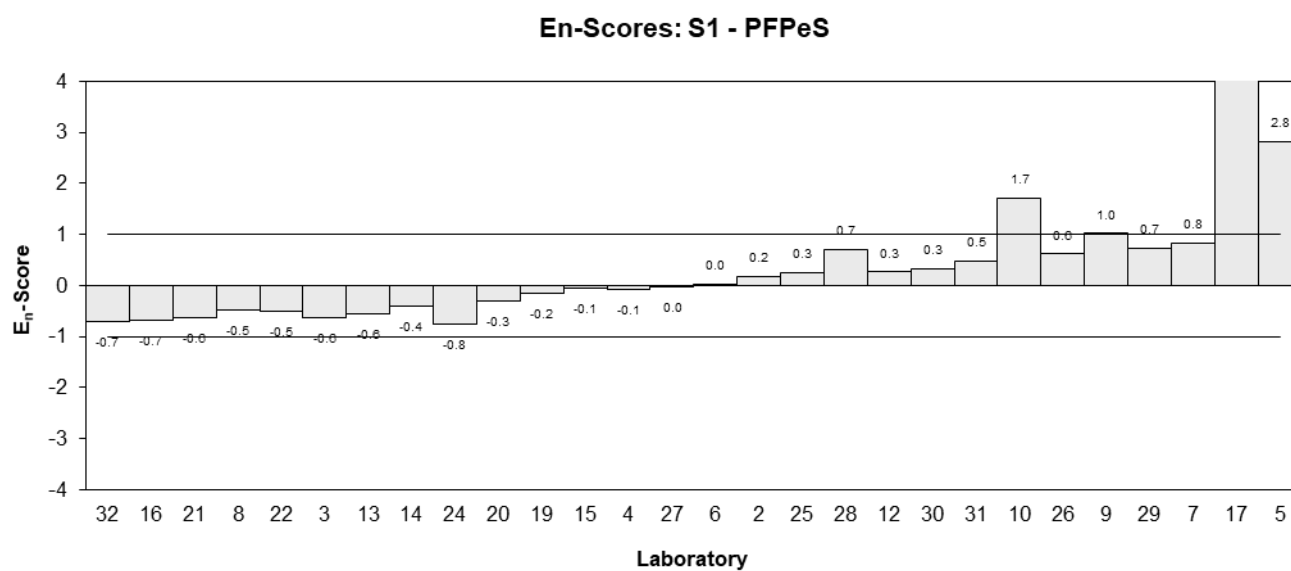
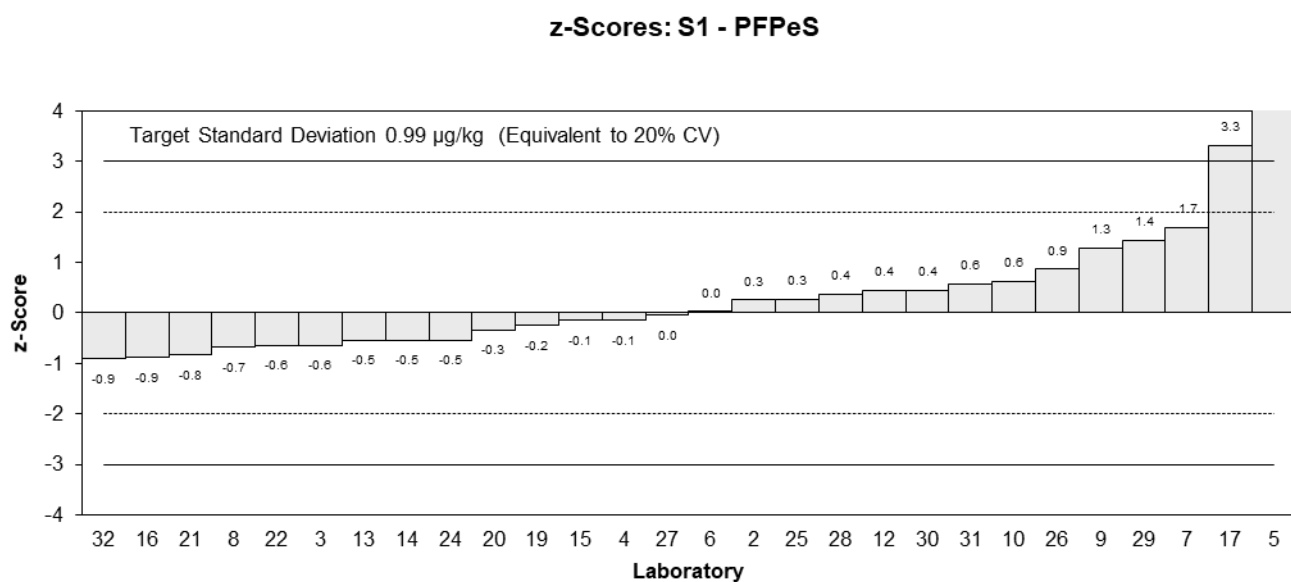
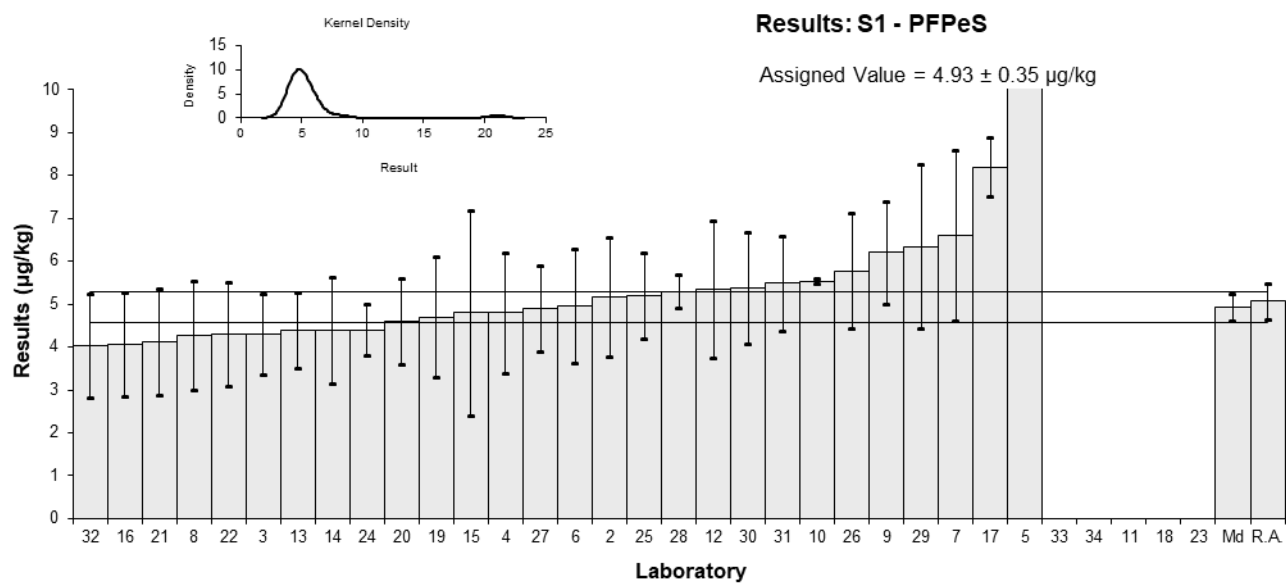


Figure 3

Table 7

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFHxS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	47.0	9.66	NR	0.69	0.57
3	40	8.8	NR	-0.16	-0.14
4	36	11	118	-0.64	-0.47
5	18.4	3.1	68	-2.77	-5.75
6	45.718	12.344	>80	0.53	0.35
7	60.68	18.20	NR	2.35	1.05
8	40.715	12.214	95	-0.07	-0.05
9	44.7	9.8	99	0.41	0.34
10	54.34	4.49	NR	1.58	2.54
11	32	6	131	-1.13	-1.43
12	33.1	9.9	92	-0.99	-0.80
13	41	8.2	99	-0.04	-0.03
14	39.9	7.35	99	-0.17	-0.18
15	42	21	80	0.08	0.03
16	34.498	7.267	96.2	-0.82	-0.89
17	46.2	3.20	80	0.59	1.21
18	40	8.1	NR	-0.16	-0.15
19	41	12	NR	-0.04	-0.02
20	35	5.2	116	-0.76	-1.09
21	35.3	10.6	93	-0.73	-0.55
22	41.6	10	86	0.04	0.03
23	NT	NT	NT		
24	44	10	96	0.33	0.26
25	42	10	99	0.08	0.07
26	45.0	9.6	104	0.45	0.37
27	39	10	101	-0.28	-0.22
28	45	5	89	0.45	0.66
29	51.1192	15.3358	74.23	1.19	0.63
30	40.6	10	82	-0.08	-0.07
31	36.03	7.24	NR	-0.64	-0.69
32	40.5	12.2	80.6	-0.10	-0.06
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	41.3	2.5
Spike	Not Spiked	
Robust Average	41.0	2.6
Median	40.9	2.3
Mean	41.1	
N	30	
Max.	60.68	
Min.	18.4	
Robust SD	5.7	
Robust CV	14%	

*Robust Average excluding laboratory 5.

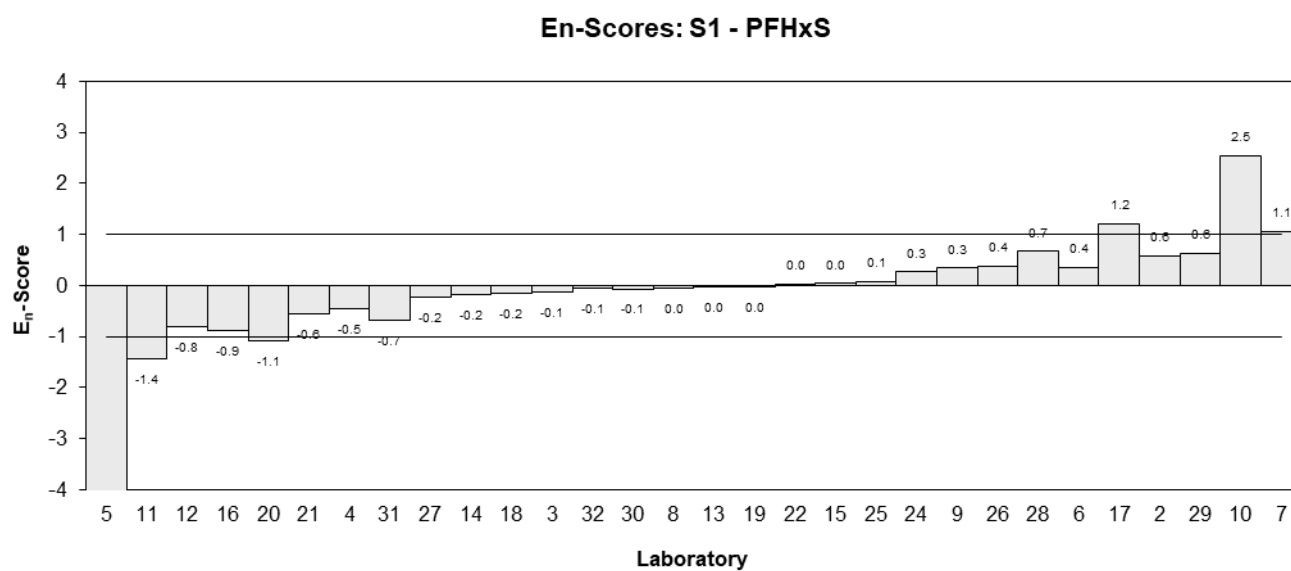
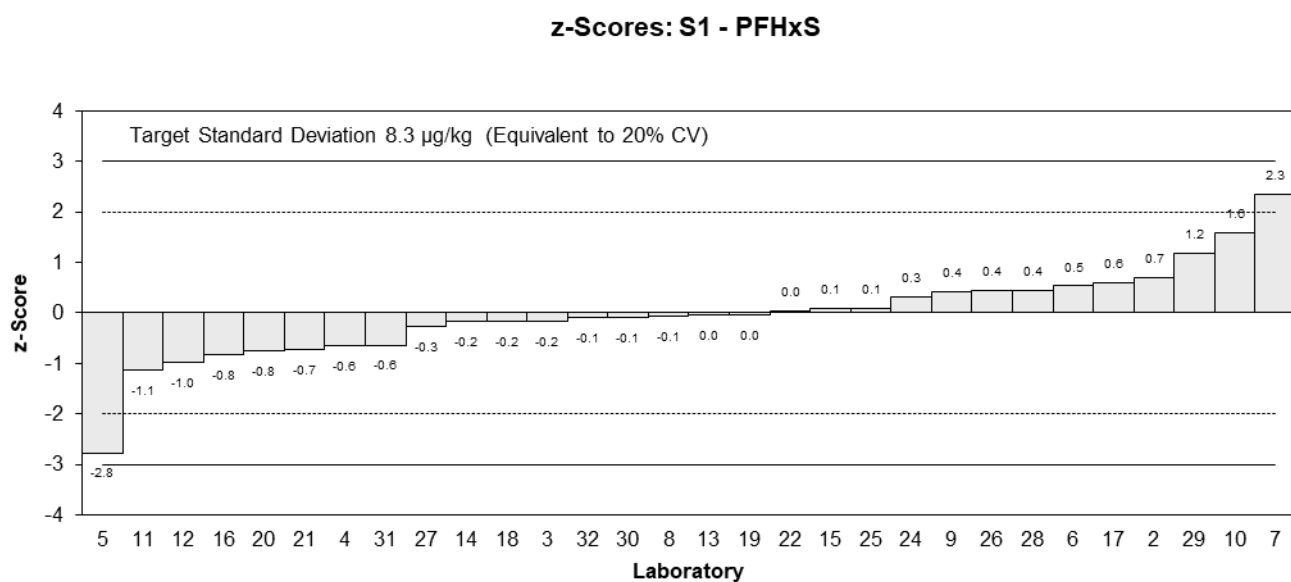
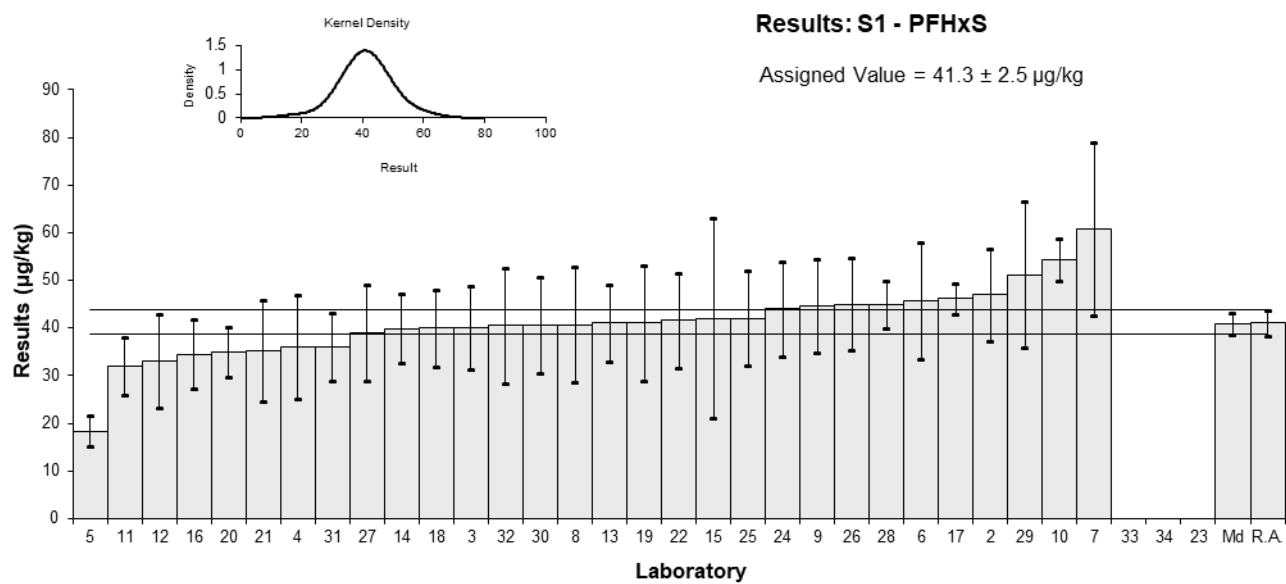


Figure 4

Table 8

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFHxS_L
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	40.5	8.32	131	0.56	0.46
3	35	7.7	NR	-0.19	-0.17
4	33	9.9	118	-0.47	-0.33
5	18.4	3.1	68	-2.47	-4.11
6	NT	NT	NT		
7	53.14	15.94	NR	2.30	1.03
8	38.489	11.547	95	0.29	0.17
9	NT	NT	NT		
10	45.46	7.10	104	1.24	1.17
11	NT	NT	NT		
12	31	9.3	92	-0.74	-0.55
13	35	7.0	99	-0.19	-0.18
14	NT	NT	NT		
15	39	NR	NR	0.36	0.84
16	16.808	6.487	96.2	-2.69	-2.73
17	40.4	1.34	80	0.55	1.18
18	38	7.5	NR	0.22	0.20
19	NT	NT	NT		
20	31	5.1	116	-0.74	-0.90
21	32.5	9.75	93	-0.54	-0.38
22	36.9	8.9	NR	0.07	0.05
23	NT	NT	NT		
24	38	9.0	96	0.22	0.17
25	37	10	99	0.08	0.06
26	NT	NT	NT		
27	34	10	101	-0.33	-0.23
28	NT	NT	NT		
29	45.9686	13.7906	NR	1.31	0.68
30	28.3	7.1	81	-1.11	-1.05
31	31.18	6.27	101.8	-0.72	-0.75
32	39	11.7	80.6	0.36	0.21
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	36.4	3.1
Spike	Not Spiked	
Robust Average	36.0	3.3
Median	36.9	2.3
Mean	35.6	
N	23	
Max.	53.14	
Min.	16.808	
Robust SD	6.3	
Robust CV	18%	

*Robust Average excluding laboratory 16.

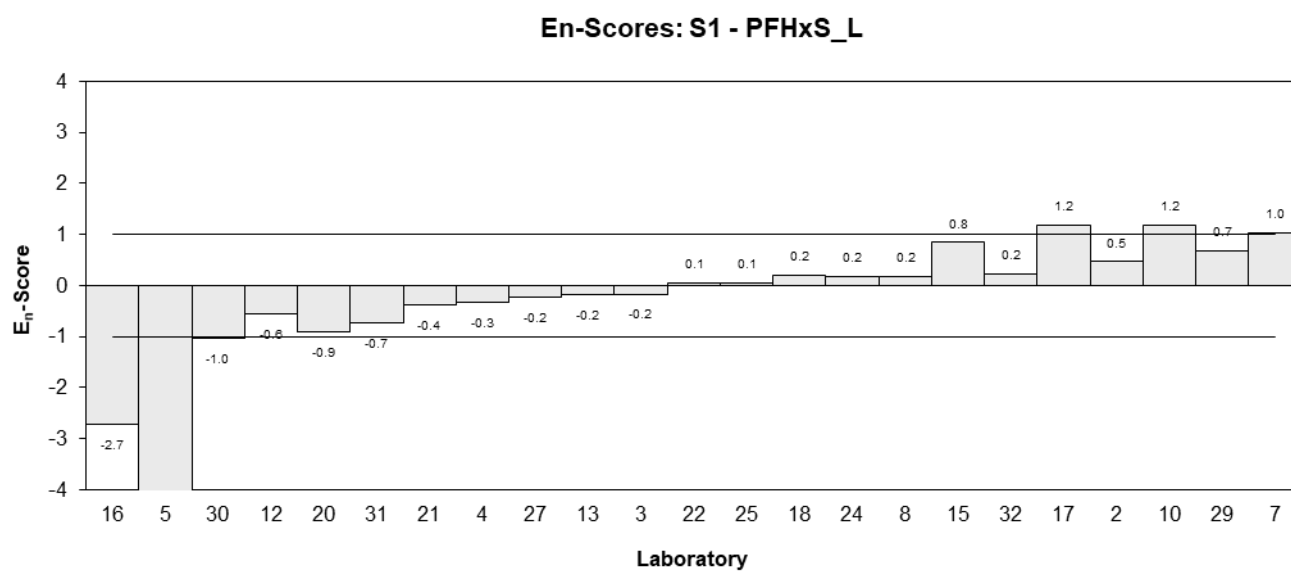
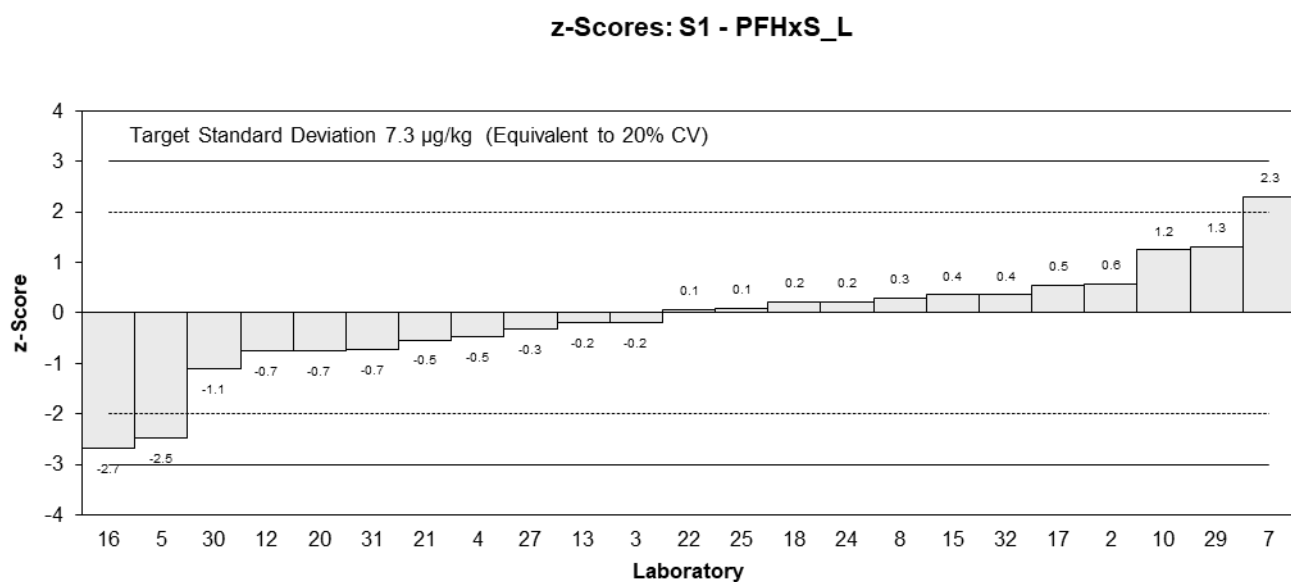
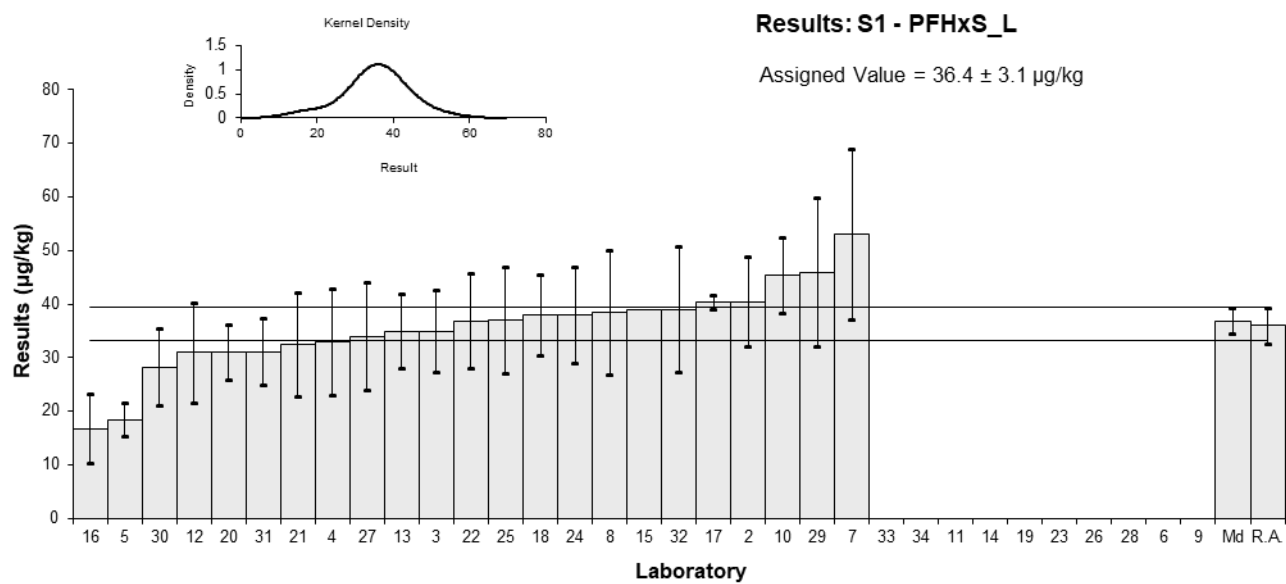


Figure 5

Table 9

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFHpS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	7.67	1.86	NR	3.84	1.75
3	3.3	0.73	NR	-1.20	-1.24
4	6.2	1.9	NR	2.14	0.96
5	2.05	0.4	69	-2.64	-4.00
6	4.949	1.336	>80	0.70	0.44
7	<5	1.5	NR		
8	3.024	0.907	95	-1.52	-1.32
9	5.4	1.1	91.2	1.22	0.90
10	4.83	0.336	NR	0.56	0.92
11	NT	NT	NT		
12	5	1.5	NR	0.76	0.42
13	3.6	0.72	99	-0.85	-0.89
14	4.2	0.97	117	-0.16	-0.13
15	4.1	2.1	NR	-0.28	-0.11
16	2.791	0.970	NR	-1.78	-1.47
17	4.8	0.75	80	0.53	0.54
18	5.8	1.2	NR	1.68	1.15
19	4.6	1.4	NR	0.30	0.18
20	4.2	0.9	116	-0.16	-0.14
21	3.17	0.951	85	-1.35	-1.13
22	5.1	1.4	NR	0.88	0.52
23	NT	NT	NT		
24	3.6	0.61	96	-0.85	-1.01
25	4.4	1	93	0.07	0.06
26	4.68	1	92	0.39	0.31
27	4.3	1	101	-0.05	-0.04
28	4.4	0.3	89	0.07	0.12
29	4.5315	1.3595	NR	0.22	0.13
30	3.97	0.99	81	-0.43	-0.35
31	4.52	0.95	NR	0.21	0.17
32	3.87	1.16	80.6	-0.54	-0.38
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	4.34	0.41
Spike	Not Spiked	
Robust Average	4.35	0.45
Median	4.40	0.31
Mean	4.39	
N	28	
Max.	7.67	
Min.	2.05	
Robust SD	0.96	
Robust CV	22%	

*Robust Average excluding laboratories 2 and 5.

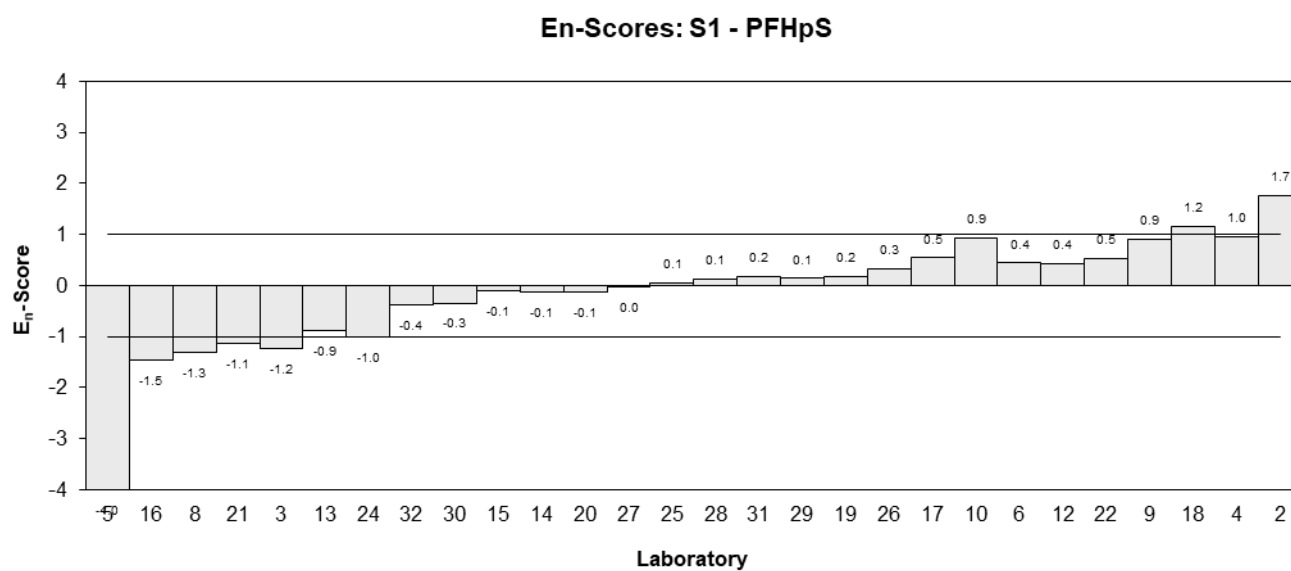
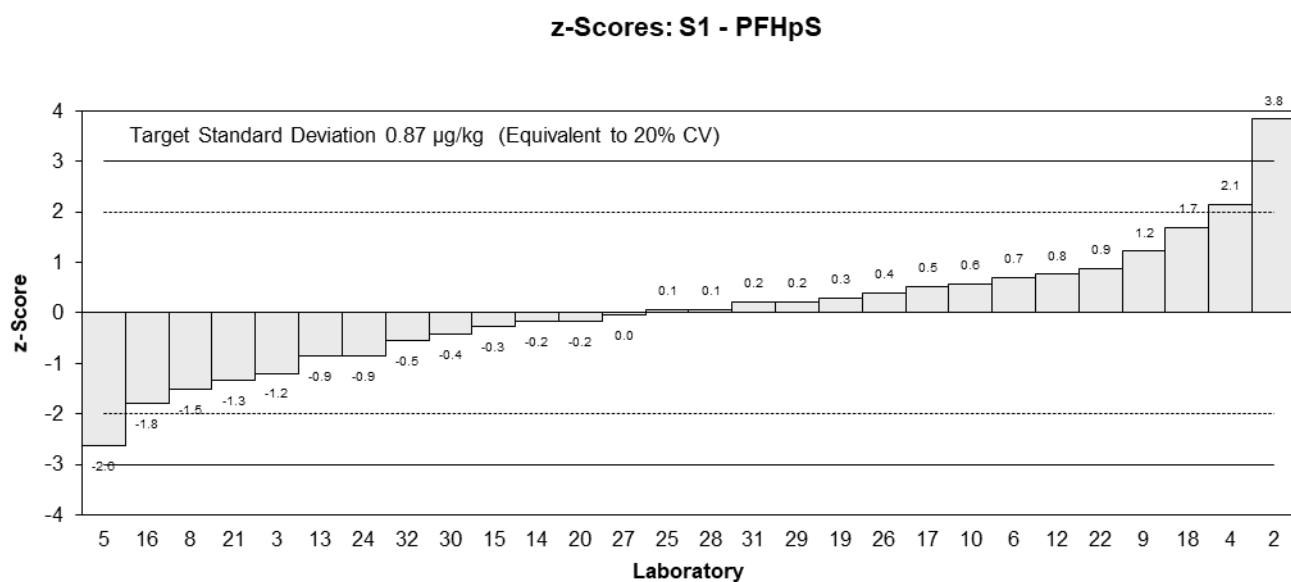
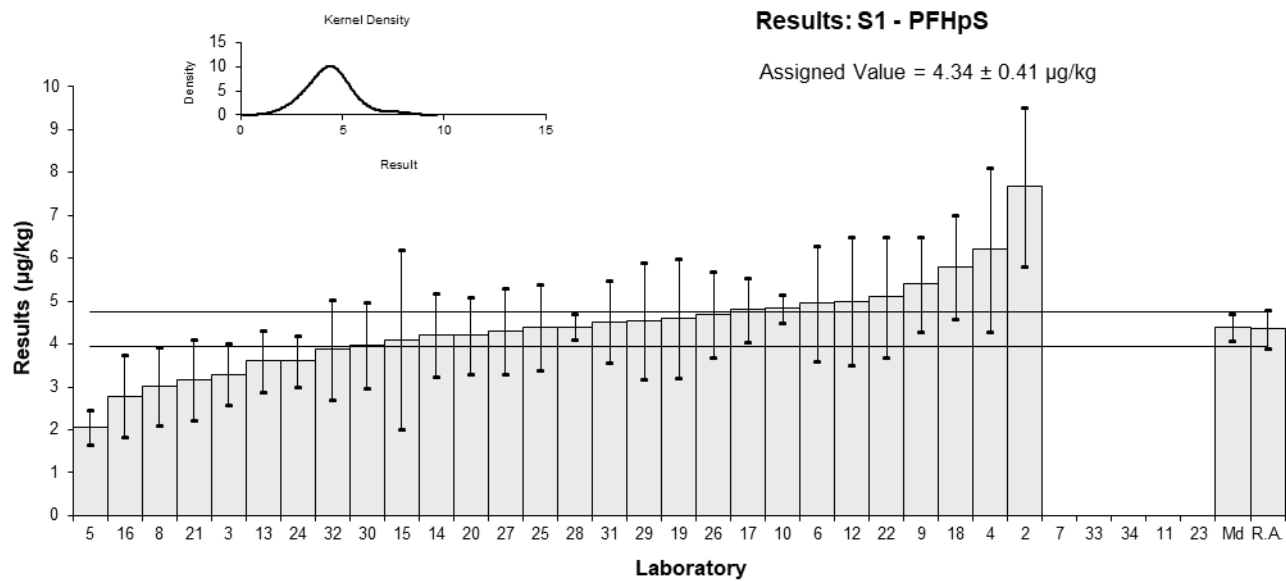


Figure 6

Table 10

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFOS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	629	134	NR	1.50	1.03
3	451	99.2	NR	-0.34	-0.31
4	528	158	67	0.45	0.27
5	4.59	0.9	69	-4.95	-11.15
6	419.8	113.346	>80	-0.66	-0.53
7	783.83	235.15	NR	3.10	1.25
8	564.588	169.376	105	0.83	0.46
9	496	108	94	0.12	0.10
10	894.45	19.091	NR	4.24	8.72
11	600	200	81	1.20	0.57
12	432	129.6	120	-0.54	-0.38
13	480	144	95	-0.04	-0.03
14	588	131.7	89	1.07	0.75
15	440	220	78	-0.45	-0.20
16	364.284	57.219	88.8	-1.24	-1.67
17	515	73	83	0.32	0.37
18	1500	300	NR	10.50	3.35
19	600	180	NR	1.20	0.63
20	360	40	97	-1.28	-2.11
21	388	116	88	-0.99	-0.78
22	504.8	136.2	40	0.21	0.15
23	NT	NT	NT		
24	492	157	104	0.08	0.05
25	480	100	93	-0.04	-0.04
26	501	117	92	0.18	0.14
27	430	100	98	-0.56	-0.50
28	490	50	107	0.06	0.09
29	464.9862	139.4959	68.5	-0.20	-0.13
30	399	99	87	-0.88	-0.79
31	601.82	120.97	NR	1.22	0.92
32	372	112	83.5	-1.16	-0.93
33	NT	NT	NT		
34	NT	NT	NT		

Statistics*

Assigned Value**	484	43
Spike	Not Spiked	
Robust Average	502	48
Median	492	41
Mean	544	
N	29	
Max.	1500	
Min.	360	
Robust SD	100	
Robust CV	21%	

*Laboratory 5 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 7, 10 and 18.

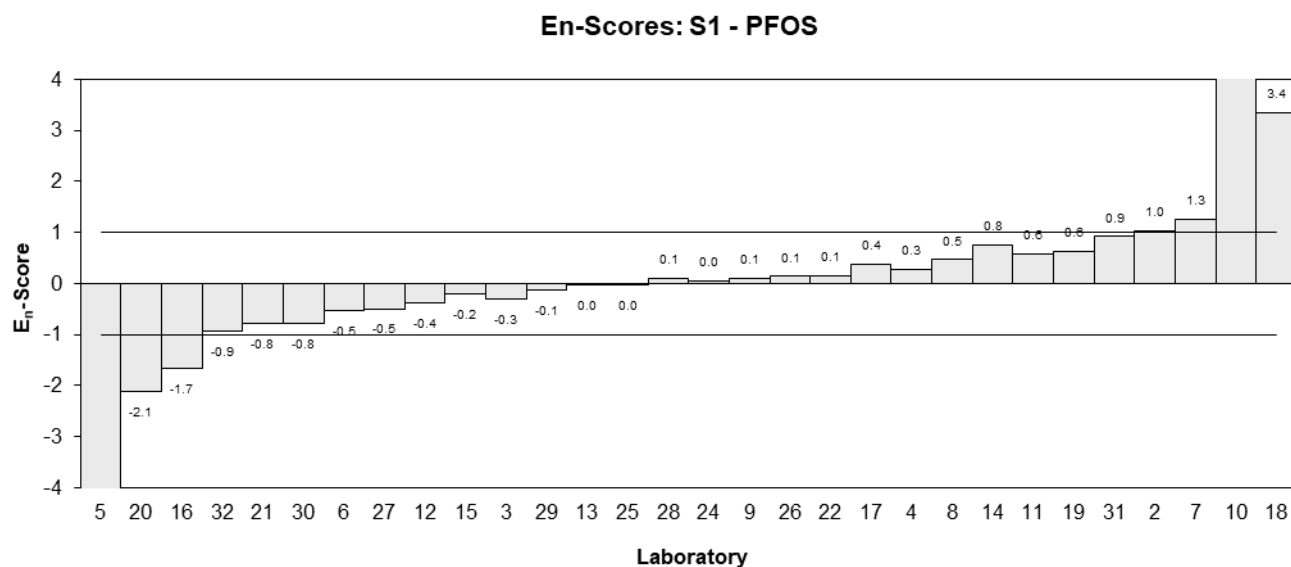
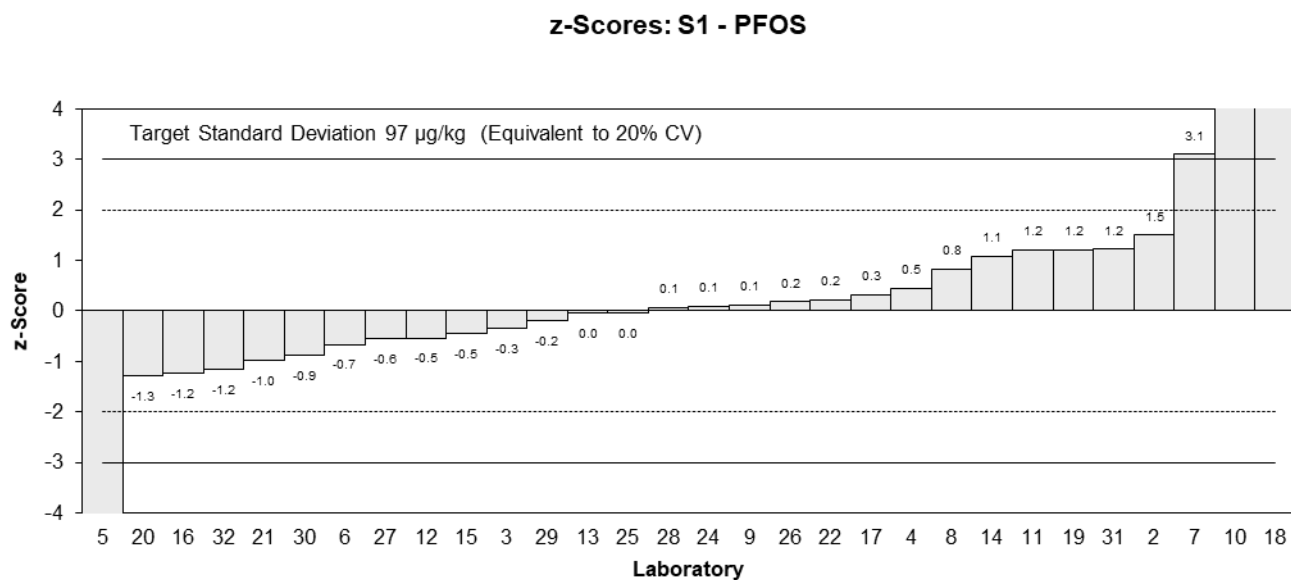
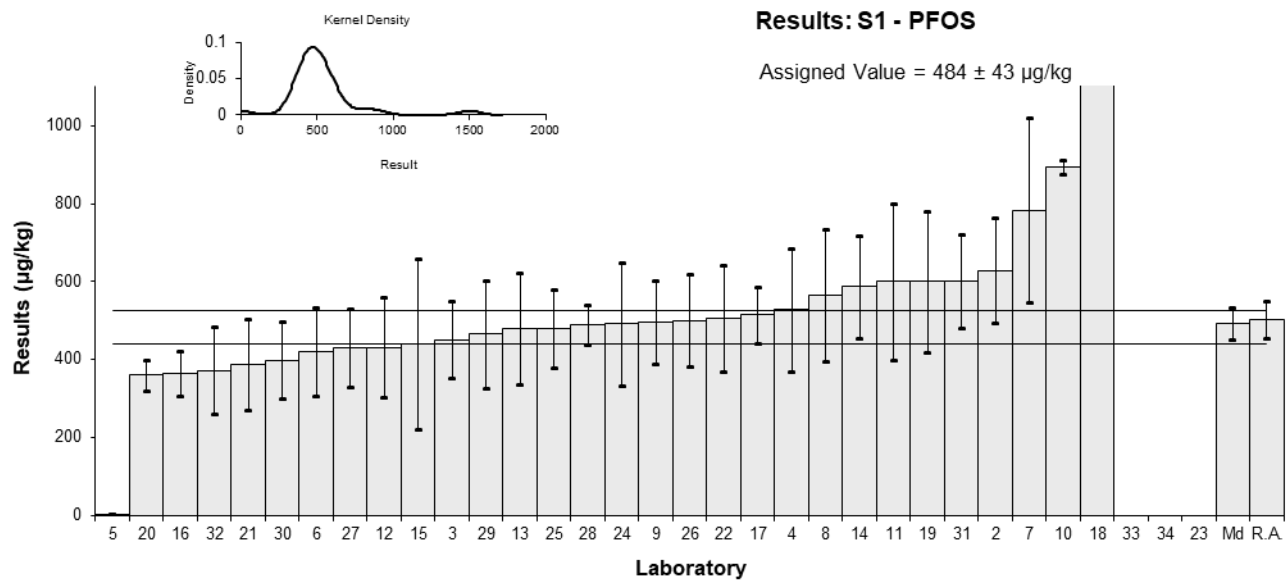


Figure 7

Table 11

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFOS_L
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	418	89	101	0.92	0.70
3	354	78.0	94	0.01	0.01
4	356	107	67	0.04	0.03
5	4.59	0.9	69	-4.93	-12.90
6	NT	NT	NT		
7	587.17	176.15	NR	3.32	1.31
8	392.053	117.616	105	0.55	0.32
9	388	85	101	0.50	0.39
10	635.04	15.67	65	3.99	9.03
11	NT	NT	NT		
12	320	96	120	-0.47	-0.33
13	390	98	95	0.52	0.36
14	NT	NT	NT		
15	370	190	NR	0.24	0.09
16	278.349	43.721	88.8	-1.06	-1.45
17	380	53	83	0.38	0.45
18	1200	240	NR	12.00	3.51
19	NT	NT	NT		
20	290	32	97	-0.89	-1.50
21	300	90	88	-0.75	-0.56
22	388.5	108.8	NR	0.50	0.32
23	NT	NT	NT		
24	386	123	104	0.47	0.26
25	350	100	93	-0.04	-0.03
26	368	86	92	0.21	0.17
27	320	100	98	-0.47	-0.32
28	NT	NT	NT		
29	331.9224	99.57672	NR	-0.30	-0.20
30	319	80	87	-0.48	-0.40
31	459.81	92.42	94.5	1.51	1.11
32	268	80.4	83.5	-1.20	-1.00
33	NT	NT	NT		
34	NT	NT	NT		

Statistics*

Assigned Value**	353	27
Spike	Not Spiked	
Robust Average	368	35
Median	369	27
Mean	410	
N	24	
Max.	1200	
Min.	268	
Robust SD	68	
Robust CV	18%	

*Laboratory 5 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 7, 10 and 18.

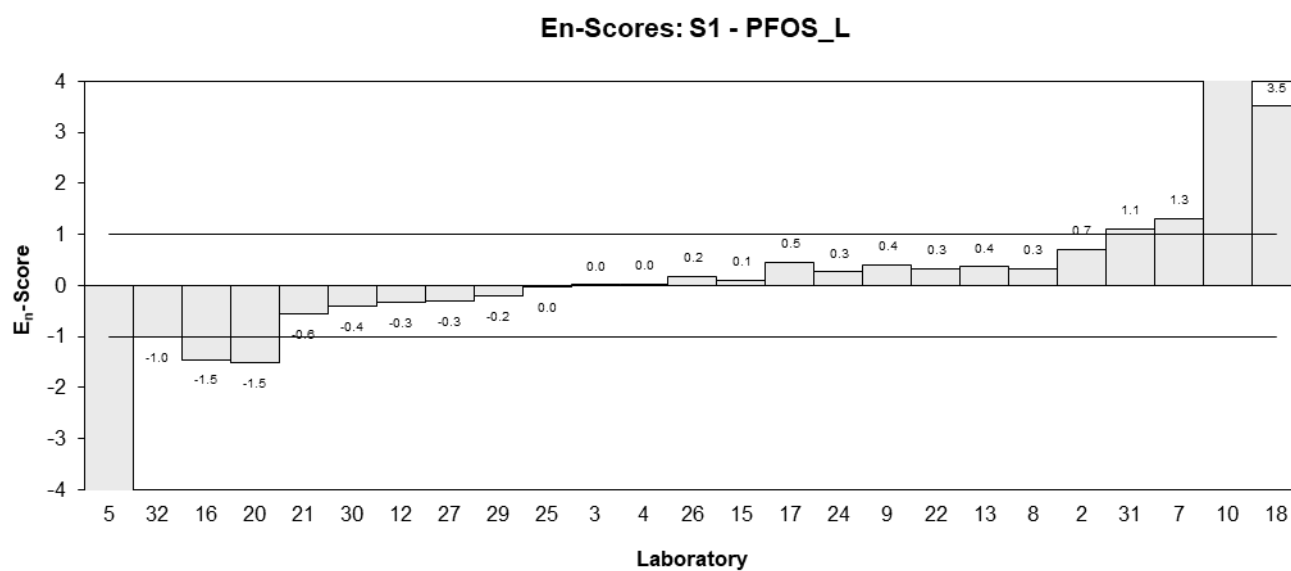
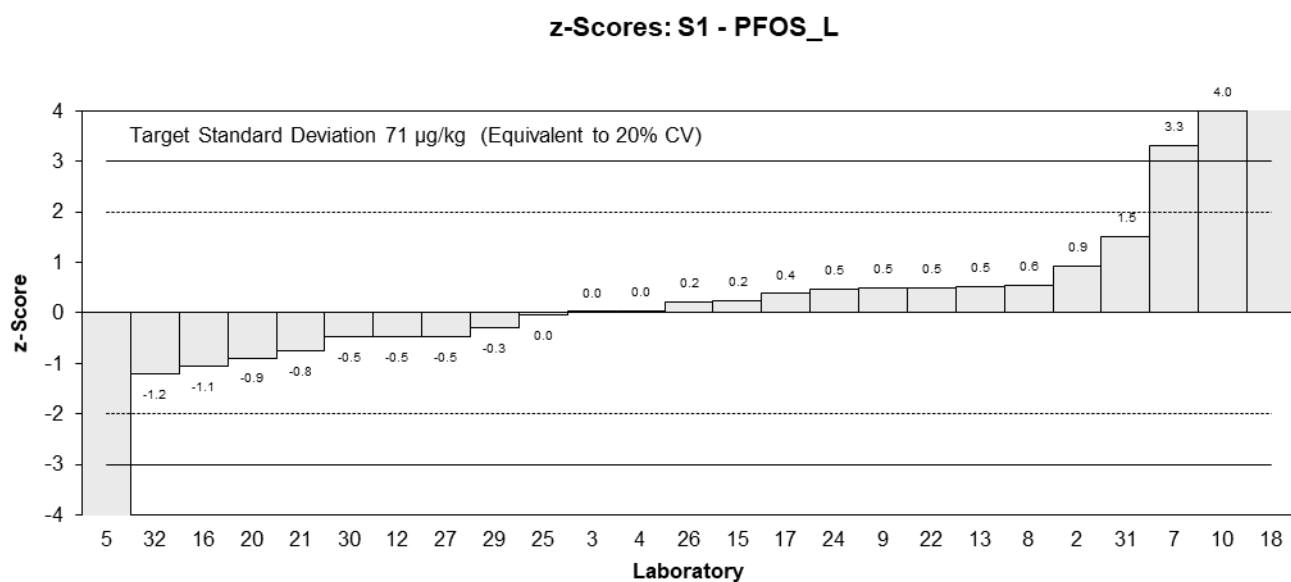
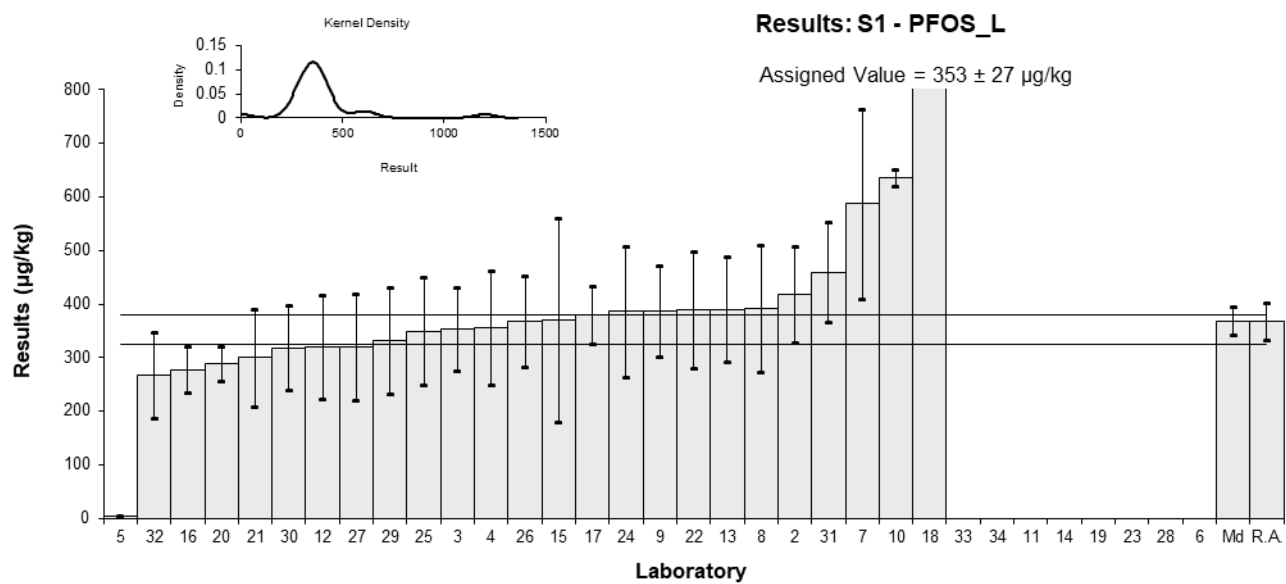


Figure 8

Table 12

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFNS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	11.3	3.14	NR
3	1.3	0.29	NR
4	6.6	2.0	NR
5	<0.196	NR	69
6	NT	NT	NT
7	NT	NT	NT
8	1.901	0.570	105
9	NT	NT	NT
10	4.89	0.693	NR
11	NT	NT	NT
12	5.06	0.03	NR
13	1.5	0.30	NR
14	NT	NT	NT
15	3.8	1.9	NR
16	0.756	0.350	NR
17	1.0	0.19	65
18	12	2.4	NR
19	NT	NT	NT
20	NT	NT	NT
21	0.894	0.268	85
22	5.6	1.6	NR
23	NT	NT	NT
24	1.1	0.17	104
25	7.1	2	93
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	1.2547	0.37641	NR
30	4.68	1.2	67
31	2.76	0.55	NR
32	NT	NT	NT
33	NT	NT	NT
34	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	3.7	1.8
Median	3.3	1.6
Mean	4.1	
N	18	
Max.	12	
Min.	0.756	
Robust SD	3.0	
Robust CV	81%	

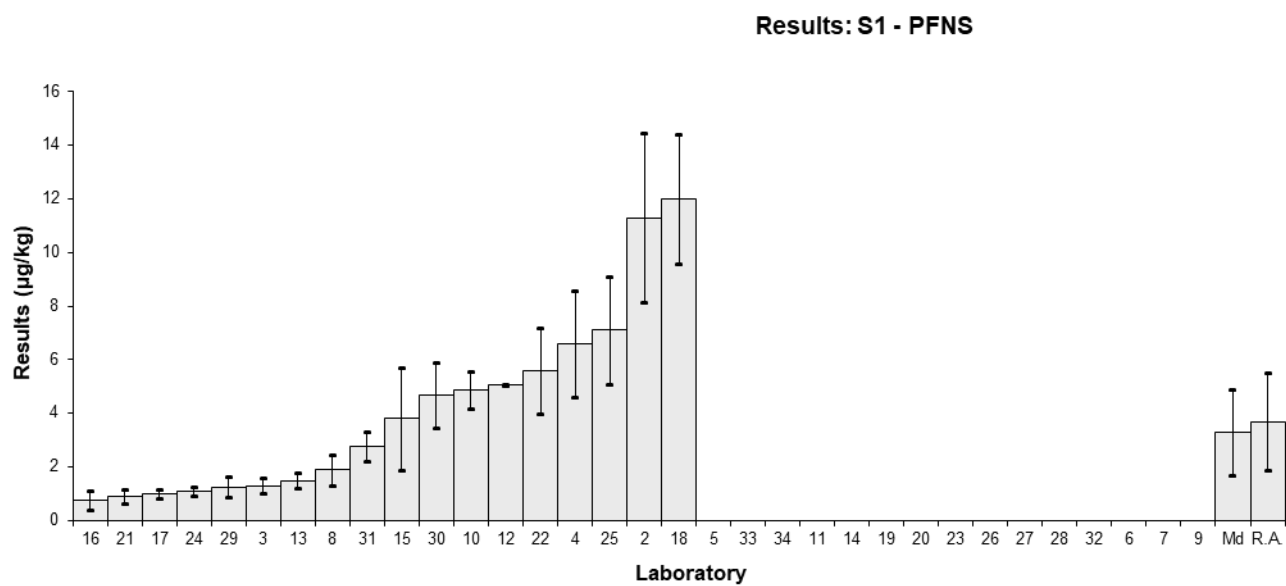


Figure 9

Table 13

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFDS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	7.07	1.83	NR
3	1.1	0.24	NR
4	4.3	1.3	NR
5	<0.196	NR	69
6	< 2.5	NR	>80
7	<5	1.50	NR
8	1.680	0.504	105
9	5.2	1.1	96
10	3.21	0.391	NR
11	NT	NT	NT
12	5.51	0.03	NR
13	1.2	0.24	NR
14	4.6	1.04	78
15	< 2.0	1	NR
16	0.751	0.294	NR
17	0.8	0.31	83
18	NT	NT	NT
19	NR	NR	NR
20	<0.4	NR	97
21	0.804	0.241	85
22	6	1.8	NR
23	NT	NT	NT
24	< 1.0	NR	104
25	4.8	2	93
26	5	1.2	92
27	3.8	2	117
28	5.3	0.8	107
29	<0.500	NR	NR
30	2.58	0.64	70
31	1.76	0.35	NR
32	<2.26	NR	94.8
33	NT	NT	NT
34	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	3.4	1.3
Median	3.8	1.2
Mean	3.4	
N	19	
Max.	7.07	
Min.	0.751	
Robust SD	2.3	
Robust CV	67%	

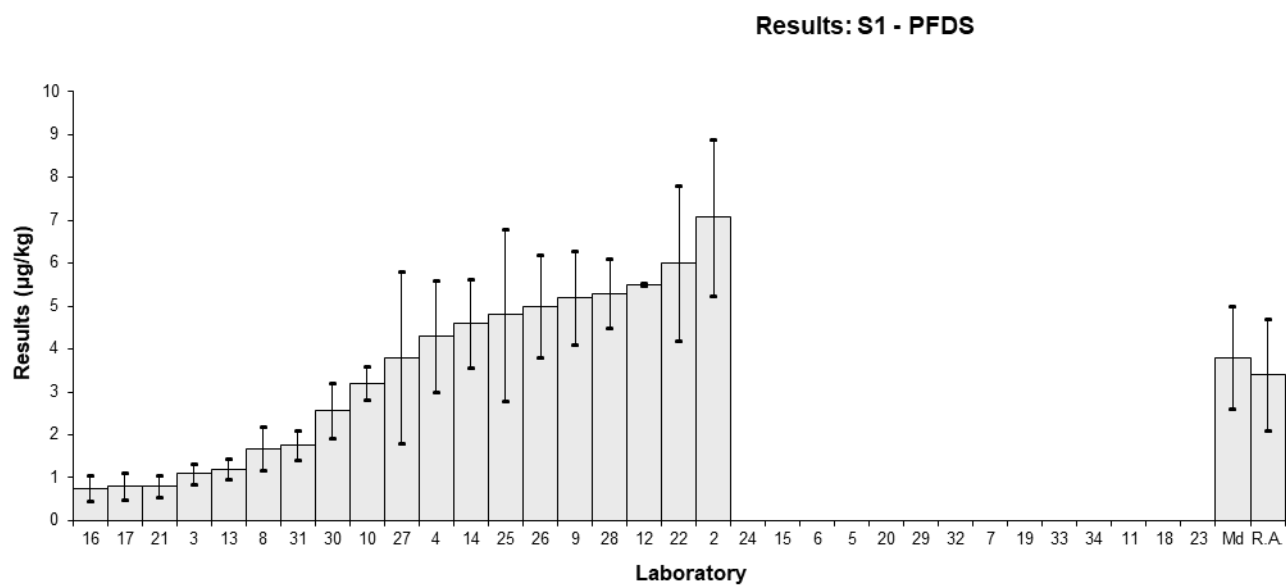


Figure 10

Table 14

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFBA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	2.59	0.45	62	0.70	0.66
3	2.5	0.56	NR	0.51	0.39
4	2.2	0.66	79	-0.15	-0.10
5	5.52	0.82	67	7.16	3.87
6	< 2.5	NR	>80		
7	<5	1.50	NR		
8	2.51	0.754	77	0.53	0.31
9	2	0.7	125	-0.59	-0.37
10	2.76	0.029	98	1.08	2.69
11	NT	NT	NT		
12	2.08	0.6	99	-0.42	-0.30
13	2.5	0.50	101	0.51	0.43
14	2	0.44	129	-0.59	-0.57
15	2.4	1.2	82	0.29	0.11
16	4.589	1.281	70.9	5.11	1.79
17	2.2	0.24	82	-0.15	-0.23
18	2.4	0.5	NR	0.29	0.24
19	1.9	0.6	NR	-0.81	-0.59
20	2.4	0.5	109	0.29	0.24
21	3.37	1.01	98	2.42	1.07
22	2.2	0.7	134	-0.15	-0.10
23	NT	NT	NT		
24	2.4	0.76	112	0.29	0.17
25	2.1	1	99	-0.37	-0.17
26	1.8	0.5	148	-1.04	-0.88
27	2.2	1	106	-0.15	-0.07
28	3.1	0.2	94	1.83	3.08
29	1.7588	0.5276	78.45	-1.13	-0.92
30	2.28	0.56	74	0.02	0.02
31	1.68	0.33	103.2	-1.30	-1.57
32	<2.26	NR	57.4		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	2.27	0.18
Spike	Not Spiked	
Robust Average	2.34	0.22
Median	2.34	0.15
Mean	2.52	
N	26	
Max.	5.52	
Min.	1.68	
Robust SD	0.44	
Robust CV	19%	

*Robust Average excluding laboratories 5 and 16.

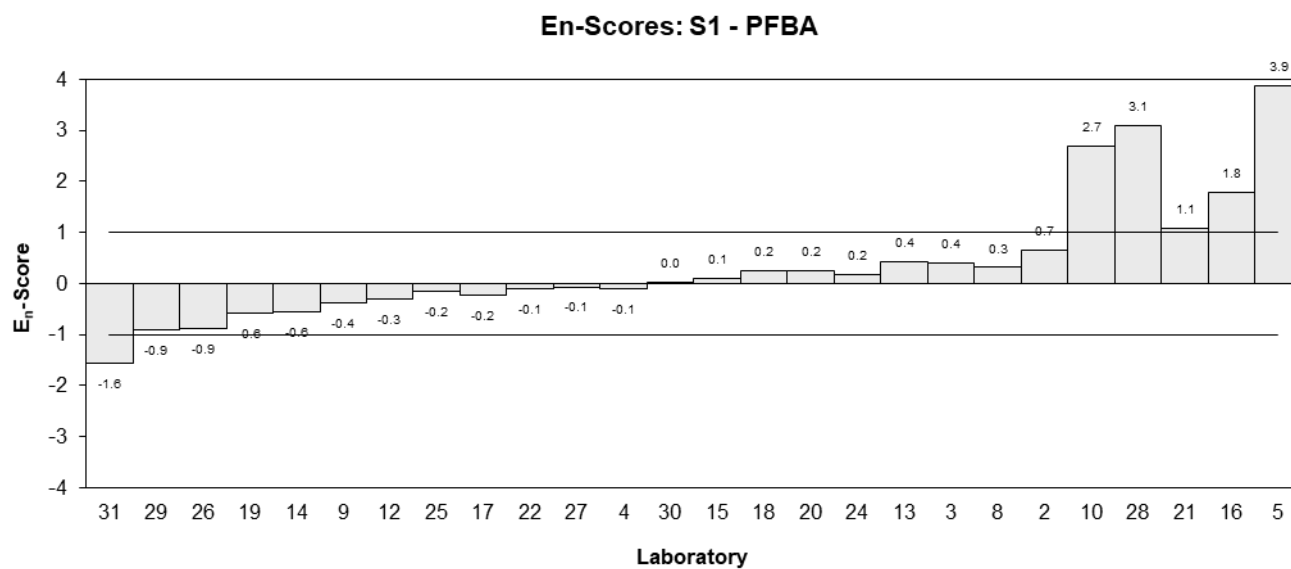
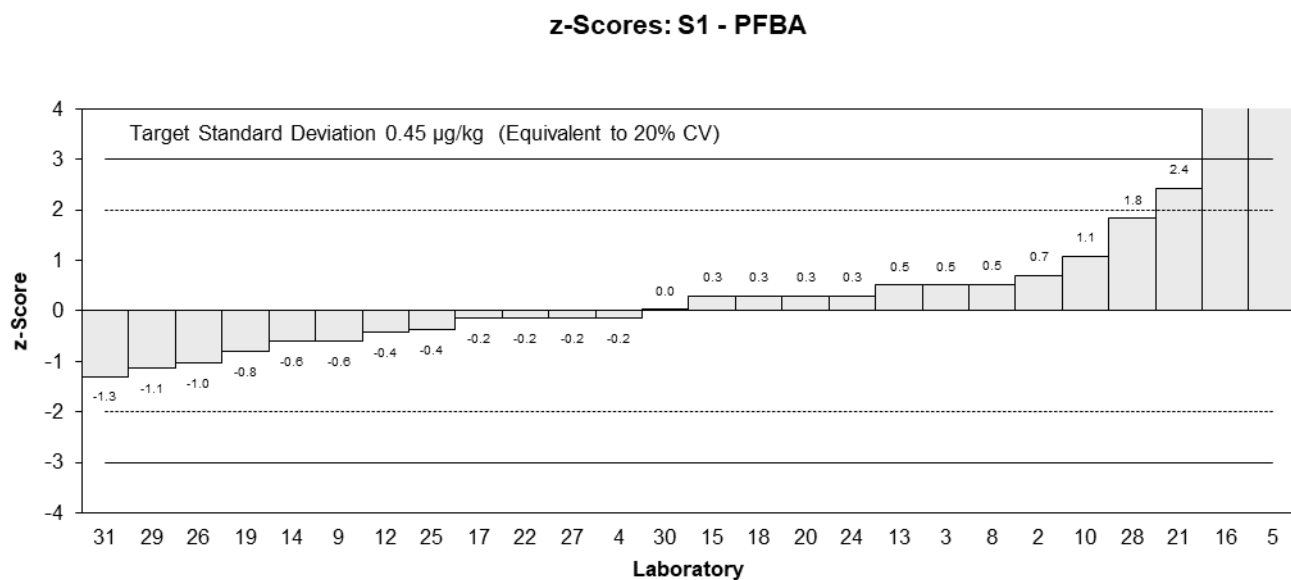
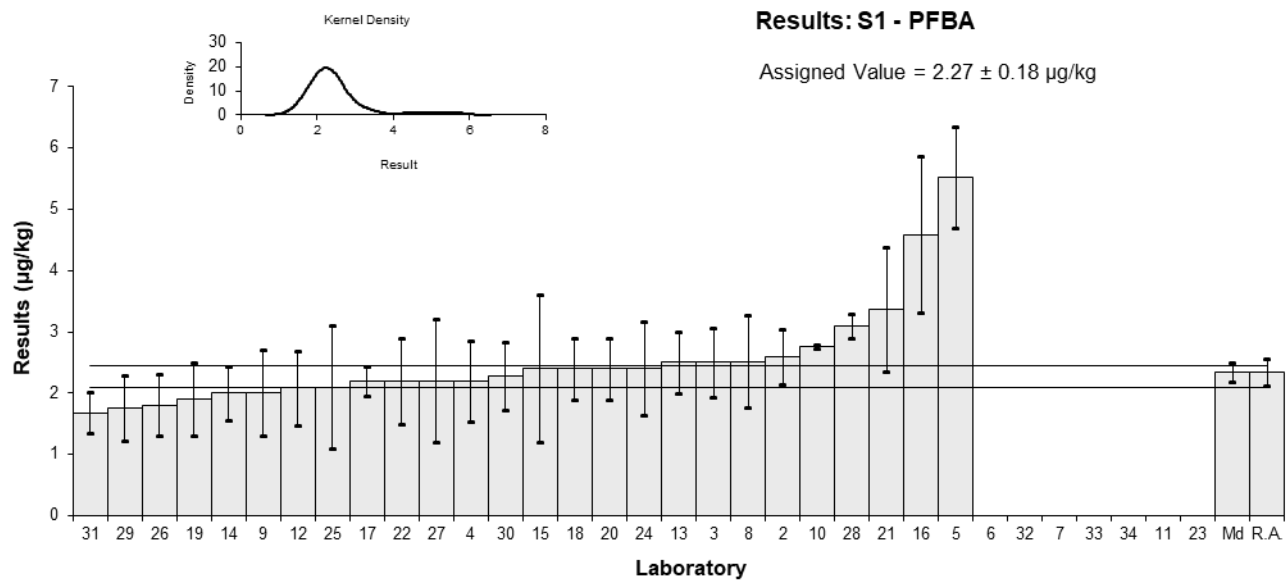


Figure 11

Table 15

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFPeA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	3.08	0.70	81	0.58	0.44
3	2.4	0.52	NR	-0.65	-0.65
4	3.1	0.92	67	0.62	0.36
5	9.56	1.95	77	12.32	3.47
6	3.023	0.81621	>80	0.48	0.31
7	<5	1.50	NR		
8	2.82	0.847	95	0.11	0.07
9	3.3	0.6	136	0.98	0.86
10	2.73	0.66	112	-0.05	-0.04
11	NT	NT	NT		
12	2.36	0.7	111	-0.72	-0.55
13	2.6	0.52	93	-0.29	-0.29
14	2.7	0.45	127	-0.11	-0.12
15	2.5	1.3	84	-0.47	-0.20
16	3.495	0.677	83.9	1.33	1.05
17	2.6	0.46	86	-0.29	-0.32
18	2.5	0.5	NR	-0.47	-0.49
19	2.2	0.7	NR	-1.01	-0.77
20	2.6	0.6	94	-0.29	-0.26
21	2.6	0.78	103	-0.29	-0.20
22	2.5	0.7	89	-0.47	-0.36
23	NT	NT	NT		
24	2.7	0.36	113	-0.11	-0.15
25	2.7	1	97	-0.11	-0.06
26	3.33	0.67	121	1.03	0.82
27	2.6	1	108	-0.29	-0.16
28	3.5	0.2	105	1.34	2.75
29	1.9931	0.5979	NR	-1.39	-1.23
30	3.05	0.76	73	0.53	0.37
31	2.92	0.58	90.3	0.29	0.26
32	2.82	0.846	72.6	0.11	0.07
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	2.76	0.18
Spike	Not Spiked	
Robust Average	2.79	0.19
Median	2.70	0.12
Mean	3.01	
N	28	
Max.	9.56	
Min.	1.9931	
Robust SD	0.41	
Robust CV	15%	

*Robust Average excluding laboratory 5.

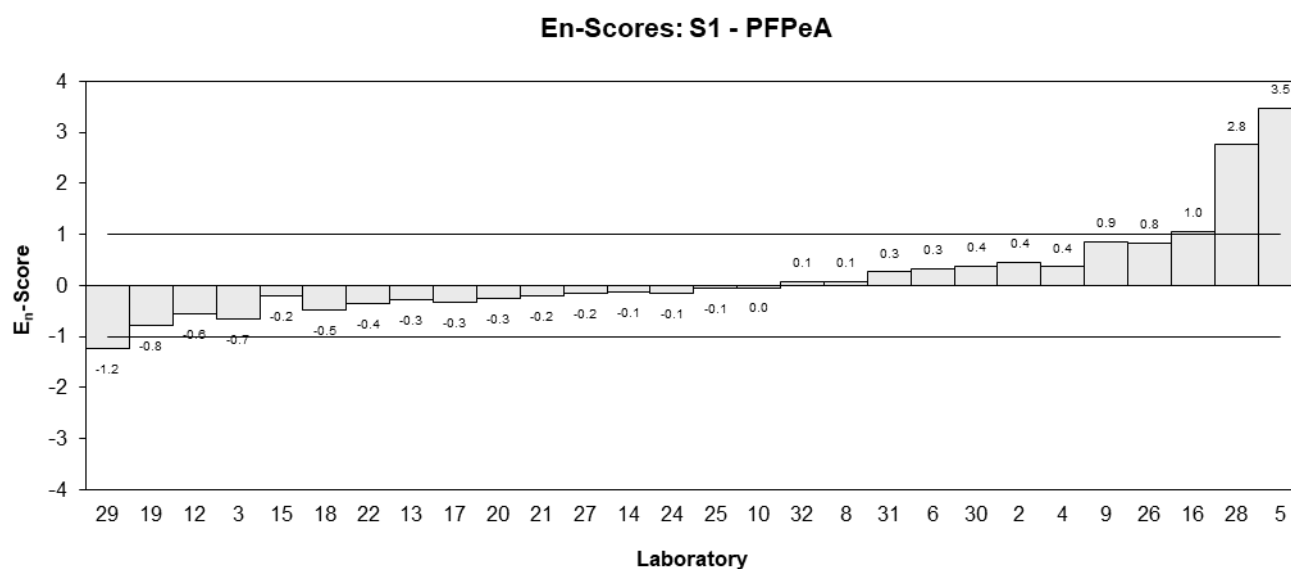
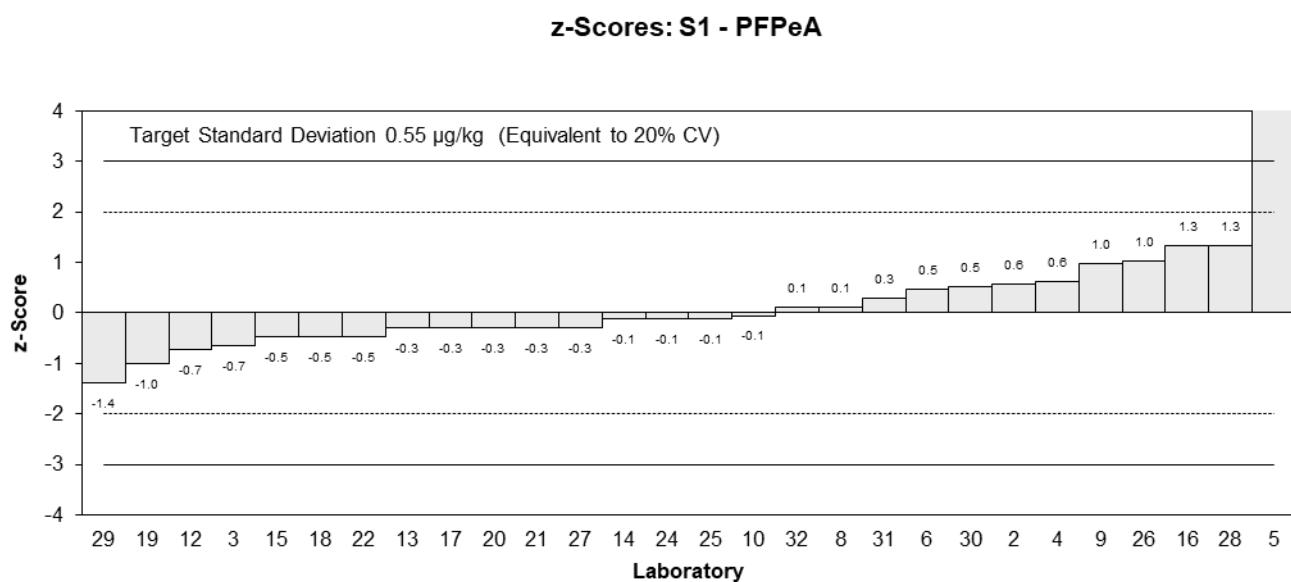
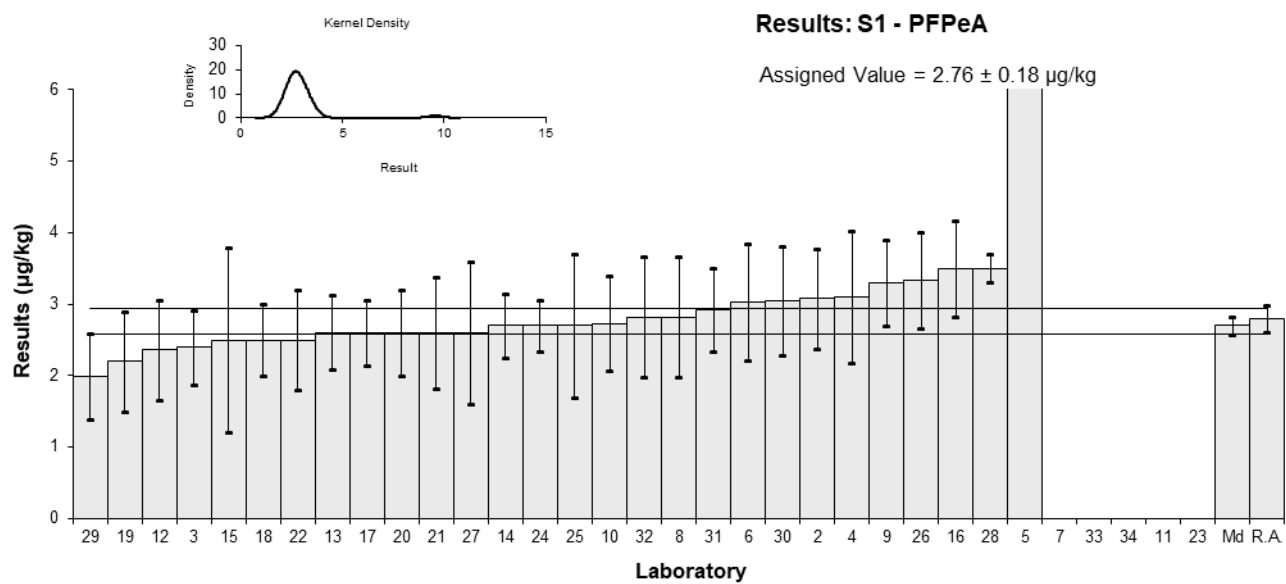


Figure 12

Table 16

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFHxA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	14.6	3.18	82	0.70	0.56
3	12	2.5	NR	-0.31	-0.31
4	13	3.8	94	0.08	0.05
5	9.32	2.12	76	-1.36	-1.58
6	10.957	2.958	>80	-0.72	-0.61
7	15.71	4.71	NR	1.14	0.61
8	12.58	3.774	105	-0.09	-0.06
9	15.0	3.1	109	0.86	0.70
10	14.12	0.05	104	0.52	2.19
11	13	2	89	0.08	0.10
12	12.7	3.8	122	-0.04	-0.03
13	11	2.2	90	-0.70	-0.79
14	13.1	2.38	134	0.12	0.12
15	13	6.5	82	0.08	0.03
16	11.752	1.736	88.2	-0.41	-0.57
17	13.5	1.26	84	0.27	0.50
18	14	2.8	NR	0.47	0.42
19	12.8	3.8	NR	0.00	0.00
20	10	3	110	-1.09	-0.92
21	11.4	3.42	96	-0.55	-0.40
22	13.8	3.7	92	0.39	0.27
23	NT	NT	NT		
24	12	1.7	117	-0.31	-0.44
25	13	4	92	0.08	0.05
26	13.5	2.6	121	0.27	0.26
27	13	4	106	0.08	0.05
28	13	1	107	0.08	0.17
29	12.2162	3.6649	80.19	-0.23	-0.16
30	12.1	3	77	-0.27	-0.23
31	12.82	2.56	100.8	0.01	0.01
32	15.2	4.56	83.5	0.94	0.52
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	12.8	0.6
Spike	Not Spiked	
Robust Average	12.8	0.6
Median	13.0	0.5
Mean	12.8	
N	30	
Max.	15.71	
Min.	9.32	
Robust SD	1.4	
Robust CV	11%	

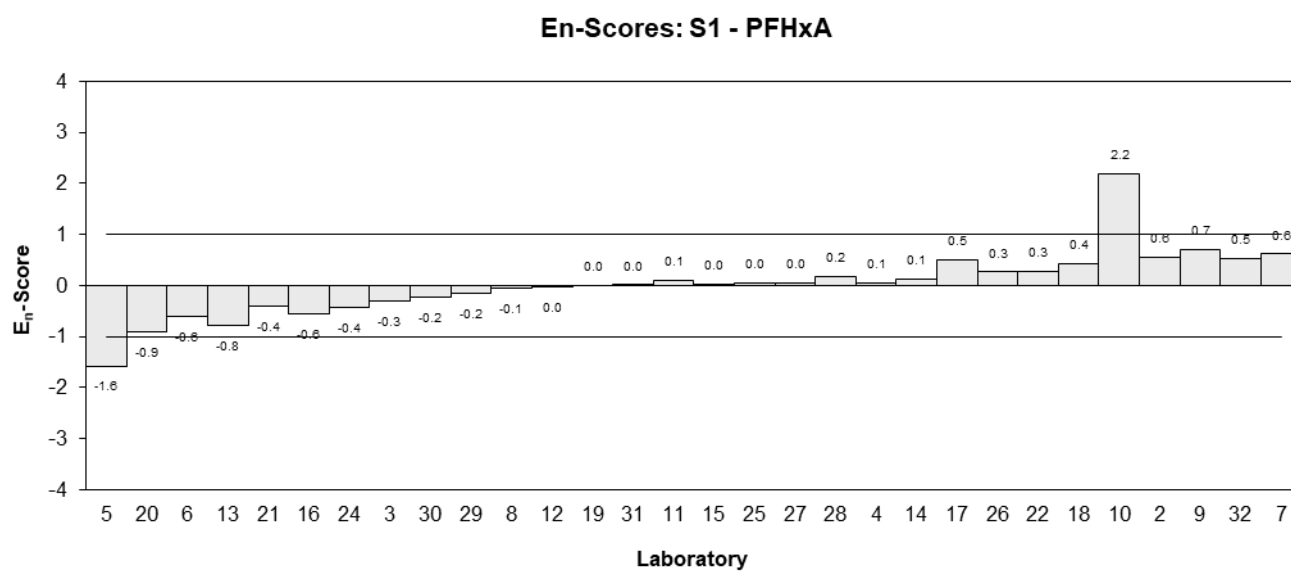
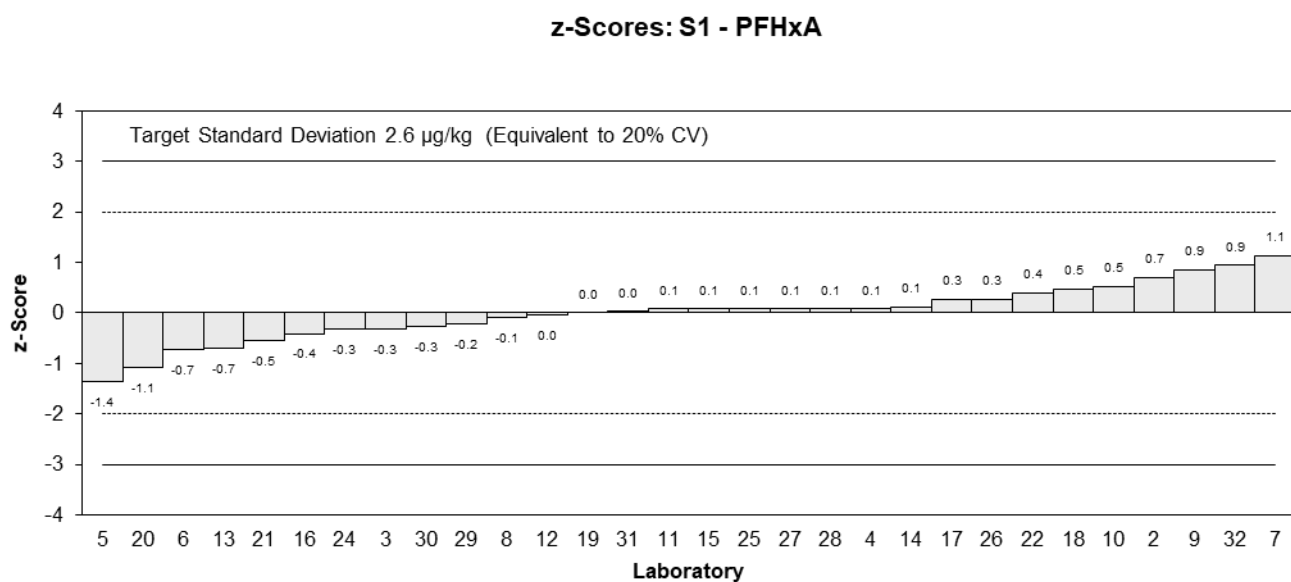
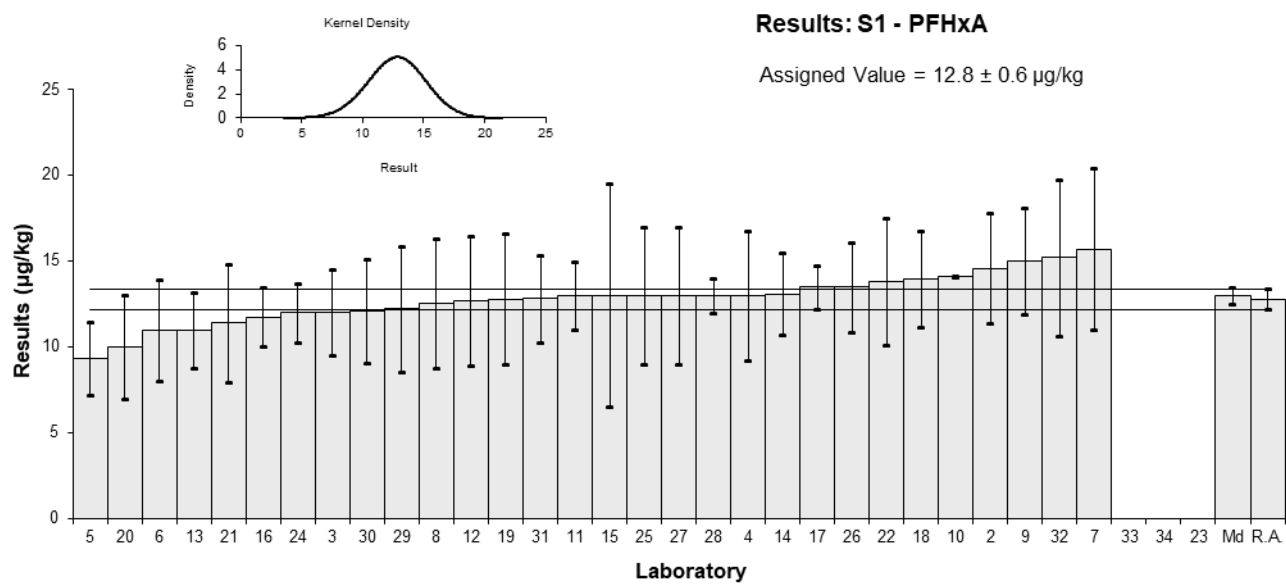


Figure 13

Table 17

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFHpA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	1.56	0.30	103	1.50	1.16
3	<1.0	NR	NR		
4	1.2	0.35	86	0.00	0.00
5	3.39	0.69	74	9.13	3.15
6	< 2.5	NR	>80		
7	<5	1.50	NR		
8	1.23	0.369	113	0.13	0.08
9	1.5	0.3	101	1.25	0.97
10	1.59	0.026	98	1.63	4.64
11	1.1	0.3	95	-0.42	-0.32
12	1.1	0	109	-0.42	-1.25
13	1.1	0.22	93	-0.42	-0.43
14	1.2	0.02	138	0.00	0.00
15	1.1	0.55	81	-0.42	-0.18
16	1.138	0.139	88.5	-0.26	-0.39
17	1.2	0.15	76	0.00	0.00
18	0.9	0.2	NR	-1.25	-1.39
19	1.2	0.4	NR	0.00	0.00
20	<0.2	NR	128		
21	1	0.3	101	-0.83	-0.64
22	1.2	0.4	68	0.00	0.00
23	NT	NT	NT		
24	1.1	0.28	121	-0.42	-0.34
25	1.4	1	99	0.83	0.20
26	1.26	0.26	111	0.25	0.22
27	1.2	1	102	0.00	0.00
28	1.7	0.1	105	2.08	3.90
29	1.1491	0.3447	71.71	-0.21	-0.14
30	1.19	0.29	85	-0.04	-0.03
31	1.05	0.21	96.7	-0.62	-0.67
32	<2.26	NR	83.5		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	1.20	0.08
Spike	Not Spiked	
Robust Average	1.22	0.10
Median	1.20	0.06
Mean	1.31	
N	25	
Max.	3.39	
Min.	0.9	
Robust SD	0.20	
Robust CV	16%	

*Robust Average excluding laboratory 5.

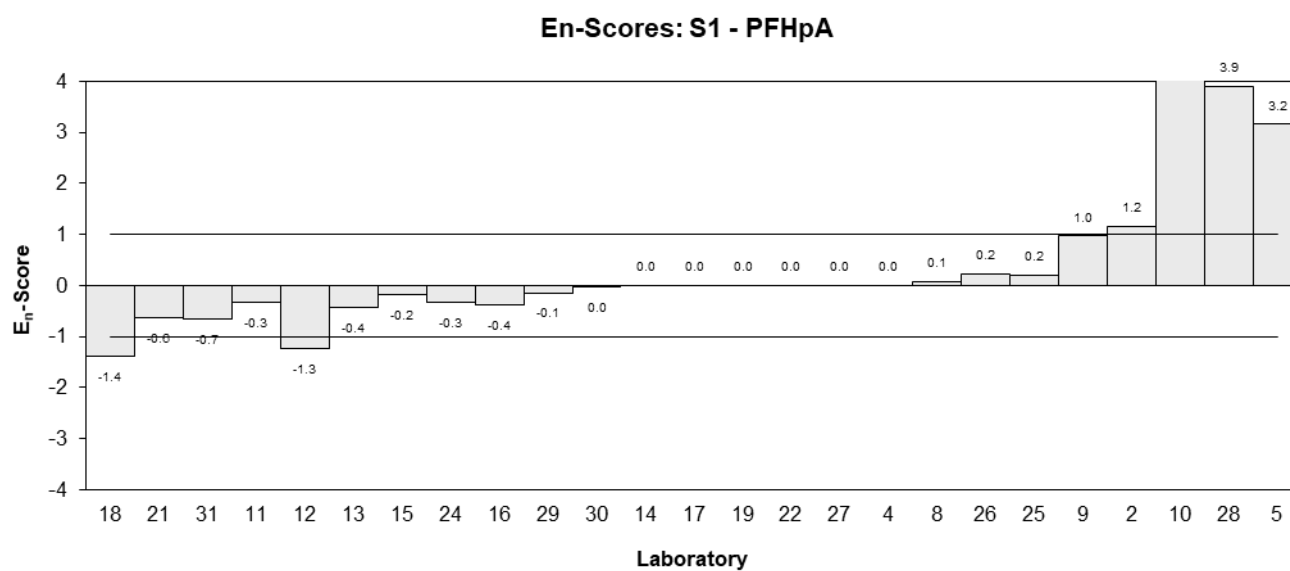
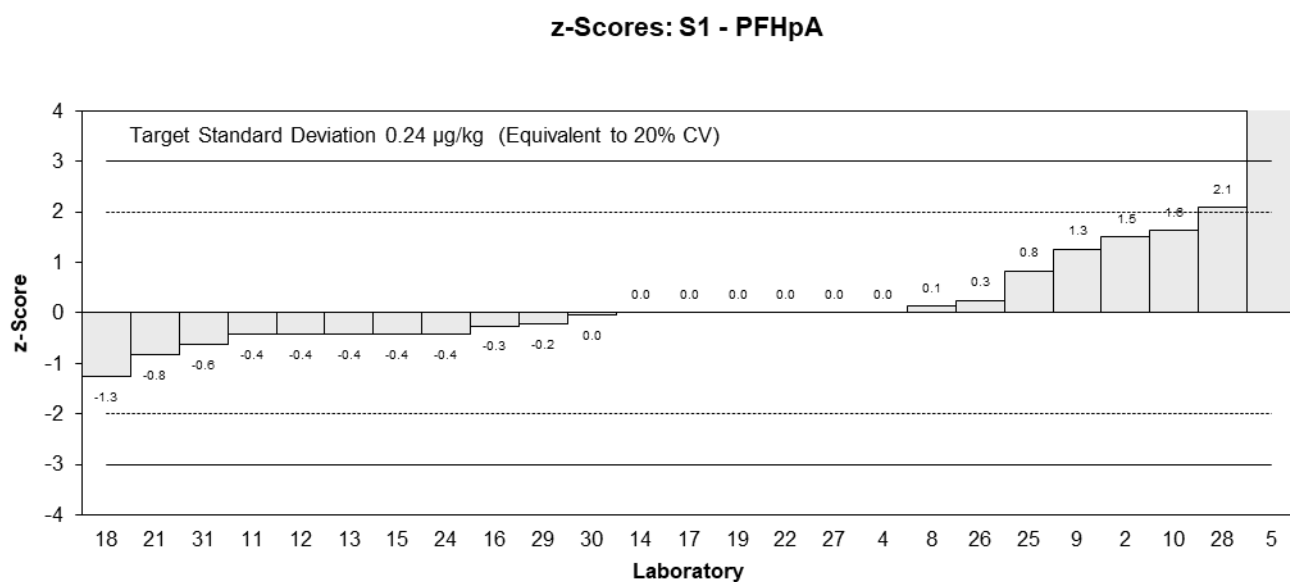
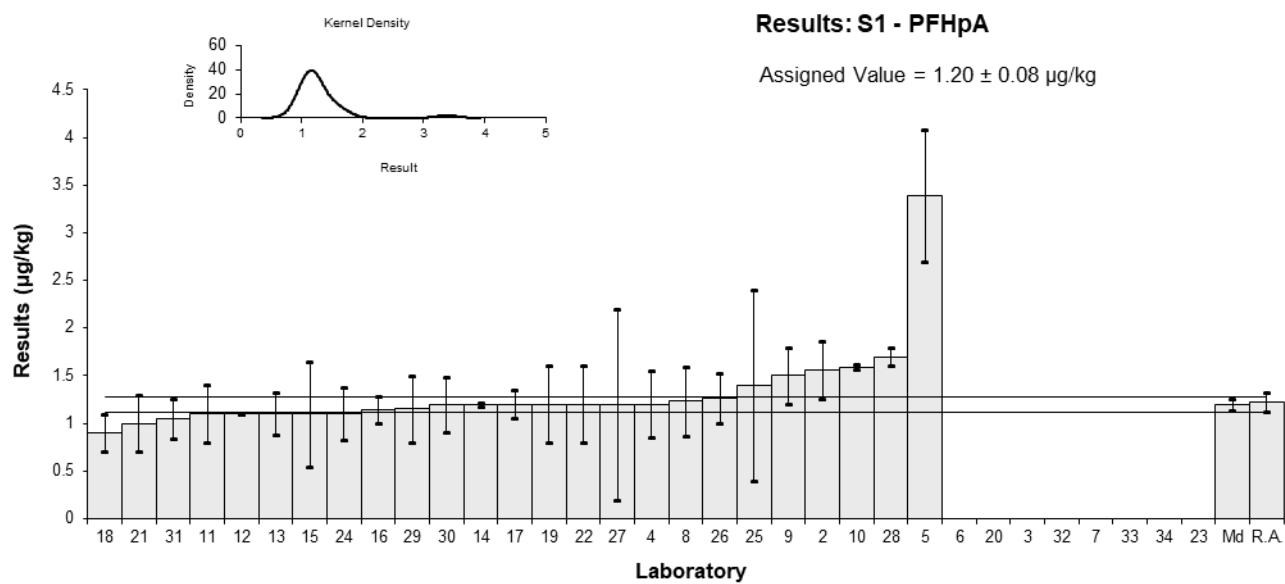


Figure 14

Table 18

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFOA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	4.68	0.93	101	1.32	1.01
3	3.1	0.67	100	-0.81	-0.83
4	3.7	1.1	98	0.00	0.00
5	12.6	2.5	71	12.03	3.54
6	3.665	0.990	>80	-0.05	-0.03
7	5.18	1.55	NR	2.00	0.94
8	3.48	1.043	108	-0.30	-0.20
9	4.2	0.8	98	0.68	0.59
10	4.53	0.075	99	1.12	3.07
11	3.1	0.6	101	-0.81	-0.92
12	3.55	1.1	106	-0.20	-0.13
13	3.1	0.62	102	-0.81	-0.89
14	3.3	0.55	150	-0.54	-0.66
15	3.6	1.8	77	-0.14	-0.05
16	3.426	0.288	90.1	-0.37	-0.71
17	3.9	0.69	86	0.27	0.27
18	3.1	0.6	NR	-0.81	-0.92
19	3.4	1.0	NR	-0.41	-0.29
20	3.8	1.5	110	0.14	0.07
21	3.65	1.1	96	-0.07	-0.04
22	3.7	1	82	0.00	0.00
23	NT	NT	NT		
24	3.1	0.44	86	-0.81	-1.17
25	3.5	1	98	-0.27	-0.19
26	4.05	0.86	108	0.47	0.39
27	3.4	1	116	-0.41	-0.29
28	4.6	0.3	97	1.22	2.27
29	3.019	0.9057	78.52	-0.92	-0.72
30	3.89	0.97	84	0.26	0.19
31	4.93	0.98	99.7	1.66	1.21
32	3.9	1.17	96.4	0.27	0.17
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	3.70	0.26
Spike	Not Spiked	
Robust Average	3.75	0.28
Median	3.66	0.17
Mean	4.04	
N	30	
Max.	12.6	
Min.	3.019	
Robust SD	0.61	
Robust CV	16%	

*Robust Average excluding laboratory 5.

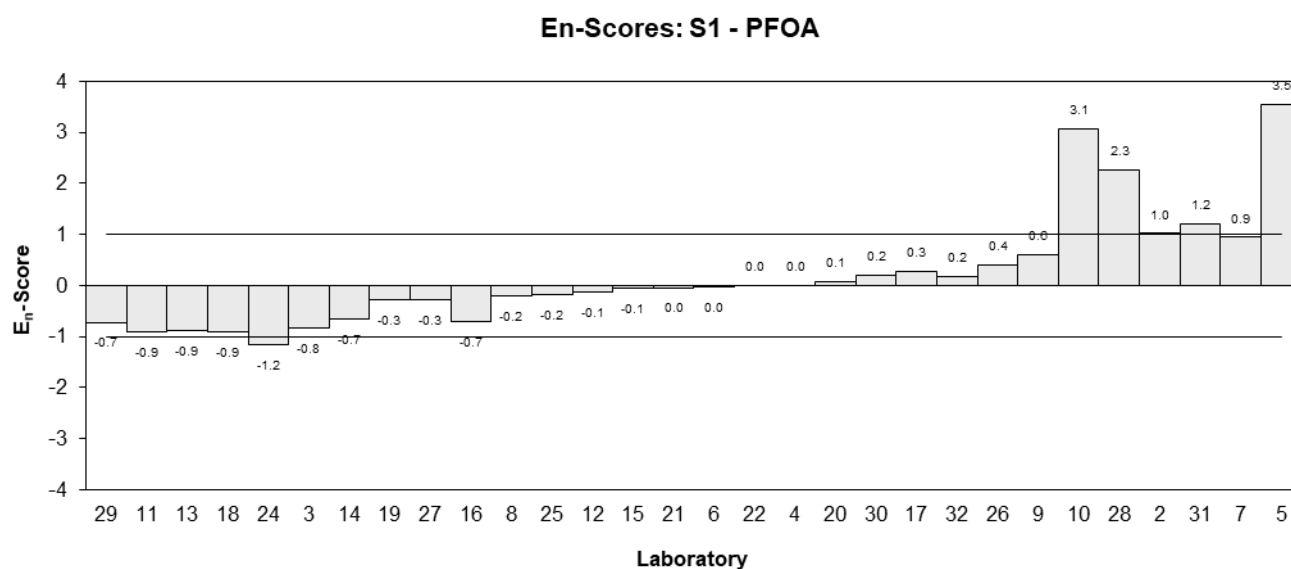
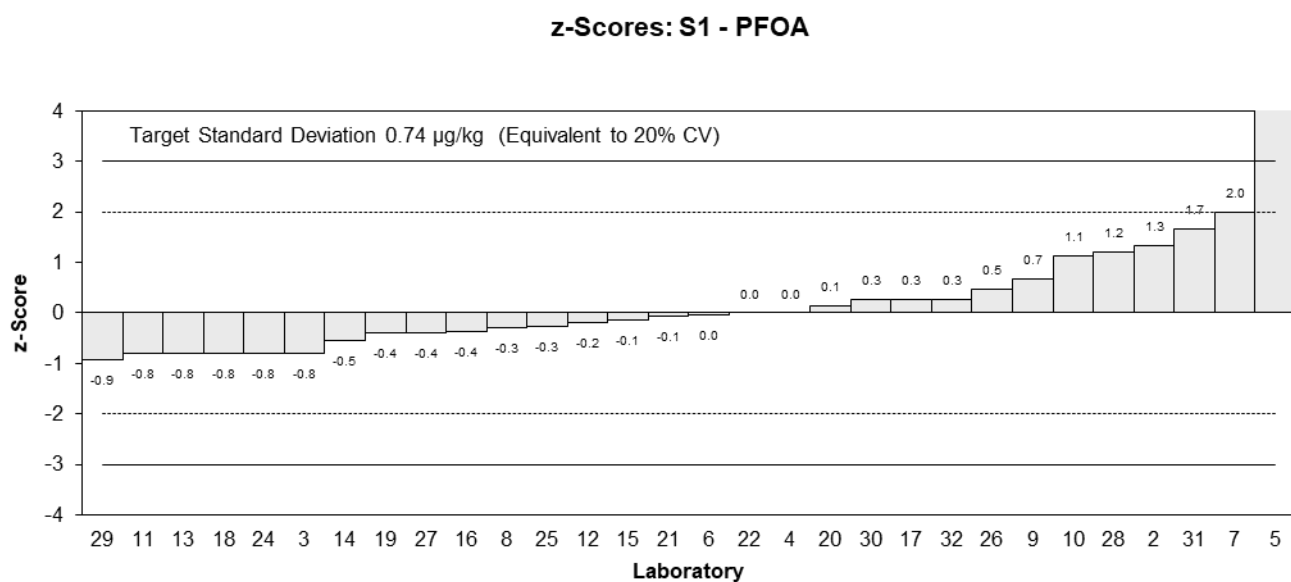
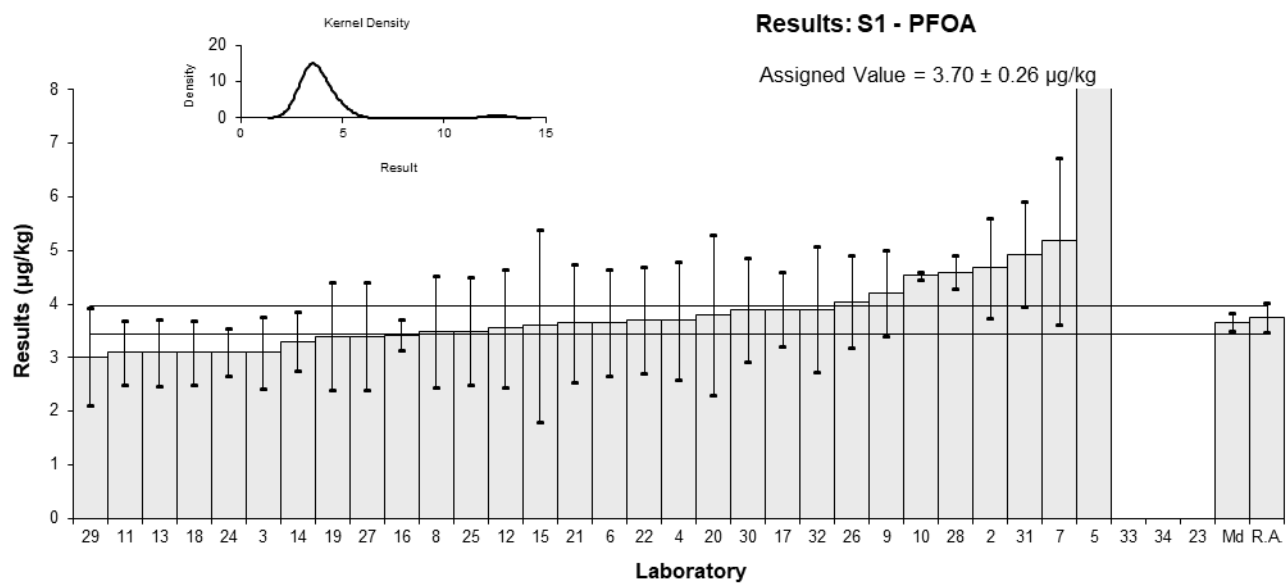


Figure 15

Table 19

Sample Details

Sample No.	S1
Matrix.	Soil
Analyte.	PFOSA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	2.13	0.37	118	1.26	1.01
3	1.3	0.29	NR	-1.18	-1.12
4	2.03	0.61	75	0.97	0.51
5	3.99	1.05	82	6.74	2.14
6	< 2.5	NR	>80		
7	<5	1.50	NR		
8	1.527	0.458	70	-0.51	-0.34
9	1.9	0.4	91	0.59	0.44
10	1.02	0.63	110	-2.00	-1.02
11	NT	NT	NT		
12	1.63	0.5	100	-0.21	-0.13
13	1.6	0.32	99	-0.29	-0.26
14	1.3	0.24	129	-1.18	-1.25
15	< 10	5	59		
16	NR	NR	NR		
17	2.2	0.24	62	1.47	1.57
18	NT	NT	NT		
19	NR	NR	NR		
20	0.9	0.3	94	-2.35	-2.18
21	1.33	0.399	84	-1.09	-0.82
22	1.8	0.5	NR	0.29	0.18
23	NT	NT	NT		
24	1.5	0.18	107	-0.59	-0.72
25	2.1	1	106	1.18	0.39
26	1.89	0.44	92	0.56	0.39
27	1.9	1	109	0.59	0.20
28	2.0	0.2	118	0.88	1.03
29	1.5881	0.4764	NR	-0.33	-0.21
30	2.08	0.52	85	1.12	0.68
31	1.69	0.33	124.7	-0.03	-0.03
32	<2.26	NR	72.7		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	1.70	0.21
Spike	Not Spiked	
Robust Average	1.73	0.22
Median	1.75	0.18
Mean	1.79	
N	22	
Max.	3.99	
Min.	0.9	
Robust SD	0.40	
Robust CV	23%	

*Robust Average excluding laboratory 5.

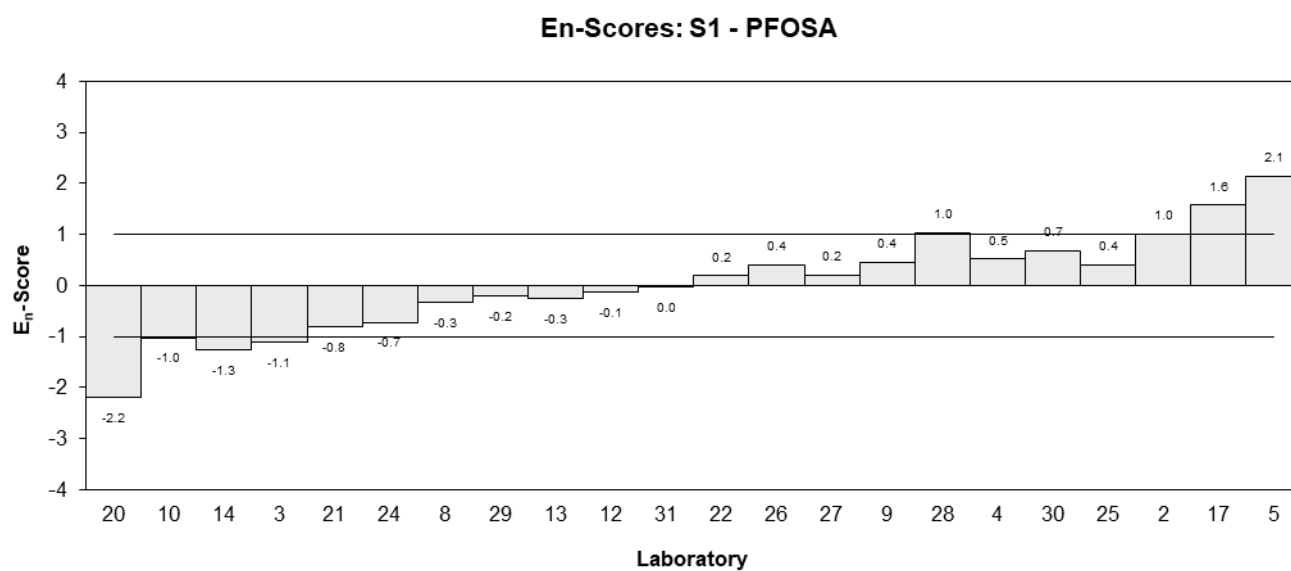
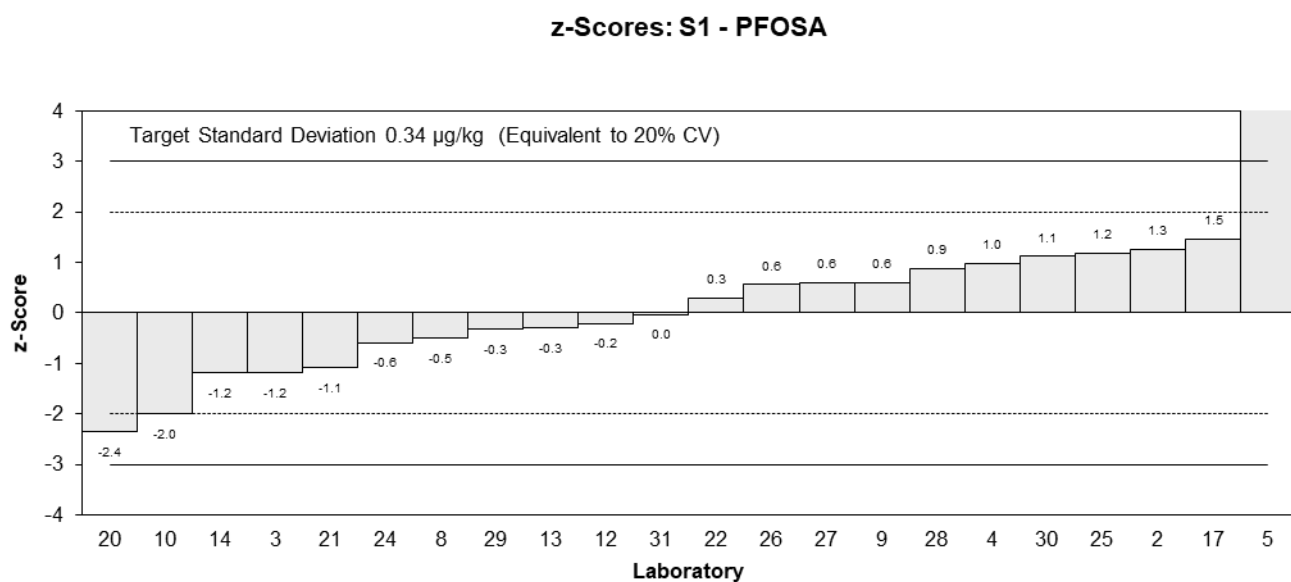
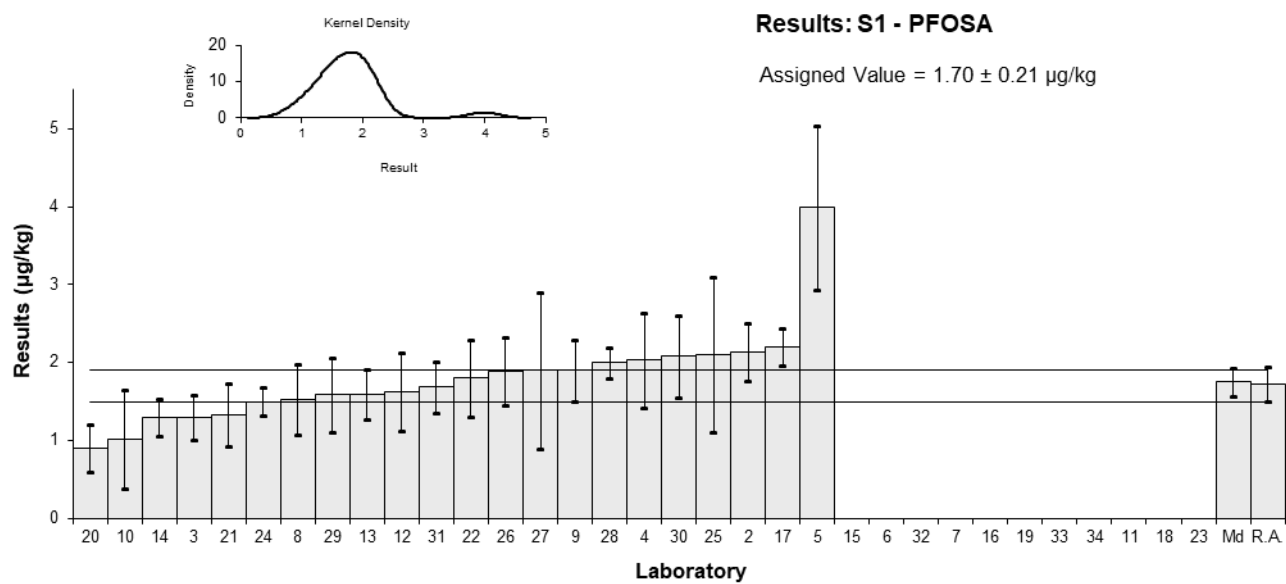


Figure 16

Table 20

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFBS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	18.2	3.06	105	-0.03	-0.03
3	18	3.9	NR	-0.08	-0.08
4	19	5.8	51	0.19	0.12
5	3.04	0.3	59	-4.17	-20.04
6	17.855	4.821	>50	-0.12	-0.09
7	23.23	6.97	NR	1.35	0.70
8	18.42	5.527	71	0.03	0.02
9	19.6	4.0	114	0.36	0.32
10	26.42	1.28	95	2.22	5.57
11	16	2	109	-0.63	-1.09
12	17.8	5.3	102	-0.14	-0.09
13	18	3.6	105	-0.08	-0.08
14	17.6	3.35	113	-0.19	-0.20
15	18	9	81	-0.08	-0.03
16	19.042	4.530	101.7	0.20	0.16
17	18.6	0.59	88.58	0.08	0.33
18	33	6.6	NR	4.02	2.21
19	21.2	6.4	NR	0.79	0.45
20	16	3.3	80	-0.63	-0.68
21	15.9	4.77	95	-0.66	-0.50
22	18.9	4.7	94	0.16	0.13
23	NT	NT	NT		
24	19	2.1	111	0.19	0.32
25	20	6	113	0.46	0.28
26	19.5	4.7	109	0.33	0.25
27	18	6	110	-0.08	-0.05
28	18	1	103	-0.08	-0.25
29	17.3724	5.21172	84.97	-0.25	-0.18
30	19	4.7	80	0.19	0.15
31	13.05	2.61	101	-1.43	-1.94
32	16.8	5.04	98.1	-0.41	-0.29
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	18.3	0.7
Spike	20.0	1.0
Robust Average	18.3	0.8
Median	18.1	0.5
Mean	18.5	
N	30	
Max.	33	
Min.	3.04	
Robust SD	1.8	
Robust CV	9.8%	

*Robust Average excluding laboratories 5 and 18.

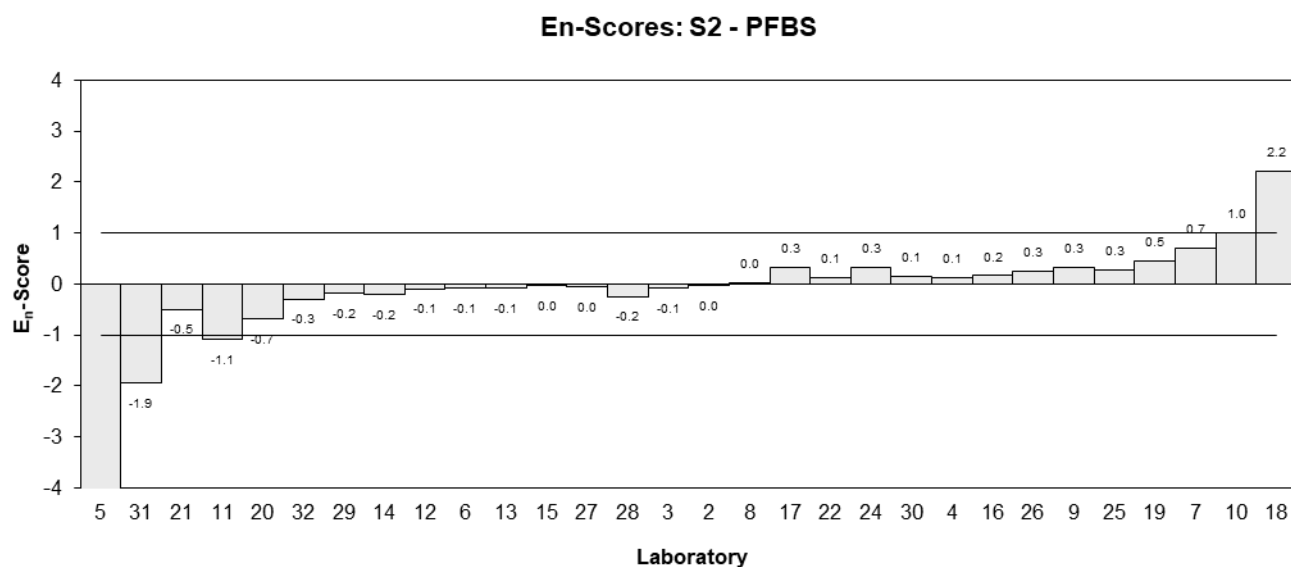
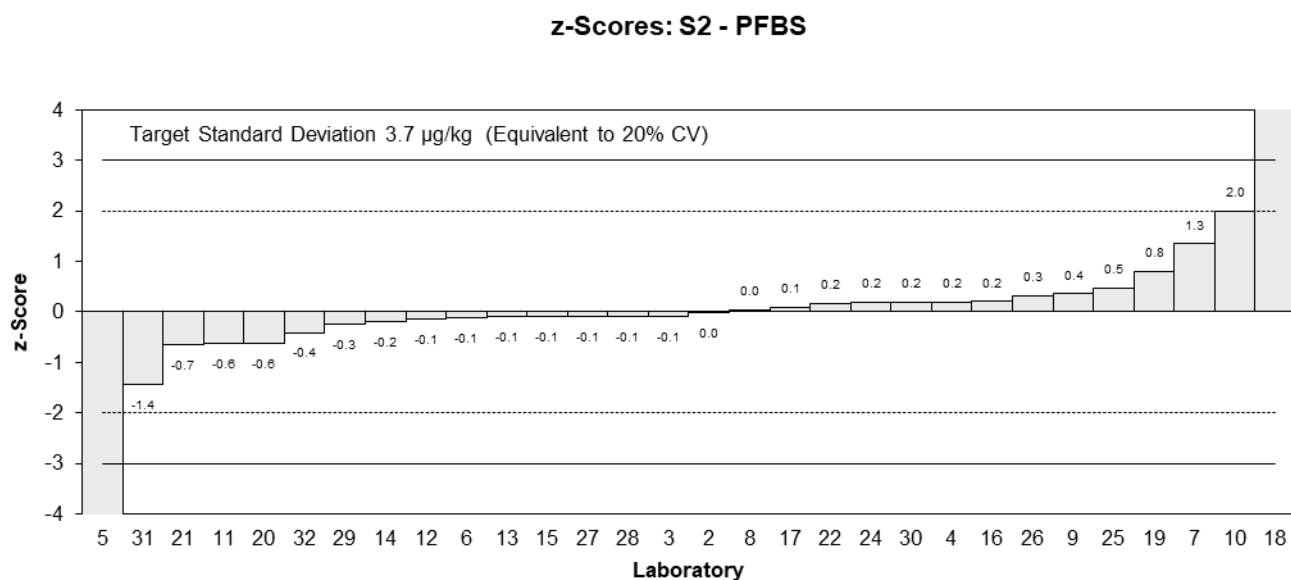
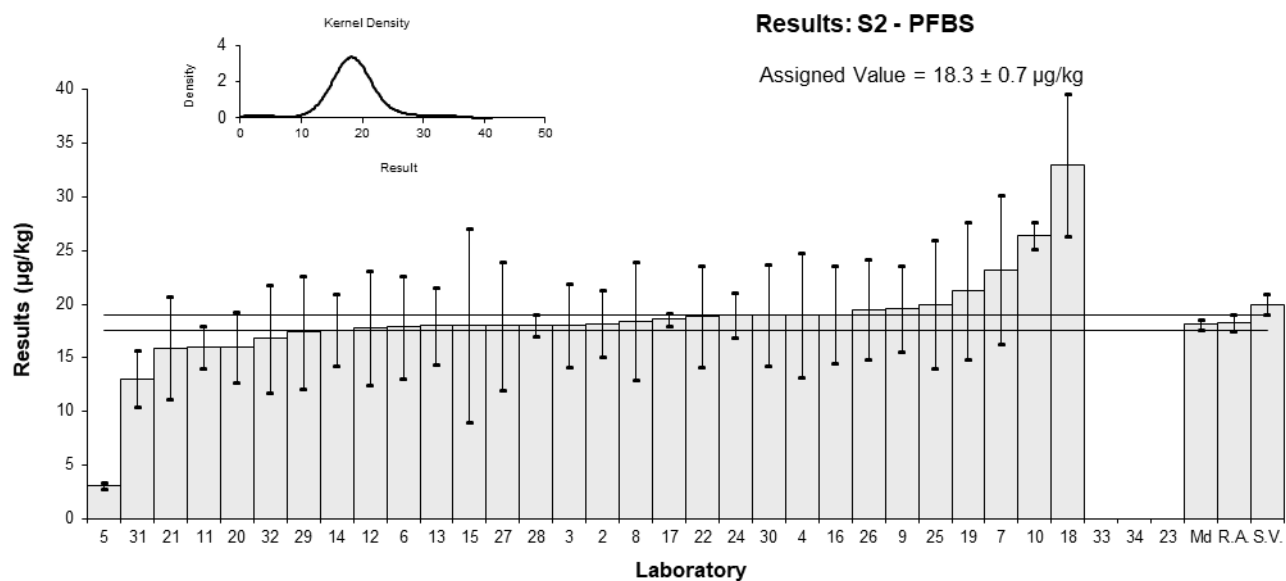


Figure 17

Table 21

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFPeS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	22.9	6.16	NR	-0.23	-0.17
3	25	5.4	NR	0.21	0.18
4	21	6.4	NR	-0.62	-0.46
5	3.53	0.96	59	-4.26	-11.49
6	21.505	5.806	>50	-0.52	-0.42
7	33.78	10.14	NR	2.04	0.95
8	24.83	7.449	75	0.17	0.11
9	27.7	5.4	96	0.77	0.66
10	24.13	3.06	NR	0.03	0.04
11	NT	NT	NT		
12	24.4	7.3	NR	0.08	0.05
13	23	4.6	105	-0.21	-0.21
14	23.6	6.65	111	-0.08	-0.06
15	23	12	NR	-0.21	-0.08
16	22.168	6.573	NR	-0.38	-0.27
17	23.1	1.44	84.24	-0.19	-0.43
18	NT	NT	NT		
19	26.60	8.0	NR	0.54	0.32
20	22	4.8	128	-0.42	-0.40
21	18.7	5.61	82	-1.10	-0.91
22	19.5	5.1	NR	-0.94	-0.85
23	NT	NT	NT		
24	24	3.2	107	0.00	0.00
25	25	7	100	0.21	0.14
26	29.7	6.8	109	1.19	0.82
27	23	7	97	-0.21	-0.14
28	26	2	90	0.42	0.80
29	28.5077	8.55231	NR	0.94	0.52
30	28.1	7	75	0.85	0.57
31	17.53	3.51	NR	-1.35	-1.70
32	22.1	6.63	98.1	-0.40	-0.28
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	24.0	1.5
Spike	23.4	1.2
Robust Average	23.7	1.6
Median	23.4	0.9
Mean	23.4	
N	28	
Max.	33.78	
Min.	3.53	
Robust SD	3.4	
Robust CV	15%	

*Robust Average excluding laboratory 5.

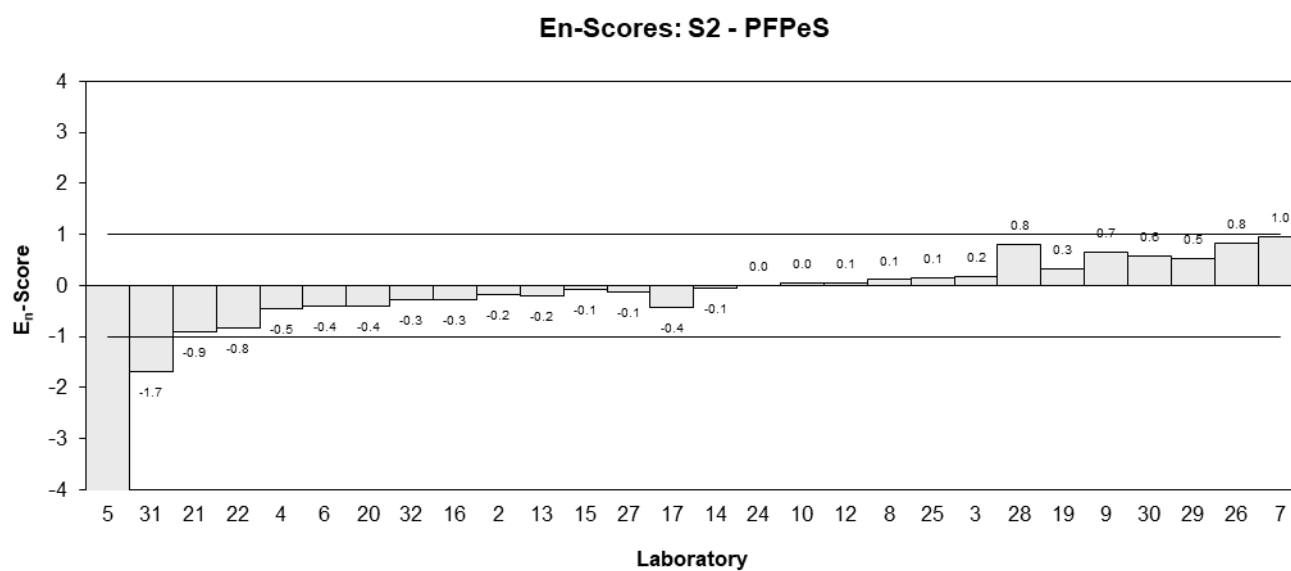
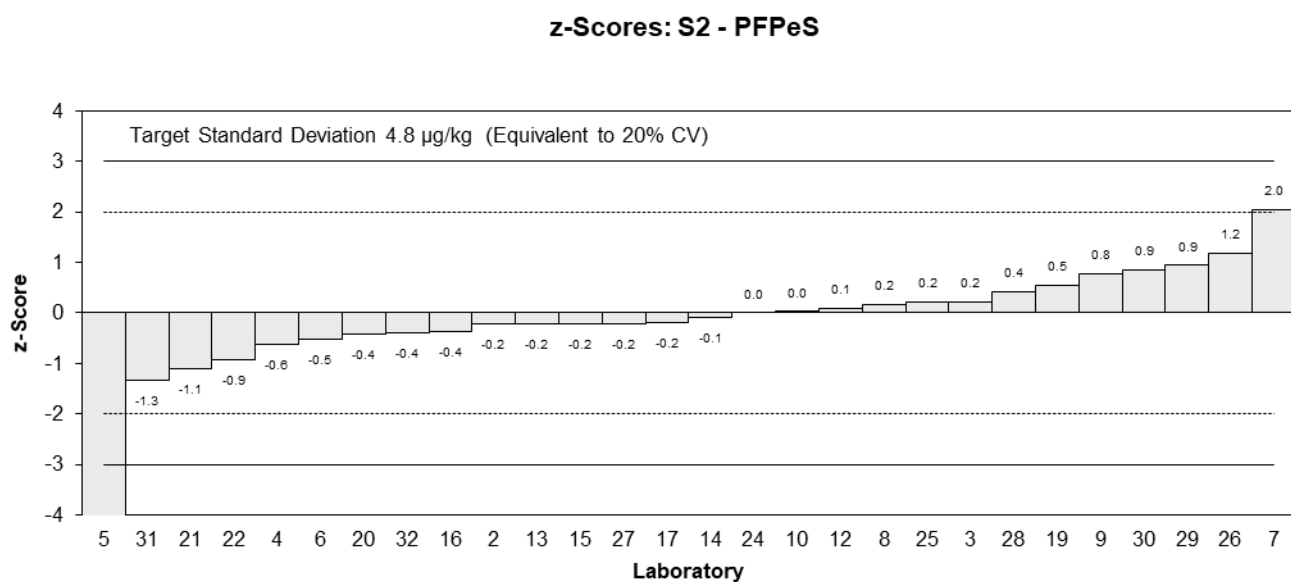
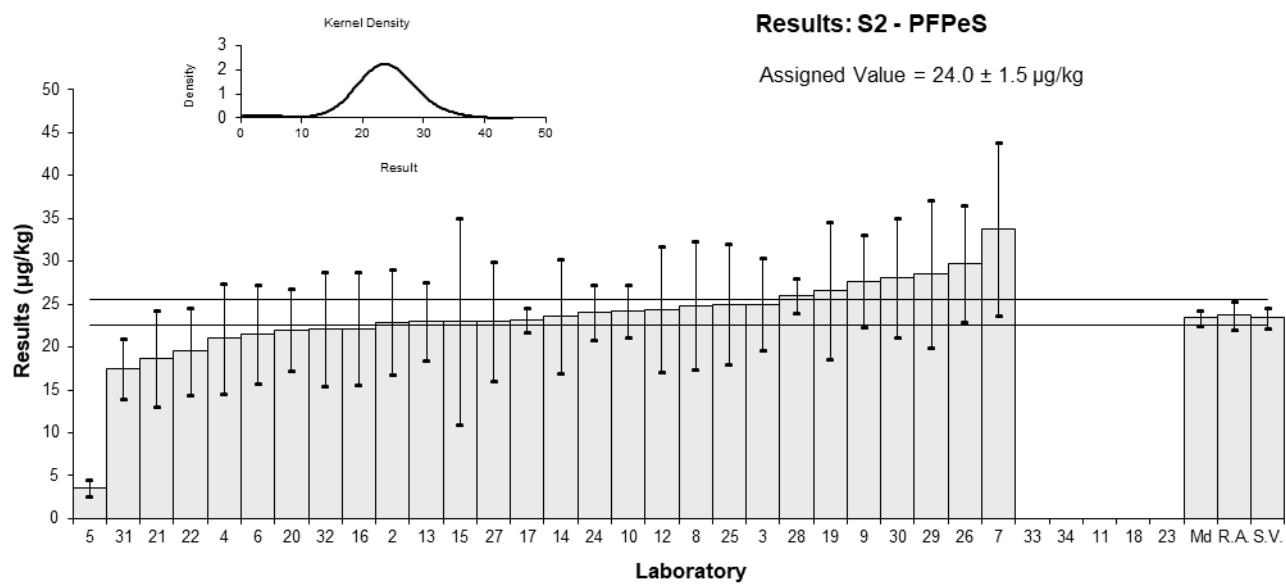


Figure 18

Table 22

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFHxS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	19.2	3.95	NR	0.33	0.29
3	18	3.9	NR	0.00	0.00
4	17	5.2	66	-0.28	-0.19
5	33.6	5.7	54	4.33	2.70
6	17.995	4.859	>50	0.00	0.00
7	26.96	8.09	NR	2.49	1.10
8	20.19	6.058	75	0.61	0.36
9	20.8	4.6	96	0.78	0.59
10	NR	NR	NR		
11	15	3	80	-0.83	-0.95
12	19	5.7	85	0.28	0.17
13	17	3.4	103	-0.28	-0.28
14	17	3.13	111	-0.28	-0.30
15	18	9	79	0.00	0.00
16	16.808	3.541	94	-0.33	-0.32
17	19.8	1.02	85.42	0.50	1.26
18	13	2.7	NR	-1.39	-1.74
19	15.9	4.8	NR	-0.58	-0.43
20	20	3.0	128	0.56	0.63
21	15.7	4.71	88	-0.64	-0.48
22	16.7	4.3	94	-0.36	-0.29
23	NT	NT	NT		
24	19	4.4	95	0.28	0.22
25	19	6	100	0.28	0.16
26	20.3	4.3	104	0.64	0.52
27	17	6	97	-0.28	-0.16
28	20.9	2.2	90	0.81	1.20
29	17.386	5.2158	74.31	-0.17	-0.12
30	18.6	4.6	88	0.17	0.13
31	13.54	2.71	NR	-1.24	-1.54
32	17.7	5.31	114	-0.08	-0.06
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	18.0	1.0
Spike	18.9	1.0
Robust Average	18.2	1.0
Median	18.0	0.7
Mean	18.7	
N	29	
Max.	33.6	
Min.	13	
Robust SD	2.2	
Robust CV	12%	

*Robust Average excluding laboratory 5.

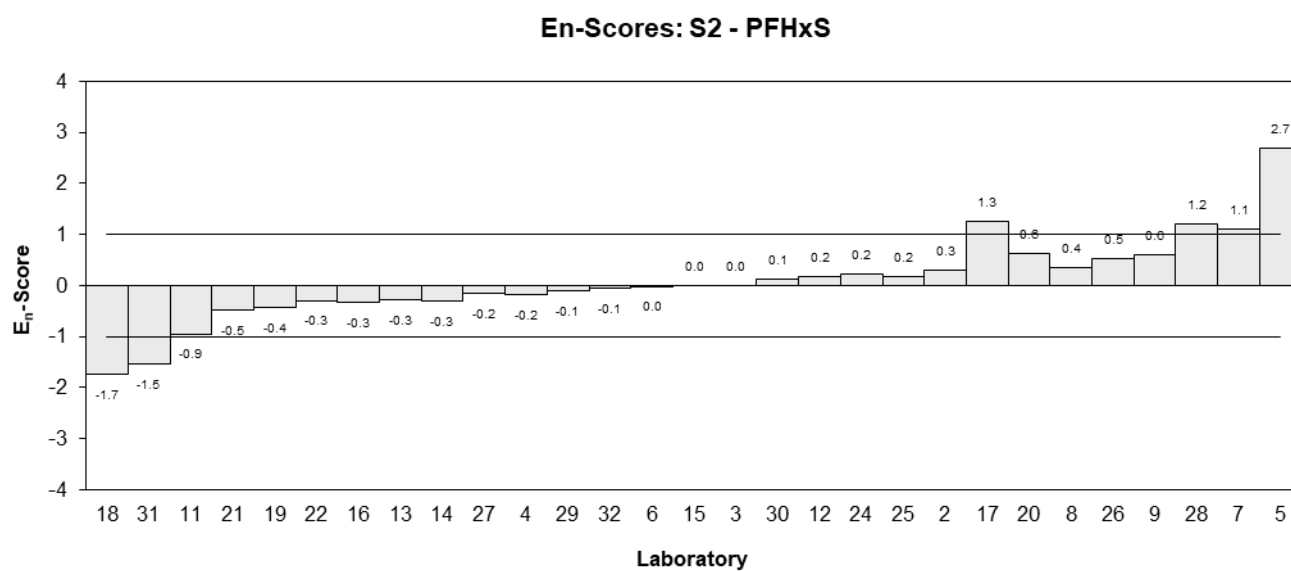
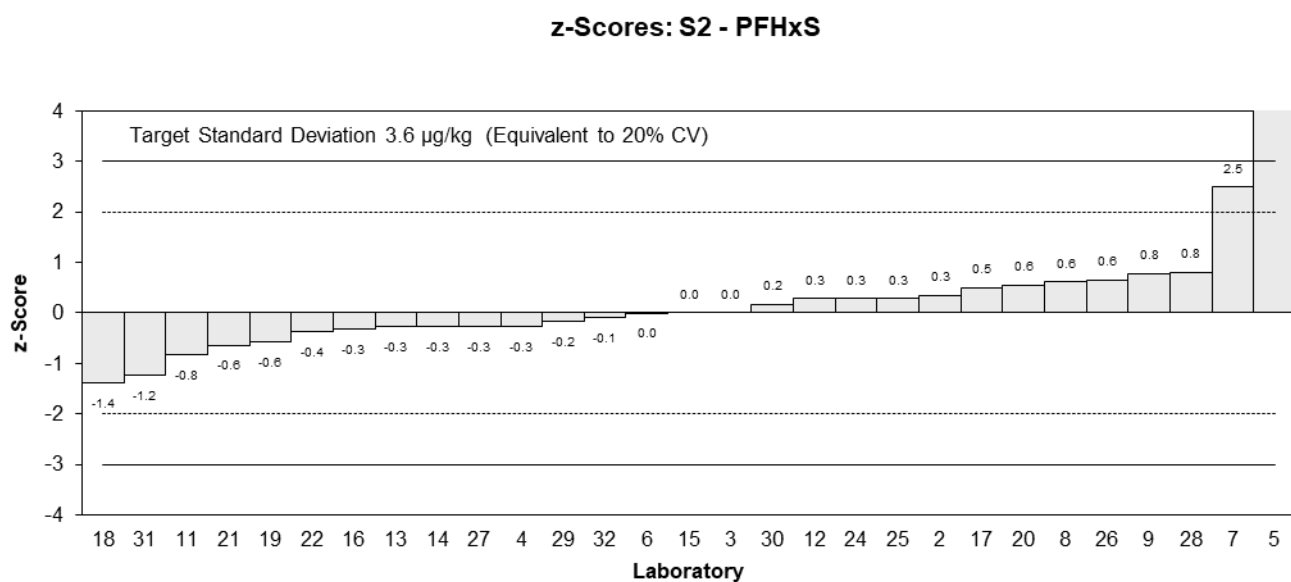
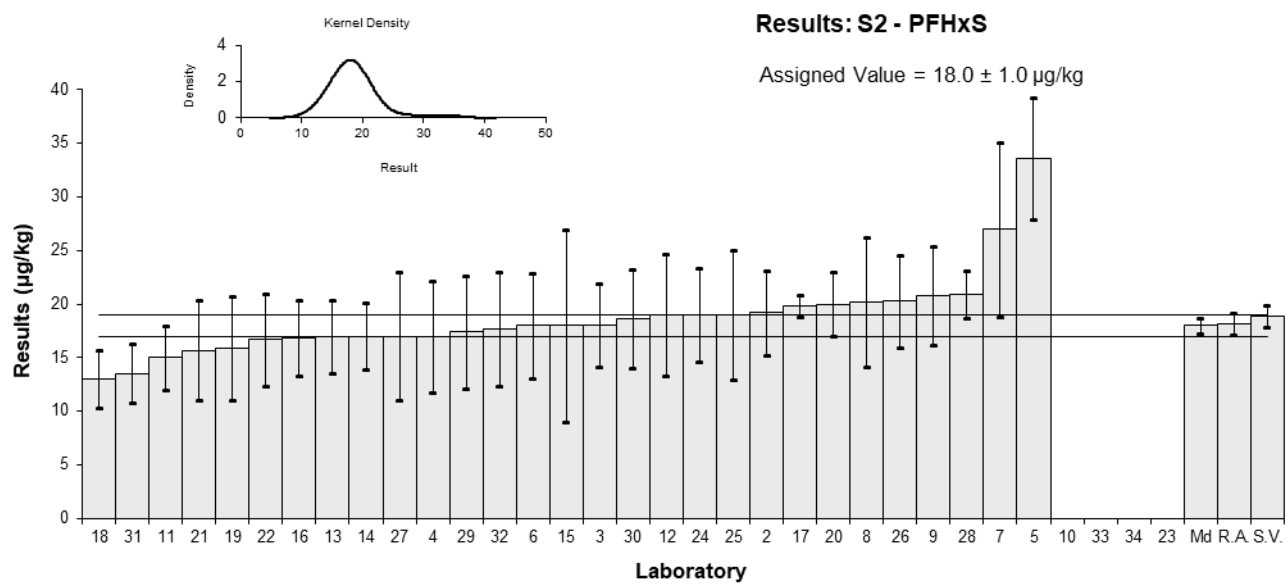


Figure 19

Table 23

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFHxS_L
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	19.2	3.95	112	0.36	0.31
3	18	3.9	NR	0.03	0.02
4	17	5.2	66	-0.25	-0.17
5	29.8	5.1	54	3.32	2.26
6	NT	NT	NT		
7	26.96	8.09	NR	2.53	1.11
8	20.67	6.202	75	0.77	0.44
9	NT	NT	NT		
10	22.15	0.38	88	1.19	3.14
11	NT	NT	NT		
12	19	5.7	85	0.31	0.19
13	17	3.4	103	-0.25	-0.25
14	NT	NT	NT		
15	18	NR	NR	0.03	0.08
16	16.808	3.541	94	-0.31	-0.29
17	19.8	1.02	85.42	0.53	1.15
18	13	2.7	NR	-1.37	-1.64
19	NT	NT	NT		
20	20	3.0	128	0.59	0.64
21	15.7	4.71	88	-0.61	-0.45
22	16.7	4.3	NR	-0.34	-0.27
23	NT	NT	NT		
24	19	4.4	95	0.31	0.24
25	19	6	100	0.31	0.18
26	NT	NT	NT		
27	17	6	97	-0.25	-0.15
28	NT	NT	NT		
29	17.386	5.2158	NR	-0.14	-0.10
30	13.4	3.3	88	-1.26	-1.27
31	13.54	2.71	102.6	-1.22	-1.45
32	17.7	5.31	114	-0.06	-0.04
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	17.9	1.3
Spike	18.9	1.0
Robust Average	18.1	1.5
Median	18.0	0.8
Mean	18.6	
N	23	
Max.	29.8	
Min.	13	
Robust SD	2.8	
Robust CV	16%	

*Robust Average excluding laboratory 5.

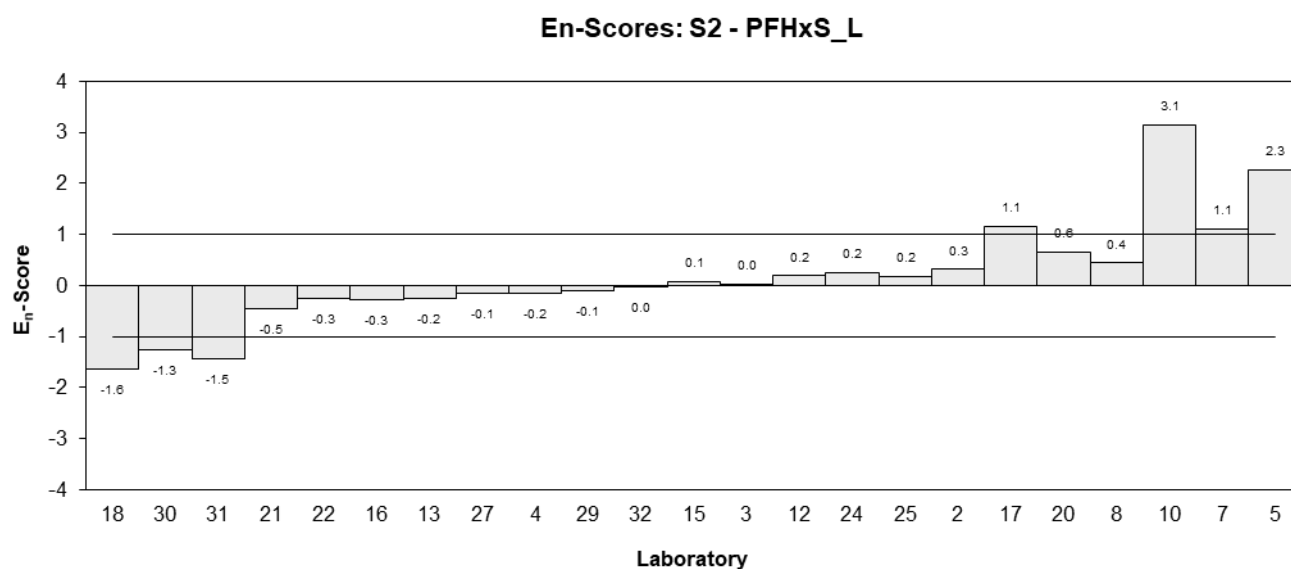
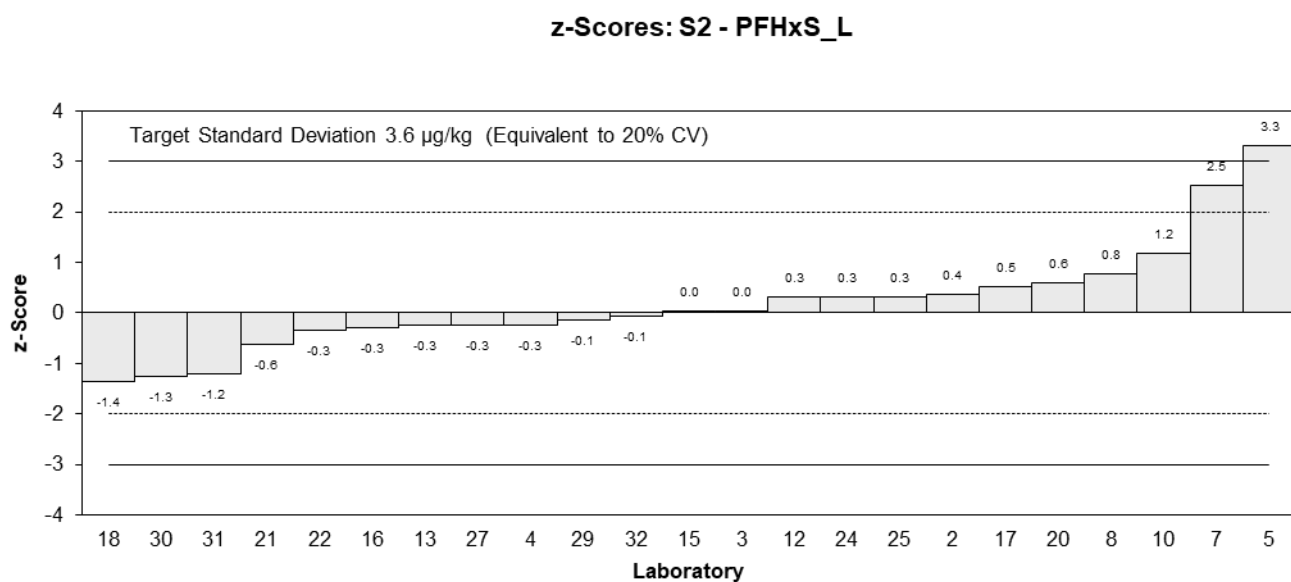
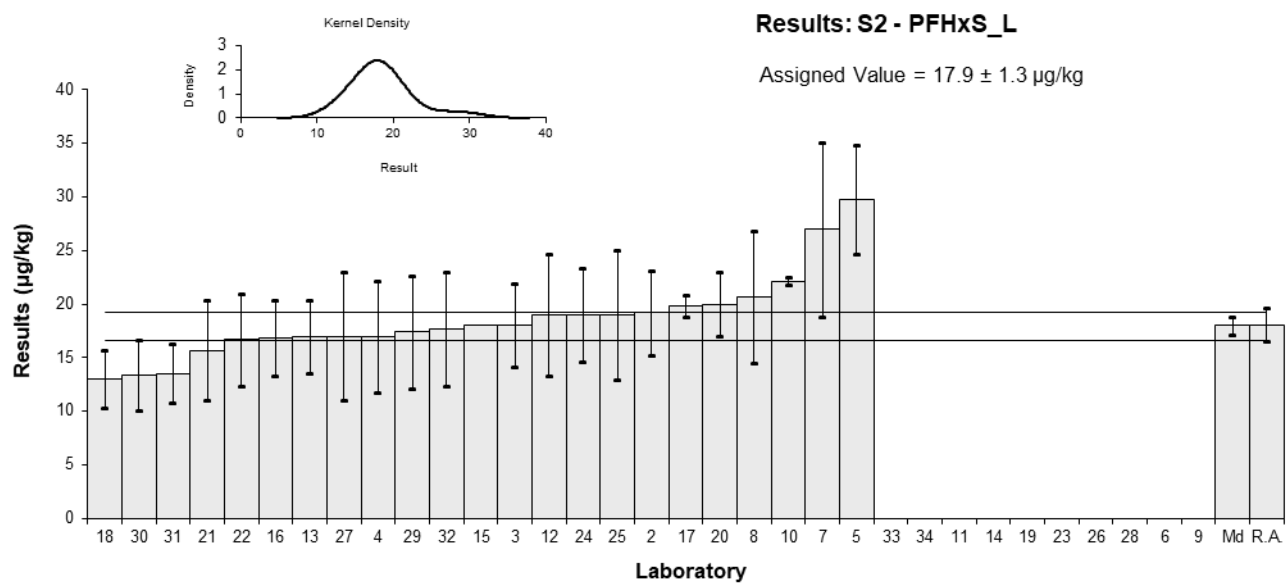


Figure 20

Table 24

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFHpS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	2.13	0.52	NR	0.32	0.24
3	1.9	0.42	NR	-0.25	-0.23
4	2.3	0.68	NR	0.75	0.44
5	3.68	0.63	43	4.20	2.63
6	<2.5	NR	>50		
7	<5	1.50	NR		
8	1.90	0.570	75	-0.25	-0.17
9	2.0	0.4	96	0.00	0.00
10	2.54	0.55	NR	1.35	0.96
11	NT	NT	NT		
12	1.88	0	NR	-0.30	-1.09
13	2.0	0.40	103	0.00	0.00
14	1.8	0.41	111	-0.50	-0.47
15	1.8	0.9	NR	-0.50	-0.22
16	1.888	0.656	NR	-0.28	-0.17
17	2.2	0.23	85.42	0.50	0.78
18	2.5	0.5	NR	1.25	0.98
19	1.9	0.6	NR	-0.25	-0.16
20	1.7	0.5	128	-0.75	-0.59
21	1.84	0.55	87	-0.40	-0.29
22	2.1	0.6	NR	0.25	0.16
23	NT	NT	NT		
24	1.9	0.32	95	-0.25	-0.30
25	2.2	1	109	0.50	0.20
26	2.06	0.46	109	0.15	0.13
27	1.9	1	97	-0.25	-0.10
28	2.3	0.2	90	0.75	1.31
29	2.0063	0.60189	NR	0.02	0.01
30	1.68	0.42	73	-0.80	-0.74
31	1.87	0.37	NR	-0.32	-0.34
32	<1.91	NR	114		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	2.00	0.11
Spike	2.01	0.10
Robust Average	2.01	0.12
Median	1.95	0.08
Mean	2.08	
N	26	
Max.	3.68	
Min.	1.68	
Robust SD	0.24	
Robust CV	12%	

*Robust Average excluding laboratory 5.

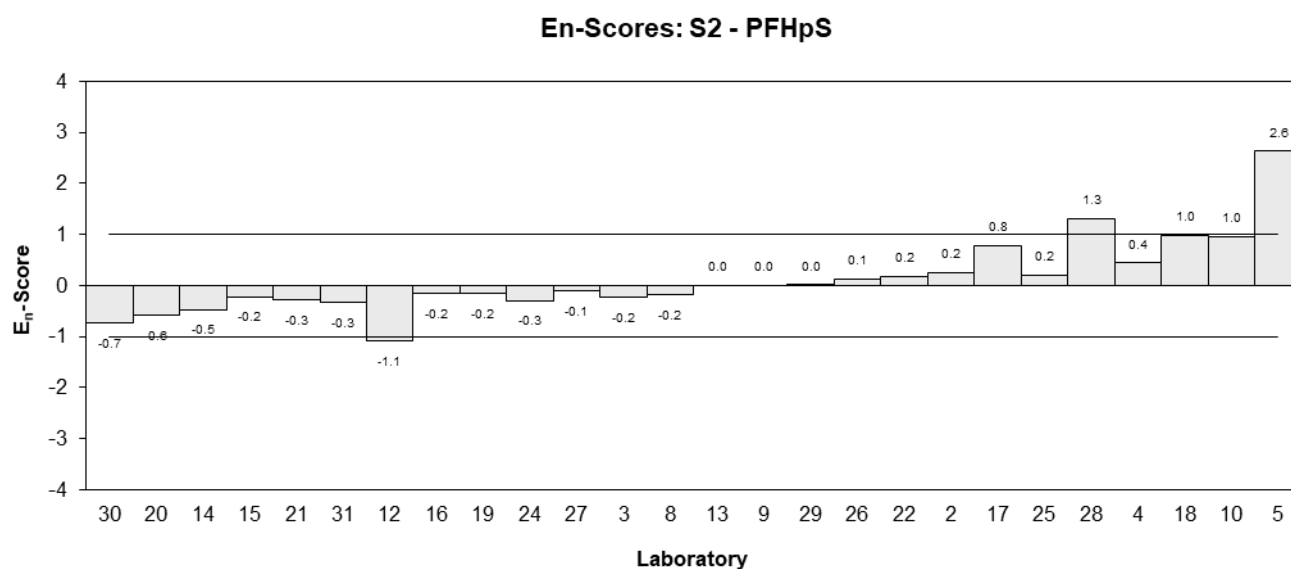
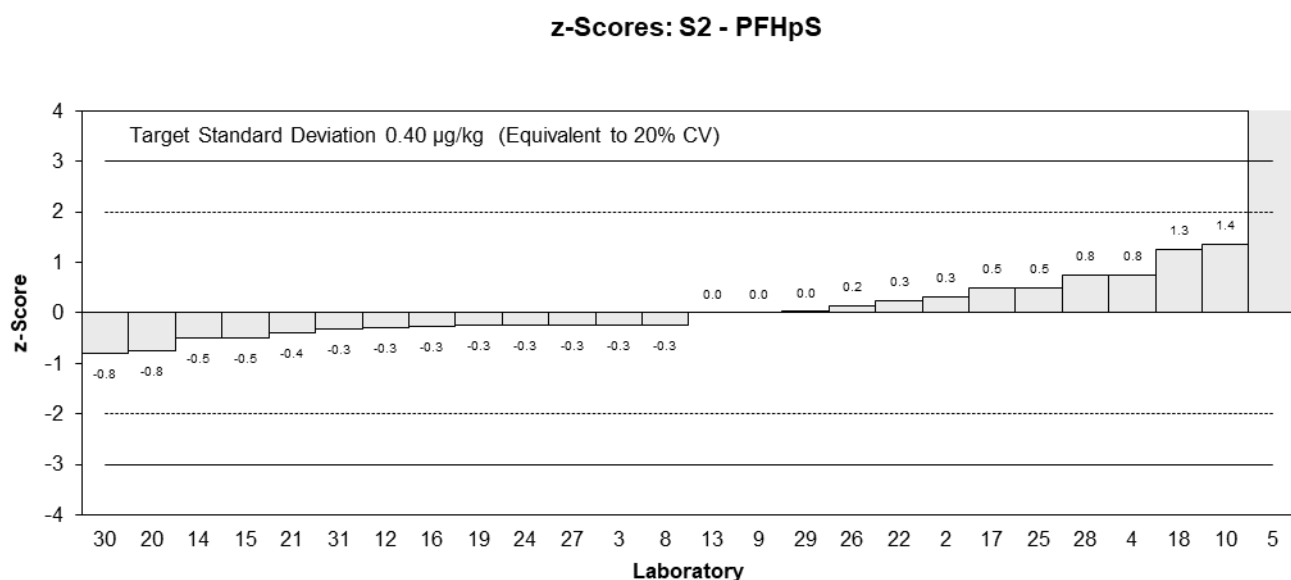
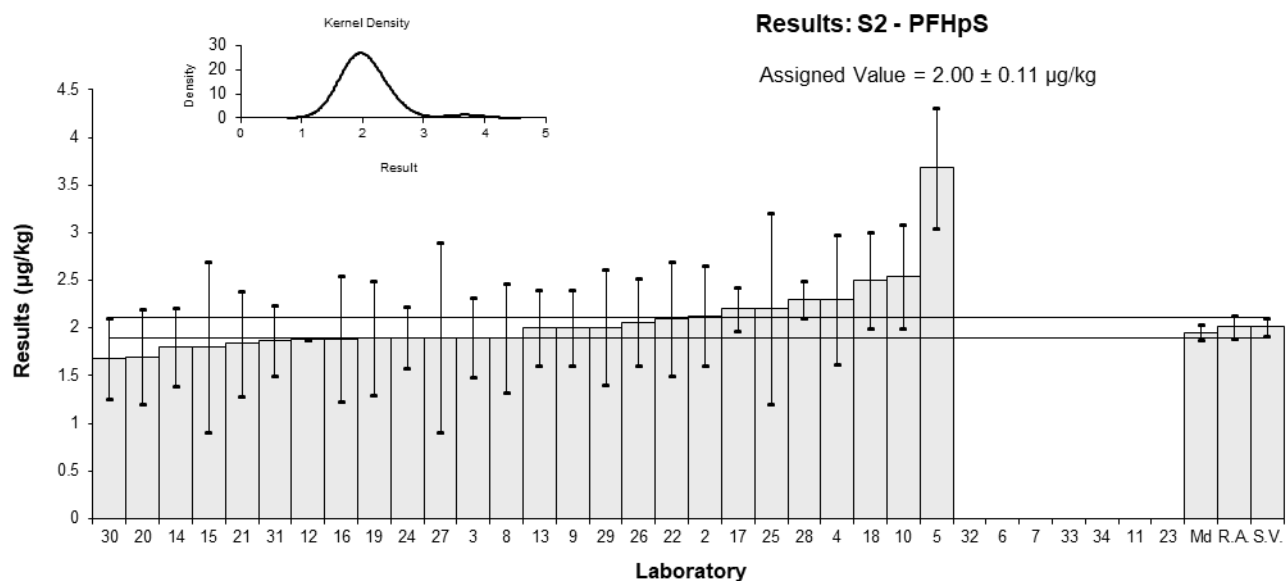


Figure 21

Table 25

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFOS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	5.27	1.12	NR	0.63	0.51
3	4.4	1.0	NR	-0.30	-0.27
4	4.6	1.4	87	-0.09	-0.06
5	492	97.2	40	520.64	5.01
6	4.914	1.327	>50	0.25	0.17
7	8.66	2.60	NR	4.25	1.52
8	4.35	1.304	78	-0.35	-0.25
9	5.6	1.2	91	0.98	0.75
10	28.23	1.38	NR	25.16	16.70
11	3.8	1.3	80	-0.94	-0.66
12	5	1.5	103	0.34	0.21
13	4.9	1.2	96	0.24	0.18
14	4	0.89	109	-0.73	-0.73
15	4.3	2.2	83	-0.41	-0.17
16	4.429	0.696	91.2	-0.27	-0.33
17	4.9	0.55	84.24	0.24	0.35
18	5.4	1.1	NR	0.77	0.63
19	4.6	1.4	NR	-0.09	-0.06
20	4.0	0.9	130	-0.73	-0.72
21	4.05	1.22	87	-0.67	-0.50
22	5.2	1.4	98	0.56	0.36
23	NT	NT	NT		
24	5.0	1.6	104	0.34	0.20
25	4.5	1	109	-0.19	-0.17
26	5.16	1.23	109	0.51	0.38
27	4.1	1	96	-0.62	-0.56
28	5.1	0.6	100	0.45	0.63
29	4.6168	1.38504	73.17	-0.07	-0.04
30	3.55	0.89	95	-1.21	-1.21
31	5.85	1.17	NR	1.25	0.97
32	4.84	1.45	98.3	0.17	0.11
33	NT	NT	NT		
34	NT	NT	NT		

Statistics*

Assigned Value**	4.68	0.29
Spike	4.78	0.24
Robust Average	4.76	0.31
Median	4.84	0.24
Mean	5.63	
N	29	
Max.	28.23	
Min.	3.55	
Robust SD	0.67	
Robust CV	14%	

*Laboratory 5 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 7 and 10.

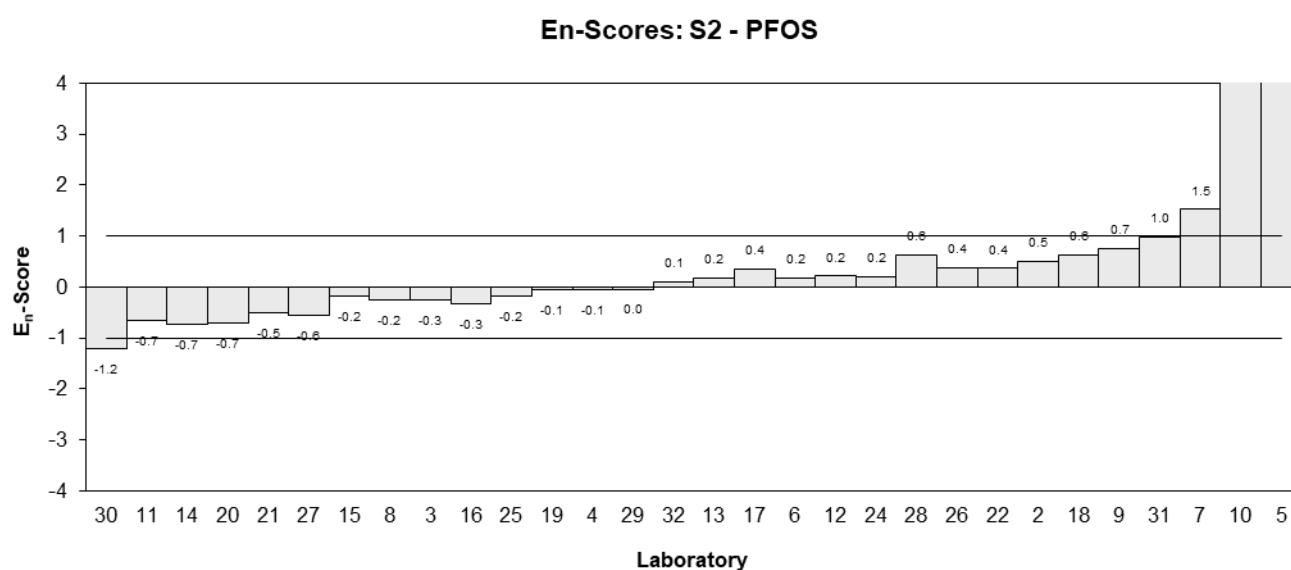
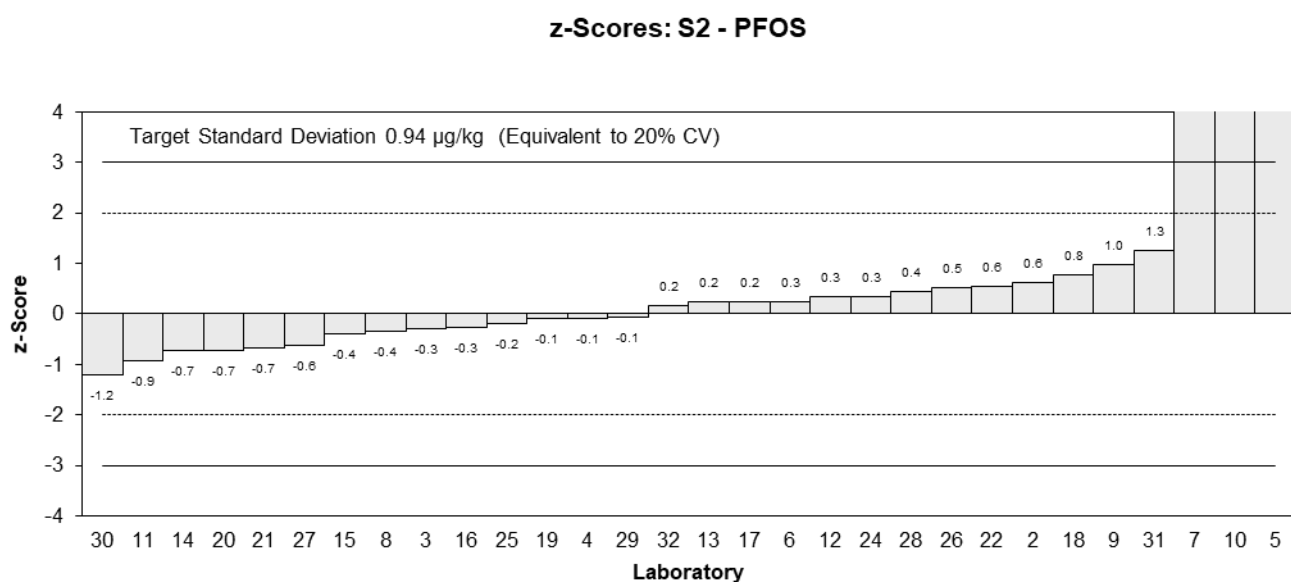
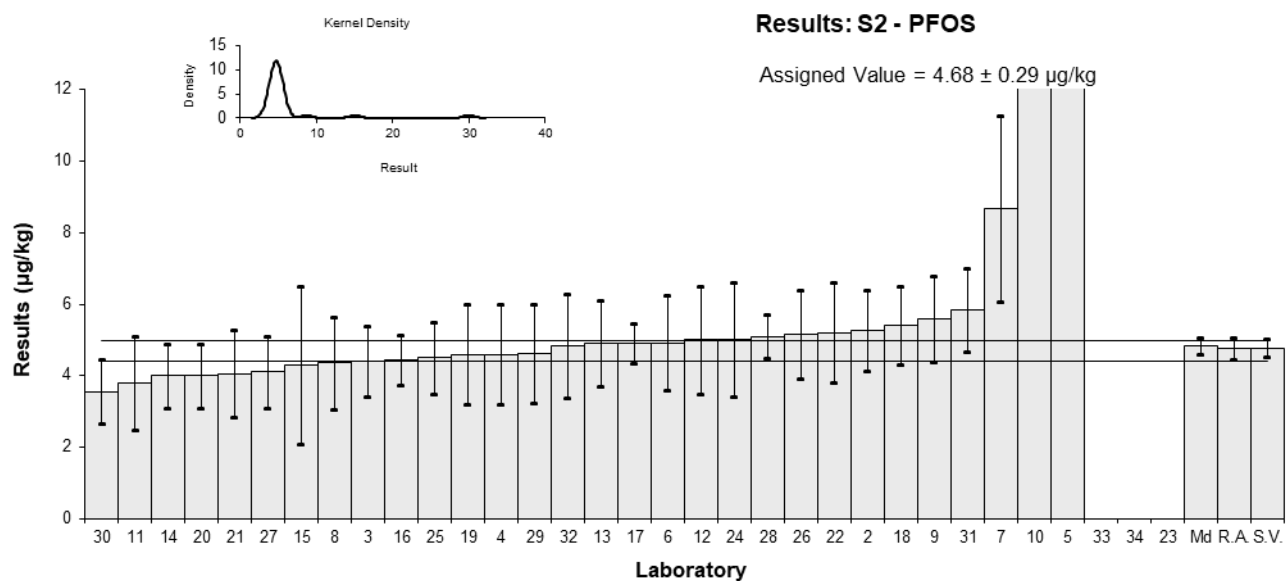


Figure 22

Table 26

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFOS_L
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	5.27	1.12	130	0.51	0.42
3	4.4	1.0	99	-0.40	-0.36
4	4.6	1.4	87	-0.19	-0.13
5	384	76	40	396.67	4.99
6	NT	NT	NT		
7	8.33	2.50	NR	3.71	1.41
8	4.91	1.473	78	0.14	0.09
9	5.6	1.2	91	0.86	0.66
10	22.78	1.09	73	18.83	15.96
11	NT	NT	NT		
12	5	1.5	103	0.23	0.14
13	4.9	1.2	96	0.13	0.10
14	NT	NT	NT		
15	4.3	2.2	NR	-0.50	-0.22
16	4.390	0.690	91.2	-0.41	-0.52
17	4.9	0.54	84.24	0.13	0.20
18	5.4	1.1	NR	0.65	0.55
19	NT	NT	NT		
20	4.0	0.9	130	-0.82	-0.82
21	4.05	1.22	87	-0.76	-0.58
22	5.2	1.4	NR	0.44	0.29
23	NT	NT	NT		
24	5.0	1.6	104	0.23	0.14
25	4.5	1	109	-0.29	-0.27
26	5.16	1.23	109	0.40	0.30
27	4.1	1	96	-0.71	-0.65
28	NT	NT	NT		
29	4.4974	1.34922	NR	-0.30	-0.20
30	4.25	1.1	95	-0.55	-0.47
31	5.85	1.17	97.3	1.12	0.89
32	4.84	1.45	98.4	0.06	0.04
33	5.16	1.03	88.9	0.40	0.36
34	NT	NT	NT		

Statistics*

Assigned Value**	4.78	0.29
Spike	4.78	0.24
Robust Average	4.88	0.32
Median	4.90	0.25
Mean	5.66	
N	25	
Max.	22.78	
Min.	4	
Robust SD	0.64	
Robust CV	13%	

*Laboratory 5 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 7 and 10.

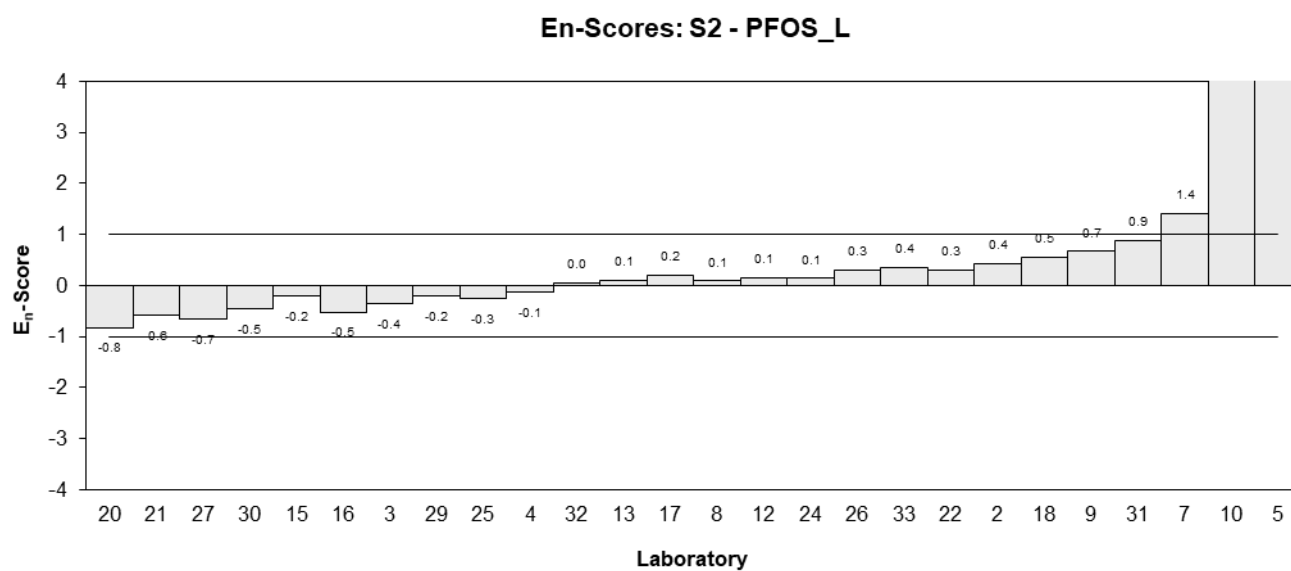
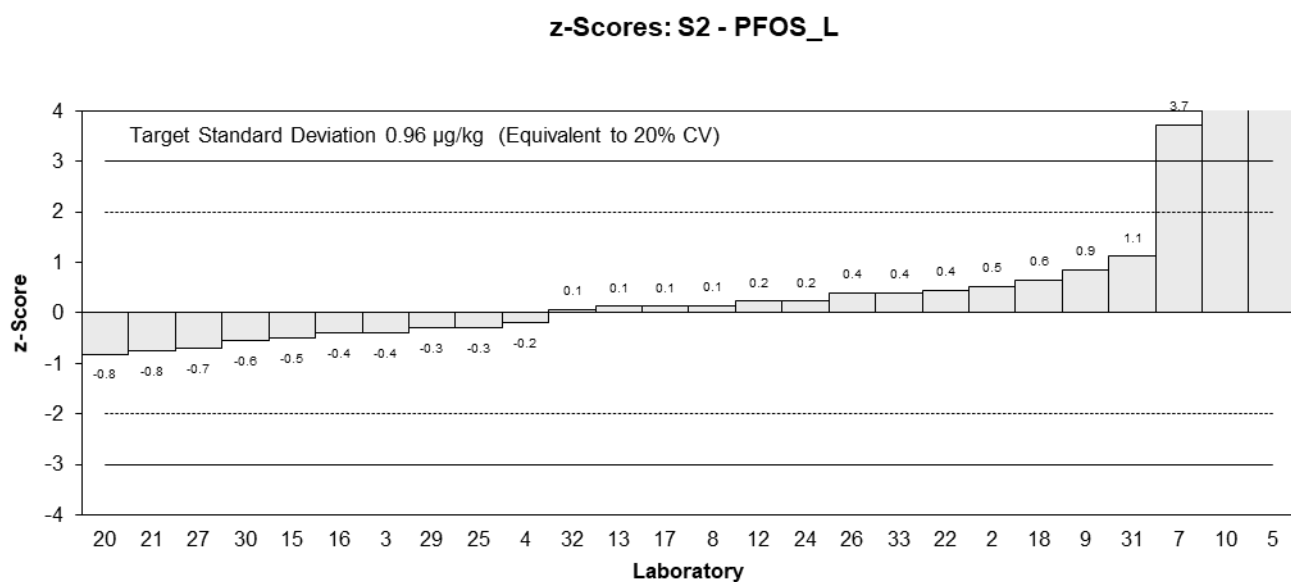
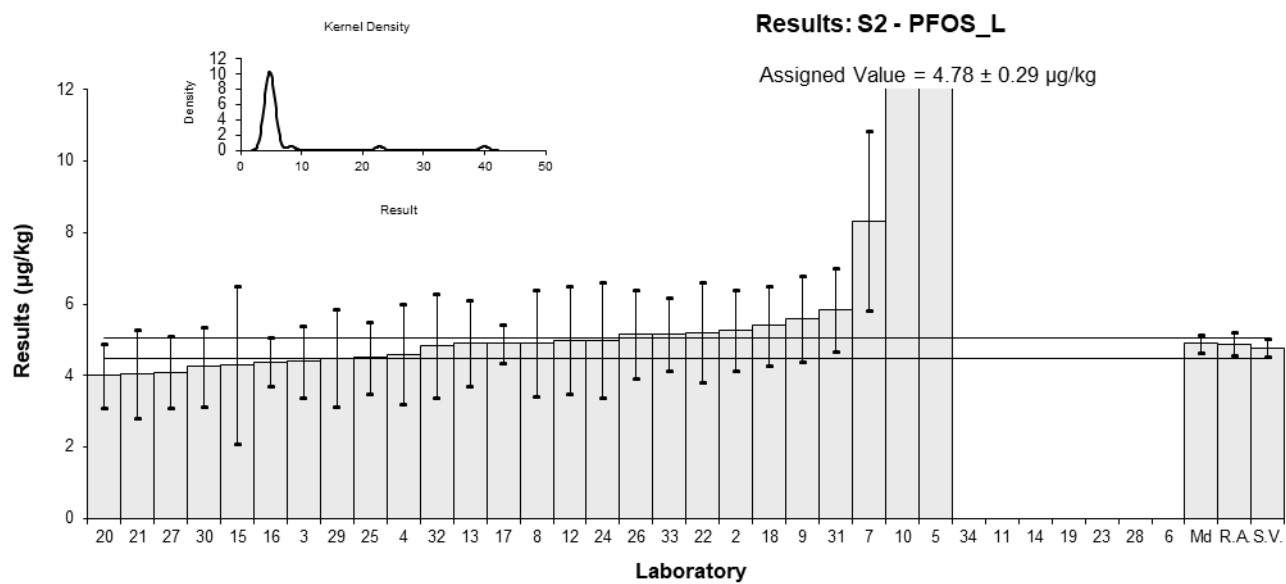


Figure 23

Table 27

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFBA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	5.39	0.93	72	0.29	0.30
3	4.9	1.1	NR	-0.19	-0.16
4	4.9	1.5	77	-0.19	-0.12
5	2.12	0.31	53	-2.92	-6.15
6	4.43	1.1961	>50	-0.65	-0.53
7	7.03	2.11	NR	1.91	0.91
8	5.99	1.798	66	0.88	0.49
9	4.0	1.3	117	-1.07	-0.81
10	6.06	0.13	84	0.95	2.47
11	NT	NT	NT		
12	5	1.5	83	-0.09	-0.06
13	52	10	107	46.08	4.69
14	4	0.88	126	-1.07	-1.14
15	5.1	2.6	81	0.01	0.00
16	7.171	2.002	78.3	2.04	1.02
17	5.0	0.27	82.88	-0.09	-0.20
18	4.9	1.0	NR	-0.19	-0.18
19	4.9	1.5	NR	-0.19	-0.12
20	4.8	1.0	98	-0.28	-0.27
21	4.66	1.4	85	-0.42	-0.30
22	5.1	1.6	120	0.01	0.01
23	NT	NT	NT		
24	5.3	1.7	100	0.21	0.12
25	5.2	1	101	0.11	0.10
26	4.15	1	154	-0.92	-0.88
27	4.8	1	100	-0.28	-0.27
28	5.9	0.5	97	0.80	1.30
29	NT	NT	NT		
30	5.95	1.5	83	0.84	0.56
31	5.33	1.07	102.5	0.24	0.21
32	4.19	1.26	81.8	-0.88	-0.69
33	NT	NT	NT		
34	NT	NT	NT		

Statistics*

Assigned Value**	5.09	0.37
Spike	5.02	0.25
Robust Average	5.05	0.38
Median	5.00	0.20
Mean	5.05	
N	27	
Max.	7.171	
Min.	2.12	
Robust SD	0.78	
Robust CV	15%	

*Laboratory 13 excluded from statistical calculation (gross error).

**Robust Average excluding laboratory 5.

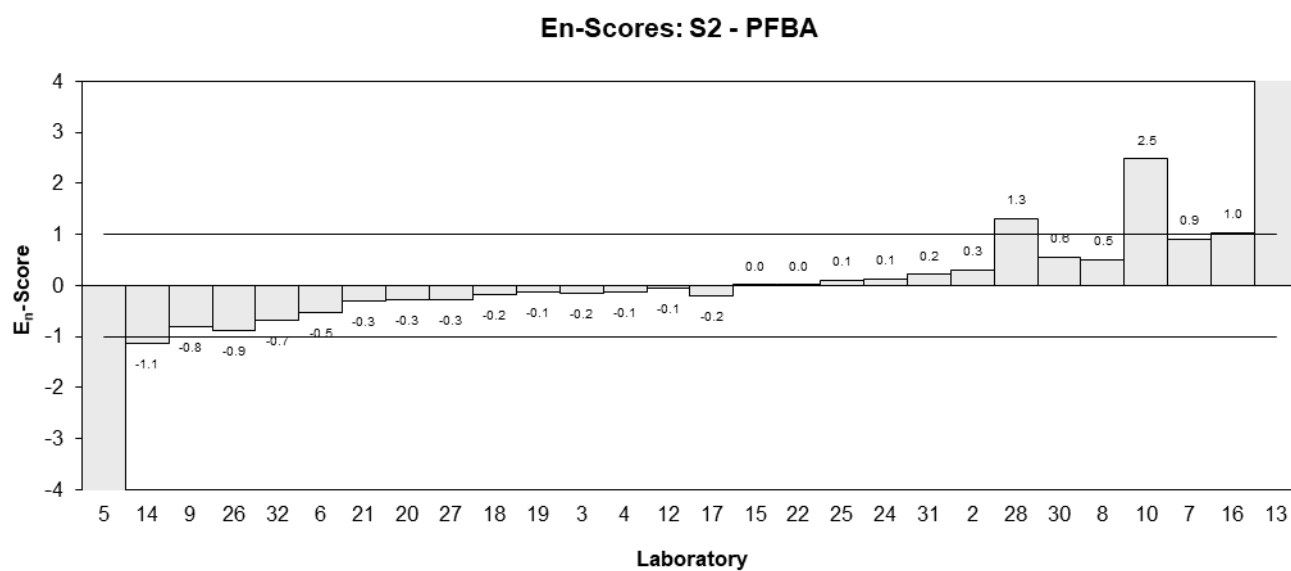
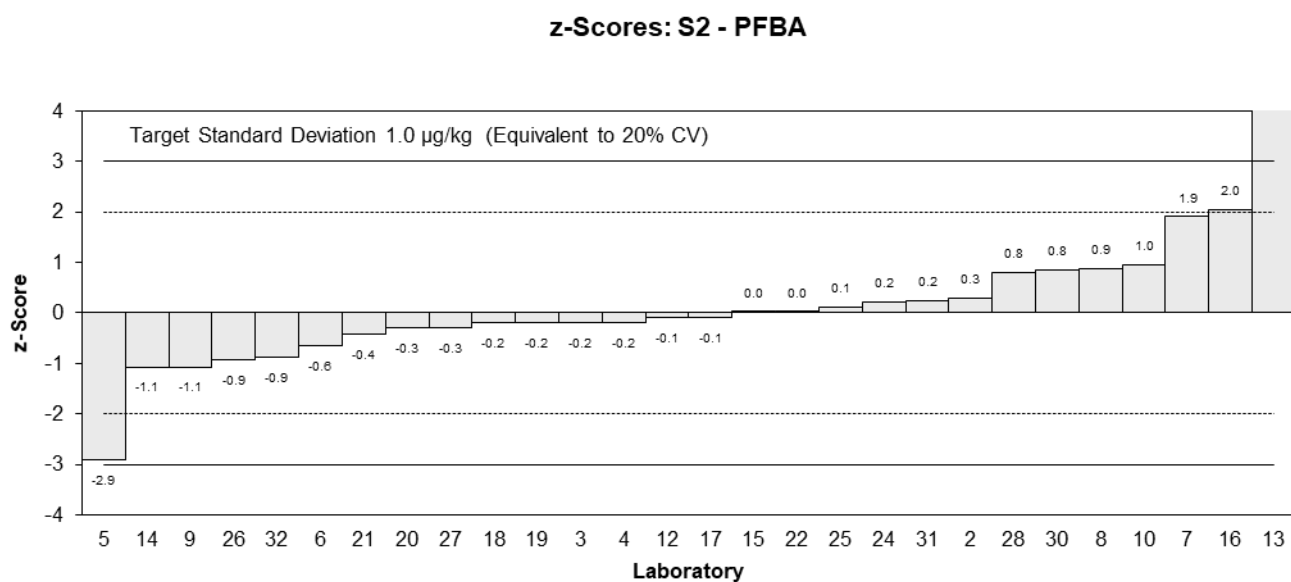
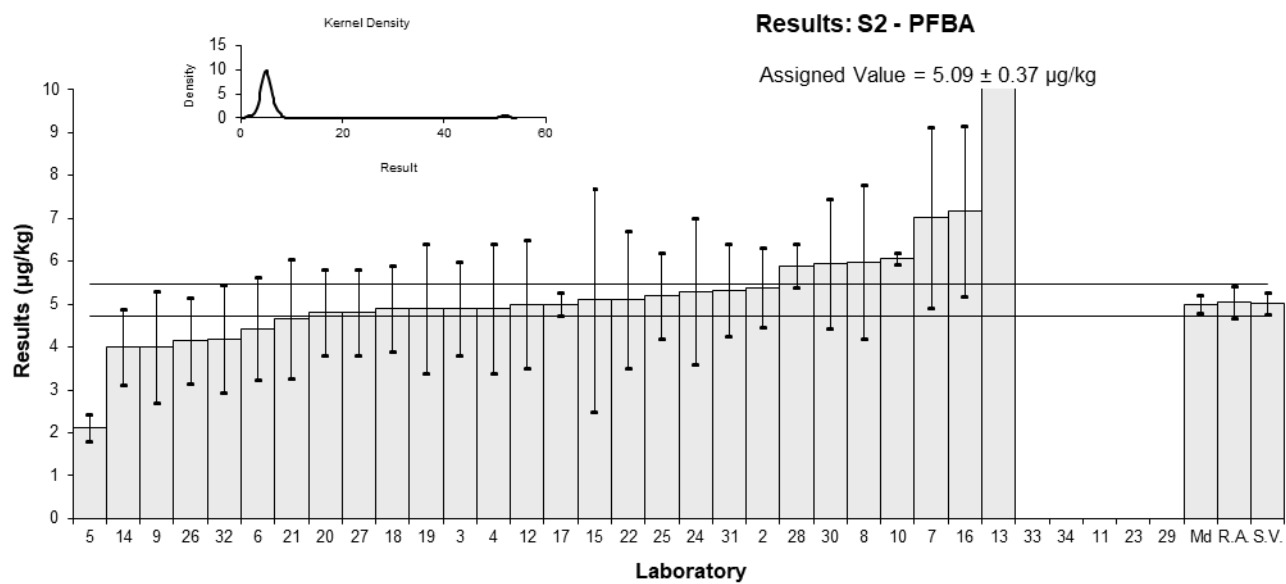


Figure 24

Table 28

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFPeA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	10.1	2.29	86	0.00	0.00
3	9.1	2.0	NR	-0.50	-0.49
4	10	3.0	59	-0.05	-0.03
5	2.42	0.49	57	-3.80	-10.97
6	9.145	2.469	>50	-0.47	-0.38
7	13.46	4.04	NR	1.66	0.83
8	10.44	3.133	76	0.17	0.11
9	11.3	2.2	123	0.59	0.53
10	10.77	0.29	86	0.33	1.16
11	NT	NT	NT		
12	9	2.7	84	-0.54	-0.40
13	9.8	2.0	100	-0.15	-0.15
14	9.4	1.57	114	-0.35	-0.42
15	9.7	4.9	81	-0.20	-0.08
16	13.072	2.531	89.1	1.47	1.15
17	10.3	0.41	84.64	0.10	0.31
18	8.8	1.8	NR	-0.64	-0.70
19	8.1	2.4	NR	-0.99	-0.82
20	8.3	1.8	97	-0.89	-0.96
21	9.09	2.73	88	-0.50	-0.36
22	10.5	2.8	84	0.20	0.14
23	NT	NT	NT		
24	11	1.4	102	0.45	0.61
25	11	3	104	0.45	0.30
26	10.4	2	112	0.15	0.15
27	9.5	3	115	-0.30	-0.20
28	10.7	0.7	103	0.30	0.70
29	NT	NT	NT		
30	10.6	2.7	88	0.25	0.18
31	10.83	2.17	91.4	0.36	0.33
32	9.74	2.92	96.4	-0.18	-0.12
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	10.1	0.5
Spike	10.1	0.5
Robust Average	9.99	0.52
Median	10.1	0.4
Mean	9.88	
N	28	
Max.	13.46	
Min.	2.42	
Robust SD	1.1	
Robust CV	11%	

*Robust Average excluding laboratory 5.

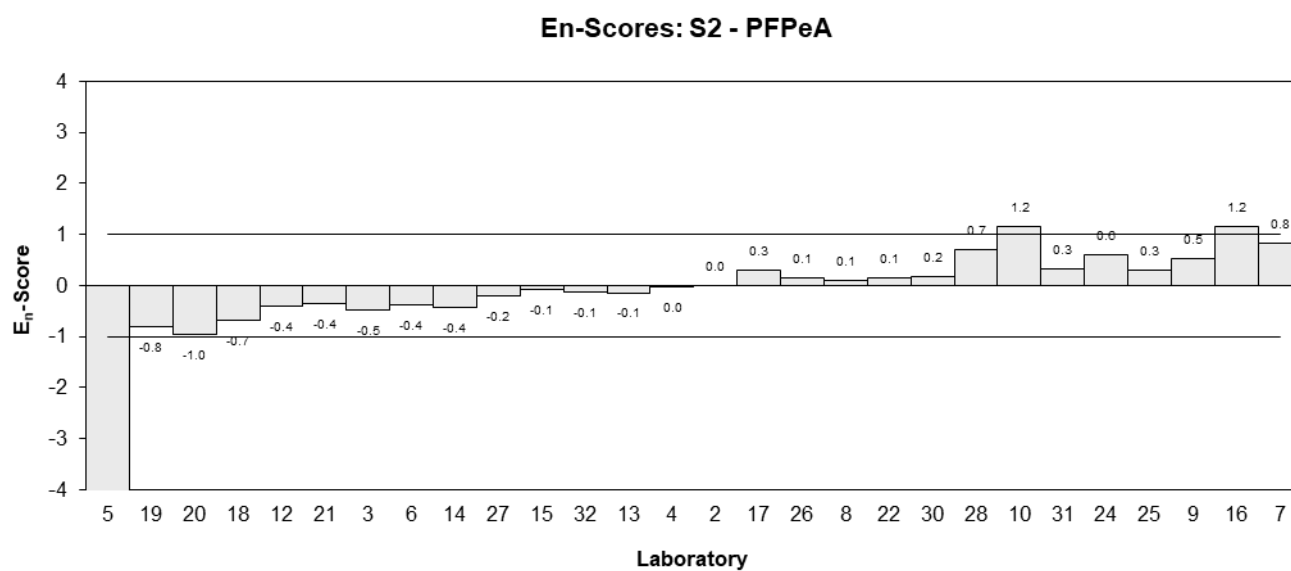
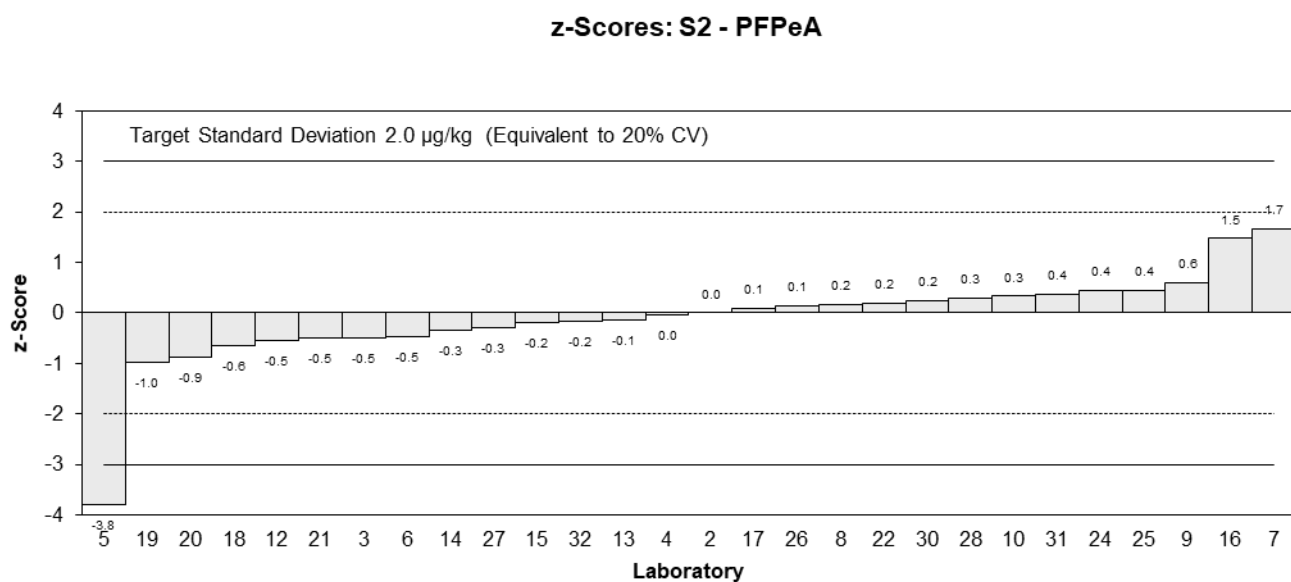
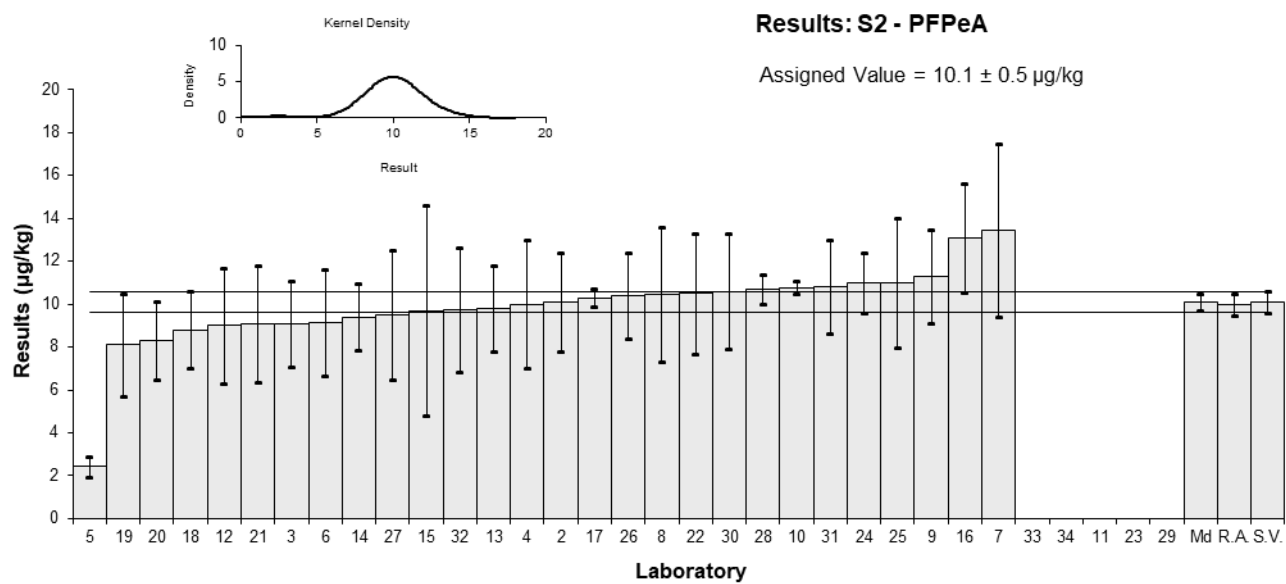


Figure 25

Table 29

Sample Details

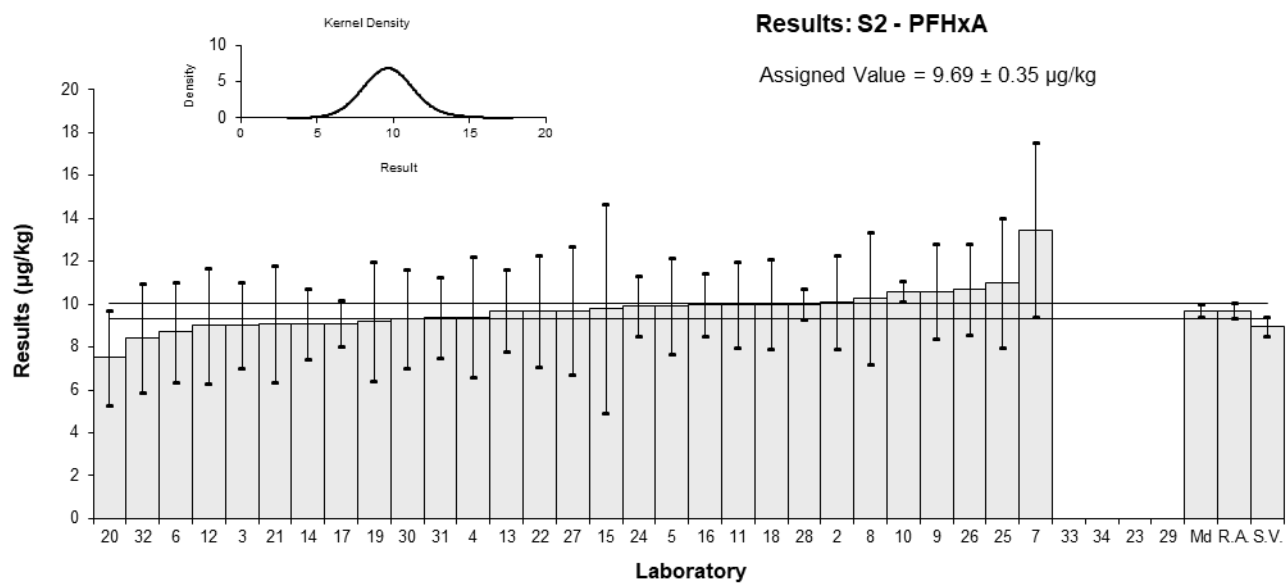
Sample No.	S2
Matrix.	Soil
Analyte.	PFHxA
Units	µg/kg

Participant Results

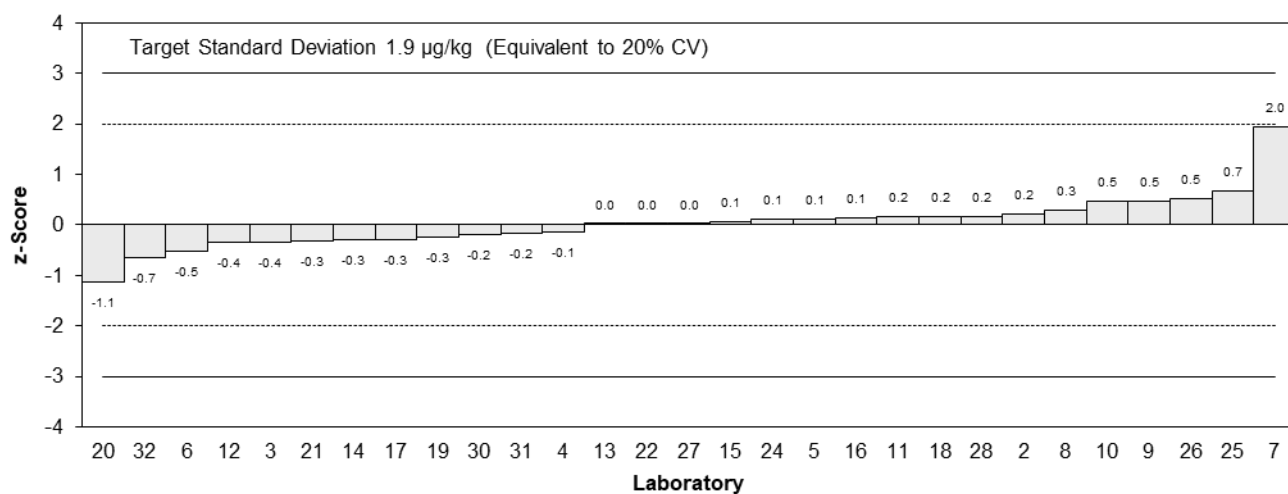
Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	10.10	2.20	83	0.21	0.18
3	9.0	2.0	NR	-0.36	-0.34
4	9.4	2.8	53	-0.15	-0.10
5	9.90	2.25	53	0.11	0.09
6	8.696	2.348	>50	-0.51	-0.42
7	13.47	4.04	NR	1.95	0.93
8	10.27	3.080	81	0.30	0.19
9	10.6	2.2	123	0.47	0.41
10	10.59	0.47	82	0.46	1.54
11	10	2	69	0.16	0.15
12	9	2.7	90	-0.36	-0.25
13	9.7	1.9	91	0.01	0.01
14	9.1	1.65	122	-0.30	-0.35
15	9.8	4.9	80	0.06	0.02
16	9.960	1.471	89.7	0.14	0.18
17	9.1	1.06	82.7	-0.30	-0.53
18	10	2.1	NR	0.16	0.15
19	9.2	2.8	NR	-0.25	-0.17
20	7.5	2.2	97	-1.13	-0.98
21	9.06	2.72	83	-0.33	-0.23
22	9.7	2.6	88	0.01	0.00
23	NT	NT	NT		
24	9.9	1.4	107	0.11	0.15
25	11	3	106	0.68	0.43
26	10.7	2.1	112	0.52	0.47
27	9.7	3	111	0.01	0.00
28	10.0	0.7	102	0.16	0.40
29	NT	NT	NT		
30	9.33	2.3	98	-0.19	-0.15
31	9.38	1.88	93.1	-0.16	-0.16
32	8.42	2.53	107	-0.66	-0.50
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	9.69	0.35
Spike	8.97	0.45
Robust Average	9.69	0.35
Median	9.70	0.28
Mean	9.74	
N	29	
Max.	13.47	
Min.	7.5	
Robust SD	0.75	
Robust CV	7.8%	



z-Scores: S2 - PFHxA



En-Scores: S2 - PFHxA

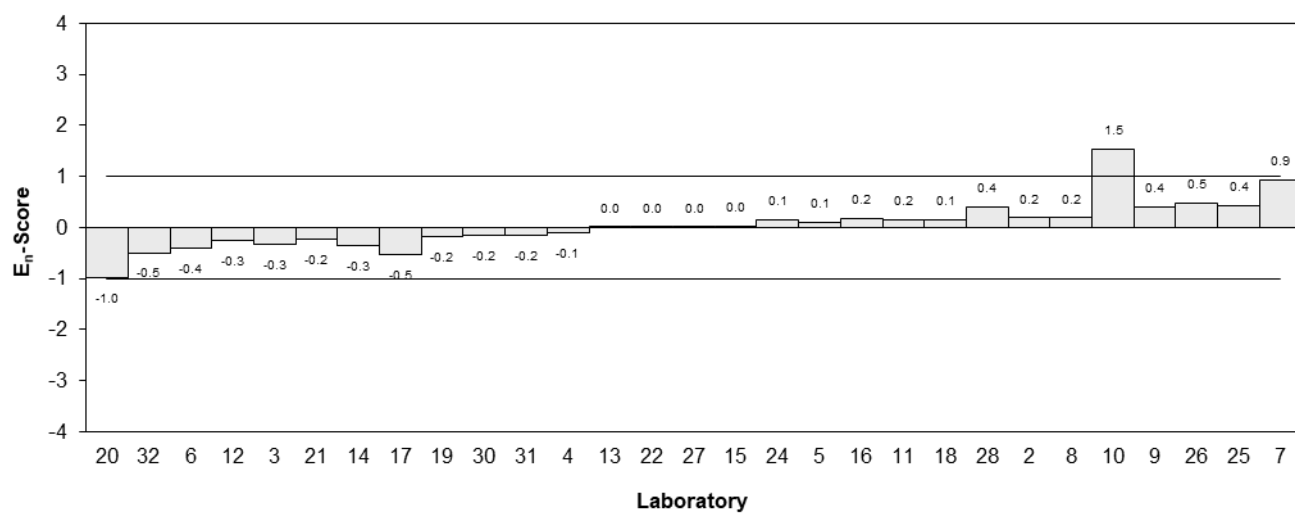


Figure 26

Table 30

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFHpA
Units	µg/kg

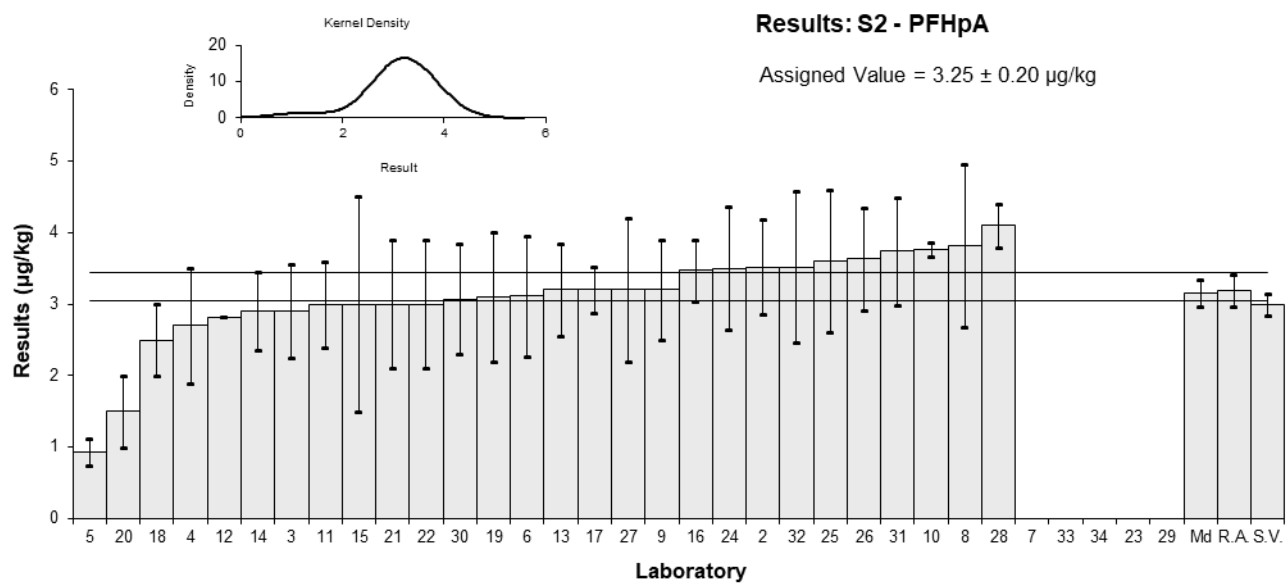
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	3.52	0.67	101	0.42	0.39
3	2.9	0.65	NR	-0.54	-0.51
4	2.7	0.81	83	-0.85	-0.66
5	0.927	0.187	53	-3.57	-8.48
6	3.116	0.841	>50	-0.21	-0.16
7	<5	1.50	NR		
8	3.82	1.145	83	0.88	0.49
9	3.2	0.7	113	-0.08	-0.07
10	3.77	0.10	82	0.80	2.33
11	3.0	0.6	76	-0.38	-0.40
12	2.82	0	82	-0.66	-2.15
13	3.2	0.64	98	-0.08	-0.07
14	2.9	0.55	121	-0.54	-0.60
15	3	1.5	77	-0.38	-0.17
16	3.472	0.426	90.1	0.34	0.47
17	3.2	0.32	69.7	-0.08	-0.13
18	2.5	0.5	NR	-1.15	-1.39
19	3.1	0.9	NR	-0.23	-0.16
20	1.5	0.5	128	-2.69	-3.25
21	3	0.9	88	-0.38	-0.27
22	3	0.9	72	-0.38	-0.27
23	NT	NT	NT		
24	3.5	0.86	108	0.38	0.28
25	3.6	1	102	0.54	0.34
26	3.63	0.72	103	0.58	0.51
27	3.2	1	93	-0.08	-0.05
28	4.1	0.3	101	1.31	2.36
29	NT	NT	NT		
30	3.07	0.77	73	-0.28	-0.23
31	3.74	0.75	96.7	0.75	0.63
32	3.52	1.06	108	0.42	0.25
33	NT	NT	NT		
34	NT	NT	NT		

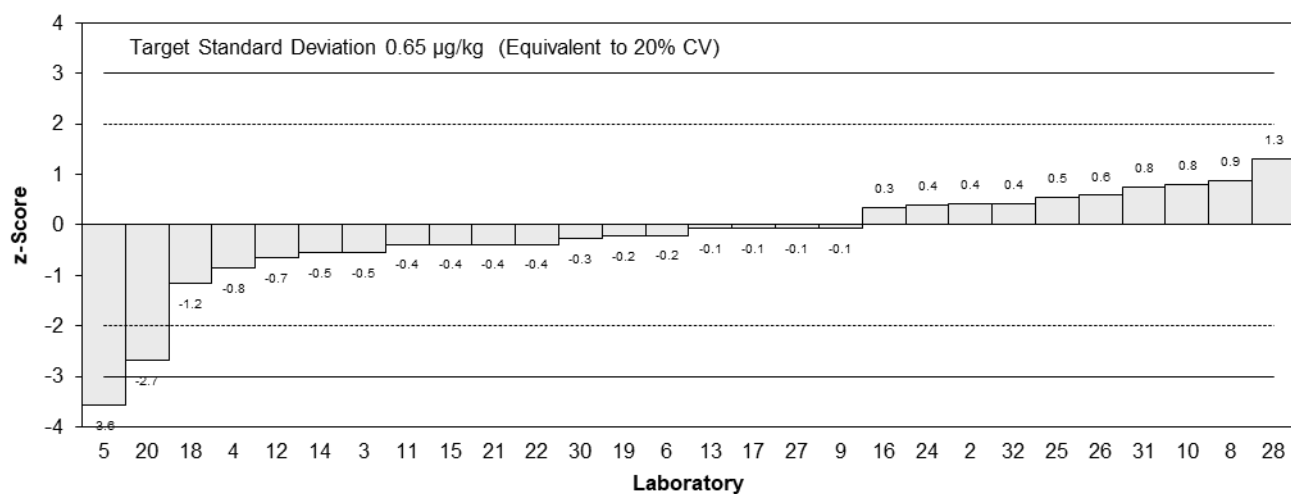
Statistics

Assigned Value*	3.25	0.20
Spike	2.99	0.15
Robust Average	3.19	0.22
Median	3.16	0.19
Mean	3.11	
N	28	
Max.	4.1	
Min.	0.927	
Robust SD	0.46	
Robust CV	14%	

*Robust Average excluding laboratories 5 and 20.



z-Scores: S2 - PFHpA



En-Scores: S2 - PFHpA

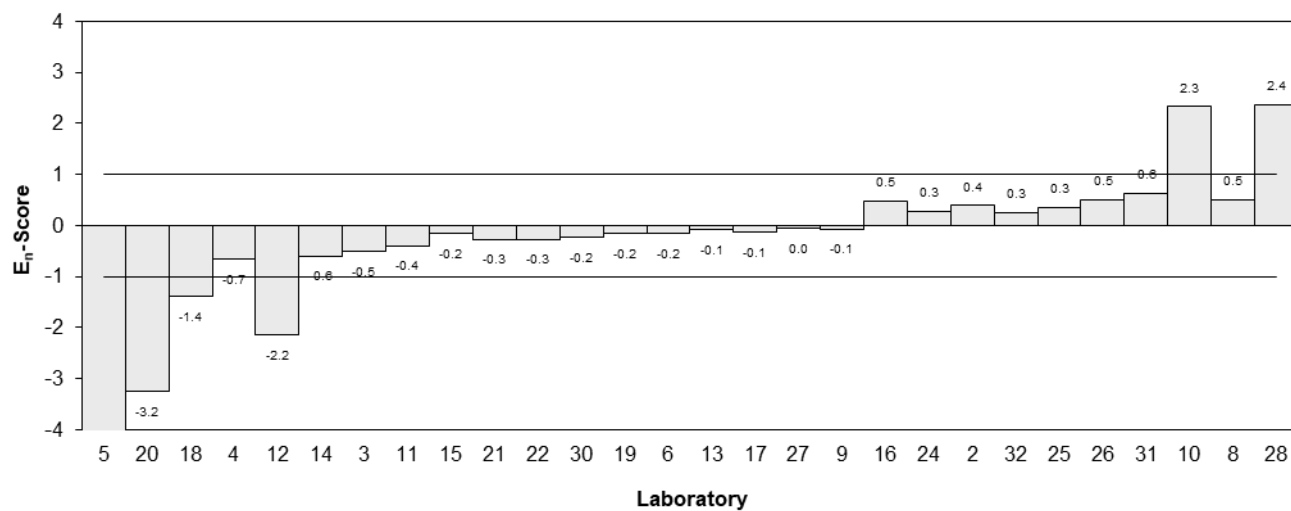


Figure 27

Table 31

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFOA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	12.9	2.55	92	0.38	0.35
3	11	2.5	105	-0.42	-0.39
4	12	3.6	77	0.00	0.00
5	3.4	NR	52	-3.58	-17.20
6	11.108	2.999	>50	-0.37	-0.29
7	14.78	4.43	NR	1.16	0.62
8	13.65	4.096	92	0.69	0.40
9	12.4	2.3	103	0.17	0.17
10	14.81	0.56	84	1.17	3.74
11	11	2	84	-0.42	-0.49
12	12	3.6	82	0.00	0.00
13	11	2.2	108	-0.42	-0.44
14	11.1	1.85	134	-0.38	-0.47
15	12	6	74	0.00	0.00
16	12.645	1.064	90.8	0.27	0.55
17	12.0	1.37	85.04	0.00	0.00
18	12	2.4	NR	0.00	0.00
19	11.9	3.6	NR	-0.04	-0.03
20	9.8	1.7	121	-0.92	-1.24
21	10.7	3.21	90	-0.54	-0.40
22	11.3	2.8	85	-0.29	-0.25
23	NT	NT	NT		
24	12	1.7	82	0.00	0.00
25	13	4	106	0.42	0.25
26	12.1	3.1	118	0.04	0.03
27	11	4	98	-0.42	-0.25
28	14.0	0.9	92	0.83	1.94
29	NT	NT	NT		
30	12.5	3.2	85	0.21	0.15
31	9.91	1.98	95.6	-0.87	-1.02
32	12.2	3.66	102	0.08	0.05
33	13.0	2.6	99.3	0.42	0.38
34	NT	NT	NT		

Statistics

Assigned Value*	12.0	0.5
Spike	12.1	0.6
Robust Average	11.9	0.6
Median	12.0	0.5
Mean	11.8	
N	30	
Max.	14.81	
Min.	3.4	
Robust SD	1.3	
Robust CV	11%	

*Robust Average excluding laboratory 5.

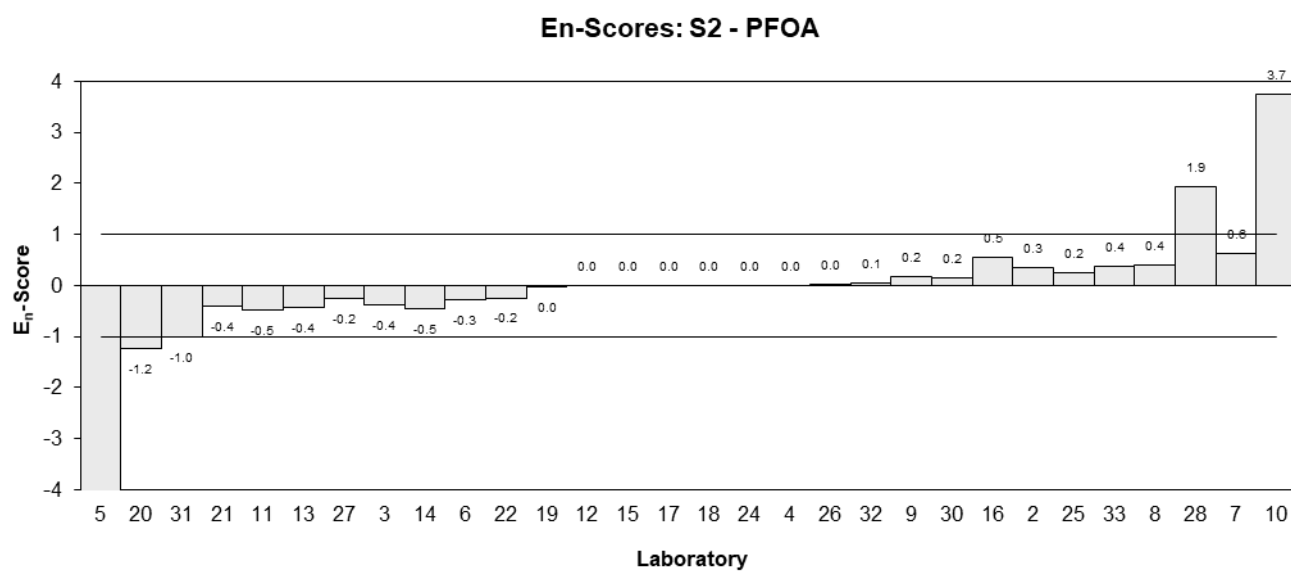
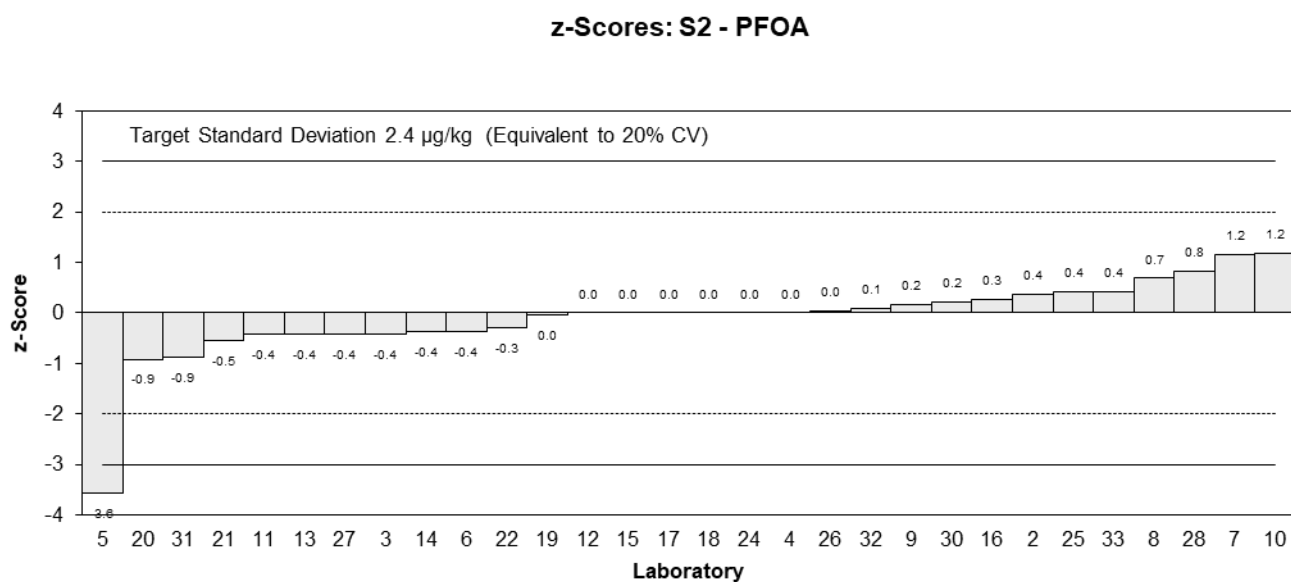
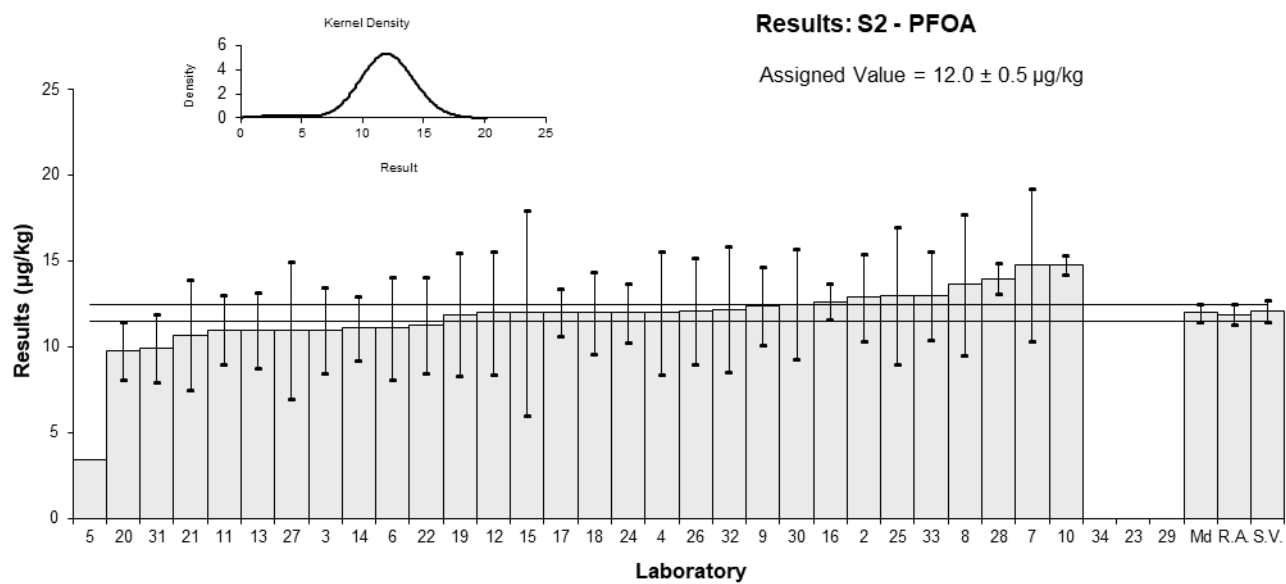


Figure 28

Table 32

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFNA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	6.75	1.48	102	0.51	0.41
3	5.8	1.3	NR	-0.26	-0.24
4	5.9	1.8	96	-0.18	-0.12
5	<0.197	NR	46		
6	5.508	1.487	>50	-0.50	-0.40
7	7.29	2.19	NR	0.96	0.53
8	6.03	1.808	78	-0.07	-0.05
9	6.8	1.1	97	0.56	0.58
10	8.58	0.44	80	2.01	4.23
11	5.6	2.0	80	-0.42	-0.26
12	5	1.5	101	-0.92	-0.72
13	6.6	1.3	91	0.39	0.35
14	5.4	1	148	-0.59	-0.67
15	6	3	75	-0.10	-0.04
16	6.725	1.823	97	0.49	0.32
17	6.2	0.49	69.94	0.07	0.13
18	5.4	1.1	NR	-0.59	-0.62
19	4.7	1.4	NR	-1.16	-0.98
20	6.9	1.4	113	0.64	0.54
21	5.72	1.72	86	-0.33	-0.23
22	4.9	1.5	95	-1.00	-0.79
23	NT	NT	NT		
24	6.3	2.2	104	0.15	0.08
25	6.3	2	106	0.15	0.09
26	6.14	1.6	113	0.02	0.01
27	5.8	2	93	-0.26	-0.16
28	6.8	0.4	97	0.56	1.23
29	NT	NT	NT		
30	6.33	1.6	75	0.17	0.13
31	7.59	1.52	100.9	1.20	0.94
32	5.63	1.69	153	-0.40	-0.28
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	6.12	0.38
Spike	6.06	0.30
Robust Average	6.12	0.38
Median	6.09	0.31
Mean	6.17	
N	28	
Max.	8.58	
Min.	4.7	
Robust SD	0.80	
Robust CV	13%	

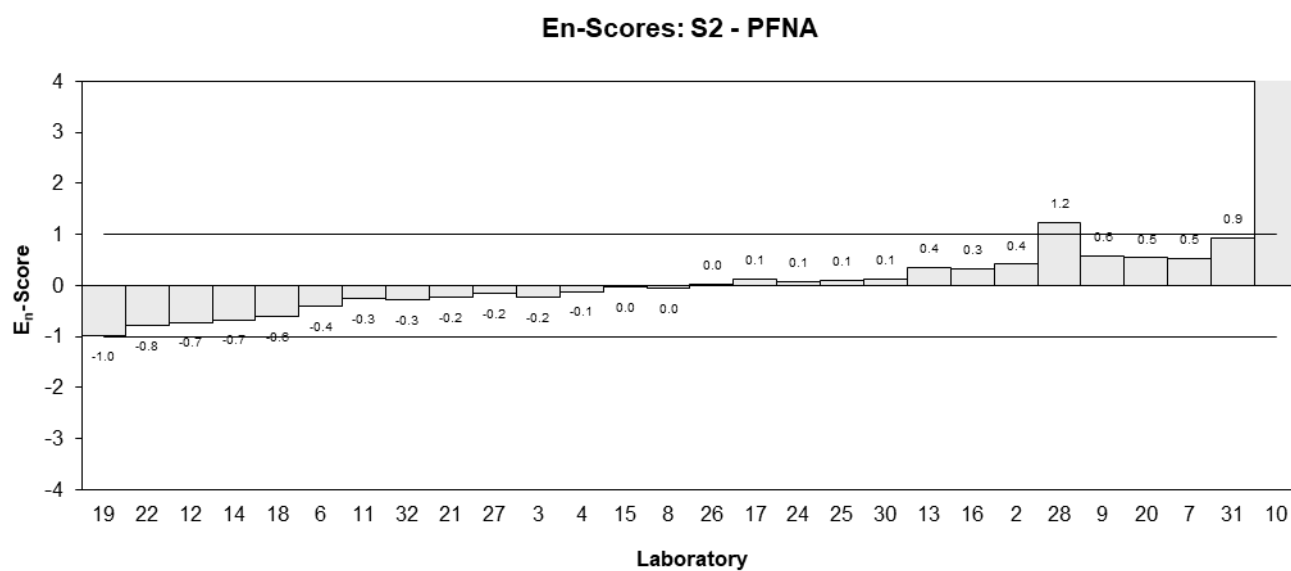
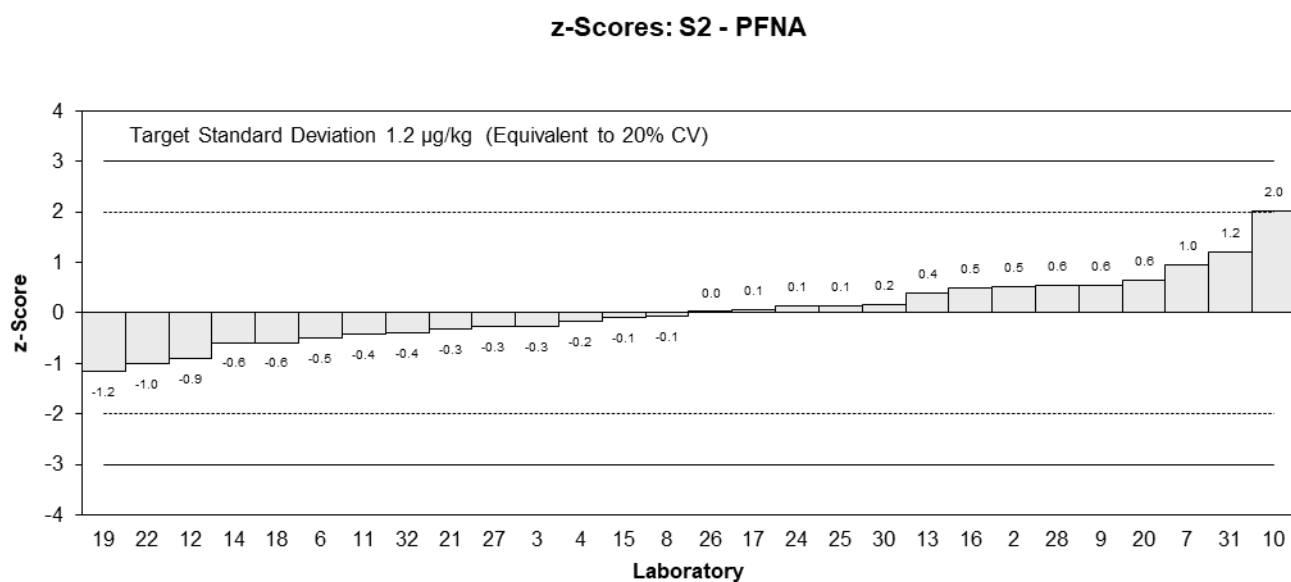
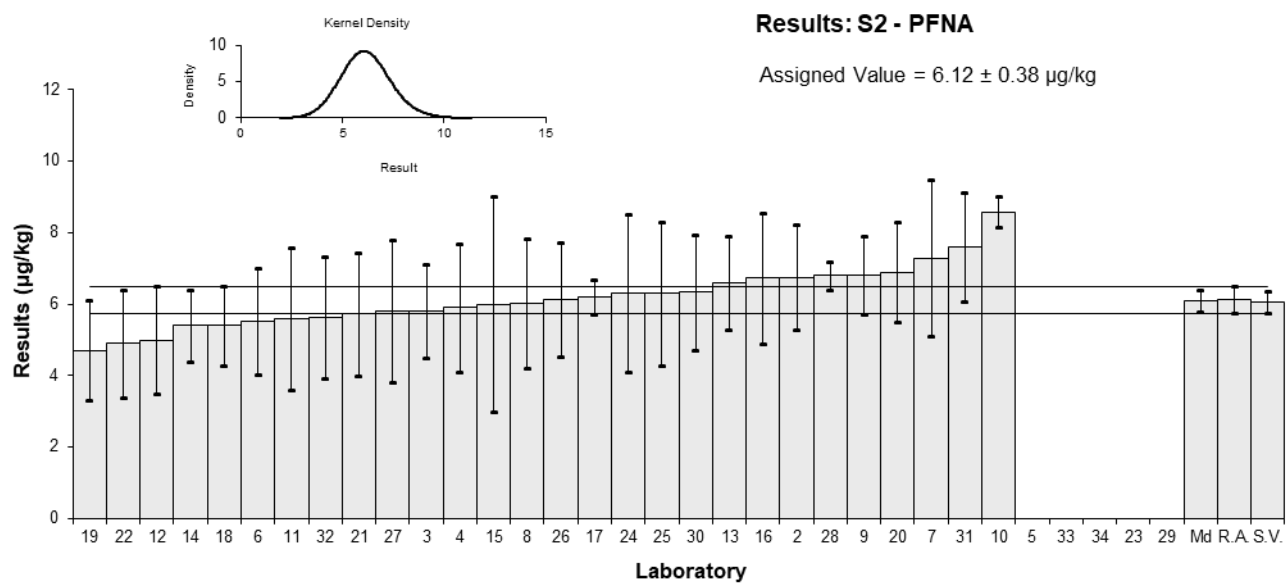


Figure 29

Table 33

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFDA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	21.1	4.26	94	0.30	0.27
3	19	4.2	NR	-0.23	-0.21
4	20	6.0	145	0.03	0.02
5	<0.197	NR	51		
6	18.103	4.888	>50	-0.45	-0.36
7	25.26	7.58	NR	1.35	0.70
8	19.55	5.864	78	-0.09	-0.06
9	22.2	4.8	103	0.58	0.47
10	22.16	0.49	85	0.57	2.03
11	19	4	66	-0.23	-0.22
12	18.1	5.4	110	-0.45	-0.33
13	21	4.2	98	0.28	0.25
14	18.4	3.47	138	-0.38	-0.42
15	20	10	65	0.03	0.01
16	20.668	3.764	94.8	0.19	0.20
17	20.4	4.69	67.26	0.13	0.10
18	23	4.7	NR	0.78	0.65
19	16.9	5.1	NR	-0.75	-0.58
20	15	3.2	87	-1.23	-1.46
21	16.5	4.95	89	-0.85	-0.67
22	18.7	5.2	96	-0.30	-0.23
23	NT	NT	NT		
24	20	3.2	84	0.03	0.03
25	20	6	106	0.03	0.02
26	22.2	4.4	113	0.58	0.51
27	19	6	99	-0.23	-0.15
28	22.6	1.5	98	0.68	1.50
29	NT	NT	NT		
30	20.1	5	67	0.05	0.04
31	18.98	3.8	100.8	-0.23	-0.23
32	20.2	6.06	103	0.08	0.05
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	19.9	1.0
Spike	19.9	1.0
Robust Average	19.9	1.0
Median	20.0	0.6
Mean	19.9	
N	28	
Max.	25.26	
Min.	15	
Robust SD	2.0	
Robust CV	10%	

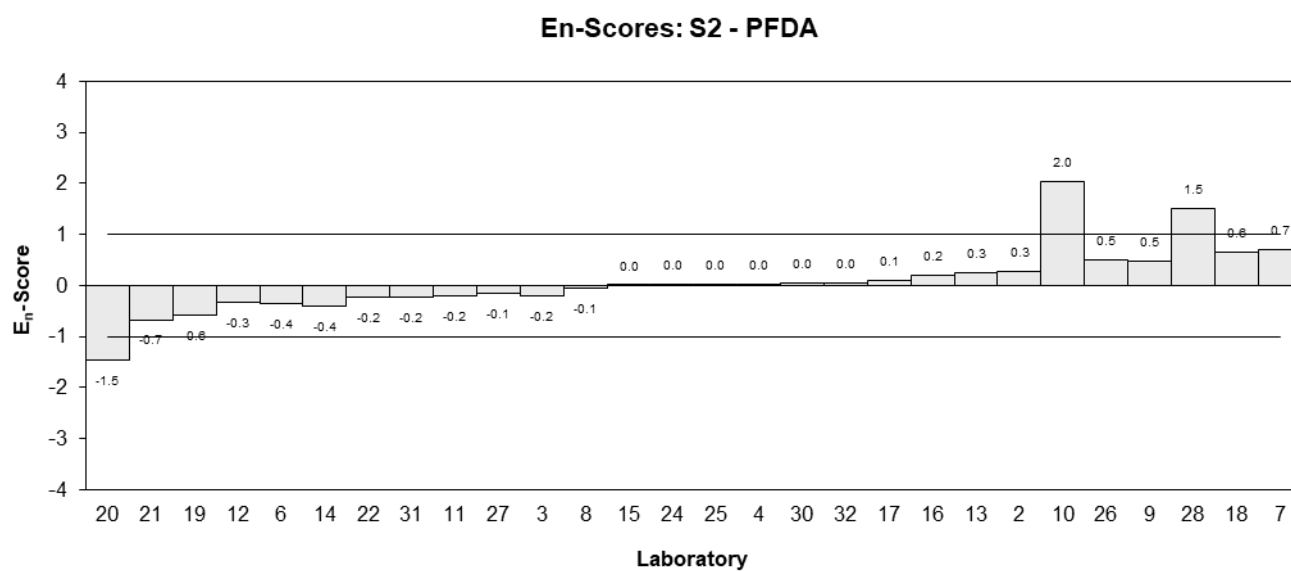
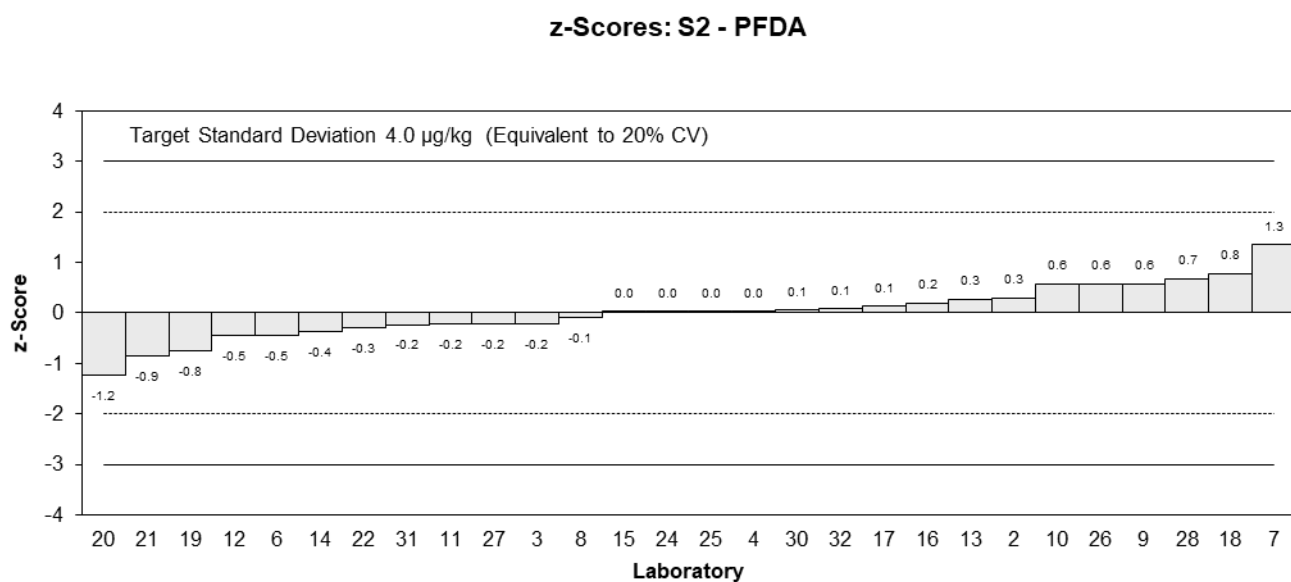
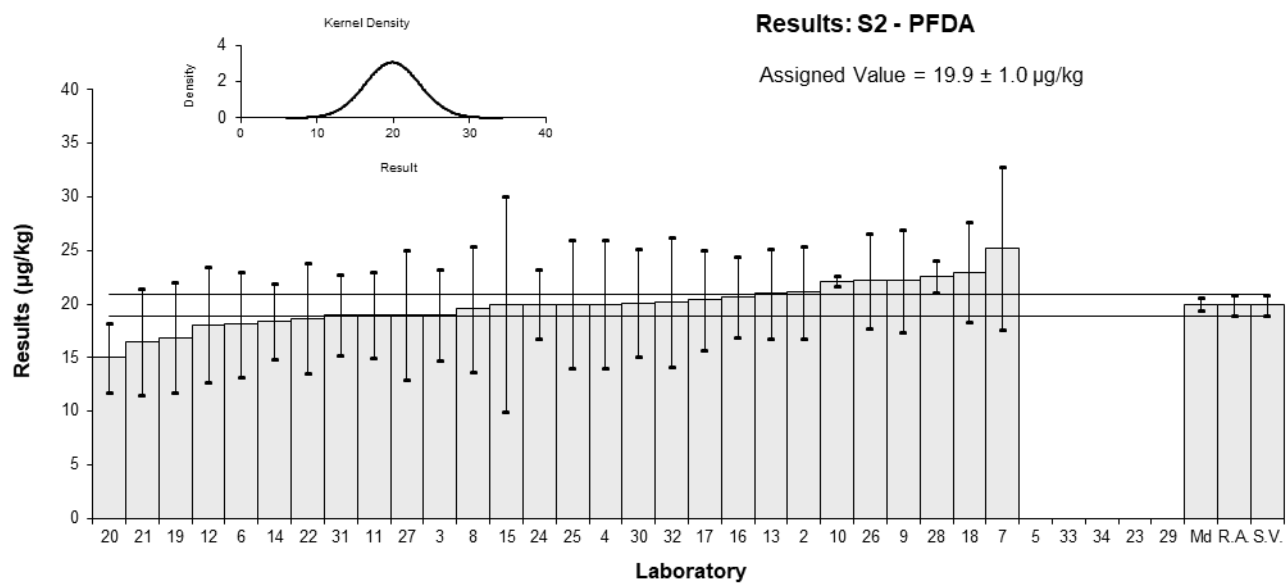


Figure 30

Table 34

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	PFOSA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	4.77	0.84	75	0.76	0.71
3	3.8	0.84	NR	-0.41	-0.38
4	4.2	1.3	76	0.07	0.05
5	1.17	0.31	50	-3.59	-7.00
6	4.691	1.267	>50	0.67	0.42
7	<5	1.50	NR		
8	4.13	1.238	66	-0.01	-0.01
9	4.2	1.0	84	0.07	0.06
10	4.56	0.53	72	0.51	0.70
11	NT	NT	NT		
12	4.15	1.2	106	0.01	0.01
13	4.0	0.80	101	-0.17	-0.16
14	3.5	0.65	118	-0.77	-0.90
15	< 10	5	49		
16	0.811	0.245	100	-4.02	-8.77
17	4.7	0.52	71.18	0.68	0.94
18	NT	NT	NT		
19	NR	NR	NR		
20	2.7	1.2	95	-1.74	-1.17
21	3.98	1.19	82	-0.19	-0.13
22	3.3	1	NR	-1.01	-0.81
23	NT	NT	NT		
24	4.4	0.53	100	0.31	0.43
25	4.8	2	107	0.80	0.33
26	3.83	1	103	-0.37	-0.30
27	4.2	2	100	0.07	0.03
28	4.8	0.5	120	0.80	1.14
29	2.2851	0.68553	NR	-2.24	-2.49
30	4.63	1.1	70	0.59	0.43
31	3.68	0.74	93.8	-0.56	-0.58
32	4.32	1.30	41.8	0.22	0.14
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	4.14	0.29
Spike	4.96	0.25
Robust Average	4.02	0.35
Median	4.15	0.29
Mean	3.82	
N	25	
Max.	4.8	
Min.	0.811	
Robust SD	0.70	
Robust CV	17%	

*Robust Average excluding laboratories 5 and 16.

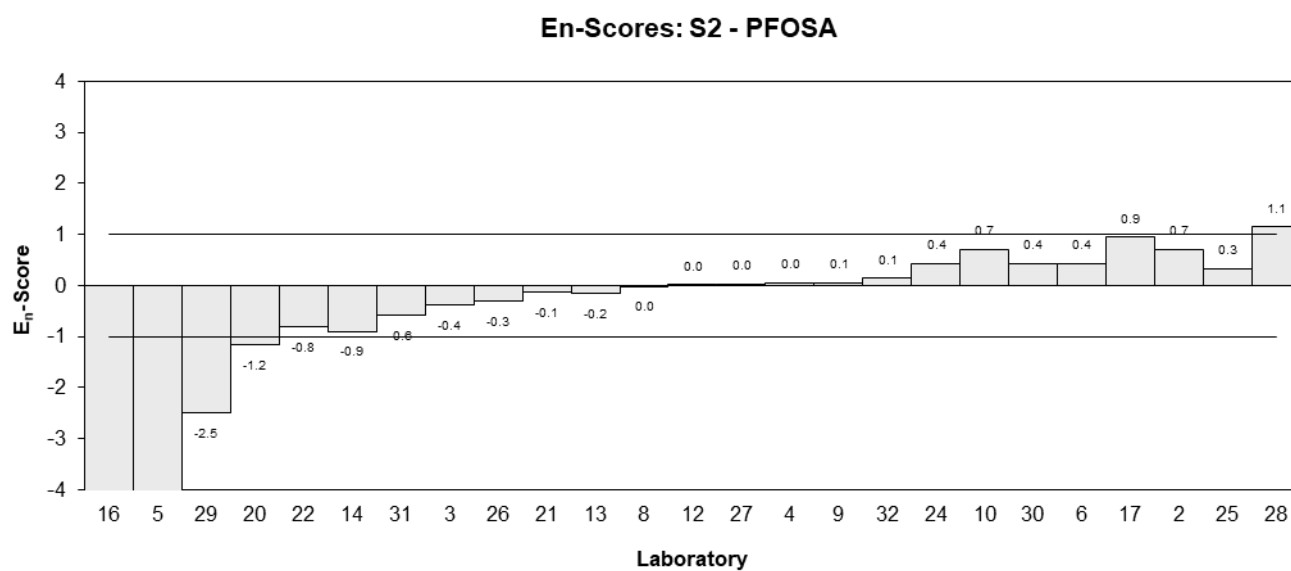
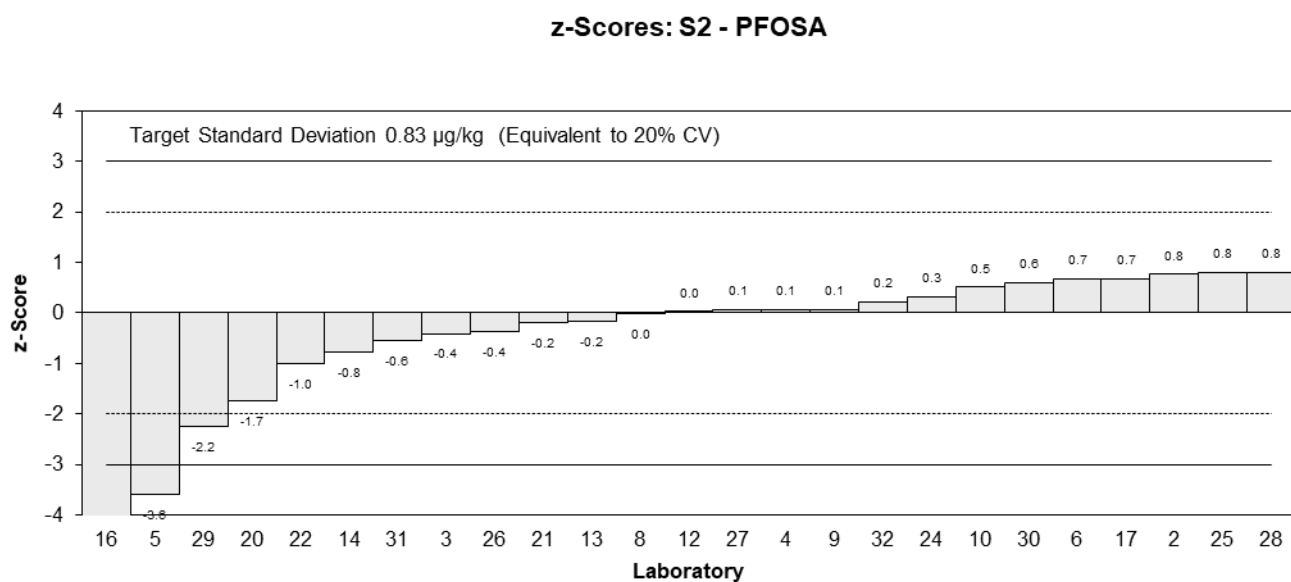
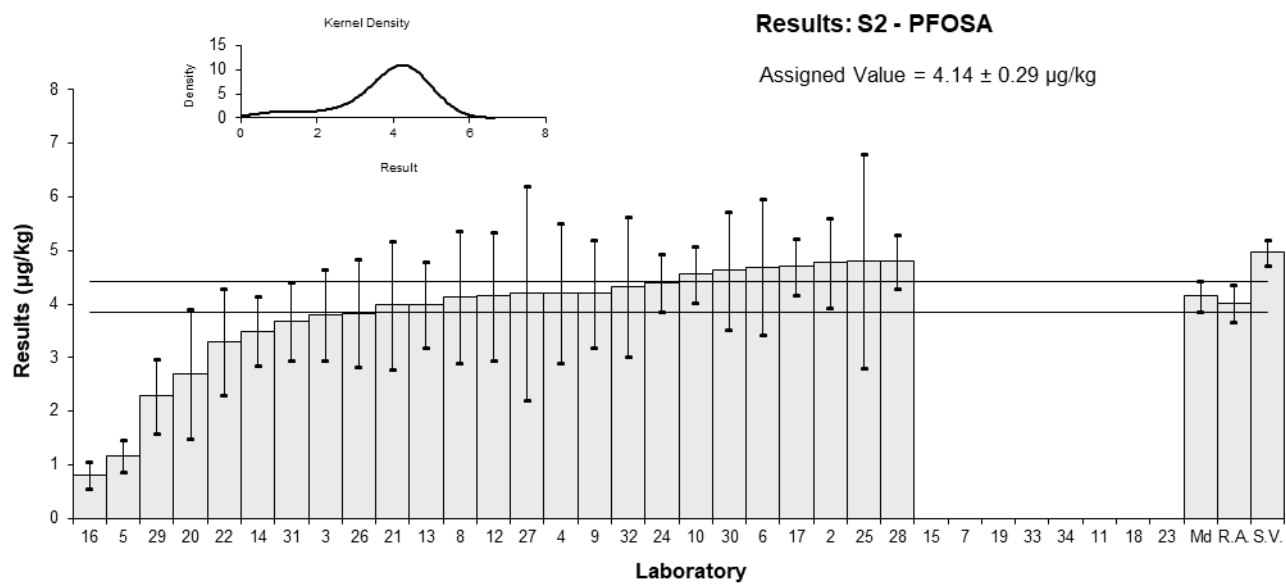


Figure 31

Table 35

Sample Details

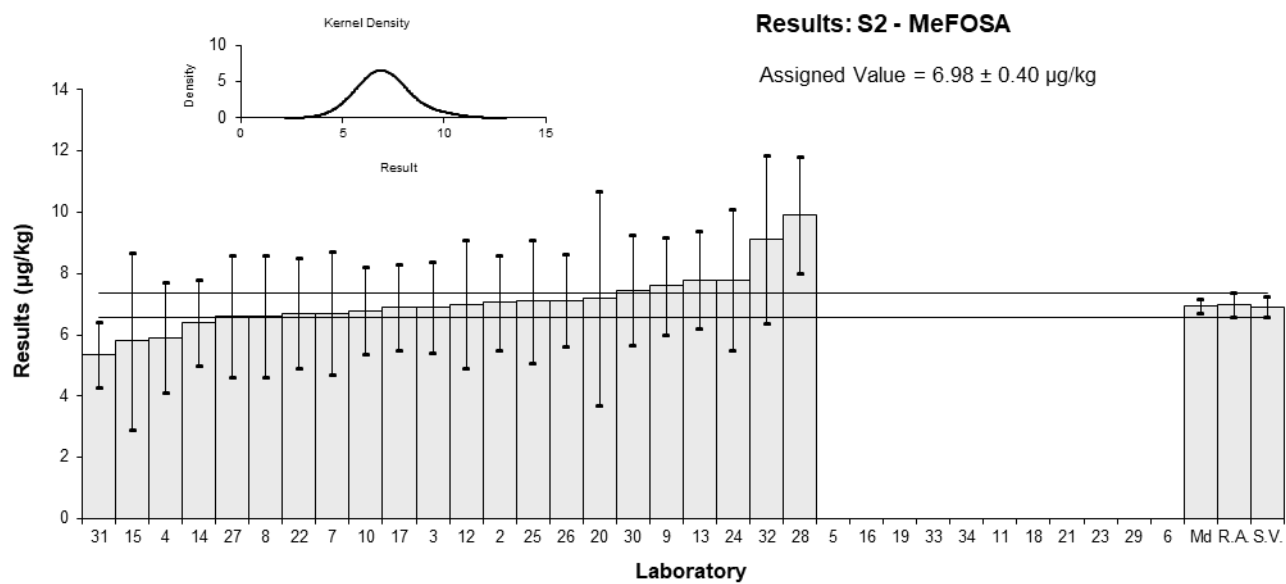
Sample No.	S2
Matrix.	Soil
Analyte.	MeFOSA
Units	µg/kg

Participant Results

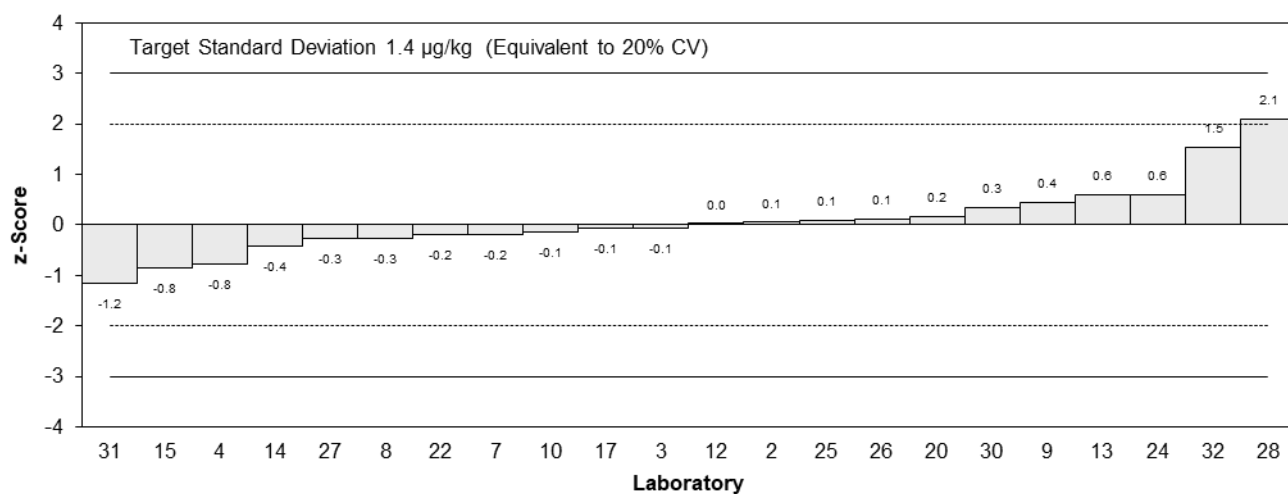
Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	7.05	1.56	89	0.05	0.04
3	6.9	1.5	NR	-0.06	-0.05
4	5.9	1.8	75	-0.77	-0.59
5	<0.197	NR	49		
6	NT	NT	NT		
7	6.71	2.01	NR	-0.19	-0.13
8	6.60	1.981	69	-0.27	-0.19
9	7.6	1.6	91	0.44	0.38
10	6.78	1.42	77	-0.14	-0.14
11	NT	NT	NT		
12	7	2.1	103	0.01	0.01
13	7.8	1.6	95	0.59	0.50
14	6.4	1.4	99	-0.42	-0.40
15	5.8	2.9	32	-0.85	-0.40
16	NR	NR	NR		
17	6.9	1.39	39.36	-0.06	-0.06
18	NT	NT	NT		
19	NR	NR	NR		
20	7.2	3.5	88	0.16	0.06
21	NT	NT	NT		
22	6.7	1.8	96	-0.20	-0.15
23	NT	NT	NT		
24	7.8	2.3	84	0.59	0.35
25	7.1	2	110	0.09	0.06
26	7.13	1.49	98	0.11	0.10
27	6.6	2	87	-0.27	-0.19
28	9.9	1.9	87	2.09	1.50
29	NT	NT	NT		
30	7.45	1.8	68	0.34	0.25
31	5.37	1.07	99.1	-1.15	-1.41
32	9.13	2.74	1070	1.54	0.78
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	6.98	0.40
Spike	6.92	0.35
Robust Average	6.98	0.40
Median	6.95	0.23
Mean	7.08	
N	22	
Max.	9.9	
Min.	5.37	
Robust SD	0.74	
Robust CV	11%	



z-Scores: S2 - MeFOSA



En-Scores: S2 - MeFOSA

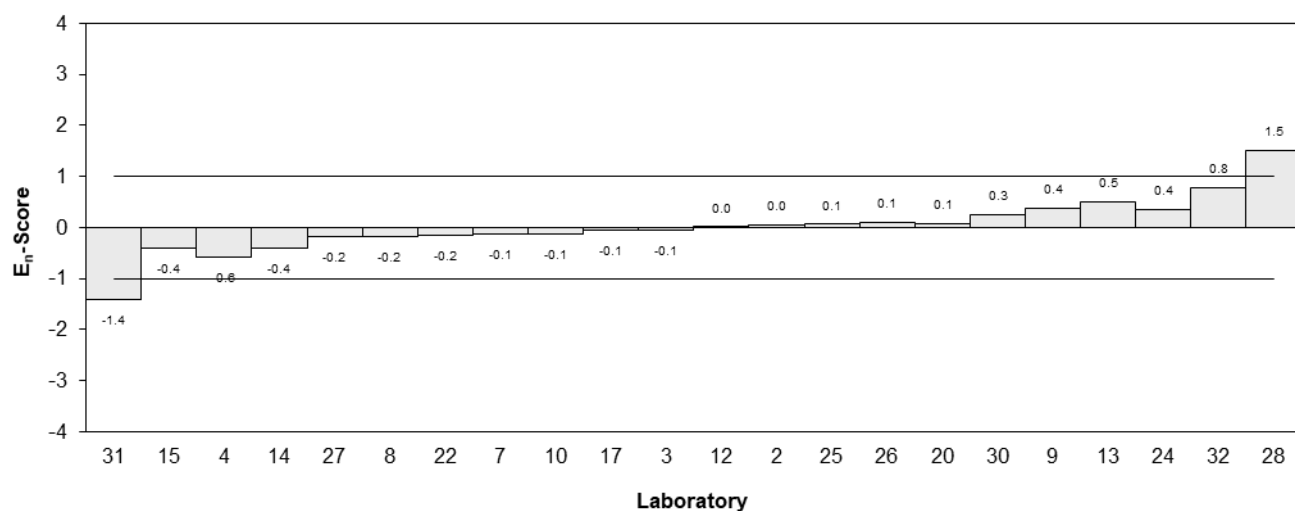


Figure 32

Table 36

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	EtFOSA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	10.5	1.83	87	0.35	0.36
3	9.6	2.1	NR	-0.11	-0.10
4	9.2	2.8	53	-0.32	-0.22
5	<0.197	NR	47		
6	NT	NT	NT		
7	10.16	3.05	NR	0.17	0.11
8	10.35	3.106	63	0.27	0.17
9	9.5	2.0	104	-0.16	-0.16
10	12.27	1.19	52	1.25	1.95
11	NT	NT	NT		
12	10	3	99	0.09	0.06
13	10	2.00	102	0.09	0.09
14	9	2.34	105	-0.42	-0.35
15	9.9	20	25	0.04	0.00
16	NR	NR	NR		
17	9.3	1.52	25.54	-0.26	-0.33
18	NT	NT	NT		
19	NR	NR	NR		
20	7.1	1.8	88	-1.38	-1.47
21	NT	NT	NT		
22	10.1	2.8	46	0.14	0.10
23	NT	NT	NT		
24	9.8	2.1	82	-0.01	-0.01
25	9.9	3	110	0.04	0.03
26	9.3	3	104	-0.26	-0.17
27	9.4	3	84	-0.21	-0.14
28	11	2	105	0.60	0.58
29	NT	NT	NT		
30	6.71	1.6	65	-1.58	-1.88
31	9.81	1.96	77.2	-0.01	0.00
32	11.2	3.36	1090	0.70	0.41
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	9.82	0.41
Spike	10.0	0.5
Robust Average	9.82	0.41
Median	9.86	0.31
Mean	9.73	
N	22	
Max.	12.27	
Min.	6.71	
Robust SD	0.76	
Robust CV	7.7%	

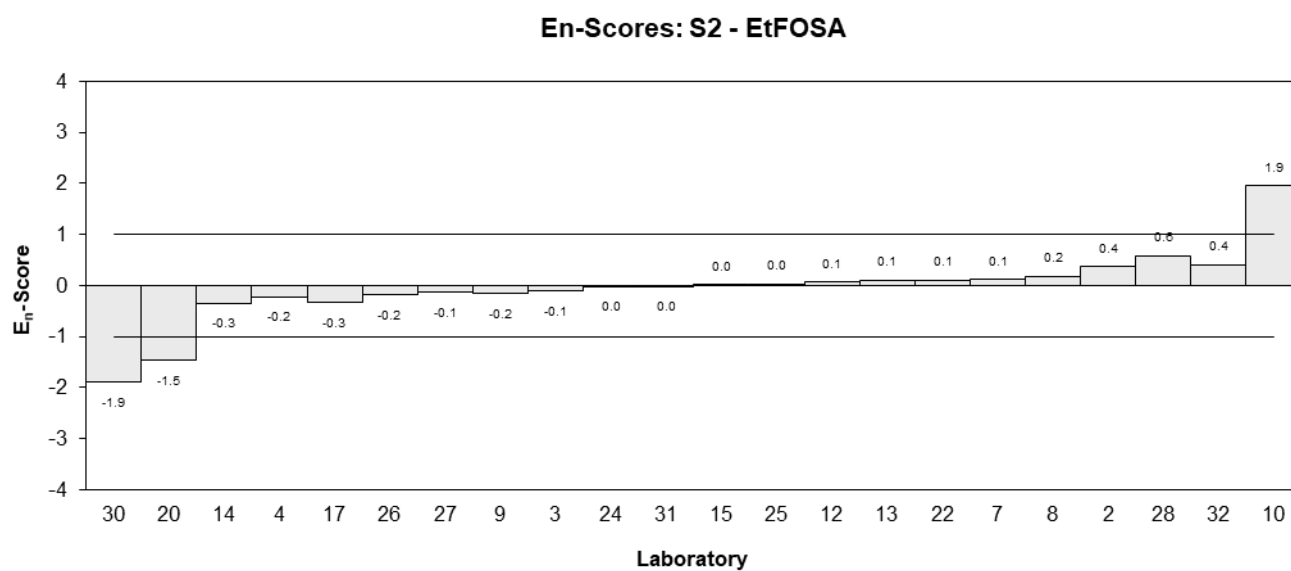
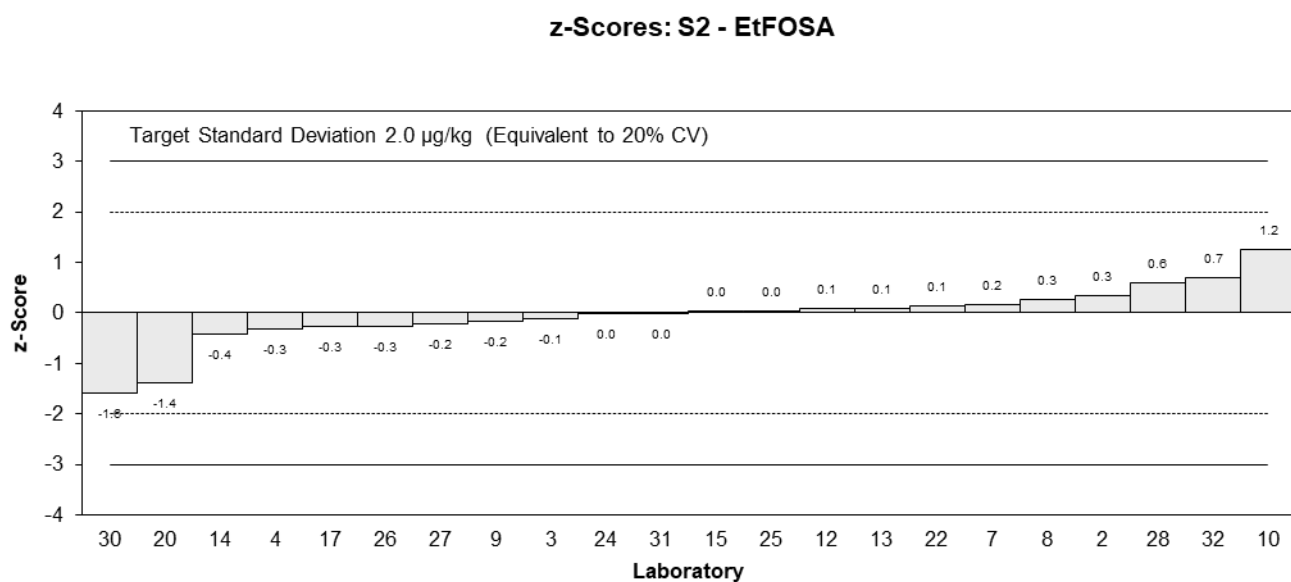
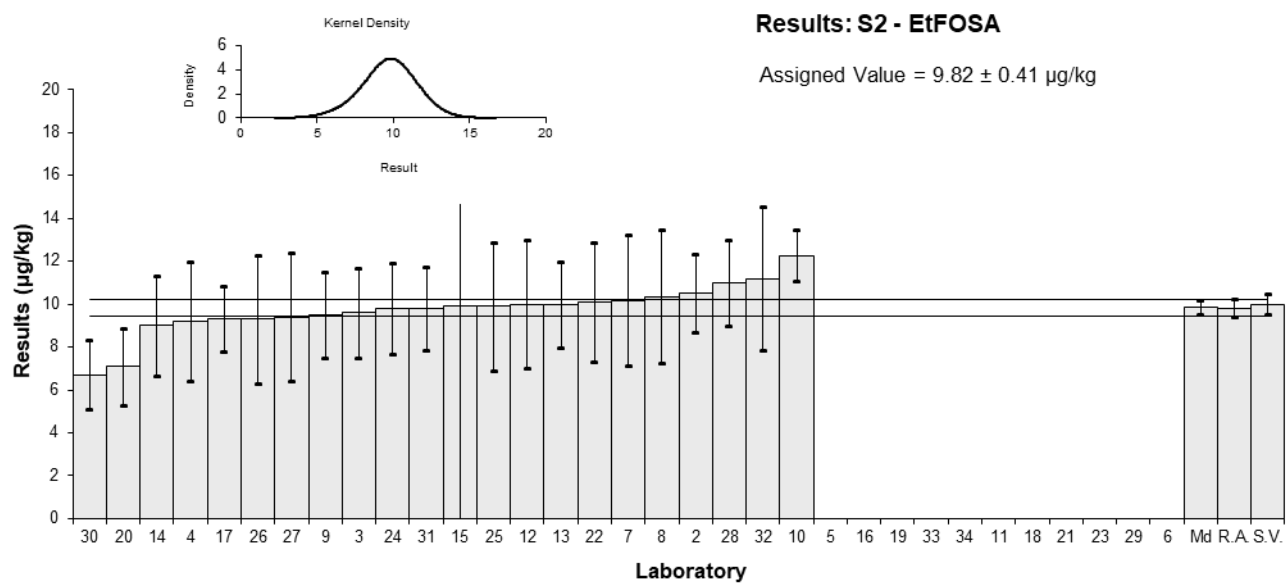


Figure 33

Table 37

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	MeFOSAA
Units	µg/kg

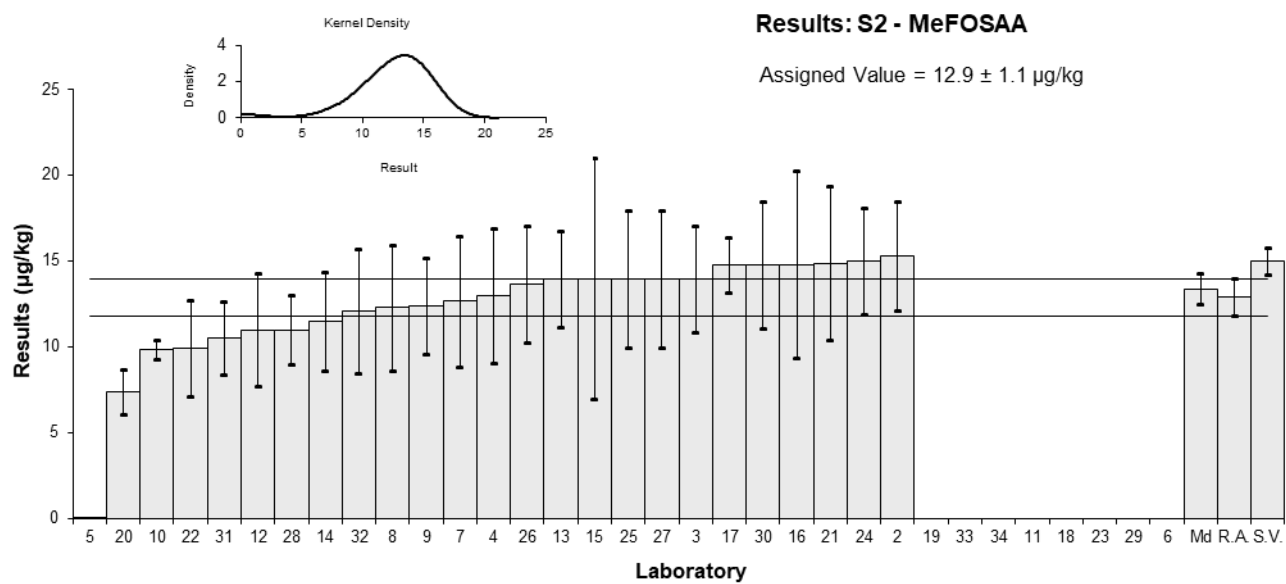
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	15.3	3.16	69	0.93	0.72
3	14	3.1	NR	0.43	0.33
4	13	3.9	47	0.04	0.02
5	0.0255	NR	31	-4.99	-11.70
6	NT	NT	NT		
7	12.68	3.80	NR	-0.09	-0.06
8	12.29	3.686	77	-0.24	-0.16
9	12.4	2.8	103	-0.19	-0.17
10	9.85	0.59	NR	-1.18	-2.44
11	NT	NT	NT		
12	11	3.3	97	-0.74	-0.55
13	14	2.8	92	0.43	0.37
14	11.5	2.87	166	-0.54	-0.46
15	14	7	NR	0.43	0.16
16	14.824	5.426	95.7	0.75	0.35
17	14.8	1.63	62.46	0.74	0.97
18	NT	NT	NT		
19	NR	NR	NR		
20	7.4	1.3	88	-2.13	-3.23
21	14.9	4.47	80	0.78	0.43
22	9.9	2.8	100	-1.16	-1.00
23	NT	NT	NT		
24	15	3.1	117	0.81	0.64
25	14	4	115	0.43	0.27
26	13.7	3.4	102	0.31	0.22
27	14	4	126	0.43	0.27
28	11	2	99	-0.74	-0.83
29	NT	NT	NT		
30	14.8	3.7	71	0.74	0.49
31	10.53	2.11	81.1	-0.92	-1.00
32	12.1	3.63	31.4	-0.31	-0.21
33	NT	NT	NT		
34	NT	NT	NT		

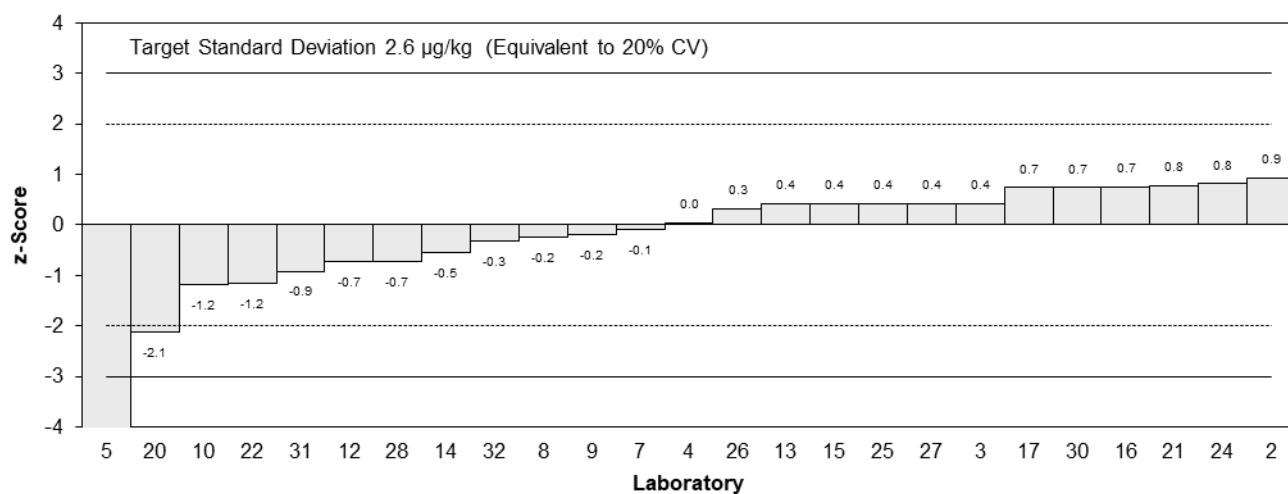
Statistics*

Assigned Value	12.9	1.1
Spike	15.0	0.8
Robust Average	12.9	1.1
Median	13.4	0.9
Mean	12.8	
N	24	
Max.	15.3	
Min.	7.4	
Robust SD	2.1	
Robust CV	16%	

*Laboratory 5 excluded from statistical calculation (gross error).



z-Scores: S2 - MeFOSAA



En-Scores: S2 - MeFOSAA

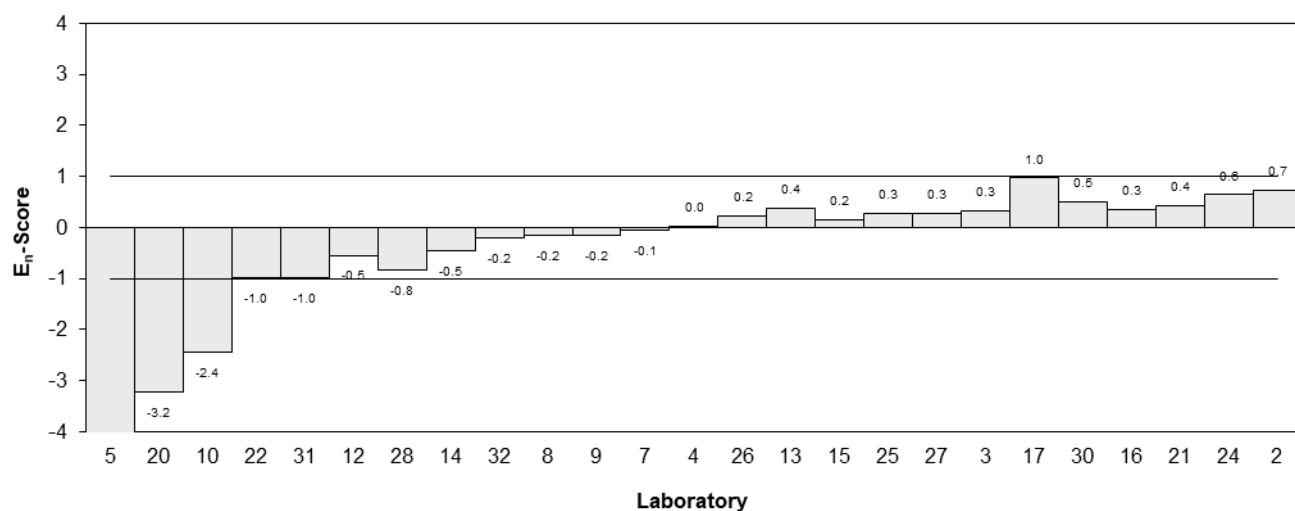


Figure 34

Table 38

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	MeFOSE
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	7.73	1.64	97	0.01	0.01
3	7.9	1.7	NR	0.12	0.11
4	7.0	2.1	39	-0.46	-0.33
5	<0.197	NR	39		
6	NT	NT	NT		
7	9.62	2.89	NR	1.24	0.65
8	8.71	2.613	54	0.65	0.37
9	7.1	1.8	107	-0.40	-0.32
10	6.68	0.18	52	-0.67	-1.75
11	NT	NT	NT		
12	5.46	1.6	87	-1.46	-1.33
13	7.7	1.5	91	-0.01	-0.01
14	7.4	1.96	106	-0.20	-0.15
15	7.1	7.6	45	-0.40	-0.08
16	NR	NR	NR		
17	7.5	1.37	58.14	-0.14	-0.14
18	NT	NT	NT		
19	NT	NT	NT		
20	5.0	1.0	88	-1.76	-2.36
21	NT	NT	NT		
22	<1	NR	NR		
23	NT	NT	NT		
24	8.3	1.7	115	0.38	0.33
25	8.9	3	104	0.77	0.39
26	7.71	1.6	112	0.00	0.00
27	7.4	3	129	-0.20	-0.10
28	9.0	1.1	101	0.84	1.05
29	NT	NT	NT		
30	7.07	1.7	105	-0.42	-0.36
31	8.07	1.61	106	0.23	0.21
32	9.08	2.72	70.1	0.89	0.49
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	7.71	0.56
Spike	8.08	0.40
Robust Average	7.71	0.56
Median	7.70	0.40
Mean	7.64	
N	21	
Max.	9.62	
Min.	5	
Robust SD	1.0	
Robust CV	13%	

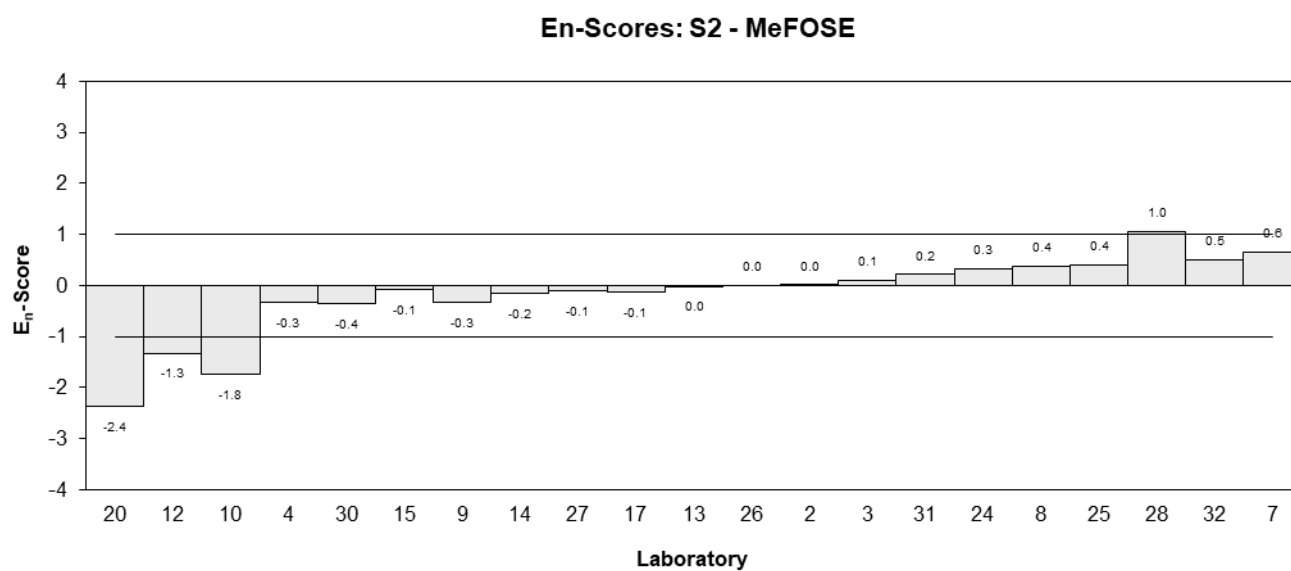
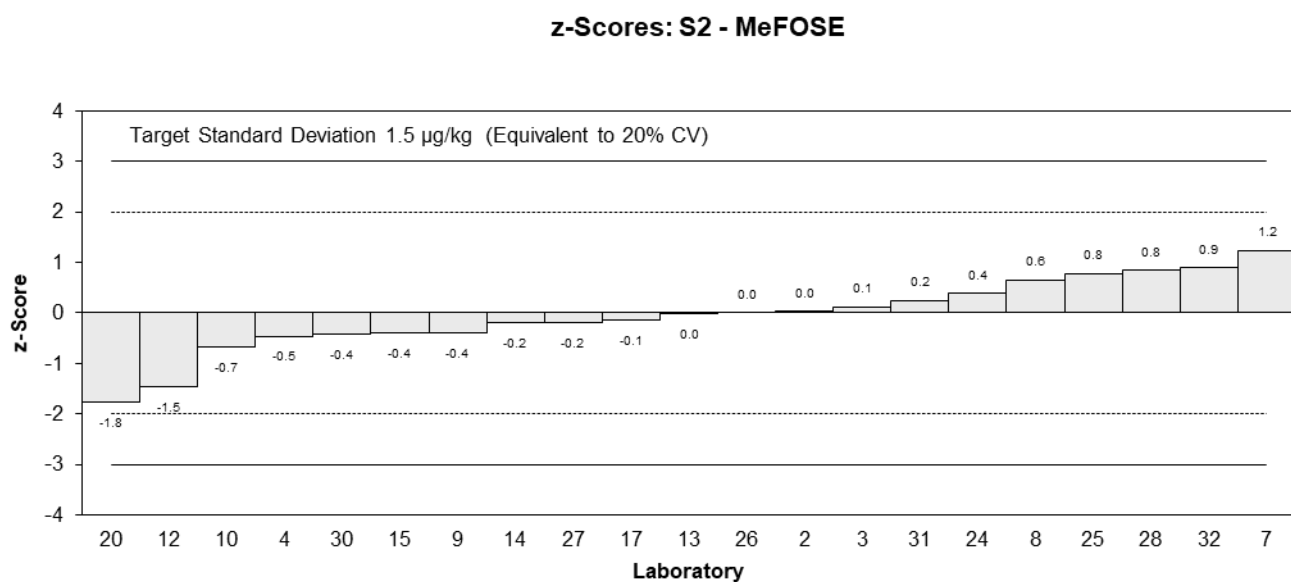
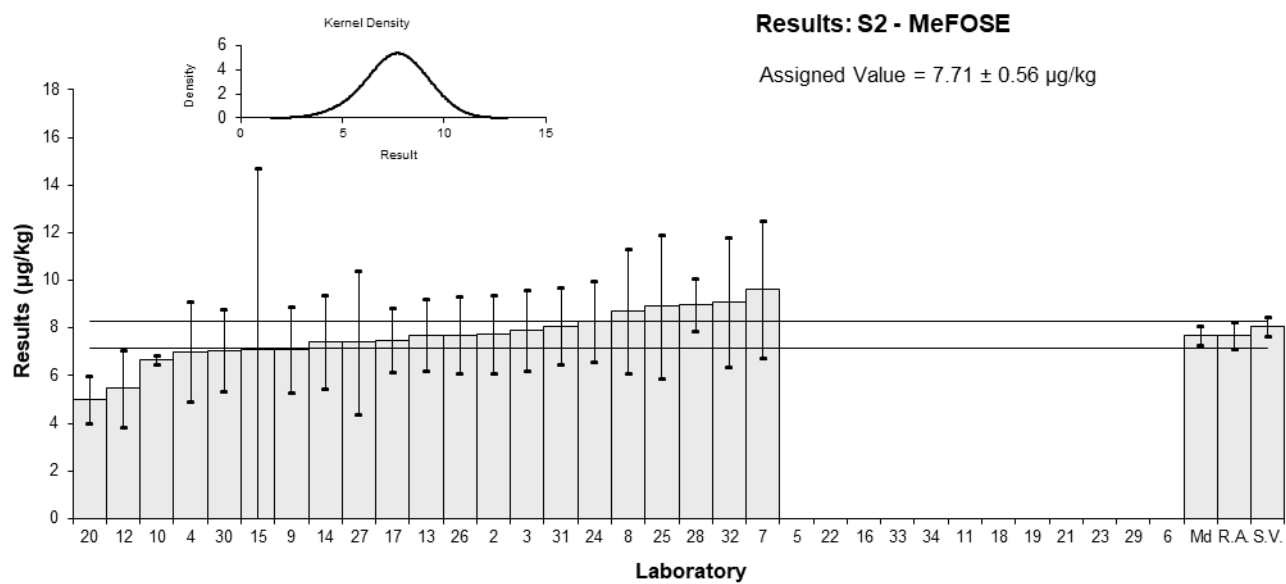


Figure 35

Table 39

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	8:2 FTS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	9.40	1.90	173	0.21	0.19
3	9.3	2.0	NR	0.16	0.13
4	7.5	2.3	141	-0.84	-0.64
5	<0.197	NR	44		
6	7.824	2.112	>50	-0.66	-0.54
7	13.47	4.04	NR	2.47	1.09
8	9.16	2.747	109	0.08	0.05
9	10.4	2.3	137	0.76	0.58
10	14.05	0.67	78	2.79	5.35
11	9.0	2.1	67	-0.01	-0.01
12	9.11	2.7	82	0.05	0.03
13	9.7	1.9	87	0.38	0.34
14	9	1.99	482	-0.01	-0.01
15	10	5	64	0.54	0.19
16	7.891	3.169	NR	-0.63	-0.35
17	8.1	1.50	82.56	-0.51	-0.56
18	7.1	1.4	NR	-1.06	-1.24
19	NR	NR	NR		
20	7.5	1.3	95	-0.84	-1.04
21	8.76	2.63	84	-0.14	-0.10
22	12.7	3.3	101	2.04	1.09
23	NT	NT	NT		
24	6.2	1.1	184	-1.56	-2.20
25	9.6	3	119	0.32	0.19
26	9.7	2.5	196	0.38	0.26
27	9.3	3	132	0.16	0.09
28	9.4	0.8	137	0.21	0.37
29	5.582	1.6746	34.86	-1.91	-1.91
30	11.2	2.8	69	1.21	0.76
31	9.23	1.85	100.2	0.12	0.11
32	9.52	2.86	200	0.28	0.17
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value*	9.02	0.66
Spike	9.58	0.48
Robust Average	9.13	0.70
Median	9.27	0.36
Mean	9.27	
N	28	
Max.	14.05	
Min.	5.582	
Robust SD	1.5	
Robust CV	16%	

*Robust Average excluding Laboratory 10.

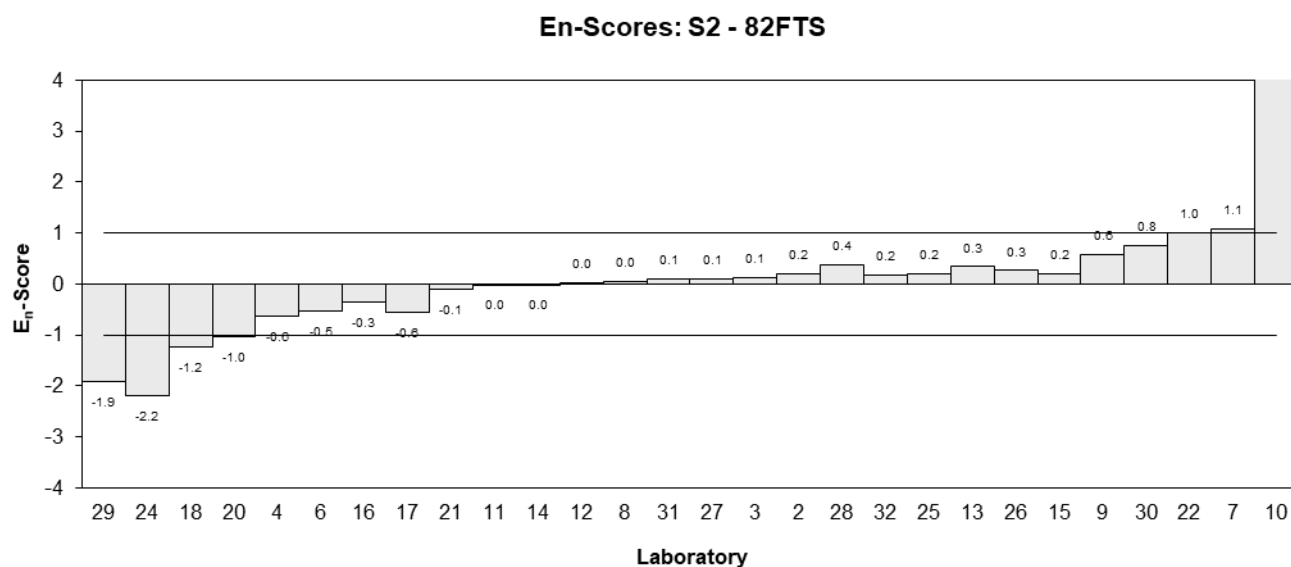
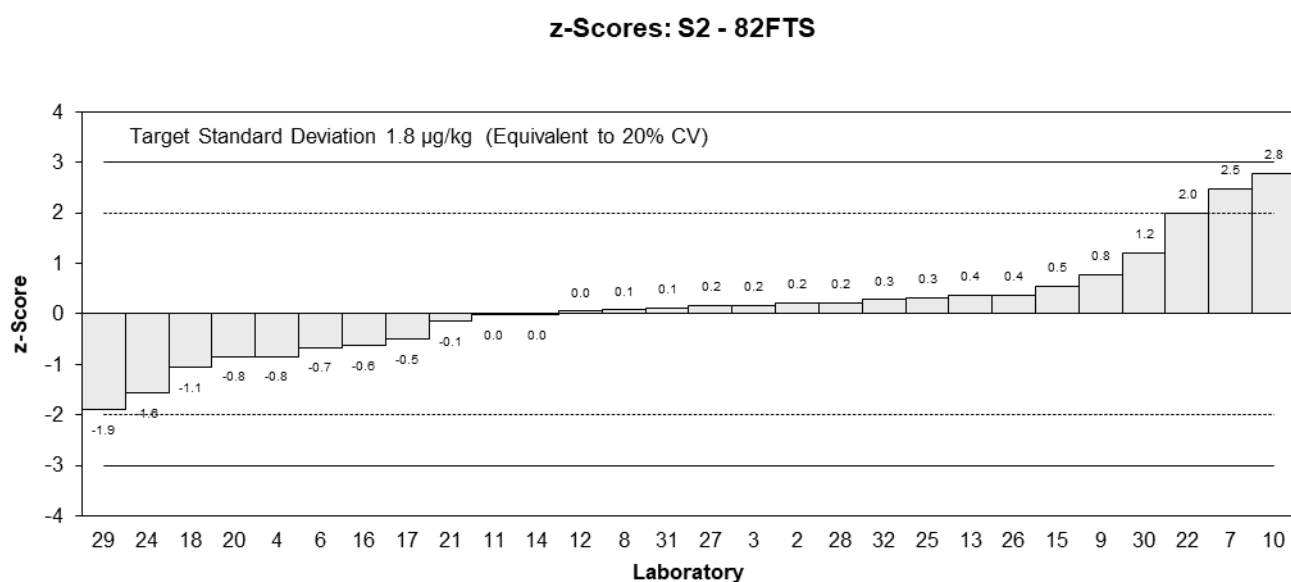
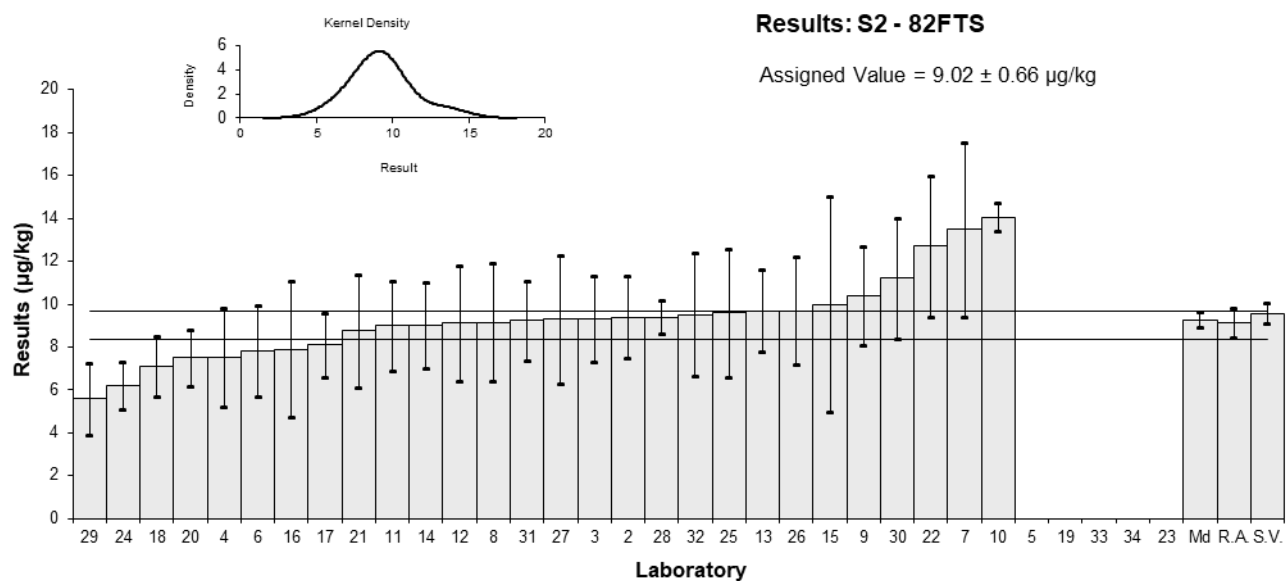


Figure 36

Table 40

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	GenX
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	7.8	1.7	NR	0.26	0.21
4	5.4	1.6	106	-1.36	-1.17
5	<0.197	NR	57		
6	7.782	2.101	>50	0.25	0.17
7	NT	NT	NT		
8	7.70	2.311	70	0.20	0.12
9	NT	NT	NT		
10	7.91	1.20	NR	0.34	0.37
11	NT	NT	NT		
12	2.61	0.8	84	-3.24	-4.69
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	7.470	2.374	81	0.04	0.02
17	6.6	0.85	85.04	-0.55	-0.76
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	7.63	2.29	77	0.15	0.09
22	89	2.8	94	55.05	28.41
23	NT	NT	NT		
24	8.3	0.85	75	0.60	0.84
25	8	3	113	0.40	0.19
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	6.17	1.5	74	-0.84	-0.76
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics*

Assigned Value**	7.41	0.64
Spike	15.0	0.8
Robust Average	7.21	0.79
Median	7.67	0.27
Mean	6.95	
N	12	
Max.	8.3	
Min.	2.61	
Robust SD	1.1	
Robust CV	15%	

*Laboratory 22 excluded from statistical calculation (gross error).

**Robust Average excluding laboratory 12.

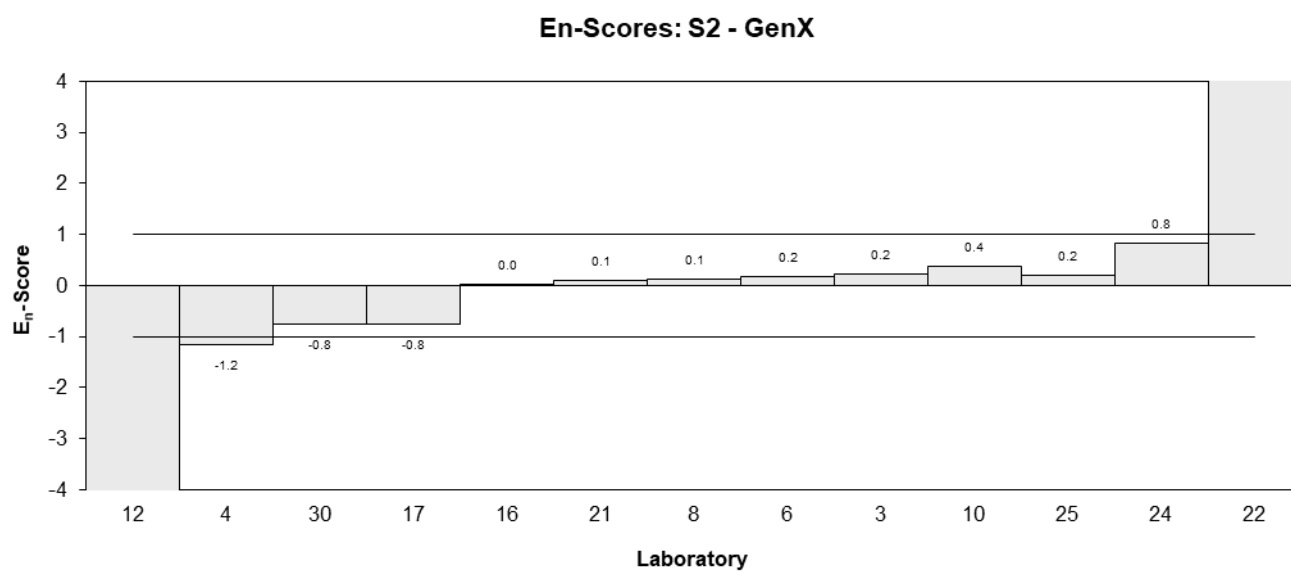
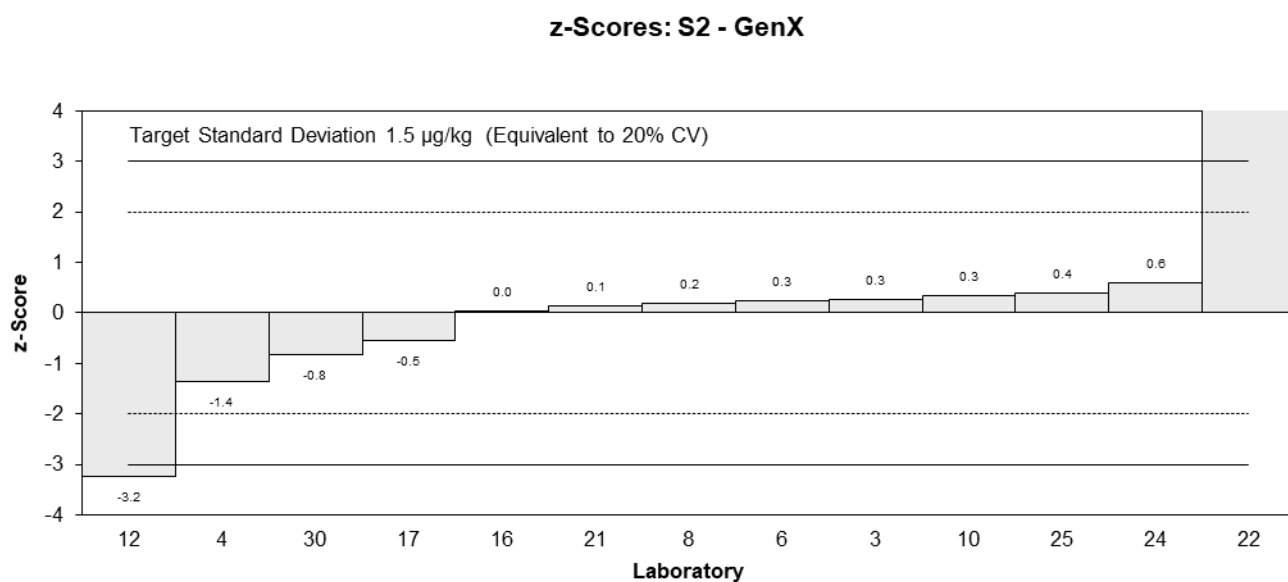
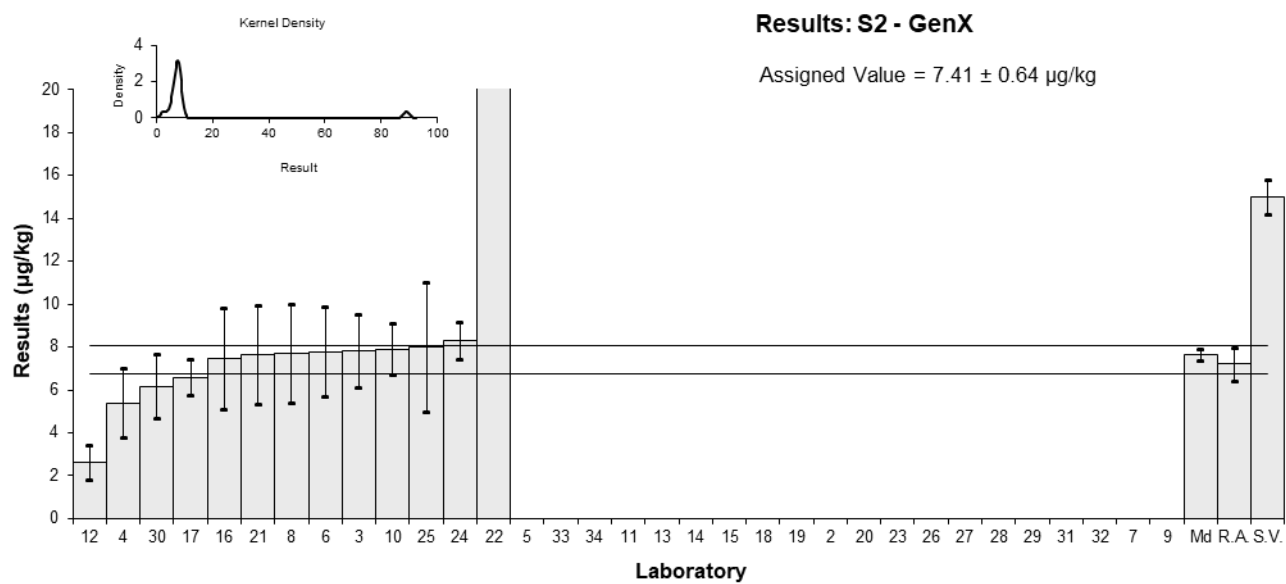


Figure 37

Table 41

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	ADONA
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	NT	NT	NT		
4	32	9.6	NR	-1.20	-0.85
5	<0.197	NR	43		
6	31.96	8.63	>50	-1.20	-0.92
7	NT	NT	NT		
8	46.97	14.092	75	0.58	0.31
9	NT	NT	NT		
10	24.44	2.38	NR	-2.10	-2.42
11	NT	NT	NT		
12	50	15	NR	0.94	0.48
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	42.425	12.610	NR	0.04	0.02
17	42.0	2.46	85.04	-0.01	-0.01
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	43.9	13.2	72	0.21	0.12
22	48.6	13.1	NR	0.77	0.44
23	NT	NT	NT		
24	NR	NR	NR		
25	53	20	102	1.29	0.52
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	43.4	10	79	0.15	0.11
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	42.1	6.9
Spike	47.1	2.4
Robust Average	42.1	6.9
Median	43.4	5.2
Mean	41.7	
N	11	
Max.	53	
Min.	24.44	
Robust SD	9.1	
Robust CV	22%	

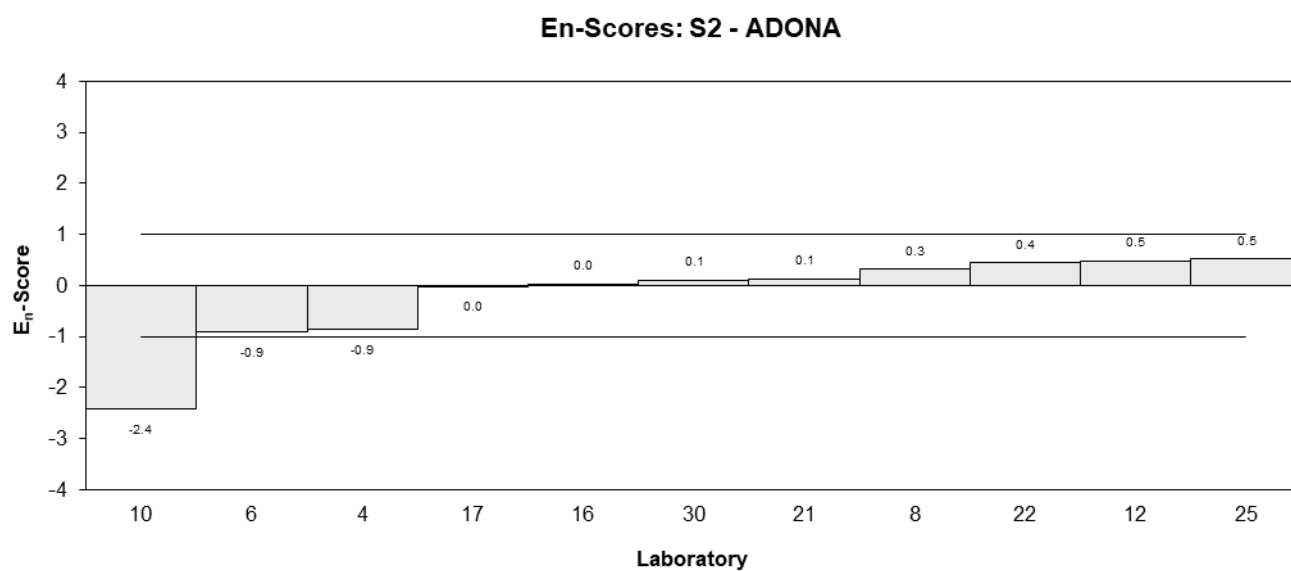
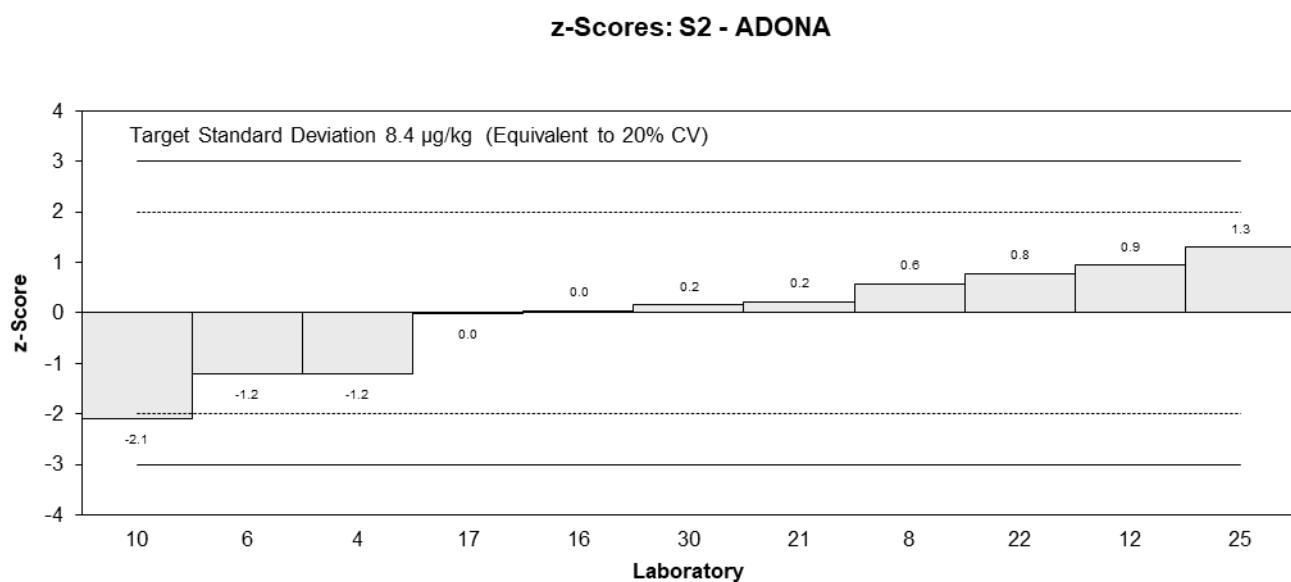
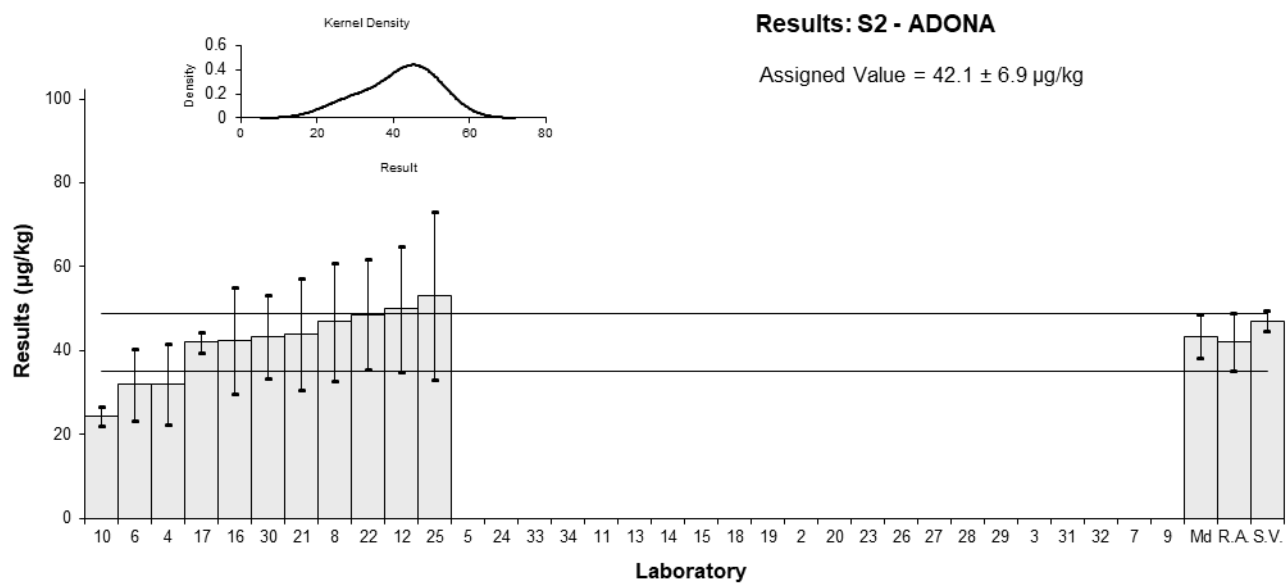


Figure 38

Table 42

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	9CI-PF3ONS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	NT	NT	NT		
4	48	15	NR	1.96	0.87
5	<0.197	NR	43		
6	31.775	8.579	>50	-0.39	-0.29
7	NT	NT	NT		
8	31.12	9.337	78	-0.49	-0.33
9	NT	NT	NT		
10	NT	NT	NT		
11	NT	NT	NT		
12	36	10.8	NR	0.22	0.13
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	30.119	9.579	NR	-0.63	-0.42
17	31.5	2.58	84.24	-0.43	-0.62
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	30.8	9.24	72	-0.54	-0.37
22	NT	NT	NT		
23	NT	NT	NT		
24	38	4.8	104	0.51	0.55
25	39	10	109	0.65	0.42
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	34.5	4.1
Spike	37.3	1.9
Robust Average	34.5	4.1
Median	31.8	1.9
Mean	35.1	
N	9	
Max.	48	
Min.	30.119	
Robust SD	4.9	
Robust CV	14%	

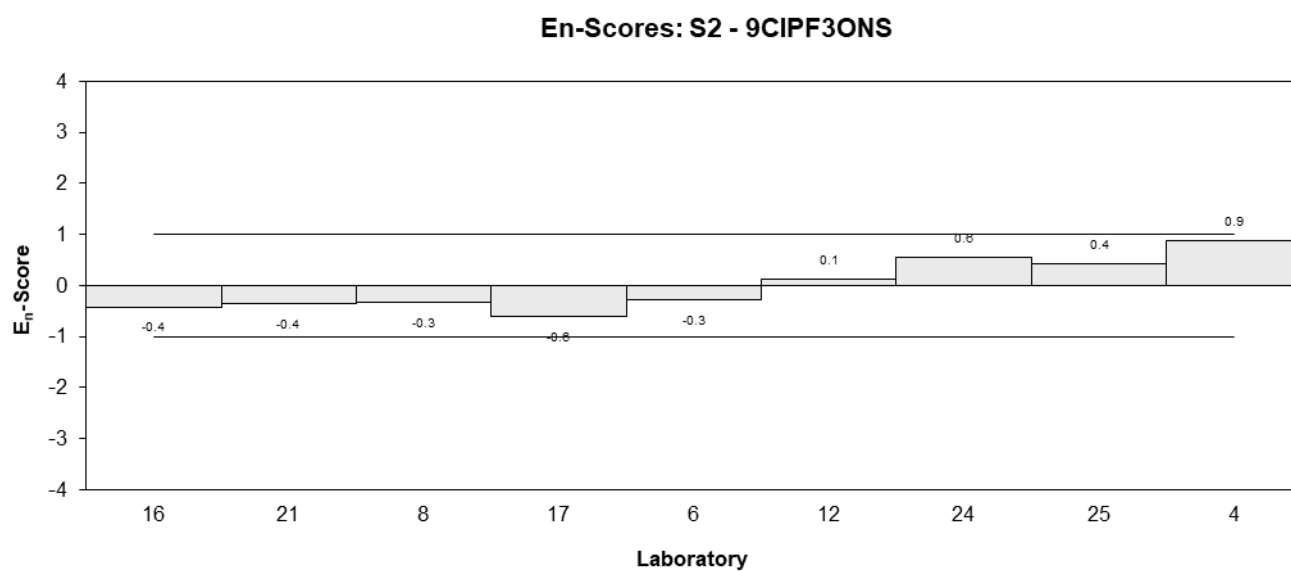
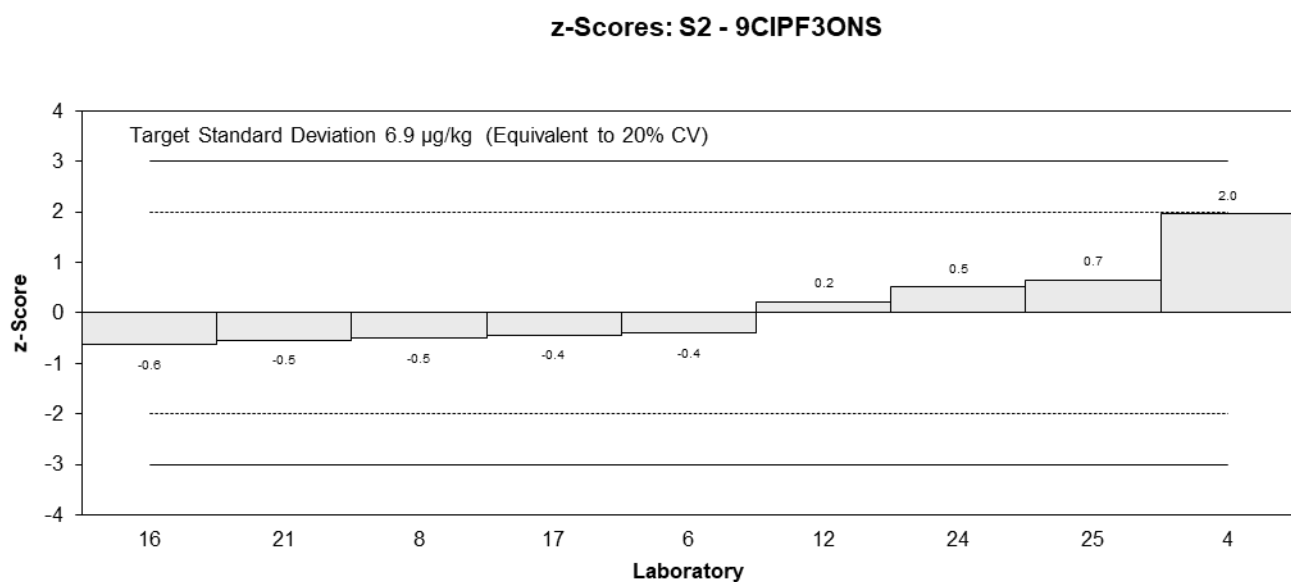
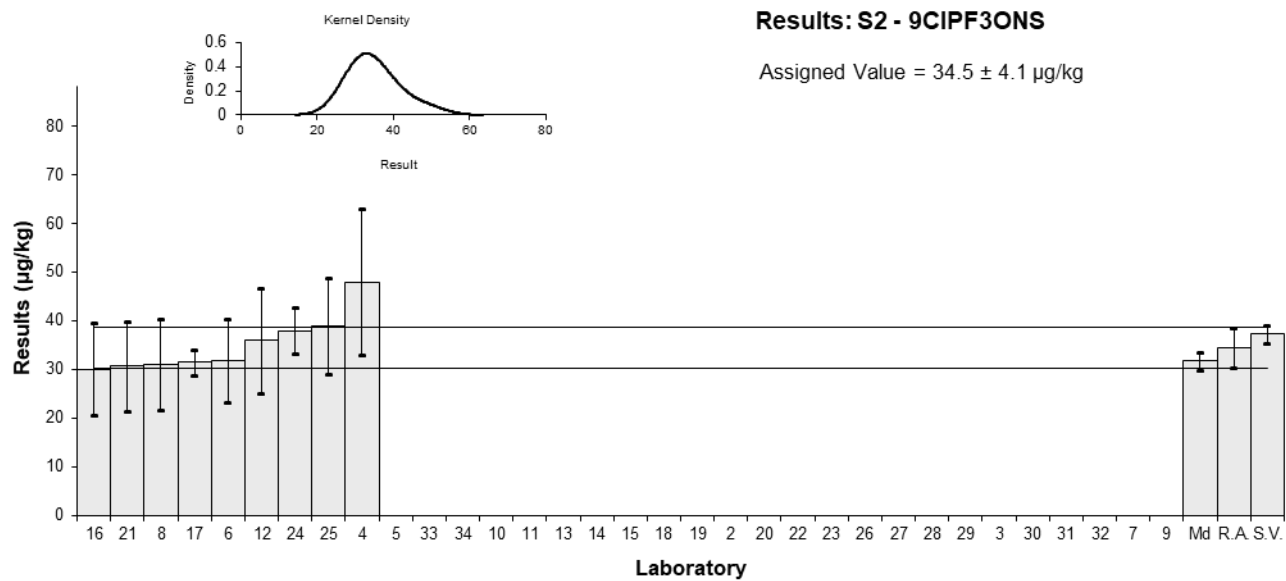


Figure 39

Table 43

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	11Cl-PF3OUdS
Units	µg/kg

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	NT	NT	NT		
4	47	14	NR	1.95	0.84
5	<0.197	NR	43		
6	34.143	9.219	>50	0.05	0.03
7	NT	NT	NT		
8	28.23	8.470	93	-0.82	-0.50
9	NT	NT	NT		
10	NT	NT	NT		
11	NT	NT	NT		
12	32	9.6	NR	-0.27	-0.15
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	28.207	11.764	NR	-0.83	-0.41
17	22.3	0.98	84.24	-1.70	-1.58
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	31.9	9.57	72	-0.28	-0.16
22	NT	NT	NT		
23	NT	NT	NT		
24	39	5.9	127	0.77	0.56
25	42	10	109	1.21	0.67
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NT	NT	NT		

Statistics

Assigned Value	33.8	7.2
Spike	58.1	2.9
Robust Average	33.8	7.2
Median	32.0	4.3
Mean	33.9	
N	9	
Max.	47	
Min.	22.3	
Robust SD	8.6	
Robust CV	26%	

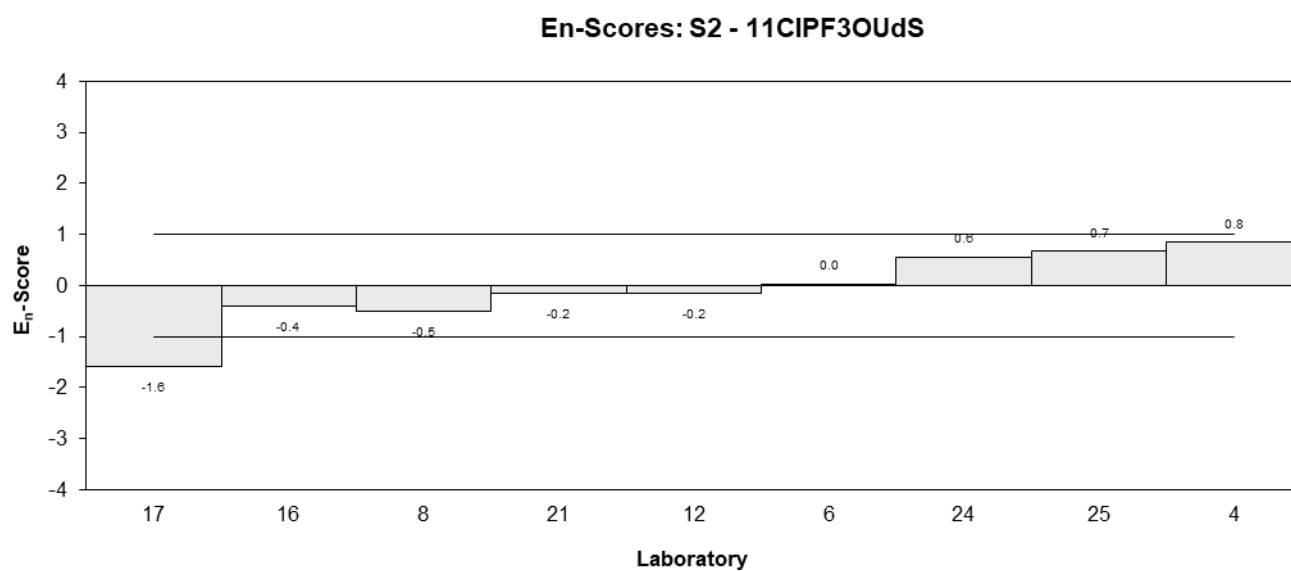
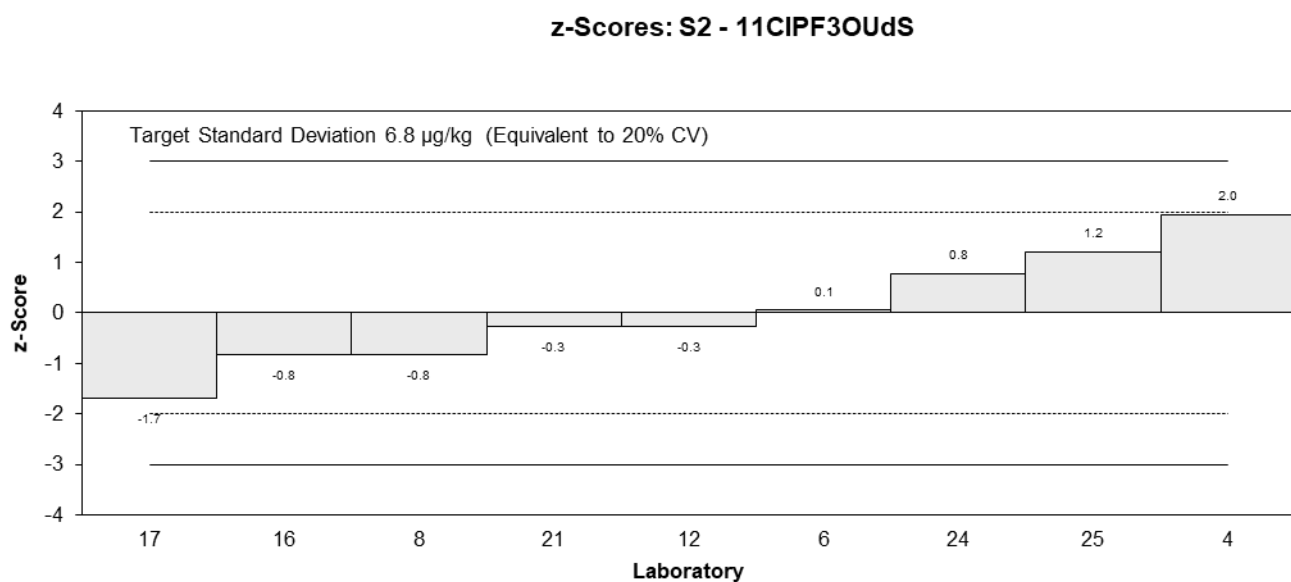
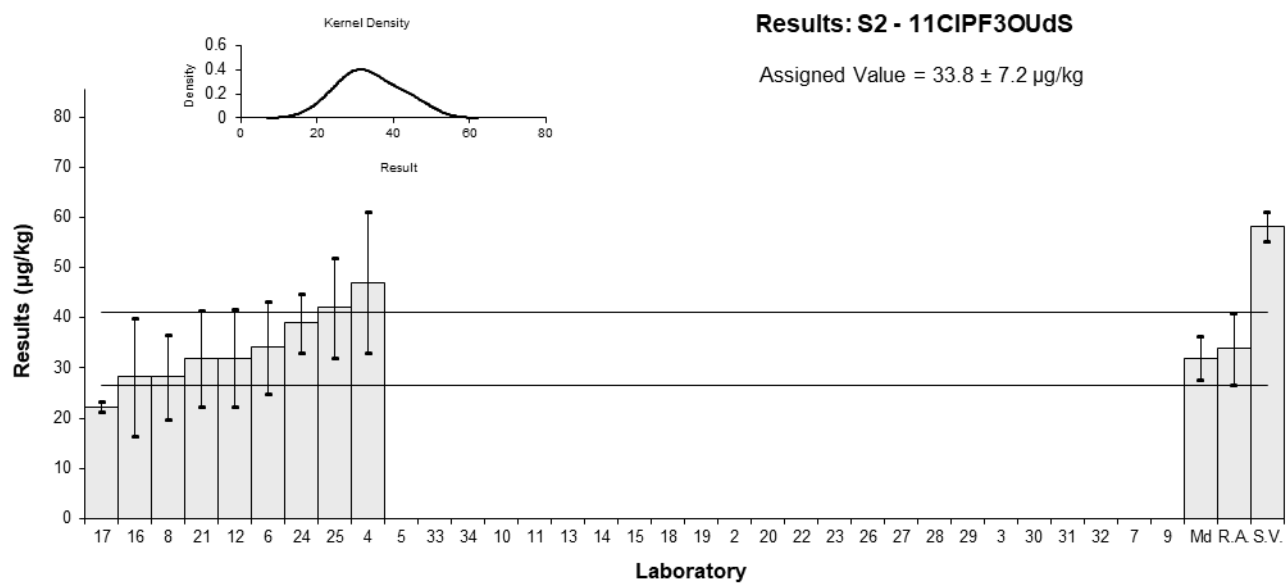


Figure 40

Table 44

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFBS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.325	0.051	82	0.05	0.06
3	0.31	0.08	83	-0.19	-0.15
4	0.29	0.09	112	-0.50	-0.35
5	0.315	0.098	95	-0.11	-0.07
6	0.326	0.088	80-100	0.06	0.04
7	0.290	0.087	NR	-0.50	-0.36
8	0.311	0.0933	111	-0.17	-0.12
9	0.38	0.07	62	0.90	0.80
10	0.506	0.099	104	2.86	1.83
11	0.27	0.07	142	-0.81	-0.72
12	0.321	0.096	86	-0.02	-0.01
13	0.31	0.062	96	-0.19	-0.19
14	0.33	0.07	88	0.12	0.11
15	0.33	0.17	104	0.12	0.05
16	0.302	0.072	88.4	-0.31	-0.27
17	0.3	0.002	124.3	-0.34	-1.21
18	0.34	0.07	NR	0.28	0.25
19	0.43	0.13	NR	1.68	0.82
20	0.28	0.03	109	-0.65	-1.20
21	0.3	0.09	112	-0.34	-0.24
22	0.67	0.21	111	5.40	1.65
23	0.37	0.03	NR	0.75	1.37
24	0.30	0.037	97	-0.34	-0.53
25	0.32	0.1	107	-0.03	-0.02
26	0.366	0.096	102	0.68	0.45
27	0.32	0.1	99	-0.03	-0.02
28	0.37	0.08	104	0.75	0.59
29	0.4244	0.12732	80	1.59	0.80
30	0.301	0.075	85	-0.33	-0.27
31	0.27	0.05	111.2	-0.81	-0.98
32	0.276	0.0828	83.7	-0.71	-0.54
33	NT	NT	NT		
34	0.486	0.073	108	2.55	2.18

Statistics

Assigned Value*	0.322	0.018
Spike	Not Spiked	
Robust Average	0.329	0.021
Median	0.320	0.011
Mean	0.345	
N	32	
Max.	0.67	
Min.	0.27	
Robust SD	0.047	
Robust CV	14%	

*Robust Average excluding laboratories 10 and 22.

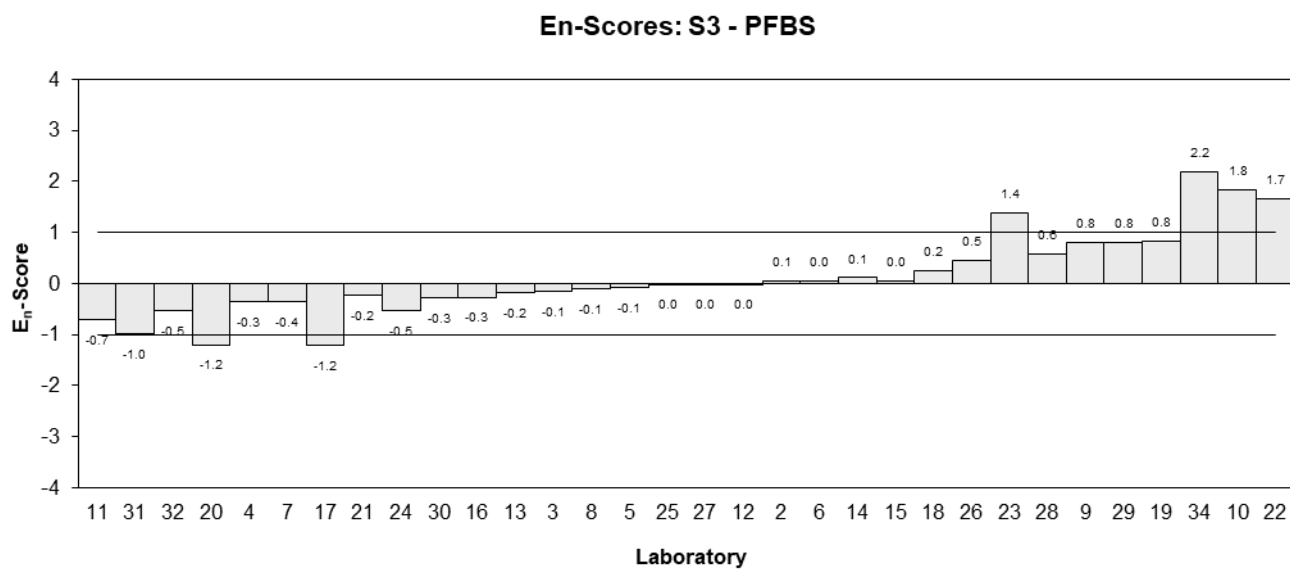
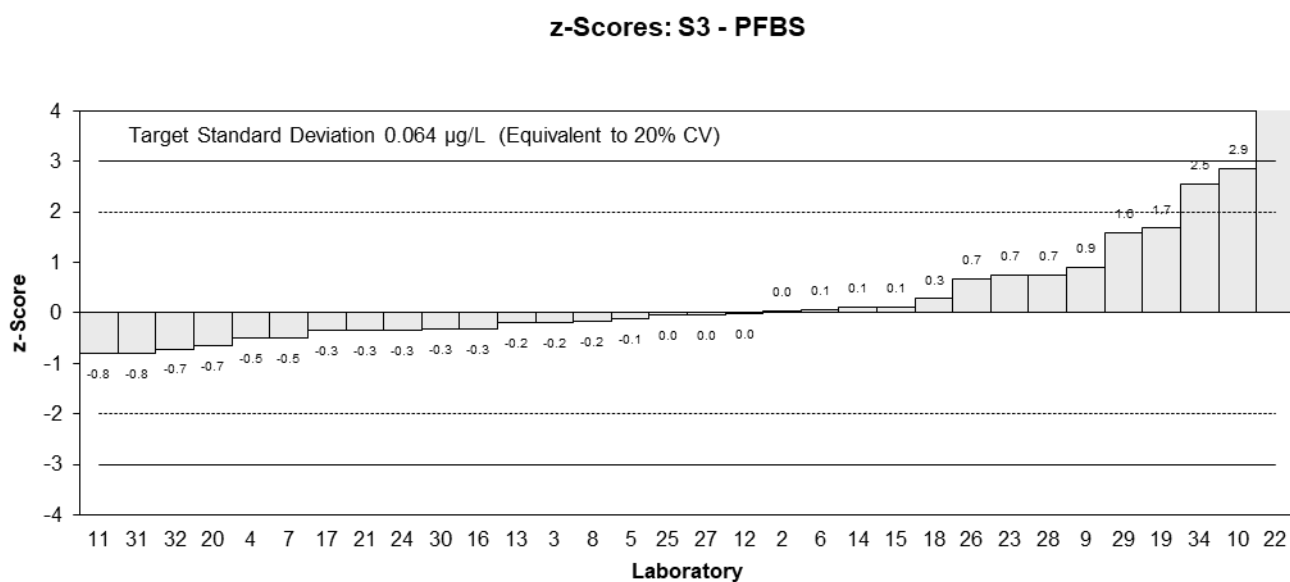
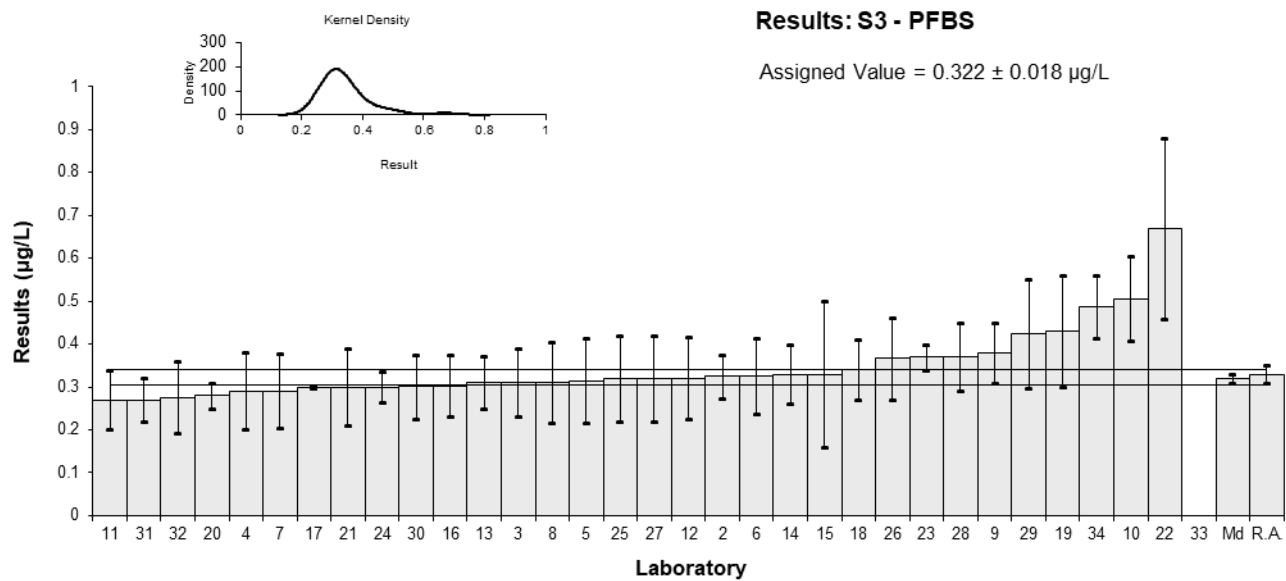


Figure 41

Table 45

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFPeS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.405	0.066	NR	0.40	0.42
3	0.41	0.11	NR	0.47	0.31
4	0.30	0.09	NR	-1.00	-0.79
5	0.315	0.08	95	-0.80	-0.71
6	0.331	0.089	80-100	-0.59	-0.47
7	0.407	0.122	NR	0.43	0.26
8	0.368	0.1105	89	-0.09	-0.06
9	0.47	0.09	53	1.27	1.00
10	0.386	0.015	NR	0.15	0.34
11	NT	NT	NT		
12	0.369	0.110	NR	-0.08	-0.05
13	0.31	0.062	96	-0.87	-0.95
14	0.32	0.09	78	-0.73	-0.58
15	0.35	0.18	NR	-0.33	-0.14
16	0.308	0.091	NR	-0.89	-0.70
17	0.4	0.03	102.2	0.33	0.60
18	NT	NT	NT		
19	0.50	0.15	NR	1.67	0.82
20	0.34	0.04	106	-0.47	-0.71
21	0.342	0.1026	98	-0.44	-0.31
22	0.58	0.17	NR	2.73	1.19
23	0.34	0.03	NR	-0.47	-0.84
24	0.31	0.030	97	-0.87	-1.56
25	0.38	0.1	95	0.07	0.05
26	0.527	0.13	102	2.03	1.14
27	0.38	0.1	92	0.07	0.05
28	0.43	0.12	103	0.73	0.45
29	0.4485	0.1346	NR	0.98	0.53
30	0.329	0.082	75	-0.61	-0.53
31	0.34	0.07	NR	-0.47	-0.46
32	0.467	0.140	83.7	1.23	0.64
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	0.375	0.029
Spike	Not Spiked	
Robust Average	0.379	0.031
Median	0.369	0.023
Mean	0.385	
N	29	
Max.	0.58	
Min.	0.3	
Robust SD	0.067	
Robust CV	18%	

*Robust Average excluding laboratory 22.

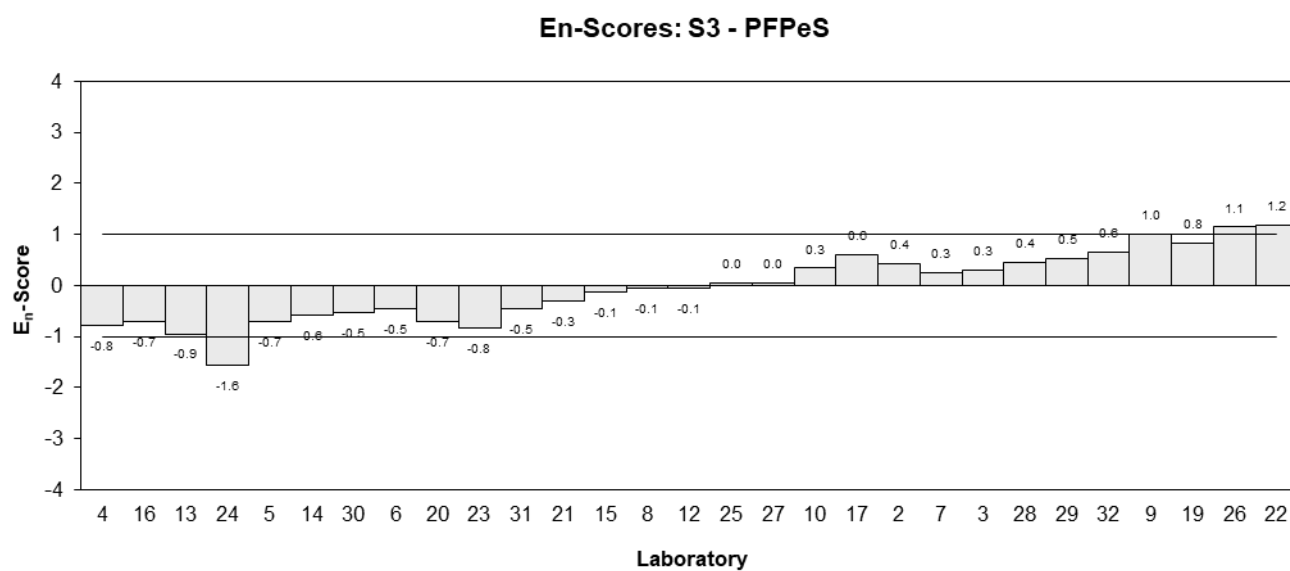
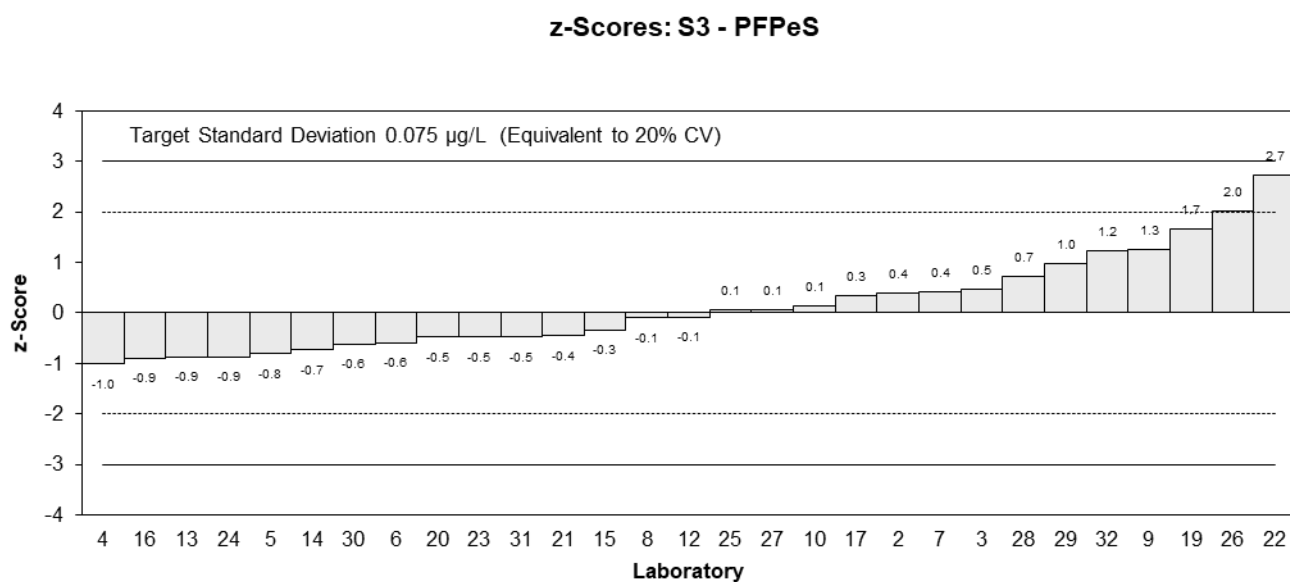
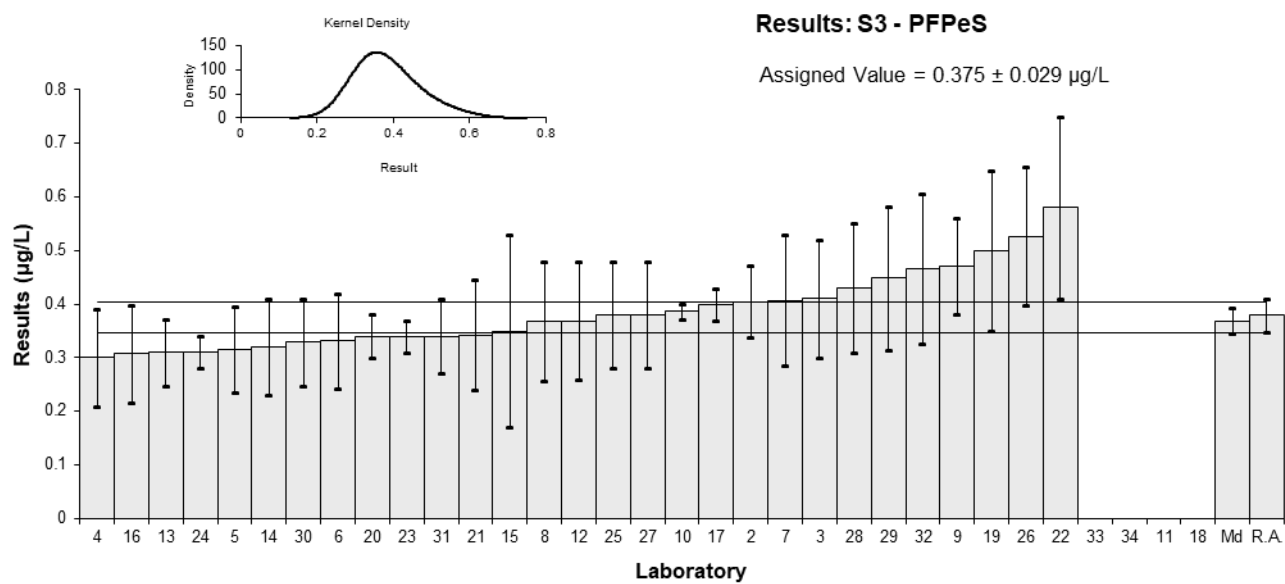


Figure 42

Table 46

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFHxS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	3.47	0.488	NR	0.56	0.67
3	2.9	0.77	NR	-0.35	-0.28
4	2.8	0.85	103	-0.51	-0.37
5	3.37	0.6	83	0.40	0.40
6	3.234	0.873	80-100	0.18	0.13
7	3.387	1.016	NR	0.43	0.26
8	3.571	1.0712	89	0.72	0.42
9	3.46	0.69	95	0.54	0.48
10	4.63	0.467	NR	2.42	3.02
11	2.6	0.4	107	-0.83	-1.19
12	3.027	0.908	98	-0.15	-0.10
13	2.8	0.56	83	-0.51	-0.54
14	2.79	0.67	103	-0.53	-0.48
15	3.2	1.6	102	0.13	0.05
16	2.449	0.516	100.6	-1.08	-1.23
17	3.4	0.4	100.1	0.45	0.64
18	3.1	0.62	NR	-0.03	-0.03
19	3.06	0.80	NR	-0.10	-0.07
20	2.9	0.3	106	-0.35	-0.63
21	2.77	0.831	89	-0.56	-0.41
22	5.54	1.4	90	3.88	1.71
23	2.66	0.19	NR	-0.74	-1.76
24	2.9	0.38	110	-0.35	-0.52
25	3.3	1	95	0.29	0.18
26	3.46	0.91	80	0.54	0.37
27	3.0	1	92	-0.19	-0.12
28	3.7	0.7	103	0.93	0.80
29	2.8842	0.86526	75	-0.38	-0.27
30	2.74	0.68	88	-0.61	-0.54
31	3.38	0.68	NR	0.42	0.37
32	3.63	1.09	73.3	0.82	0.46
33	NT	NT	NT		
34	15.6	2.02	108	20.00	6.15

Statistics

Assigned Value*	3.12	0.18
Spike	Not Spiked	
Robust Average	3.17	0.19
Median	3.15	0.17
Mean	3.62	
N	32	
Max.	15.6	
Min.	2.449	
Robust SD	0.43	
Robust CV	14%	

*Robust Average excluding laboratories 22 and 34.

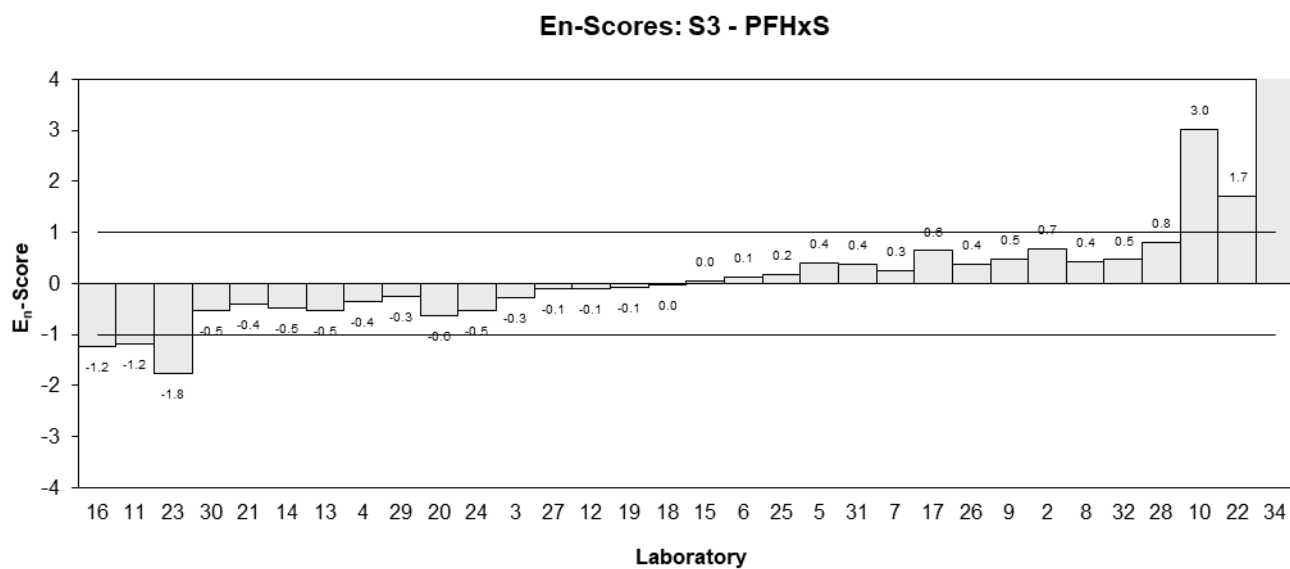
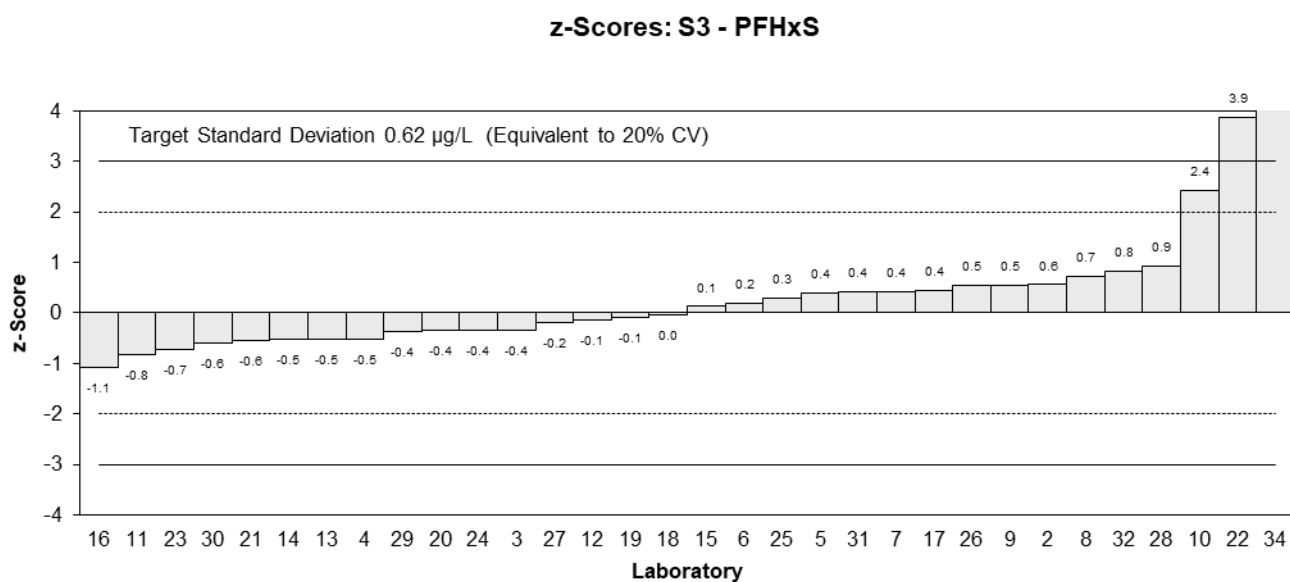
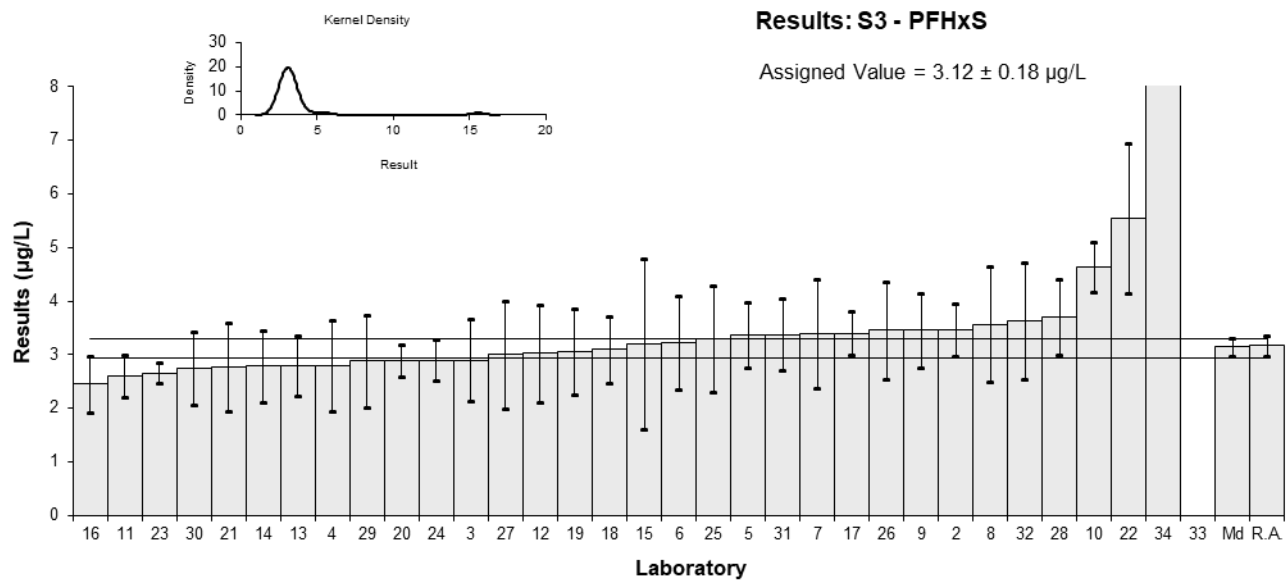


Figure 43

Table 47

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFHxS_L
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	2.79	0.39	83	0.37	0.45
3	2.4	0.65	59	-0.38	-0.30
4	2.5	0.76	103	-0.19	-0.13
5	2.84	0.51	83	0.46	0.45
6	NT	NT	NT		
7	3.040	0.912	NR	0.85	0.48
8	2.626	0.7878	89	0.05	0.03
9	NT	NT	NT		
10	NR	NR	NR		
11	NT	NT	NT		
12	2.803	0.841	98	0.39	0.24
13	2.3	0.46	83	-0.58	-0.62
14	NT	NT	NT		
15	2.8	1.4	NR	0.38	0.14
16	2.108	0.444	100.6	-0.95	-1.05
17	2.8	0.3	100.1	0.38	0.60
18	2.0	0.39	NR	-1.15	-1.44
19	NT	NT	NT		
20	2.4	0.3	106	-0.38	-0.60
21	2.48	0.744	89	-0.23	-0.16
22	4.8	1.2	NR	4.23	1.82
23	2.66	0.19	NR	0.12	0.25
24	2.5	0.33	110	-0.19	-0.28
25	2.8	1	95	0.38	0.20
26	NT	NT	NT		
27	2.5	1	92	-0.19	-0.10
28	NT	NT	NT		
29	2.4652	0.73956	NR	-0.26	-0.18
30	2.304	0.575	88	-0.57	-0.50
31	2.83	0.57	88.6	0.44	0.39
32	2.93	0.879	73.3	0.63	0.37
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	2.60	0.15
Spike	Not Spiked	
Robust Average	2.62	0.15
Median	2.63	0.11
Mean	2.68	
N	23	
Max.	4.8	
Min.	2	
Robust SD	0.30	
Robust CV	11%	

*Robust Average excluding laboratory 22.

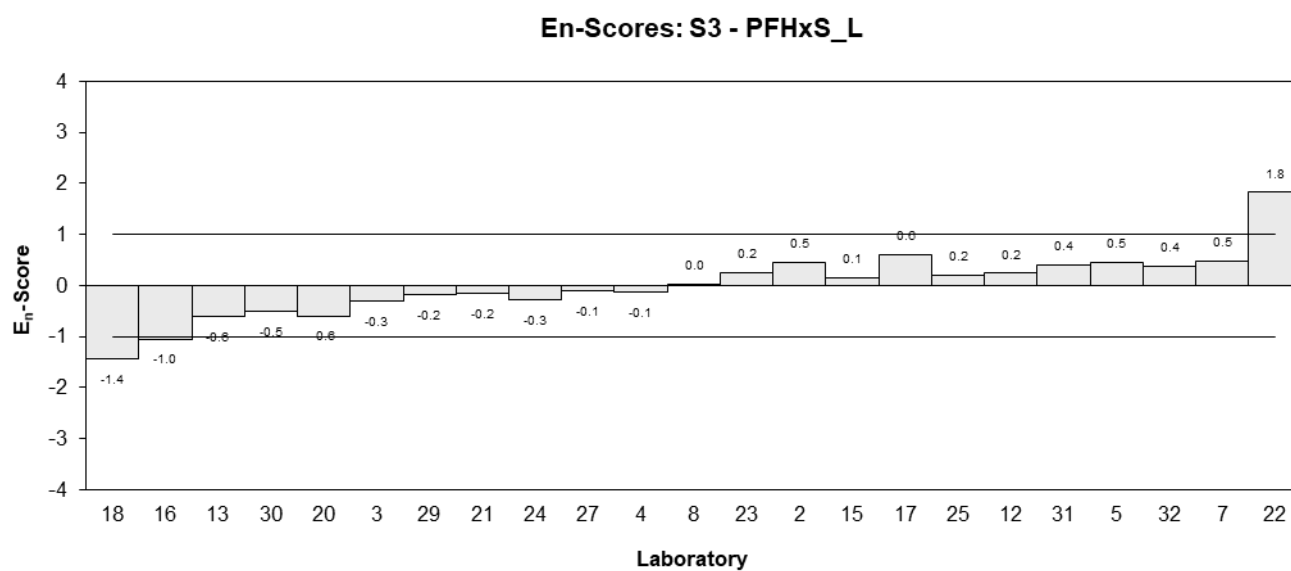
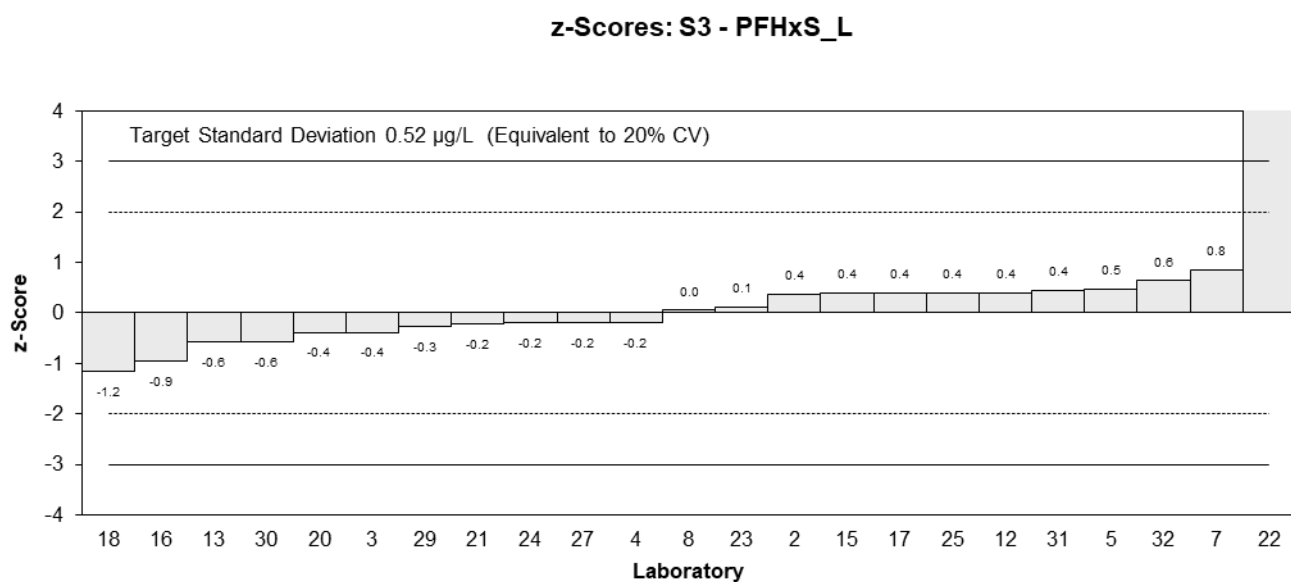
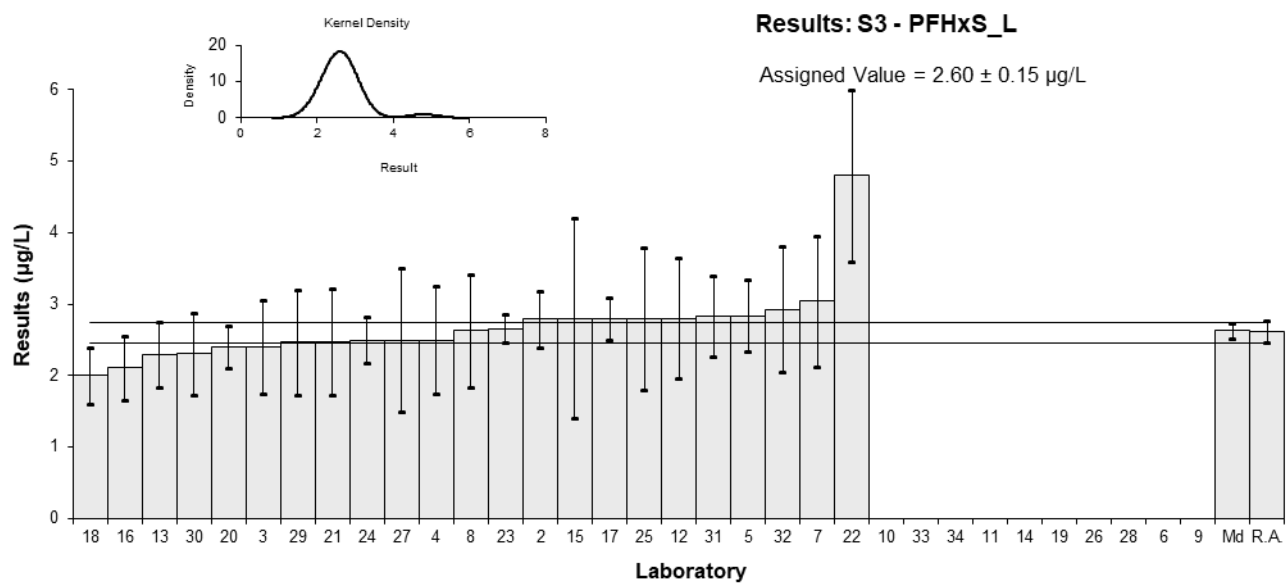


Figure 44

Table 48

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFHpS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.294	0.042	NR	2.50	1.96
3	0.18	0.05	NR	-0.41	-0.28
4	0.23	0.07	NR	0.87	0.45
5	0.157	0.02	87	-0.99	-1.16
6	0.223	0.060	80-100	0.69	0.41
7	0.153	0.046	NR	-1.10	-0.81
8	0.187	0.0560	89	-0.23	-0.14
9	0.26	0.05	53	1.63	1.13
10	0.1928	0.024	NR	-0.08	-0.09
11	NT	NT	NT		
12	0.218	0.065	NR	0.56	0.31
13	0.16	0.032	83	-0.92	-0.86
14	0.21	0.05	93	0.36	0.25
15	0.19	0.1	NR	-0.15	-0.06
16	0.130	0.045	NR	-1.68	-1.26
17	0.2	0.04	93.1	0.10	0.08
18	NT	NT	NT		
19	0.28	0.07	NR	2.14	1.12
20	0.14	0.02	106	-1.43	-1.67
21	0.15	0.045	98	-1.17	-0.88
22	0.46	0.13	NR	6.73	1.99
23	0.16	0.02	NR	-0.92	-1.07
24	0.13	0.017	110	-1.68	-2.07
25	0.24	0.1	101	1.12	0.42
26	0.296	0.077	95	2.55	1.23
27	0.21	0.1	92	0.36	0.14
28	0.24	0.05	103	1.12	0.77
29	0.1181	0.0354	NR	-1.99	-1.75
30	0.133	0.033	83	-1.61	-1.48
31	0.18	0.04	NR	-0.41	-0.33
32	0.26	0.078	73.3	1.63	0.78
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	0.196	0.027
Spike	Not Spiked	
Robust Average	0.200	0.028
Median	0.193	0.022
Mean	0.206	
N	29	
Max.	0.46	
Min.	0.1181	
Robust SD	0.060	
Robust CV	30%	

*Robust Average excluding laboratory 22.

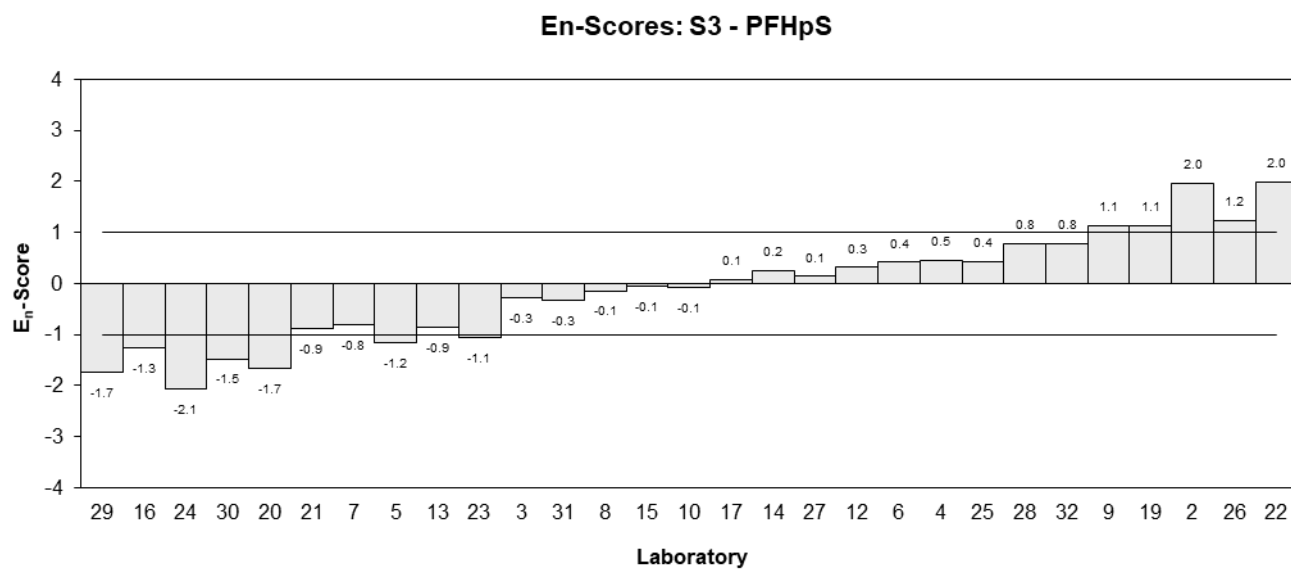
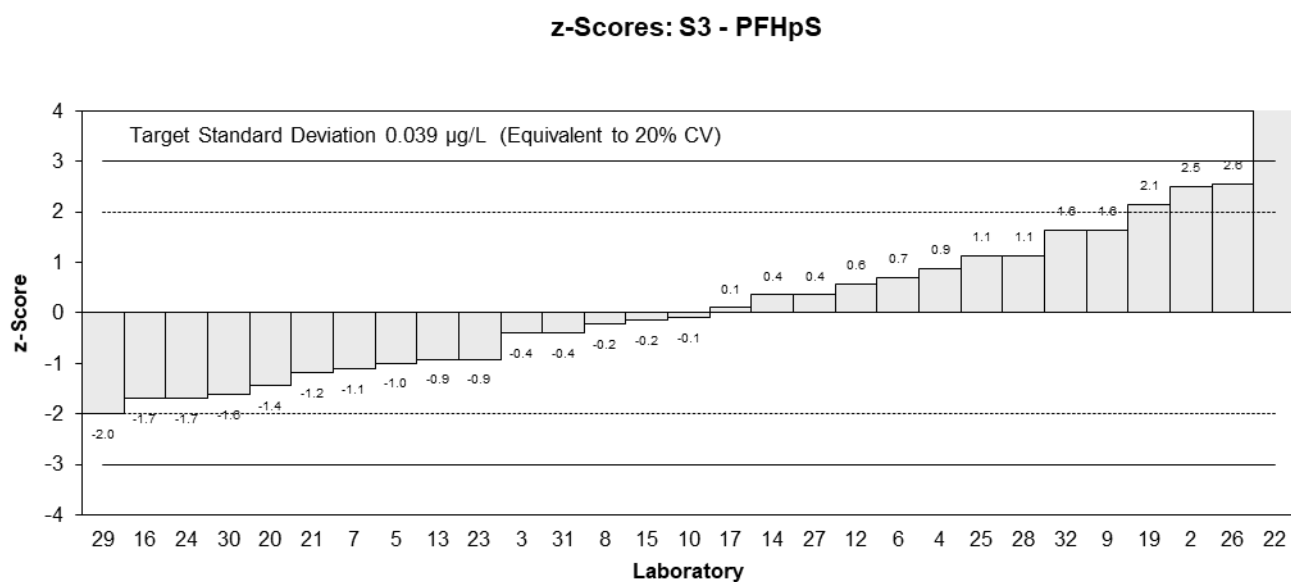
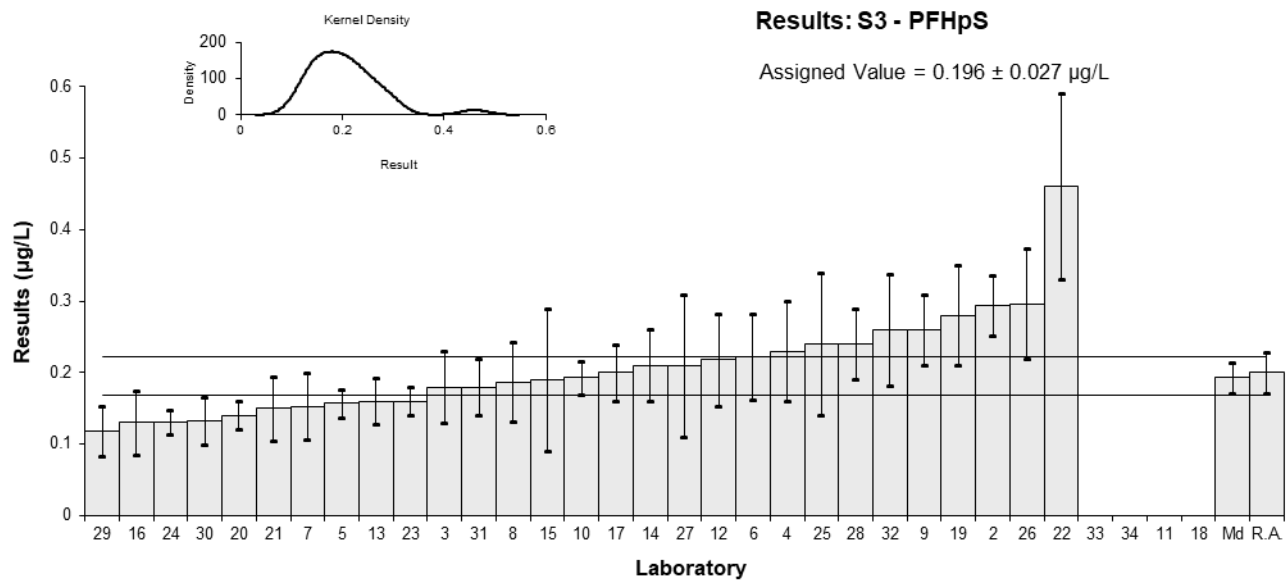


Figure 45

Table 49

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFOS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	4.79	0.552	NR	1.32	1.48
3	2.8	0.76	NR	-1.31	-1.16
4	4.3	1.3	100	0.67	0.38
5	3.52	0.57	90	-0.36	-0.39
6	3.95	1.07	80-100	0.21	0.14
7	4.365	1.310	NR	0.76	0.42
8	3.938	1.1813	106	0.20	0.12
9	4.67	1.01	97	1.16	0.81
10	1.85	6.1	NR	-2.56	-0.32
11	4.4	1.1	85	0.80	0.52
12	3.865	1.159	87	0.10	0.06
13	2.8	0.70	84	-1.31	-1.24
14	3.6	0.88	103	-0.25	-0.20
15	3.1	1.6	99	-0.91	-0.42
16	2.875	0.452	73	-1.21	-1.53
17	3	0.3	106.6	-1.04	-1.61
18	5.1	1.0	NR	1.73	1.22
19	4.23	1.06	126	0.58	0.39
20	2.6	0.3	122	-1.57	-2.42
21	3.41	1.023	82	-0.50	-0.35
22	6.49	1.56	98	3.56	1.68
23	3.23	0.23	NR	-0.74	-1.24
24	2.8	0.37	108	-1.31	-1.84
25	3.7	1	101	-0.12	-0.08
26	4.65	1.32	95	1.13	0.62
27	3.8	1	88	0.01	0.01
28	4.52	0.92	107	0.96	0.73
29	3.9339	1.1802	70	0.19	0.12
30	2.76	0.69	95	-1.36	-1.30
31	4.15	0.83	NR	0.47	0.39
32	5.53	1.66	91.6	2.30	1.02
33	NT	NT	NT		
34	113	18	108	144.08	6.07

Statistics*

Assigned Value**	3.79	0.39
Spike	Not Spiked	
Robust Average	3.79	0.41
Median	3.87	0.36
Mean	3.83	
N	31	
Max.	6.49	
Min.	1.85	
Robust SD	0.92	
Robust CV	24%	

*Laboratory 34 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 10 and 22.

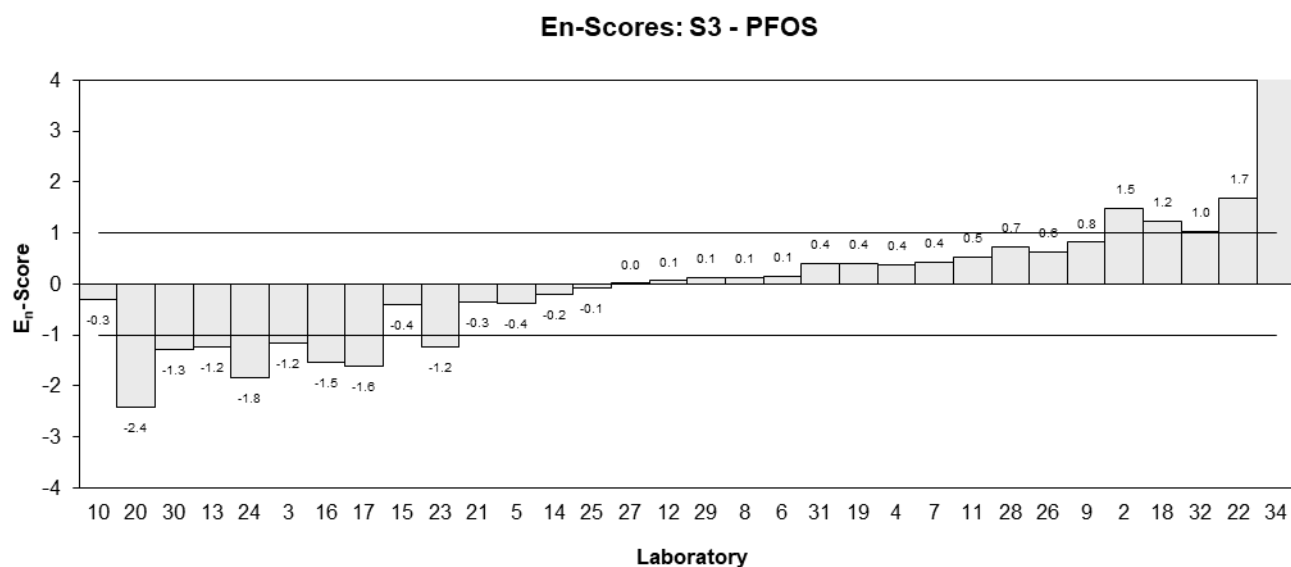
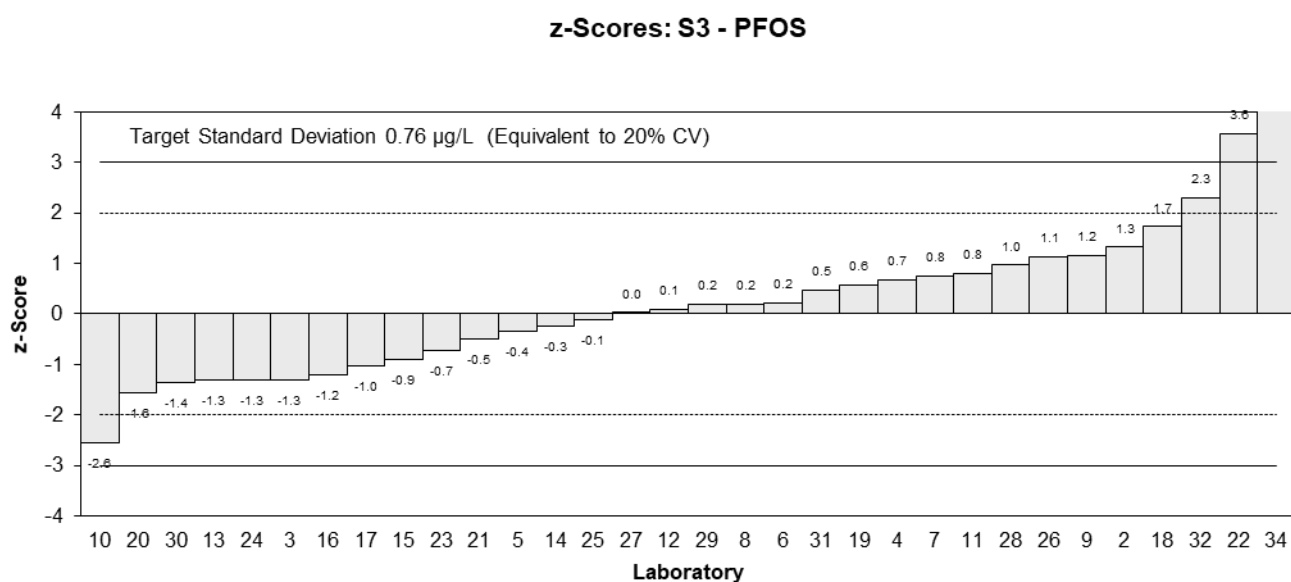
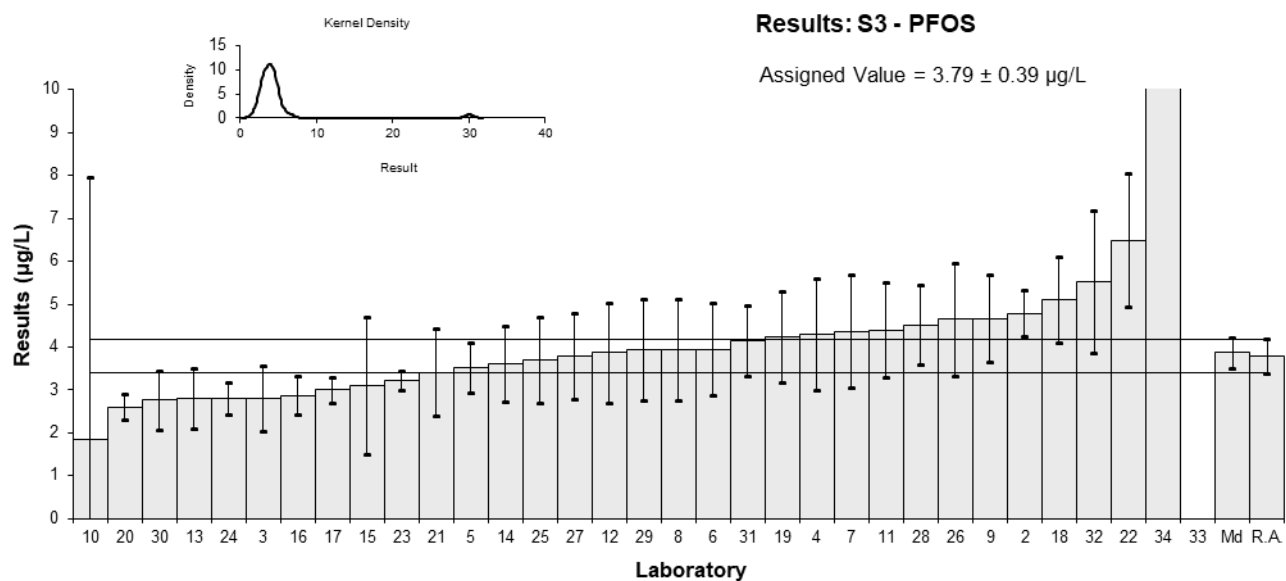


Figure 46

Table 50

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFOS_L
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	1.78	0.21	82	0.46	0.59
3	1.3	0.35	60	-1.01	-0.88
4	1.6	0.48	92	-0.09	-0.06
5	1.55	0.25	90	-0.25	-0.28
6	NT	NT	NT		
7	2.064	0.619	NR	1.33	0.68
8	1.858	0.5575	106	0.70	0.40
9	1.85	0.40	94	0.67	0.52
10	NR	NR	NR		
11	NT	NT	NT		
12	1.643	0.493	87	0.04	0.03
13	1.3	0.33	84	-1.01	-0.92
14	NT	NT	NT		
15	1.6	0.8	NR	-0.09	-0.04
16	1.248	0.196	73	-1.17	-1.59
17	1.6	0.04	102.2	-0.09	-0.21
18	2.1	0.42	NR	1.44	1.06
19	NT	NT	NT		
20	1.4	0.2	122	-0.71	-0.94
21	1.44	0.432	82	-0.58	-0.42
22	2.95	0.71	NR	4.05	1.82
23	1.65	0.12	NR	0.06	0.11
24	1.3	0.17	108	-1.01	-1.50
25	1.5	1	101	-0.40	-0.13
26	1.68	0.47	95	0.15	0.10
27	1.4	1	88	-0.71	-0.23
28	NT	NT	NT		
29	1.809	0.5427	NR	0.55	0.32
30	1.62	0.405	95	-0.03	-0.02
31	1.79	0.36	86.3	0.49	0.41
32	2.29	0.687	91.6	2.02	0.94
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	1.63	0.14
Spike	Not Spiked	
Robust Average	1.65	0.15
Median	1.62	0.12
Mean	1.69	
N	25	
Max.	2.95	
Min.	1.248	
Robust SD	0.30	
Robust CV	18%	

*Robust Average excluding laboratory 22.

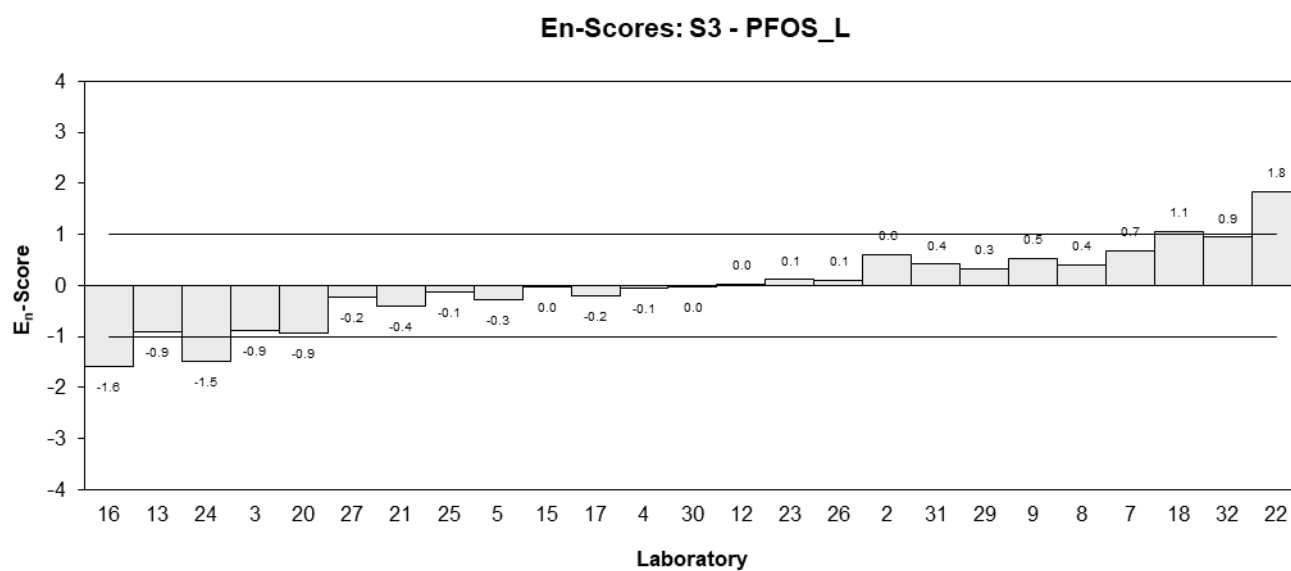
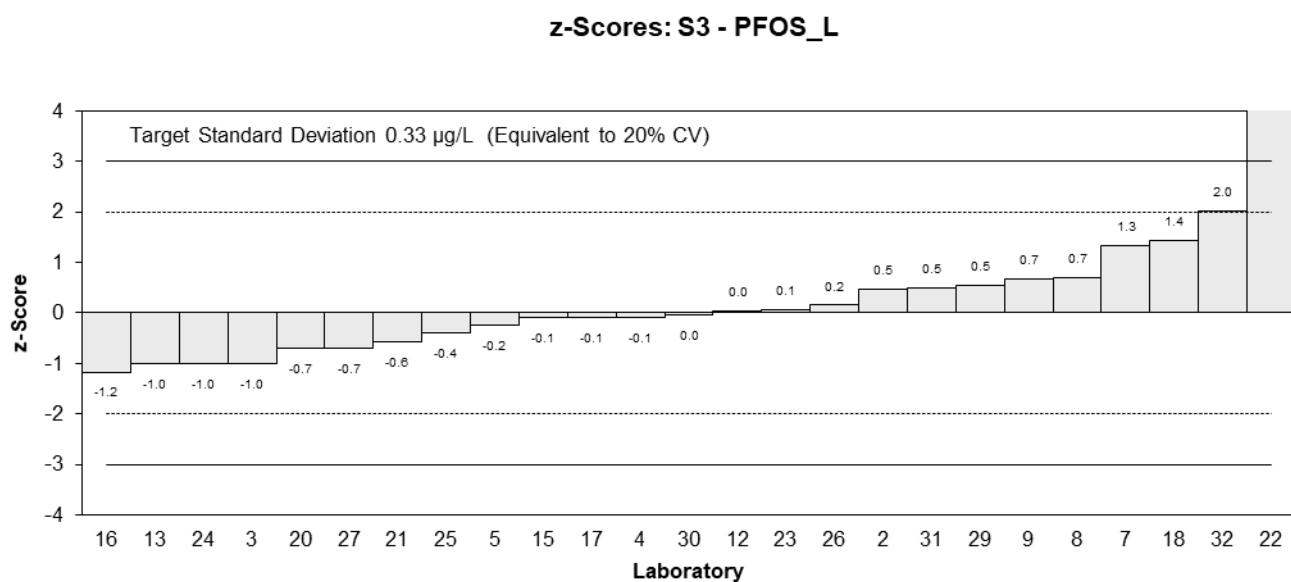
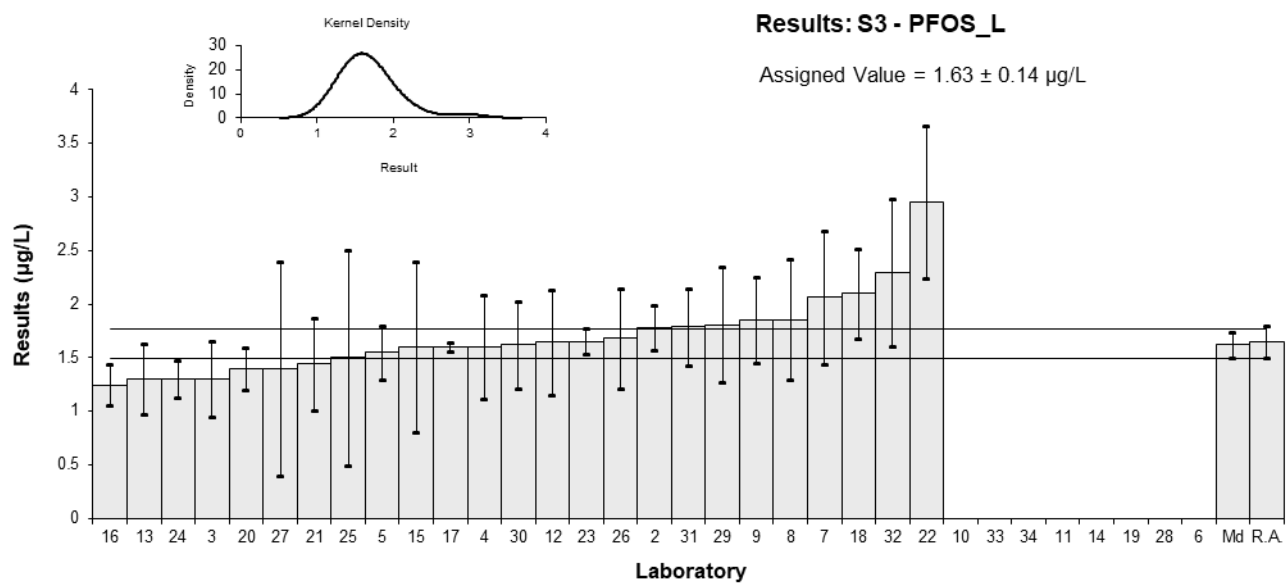


Figure 47

Table 51

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFBA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.116	0.016	57	0.23	0.29
3	0.10	0.03	86	-0.50	-0.36
4	0.11	0.03	74	-0.05	-0.03
5	0.121	0.024	86	0.45	0.40
6	0.101	0.027	80-100	-0.45	-0.36
7	0.116	0.035	NR	0.23	0.14
8	0.121	0.0362	19	0.45	0.27
9	<0.2	NR	62		
10	0.1643	0.014	56	2.40	3.41
11	NT	NT	NT		
12	0.103	0.031	85	-0.36	-0.25
13	0.10	0.025	96	-0.50	-0.42
14	0.2	0.05	97	4.01	1.76
15	0.12	0.06	37	0.41	0.15
16	0.099	0.028	64.3	-0.54	-0.42
17	0.09	0.006	58.3	-0.95	-2.28
18	0.14	0.03	NR	1.31	0.94
19	0.12	0.02	NR	0.41	0.42
20	0.093	0.013	95	-0.81	-1.22
21	0.1	0.03	93	-0.50	-0.36
22	0.28	NR	111	7.61	24.14
23	0.13	0.01	NR	0.86	1.56
24	0.11	0.015	102	-0.05	-0.06
25	0.13	0.05	91	0.86	0.38
26	<0.5	NR	89		
27	0.11	0.05	77	-0.05	-0.02
28	<0.2	NR	99		
29	0.1089	0.0436	80	-0.09	-0.05
30	0.0981	0.025	83	-0.58	-0.50
31	0.10	0.02	104.3	-0.50	-0.52
32	0.117	0.0351	58.9	0.27	0.17
33	NT	NT	NT		
34	0.275	0.05	108	7.39	3.25

Statistics

Assigned Value*	0.111	0.007
Spike	Not Spiked	
Robust Average	0.115	0.009
Median	0.113	0.007
Mean	0.128	
N	28	
Max.	0.28	
Min.	0.09	
Robust SD	0.019	
Robust CV	16%	

*Robust Average excluding laboratories 14, 22 and 34.

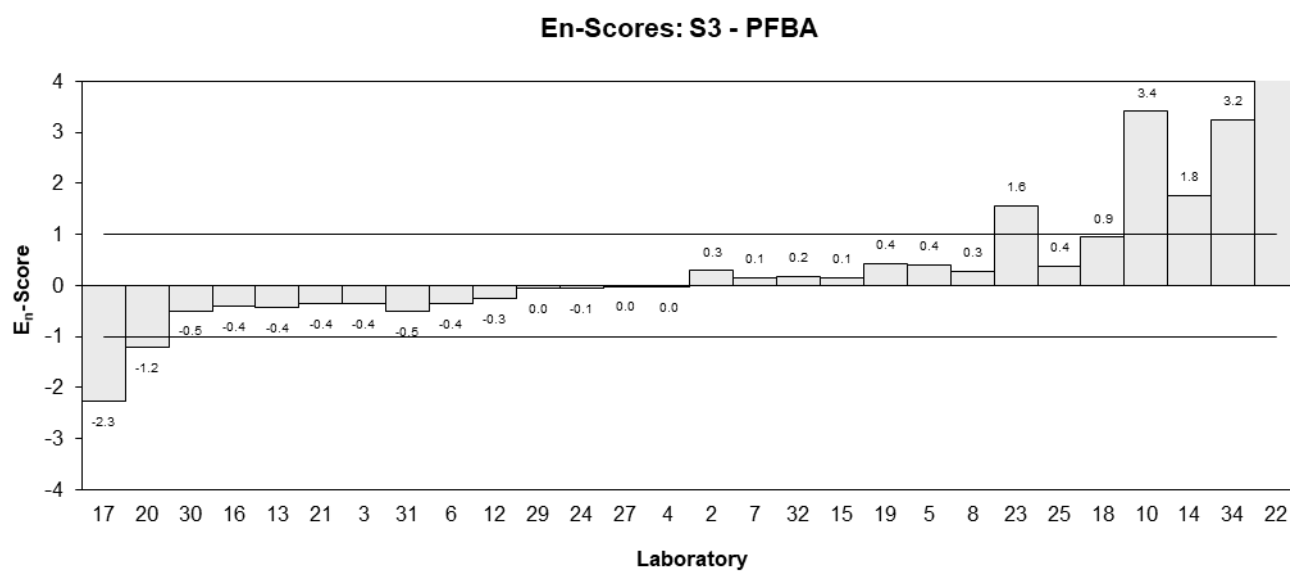
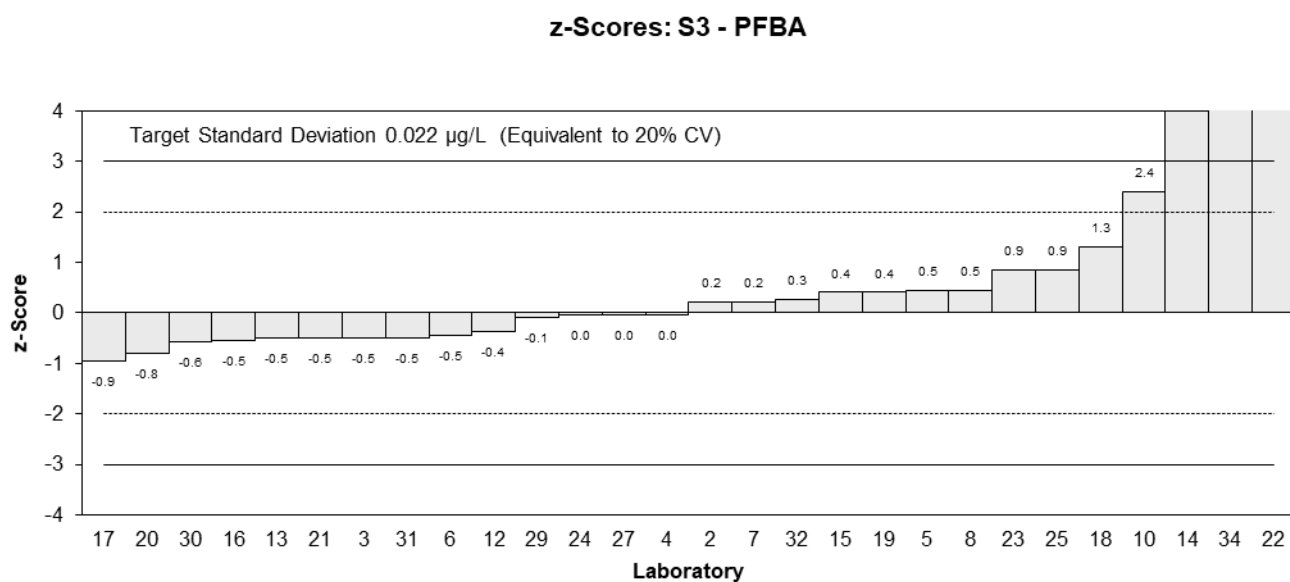
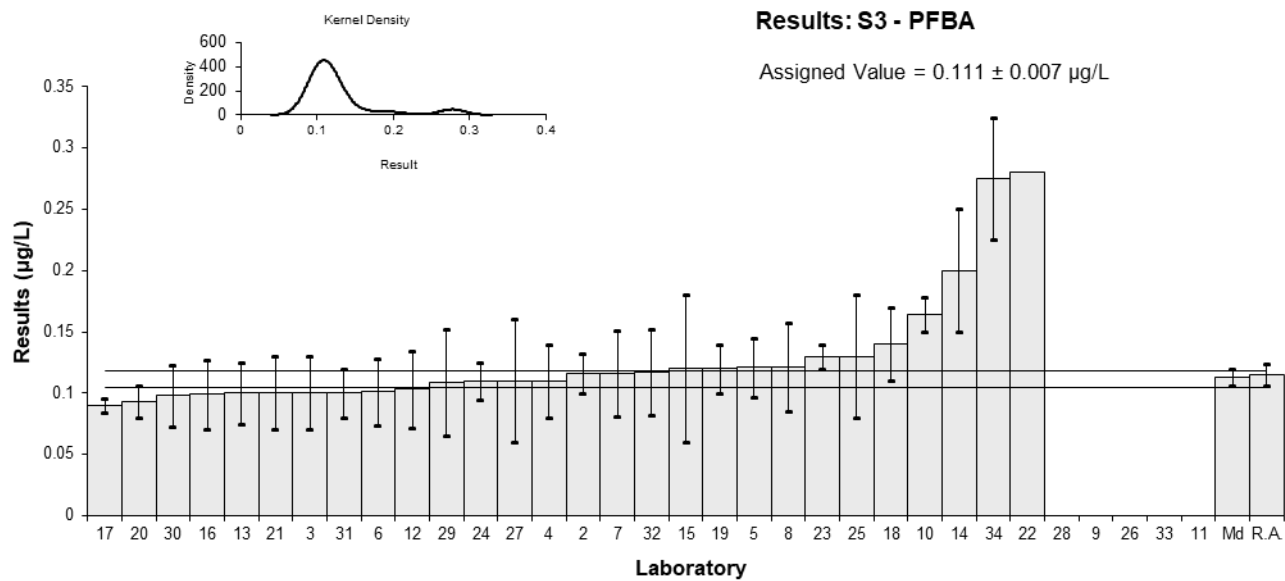


Figure 48

Table 52

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFPeA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.212	0.038	76	0.82	0.75
3	0.16	0.04	89	-0.60	-0.52
4	0.13	0.04	101	-1.43	-1.24
5	0.188	0.034	89	0.16	0.16
6	0.193	0.052	80-100	0.30	0.21
7	0.194	0.058	NR	0.33	0.20
8	0.174	0.0523	120	-0.22	-0.15
9	0.18	0.04	68	-0.05	-0.05
10	0.299	0.11	82	3.21	1.06
11	NT	NT	NT		
12	0.194	0.060	92	0.33	0.20
13	0.17	0.034	86	-0.33	-0.33
14	0.14	0.03	67	-1.15	-1.28
15	0.18	0.09	101	-0.05	-0.02
16	0.173	0.033	69	-0.25	-0.25
17	0.2	0.01	101.8	0.49	1.10
18	0.21	0.04	NR	0.77	0.67
19	0.22	0.04	NR	1.04	0.90
20	0.15	0.02	92	-0.88	-1.34
21	0.179	0.0537	99	-0.08	-0.05
22	0.36	0.1	139	4.89	1.77
23	0.15	0.01	NR	-0.88	-1.95
24	0.18	0.016	106	-0.05	-0.10
25	0.19	0.05	99	0.22	0.15
26	0.233	0.06	81	1.40	0.83
27	0.19	0.05	104	0.22	0.15
28	0.22	0.04	104	1.04	0.90
29	0.1496	0.0598	NR	-0.89	-0.53
30	0.172	0.043	88	-0.27	-0.22
31	0.16	0.03	94.2	-0.60	-0.67
32	0.192	0.0576	76.9	0.27	0.17
33	NT	NT	NT		
34	0.592	0.112	108	11.26	3.64

Statistics

Assigned Value*	0.182	0.013
Spike	Not Spiked	
Robust Average	0.187	0.014
Median	0.188	0.010
Mean	0.204	
N	31	
Max.	0.592	
Min.	0.13	
Robust SD	0.032	
Robust CV	17%	

*Robust Average excluding laboratories 10, 22 and 34.

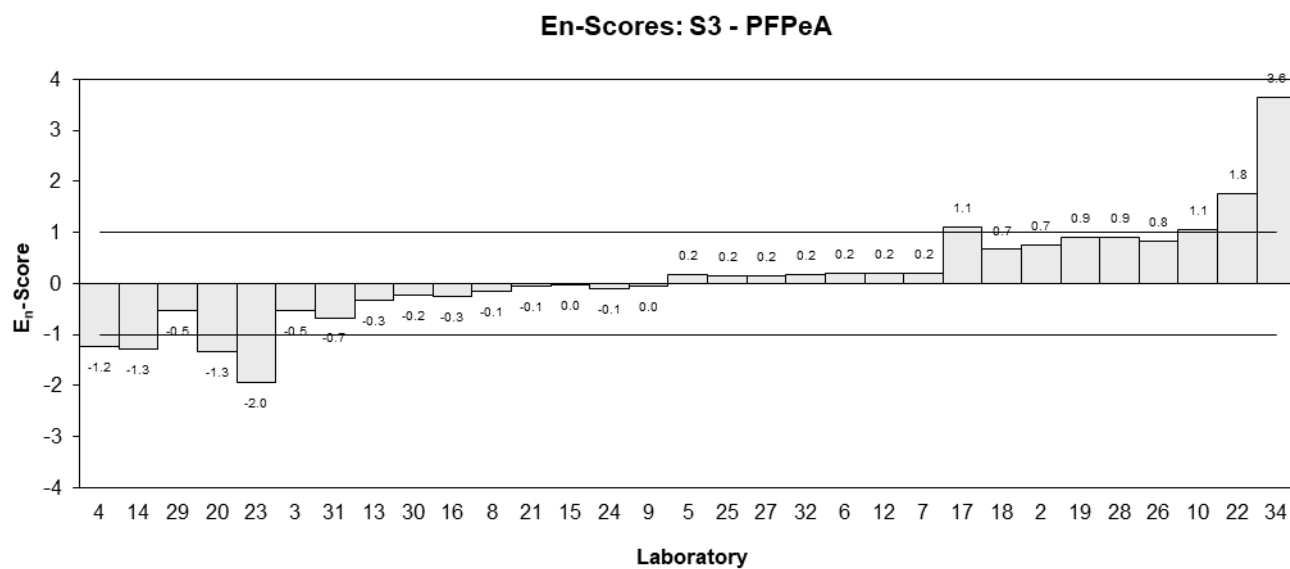
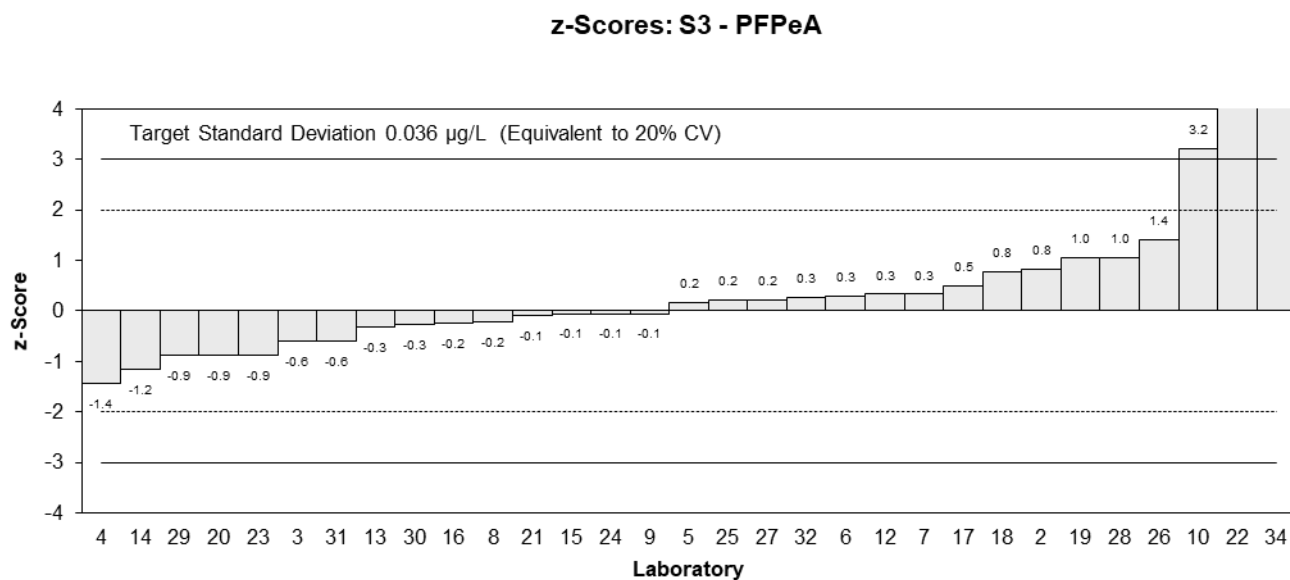
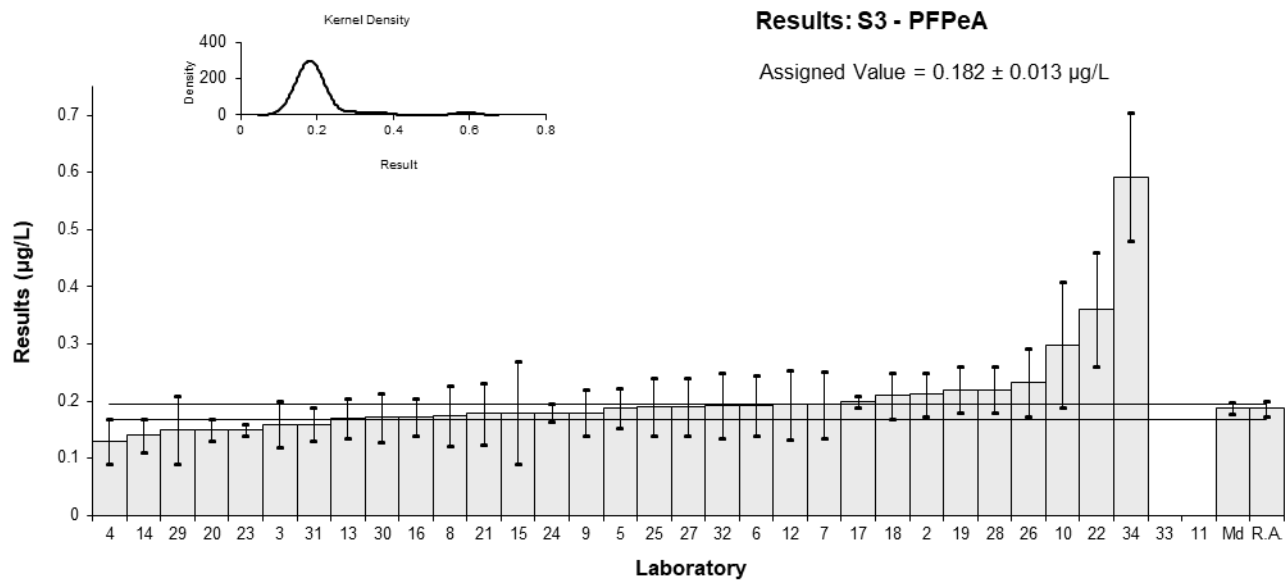


Figure 49

Table 53

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFHxA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.871	0.136	75	0.63	0.66
3	0.62	0.17	82	-0.99	-0.86
4	0.78	0.23	97	0.04	0.03
5	0.707	0.154	86	-0.43	-0.41
6	0.569	0.154	80-100	-1.32	-1.25
7	0.816	0.245	NR	0.27	0.17
8	0.758	0.2273	105	-0.10	-0.07
9	0.99	0.18	59	1.40	1.14
10	0.899	0.12	82	0.81	0.94
11	0.77	0.13	84	-0.03	-0.03
12	0.875	0.262	98	0.65	0.38
13	0.65	0.13	89	-0.80	-0.87
14	0.8	0.2	78	0.17	0.13
15	0.75	0.38	105	-0.16	-0.06
16	0.637	0.094	73	-0.89	-1.25
17	0.74	0.08	96.4	-0.22	-0.35
18	0.85	0.17	NR	0.49	0.42
19	0.94	0.19	NR	1.07	0.84
20	0.060	0.07	93	-4.61	-7.91
21	0.731	0.2193	95	-0.28	-0.19
22	1.64	0.44	147	5.59	1.95
23	0.71	0.05	NR	-0.41	-0.84
24	0.69	0.058	97	-0.54	-1.03
25	0.83	0.3	100	0.36	0.18
26	0.968	0.25	93	1.25	0.76
27	0.81	0.3	99	0.23	0.12
28	0.94	0.22	102	1.07	0.73
29	0.7207	0.2162	85	-0.34	-0.24
30	0.66	0.17	98	-0.74	-0.64
31	0.61	0.12	79.1	-1.06	-1.23
32	0.775	0.233	91.2	0.01	0.00
33	NT	NT	NT		
34	3.59	0.61	108	18.19	4.60

Statistics*

Assigned Value**	0.774	0.057
Spike	Not Spiked	
Robust Average	0.789	0.061
Median	0.775	0.046
Mean	0.893	
N	31	
Max.	3.59	
Min.	0.569	
Robust SD	0.14	
Robust CV	17%	

*Laboratory 20 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 22 and 34.

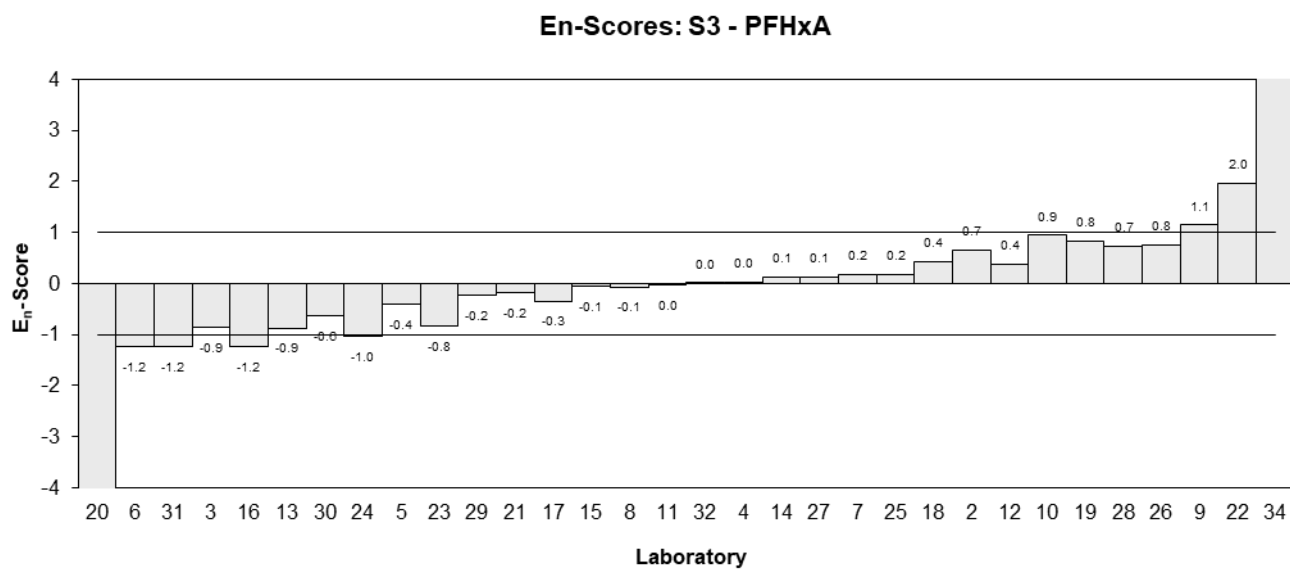
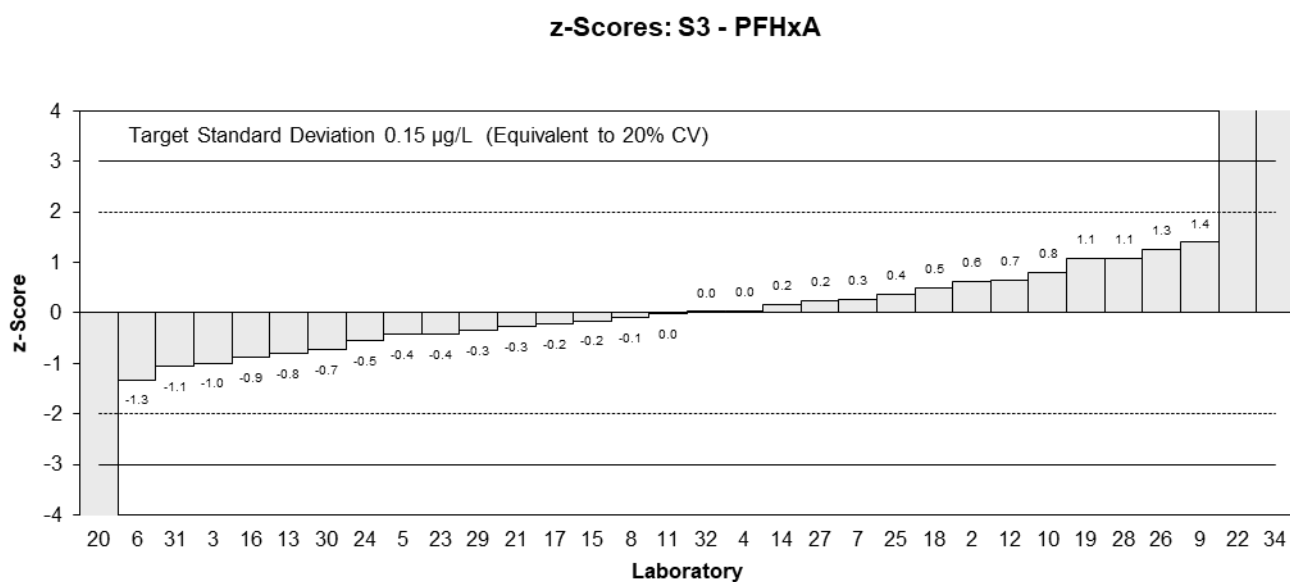
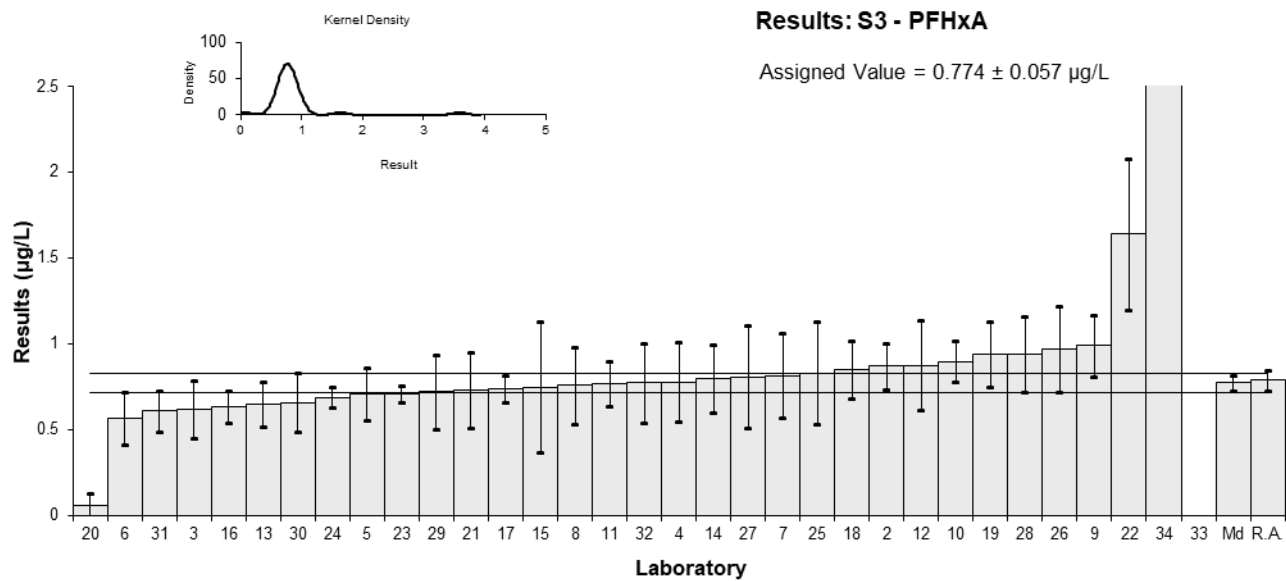


Figure 50

Table 54

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFHpA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.113	0.022	97	1.09	0.88
3	0.077	0.02	84	-0.85	-0.74
4	0.08	0.02	111	-0.69	-0.60
5	0.0909	0.021	89	-0.10	-0.08
6	0.094	0.025	80-100	0.07	0.05
7	0.104	0.031	NR	0.61	0.36
8	0.085	0.0254	82	-0.42	-0.29
9	0.12	0.02	56	1.47	1.28
10	0.168	0.02	74	4.06	3.54
11	0.08	0.02	73	-0.69	-0.60
12	0.090	0.027	87	-0.15	-0.10
13	0.083	0.0017	89	-0.52	-1.31
14	0.09	0.02	74	-0.15	-0.13
15	0.092	0.045	100	-0.04	-0.02
16	0.080	0.010	52.2	-0.69	-1.03
17	0.09	0.01	88.5	-0.15	-0.22
18	0.10	0.02	NR	0.39	0.34
19	0.10	0.02	NR	0.39	0.34
20	<0.004	NR	88		
21	0.086	0.0258	91	-0.36	-0.25
22	0.22	0.07	147	6.87	1.81
23	0.08	0.01	NR	-0.69	-1.03
24	0.079	0.0091	104	-0.74	-1.18
25	0.11	0.03	96	0.93	0.56
26	0.115	0.03	69	1.20	0.72
27	0.11	0.03	90	0.93	0.56
28	0.14	0.02	103	2.55	2.23
29	0.0805	0.0242	80	-0.66	-0.48
30	0.086	0.022	73	-0.36	-0.29
31	0.07	0.01	90.2	-1.22	-1.84
32	0.0988	0.0296	98.9	0.33	0.20
33	NT	NT	NT		
34	0.456	0.118	108	19.60	3.07

Statistics

Assigned Value*	0.0927	0.0072
Spike	Not Spiked	
Robust Average	0.0961	0.0084
Median	0.0909	0.0059
Mean	0.112	
N	31	
Max.	0.456	
Min.	0.07	
Robust SD	0.019	
Robust CV	19%	

*Robust Average excluding laboratories 10, 22 and 34.

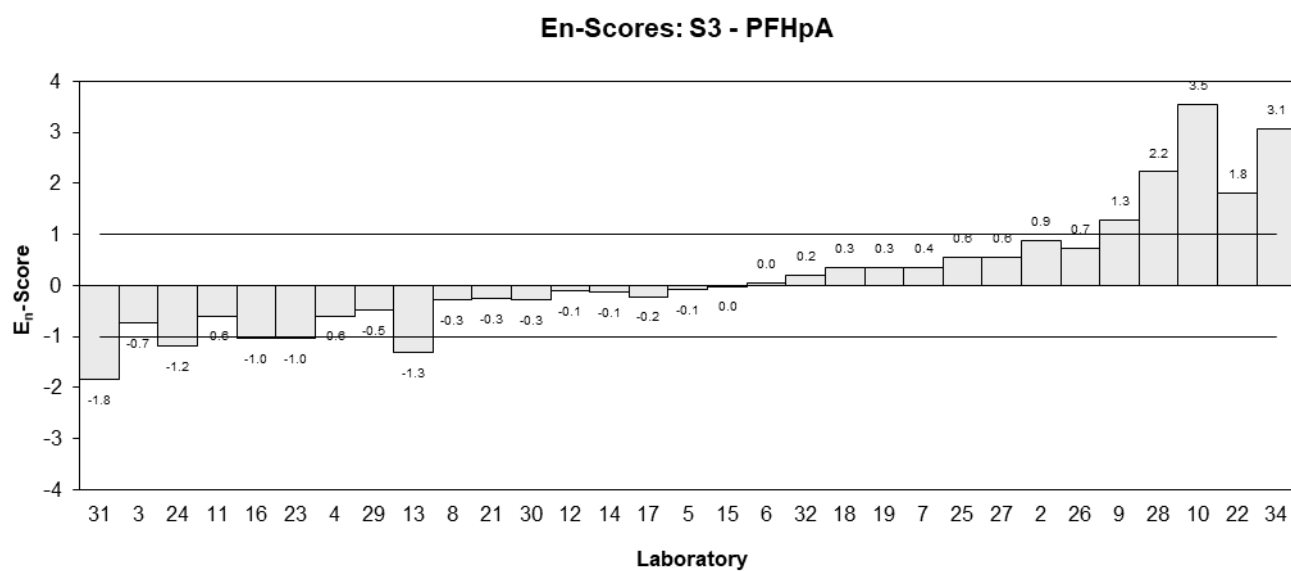
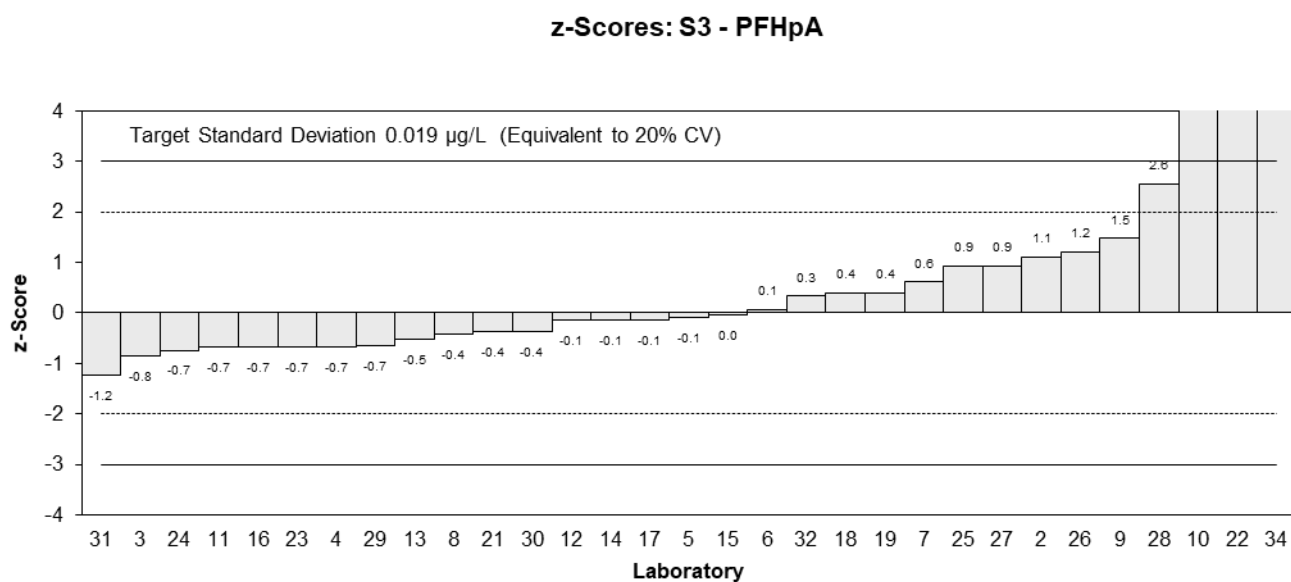
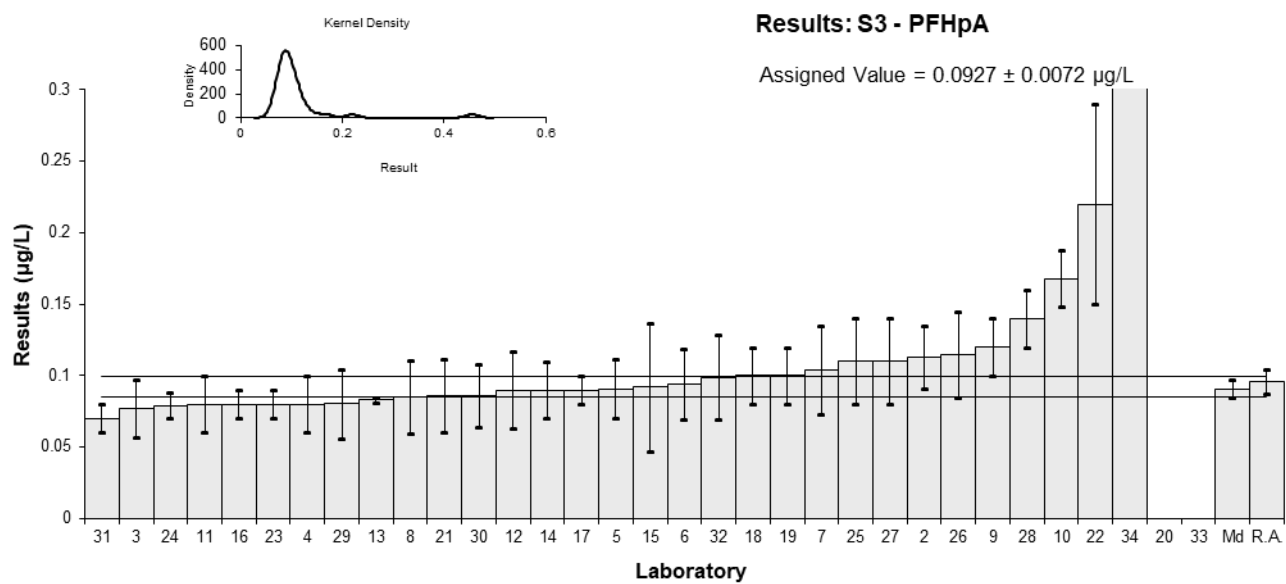


Figure 51

Table 55

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFOA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.277	0.034	76	1.16	1.38
3	0.17	0.05	83	-1.22	-1.05
4	0.21	0.06	88	-0.33	-0.24
5	0.254	0.069	87	0.64	0.41
6	0.202	0.055	80-100	-0.51	-0.40
7	0.199	0.060	NR	-0.58	-0.42
8	0.239	0.0717	136	0.31	0.19
9	0.26	0.05	59	0.78	0.67
10	0.2973	0.055	77	1.61	1.26
11	0.19	0.04	82	-0.78	-0.81
12	0.240	0.072	86	0.33	0.20
13	0.18	0.036	95	-1.00	-1.14
14	0.21	0.05	107	-0.33	-0.29
15	0.22	0.22	103	-0.11	-0.02
16	0.203	0.017	69.4	-0.49	-0.94
17	0.2	0.03	88.5	-0.56	-0.74
18	0.22	0.04	NR	-0.11	-0.12
19	0.27	0.05	110	1.00	0.86
20	0.20	0.02	123	-0.56	-0.98
21	0.231	0.0693	99	0.13	0.08
22	0.42	0.13	161	4.33	1.49
23	0.19	0.02	NR	-0.78	-1.37
24	0.21	0.030	107	-0.33	-0.44
25	0.23	0.07	98	0.11	0.07
26	0.284	0.07	107	1.31	0.82
27	0.21	0.07	92	-0.33	-0.21
28	0.25	0.03	100	0.56	0.74
29	0.1995	0.0599	75	-0.57	-0.41
30	0.219	0.055	85	-0.13	-0.10
31	0.27	0.05	86.5	1.00	0.86
32	0.244	0.0732	94.3	0.42	0.25
33	NT	NT	NT		
34	1.05	0.167	108	18.33	4.92

Statistics

Assigned Value*	0.225	0.016
Spike	Not Spiked	
Robust Average	0.230	0.017
Median	0.220	0.011
Mean	0.258	
N	32	
Max.	1.05	
Min.	0.17	
Robust SD	0.039	
Robust CV	17%	

*Robust Average excluding laboratories 22 and 34.

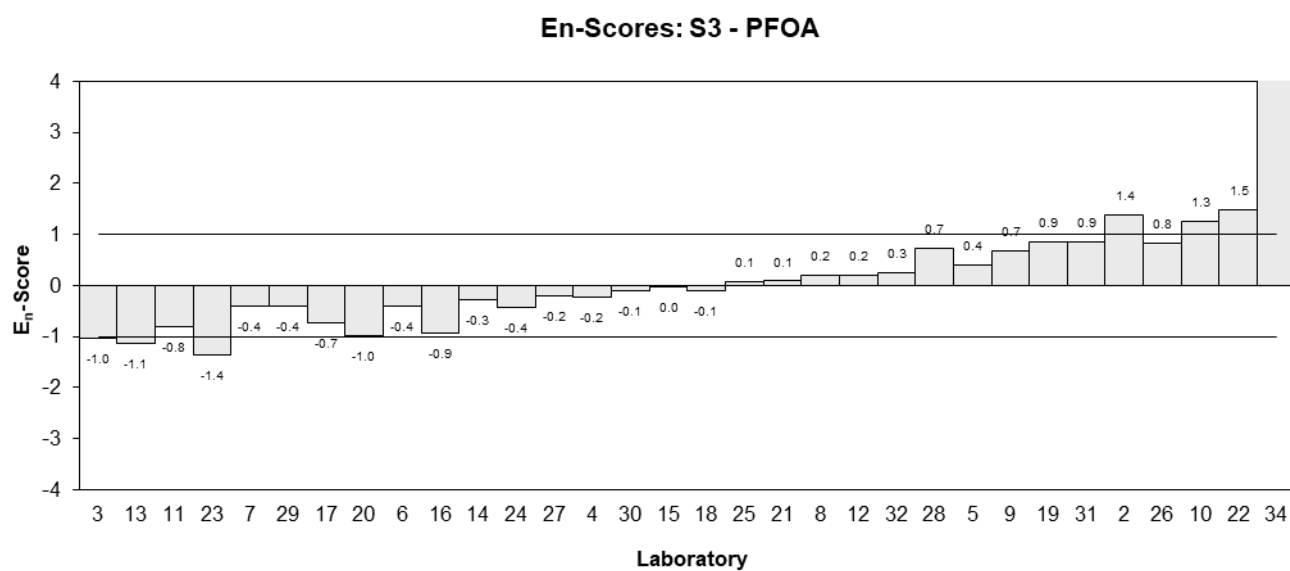
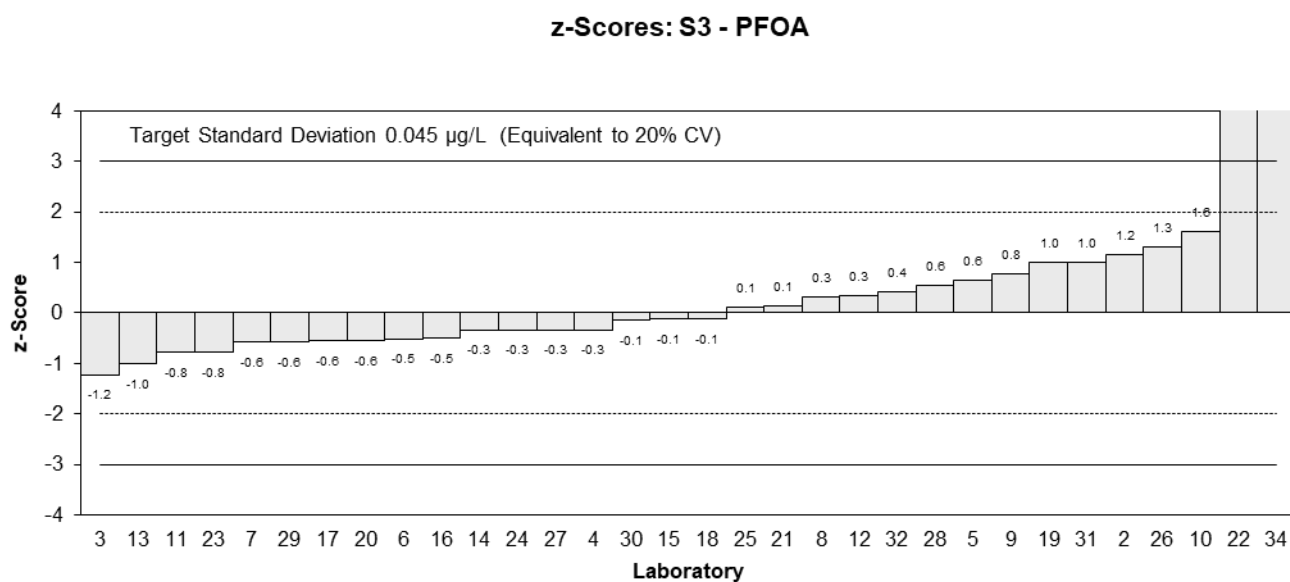
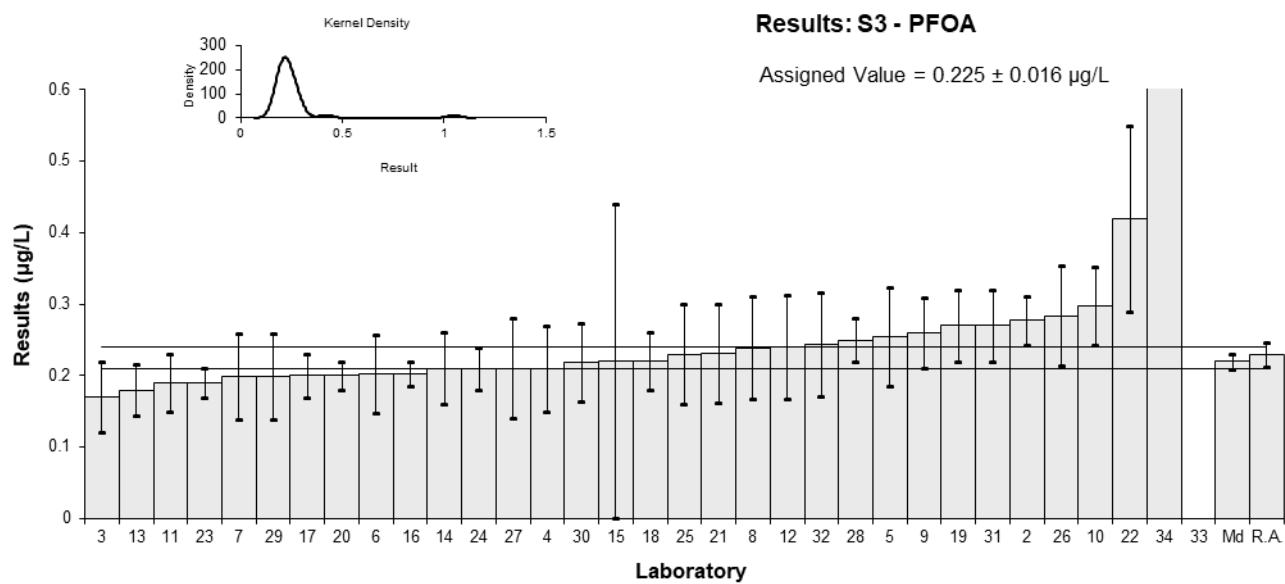


Figure 52

Table 56

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFNA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	0.005	0.001	110
3	0.0030	0.00080	88
4	<0.01	0.003	126
5	0.00427	0.00098	83
6	<0.01	NR	80-100
7	<0.005	0.002	NR
8	<0.01	NR	NR
9	<0.02	NR	54
10	<0.05	NR	67
11	<0.02	NR	74
12	0.003	0.001	87
13	<0.01	NR	NR
14	<0.02	NR	97
15	< 0.03	0.015	98
16	NR	NR	NR
17	0.003	0	88.1
18	NT	NT	NT
19	0.005	0.001	NR
20	0.003	0.002	96
21	0.0048	0.00144	96
22	0.03	0.01	132
23	NR	NR	NR
24	< 0.025	NR	111
25	0.003	0.002	93
26	<0.02	NR	93
27	0.004	0.002	66
28	<0.02	NR	95
29	<0.0100	NR	70
30	0.00298	0.00075	75
31	<0.004	NR	109.1
32	<0.017	NR	89.3
33	NT	NT	NT
34	<0.3	NR	108

Statistics*

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	0.00373	0.00076
Median	0.00300	0.00002
Mean	0.00373	
N	11	
Max.	0.005	
Min.	0.00298	
Robust SD	0.0010	
Robust CV	27%	

*Laboratory 22 excluded from statistical calculation (gross error).

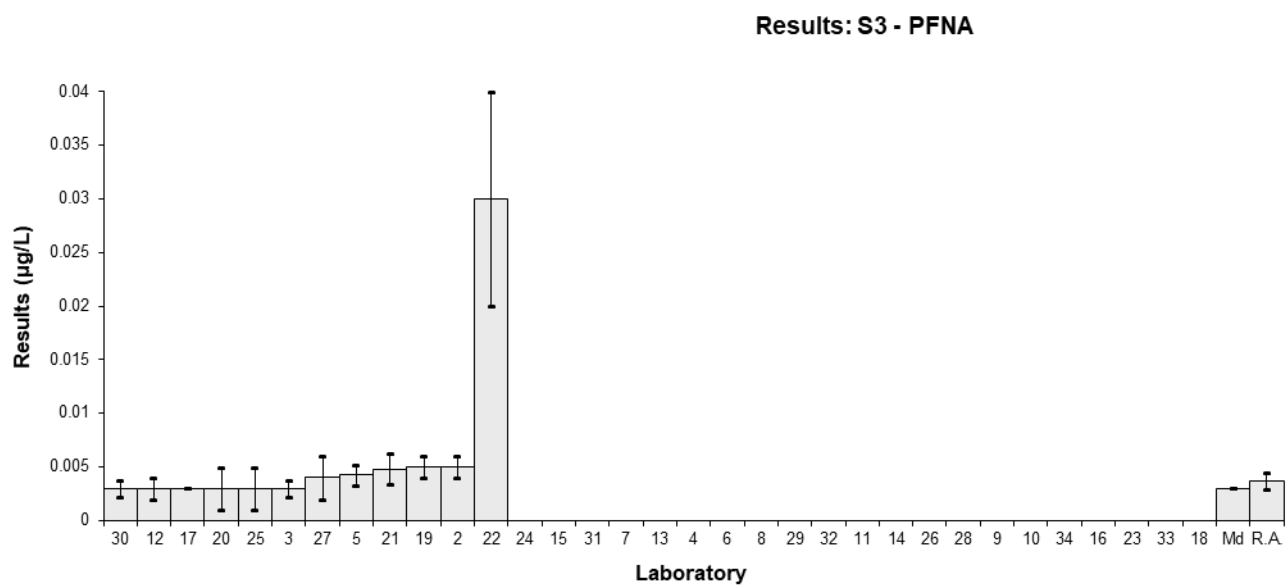


Figure 53

Table 57

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	PFOSA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.011	0.001	115	0.73	0.94
3	0.0075	0.0020	86	-1.09	-0.92
4	<0.05	0.02	147		
5	0.00962	0.026	99	0.01	0.00
6	0.012	0.003	50	1.25	0.75
7	0.009	0.003	NR	-0.31	-0.19
8	<0.01	NR	NR		
9	<0.02	NR	54		
10	<0.05	NR	69		
11	NT	NT	NT		
12	0.010	0.003	91	0.21	0.13
13	0.011	0.0022	70	0.73	0.57
14	<0.02	NR	78		
15	< 0.18	0.09	89		
16	NR	NR	NR		
17	<0.01	NR	84.5		
18	NT	NT	NT		
19	0.082	0.02	NR	37.71	3.61
20	0.006	0.003	99	-1.87	-1.13
21	0.0087	0.00261	100	-0.47	-0.32
22	0.01	0.003	NR	0.21	0.13
23	0.007	0.01	NR	-1.35	-0.26
24	< 0.025	NR	111		
25	0.01	0.01	97	0.21	0.04
26	<0.02	NR	91		
27	0.01	0.01	69	0.21	0.04
28	<0.02	NR	91		
29	0.0115	0.0035	NR	0.99	0.52
30	0.00912	0.0023	75	-0.25	-0.19
31	<0.008	NR	103.1		
32	0.0181	0.00543	45.4	4.43	1.53
33	NT	NT	NT		
34	<0.5	NR	108		

Statistics*

Assigned Value**	0.0096	0.0011
Spike	Not Spiked	
Robust Average	0.0097	0.0012
Median	0.0100	0.0008
Mean	0.0100	
N	16	
Max.	0.0181	
Min.	0.006	
Robust SD	0.0019	
Robust CV	20%	

*Laboratory 19 excluded from statistical calculation (gross error).

**Robust Average excluding laboratory 32.

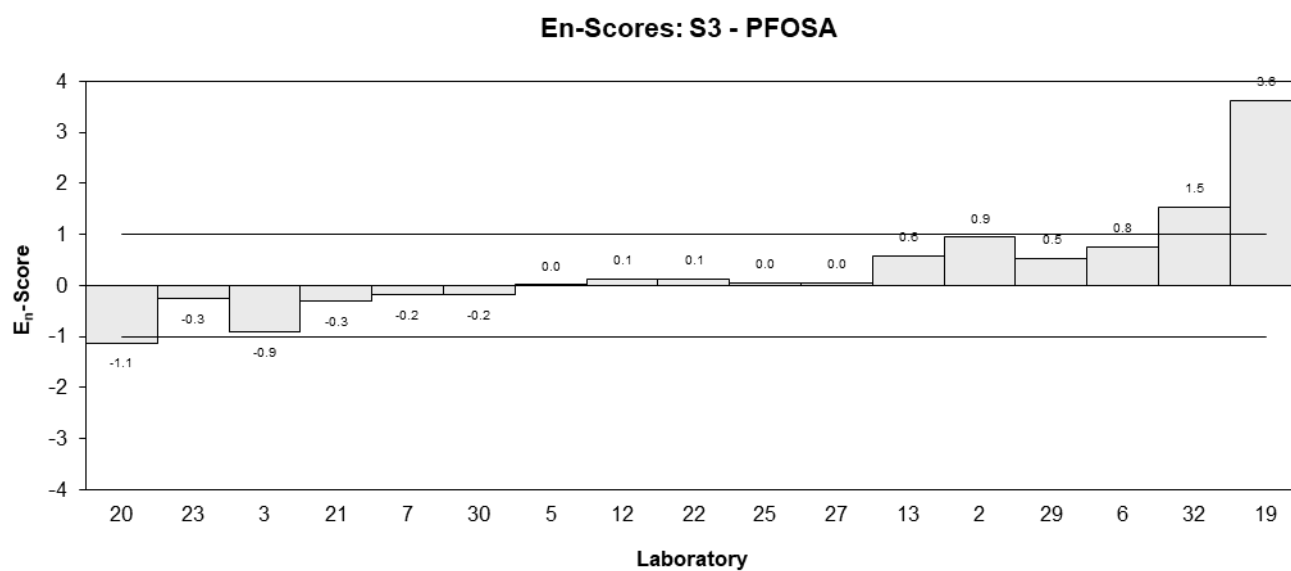
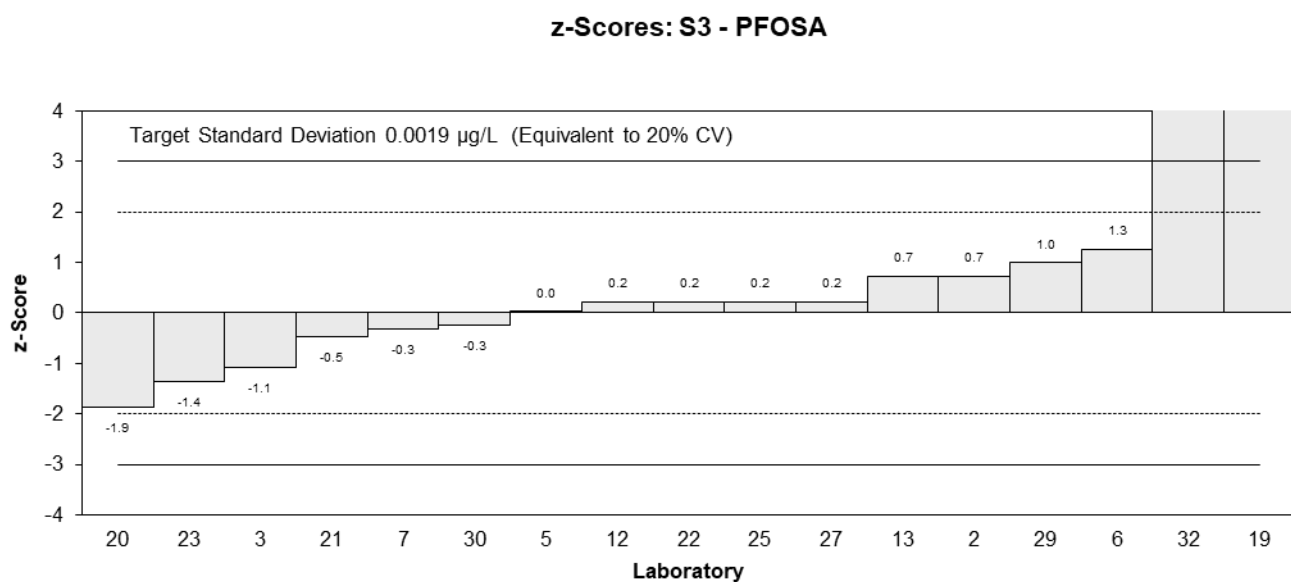
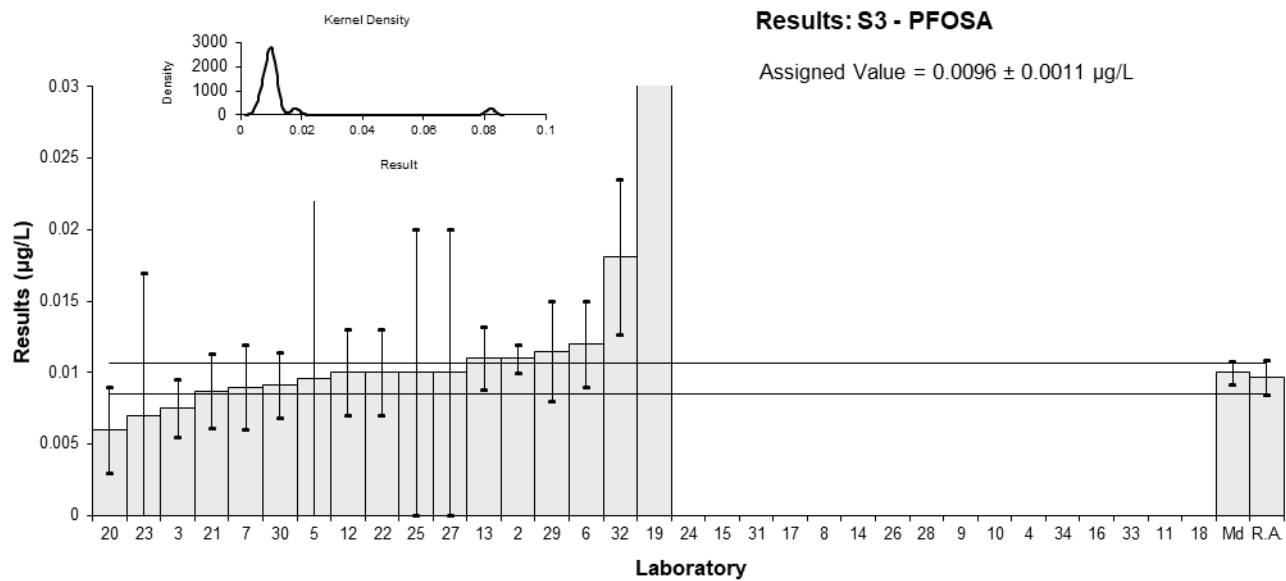


Figure 54

Table 58

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFBS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.069	0.011	123	0.40	0.44
3	0.062	0.017	85	-0.15	-0.11
4	0.06	0.02	118	-0.31	-0.19
5	0.0588	0.018	98	-0.40	-0.28
6	0.071	0.019	80-100	0.56	0.37
7	0.068	0.020	NR	0.32	0.20
8	0.061	0.0184	111	-0.23	-0.15
9	0.07	0.02	80	0.48	0.30
10	0.0976	0.08	103	2.64	0.42
11	0.06	0.02	98	-0.31	-0.19
12	0.062	0.019	103	-0.15	-0.10
13	0.063	0.019	88	-0.07	-0.05
14	0.056	0.012	141	-0.62	-0.63
15	0.067	0.038	104	0.24	0.08
16	0.057	0.013	110.3	-0.54	-0.51
17	0.05	0.03	96.3	-1.09	-0.46
18	0.07	0.01	NR	0.48	0.57
19	0.12	0.03	NR	4.39	1.86
20	0.050	0.007	81	-1.09	-1.76
21	0.064	0.019	102	0.01	0.01
22	0.13	NR	105	5.17	17.86
23	0.071	0.015	NR	0.56	0.46
24	0.061	0.0066	99	-0.23	-0.38
25	0.067	0.02	106	0.24	0.15
26	0.0696	0.019	117	0.45	0.29
27	0.058	0.02	92	-0.46	-0.29
28	0.079	0.02	92	1.18	0.74
29	0.0848	0.0254	90	1.64	0.81
30	0.0584	0.015	80	-0.43	-0.36
31	0.05	0.01	99.2	-1.09	-1.30
32	0.0658	0.0197	109	0.15	0.09
33	NT	NT	NT		
34	<0.2	NR	113		

Statistics

Assigned Value*	0.0639	0.0037
Spike	0.0700	0.0035
Robust Average	0.0651	0.0045
Median	0.0640	0.0030
Mean	0.0687	
N	31	
Max.	0.13	
Min.	0.05	
Robust SD	0.010	
Robust CV	15%	

*Robust Average excluding laboratories 19 and 22.

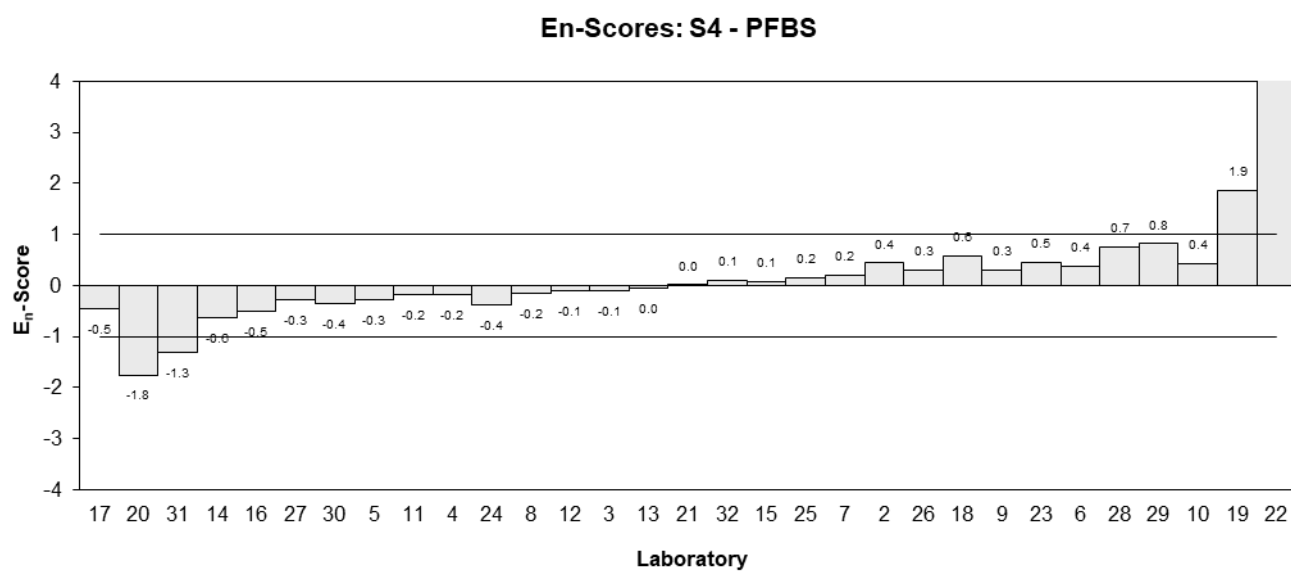
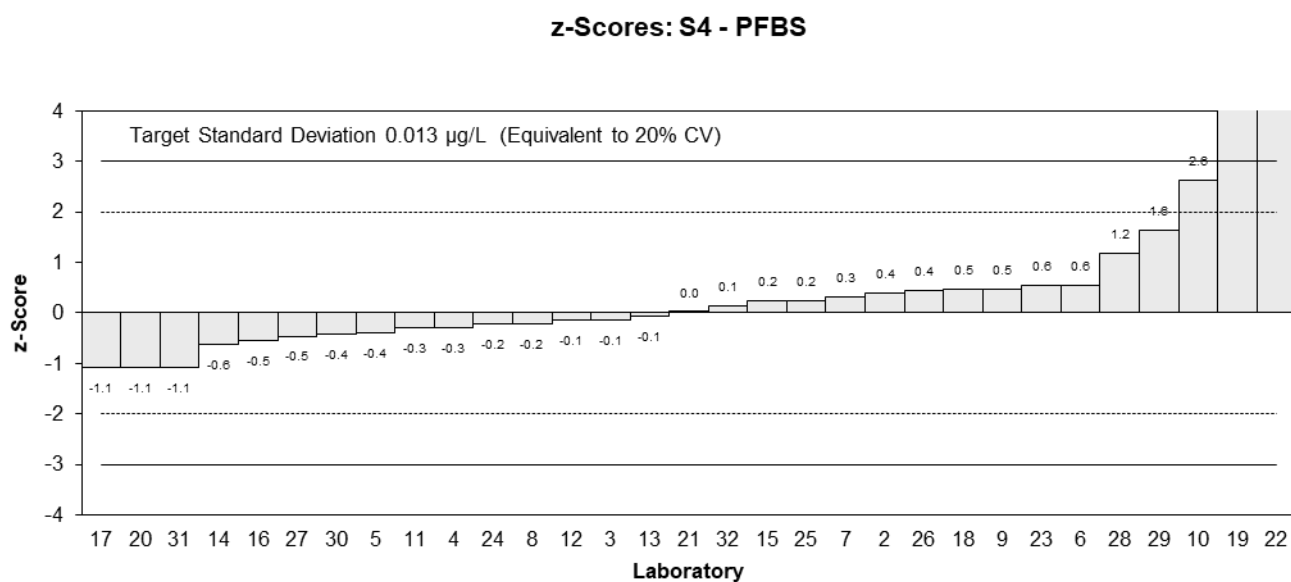
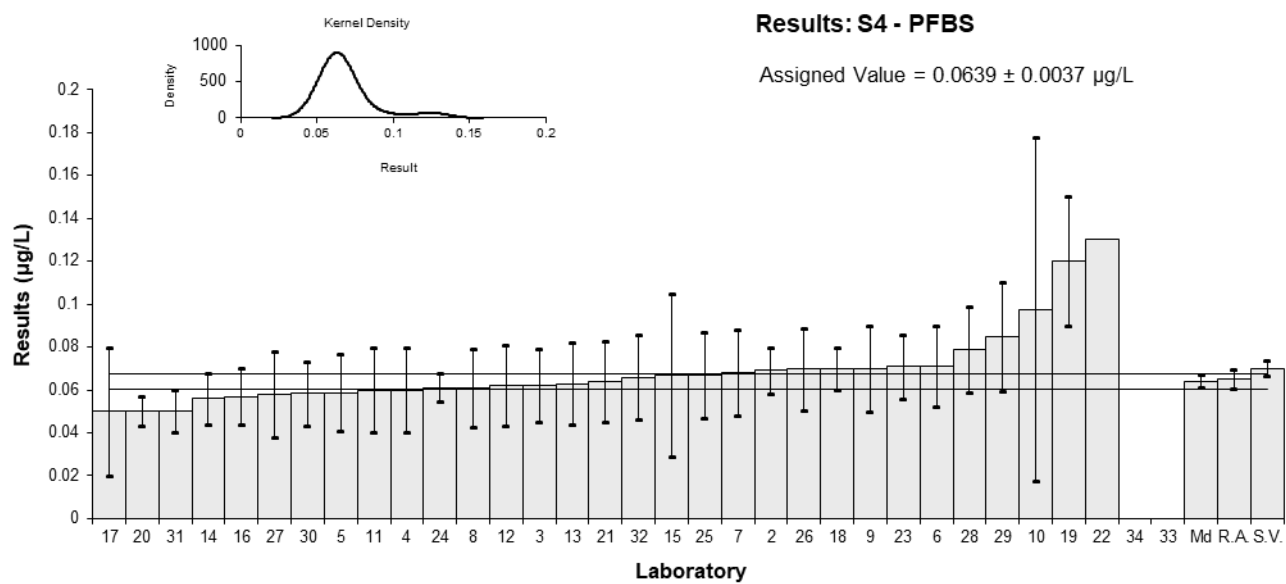


Figure 55

Table 59

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFPeS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.036	0.006	NR	0.25	0.26
3	0.030	0.0081	NR	-0.63	-0.50
4	0.03	0.01	NR	-0.63	-0.42
5	0.0325	0.0082	98	-0.26	-0.21
6	0.043	0.012	80-100	1.27	0.71
7	0.041	0.012	NR	0.98	0.54
8	0.030	0.0090	113	-0.63	-0.46
9	0.04	0.01	74	0.83	0.55
10	0.0506	0.1	NR	2.38	0.16
11	NT	NT	NT		
12	0.033	0.010	NR	-0.19	-0.13
13	0.033	0.0066	88	-0.19	-0.18
14	0.031	0.012	135	-0.48	-0.27
15	0.032	0.016	NR	-0.34	-0.14
16	0.031	0.009	NR	-0.48	-0.35
17	0.03	0.02	94.9	-0.63	-0.21
18	NT	NT	NT		
19	0.041	0.01	NR	0.98	0.65
20	0.026	0.003	114	-1.21	-2.06
21	0.0338	0.01014	100	-0.07	-0.05
22	0.06	NR	NR	3.75	9.52
23	0.035	0.014	NR	0.10	0.05
24	0.031	0.0082	105	-0.48	-0.38
25	0.038	0.01	98	0.54	0.36
26	0.0409	0.011	117	0.96	0.58
27	0.033	0.01	89	-0.19	-0.13
28	0.047	0.02	91	1.85	0.63
29	0.0367	0.011	NR	0.35	0.21
30	0.0301	0.0075	75	-0.61	-0.53
31	0.03	0.01	NR	-0.63	-0.42
32	0.0283	0.00849	109	-0.87	-0.67
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	0.0343	0.0027
Spike	0.0328	0.0016
Robust Average	0.0347	0.0028
Median	0.0330	0.0017
Mean	0.0357	
N	29	
Max.	0.06	
Min.	0.026	
Robust SD	0.0060	
Robust CV	17%	

*Robust Average excluding laboratory 22.

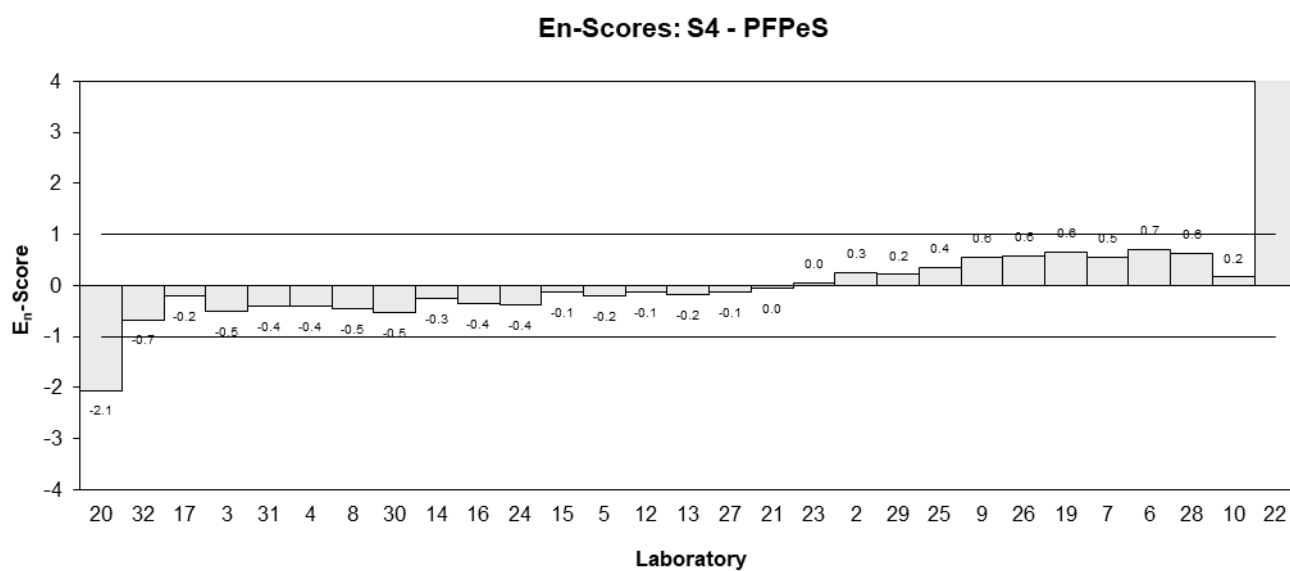
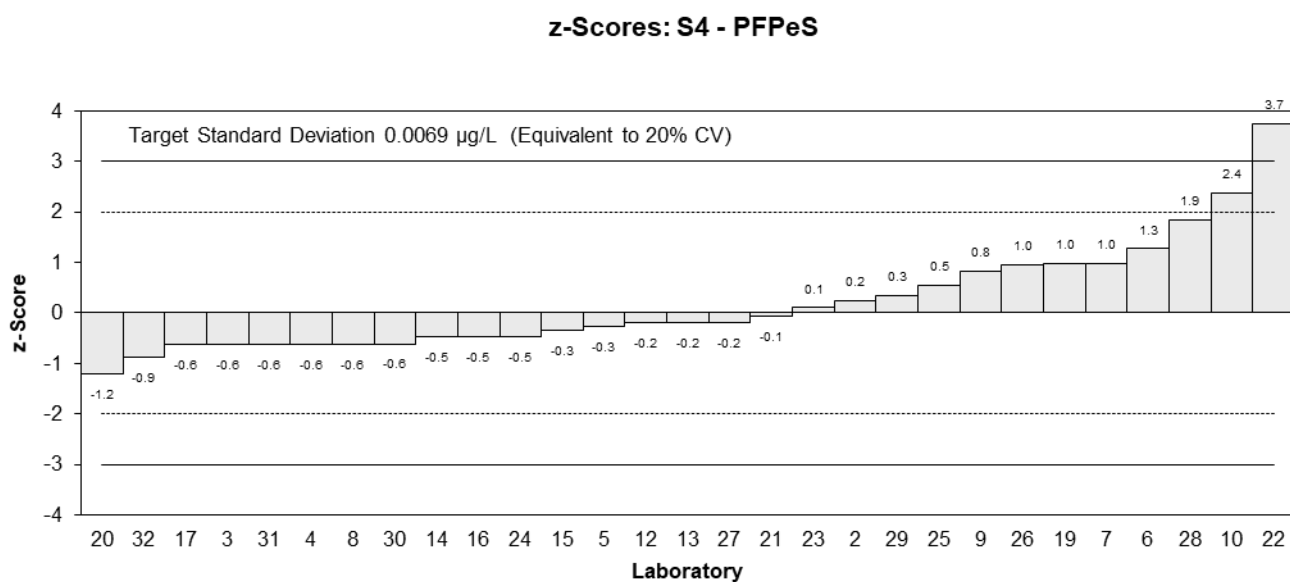
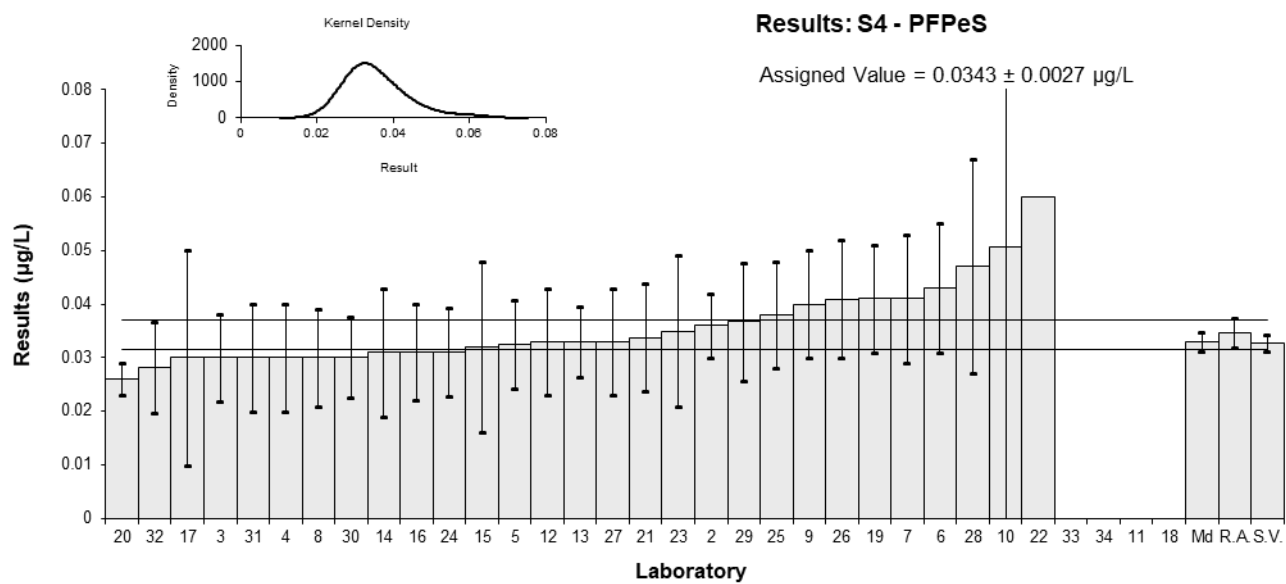


Figure 56

Table 60

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFHxS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.033	0.005	NR	1.02	1.01
3	0.025	0.0067	NR	-0.44	-0.34
4	0.02	0.01	130	-1.35	-0.72
5	0.0293	0.00523	84	0.35	0.33
6	0.038	0.010	80-100	1.93	1.03
7	0.033	0.010	NR	1.02	0.54
8	0.034	0.0101	113	1.20	0.64
9	0.03	0.01	74	0.47	0.25
10	0.0486	0.01	126	3.87	2.06
11	0.02	0.01	89	-1.35	-0.72
12	0.025	0.008	91	-0.44	-0.29
13	0.027	0.0054	87	-0.07	-0.07
14	0.025	0.005	135	-0.44	-0.43
15	0.028	0.014	100	0.11	0.04
16	0.023	0.005	102.1	-0.80	-0.79
17	0.02	0.01	91.5	-1.35	-0.72
18	0.03	0.01	NR	0.47	0.25
19	0.030	0.01	NR	0.47	0.25
20	0.024	0.005	114	-0.62	-0.61
21	0.0269	0.00807	100	-0.09	-0.06
22	0.05	NR	101	4.12	9.42
23	0.029	0.014	NR	0.29	0.11
24	0.026	0.0044	94	-0.26	-0.28
25	0.029	0.01	98	0.29	0.16
26	0.0297	0.011	114	0.42	0.20
27	0.024	0.01	89	-0.62	-0.33
28	0.04	0.01	91	2.30	1.23
29	0.0304	0.0091	75	0.55	0.32
30	0.0255	0.0064	88	-0.35	-0.28
31	0.02	NR	NR	-1.35	-3.08
32	<0.025	NR	110		
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.0274	0.0024
Spike	0.0284	0.0014
Robust Average	0.0282	0.0027
Median	0.0285	0.0019
Mean	0.0291	
N	30	
Max.	0.05	
Min.	0.02	
Robust SD	0.0059	
Robust CV	21%	

*Robust Average excluding laboratories 10 and 22.

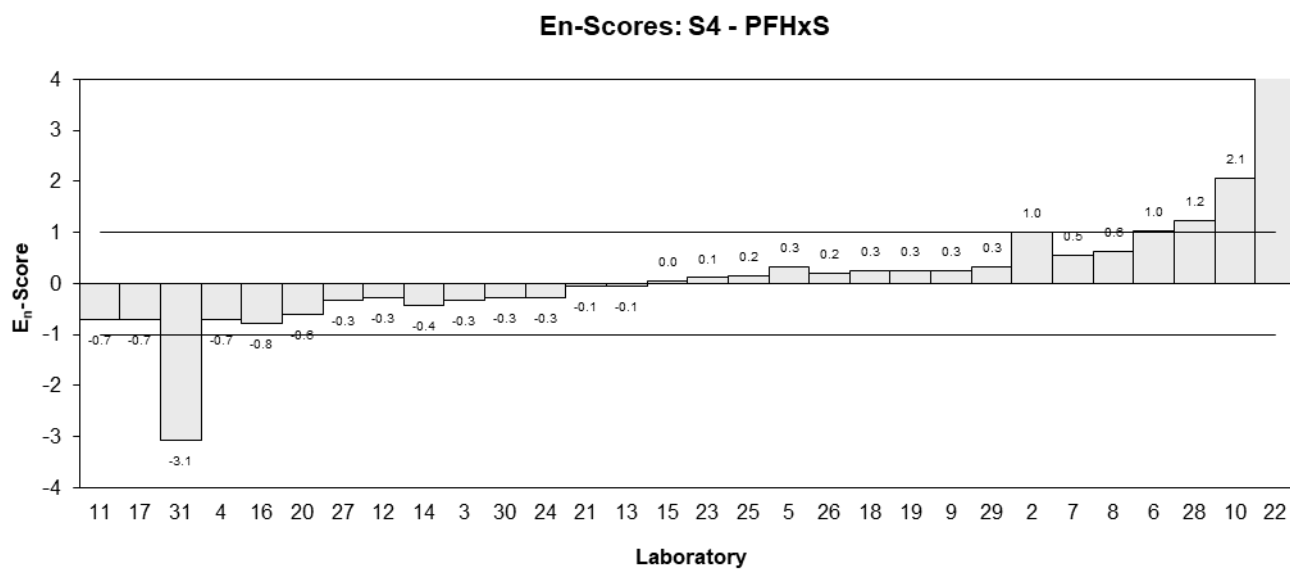
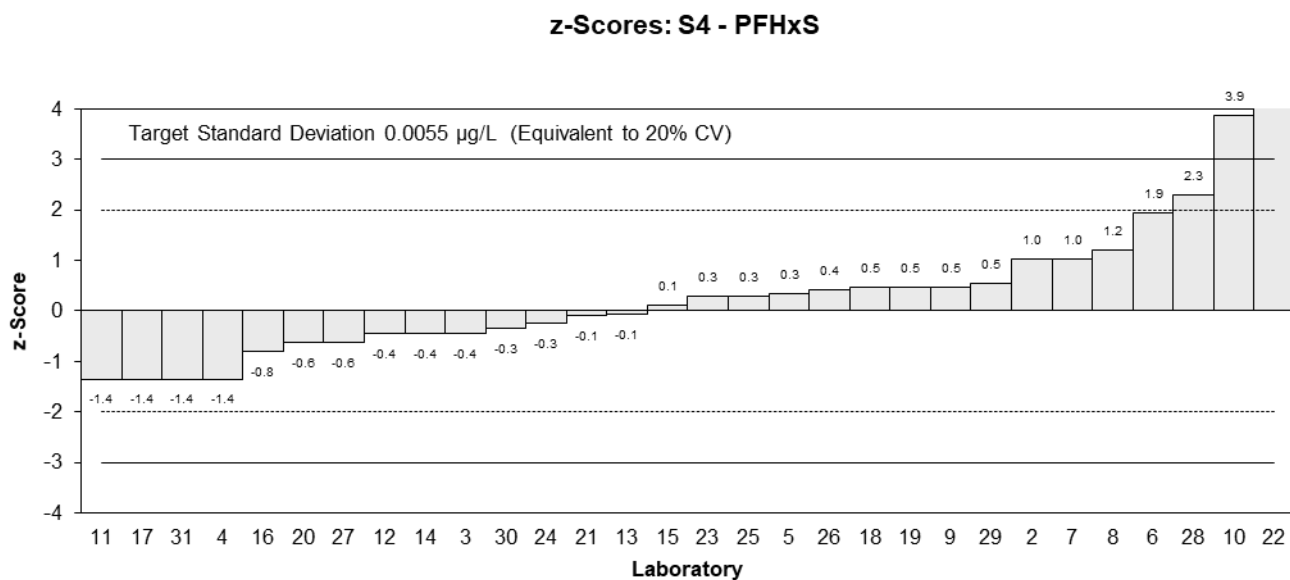
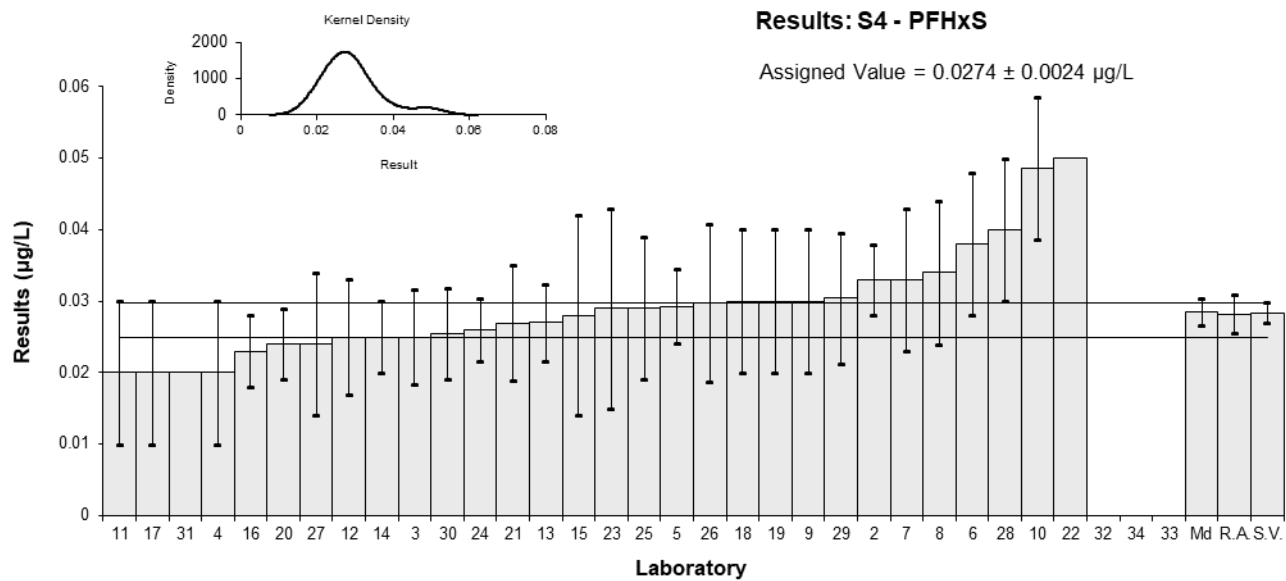


Figure 57

Table 61

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFHxS_L
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.033	0.005	109	1.37	1.28
3	0.025	0.0067	94	-0.17	-0.13
4	0.02	0.01	130	-1.14	-0.57
5	0.0293	0.00523	84	0.66	0.59
6	NT	NT	NT		
7	0.033	0.010	NR	1.37	0.69
8	0.026	0.0078	113	0.02	0.01
9	NT	NT	NT		
10	NR	NR	NR		
11	NT	NT	NT		
12	0.025	0.008	91	-0.17	-0.11
13	0.027	0.0054	87	0.21	0.19
14	NT	NT	NT		
15	0.028	0.014	NR	0.41	0.15
16	0.023	0.005	102.1	-0.56	-0.52
17	0.02	0.01	91.25	-1.14	-0.57
18	0.02	0.00	NR	-1.14	-2.46
19	NT	NT	NT		
20	0.024	0.005	114	-0.37	-0.34
21	0.0269	0.00807	100	0.19	0.12
22	0.05	NR	NR	4.65	10.04
23	0.029	0.014	NR	0.60	0.22
24	0.026	0.0044	94	0.02	0.02
25	0.029	0.01	98	0.60	0.30
26	NT	NT	NT		
27	0.024	0.01	89	-0.37	-0.18
28	NT	NT	NT		
29	0.0304	0.0091	NR	0.87	0.48
30	0.0255	0.0064	88	-0.08	-0.06
31	0.02	NR	101	-1.14	-2.46
32	<0.025	NR	110		
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	0.0259	0.0024
Spike	0.0284	0.0014
Robust Average	0.0262	0.0025
Median	0.0260	0.0020
Mean	0.0270	
N	22	
Max.	0.05	
Min.	0.02	
Robust SD	0.0047	
Robust CV	18%	

*Robust Average excluding laboratory 22.

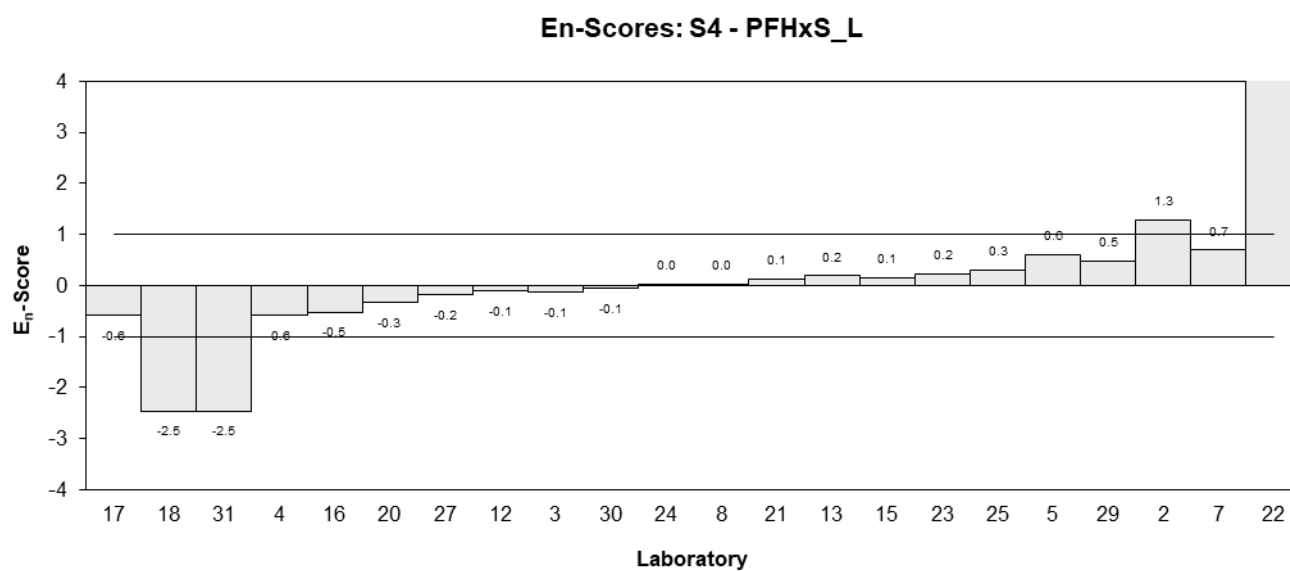
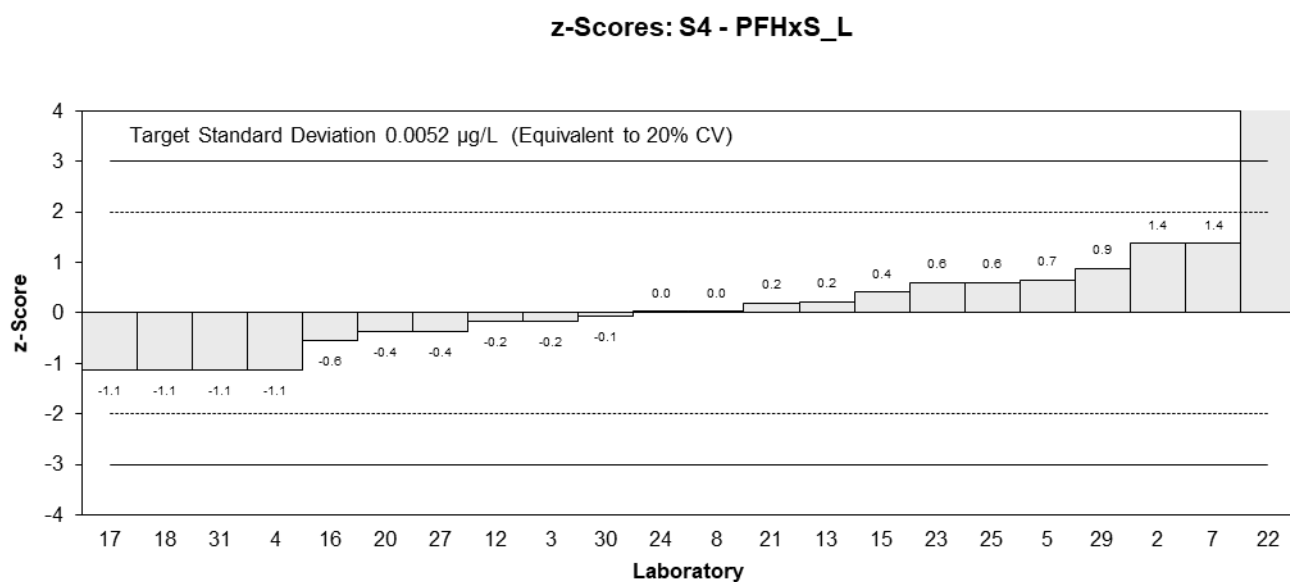
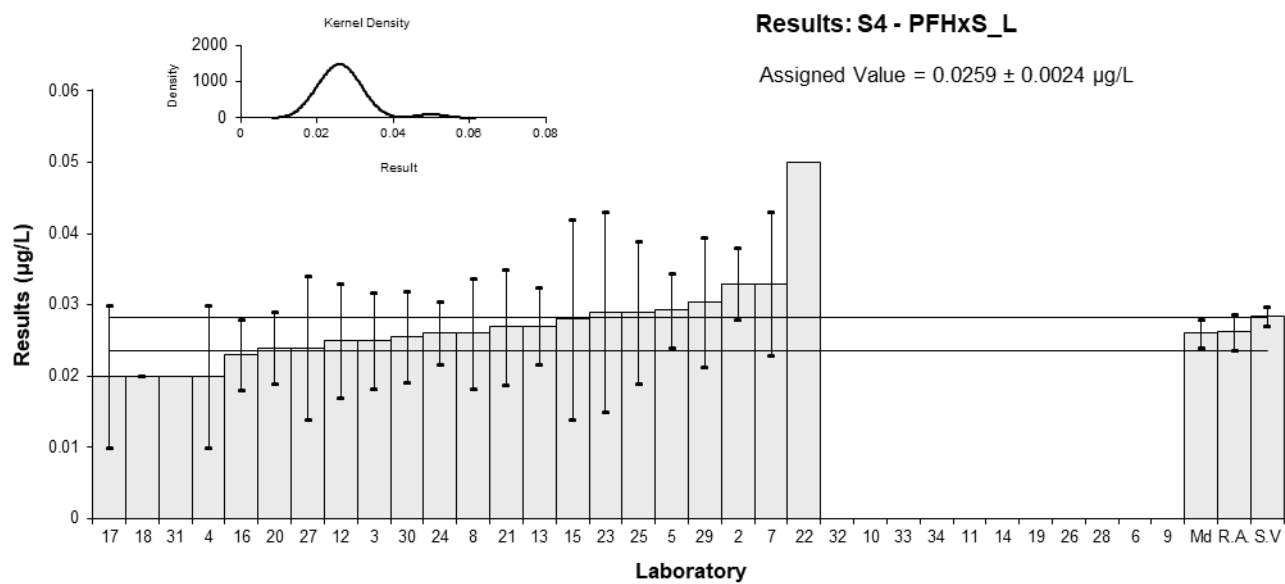


Figure 58

Table 62

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFHpS
Units	µg/L

Participant Results

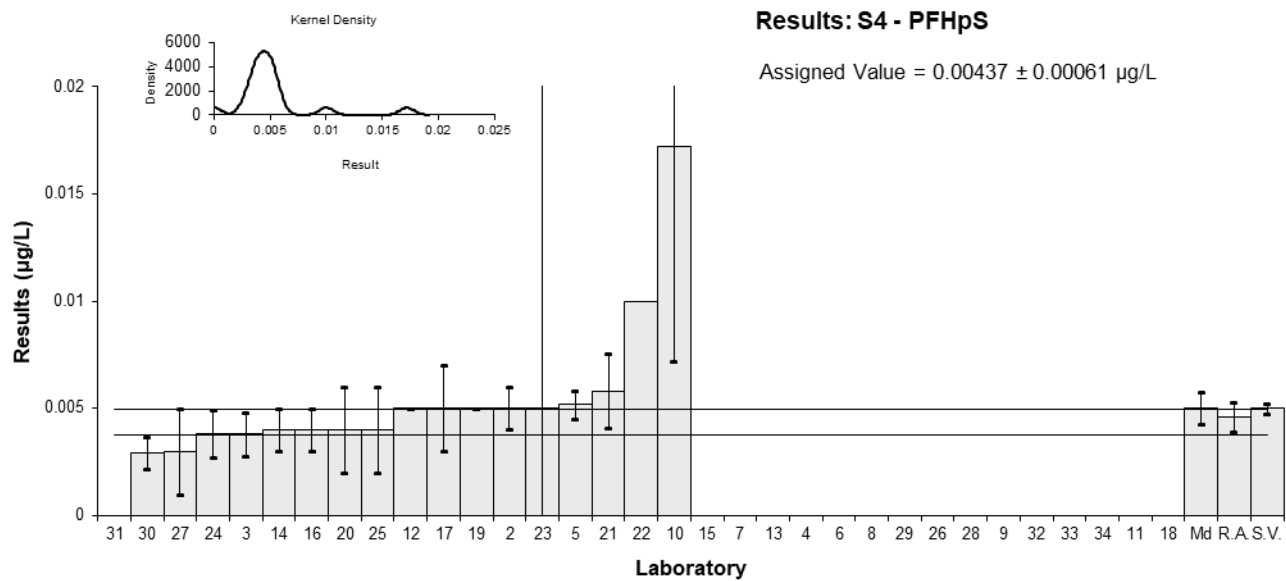
Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.005	0.001	NR	0.72	0.54
3	0.0038	0.0010	NR	-0.65	-0.49
4	<0.01	0.003	NR		
5	0.00518	0.00067	86	0.93	0.89
6	<0.01	NR	80-100		
7	<0.005	0.002	NR		
8	<0.01	NR	113		
9	<0.02	NR	74		
10	0.0172	0.01	NR	14.68	1.28
11	NT	NT	NT		
12	0.005	0.000	NR	0.72	1.03
13	<0.01	NR	NR		
14	0.004	0.001	135	-0.42	-0.32
15	< 0.02	0.01	NR		
16	0.004	0.001	NR	-0.42	-0.32
17	0.005	0.002	91.25	0.72	0.30
18	NT	NT	NT		
19	0.005	0.00	NR	0.72	1.03
20	0.004	0.002	114	-0.42	-0.18
21	0.0058	0.00174	94	1.64	0.78
22	0.01	NR	NR	6.44	9.23
23	0.005	0.024	NR	0.72	0.03
24	0.0038	0.0011	94	-0.65	-0.45
25	0.004	0.002	94	-0.42	-0.18
26	<0.02	NR	111		
27	0.003	0.002	89	-1.57	-0.66
28	<0.02	NR	91		
29	<0.0100	NR	NR		
30	0.00294	0.00074	73	-1.64	-1.49
31	0.00	NR	NR	-5.00	-7.16
32	<0.025	NR	110		
33	NT	NT	NT		
34	NR	NR	NR		

Statistics*

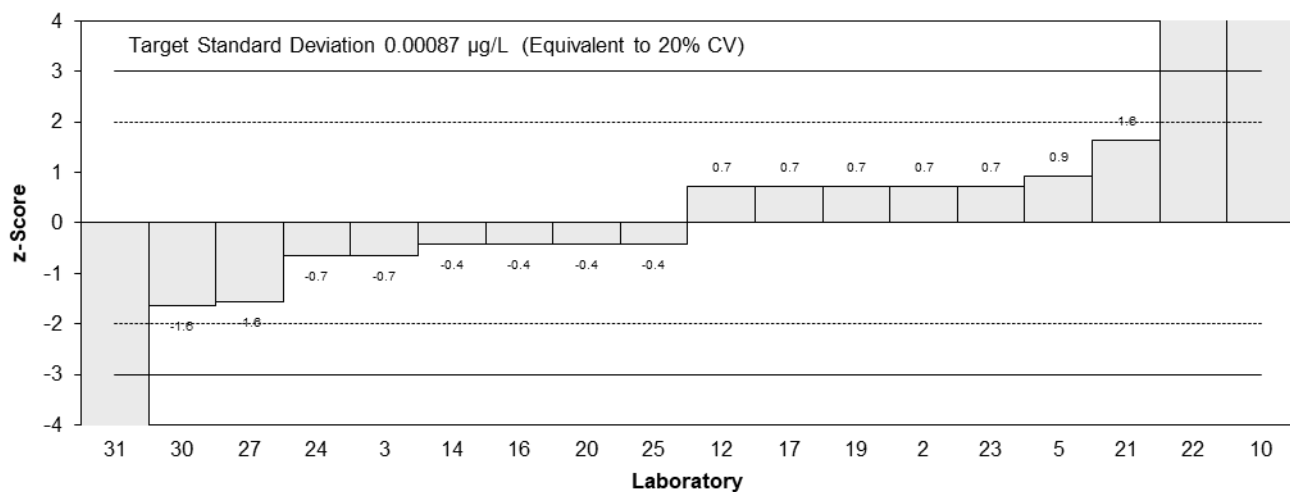
Assigned Value**	0.00437	0.00061
Spike	0.00500	0.00025
Robust Average	0.00460	0.00070
Median	0.00500	0.00076
Mean	0.00545	
N	17	
Max.	0.0172	
Min.	0.00294	
Robust SD	0.0012	
Robust CV	25%	

*Laboratory 31 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 10 and 22.



z-Scores: S4 - PFHpS



En-Scores: S4 - PFHpS

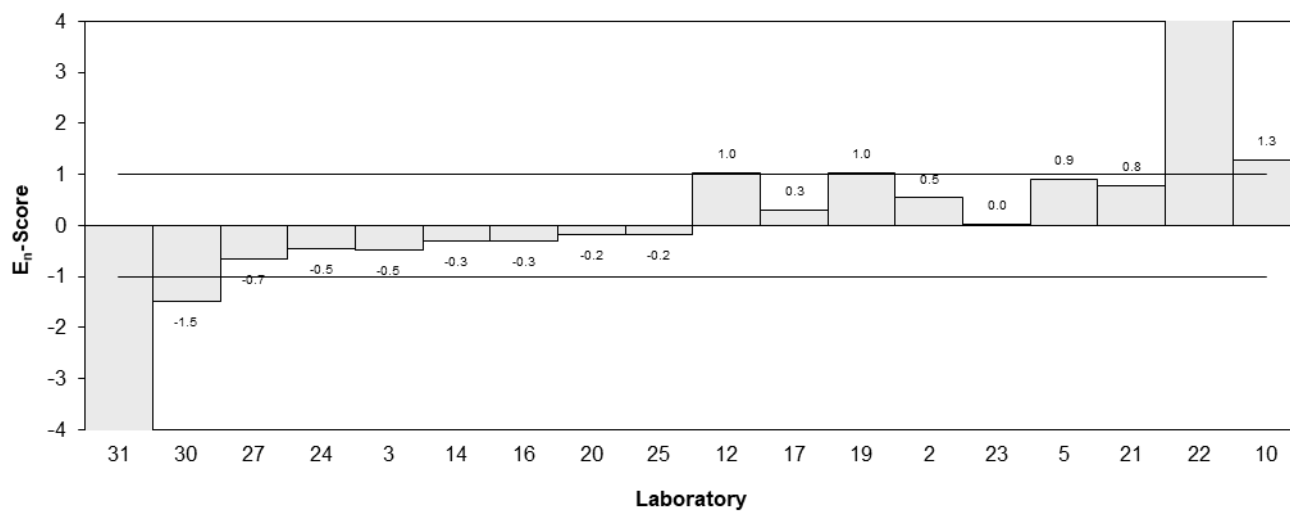


Figure 59

Table 63

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFOS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.016	0.002	NR	0.80	0.80
3	0.012	0.0034	NR	-0.65	-0.46
4	0.01	0.00	134	-1.38	-2.00
5	0.0136	0.0022	86	-0.07	-0.07
6	0.014	0.004	80-100	0.07	0.05
7	0.019	0.006	NR	1.88	0.83
8	0.014	0.0041	123	0.07	0.04
9	0.02	0.01	97	2.25	0.61
10	NR	NR	NR		
11	0.01	0.01	78	-1.38	-0.37
12	0.014	0.004	68	0.07	0.05
13	<0.02	NR	NR		
14	0.012	0.003	137	-0.65	-0.51
15	< 0.02	0.01	100		
16	0.012	0.002	89.5	-0.65	-0.65
17	0.02	0.004	94.9	2.25	1.40
18	0.01	0.00	NR	-1.38	-2.00
19	0.020	0.01	124	2.25	0.61
20	0.012	0.006	110	-0.65	-0.29
21	0.0126	0.00378	94	-0.43	-0.28
22	0.03	NR	107	5.87	8.53
23	0.013	0.014	NR	-0.29	-0.06
24	0.011	0.0039	98	-1.01	-0.65
25	0.013	0.005	94	-0.29	-0.15
26	0.0142	NR	111	0.14	0.21
27	0.009	0.005	66	-1.74	-0.90
28	0.018	0.01	90	1.52	0.41
29	0.0188	0.0056	70	1.81	0.85
30	0.0118	0.0029	95	-0.72	-0.58
31	0.01	NR	NR	-1.38	-2.00
32	<0.017	NR	94.5		
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.0138	0.0019
Spike	0.0143	0.0007
Robust Average	0.0141	0.0020
Median	0.0130	0.0012
Mean	0.0144	
N	27	
Max.	0.03	
Min.	0.009	
Robust SD	0.0041	
Robust CV	29%	

*Robust Average excluding laboratory 22.

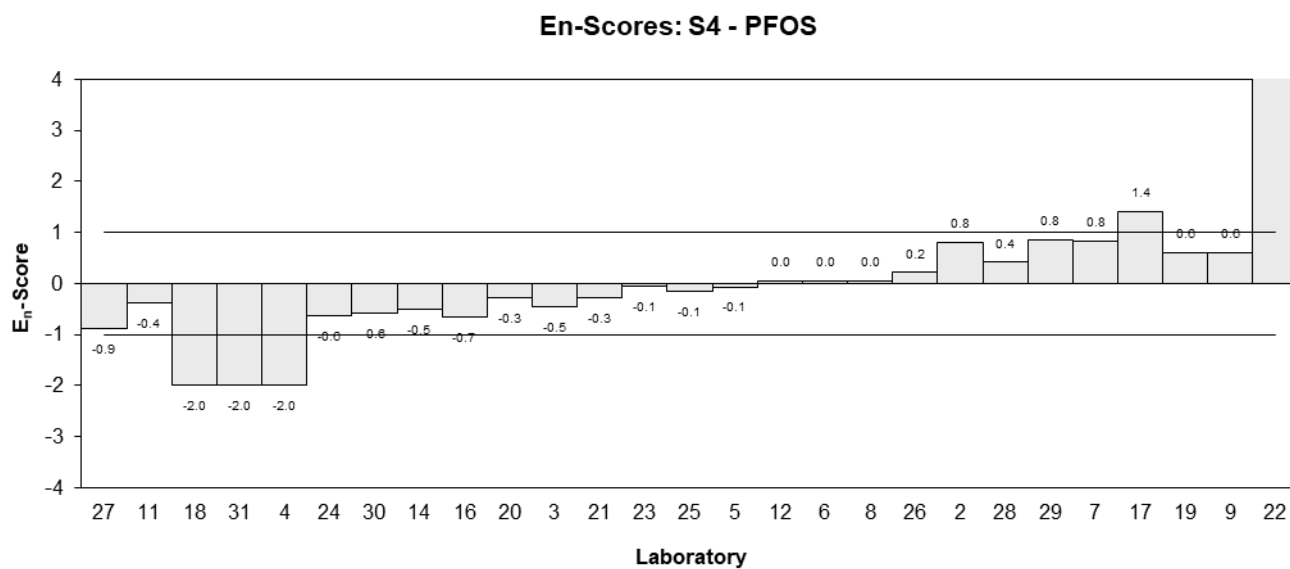
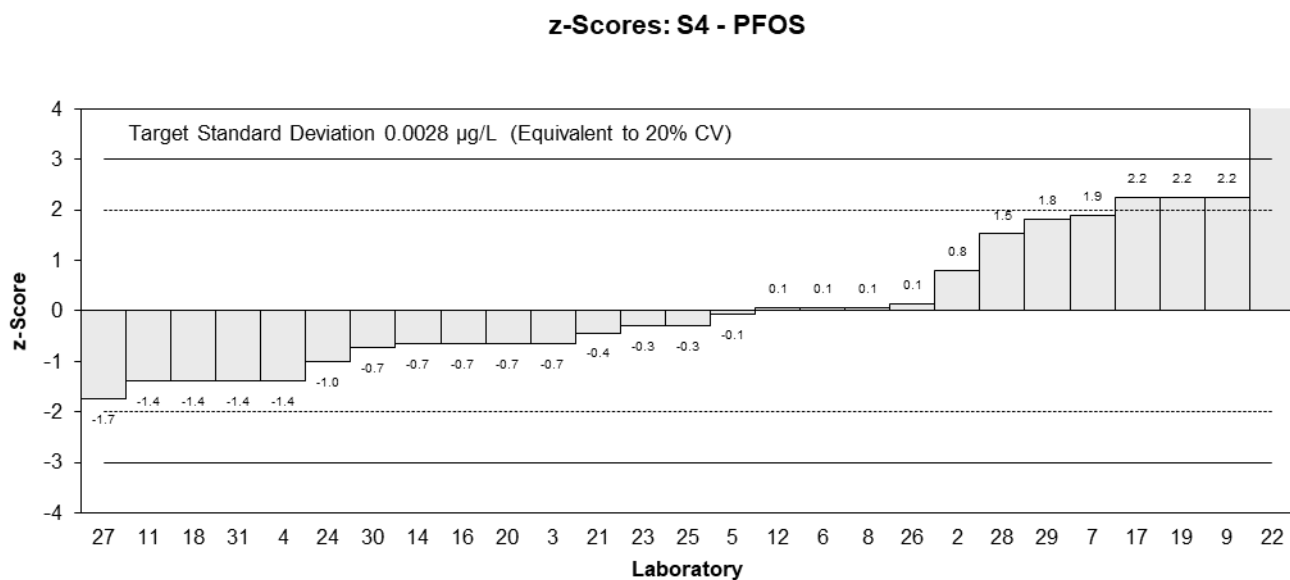
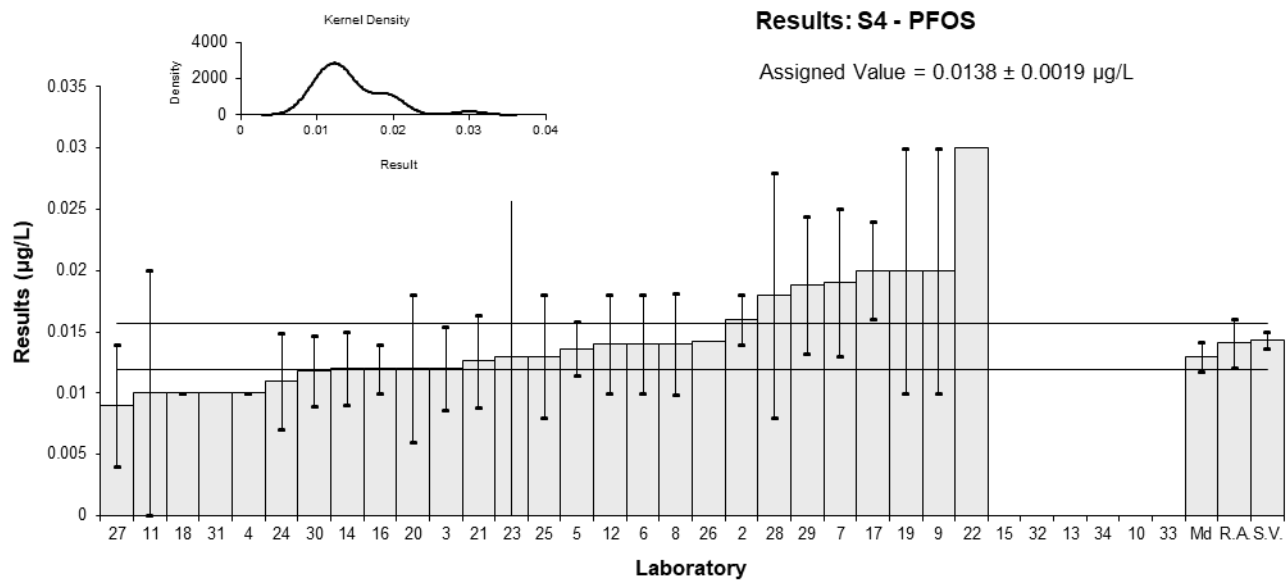


Figure 60

Table 64

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFOS_L
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.016	0.002	118	0.93	0.88
3	0.012	0.0034	84	-0.56	-0.38
4	0.01	0.00	134	-1.30	-1.75
5	0.0136	0.0022	86	0.04	0.03
6	NT	NT	NT		
7	0.019	0.006	NR	2.04	0.87
8	0.012	0.0037	123	-0.56	-0.36
9	0.02	0.01	94	2.41	0.64
10	<0.01	NR	112		
11	NT	NT	NT		
12	0.014	0.004	68	0.19	0.11
13	<0.02	NR	NR		
14	NT	NT	NT		
15	< 0.02	0.01	NR		
16	0.011	0.002	89.5	-0.93	-0.88
17	0.02	0.004	94.9	2.41	1.45
18	0.01	0.00	NR	-1.30	-1.75
19	NT	NT	NT		
20	0.011	0.006	110	-0.93	-0.40
21	0.0126	0.00378	94	-0.33	-0.21
22	0.02	NR	NR	2.41	3.25
23	0.013	0.014	NR	-0.19	-0.04
24	0.011	0.0039	98	-0.93	-0.57
25	0.013	0.005	94	-0.19	-0.09
26	0.0142	NR	111	0.26	0.35
27	0.009	0.005	66	-1.67	-0.84
28	NT	NT	NT		
29	0.0188	0.0056	NR	1.96	0.89
30	0.0118	0.0029	95	-0.63	-0.48
31	0.01	NR	NR	-1.30	-1.75
32	<0.017	NR	94.5		
33	0.0113	0.0029	89.9	-0.81	-0.62
34	NR	NR	NR		

Statistics

Assigned Value	0.0135	0.0020
Spike	0.0143	0.0007
Robust Average	0.0135	0.0020
Median	0.0126	0.0010
Mean	0.0136	
N	23	
Max.	0.02	
Min.	0.009	
Robust SD	0.0039	
Robust CV	29%	

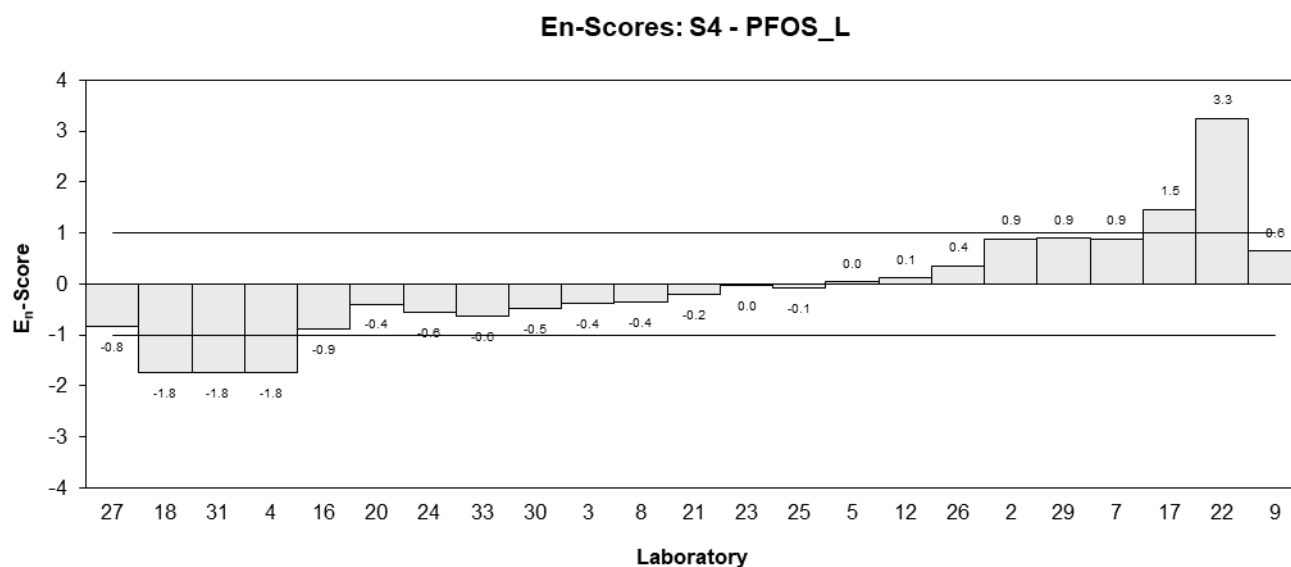
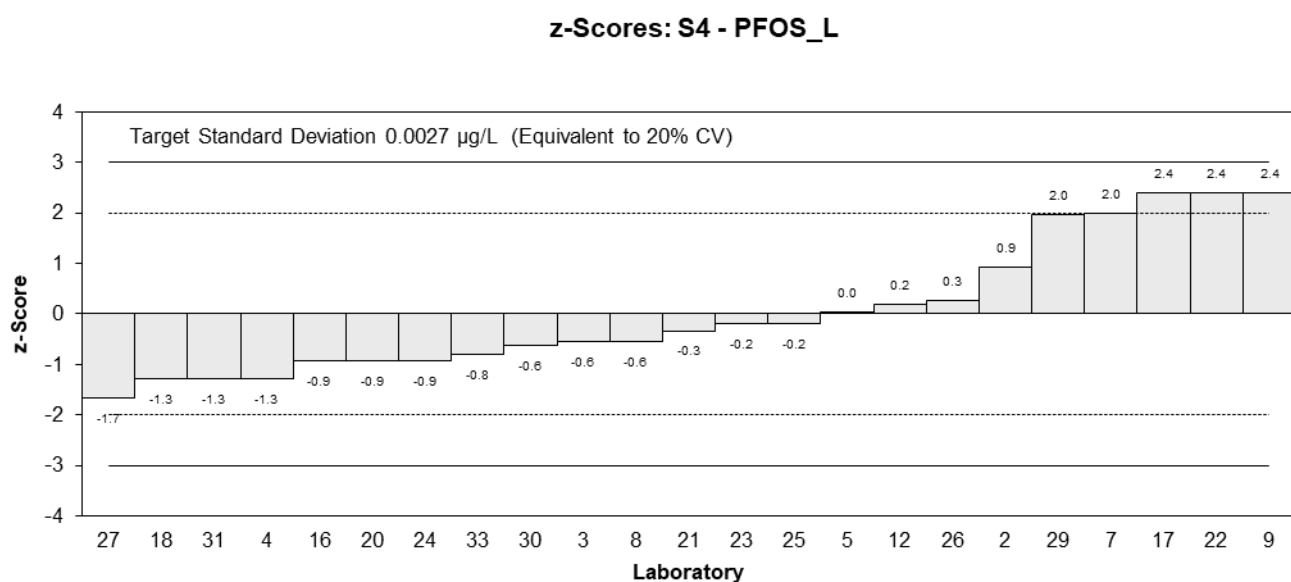
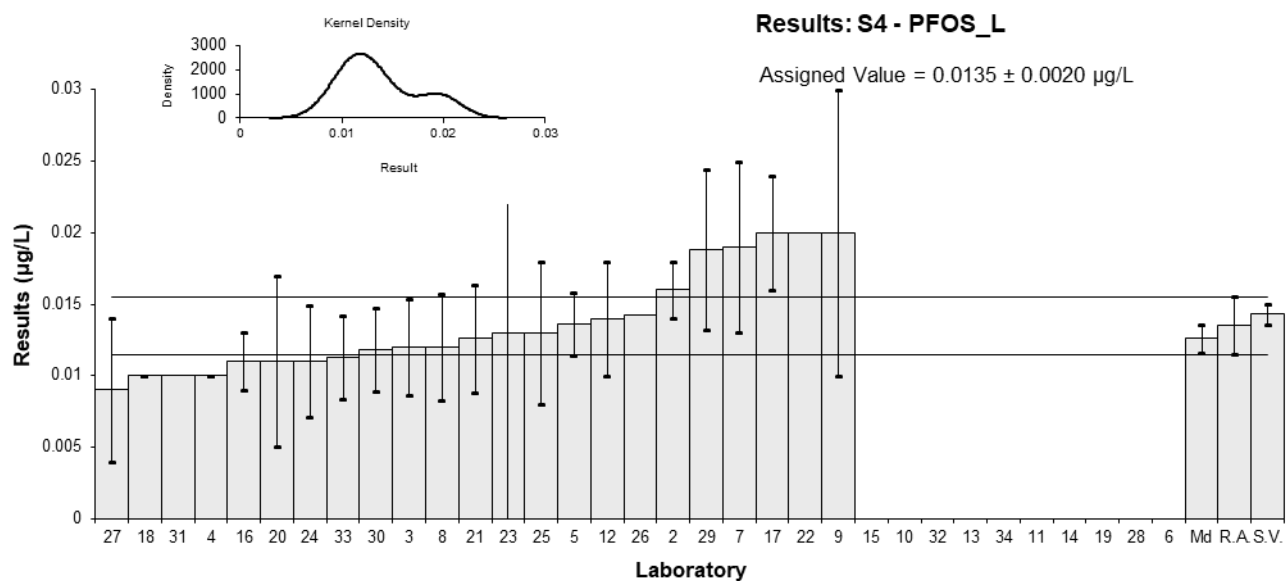


Figure 61

Table 65

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFDS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	0.035	0.004	NR
3	0.039	0.011	NR
4	0.04	0.01	NR
5	0.0572	0.01	86
6	0.031	0.008	80-100
7	0.056	0.017	NR
8	0.034	0.0102	123
9	0.06	0.02	84
10	0.118	NR	NR
11	NT	NT	NT
12	0.036	0.011	NR
13	0.052	0.010	89
14	0.056	0.013	137
15	<0.09	0.045	NR
16	0.056	0.022	NR
17	0.03	0.02	94.9
18	NT	NT	NT
19	0.087	0.023	NR
20	0.035	0.017	110
21	0.0315	0.00945	94
22	0.09	NR	NR
23	0.011	0.014	NR
24	NR	NR	NR
25	0.045	0.02	94
26	0.0548	0.018	111
27	0.031	0.02	55
28	0.076	0.02	90
29	NT	NT	NT
30	0.0315	0.0079	73
31	0.02	NR	NR
32	0.0728	0.0218	116
33	NT	NT	NT
34	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike	0.0645	0.0032
Robust Average	0.047	0.011
Median	0.0425	0.0074
Mean	0.0495	
N	26	
Max.	0.118	
Min.	0.011	
Robust SD	0.022	
Robust CV	45%	

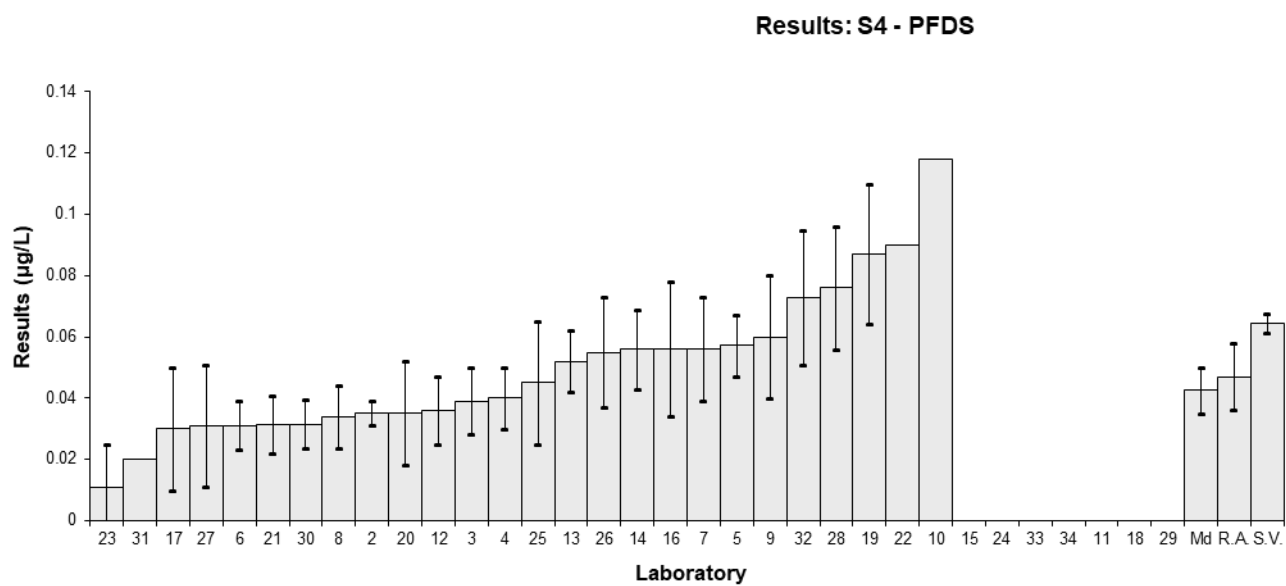


Figure 62

Table 66

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFUdS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	NT	NT	NT
3	NT	NT	NT
4	NT	NT	NT
5	NT	NT	NT
6	0.034	0.009	70
7	NT	NT	NT
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NT	NT	NT
17	NT	NT	NT
18	NT	NT	NT
19	NT	NT	NT
20	NT	NT	NT
21	NT	NT	NT
22	NT	NT	NT
23	NT	NT	NT
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	0.0328	NR	NR
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
34	NR	NR	NR

Statistics*

Assigned Value	Not Set	
Spike	0.0966	0.0048
Mean	0.0334	
N	2	

*Insufficient data to calculate statistics.

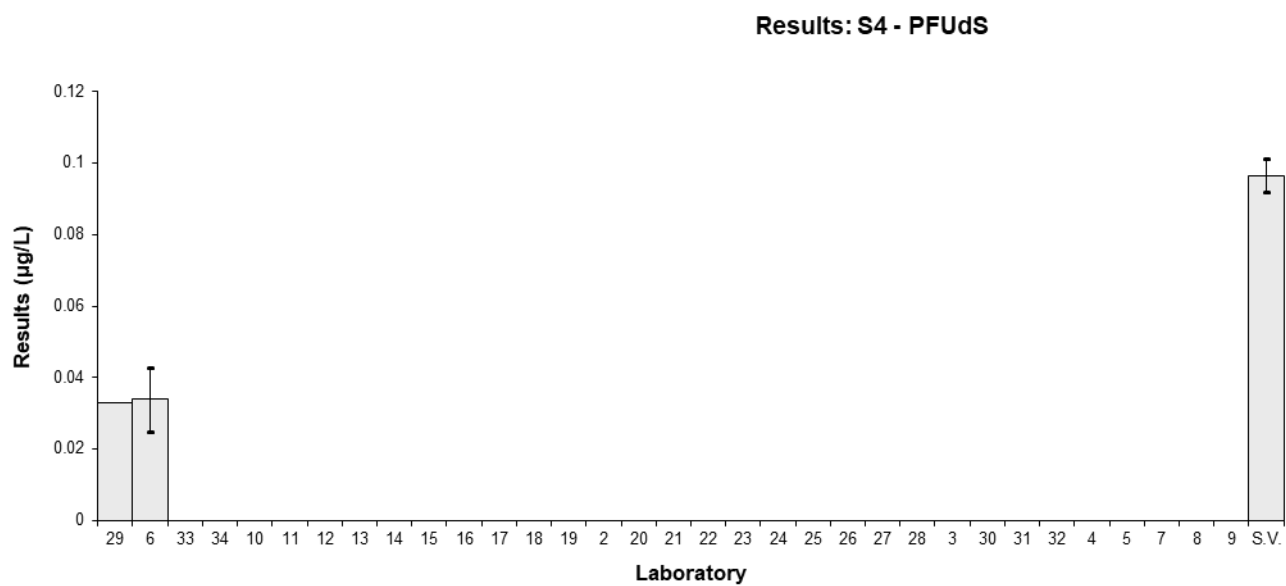


Figure 63

Table 67

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFDoS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	NT	NT	NT
3	NT	NT	NT
4	NT	NT	NT
5	0.0339	0.0099	86
6	0.014	0.004	70
7	NT	NT	NT
8	<0.02	NR	NR
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NT	NT	NT
17	<0.03	NR	41.9
18	NT	NT	NT
19	NT	NT	NT
20	NT	NT	NT
21	0.0156	0.00468	94
22	NT	NT	NT
23	NT	NT	NT
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	0.0117	0.0029	75
31	<0.002	NR	NR
32	NT	NT	NT
33	NT	NT	NT
34	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike	0.0387	0.0019
Median	0.0148	0.0046
Mean	0.0188	
N	4	
Max.	0.0339	
Min.	0.0117	

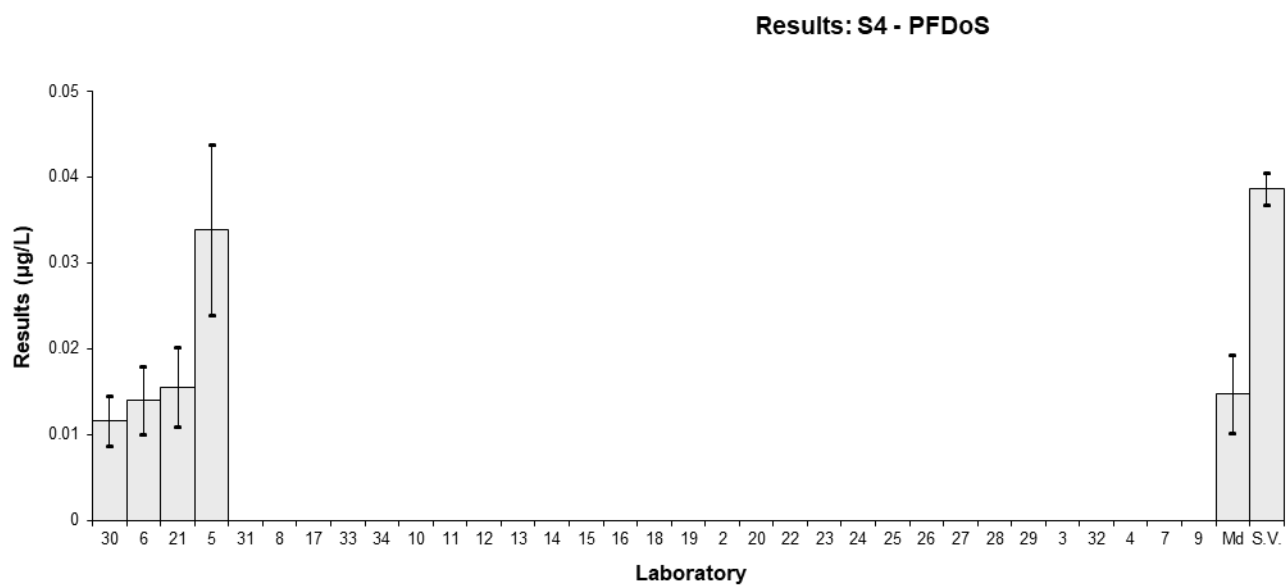


Figure 64

Table 68

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFTTrDS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	NT	NT	NT
3	NT	NT	NT
4	NT	NT	NT
5	NT	NT	NT
6	0.028	0.008	70
7	NT	NT	NT
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NT	NT	NT
17	NT	NT	NT
18	NT	NT	NT
19	NT	NT	NT
20	NT	NT	NT
21	NT	NT	NT
22	NT	NT	NT
23	NT	NT	NT
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	0.0357	NR	NR
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
34	NR	NR	NR

Statistics*

Assigned Value	Not Set	
Spike	0.0582	0.0029
Mean	0.032	
N	2	

*Insufficient data to calculate statistics.

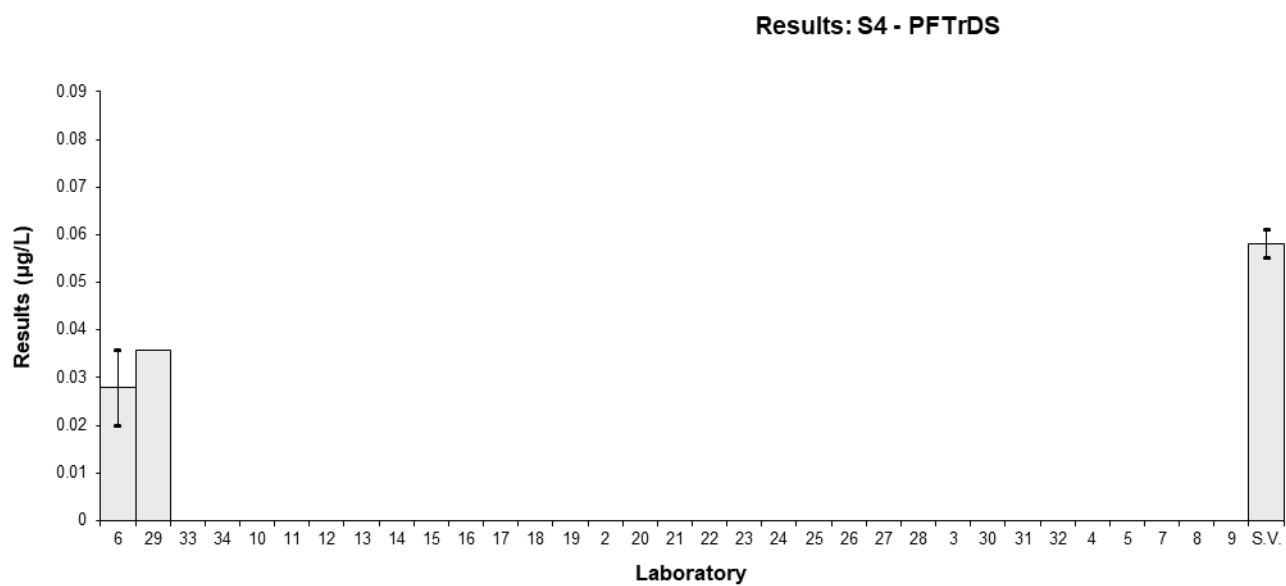


Figure 65

Table 69

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFBA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.051	0.007	75	0.58	0.71
3	0.041	0.011	98	-0.51	-0.42
4	0.05	0.02	97	0.47	0.21
5	0.0513	0.01	85	0.61	0.54
6	0.044	0.012	80-100	-0.19	-0.14
7	0.044	0.013	NR	-0.19	-0.13
8	0.051	0.0153	29	0.58	0.34
9	<0.1	NR	85		
10	0.021	0.03	110	-2.70	-0.82
11	NT	NT	NT		
12	0.044	0.013	81	-0.19	-0.13
13	0.048	0.0096	96	0.25	0.23
14	0.04	0.012	141	-0.62	-0.46
15	0.05	0.03	92	0.47	0.14
16	0.042	0.012	95.3	-0.40	-0.30
17	0.03	0.02	93.6	-1.72	-0.78
18	0.06	0.01	NR	1.56	1.38
19	0.052	0.01	NR	0.69	0.61
20	0.042	0.007	93	-0.40	-0.50
21	0.0465	0.01395	97	0.09	0.06
22	0.09	NR	98	4.85	17.04
23	0.05	0.008	NR	0.47	0.51
24	0.044	0.037	100	-0.19	-0.05
25	0.047	0.01	102	0.14	0.13
26	<0.5	NR	164		
27	0.043	0.01	95	-0.30	-0.26
28	<0.1	NR	96		
29	0.0392	0.0157	98	-0.71	-0.41
30	0.0425	0.011	83	-0.35	-0.28
31	0.04	0.01	100.3	-0.62	-0.55
32	0.0495	0.0149	97.8	0.42	0.25
33	NT	NT	NT		
34	0.662	0.119	113	67.43	5.18

Statistics*

Assigned Value**	0.0457	0.0026
Spike	0.0556	0.0028
Robust Average	0.0457	0.0028
Median	0.0440	0.0023
Mean	0.0464	
N	27	
Max.	0.09	
Min.	0.021	
Robust SD	0.0059	
Robust CV	13%	

*Laboratory 34 excluded from statistical calculation (gross error).

**Robust Average excluding laboratories 10 and 22.

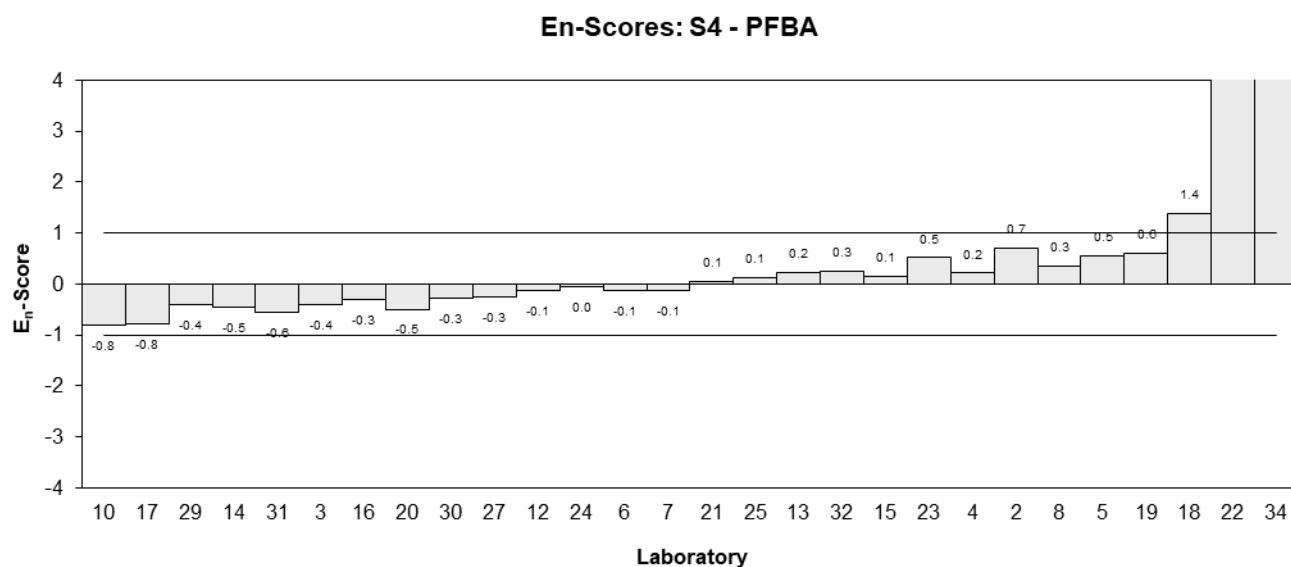
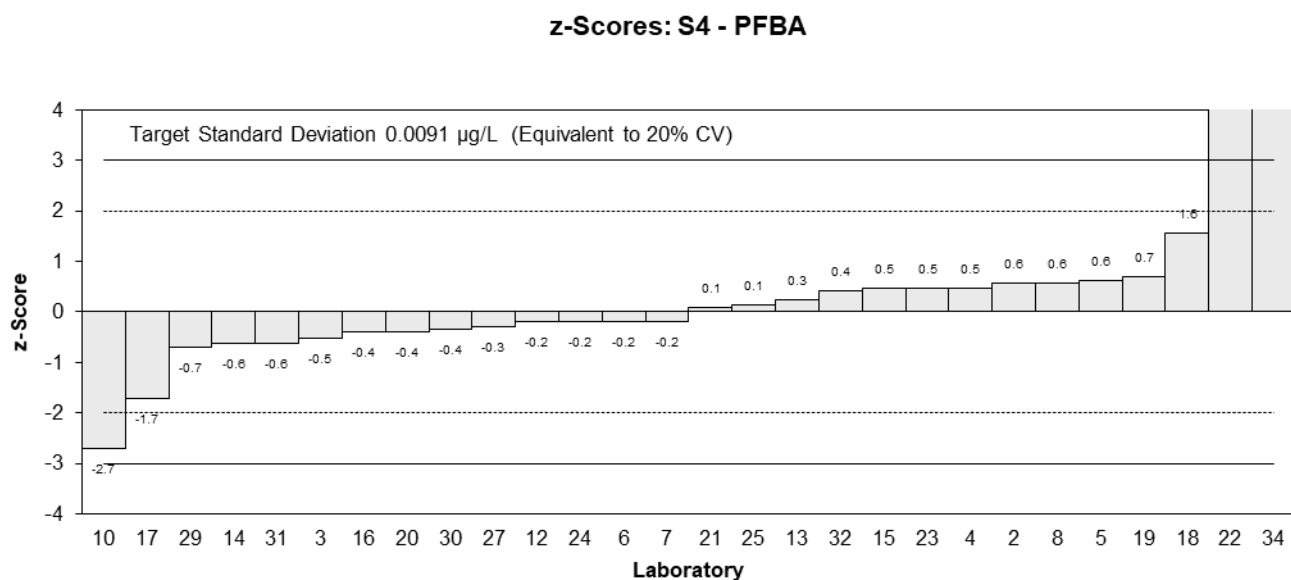
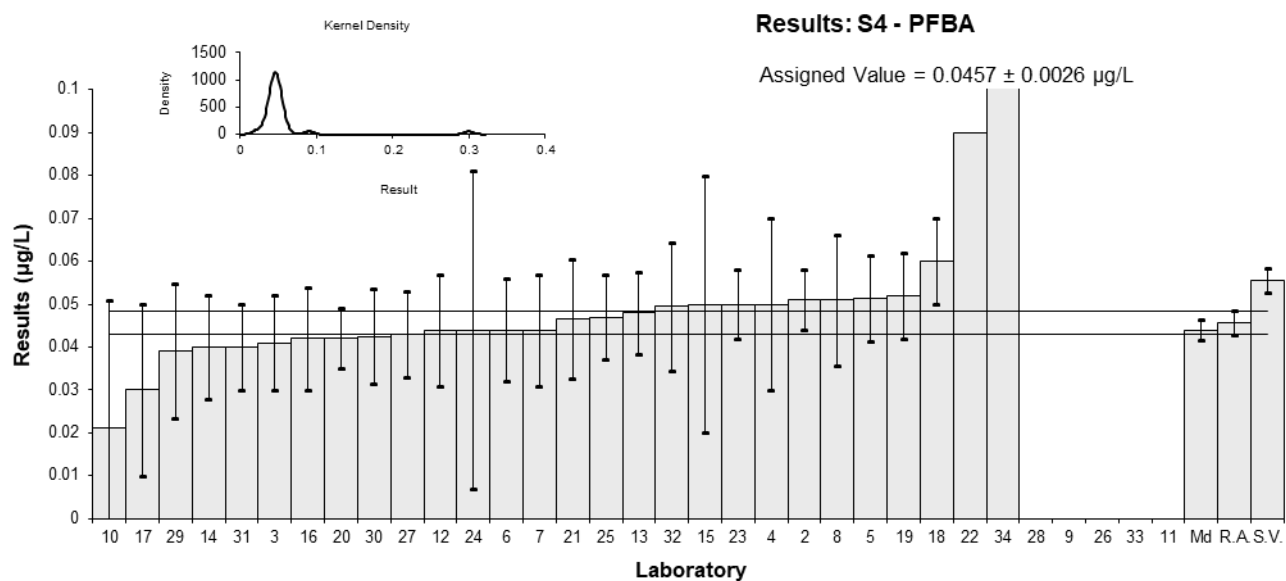


Figure 66

Table 70

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFPeA
Units	µg/L

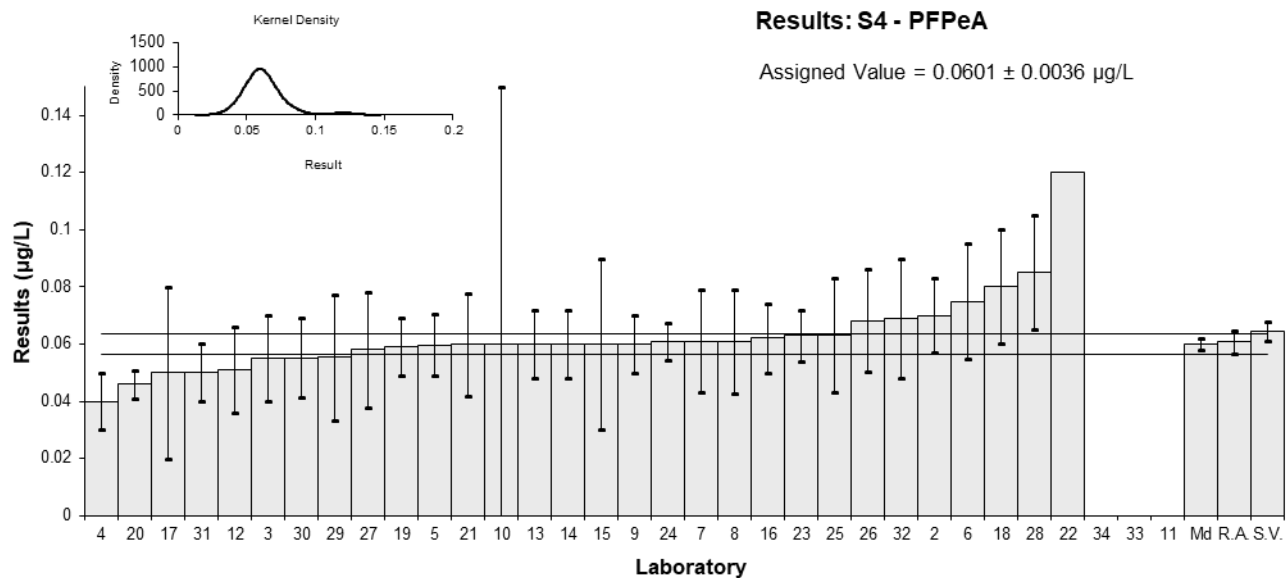
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.07	0.013	90	0.82	0.73
3	0.055	0.015	99	-0.42	-0.33
4	0.04	0.01	137	-1.67	-1.89
5	0.0597	0.0108	89	-0.03	-0.04
6	0.075	0.020	80-100	1.24	0.73
7	0.061	0.018	NR	0.07	0.05
8	0.061	0.0182	129	0.07	0.05
9	0.06	0.01	87	-0.01	-0.01
10	0.060	0.09	100	-0.01	0.00
11	NT	NT	NT		
12	0.051	0.015	118	-0.76	-0.59
13	0.060	0.012	87	-0.01	-0.01
14	0.06	0.012	117	-0.01	-0.01
15	0.06	0.03	107	-0.01	0.00
16	0.062	0.012	91.7	0.16	0.15
17	0.05	0.03	98.1	-0.84	-0.33
18	0.08	0.02	NR	1.66	0.98
19	0.059	0.01	NR	-0.09	-0.10
20	0.046	0.005	87	-1.17	-2.29
21	0.0598	0.01794	98	-0.02	-0.02
22	0.12	NR	120	4.98	16.64
23	0.063	0.009	NR	0.24	0.30
24	0.061	0.0065	99	0.07	0.12
25	0.063	0.02	103	0.24	0.14
26	0.0682	0.018	118	0.67	0.44
27	0.058	0.02	93	-0.17	-0.10
28	0.085	0.02	91	2.07	1.23
29	0.0553	0.0221	NR	-0.40	-0.21
30	0.0552	0.014	88	-0.41	-0.34
31	0.05	0.01	103.6	-0.84	-0.95
32	0.069	0.0207	91.9	0.74	0.42
33	NT	NT	NT		
34	<0.2	NR	113		

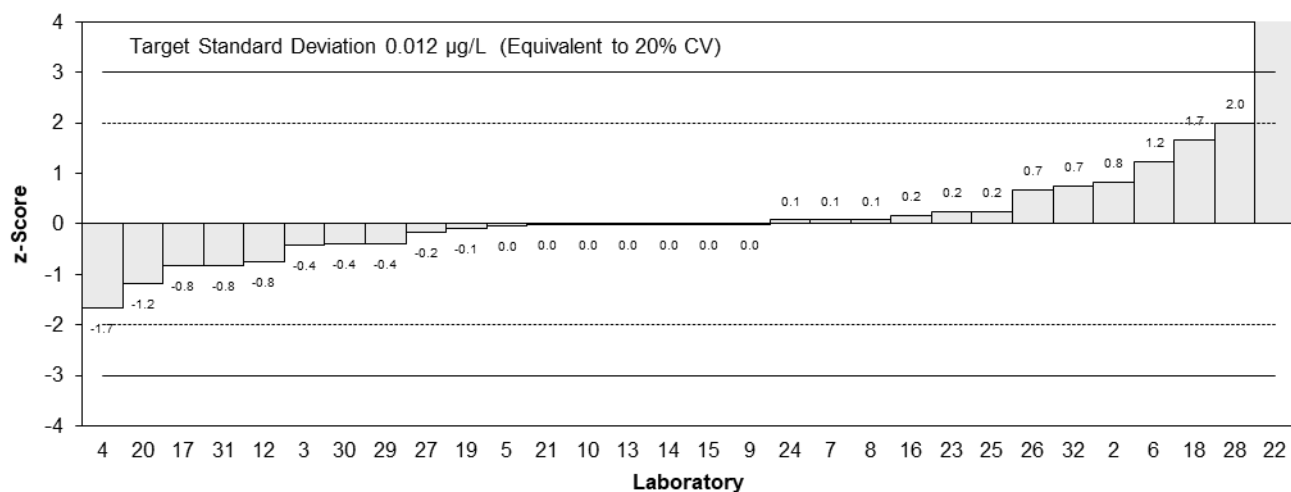
Statistics

Assigned Value*	0.0601	0.0036
Spike	0.0645	0.0032
Robust Average	0.0607	0.0039
Median	0.0600	0.0021
Mean	0.0626	
N	30	
Max.	0.12	
Min.	0.04	
Robust SD	0.0085	
Robust CV	14%	

*Robust Average excluding Laboratory 22.



z-Scores: S4 - PFPeA



En-Scores: S4 - PFPeA

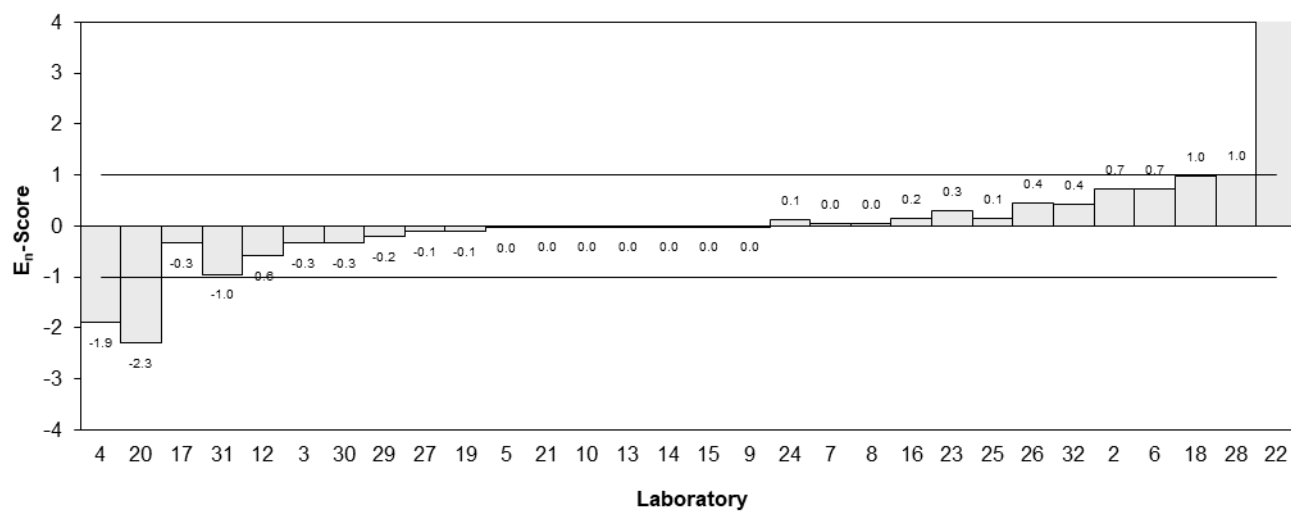


Figure 67

Table 71

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFHxA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.029	0.005	120	0.41	0.41
3	0.024	0.0065	100	-0.52	-0.41
4	0.02	0.01	133	-1.27	-0.67
5	0.0286	0.0062	89	0.34	0.28
6	0.029	0.008	80-100	0.41	0.27
7	0.028	0.008	NR	0.22	0.15
8	0.026	0.0077	126	-0.15	-0.10
9	0.03	0.01	76	0.60	0.31
10	0.031	0.09	102	0.78	0.05
11	0.026	0.006	82	-0.15	-0.13
12	0.030	0.009	115	0.60	0.35
13	0.025	0.005	89	-0.34	-0.34
14	0.024	0.005	132	-0.52	-0.52
15	0.027	0.024	103	0.04	0.01
16	0.023	0.003	98.3	-0.71	-1.07
17	0.02	0.008	96.6	-1.27	-0.83
18	0.03	0.01	NR	0.60	0.31
19	0.031	0.01	NR	0.78	0.41
20	0.022	0.003	104	-0.90	-1.35
21	0.0269	0.00807	95	0.02	0.01
22	0.05	NR	133	4.33	12.21
23	0.03	0.008	NR	0.60	0.39
24	0.025	0.0037	105	-0.34	-0.43
25	0.027	0.01	104	0.04	0.02
26	0.0323	0.011	120	1.03	0.49
27	0.026	0.01	93	-0.15	-0.08
28	0.036	0.01	88	1.72	0.90
29	0.0243	NR	92	-0.47	-1.32
30	0.023	0.0058	98	-0.71	-0.62
31	0.02	NR	91.5	-1.27	-3.58
32	0.0324	0.00972	101	1.04	0.57
33	NT	NT	NT		
34	<0.1	NR	113		

Statistics

Assigned Value*	0.0268	0.0019
Spike	0.0251	0.0013
Robust Average	0.0271	0.0020
Median	0.0270	0.0016
Mean	0.0276	
N	31	
Max.	0.05	
Min.	0.02	
Robust SD	0.0044	
Robust CV	16%	

*Robust Average excluding laboratory 22.

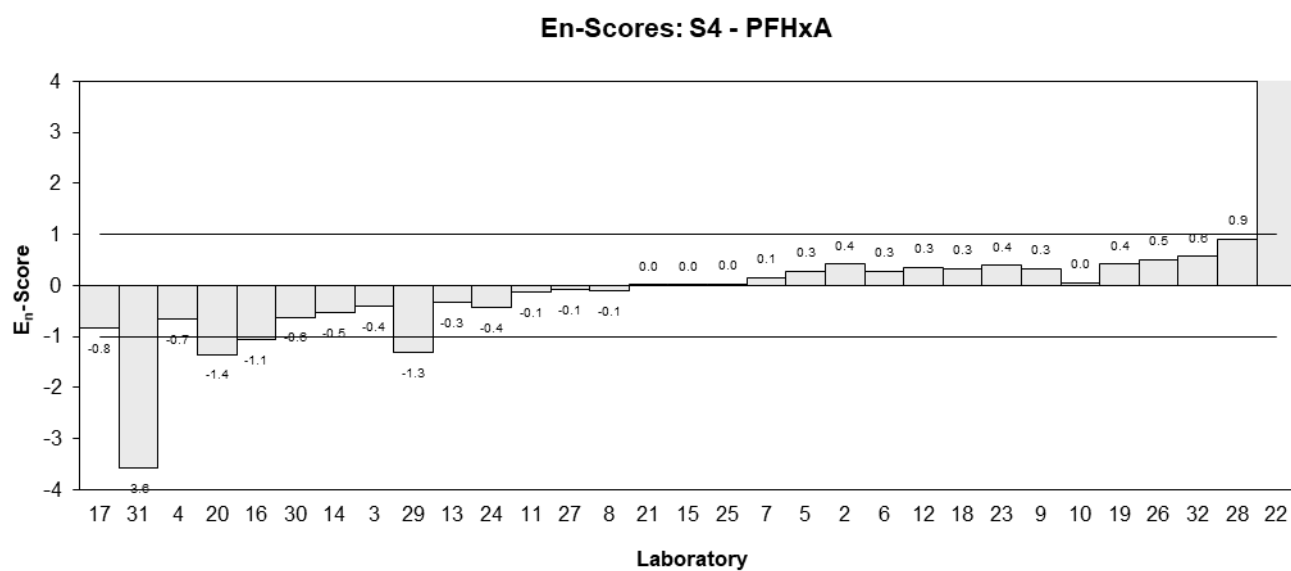
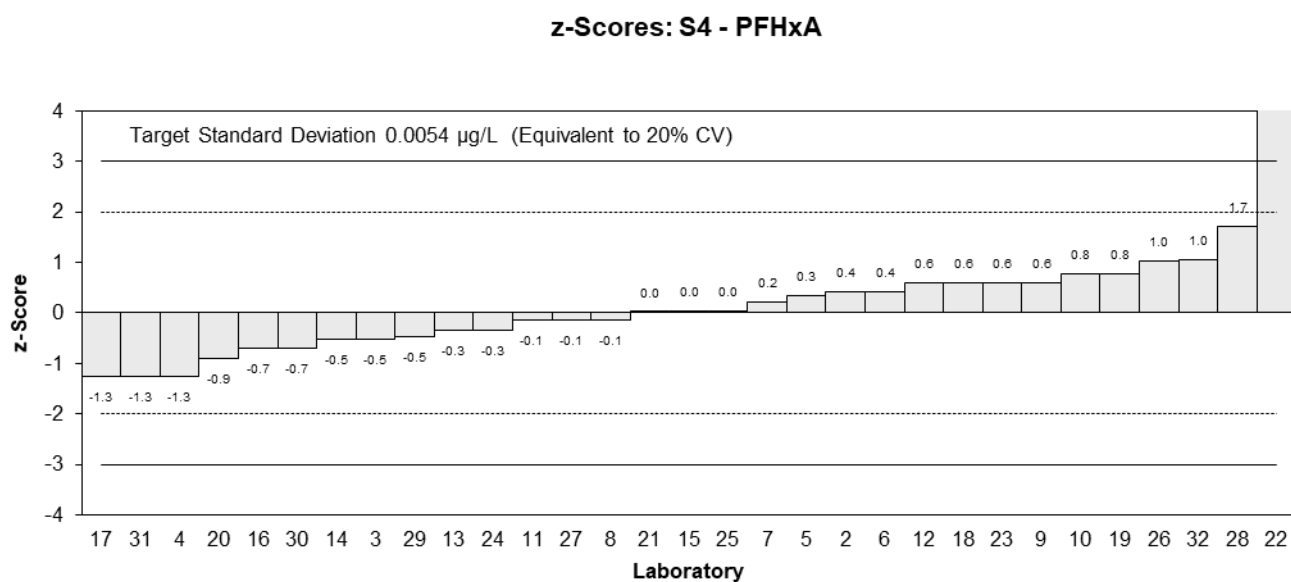
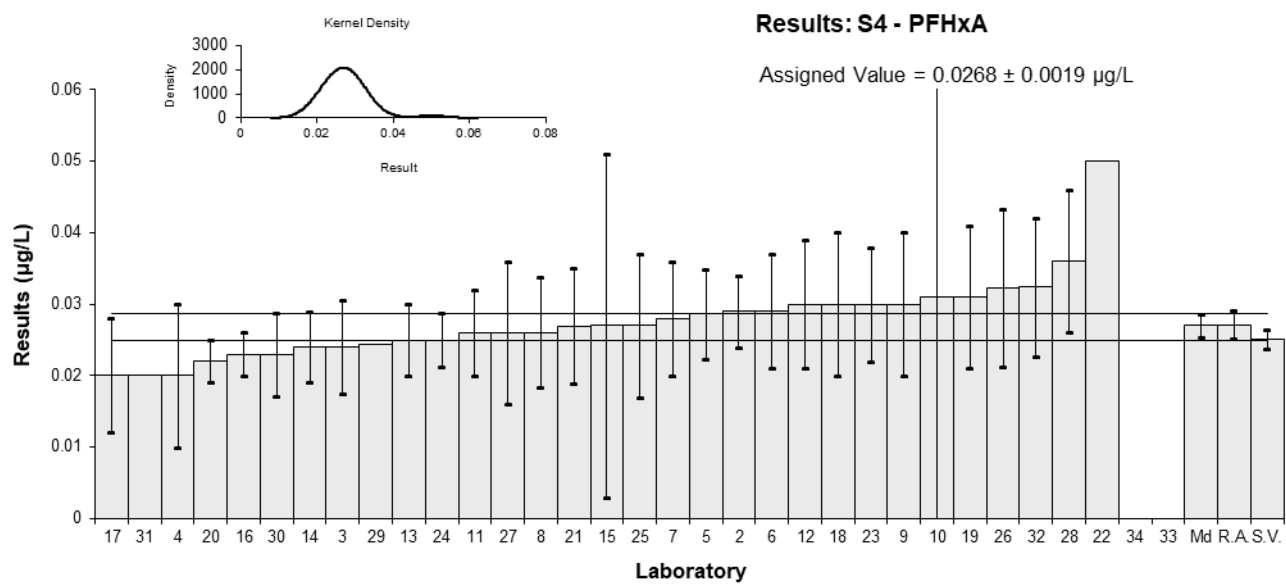


Figure 68

Table 72

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFHpA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.009	0.002	110	0.56	0.39
3	0.0070	0.0019	99	-0.68	-0.49
4	<0.01	0.003	149		
5	0.00769	0.0018	92	-0.25	-0.19
6	<0.01	NR	80-100		
7	0.008	0.002	NR	-0.06	-0.04
8	<0.01	NR	NR		
9	<0.02	NR	74		
10	0.011	0.08	104	1.79	0.04
11	<0.01	NR	91		
12	0.006	0.000	120	-1.30	-1.75
13	<0.01	NR	NR		
14	0.006	0.001	147	-1.30	-1.34
15	< 0.02	0.01	100		
16	0.007	0.001	96	-0.68	-0.70
17	0.01	0.004	96.6	1.17	0.45
18	<0.01	NR	NR		
19	0.010	0.00	NR	1.17	1.58
20	0.014	0.005	96	3.64	1.15
21	0.0082	0.00246	101	0.06	0.04
22	0.02	NR	128	7.35	9.92
23	0.005	0.008	NR	-1.91	-0.38
24	0.0073	0.0010	104	-0.49	-0.51
25	0.009	0.005	99	0.56	0.18
26	<0.02	NR	117		
27	0.008	0.005	84	-0.06	-0.02
28	<0.02	NR	88		
29	<0.0100	NR	90		
30	<0.01	NR	73		
31	0.01	NR	98.4	1.17	1.58
32	<0.017	NR	104		
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.0081	0.0012
Spike	0.00783	0.00040
Robust Average	0.0085	0.0013
Median	0.0081	0.0011
Mean	0.0091	
N	18	
Max.	0.02	
Min.	0.005	
Robust SD	0.0023	
Robust CV	27%	

*Robust Average excluding laboratories 20 and 22.

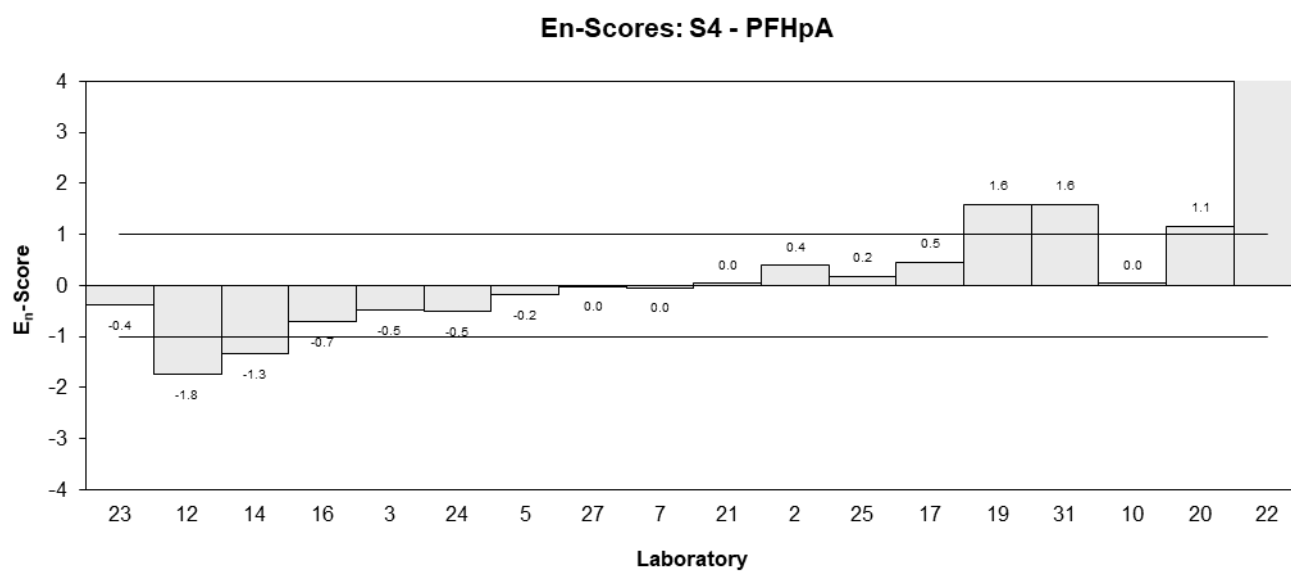
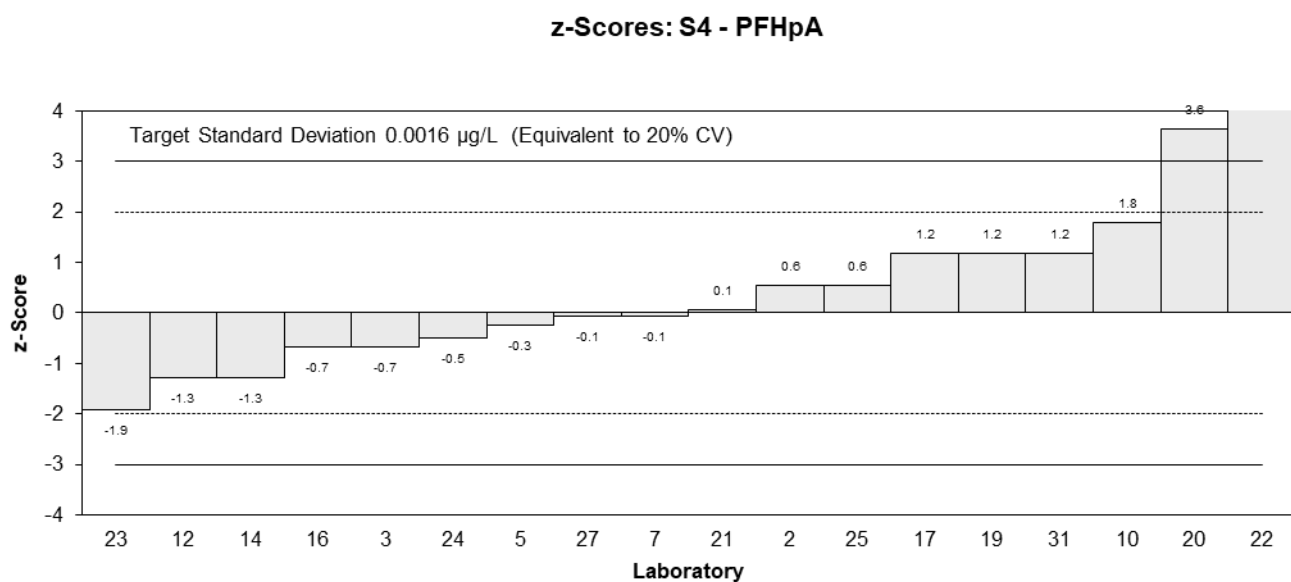
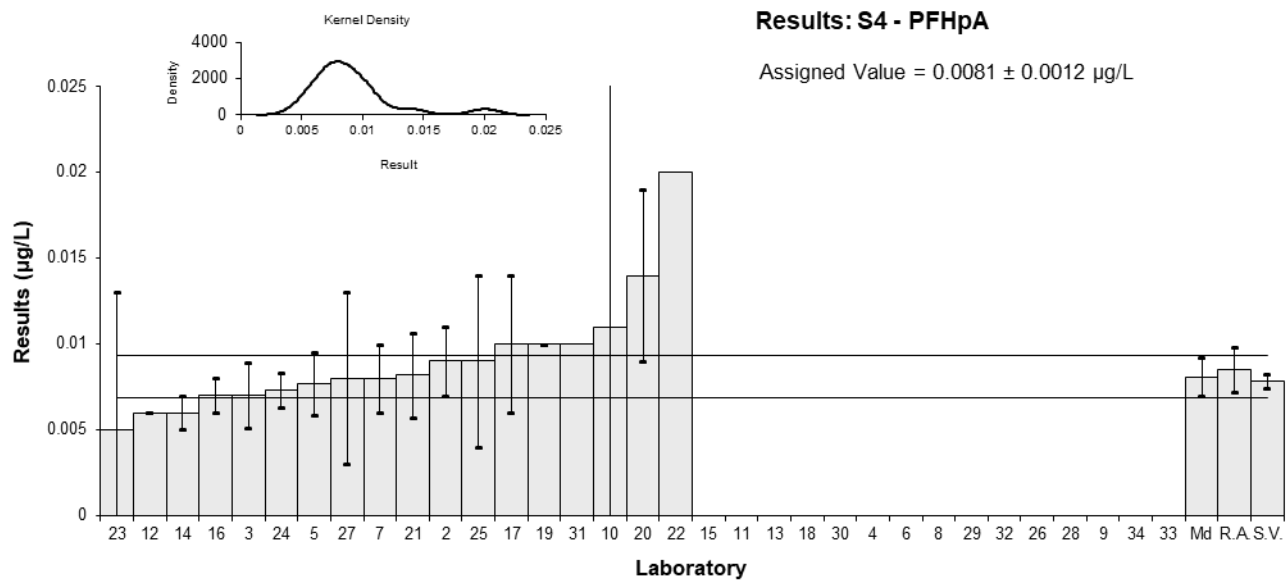


Figure 69

Table 73

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFOA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.034	0.004	110	0.82	1.12
3	0.025	0.0069	101	-0.72	-0.59
4	0.02	0.01	108	-1.58	-0.91
5	0.0309	0.0083	86	0.29	0.20
6	0.031	0.008	80-100	0.31	0.22
7	0.029	0.009	NR	-0.03	-0.02
8	0.030	0.0089	150	0.14	0.09
9	0.03	0.01	80	0.14	0.08
10	0.043	0.11	103	2.36	0.13
11	0.03	0.01	91	0.14	0.08
12	0.031	0.009	96	0.31	0.20
13	0.029	0.0058	94	-0.03	-0.03
14	0.026	0.005	152	-0.55	-0.61
15	< 0.03	0.03	104		
16	0.026	0.002	94.8	-0.55	-1.28
17	0.03	0.002	100.3	0.14	0.32
18	0.03	0.01	NR	0.14	0.08
19	0.032	0.01	107	0.48	0.28
20	0.024	0.004	119	-0.89	-1.22
21	0.0286	0.00858	99	-0.10	-0.07
22	0.06	NR	143	5.27	20.53
23	0.028	0.008	NR	-0.21	-0.15
24	0.029	0.0046	98	-0.03	-0.04
25	0.029	0.01	101	-0.03	-0.02
26	0.0365	0.011	117	1.25	0.66
27	0.028	0.01	80	-0.21	-0.12
28	0.037	0.01	91	1.34	0.77
29	0.0281	NR	80	-0.19	-0.73
30	0.027	0.0068	85	-0.38	-0.32
31	0.02	NR	97.2	-1.58	-6.13
32	0.0309	0.00927	110	0.29	0.18
33	0.0290	0.0081	94.7	-0.03	-0.02
34	<0.2	NR	113		

Statistics

Assigned Value*	0.0292	0.0015
Spike	0.0302	0.0015
Robust Average	0.0294	0.0016
Median	0.0290	0.0010
Mean	0.0304	
N	31	
Max.	0.06	
Min.	0.02	
Robust SD	0.0035	
Robust CV	12%	

*Robust Average excluding laboratory 22.

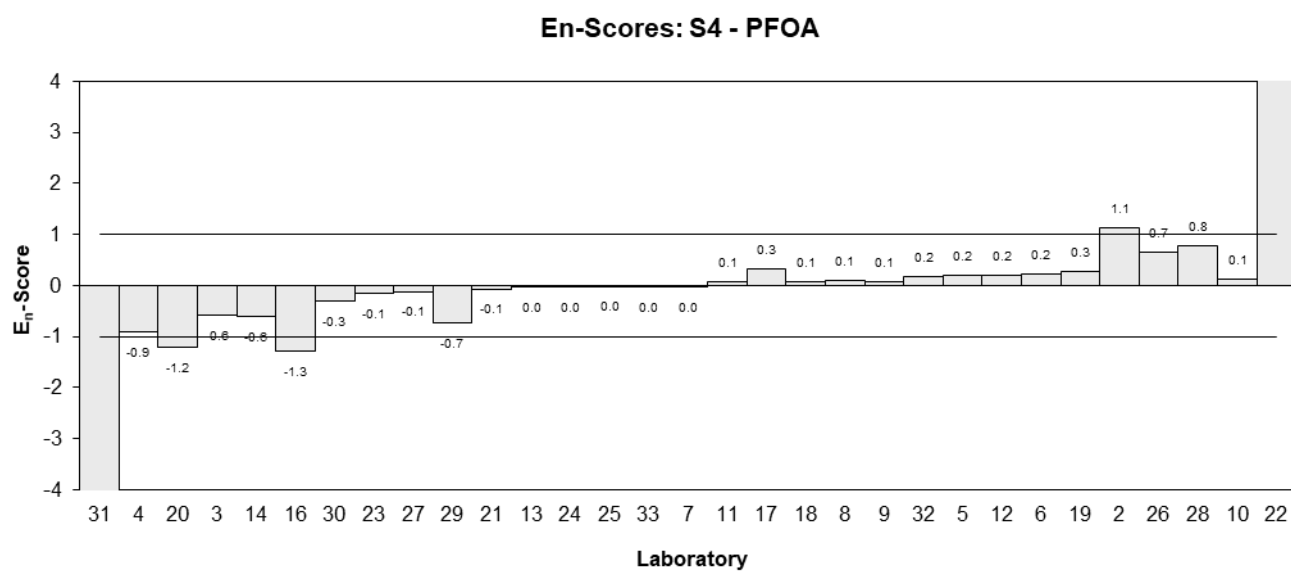
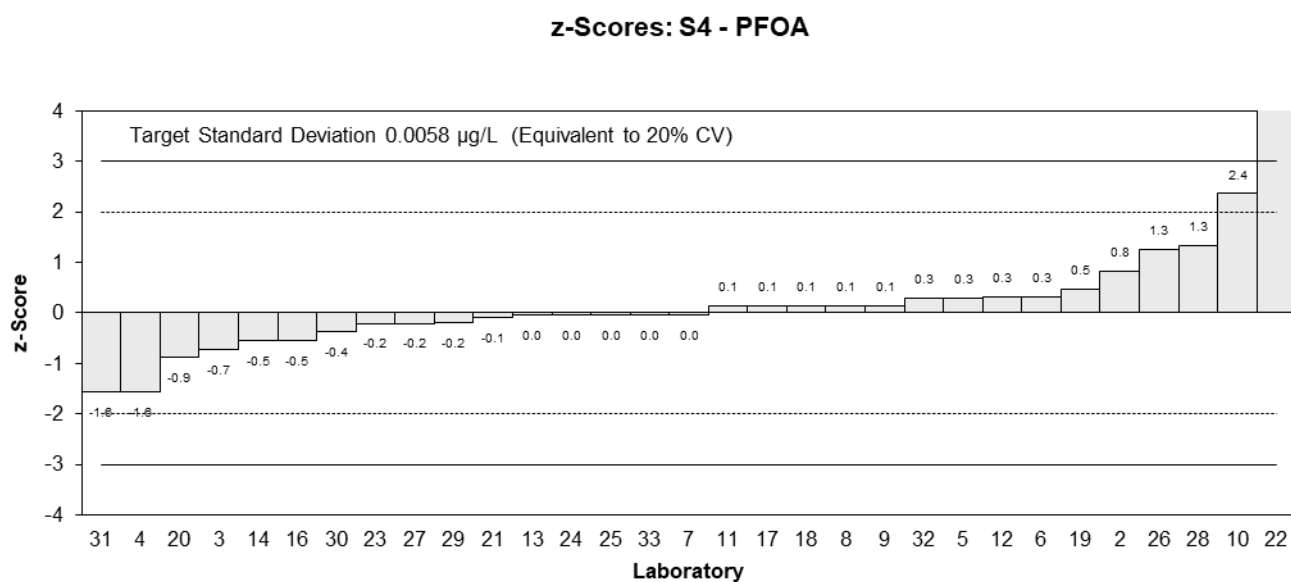
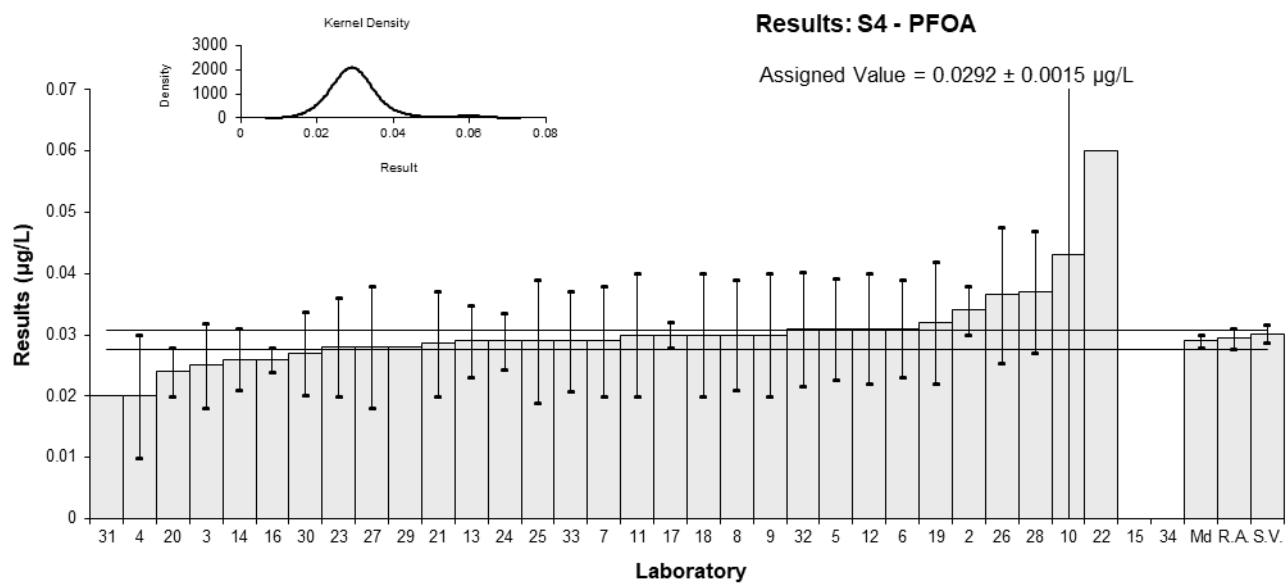


Figure 70

Table 74

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFNA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.079	0.010	101	0.97	1.13
3	0.061	0.016	95	-0.39	-0.31
4	0.05	0.02	143	-1.22	-0.78
5	0.0759	0.017	82	0.73	0.54
6	0.057	0.015	80-100	-0.69	-0.58
7	0.068	0.020	NR	0.14	0.09
8	0.062	0.0186	131	-0.32	-0.22
9	0.08	0.02	67	1.04	0.67
10	0.116	0.09	106	3.76	0.55
11	0.06	0.02	83	-0.47	-0.30
12	0.052	0.016	86	-1.07	-0.84
13	0.066	0.013	91	-0.02	-0.01
14	0.061	0.013	154	-0.39	-0.37
15	0.066	0.035	100	-0.02	-0.01
16	0.060	0.016	104.2	-0.47	-0.37
17	0.1	0.01	101.4	2.55	2.99
18	NT	NT	NT		
19	0.078	0.016	NR	0.89	0.70
20	0.058	0.007	105	-0.62	-0.93
21	0.0659	0.01977	96	-0.02	-0.01
22	0.13	NR	147	4.82	12.04
23	0.066	0.009	NR	-0.02	-0.02
24	0.071	0.014	113	0.36	0.32
25	0.065	0.02	99	-0.09	-0.06
26	0.0722	0.02	115	0.45	0.29
27	0.062	0.02	76	-0.32	-0.20
28	0.083	0.02	100	1.27	0.81
29	0.0575	NR	85	-0.66	-1.64
30	0.0625	0.016	75	-0.28	-0.22
31	0.05	0.01	94.7	-1.22	-1.43
32	0.0888	0.0266	110	1.71	0.83
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.0662	0.0053
Spike	0.0700	0.0035
Robust Average	0.0679	0.0059
Median	0.0660	0.0039
Mean	0.0708	
N	30	
Max.	0.13	
Min.	0.05	
Robust SD	0.013	
Robust CV	19%	

*Robust Average excluding laboratories 10 and 22.

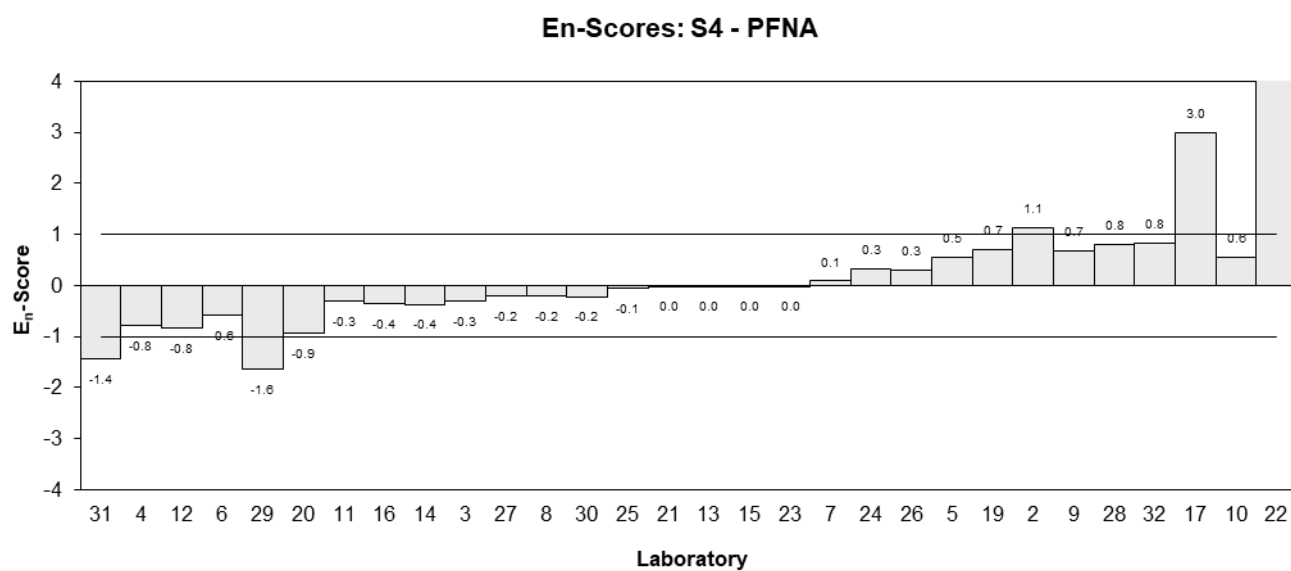
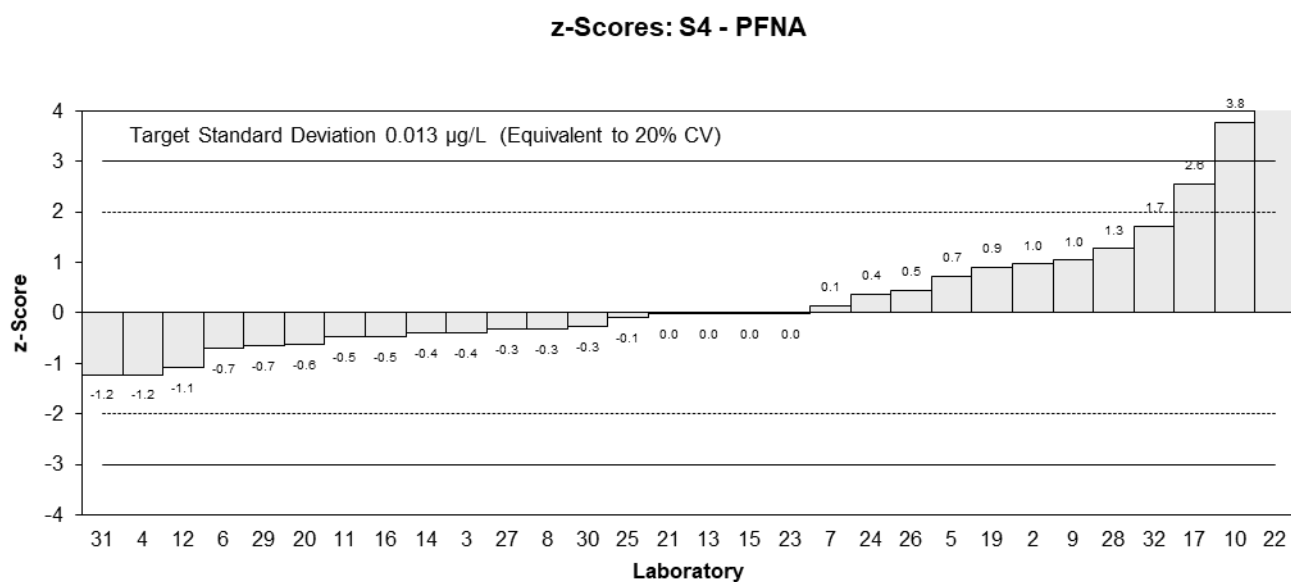
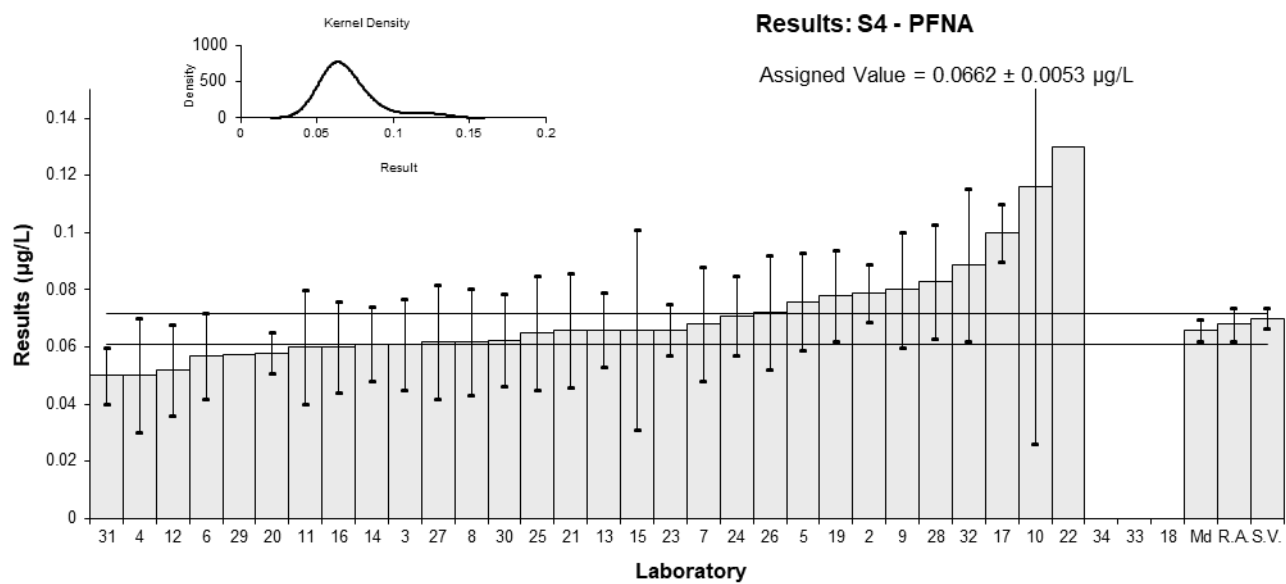


Figure 71

Table 75

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFDA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.048	0.007	102	1.37	1.30
3	0.036	0.010	95	-0.23	-0.16
4	0.03	0.01	106	-1.02	-0.72
5	0.042	0.01	87	0.57	0.40
6	0.028	0.008	80-100	-1.29	-1.10
7	0.037	0.011	NR	-0.09	-0.06
8	0.031	0.0094	149	-0.89	-0.66
9	0.05	0.01	70	1.63	1.15
10	0.042	0.09	97	0.57	0.05
11	NT	NT	NT		
12	0.031	0.009	65	-0.89	-0.69
13	0.040	0.008	93	0.31	0.26
14	0.038	0.008	148	0.04	0.03
15	< 0.05	0.03	93		
16	0.038	0.007	92.7	0.04	0.04
17	0.04	0.008	86.4	0.31	0.26
18	NT	NT	NT		
19	0.050	0.01	NR	1.63	1.15
20	0.030	0.003	128	-1.02	-1.62
21	0.0346	0.01038	92	-0.41	-0.28
22	0.07	NR	210	4.28	8.73
23	0.032	0.017	NR	-0.76	-0.33
24	0.039	0.010	113	0.17	0.12
25	0.041	0.01	103	0.44	0.31
26	0.0456	0.014	110	1.05	0.55
27	0.038	0.01	65	0.04	0.03
28	0.056	0.02	96	2.43	0.90
29	0.0292	0.0117	98	-1.13	-0.69
30	0.0329	0.0083	67	-0.64	-0.53
31	0.03	0.01	91.6	-1.02	-0.72
32	0.0632	0.0190	130	3.38	1.32
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.0377	0.0037
Spike	0.0400	0.0020
Robust Average	0.0389	0.0041
Median	0.0380	0.0037
Mean	0.0401	
N	28	
Max.	0.07	
Min.	0.028	
Robust SD	0.0088	
Robust CV	23%	

*Robust Average excluding laboratories 22 and 32.

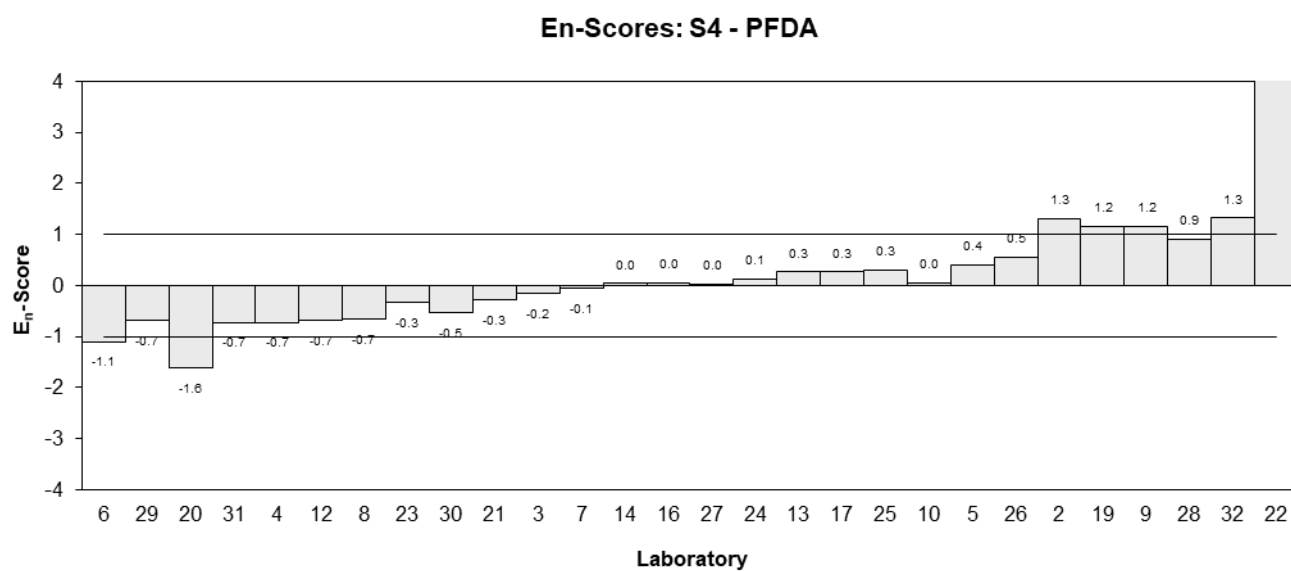
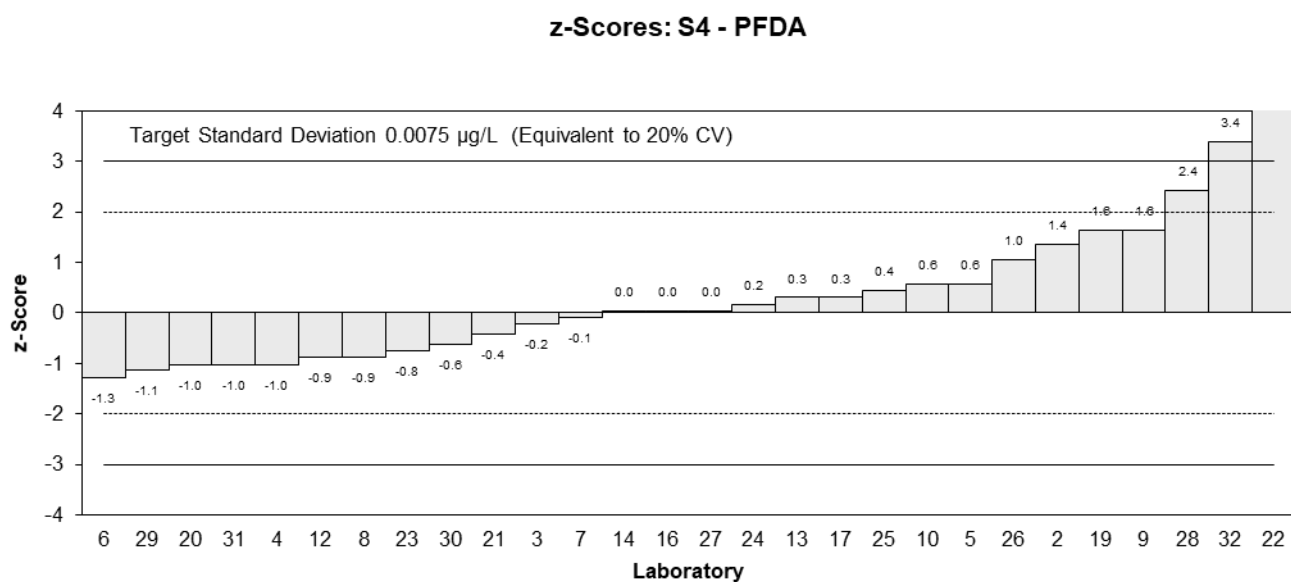
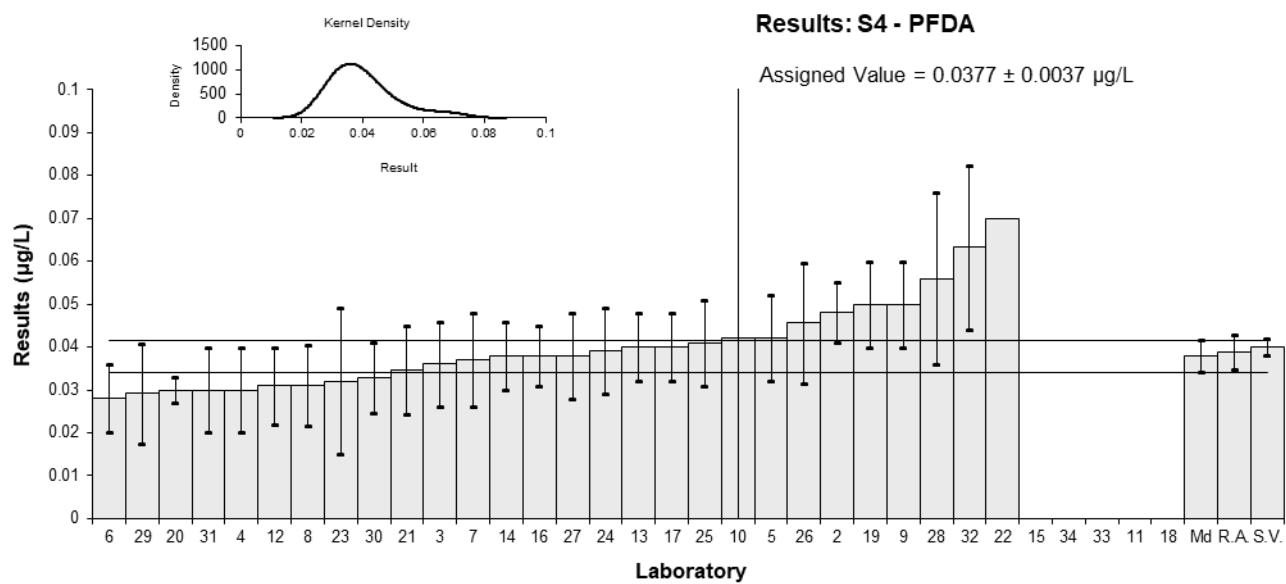


Figure 72

Table 76

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFUdA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.117	0.016	96	1.09	1.02
3	0.090	0.024	89	-0.31	-0.22
4	0.07	0.02	145	-1.35	-1.09
5	0.11	0.031	88	0.73	0.42
6	0.052	0.014	80-100	-2.29	-2.30
7	0.115	0.035	NR	0.99	0.51
8	0.069	0.0207	179	-1.41	-1.10
9	0.14	0.03	68	2.29	1.35
10	0.119	0.1	98	1.20	0.23
11	NT	NT	NT		
12	0.070	0.021	73	-1.35	-1.05
13	0.10	0.02	90	0.21	0.17
14	0.091	0.022	136	-0.26	-0.20
15	0.11	0.06	83	0.73	0.23
16	0.084	0.017	96.5	-0.62	-0.56
17	0.1	0.02	80.8	0.21	0.17
18	NT	NT	NT		
19	0.133	0.033	NR	1.93	1.04
20	0.077	0.008	108	-0.99	-1.24
21	0.0963	0.02889	76	0.02	0.01
22	0.17	NR	185	3.85	5.69
23	0.065	0.01	NR	-1.61	-1.89
24	0.091	0.042	162	-0.26	-0.11
25	0.096	0.03	100	0.00	0.00
26	0.116	0.03	111	1.04	0.61
27	0.096	0.03	55	0.00	0.00
28	0.133	0.04	96	1.93	0.88
29	NT	NT	NT		
30	0.0637	0.016	73	-1.68	-1.57
31	0.08	0.02	94.3	-0.83	-0.67
32	0.206	0.0618	116	5.73	1.74
33	NT	NT	NT		
34	<0.3	NR	113		

Statistics

Assigned Value*	0.096	0.013
Spike	0.101	0.005
Robust Average	0.099	0.014
Median	0.096	0.011
Mean	0.102	
N	28	
Max.	0.206	
Min.	0.052	
Robust SD	0.029	
Robust CV	29%	

*Robust Average excluding laboratories 22 and 32.

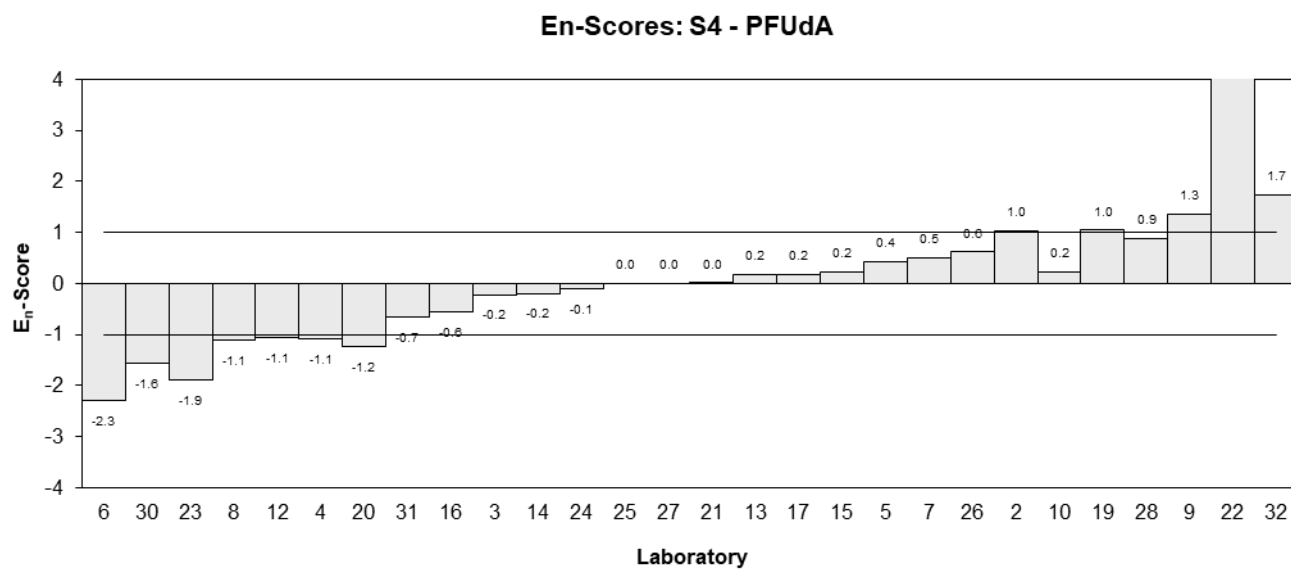
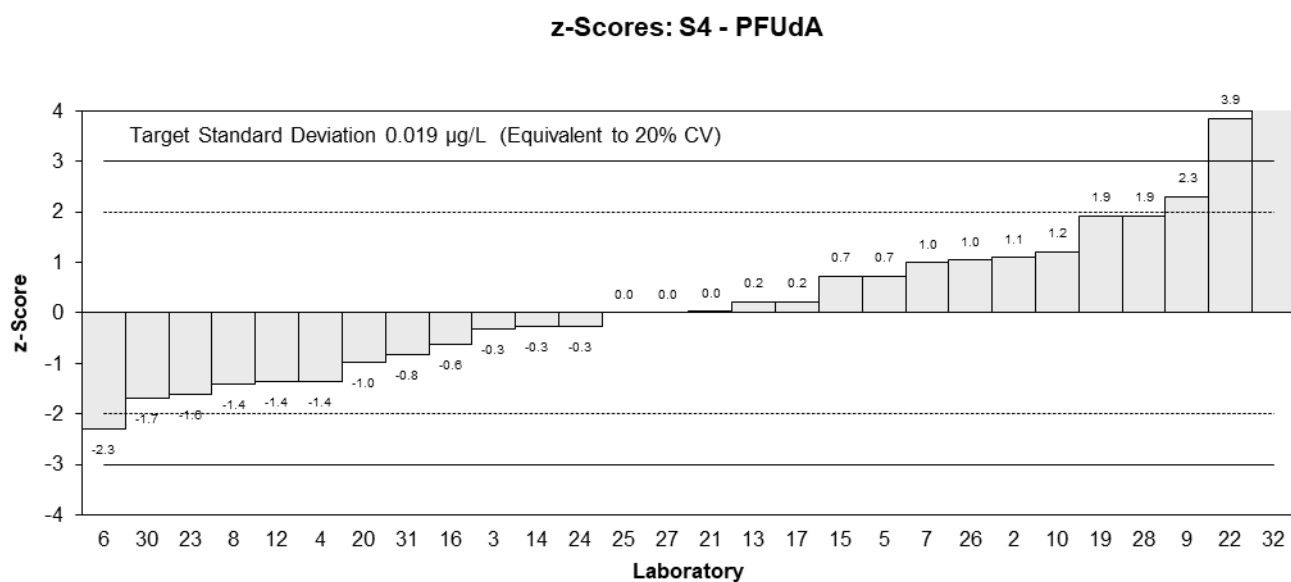
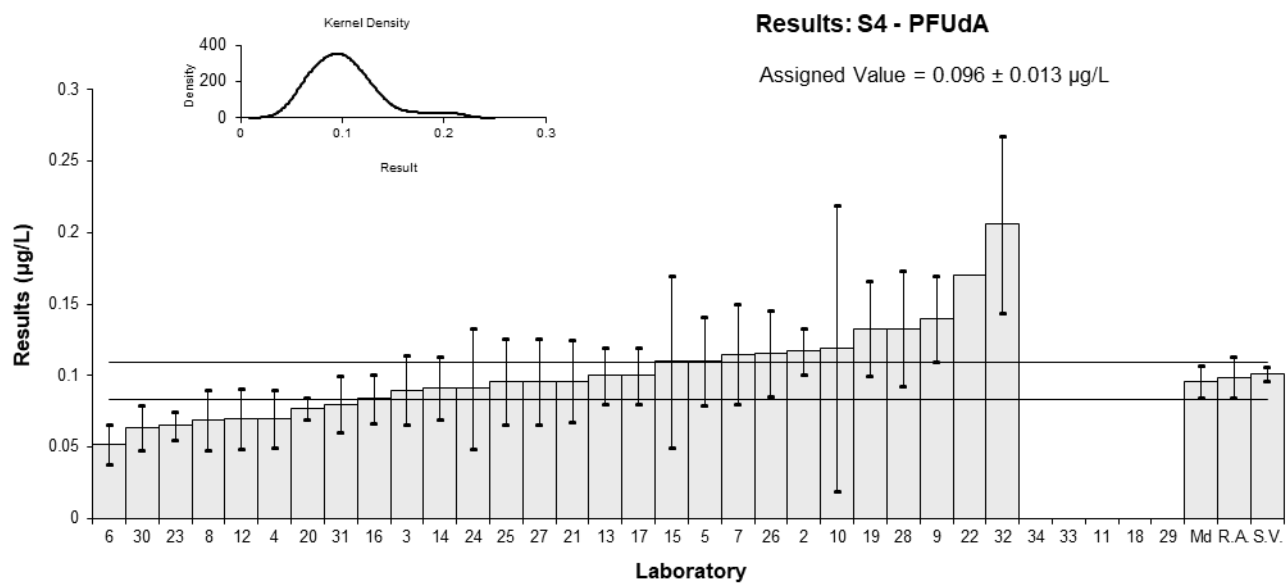


Figure 73

Table 77

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFD _o A
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.022	0.004	76	1.25	0.95
3	0.016	0.0042	85	-0.45	-0.33
4	<0.01	0.003	130		
5	0.0202	0.0079	88	0.74	0.32
6	0.014	0.004	70	-1.02	-0.78
7	0.022	0.007	NR	1.25	0.60
8	0.011	0.0034	133	-1.88	-1.61
9	0.03	0.01	71	3.52	1.21
10	0.009	0.007	93	-2.44	-1.17
11	NT	NT	NT		
12	0.017	0.005	NR	-0.17	-0.11
13	0.019	0.0038	80	0.40	0.32
14	0.017	0.005	130	-0.17	-0.11
15	< 0.09	0.05	57		
16	0.017	0.004	83.5	-0.17	-0.13
17	0.02	0	41.9	0.68	1.04
18	NT	NT	NT		
19	0.049	0.013	NR	8.92	2.38
20	0.014	0.002	117	-1.02	-1.18
21	0.0153	0.00459	73	-0.65	-0.45
22	0.03	NR	209	3.52	5.39
23	NR	NR	NR		
24	0.017	0.010	111	-0.17	-0.06
25	0.021	0.01	100	0.97	0.33
26	<0.02	NR	109		
27	0.018	0.01	48	0.11	0.04
28	0.025	0.01	98	2.10	0.72
29	NT	NT	NT		
30	0.00882	0.0022	80	-2.49	-2.76
31	0.01	NR	83.4	-2.16	-3.30
32	0.0468	0.0140	79	8.30	2.06
33	NT	NT	NT		
34	<0.7	NR	113		

Statistics

Assigned Value*	0.0176	0.0023
Spike	0.0206	0.0010
Robust Average	0.0189	0.0038
Median	0.0175	0.0022
Mean	0.0204	
N	24	
Max.	0.049	
Min.	0.00882	
Robust SD	0.0074	
Robust CV	39%	

*Robust Average excluding Laboratories 9, 10, 19, 22, 30 and 32.

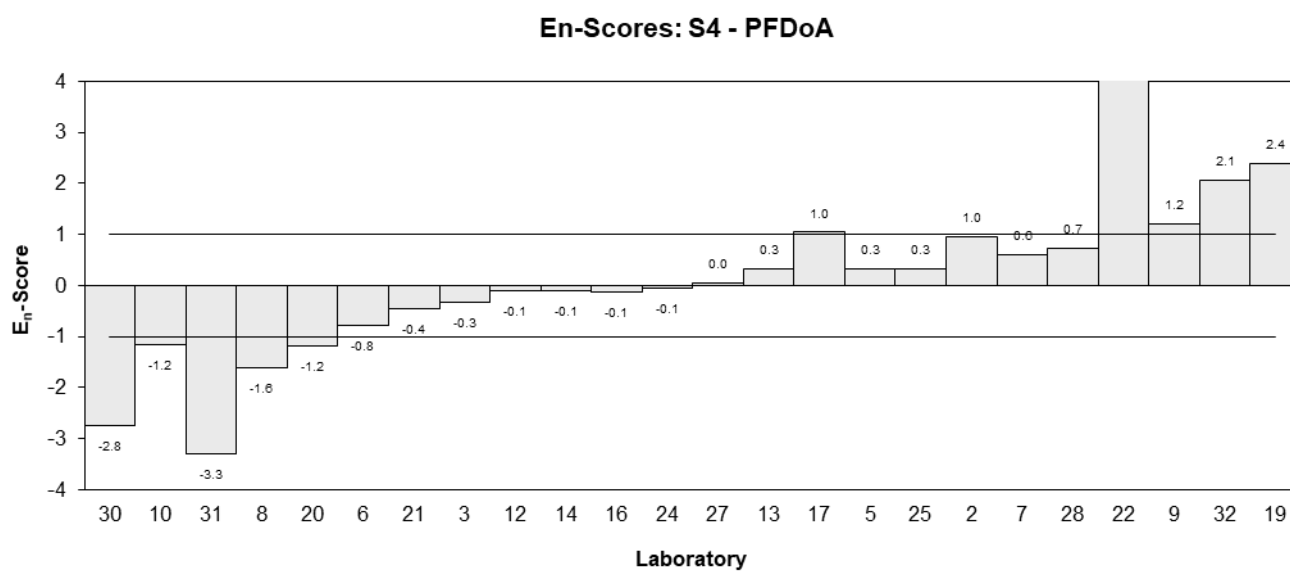
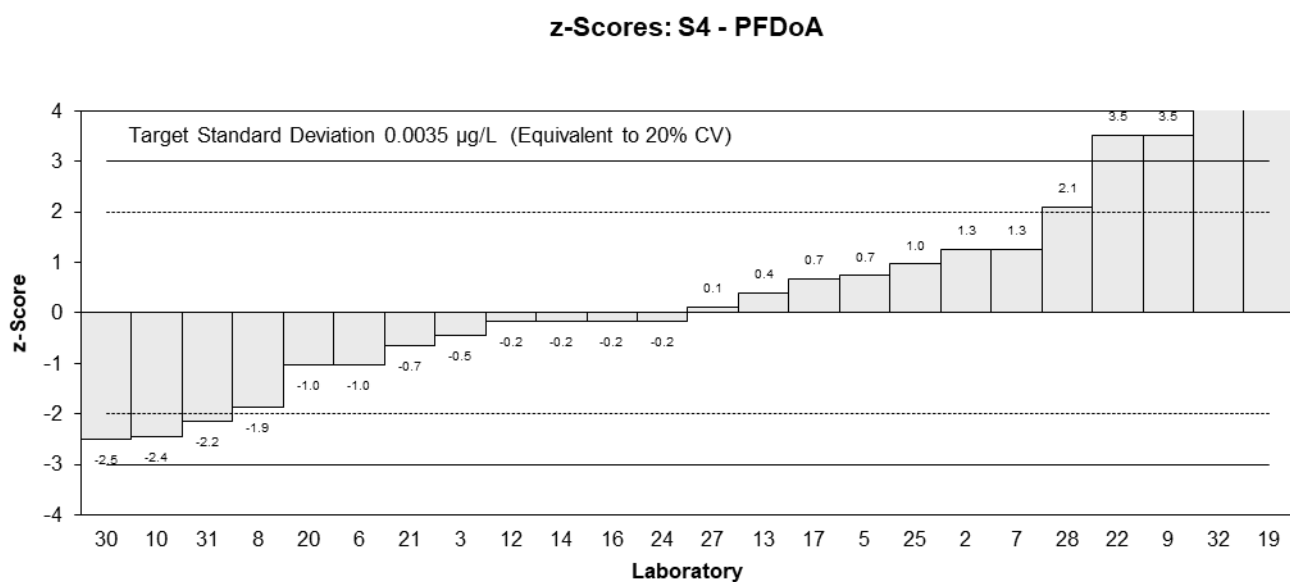
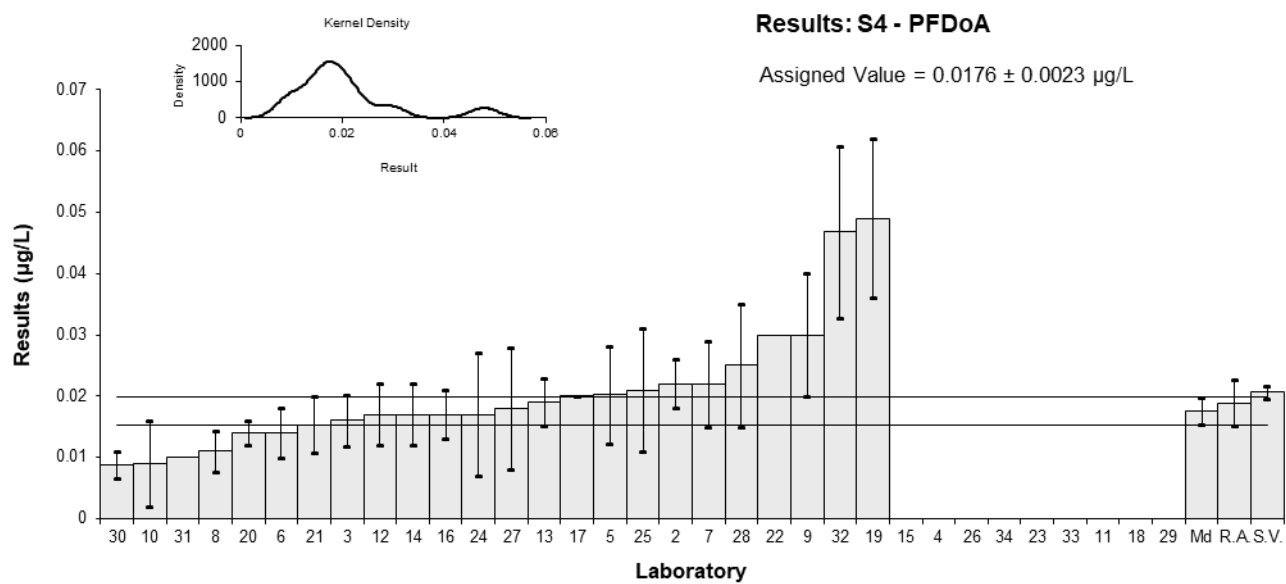


Figure 74

Table 78

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFTTrDA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	0.027	0.008	NR
3	0.027	0.0073	NR
4	<0.01	0.003	NR
5	0.0402	0.014	88
6	0.018	0.005	70
7	0.029	0.009	NR
8	0.014	0.0042	136
9	0.05	0.02	71
10	0.007	0.0035	109
11	NT	NT	NT
12	0.019	0.006	NR
13	0.035	0.007	84
14	0.027	0.007	130
15	< 0.23	0.15	NR
16	0.026	0.012	NR
17	0.1	0.1	4.3
18	NT	NT	NT
19	0.063	0.021	NR
20	0.020	0.003	117
21	0.0275	0.00825	73
22	0.08	NR	NR
23	NR	NR	NR
24	0.015	0.014	111
25	0.04	0.02	77
26	NT	NT	NT
27	0.03	0.02	48
28	0.049	0.02	98
29	NT	NT	NT
30	0.0156	0.0039	75
31	0.01	NR	NR
32	0.0271	0.00813	34.6
33	NT	NT	NT
34	<0.6	NR	113

Statistics

Assigned Value	Not Set	
Spike	0.0394	0.0020
Robust Average	0.0299	0.0084
Median	0.0271	0.0064
Mean	0.0332	
N	24	
Max.	0.1	
Min.	0.007	
Robust SD	0.016	
Robust CV	55%	

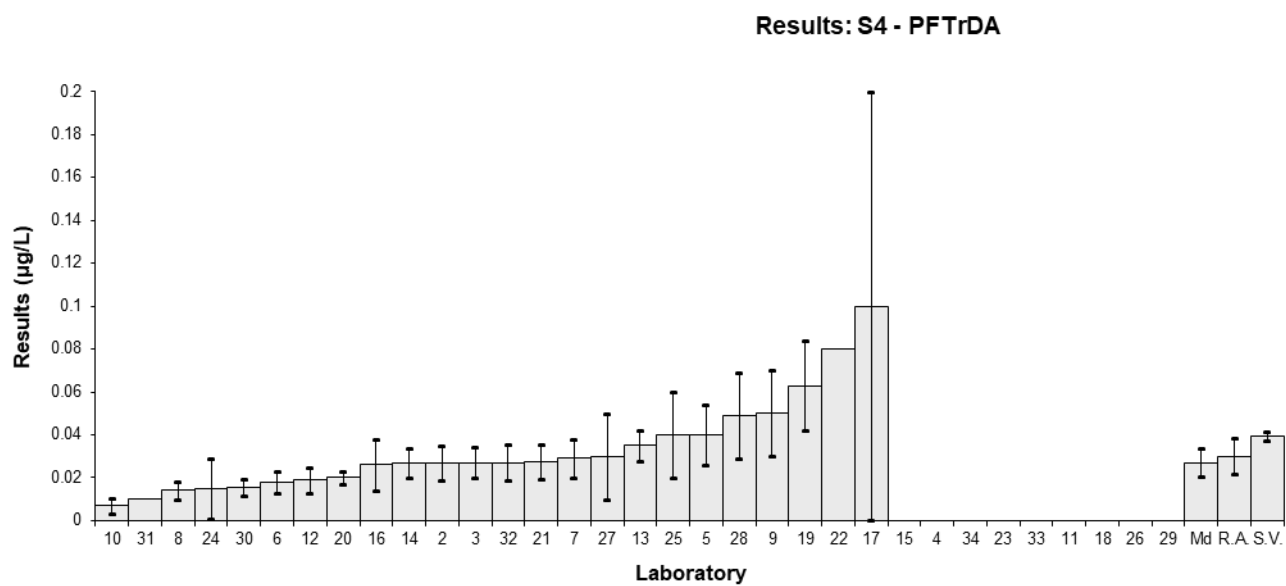


Figure 75

Table 79

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFTeDA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	0.078	0.011	69
3	0.051	0.014	76
4	0.02	0.01	124
5	0.077	0.029	90
6	0.038	0.010	70
7	0.043	0.013	NR
8	0.025	0.0074	136
9	0.10	0.03	72
10	0.005	0.0048	103
11	NT	NT	NT
12	0.033	0.010	91
13	0.069	0.014	84
14	0.069	0.02	118
15	< 0.09	0.05	8
16	0.081	0.043	NR
17	0.4	0.01	4.3
18	NT	NT	NT
19	0.072	0.018	NR
20	0.037	0.007	122
21	0.0573	0.01719	74
22	0.13	NR	172
23	0.117	0.02	NR
24	NR	NR	NR
25	0.08	0.04	77
26	0.0729	0.025	100
27	0.07	0.04	49
28	0.09	0.02	97
29	NT	NT	NT
30	0.046	0.012	67
31	0.02	NR	84.4
32	0.0637	0.0191	34.6
33	NT	NT	NT
34	<0.7	NR	113

Statistics

Assigned Value	Not Set	
Spike	0.0801	0.0040
Robust Average	0.063	0.016
Median	0.069	0.013
Mean	0.075	
N	26	
Max.	0.4	
Min.	0.005	
Robust SD	0.034	
Robust CV	53%	

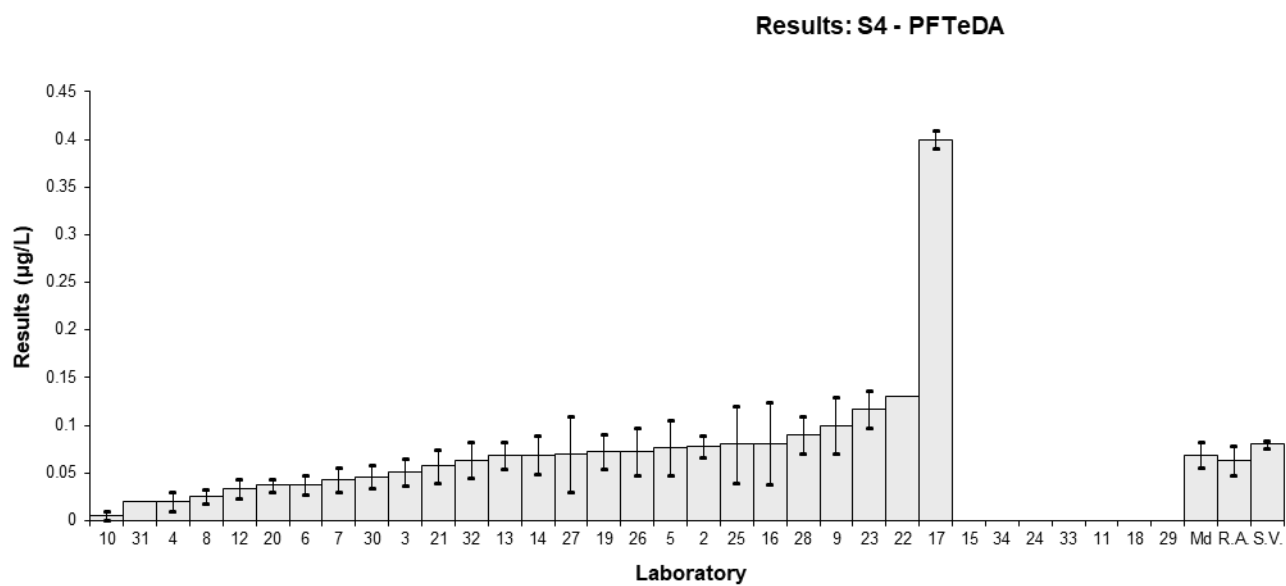


Figure 76

Table 80

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	PFOSA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	En-Score
2*	0.073	0.009	83	2.00	1.00
3	0.047	0.013	87	-0.44	-0.30
4	0.04	0.01	114	-1.12	-0.93
5	0.0593	0.016	85	0.76	0.44
6	0.05	0.014	70	-0.15	-0.10
7	0.057	0.017	NR	0.53	0.30
8	0.033	0.0098	125	-1.80	-1.52
9	0.07	0.02	72	1.80	0.87
10	0.016	0.05	75	-3.45	-0.70
11	NT	NT	NT		
12	0.054	0.020	53	0.24	0.12
13	0.055	0.011	84	0.34	0.27
14	0.052	0.011	139	0.05	0.04
15	< 0.2	0.1	84		
16	0.048	0.015	100	-0.34	-0.21
17	0.1	0	65.8	4.71	6.74
18	NT	NT	NT		
19	0.14	0.04	NR	8.59	2.18
20	0.035	0.005	86	-1.60	-1.88
21	0.0539	0.01617	68	0.23	0.14
22*	0.09	NR	NR	2.00	1.00
23	0.03	0.014	NR	-2.09	-1.37
24	0.046	0.0071	56	-0.53	-0.54
25**	0.09	0.04	103	2.00	0.95
26	0.0673	0.019	94	1.53	0.78
27	0.06	0.04	64	0.83	0.21
28*	0.09	0.02	88	2.00	1.00
29	0.0582	NR	NR	0.65	0.93
30	0.0418	0.01	70	-0.94	-0.79
31	0.02	NR	125	-3.06	-4.38
32	0.104	0.0312	65.7	5.10	1.64
33	NT	NT	NT		
34	<0.5	NR	113		

Statistics

Assigned Value***	0.0515	0.0072
Spike	0.0713	0.0036
Robust Average	0.058	0.012
Median	0.0545	0.0078
Mean	0.0600	
N	28	
Max.	0.14	
Min.	0.016	
Robust SD	0.026	
Robust CV	44%	

*z-Score adjusted to 2 and En-score adjusted to 1 (see section 6.4).

**z-Score adjusted to 2 (see section 6.4).

***Robust Average excluding Laboratories 10, 17, 19, 22, 25, 28, 31 and 32.

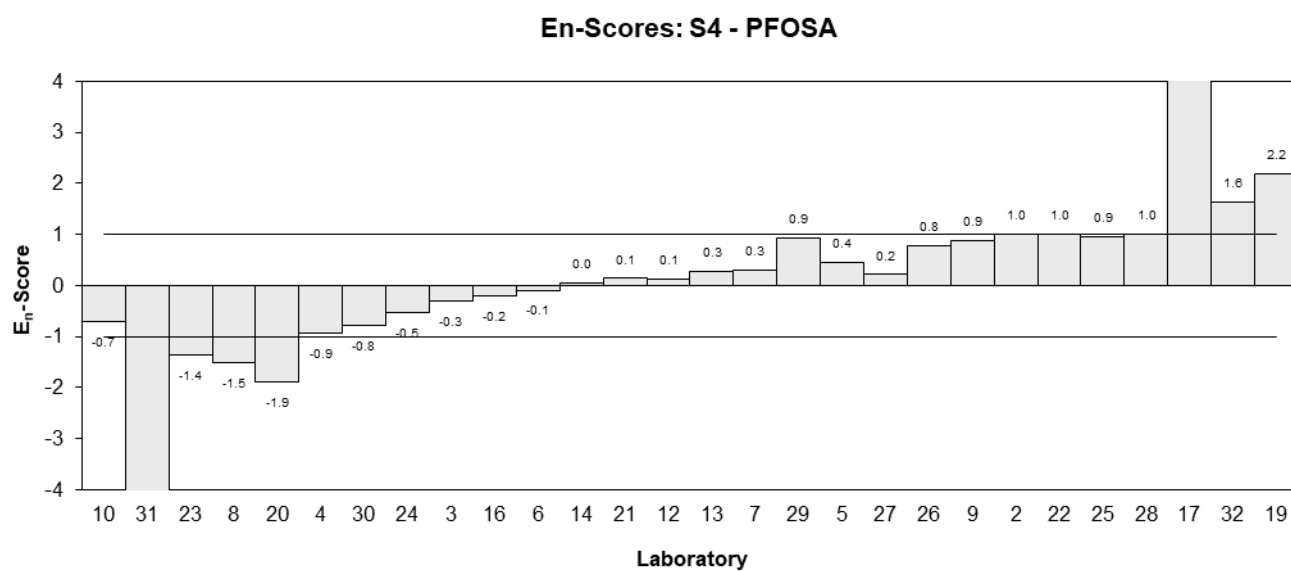
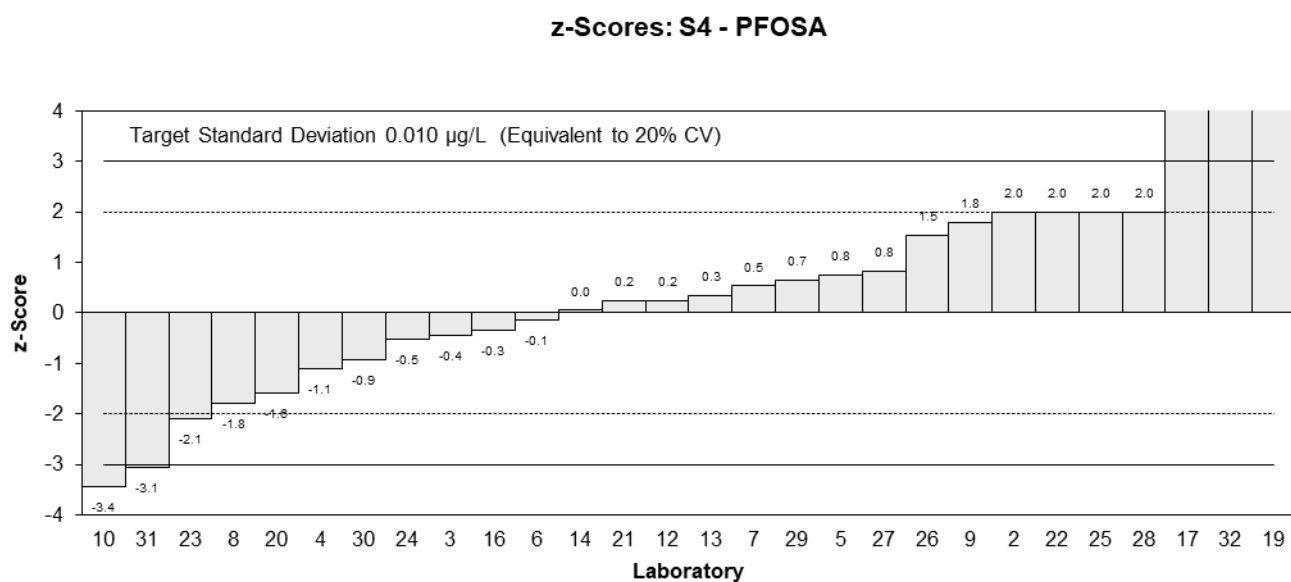
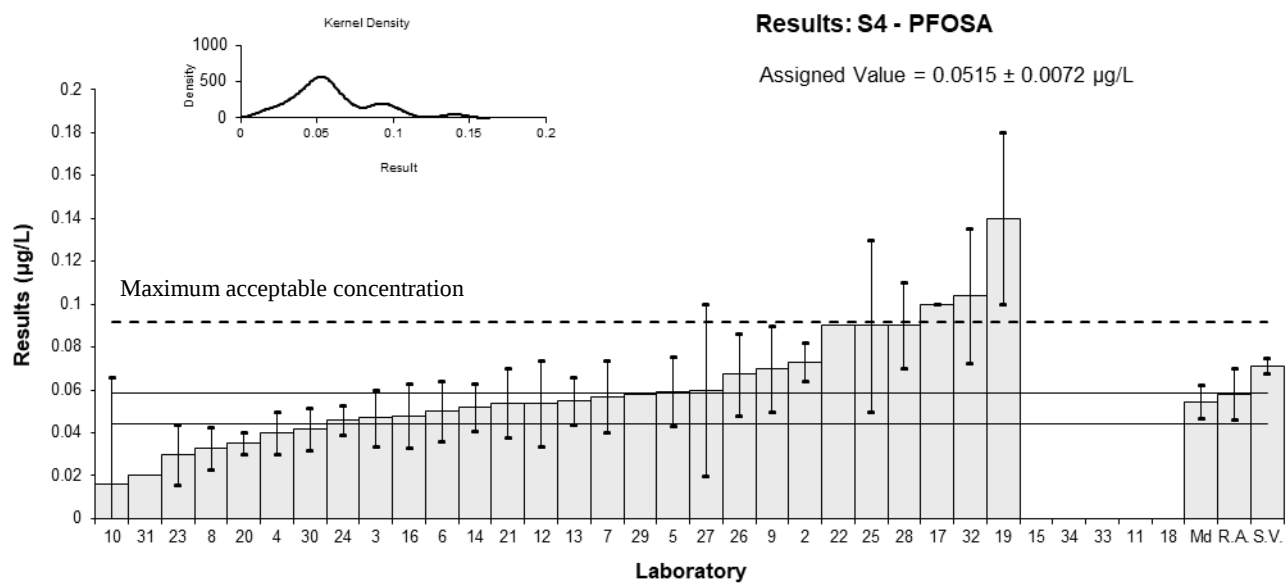


Figure 77

Table 81

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	6:2 FTS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	0.017	0.003	108	0.63	0.55
3	0.012	0.0033	95	-1.03	-0.84
4	<0.05	0.02	120		
5	0.0143	0.026	91	-0.26	-0.03
6	0.016	0.004	80-100	0.30	0.21
7	0.019	0.006	NR	1.29	0.63
8	0.014	0.0041	219	-0.36	-0.25
9	<0.05	NR	75		
10	0.02	0.1	95	1.62	0.05
11	<0.03	NR	105		
12	0.021	0.006	71	1.95	0.95
13	0.015	0.0030	76	-0.03	-0.03
14	0.015	0.005	296	-0.03	-0.02
15	< 0.05	0.03	95		
16	0.014	0.003	94.8	-0.36	-0.32
17	<0.04	NR	102.9		
18	0.01	0.00	NR	-1.69	-3.00
19	0.038	0.013	NR	7.58	1.75
20	<0.004	NR	98		
21	0.0157	0.00471	112	0.20	0.12
22	0.04	NR	NR	8.25	14.65
23	0.015	0.014	NR	-0.03	-0.01
24	NR	NR	NR		
25	0.017	0.005	101	0.63	0.36
26	<0.05	NR	116		
27	0.015	0.005	90	-0.03	-0.02
28	<0.05	NR	101		
29	0.0155	0.0062	100	0.13	0.06
30	0.0121	0.003	70	-0.99	-0.87
31	0.01	NR	90.5	-1.69	-3.00
32	<0.025	NR	302		
33	NT	NT	NT		
34	<0.1	NR	113		

Statistics

Assigned Value*	0.0151	0.0017
Spike	0.0142	0.0007
Robust Average	0.0157	0.0021
Median	0.0150	0.0013
Mean	0.0174	
N	21	
Max.	0.04	
Min.	0.01	
Robust SD	0.0038	
Robust CV	24%	

*Robust Average excluding laboratories 19 and 22.

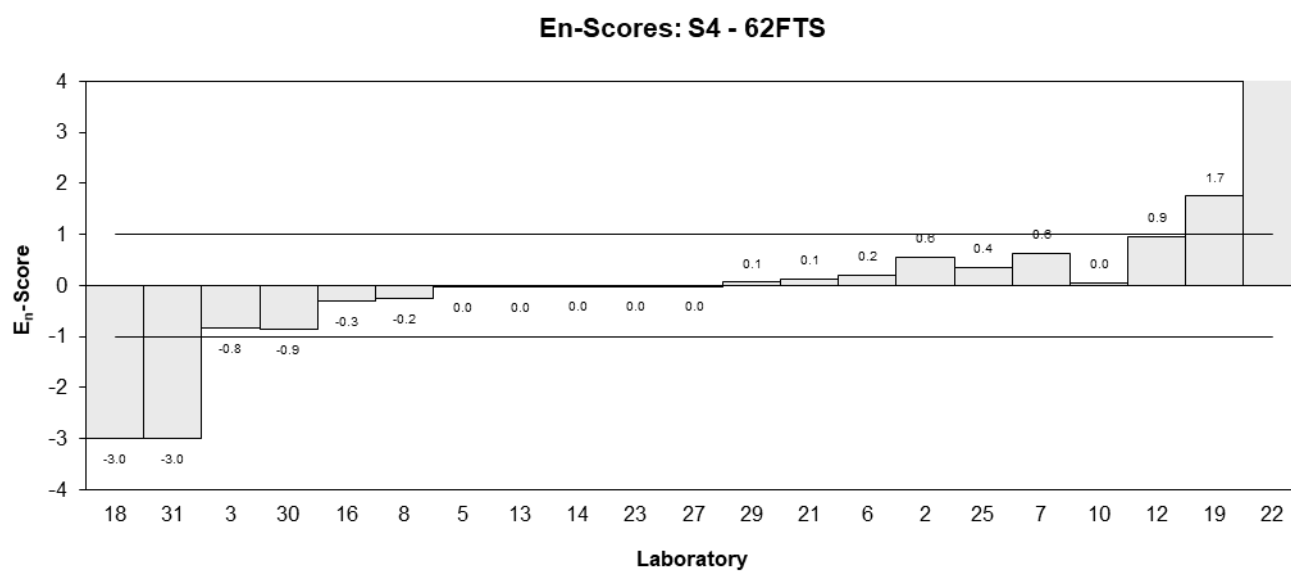
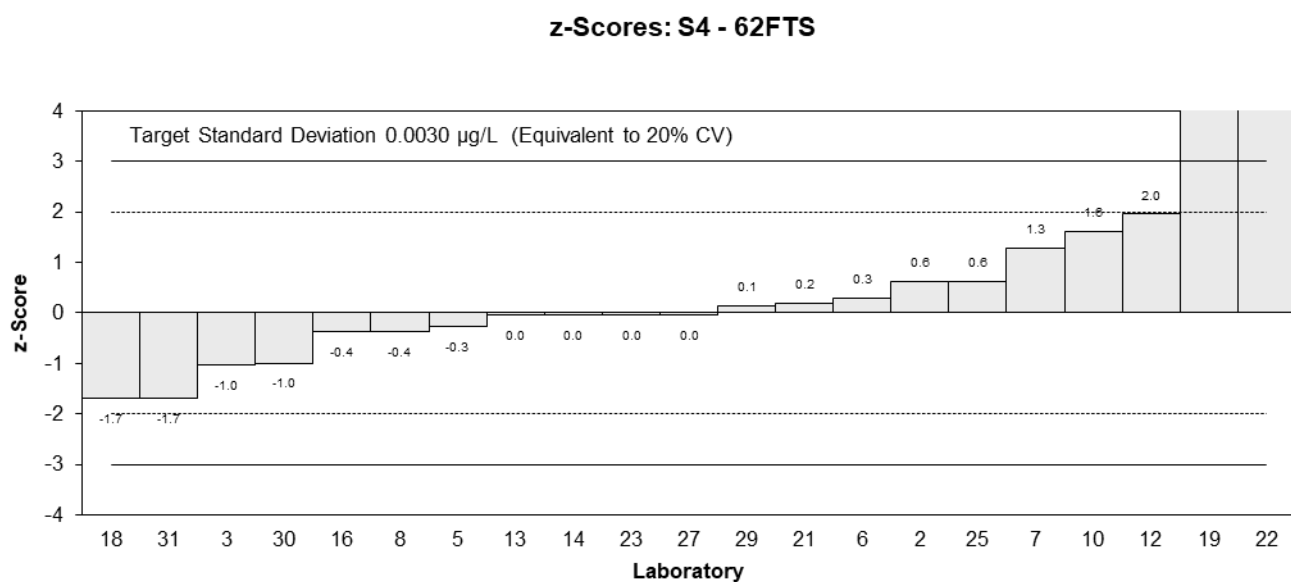
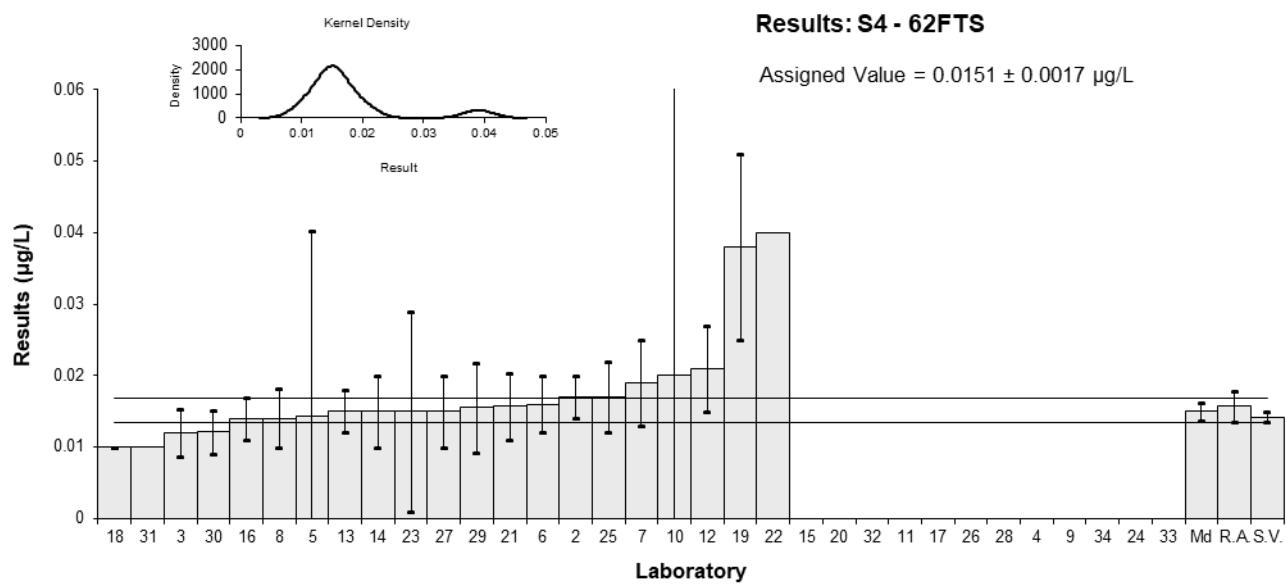


Figure 78

Table 82

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	GenX
Units	µg/L

Participant Results

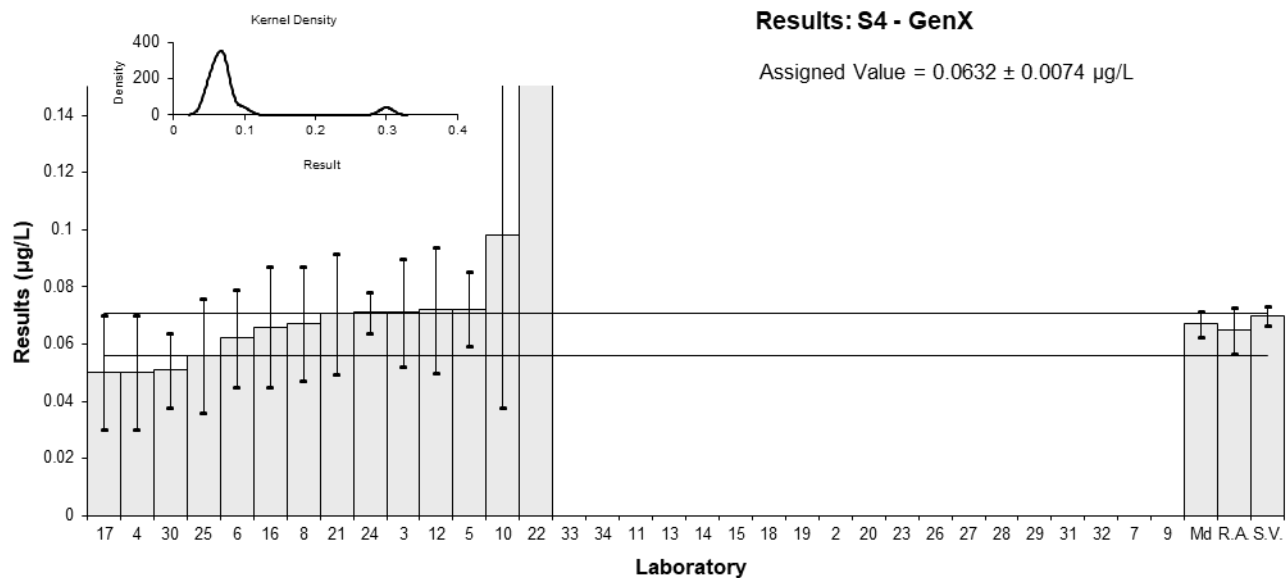
Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	0.071	0.019	97	0.62	0.38
4	0.05	0.02	128	-1.04	-0.62
5	0.0723	0.013	93	0.72	0.61
6	0.062	0.017	80-100	-0.09	-0.06
7	NT	NT	NT		
8	0.067	0.0200	112	0.30	0.18
9	NT	NT	NT		
10	0.098	0.06	NR	2.75	0.58
11	NT	NT	NT		
12	0.072	0.022	97	0.70	0.38
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	0.066	0.021	93.2	0.22	0.13
17	0.05	0.02	100.3	-1.04	-0.62
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	0.0706	0.02118	102	0.59	0.33
22	1.62	NR	120	123.16	210.38
23	NT	NT	NT		
24	0.071	0.0073	86	0.62	0.75
25	0.056	0.02	83	-0.57	-0.34
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	0.051	0.013	74	-0.97	-0.82
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NR	NR	NR		

Statistics*

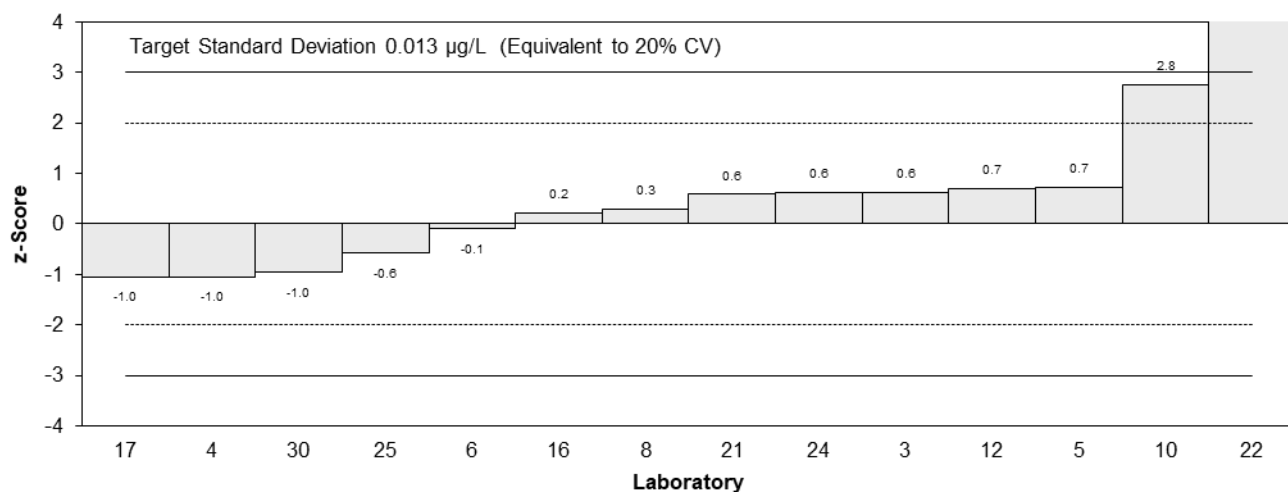
Assigned Value**	0.0632	0.0074
Spike	0.0698	0.0035
Robust Average	0.0647	0.0080
Median	0.0670	0.0045
Mean	0.0659	
N	13	
Max.	0.098	
Min.	0.05	
Robust SD	0.011	
Robust CV	18%	

*Laboratory 22 excluded from statistical calculation (gross error).

**Robust Average excluding laboratory 10.



z-Scores: S4 - GenX



En-Scores: S4 - GenX

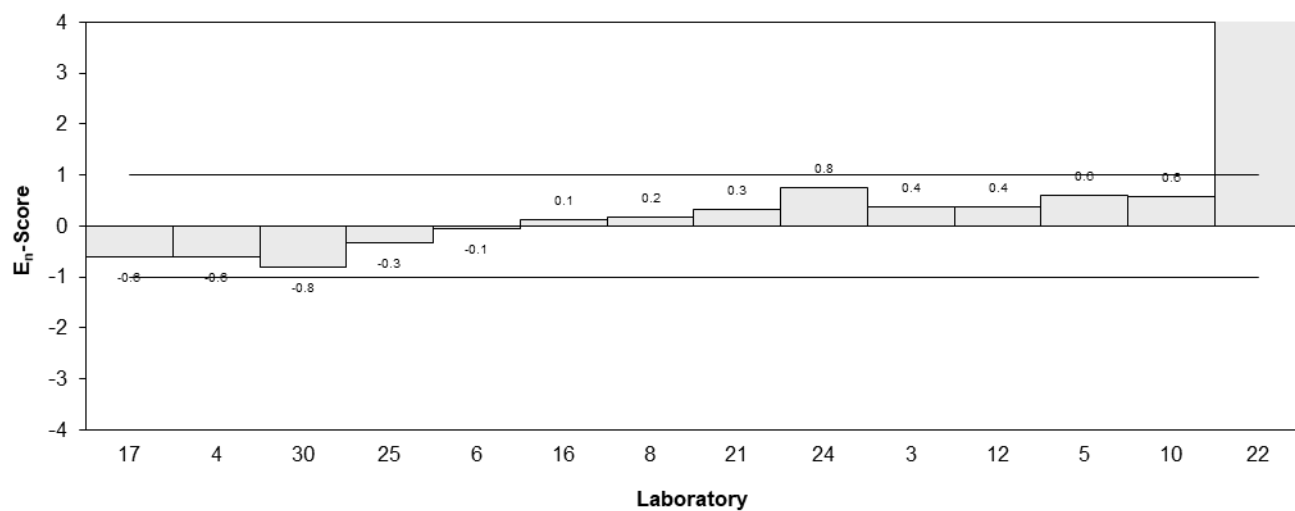


Figure 79

Table 83

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	ADONA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	NT	NT	NT		
4	0.05	NR	NR	-1.33	-2.06
5	0.0746	0.011	86	0.48	0.46
6	0.065	0.018	80-100	-0.23	-0.15
7	NT	NT	NT		
8	0.065	0.0194	113	-0.23	-0.15
9	NT	NT	NT		
10	0.118	0.09	NR	3.66	0.55
11	NT	NT	NT		
12	0.082	0.025	NR	1.02	0.52
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	0.059	0.017	NR	-0.67	-0.48
17	0.1	0.02	100.3	2.34	1.46
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	0.0671	0.02013	94	-0.07	-0.05
22	0.16	NR	NR	6.75	10.44
23	0.076	0.009	NR	0.58	0.63
24	0.067	0.0082	104	-0.08	-0.09
25	0.071	0.02	99	0.21	0.13
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	0.0538	0.013	79	-1.05	-0.91
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value*	0.0681	0.0088
Spike	0.0659	0.0033
Robust Average	0.074	0.013
Median	0.0691	0.0073
Mean	0.0792	
N	14	
Max.	0.16	
Min.	0.05	
Robust SD	0.020	
Robust CV	27%	

*Robust Average excluding laboratories 10 and 22.

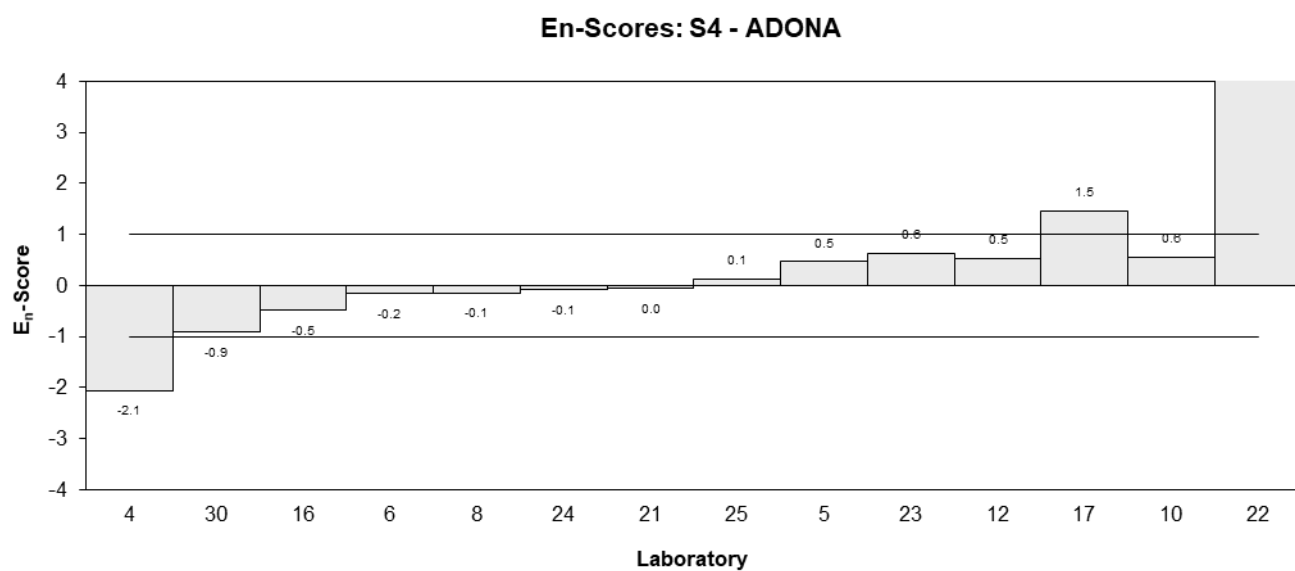
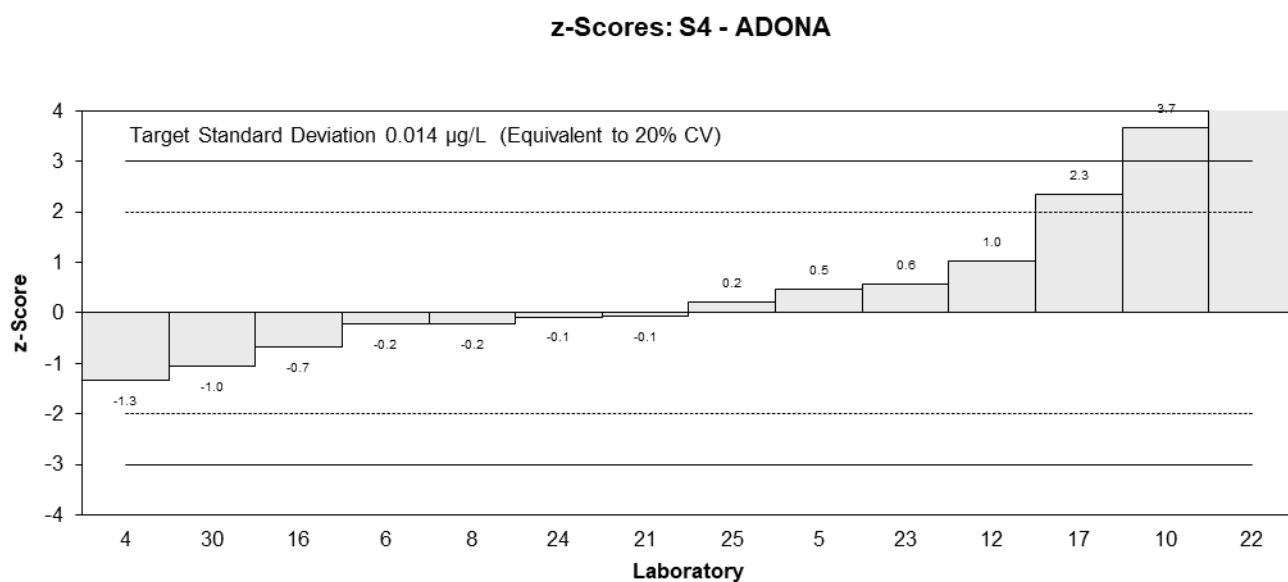
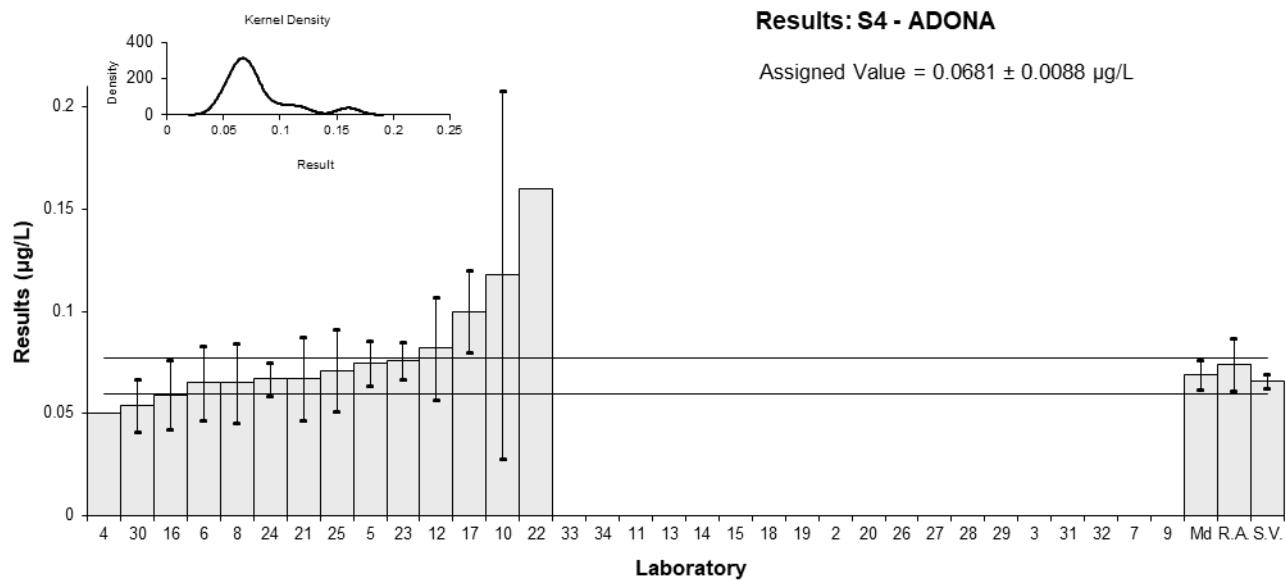


Figure 80

Table 84

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	9CI-PF3ONS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E _n -Score
2	NT	NT	NT		
3	NT	NT	NT		
4	0.06	NR	NR	-0.59	-0.73
5	0.0819	0.012	86	1.02	0.85
6	0.056	0.015	80-100	-0.88	-0.65
7	NT	NT	NT		
8	0.056	0.0167	149	-0.88	-0.60
9	NT	NT	NT		
10	NT	NT	NT		
11	NT	NT	NT		
12	0.063	0.019	NR	-0.37	-0.23
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	0.067	0.021	NR	-0.07	-0.04
17	0.1	0.01	94.9	2.35	2.15
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	0.0639	0.01917	94	-0.30	-0.19
22	NT	NT	NT		
23	0.057	0.015	NR	-0.81	-0.59
24	NR	NR	NR		
25	0.084	0.03	94	1.18	0.50
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	NT	NT	NT		
34	NR	NR	NR		

Statistics

Assigned Value	0.068	0.011
Spike	0.0839	0.0042
Robust Average	0.068	0.011
Median	0.0635	0.0074
Mean	0.0689	
N	10	
Max.	0.1	
Min.	0.056	
Robust SD	0.014	
Robust CV	21%	

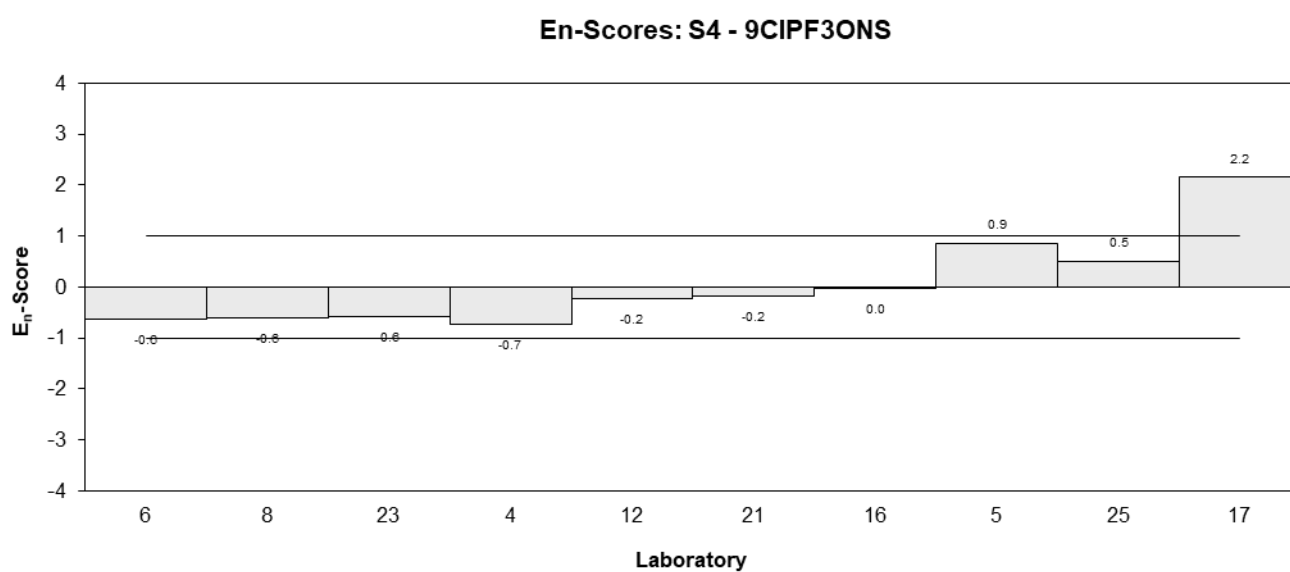
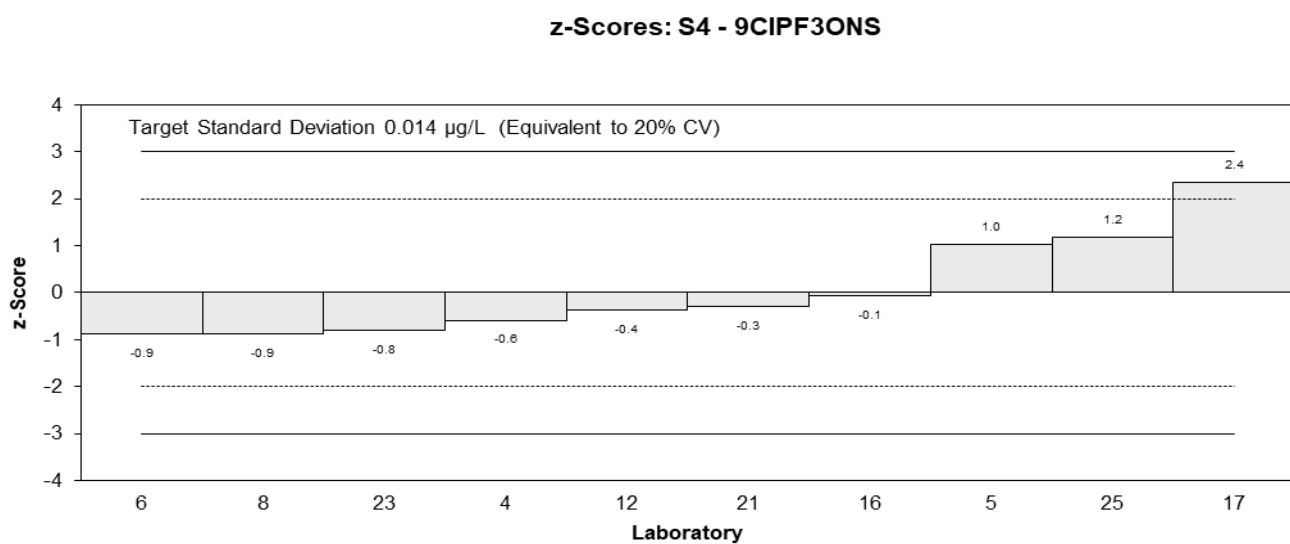
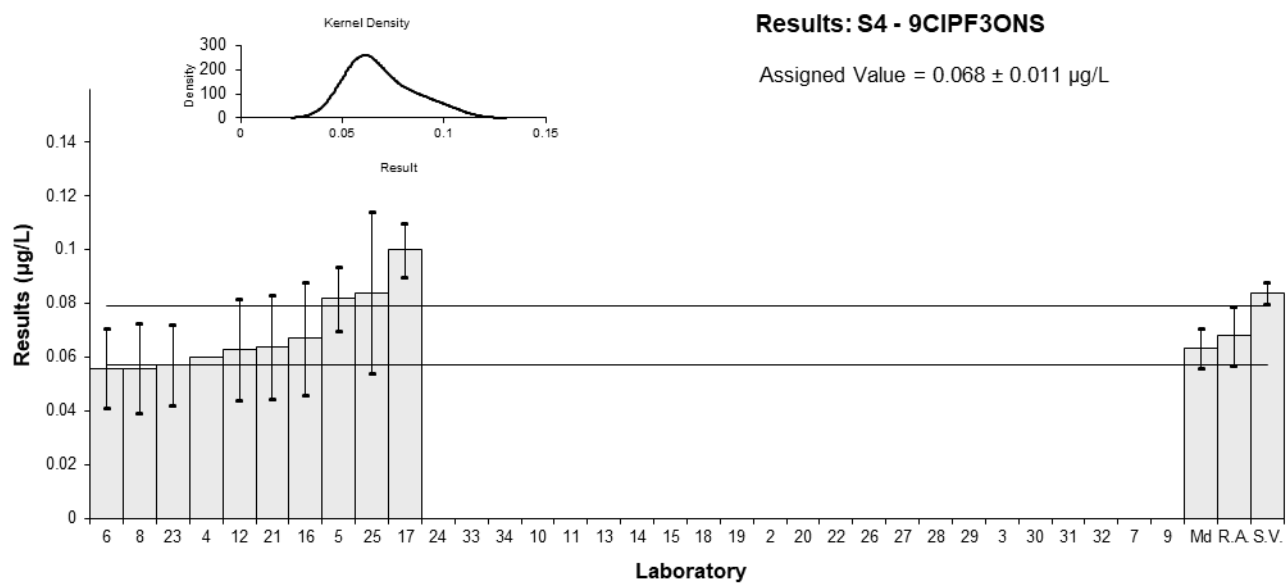


Figure 81

Table 85

Sample Details

Sample No.	S4
Matrix.	Water
Analyte.	11Cl-PF3OUdS
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
2	NT	NT	NT
3	NT	NT	NT
4	0.01	NR	NR
5	0.0393	0.073	86
6	0.019	0.005	80-100
7	NT	NT	NT
8	0.020	0.0061	124
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	0.026	0.008	NR
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	0.018	0.007	NR
17	0.01	0.004	94.9
18	NT	NT	NT
19	NT	NT	NT
20	NT	NT	NT
21	0.0231	0.00693	94
22	NT	NT	NT
23	0.007	0.012	NR
24	0.021	0.0062	111
25	0.041	0.02	94
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
34	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike	0.0565	0.0028
Robust Average	0.0212	0.0092
Median	0.0200	0.0060
Mean	0.0213	
N	11	
Max.	0.041	
Min.	0.007	
Robust SD	0.012	
Robust CV	58%	

Results: S4 - 11CIPF3OUdS

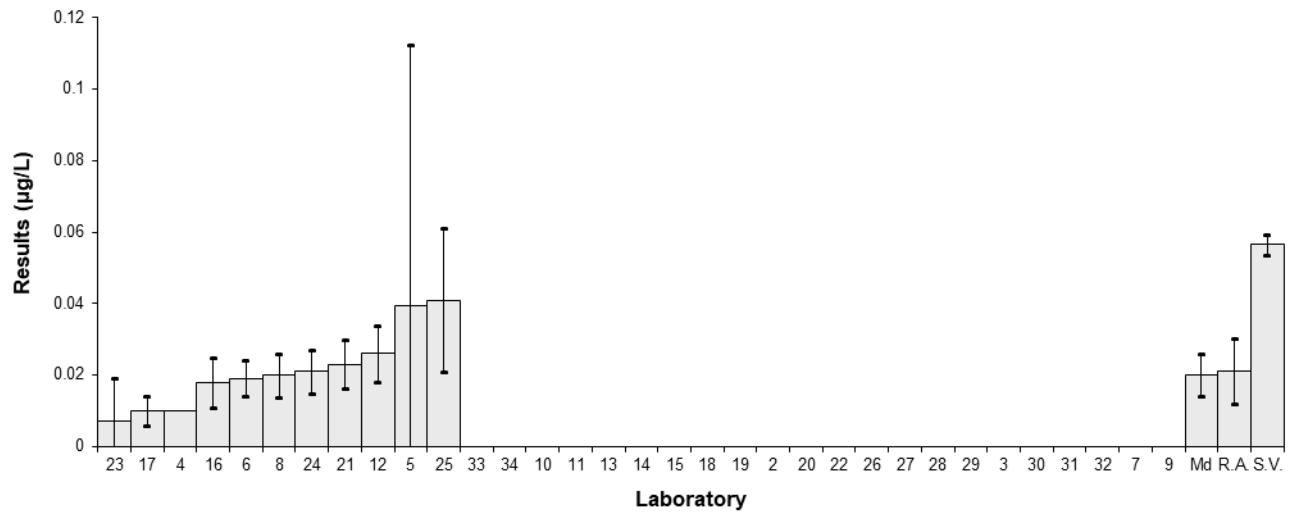


Figure 82

6 DISCUSSION OF RESULTS

6.1 Assigned Value

Assigned values for the tests in the study samples were the robust averages of participants' results. The robust averages and their associated expanded uncertainties were calculated using the procedures described in ISO 13528:2015(E). Results less than 50% or more than 150% of the robust average were removed before calculation of the assigned value.⁸ Appendix 2 sets out the calculation for the expanded uncertainty of the robust average of PFHxA in S1.

No assigned values were calculated for PFNS and PFDS in S1, PFNA in S3 and PFDS, PFUdS, PFDoS, PFTrDS, PFTrDA, PFTeDA and 11Cl-PF3OUdS in S4, because the reported results were either too few or too variable.

Traceability: The consensus of participants' results is not traceable to any external reference, so although expressed in SI units, metrological traceability has not been established.

Assigned values for spiked analytes in Samples S2 and S4 were within the range 49% to 91% of the spiked concentration for that analyte (Table 86).

Although a low spiked recovery was found for GenX and 11Cl-PF3OUdS in S2 an assigned value was still set for these analyte because there was reasonable consensus between reported results with between-laboratory CV's of 12% and 26 respectively (Table 87).

Table 86 Comparison of Assigned Value and Spiked Concentration.

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	PFBS	µg/kg	20.0	18.3	92
S2	Soil	PFPeS	µg/kg	23.4	24.0	103
S2	Soil	PFHxS	µg/kg	18.9	18.0	95
S2	Soil	PFHxS_L	µg/kg	18.9	17.9	95
S2	Soil	PFHpS	µg/kg	2.01	2.00	100
S2	Soil	PFOS	µg/kg	4.78	4.68	98
S2	Soil	PFOS_L	µg/kg	4.78	4.78	100
S2	Soil	PFBA	µg/kg	5.02	5.09	101
S2	Soil	PFPeA	µg/kg	10.1	10.1	100
S2	Soil	PFHxA	µg/kg	8.97	9.69	108
S2	Soil	PFHpA	µg/kg	2.99	3.25	109
S2	Soil	PFOA	µg/kg	12.1	12.0	99
S2	Soil	PFNA	µg/kg	6.06	6.12	101
S2	Soil	PFDA	µg/kg	19.9	19.9	100
S2	Soil	PFOSA	µg/kg	4.96	4.14	83
S2	Soil	MeFOSA	µg/kg	6.92	6.98	101
S2	Soil	EtFOSA	µg/kg	10.0	9.82	98
S2	Soil	MeFOSAA	µg/kg	15.0	12.9	86
S2	Soil	MeFOSE	µg/kg	8.08	7.71	95
S2	Soil	8:2 FTS	µg/kg	9.58	9.02	94

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	GenX	µg/kg	15.0	7.41	49
S2	Soil	ADONA	µg/kg	47.1	42.1	89
S2	Soil	9Cl-PF3ONS	µg/kg	37.3	34.5	92
S2	Soil	11Cl-PF3OUdS	µg/kg	58.1	33.8	58
S4	Water	PFBS	µg/L	0.0700	0.0639	91
S4	Water	PFPeS	µg/L	0.0328	0.0343	105
S4	Water	PFHxS	µg/L	0.0284	0.0274	96
S4	Water	PFHxS_L	µg/L	0.0284	0.0259	91
S4	Water	PFHpS	µg/L	0.00500	0.00437	87
S4	Water	PFOS	µg/L	0.0143	0.0138	97
S4	Water	PFOS_L	µg/L	0.0143	0.0135	94
S4	Water	PFDS	µg/L	0.0645	0.047*	73
S4	Water	PFBA	µg/L	0.0556	0.0457	82
S4	Water	PFPeA	µg/L	0.0645	0.0601	93
S4	Water	PFHxA	µg/L	0.0251	0.0268	107
S4	Water	PFHpA	µg/L	0.00783	0.0081	103
S4	Water	PFOA	µg/L	0.0302	0.0292	97
S4	Water	PFNA	µg/L	0.0700	0.0662	95
S4	Water	PFDA	µg/L	0.0400	0.0377	94
S4	Water	PFUdA	µg/L	0.101	0.096	95
S4	Water	PFDoA	µg/L	0.0206	0.0176	85
S4	Water	PFTTrDA	µg/L	0.0394	0.0299*	76
S4	Water	PFTeDA	µg/L	0.0801	0.063*	79
S4	Water	PFOSA	µg/L	0.0713	0.0515	72
S4	Water	6:2 FTS	µg/L	0.0142	0.0151	106
S4	Water	GenX	µg/L	0.0698	0.0632	91
S4	Water	ADONA	µg/L	0.0659	0.0681	103
S4	Water	9Cl-PF3ONS	µg/L	0.0839	0.068	81
S4	Water	11Cl-PF3OUdS	µg/L	0.0565	0.0211*	37

*Robust Average.

6.2 Measurement Uncertainty Reported by Participants

Participants were asked to report an estimate of the expanded measurement uncertainty associated with their results. Of 1962 numerical results, 1908 were reported with an expanded measurement uncertainty, indicating that not all laboratories have addressed this requirement of ISO 17025.⁷ The participants used a wide variety of procedures to estimate expanded measurement uncertainty. These are presented in Table 2. A number of participants reported using NATA GAG Estimating and Reporting MU as their guide; this document is now obsolete and removed from NATA website.

Proficiency tests allow a check of participants' uncertainty estimates. Results and the expanded MU are presented in the bar charts for each analyte (Figure 2 to 82). In this study, the magnitude of the reported expanded uncertainties was within the range 0% to 727% of the reported value. 109 were less than 10% relative, which the study coordinator believes is unrealistically small for a routine PFAS measurement, and 88 were larger than 50% relative.

Results returning a satisfactory z-score but an unsatisfactory E_n -score may have underestimated the uncertainty.

Some participants attached an estimate of the expanded measurement uncertainty to a result reported as less than their limit of reporting. An estimate of uncertainty expressed as a numerical value cannot be attached to a result expressed as a range.⁸

In some cases results were reported with an inappropriate number of significant figures. The recommended format is to write uncertainty to no more than two significant figures and then to write the result with the corresponding number of decimal places (for example a results of " $12.808 \pm 2.818 \mu\text{g/L}$ ", should instead be expressed as " $12.8 \pm 2.8 \mu\text{g/L}$ ").⁸

6.3 E_n -Score

E_n -score should be interpreted only in conjunction with z-scores. The E_n -score indicates how closely a result agrees with the assigned value taking into account the respective uncertainties. An unsatisfactory E_n score for an analyte can either be caused by an inappropriate measurement, an inappropriate estimation of measurement uncertainty, or both.

The dispersal of participants' E_n -scores is graphically presented in Figure 83. Where a laboratory did not report an expanded uncertainty with a result, an expanded uncertainty of zero (0) was used to calculate the E_n -score.

Of 1818 results for which E_n -scores were calculated, 1461 (80%) returned a satisfactory score of $|E_n| \leq 1.0$ indicating agreement of the participants' results with the assigned values within their respective expanded measurement uncertainties.

6.4 z-Score

A target standard deviation equivalent to 20% coefficient of variation (CV) was used to calculate z-scores. The between-laboratory coefficient of variation predicted by the modified Horwitz equation⁶ and the between-laboratories CV are presented for comparison in Table 87.

To account for possible bias in the consensus values due to laboratories using inefficient analytical/extraction techniques, z-scores were adjusted for PFOSA in Sample S4. Where the assigned value is less than 80% of the spiked value, a maximum acceptable concentration is set to two target standard deviations more than the spiked level and z-scores greater than 2 are adjusted to a value of 2. When the results are higher than the maximum acceptable concentration, z-scores are not adjusted. This approach ensures that laboratories reporting

results close to the spiked concentration were not penalised. z-Scores of less than 2 were left unaltered.

The dispersal of participants' z-scores is graphically presented by laboratory in Figures 84 and 86 and by analyte in Figures 85 and 87.

Of the 1818 results for which z-scores were calculated, 1654 (91%) returned a satisfactory z-score of $|z| \leq 2.0$ and 64 (4%) were questionable with a z-score of $2.0 < |z| < 3.0$. Participants with multiple z-scores larger than 2.0 or smaller than -2.0 should check for laboratory bias.

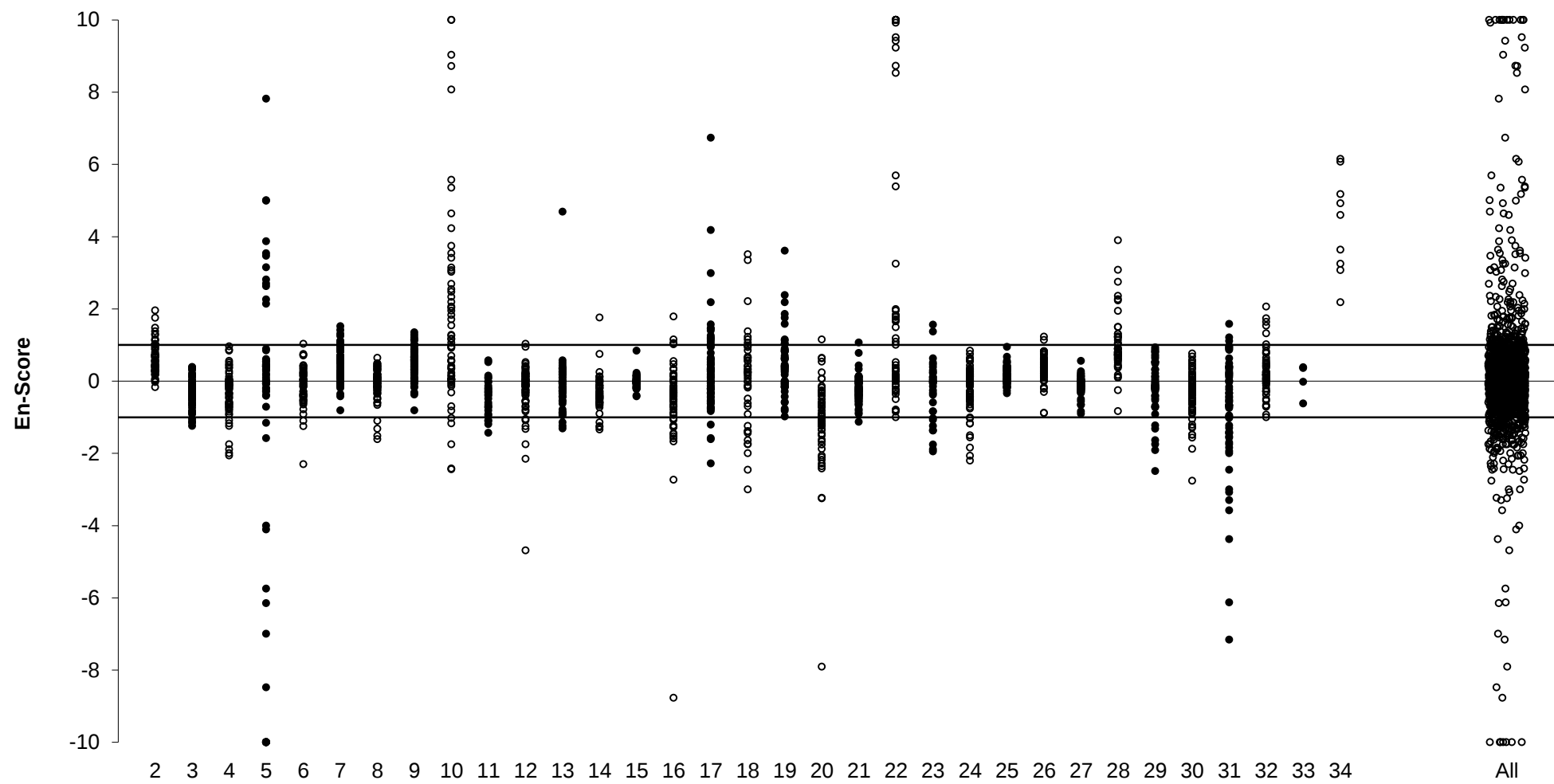
Table 87 Performance Target standard deviation, modified Horwitz values and between laboratories CV

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between laboratories' CV* (%)
S1	PFBS	3.81	µg/kg	20	22	12
S1	PFPeS	4.93	µg/kg	20	22	15
S1	PFHxS	41.3	µg/kg	20	22	13
S1	PFHxS_L	36.4	µg/kg	20	22	16
S1	PFHpS	4.34	µg/kg	20	22	19
S1	PFOS	484	µg/kg	20	18	18
S1	PFOS_L	353	µg/kg	20	19	14
S1	PFNS	Not Set	µg/kg	Not Set	NA	81
S1	PFDS	Not Set	µg/kg	Not Set	NA	67
S1	PFBA	2.27	µg/kg	20	22	16
S1	PFPeA	2.76	µg/kg	20	22	14
S1	PFHxA	12.8	µg/kg	20	22	11
S1	PFHpA	1.20	µg/kg	20	22	13
S1	PFOA	3.70	µg/kg	20	22	15
S1	PFOSA	1.70	µg/kg	20	22	22
S2	PFBS	18.3	µg/kg	20	22	8.5
S2	PFPeS	24.0	µg/kg	20	22	13
S2	PFHxS	18.0	µg/kg	20	22	12
S2	PFHxS_L	17.9	µg/kg	20	22	14
S2	PFHpS	2.00	µg/kg	20	22	11
S2	PFOS	4.68	µg/kg	20	22	13
S2	PFOS_L	4.78	µg/kg	20	22	12
S2	PFBA	5.09	µg/kg	20	22	15
S2	PFPeA	10.1	µg/kg	20	22	10
S2	PFHxA	9.69	µg/kg	20	22	7.8
S2	PFHpA	3.25	µg/kg	20	22	12
S2	PFOA	12.0	µg/kg	20	22	9.7

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between laboratories' CV* (%)
S2	PFNA	6.12	µg/kg	20	22	13
S2	PFDA	19.9	µg/kg	20	22	10
S2	PFOSA	4.14	µg/kg	20	22	14
S2	MeFOSA	6.98	µg/kg	20	22	11
S2	EtFOSA	9.82	µg/kg	20	22	7.7
S2	MeFOSAA	12.9	µg/kg	20	22	16
S2	MeFOSE	7.71	µg/kg	20	22	13
S2	8:2 FTS	9.02	µg/kg	20	22	15
S2	ADONA	42.1	µg/kg	20	22	22
S2	GenX	7.41	µg/kg	20	22	12
S2	9Cl-PF3ONS	34.5	µg/kg	20	22	14
S2	11Cl-PF3OUdS	33.8	µg/kg	20	22	26
S3	PFBS	0.322	µg/L	20	22	12
S3	PFPeS	0.375	µg/L	20	22	17
S3	PFHxS	3.12	µg/L	20	22	13
S3	PFHxS_L	2.60	µg/L	20	22	11
S3	PFHpS	0.196	µg/L	20	22	29
S3	PFOS	3.79	µg/L	20	22	22
S3	PFOS_L	1.63	µg/L	20	22	17
S3	PFBA	0.111	µg/L	20	22	13
S3	PFPeA	0.182	µg/L	20	22	15
S3	PFHxA	0.774	µg/L	20	22	16
S3	PFHpA	0.0927	µg/L	20	22	16
S3	PFOA	0.225	µg/L	20	22	16
S3	PFNA	Not Set	µg/L	Not Set	NA	27
S3	PFOSA	0.0096	µg/L	20	22	18
S4	PFBS	0.0639	µg/L	20	22	13
S4	PFPeS	0.0343	µg/L	20	22	16
S4	PFHxS	0.0274	µg/L	20	22	19
S4	PFHxS_L	0.0259	µg/L	20	22	17
S4	PFHpS	0.00437	µg/L	20	22	22
S4	PFOS	0.0138	µg/L	20	22	28
S4	PFOS_L	0.0135	µg/L	20	22	29
S4	PFDS	Not Set	µg/L	Not Set	NA	45
S4	PFDoS	Not Set	µg/L	Not Set	NA	61

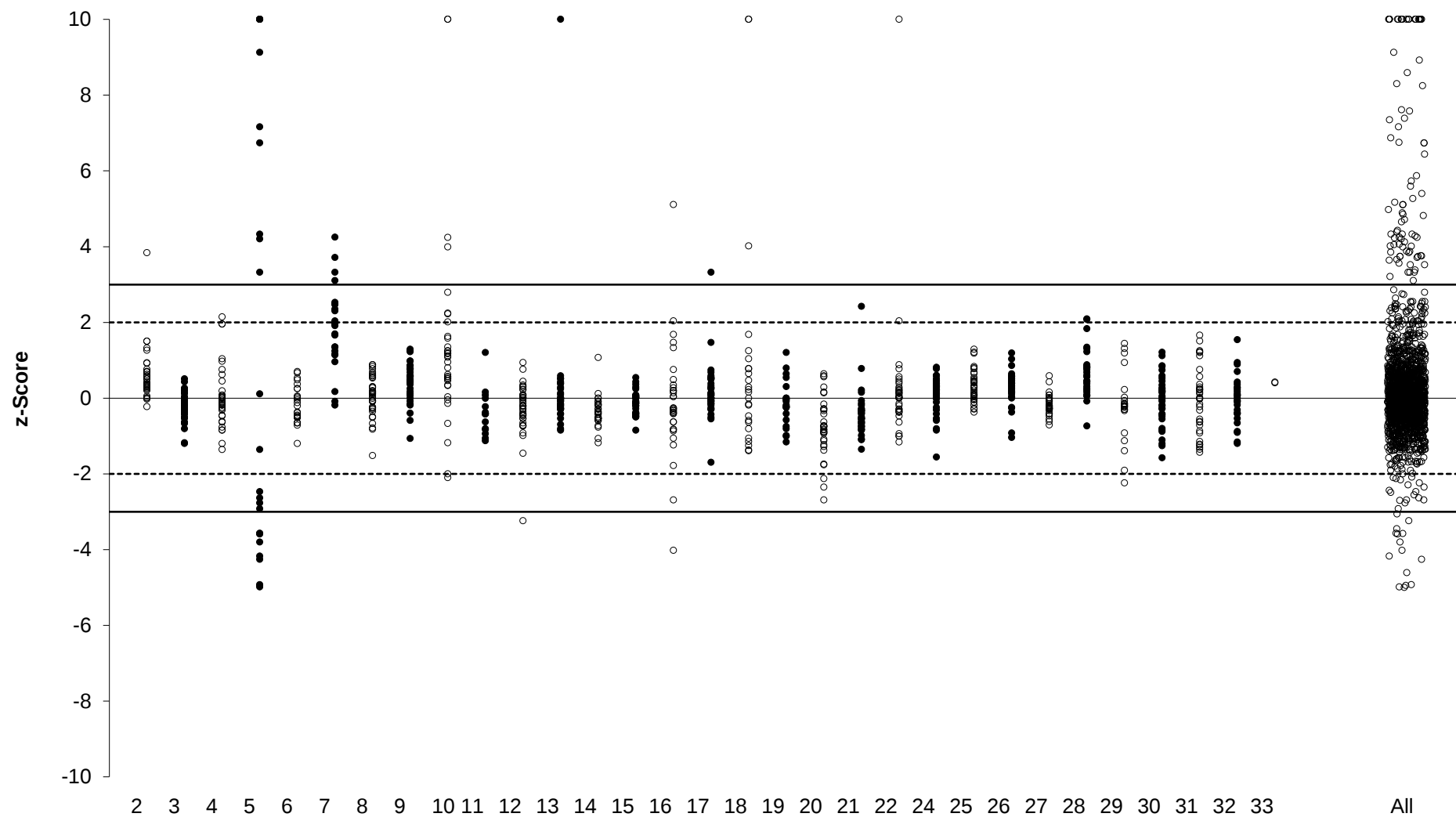
Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between laboratories' CV* (%)
S4	PFBA	0.0457	µg/L	20	22	11
S4	PFPeA	0.0601	µg/L	20	22	13
S4	PFHxA	0.0268	µg/L	20	22	15
S4	PFHpA	0.0081	µg/L	20	22	23
S4	PFOA	0.0292	µg/L	20	22	11
S4	PFNA	0.0662	µg/L	20	22	17
S4	PFDA	0.0377	µg/L	20	22	20
S4	PFUdA	0.096	µg/L	20	22	27
S4	PFDaA	0.0176	µg/L	20	22	22
S4	PFTTrDA	Not Set	µg/L	Not Set	NA	55
S4	PFTeDA	Not Set	µg/L	Not Set	NA	53
S4	PFOSA	0.0515	µg/L	20	22	25
S4	6:2 FTS	0.0151	µg/L	20	22	20
S4	ADONA	0.0681	µg/L	20	22	18
S4	GenX	0.0632	µg/L	20	22	16
S4	9Cl-PF3ONS	0.068	µg/L	20	22	21
S4	11Cl-PF3OUdS	Not Set	µg/L	Not Set	NA	58

*Robust between laboratories CV with outliers removed. Note: Shaded cells are between participant laboratories' CV which were higher than the target SD established by the study coordinator and the coefficient of variation from the predictive mathematical model (modified Horwitz equation). NA = Not Available



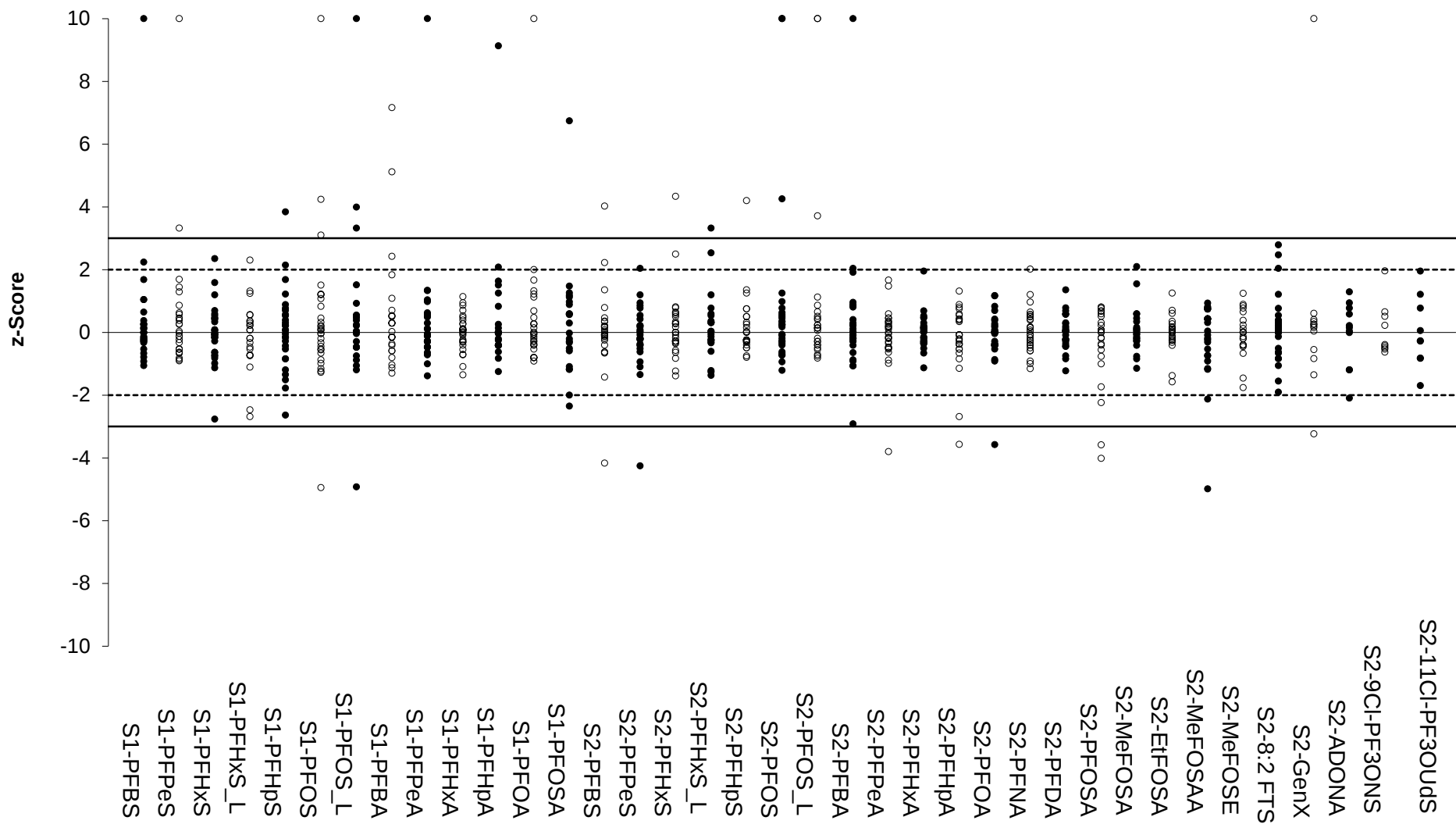
Scores greater than 10 have been plotted as 10.

Figure 83 E_n-Score Dispersal by Laboratory



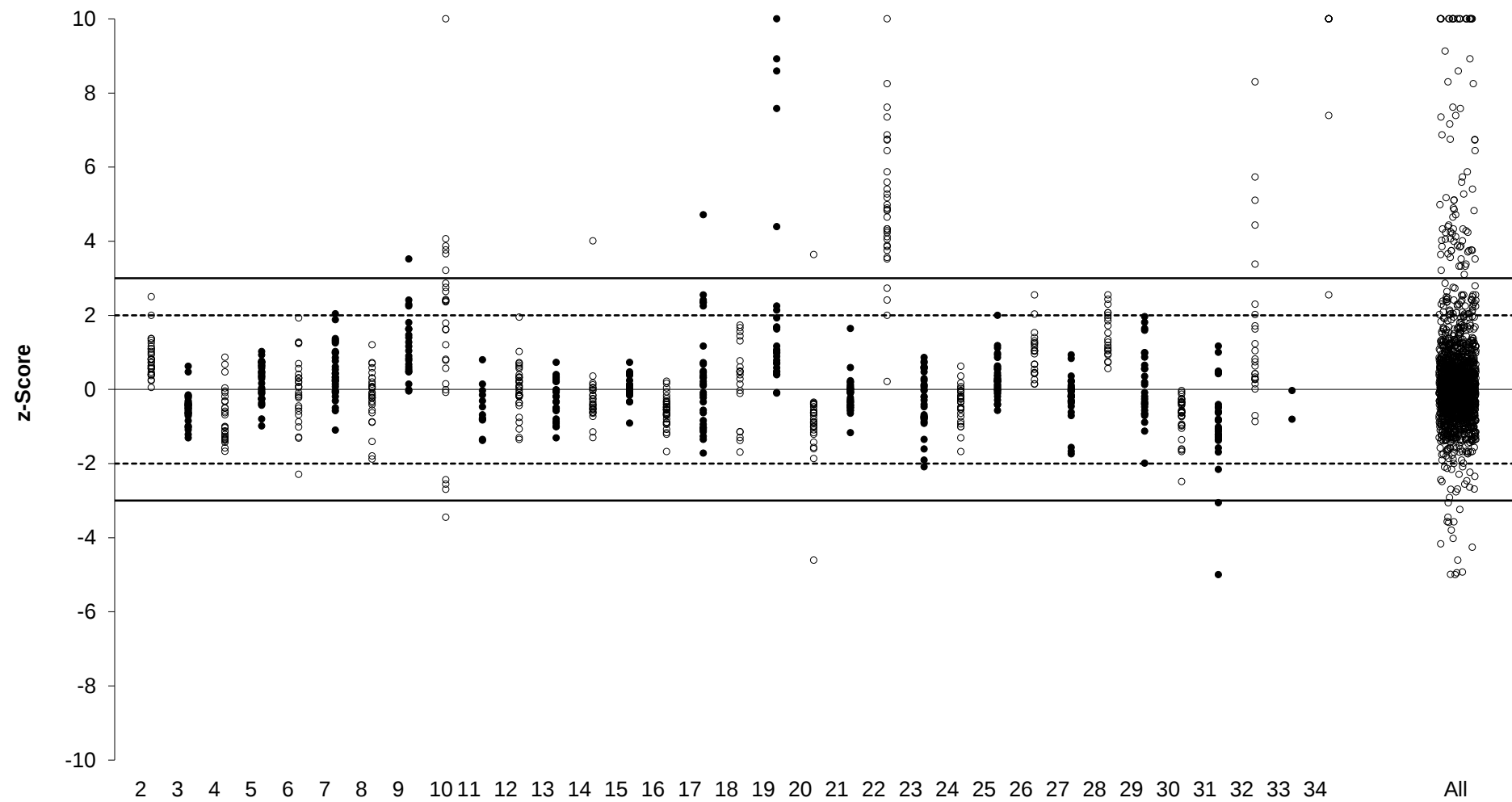
Scores greater than 10 have been plotted as 10.

Figure 84 z-Score Dispersal by Laboratory for Soil Samples S1 and S2



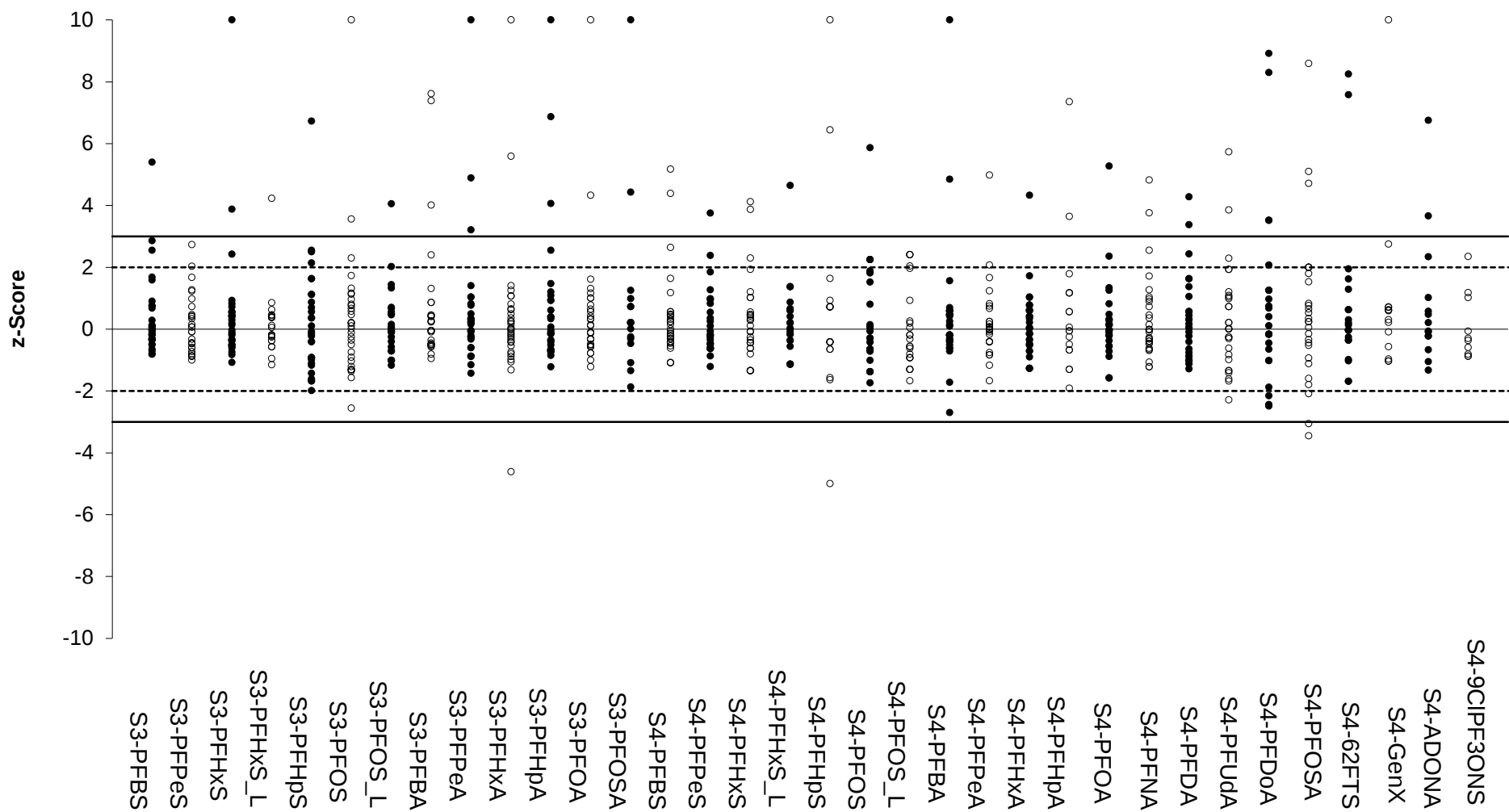
Scores greater than 10 have been plotted as 10.

Figure 85 z-Score Dispersal by Analyte for Soil Samples S1 and S2



Scores greater than 10 have been plotted as 10.

Figure 86 z-Score Dispersal by Laboratory for Water Samples S3 and S4

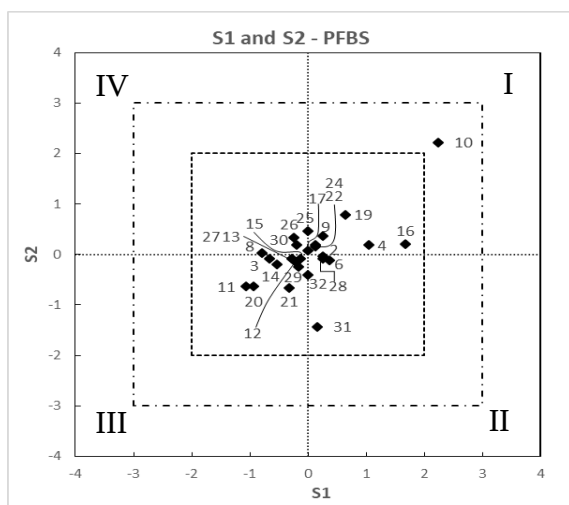


Scores greater than 10 have been plotted as 10.

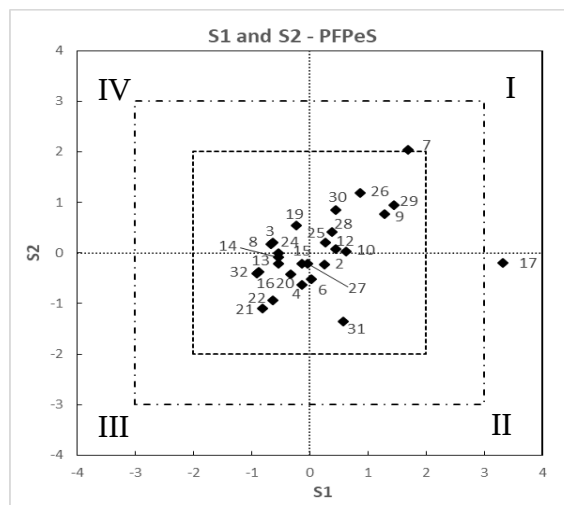
Figure 87 z-Score Dispersal by Analyte for Water Samples S3 and S4

6.5 z-Score Scatter Plots

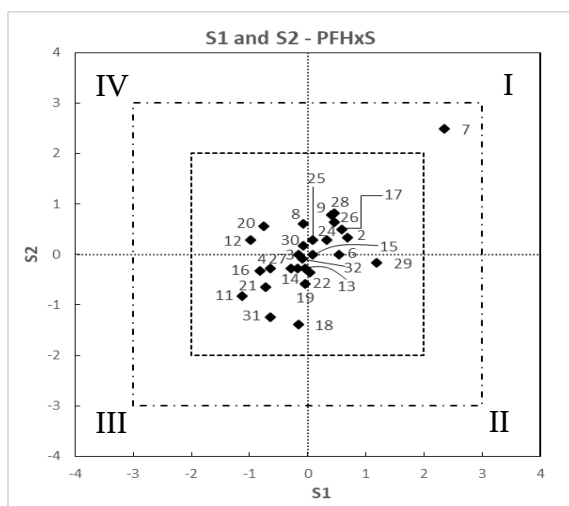
Scatter plots of z-scores for all analytes are presented in Figure 88. Scores are predominantly plotted in quadrants I and III, indicating that laboratory bias is the major contributor to the variability of results.



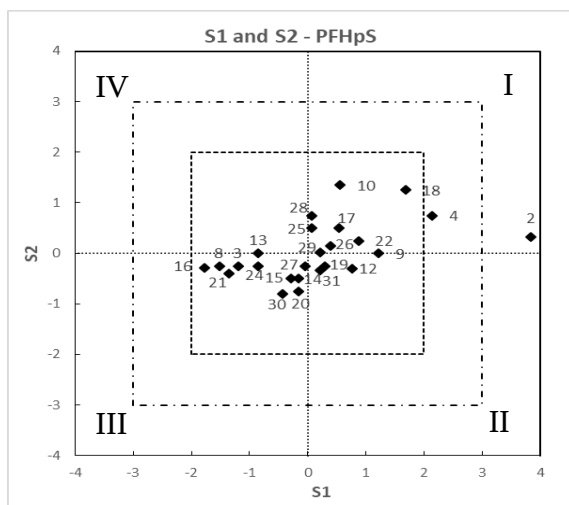
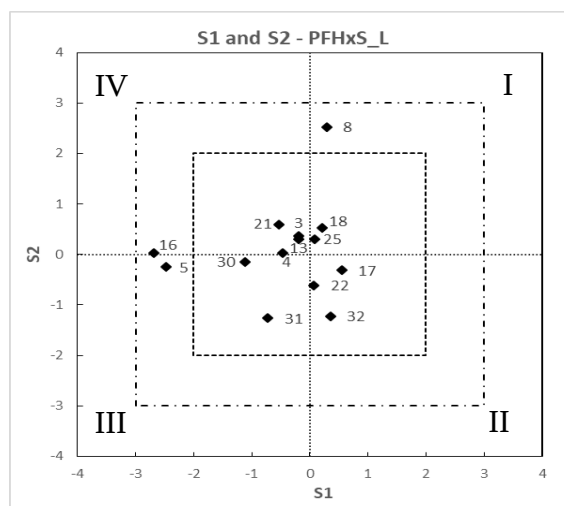
Laboratories 5 and 18 are off scale.



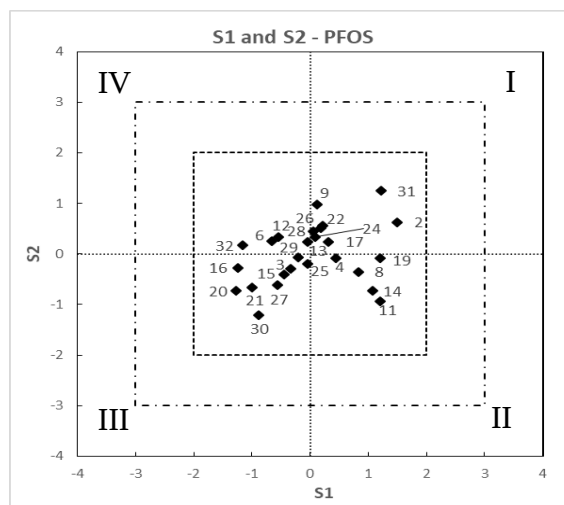
Laboratory 5 is off scale.



Laboratory 5 is off scale.

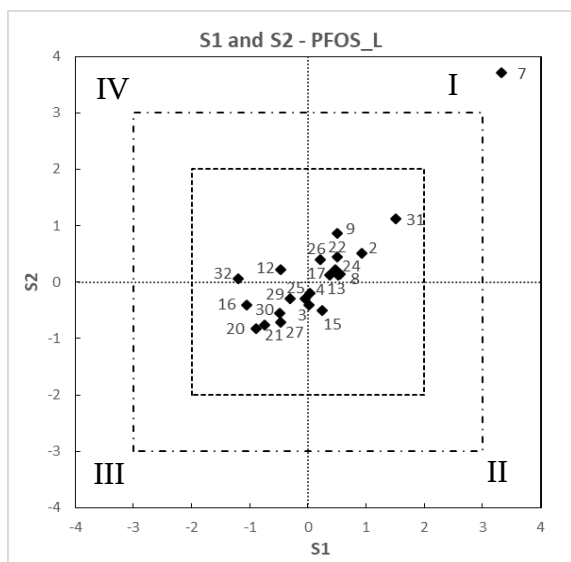


Laboratory 5 is off scale.

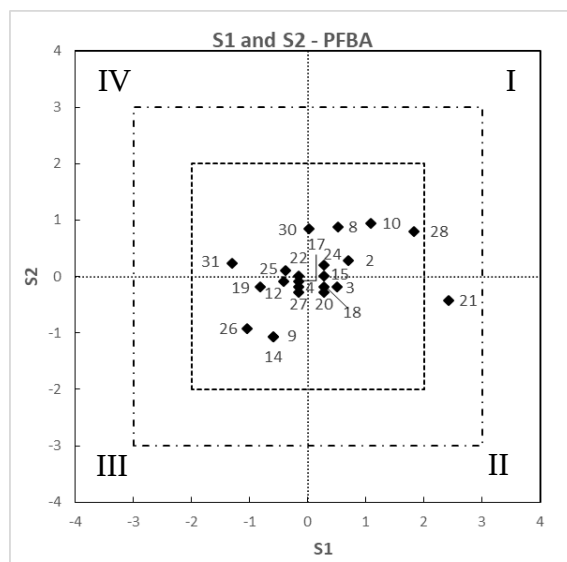


Laboratories 5, 7, 10 and 18 are off scale.

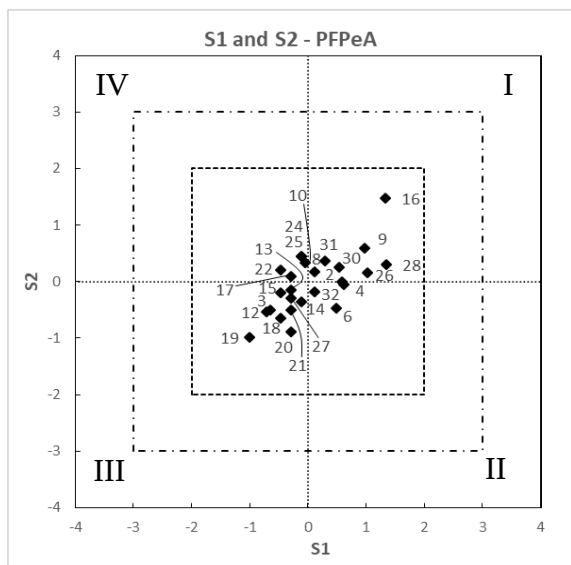
Figure 88 z-Score Scatter Plots



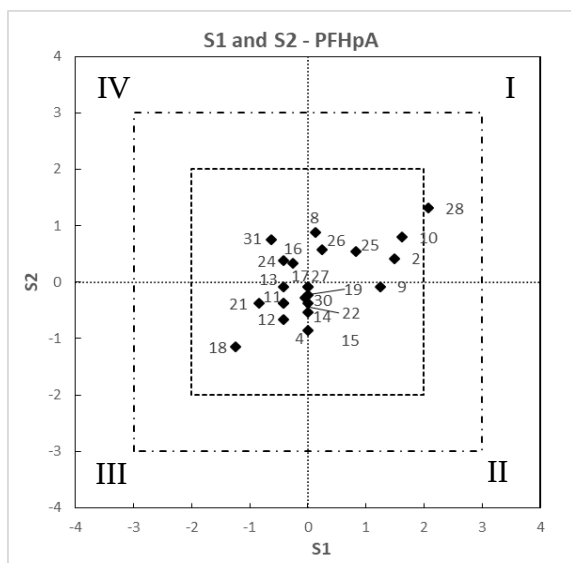
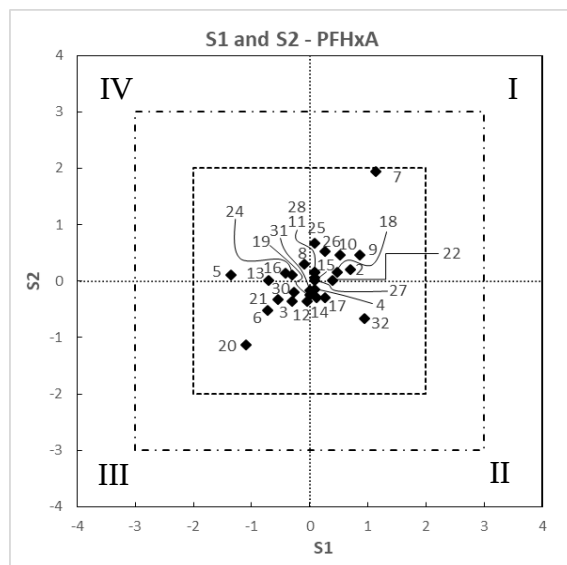
Laboratories 5, 10 and 18 are off scale.



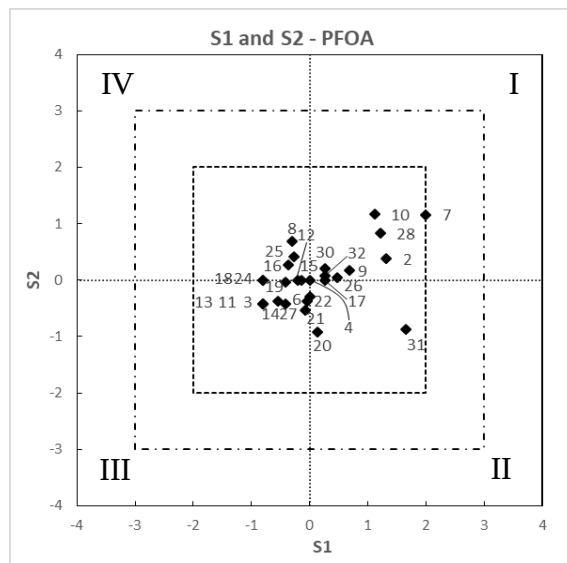
Laboratories 5, 13 and 16 are off scale.



Laboratory 5 is off scale.

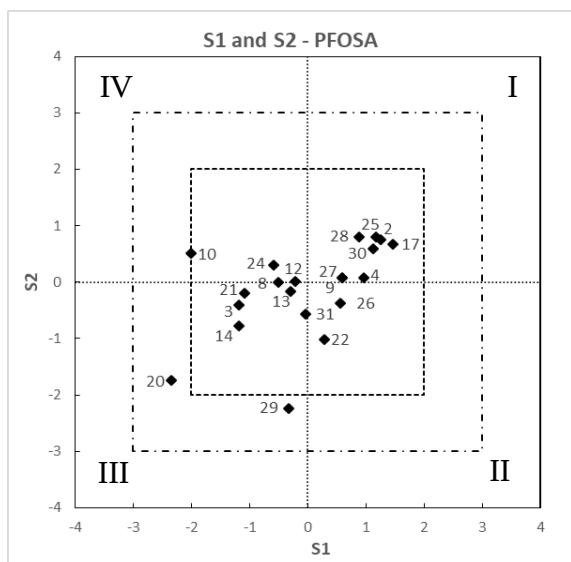


Laboratory 5 is off scale.

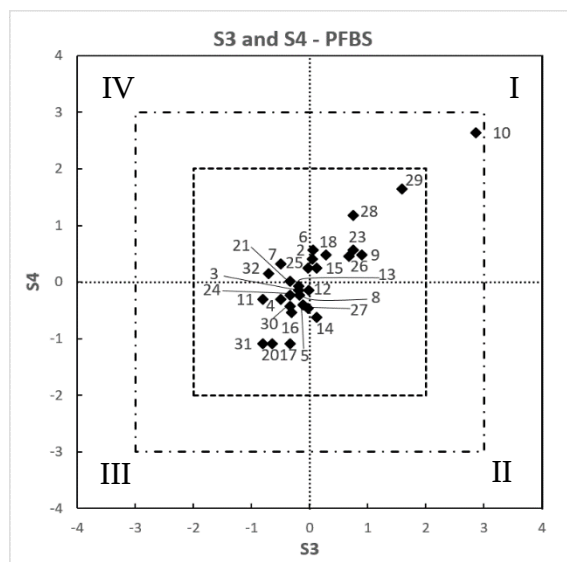


Laboratory 5 is off scale.

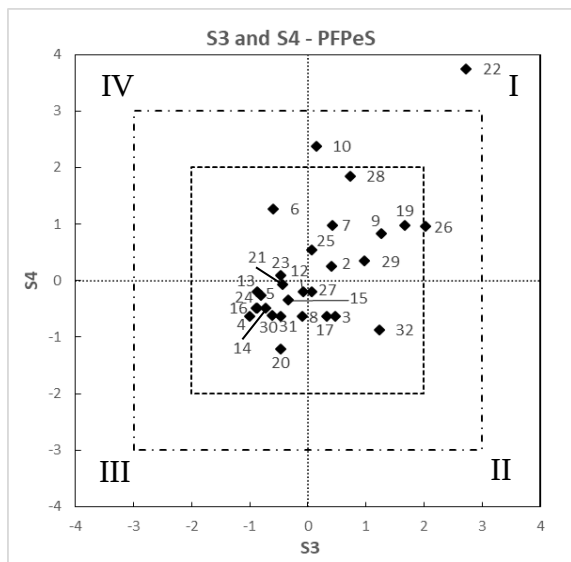
Figure 88 z-Score Scatter Plots (continued)



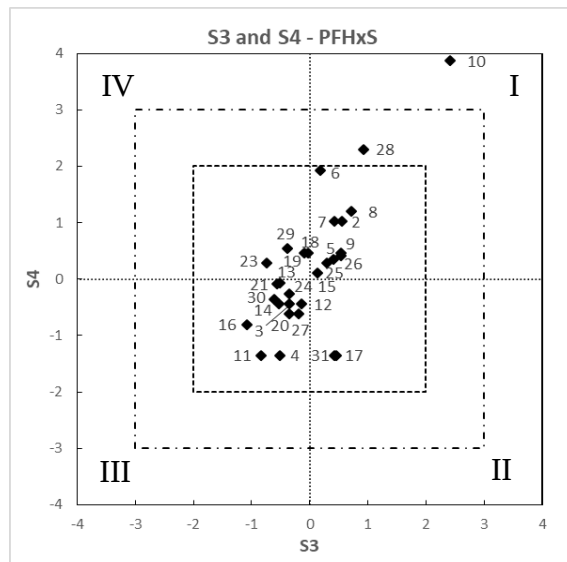
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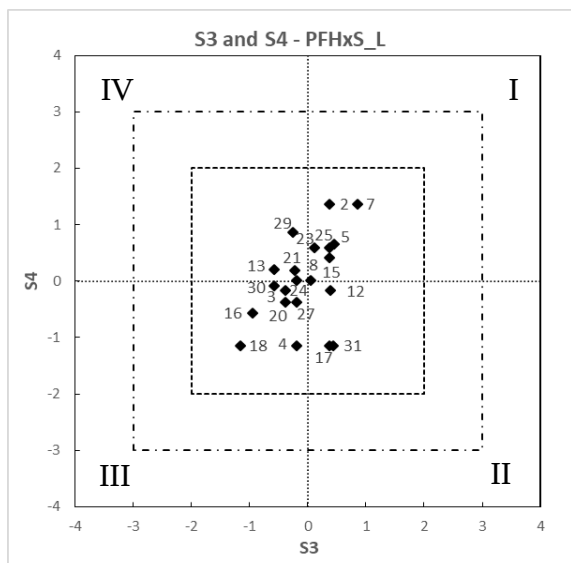
Laboratories 19 and 22 are off scale.



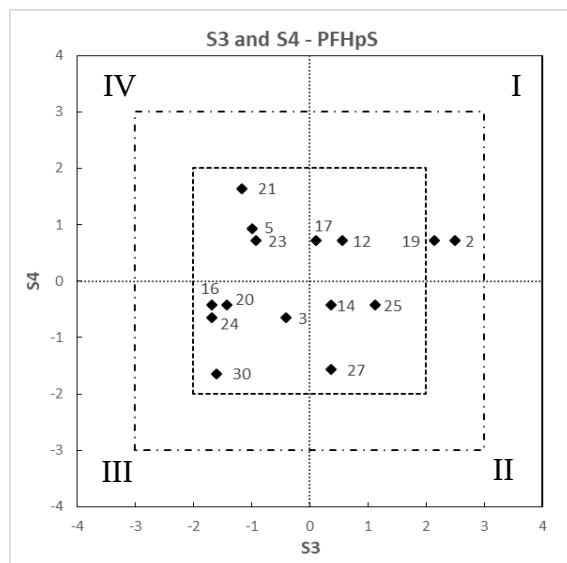
Laboratory 22 is off scale.



Laboratory 22 is off scale.

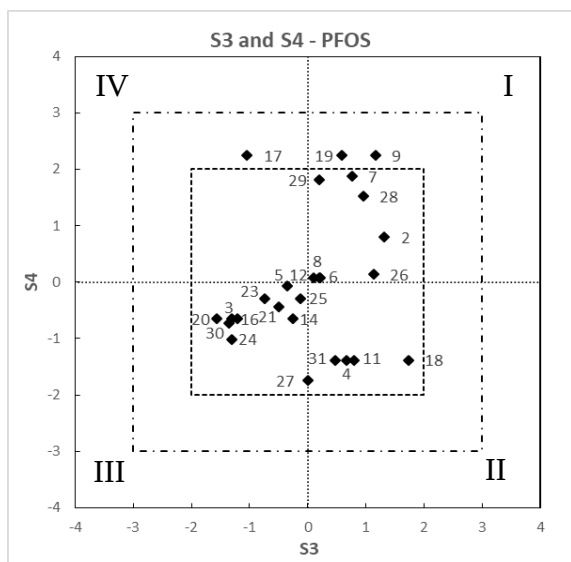


Laboratory 22 is off scale.

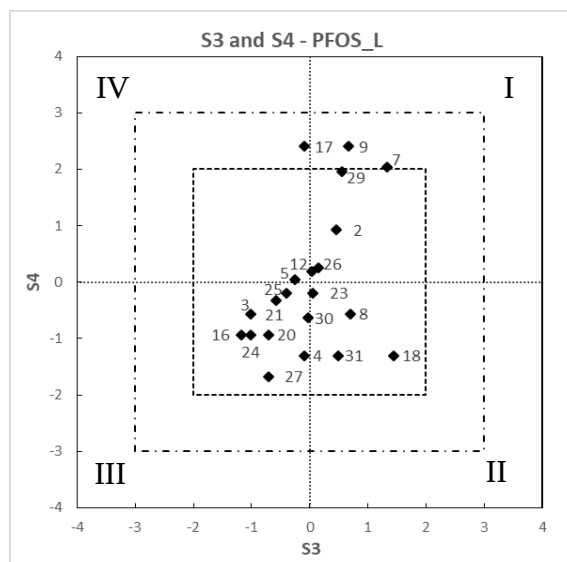


Laboratories 10, 22 and 31 are off scale.

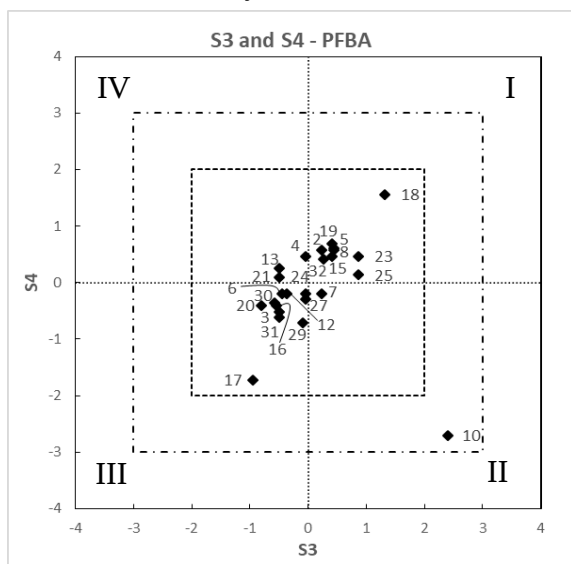
Figure 88 z-Score Scatter Plots (continued)



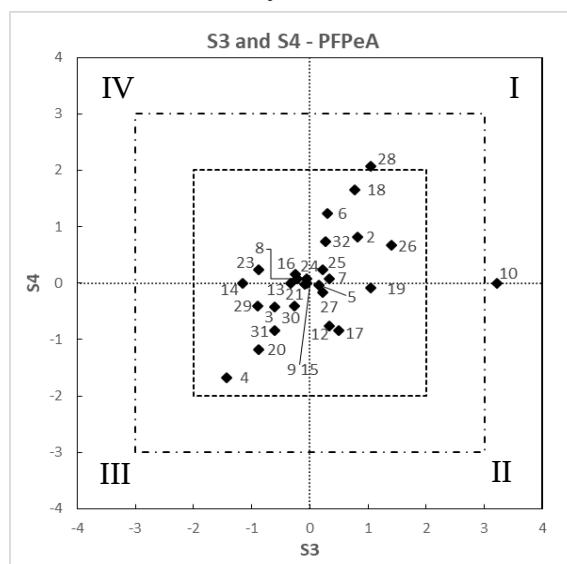
Laboratory 22 is off scale.



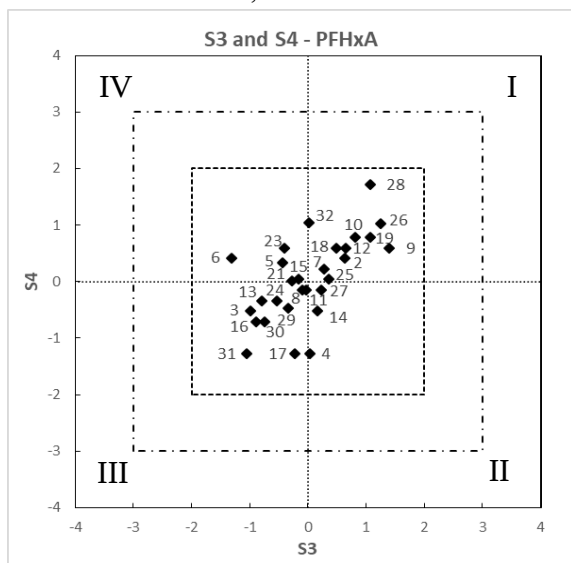
Laboratory 22 is off scale.



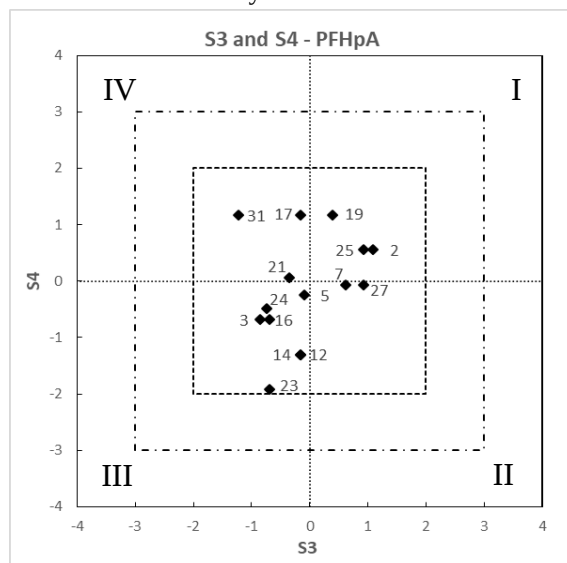
Laboratories 14, 22 and 34 are off scale.



Laboratory 22 is off scale.

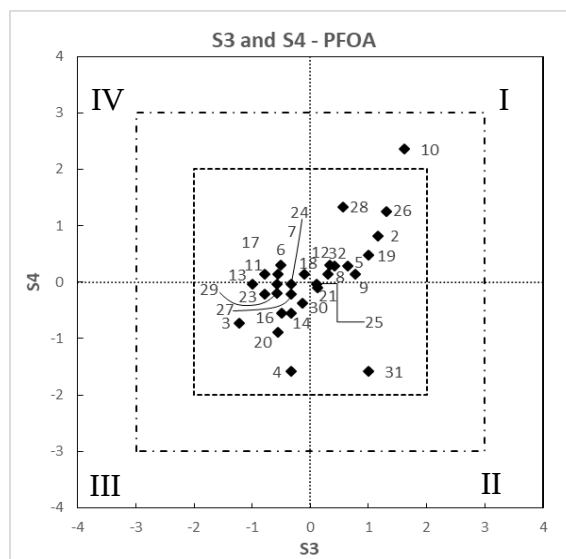


Laboratories 20 and 22 are off scale.



Laboratories 10 and 22 are off scale.

Figure 88 z-Score Scatter Plots (continued)



Laboratory 22 is off scale.

Figure 88 z-Score Scatter Plots (continued)

6.6 Summary of Participants' Results and Performances

Summaries of participants' results and performances for scored analytes in this PT study are presented in Tables 88 to 91, and Figures 84 to 87.

Five laboratories reported at least one PFAS analyte that was not spiked into the test samples S2 and S4 by the study coordinator. These results are presented in Appendix 3.

Thirty-one laboratories analysed both matrices. Laboratory 25 returned satisfactory z-scores for all analytes for which z-scores were calculated (71) while laboratory 12 returned satisfactory z-scores for 70 out of a total of 71. All results reported by laboratories 8 (68), 24 (67), 3 (65), 27 (64), 15 (52), 11 (27) and 33 (4) returned satisfactory z-scores.

Of the laboratories that analysed both matrices (soil and water), Laboratory 25 had the highest number of satisfactory E_n -scores (71 out of 71). Laboratories 15, 27 and 33 returned satisfactory E_n -scores for all analytes reported.

Two participants analysed the water matrix only. Of the total number of results for which z-scores were calculated (34), laboratory 23 reported 32. Thirty-one of these returned satisfactory z-scores and 22 returned satisfactory E_n scores.

Most unsatisfactory results reported by laboratory 5 in soil samples S1 and S2 were either lower or higher than the assigned value by a factor of 5 or 2. Systematic bias was also observed in the results of laboratory 22, most of the unsatisfactory results they reported in samples S3 and S4 were higher than the assigned value by a factor of 2. These laboratories should check their dilution and/or standard preparation procedure. Their results were not included in the analyses of extraction methods and of instrumental techniques employed by participants.

Laboratory 7 should check for method bias as most of the results they reported in S1 and S2 were higher than the assigned value. Laboratories 32 and 34 should also check for laboratory/method bias, as the unsatisfactory results they reported were consistently higher than the assigned value.

Table 88 Summary of Participants' Results and Performance for Sample S1 (all values are in µg/kg)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFNS	PFDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFOSA
A.V.	3.81	4.93	41.3	36.4	4.34	484	353	Not Set	Not Set	2.27	2.76	12.8	1.20	3.70	1.70
2	4.01	5.18	47.0	40.5	7.67	629	418	11.3	7.07	2.59	3.08	14.6	1.56	4.68	2.13
3	3.3	4.3	40	35	3.3	451	354	1.3	1.1	2.5	2.4	12	<1.0	3.1	1.3
4	4.6	4.8	36	33	6.2	528	356	6.6	4.3	2.2	3.1	13	1.2	3.7	2.03
5	17.2	21.0	18.4	18.4	2.05	4.59	4.59	<0.196	<0.196	5.52	9.56	9.32	3.39	12.6	3.99
6	4.092	4.956	45.718	NT	4.949	419.8	NT	NT	< 2.5	< 2.5	3.023	10.957	< 2.5	3.665	< 2.5
7	<5	6.60	60.68	53.14	<5	783.83	587.17	NT	<5	<5	<5	15.71	<5	5.18	<5
8	3.206	4.273	40.715	38.489	3.024	564.588	392.053	1.901	1.680	2.51	2.82	12.58	1.23	3.48	1.527
9	4.0	6.2	44.7	NT	5.4	496	388	NT	5.2	2	3.3	15.0	1.5	4.2	1.9
10	5.52	5.54	54.34	45.46	4.83	894.45	635.04	4.89	3.21	2.76	2.73	14.12	1.59	4.53	1.02
11	3.0	NT	32	NT	NT	600	NT	NT	NT	NT	NT	13	1.1	3.1	NT
12	3.64	5.36	33.1	31	5	432	320	5.06	5.51	2.08	2.36	12.7	1.1	3.55	1.63
13	3.6	4.4	41	35	3.6	480	390	1.5	1.2	2.5	2.6	11	1.1	3.1	1.6
14	3.4	4.4	39.9	NT	4.2	588	NT	NT	4.6	2	2.7	13.1	1.2	3.3	1.3
15	3.7	4.8	42	39	4.1	440	370	3.8	< 2.0	2.4	2.5	13	1.1	3.6	< 10
16	5.092	4.070	34.498	16.808	2.791	364.284	278.349	0.756	0.751	4.589	3.495	11.752	1.138	3.426	NR
17	3.8	8.2	46.2	40.4	4.8	515	380	1.0	0.8	2.2	2.6	13.5	1.2	3.9	2.2
18	4.6	NT	40	38	5.8	1500	1200	12	NT	2.4	2.5	14	0.9	3.1	NT
19	4.3	4.7	41	NT	4.6	600	NT	NT	NR	1.9	2.2	12.8	1.2	3.4	NR
20	3.1	4.6	35	31	4.2	360	290	NT	<0.4	2.4	2.6	10	<0.2	3.8	0.9
21	3.56	4.12	35.3	32.5	3.17	388	300	0.894	0.804	3.37	2.6	11.4	1	3.65	1.33
22	3.9	4.3	41.6	36.9	5.1	504.8	388.5	5.6	6	2.2	2.5	13.8	1.2	3.7	1.8
23	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
24	3.9	4.4	44	38	3.6	492	386	1.1	< 1.0	2.4	2.7	12	1.1	3.1	1.5
25	3.8	5.2	42	37	4.4	480	350	7.1	4.8	2.1	2.7	13	1.4	3.5	2.1
26	3.62	5.78	45.0	NT	4.68	501	368	NT	5	1.8	3.33	13.5	1.26	4.05	1.89
27	3.6	4.9	39	34	4.3	430	320	NT	3.8	2.2	2.6	13	1.2	3.4	1.9
28	4.0	5.3	45	NT	4.4	490	NT	NT	5.3	3.1	3.5	13	1.7	4.6	2.0
29	3.688	6.3456	51.1192	45.9686	4.5315	464.9862	331.9224	1.2547	<0.500	1.7588	1.9931	12.2162	1.1491	3.019	1.5881
30	3.66	5.37	40.6	28.3	3.97	399	319	4.68	2.58	2.28	3.05	12.1	1.19	3.89	2.08
31	3.93	5.49	36.03	31.18	4.52	601.82	459.81	2.76	1.76	1.68	2.92	12.82	1.05	4.93	1.69
32	3.81	4.03	40.5	39	3.87	372	268	NT	<2.26	<2.26	2.82	15.2	<2.26	3.9	<2.26
33	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
34	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 89 Summary of Participants' Results and Performance for Sample S2 (all values are in µg/kg)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFBA	PFPeA	PFHxA	PFHpA	PFOA
A.V.	18.3	24.0	18.0	17.9	2.00	4.68	4.78	5.09	10.1	9.69	3.25	12.0
2	18.2	22.9	19.2	19.2	2.13	5.27	5.27	5.39	10.1	10.10	3.52	12.9
3	18	25	18	18	1.9	4.4	4.4	4.9	9.1	9.0	2.9	11
4	19	21	17	17	2.3	4.6	4.6	4.9	10	9.4	2.7	12
5	3.04	3.53	33.6	29.8	3.68	492	384	2.12	2.42	9.90	0.927	3.4
6	17.855	21.505	17.995	NT	<2.5	4.914	NT	4.43	9.145	8.696	3.116	11.108
7	23.23	33.78	26.96	26.96	<5	8.66	8.33	7.03	13.46	13.47	<5	14.78
8	18.42	24.83	20.19	20.67	1.90	4.35	4.91	5.99	10.44	10.27	3.82	13.65
9	19.6	27.7	20.8	NT	2.0	5.6	5.6	4.0	11.3	10.6	3.2	12.4
10	26.42	24.13	NR	22.15	2.54	28.23	22.78	6.06	10.77	10.59	3.77	14.81
11	16	NT	15	NT	NT	3.8	NT	NT	NT	10	3.0	11
12	17.8	24.4	19	19	1.88	5	5	5	9	9	2.82	12
13	18	23	17	17	2.0	4.9	4.9	52	9.8	9.7	3.2	11
14	17.6	23.6	17	NT	1.8	4	NT	4	9.4	9.1	2.9	11.1
15	18	23	18	18	1.8	4.3	4.3	5.1	9.7	9.8	3	12
16	19.042	22.168	16.808	16.808	1.888	4.429	4.390	7.171	13.072	9.960	3.472	12.645
17	18.6	23.1	19.8	19.8	2.2	4.9	4.9	5.0	10.3	9.1	3.2	12.0
18	33	NT	13	13	2.5	5.4	5.4	4.9	8.8	10	2.5	12
19	21.2	26.60	15.9	NT	1.9	4.6	NT	4.9	8.1	9.2	3.1	11.9
20	16	22	20	20	1.7	4.0	4.0	4.8	8.3	7.5	1.5	9.8
21	15.9	18.7	15.7	15.7	1.84	4.05	4.05	4.66	9.09	9.06	3	10.7
22	18.9	19.5	16.7	16.7	2.1	5.2	5.2	5.1	10.5	9.7	3	11.3
23	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
24	19	24	19	19	1.9	5.0	5.0	5.3	11	9.9	3.5	12
25	20	25	19	19	2.2	4.5	4.5	5.2	11	11	3.6	13
26	19.5	29.7	20.3	NT	2.06	5.16	5.16	4.15	10.4	10.7	3.63	12.1
27	18	23	17	17	1.9	4.1	4.1	4.8	9.5	9.7	3.2	11
28	18	26	20.9	NT	2.3	5.1	NT	5.9	10.7	10.0	4.1	14.0
29	17.3724	28.5077	17.386	17.386	2.0063	4.6168	4.4974	NT	NT	NT	NT	NT
30	19	28.1	18.6	13.4	1.68	3.55	4.25	5.95	10.6	9.33	3.07	12.5
31	13.05	17.53	13.54	13.54	1.87	5.85	5.85	5.33	10.83	9.38	3.74	9.91
32	16.8	22.1	17.7	17.7	<1.91	4.84	4.84	4.19	9.74	8.42	3.52	12.2
33	NT	NT	NT	NT	NT	NT	5.16	NT	NT	NT	NT	13.0
34	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 89 Summary of Participants' Results and Performance for Sample S2 (all values are in µg/kg)* (continued)

Lab. Code	PFNA	PFDA	PFOSA	MeFOSA	EtFOSA	MeFOSAA	MeFOSE	8:2 FTS	GenX	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS
A.V.	6.12	19.9	4.14	6.98	9.82	12.9	7.71	9.02	7.41	42.1	34.5	33.8
2	6.75	21.1	4.77	7.05	10.5	15.3	7.73	9.40	NT	NT	NT	NT
3	5.8	19	3.8	6.9	9.6	14	7.9	9.3	7.8	NT	NT	NT
4	5.9	20	4.2	5.9	9.2	13	7.0	7.5	5.4	32	48	47
5	<0.197	<0.197	1.17	<0.197	<0.197	0.0255	<0.197	<0.197	<0.197	<0.197	<0.197	<0.197
6	5.508	18.103	4.691	NT	NT	NT	NT	7.824	7.782	31.96	31.775	34.143
7	7.29	25.26	<5	6.71	10.16	12.68	9.62	13.47	NT	NT	NT	NT
8	6.03	19.55	4.13	6.60	10.35	12.29	8.71	9.16	7.70	46.97	31.12	28.23
9	6.8	22.2	4.2	7.6	9.5	12.4	7.1	10.4	NT	NT	NT	NT
10	8.58	22.16	4.56	6.78	12.27	9.85	6.68	14.05	7.91	24.44	NT	NT
11	5.6	19	NT	NT	NT	NT	NT	9.0	NT	NT	NT	NT
12	5	18.1	4.15	7	10	11	5.46	9.11	2.61	50	36	32
13	6.6	21	4.0	7.8	10	14	7.7	9.7	NT	NT	NT	NT
14	5.4	18.4	3.5	6.4	9	11.5	7.4	9	NT	NT	NT	NT
15	6	20	< 10	5.8	9.9	14	7.1	10	NT	NT	NT	NT
16	6.725	20.668	0.811	NR	NR	14.824	NR	7.891	7.470	42.425	30.119	28.207
17	6.2	20.4	4.7	6.9	9.3	14.8	7.5	8.1	6.6	42.0	31.5	22.3
18	5.4	23	NT	NT	NT	NT	NT	7.1	NT	NT	NT	NT
19	4.7	16.9	NR	NR	NR	NR	NT	NR	NT	NT	NT	NT
20	6.9	15	2.7	7.2	7.1	7.4	5.0	7.5	NT	NT	NT	NT
21	5.72	16.5	3.98	NT	NT	14.9	NT	8.76	7.63	43.9	30.8	31.9
22	4.9	18.7	3.3	6.7	10.1	9.9	<1	12.7	89	48.6	NT	NT
23	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
24	6.3	20	4.4	7.8	9.8	15	8.3	6.2	8.3	NR	38	39
25	6.3	20	4.8	7.1	9.9	14	8.9	9.6	8	53	39	42
26	6.14	22.2	3.83	7.13	9.3	13.7	7.71	9.7	NT	NT	NT	NT
27	5.8	19	4.2	6.6	9.4	14	7.4	9.3	NT	NT	NT	NT
28	6.8	22.6	4.8	9.9	11	11	9.0	9.4	NT	NT	NT	NT
29	NT	NT	2.2851	NT	NT	NT	NT	5.582	NT	NT	NT	NT
30	6.33	20.1	4.63	7.45	6.71	14.8	7.07	11.2	6.17	43.4	NT	NT
31	7.59	18.98	3.68	5.37	9.81	10.53	8.07	9.23	NT	NT	NT	NT
32	5.63	20.2	4.32	9.13	11.2	12.1	9.08	9.52	NT	NT	NT	NT
33	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
34	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 90 Summary of Participants' Results and Performance for Sample S3 (all values are in µg/L)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFOSA
A.V.	0.322	0.375	3.12	2.60	0.196	3.79	1.63	0.111	0.182	0.774	0.0927	0.225	Not Set	0.0096
2	0.325	0.405	3.47	2.79	0.294	4.79	1.78	0.116	0.212	0.871	0.113	0.277	0.005	0.011
3	0.31	0.41	2.9	2.4	0.18	2.8	1.3	0.10	0.16	0.62	0.077	0.17	0.0030	0.0075
4	0.29	0.30	2.8	2.5	0.23	4.3	1.6	0.11	0.13	0.78	0.08	0.21	<0.01	<0.05
5	0.315	0.315	3.37	2.84	0.157	3.52	1.55	0.121	0.188	0.707	0.0909	0.254	0.00427	0.00962
6	0.326	0.331	3.234	NT	0.223	3.95	NT	0.101	0.193	0.569	0.094	0.202	<0.01	0.012
7	0.290	0.407	3.387	3.040	0.153	4.365	2.064	0.116	0.194	0.816	0.104	0.199	<0.005	0.009
8	0.311	0.368	3.571	2.626	0.187	3.938	1.858	0.121	0.174	0.758	0.085	0.239	<0.01	<0.01
9	0.38	0.47	3.46	NT	0.26	4.67	1.85	<0.2	0.18	0.99	0.12	0.26	<0.02	<0.02
10	0.506	0.386	4.63	NR	0.1928	1.85	NR	0.1643	0.299	0.899	0.168	0.2973	<0.05	<0.05
11	0.27	NT	2.6	NT	NT	4.4	NT	NT	NT	0.77	0.08	0.19	<0.02	NT
12	0.321	0.369	3.027	2.803	0.218	3.865	1.643	0.103	0.194	0.875	0.090	0.240	0.003	0.010
13	0.31	0.31	2.8	2.3	0.16	2.8	1.3	0.10	0.17	0.65	0.083	0.18	<0.01	0.011
14	0.33	0.32	2.79	NT	0.21	3.6	NT	0.2	0.14	0.8	0.09	0.21	<0.02	<0.02
15	0.33	0.35	3.2	2.8	0.19	3.1	1.6	0.12	0.18	0.75	0.092	0.22	< 0.03	< 0.18
16	0.302	0.308	2.449	2.108	0.130	2.875	1.248	0.099	0.173	0.637	0.080	0.203	NR	NR
17	0.3	0.4	3.4	2.8	0.2	3	1.6	0.09	0.2	0.74	0.09	0.2	0.003	<0.01
18	0.34	NT	3.1	2.0	NT	5.1	2.1	0.14	0.21	0.85	0.10	0.22	NT	NT
19	0.43	0.50	3.06	NT	0.28	4.23	NT	0.12	0.22	0.94	0.10	0.27	0.005	0.082
20	0.28	0.34	2.9	2.4	0.14	2.6	1.4	0.093	0.15	0.060	<0.004	0.20	0.003	0.006
21	0.3	0.342	2.77	2.48	0.15	3.41	1.44	0.1	0.179	0.731	0.086	0.231	0.0048	0.0087
22	0.67	0.58	5.54	4.8	0.46	6.49	2.95	0.28	0.36	1.64	0.22	0.42	0.03	0.01
23	0.37	0.34	2.66	2.66	0.16	3.23	1.65	0.13	0.15	0.71	0.08	0.19	NR	0.007
24	0.30	0.31	2.9	2.5	0.13	2.8	1.3	0.11	0.18	0.69	0.079	0.21	< 0.025	< 0.025
25	0.32	0.38	3.3	2.8	0.24	3.7	1.5	0.13	0.19	0.83	0.11	0.23	0.003	0.01
26	0.366	0.527	3.46	NT	0.296	4.65	1.68	<0.5	0.233	0.968	0.115	0.284	<0.02	<0.02
27	0.32	0.38	3.0	2.5	0.21	3.8	1.4	0.11	0.19	0.81	0.11	0.21	0.004	0.01
28	0.37	0.43	3.7	NT	0.24	4.52	NT	<0.2	0.22	0.94	0.14	0.25	<0.02	<0.02
29	0.4244	0.4485	2.8842	2.4652	0.1181	3.9339	1.809	0.1089	0.1496	0.7207	0.0805	0.1995	<0.0100	0.0115
30	0.301	0.329	2.74	2.304	0.133	2.76	1.62	0.0981	0.172	0.66	0.086	0.219	0.00298	0.00912
31	0.27	0.34	3.38	2.83	0.18	4.15	1.79	0.10	0.16	0.61	0.07	0.27	<0.004	<0.008
32	0.276	0.467	3.63	2.93	0.26	5.53	2.29	0.117	0.192	0.775	0.0988	0.244	<0.017	0.0181
33	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
34	0.486	NR	15.6	NR	NR	113	NR	0.275	0.592	3.59	0.456	1.05	<0.3	<0.5

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 91 Summary of Participants' Results and Performance for Sample S4 (all values are in µg/L)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFDS	PFUdS	PFDoS	PFTTrDS	PFBA	PFPeA	PFHxA
A.V.	0.0639	0.0343	0.0274	0.0259	0.00437	0.0138	0.0135	Not Set	Not Set	Not Set	Not Set	0.0457	0.0601	0.0268
2	0.069	0.036	0.033	0.033	0.005	0.016	0.016	0.035	NT	NT	NT	0.051	0.07	0.029
3	0.062	0.030	0.025	0.025	0.0038	0.012	0.012	0.039	NT	NT	NT	0.041	0.055	0.024
4	0.06	0.03	0.02	0.02	<0.01	0.01	0.01	0.04	NT	NT	NT	0.05	0.04	0.02
5	0.0588	0.0325	0.0293	0.0293	0.00518	0.0136	0.0136	0.0572	NT	0.0339	NT	0.0513	0.0597	0.0286
6	0.071	0.043	0.038	NT	<0.01	0.014	NT	0.031	0.034	0.014	0.028	0.044	0.075	0.029
7	0.068	0.041	0.033	0.033	<0.005	0.019	0.019	0.056	NT	NT	NT	0.044	0.061	0.028
8	0.061	0.030	0.034	0.026	<0.01	0.014	0.012	0.034	NT	<0.02	NT	0.051	0.061	0.026
9	0.07	0.04	0.03	NT	<0.02	0.02	0.02	0.06	NT	NT	NT	<0.1	0.06	0.03
10	0.0976	0.0506	0.0486	NR	0.0172	NR	<0.01	0.118	NT	NT	NT	0.021	0.060	0.031
11	0.06	NT	0.02	NT	NT	0.01	NT	NT	NT	NT	NT	NT	NT	0.026
12	0.062	0.033	0.025	0.025	0.005	0.014	0.014	0.036	NT	NT	NT	0.044	0.051	0.030
13	0.063	0.033	0.027	0.027	<0.01	<0.02	<0.02	0.052	NT	NT	NT	0.048	0.060	0.025
14	0.056	0.031	0.025	NT	0.004	0.012	NT	0.056	NT	NT	NT	0.04	0.06	0.024
15	0.067	0.032	0.028	0.028	< 0.02	< 0.02	< 0.02	<0.09	NT	NT	NT	0.05	0.06	0.027
16	0.057	0.031	0.023	0.023	0.004	0.012	0.011	0.056	NT	NT	NT	0.042	0.062	0.023
17	0.05	0.03	0.02	0.02	0.005	0.02	0.02	0.03	NT	<0.03	NT	0.03	0.05	0.02
18	0.07	NT	0.03	0.02	NT	0.01	0.01	NT	NT	NT	NT	0.06	0.08	0.03
19	0.12	0.041	0.030	NT	0.005	0.020	NT	0.087	NT	NT	NT	0.052	0.059	0.031
20	0.050	0.026	0.024	0.024	0.004	0.012	0.011	0.035	NT	NT	NT	0.042	0.046	0.022
21	0.064	0.0338	0.0269	0.0269	0.0058	0.0126	0.0126	0.0315	NT	0.0156	NT	0.0465	0.0598	0.0269
22	0.13	0.06	0.05	0.05	0.01	0.03	0.02	0.09	NT	NT	NT	0.09	0.12	0.05
23	0.071	0.035	0.029	0.029	0.005	0.013	0.013	0.011	NT	NT	NT	0.05	0.063	0.03
24	0.061	0.031	0.026	0.026	0.0038	0.011	0.011	NR	NT	NT	NT	0.044	0.061	0.025
25	0.067	0.038	0.029	0.029	0.004	0.013	0.013	0.045	NT	NT	NT	0.047	0.063	0.027
26	0.0696	0.0409	0.0297	NT	<0.02	0.0142	0.0142	0.0548	NT	NT	NT	<0.5	0.0682	0.0323
27	0.058	0.033	0.024	0.024	0.003	0.009	0.009	0.031	NT	NT	NT	0.043	0.058	0.026
28	0.079	0.047	0.04	NT	<0.02	0.018	NT	0.076	NT	NT	NT	<0.1	0.085	0.036
29	0.0848	0.0367	0.0304	0.0304	<0.0100	0.0188	0.0188	NT	0.0328	NT	0.0357	0.0392	0.0553	0.0243
30	0.0584	0.0301	0.0255	0.0255	0.00294	0.0118	0.0118	0.0315	NT	0.0117	NT	0.0425	0.0552	0.023
31	0.05	0.03	0.02	0.02	0.00	0.01	0.01	0.02	NT	<0.002	NT	0.04	0.05	0.02
32	0.0658	0.0283	<0.025	<0.025	<0.025	<0.017	<0.017	0.0728	NT	NT	NT	0.0495	0.069	0.0324
33	NT	NT	NT	NT	NT	NT	0.0113	NT	NT	NT	NT	NT	NT	NT
34	<0.2	NR	<0.3	NR	NR	<0.3	NR	NR	NR	NR	NR	0.662	<0.2	<0.1

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 91 Summary of Participants' Results and Performance for Sample S4 (all values are in µg/L) (continued) *

Lab. Code	PFHpA	PFOA	PFNA	PFDA	PFUdA	PFDaA	PFTTrDA	PFTeDA	PFOSA	6:2 FTS	GenX	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS
A.V.	0.0081	0.0292	0.0662	0.0377	0.096	0.0176	Not Set	Not Set	0.0515	0.0151	0.0632	0.0681	0.068	Not Set
2	0.009	0.034	0.079	0.048	0.117	0.022	0.027	0.078	0.073	0.017	NT	NT	NT	NT
3	0.0070	0.025	0.061	0.036	0.090	0.016	0.027	0.051	0.047	0.012	0.071	NT	NT	NT
4	<0.01	0.02	0.05	0.03	0.07	<0.01	<0.01	0.02	0.04	<0.05	0.05	0.05	0.06	0.01
5	0.00769	0.0309	0.0759	0.042	0.11	0.0202	0.0402	0.077	0.0593	0.0143	0.0723	0.0746	0.0819	0.0393
6	<0.01	0.031	0.057	0.028	0.052	0.014	0.018	0.038	0.05	0.016	0.062	0.065	0.056	0.019
7	0.008	0.029	0.068	0.037	0.115	0.022	0.029	0.043	0.057	0.019	NT	NT	NT	NT
8	<0.01	0.030	0.062	0.031	0.069	0.011	0.014	0.025	0.033	0.014	0.067	0.065	0.056	0.020
9	<0.02	0.03	0.08	0.05	0.14	0.03	0.05	0.10	0.07	<0.05	NT	NT	NT	NT
10	0.011	0.043	0.116	0.042	0.119	0.009	0.007	0.005	0.016	0.02	0.098	0.118	NT	NT
11	<0.01	0.03	0.06	NT	NT	NT	NT	NT	NT	<0.03	NT	NT	NT	NT
12	0.006	0.031	0.052	0.031	0.070	0.017	0.019	0.033	0.054	0.021	0.072	0.082	0.063	0.026
13	<0.01	0.029	0.066	0.040	0.10	0.019	0.035	0.069	0.055	0.015	NT	NT	NT	NT
14	0.006	0.026	0.061	0.038	0.091	0.017	0.027	0.069	0.052	0.015	NT	NT	NT	NT
15	< 0.02	< 0.03	0.066	< 0.05	0.11	< 0.09	< 0.23	< 0.09	< 0.2	< 0.05	NT	NT	NT	NT
16	0.007	0.026	0.060	0.038	0.084	0.017	0.026	0.081	0.048	0.014	0.066	0.059	0.067	0.018
17	0.01	0.03	0.1	0.04	0.1	0.02	0.1	0.4	0.1	<0.04	0.05	0.1	0.1	0.01
18	<0.01	0.03	NT	NT	NT	NT	NT	NT	NT	0.01	NT	NT	NT	NT
19	0.010	0.032	0.078	0.050	0.133	0.049	0.063	0.072	0.14	0.038	NT	NT	NT	NT
20	0.014	0.024	0.058	0.030	0.077	0.014	0.020	0.037	0.035	<0.004	NT	NT	NT	NT
21	0.0082	0.0286	0.0659	0.0346	0.0963	0.0153	0.0275	0.0573	0.0539	0.0157	0.0706	0.0671	0.0639	0.0231
22	0.02	0.06	0.13	0.07	0.17	0.03	0.08	0.13	0.09	0.04	1.62	0.16	NT	NT
23	0.005	0.028	0.066	0.032	0.065	NR	NR	0.117	0.03	0.015	NT	0.076	0.057	0.007
24	0.0073	0.029	0.071	0.039	0.091	0.017	0.015	NR	0.046	NR	0.071	0.067	NR	0.021
25	0.009	0.029	0.065	0.041	0.096	0.021	0.04	0.08	0.09	0.017	0.056	0.071	0.084	0.041
26	<0.02	0.0365	0.0722	0.0456	0.116	<0.02	NT	0.0729	0.0673	<0.05	NT	NT	NT	NT
27	0.008	0.028	0.062	0.038	0.096	0.018	0.03	0.07	0.06	0.015	NT	NT	NT	NT
28	<0.02	0.037	0.083	0.056	0.133	0.025	0.049	0.09	0.09	<0.05	NT	NT	NT	NT
29	<0.0100	0.0281	0.0575	0.0292	NT	NT	NT	NT	0.0582	0.0155	NT	NT	NT	NT
30	<0.01	0.027	0.0625	0.0329	0.0637	0.00882	0.0156	0.046	0.0418	0.0121	0.051	0.0538	NT	NT
31	0.01	0.02	0.05	0.03	0.08	0.01	0.01	0.02	0.02	0.01	NT	NT	NT	NT
32	<0.017	0.0309	0.0888	0.0632	0.206	0.0468	0.0271	0.0637	0.104	<0.025	NT	NT	NT	NT
33	NT	0.0290	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
34	<0.3	<0.2	<0.3	<0.3	<0.3	<0.7	<0.6	<0.7	<0.5	<0.1	NR	NR	NR	NR

* A.V. = Assigned Value. Shaded cells are results which returned a questionable or unsatisfactory z-score.

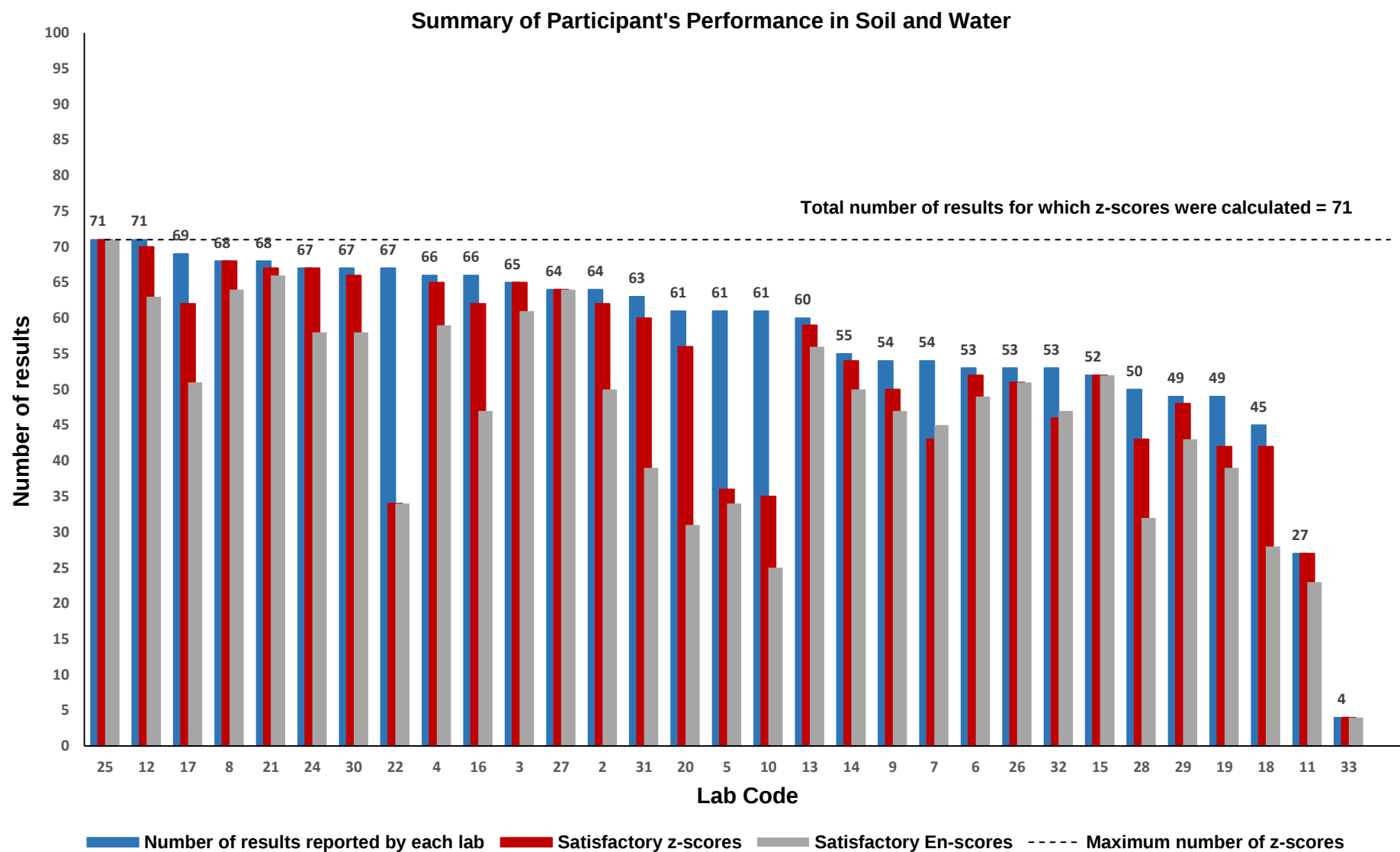


Figure 89 Summary of Participants' Performance in Soil and Water

6.7 Participants' Results and Analytical Methods for PFAS in Soil

Participants were requested to analyse the samples using their normal test method and to report a single result as they would normally report to a client. The method descriptions provided by participants for PFAS measurements in soil are presented in Appendix 5.

Participants performance in the two study samples were comparable, with similar between laboratory coefficients of variation.

Extraction

Sample S1 was contaminated soil, whereas Sample S2 was soil fortified for 22 individual PFAS components. Analytes' mass fraction in the two soil samples were between 1.20 µg/kg and 42.1 µg/kg (with PFOS in S1 at 484 µg/kg).

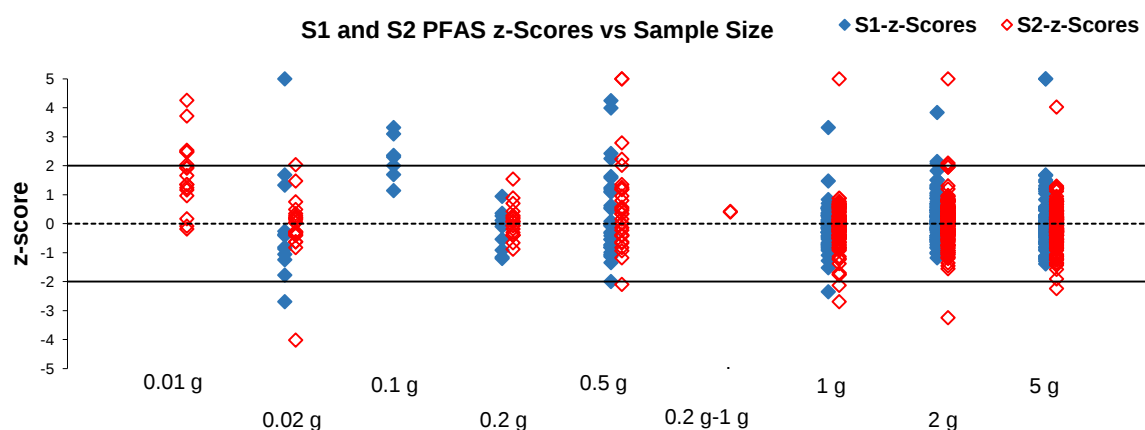
Of 30 participants who reported results for both soil samples, 28 used the same sample size for extraction. Laboratories used a wide variety of sample sizes. Plots of participants' performance in S1 and S2 versus the amount of sample taken for analysis are presented in Figure 90. Results from a sample size of 0.01 g to 0.1 g were biased low or high. Caution should be exercised when a small sample size is taken for analysis as this might not be representative of the whole sample.

Most laboratories extracted their samples for 30-60 minutes. One laboratory conducted their sample extraction over 960 min (Figure 91). Laboratory 7 reported: "Methanol extract blown to near dryness then resuspended in water before SPE." All but two results reported by Laboratory 7 in S1 and S2 were higher than the assigned value.

Methanol, base modified methanol and acetonitrile were the preferred extraction reagents. In general, PFAS results were compatible with each other regardless of the extraction reagent used (Figure 92).

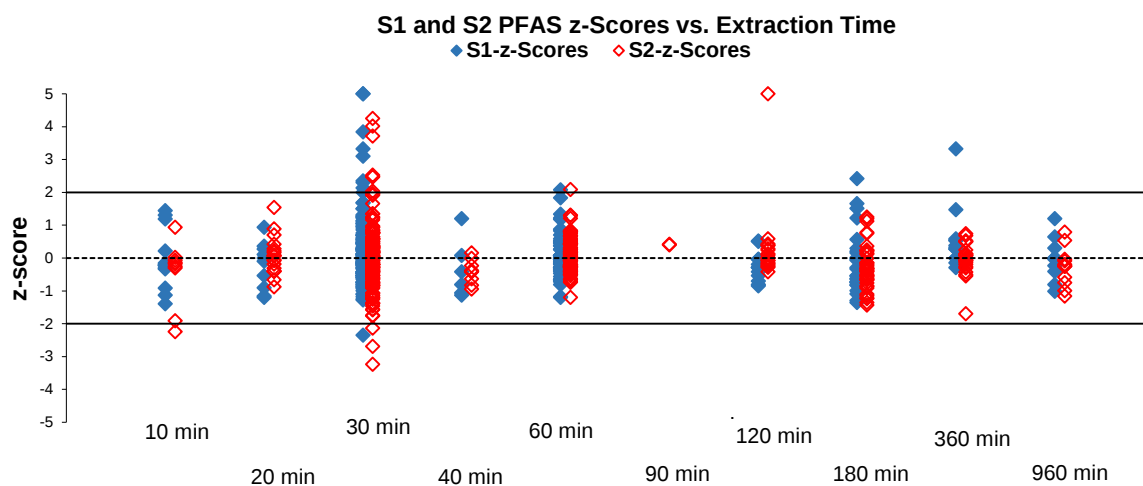
Participants used a wide variety of extraction procedures based on LSE, alkaline digestion, QuEChERS or accelerated solvent extraction. The use of mass labelled standards played a significant role in correcting the difference between these in-house analytical methods. Most results produced were compatible with each other (Figure 93).

The most popular method was a LSE extraction based on the method developed by Powley et al. This method involved a sample size of 2 g, methanol or methanol base as extraction solvent, two to three rounds of 30 min shaking at room temperature and a clean-up step using active carbon. This method is known to give a recovery of 75% to 120% for all chain lengths.⁹



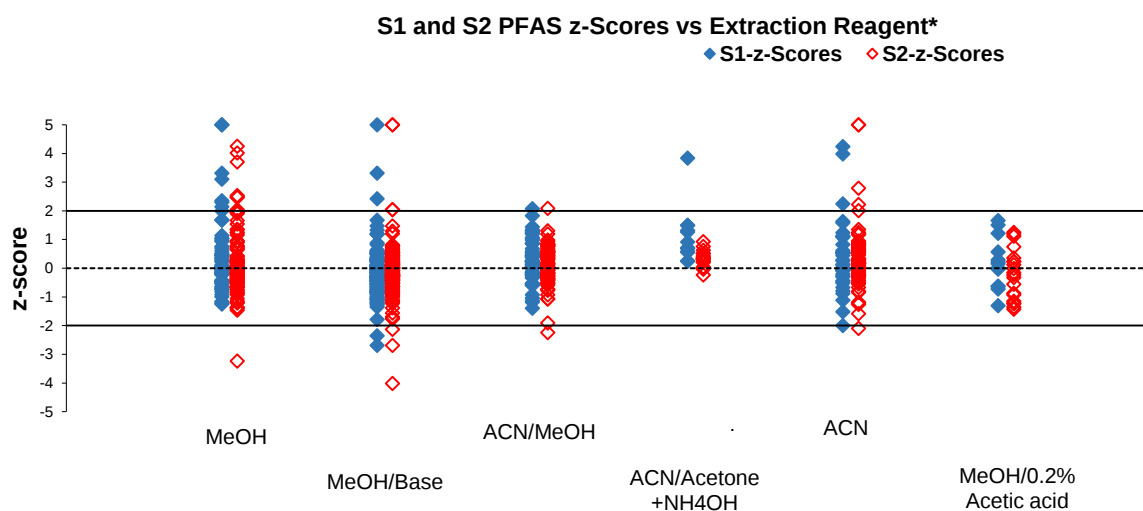
Scores greater than 5 have been plotted as 5.

Figure 90 Participants' Performance in S1 and S2 vs Sample Size



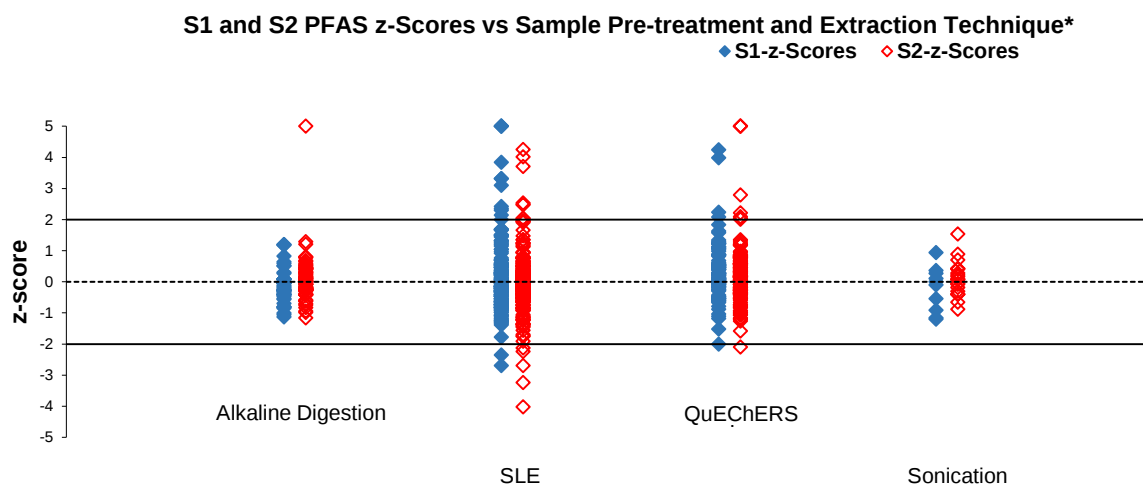
Scores greater than 5 have been plotted as 5.

Figure 91 Participants' Performance in S1 and S2 vs Extraction Time



*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

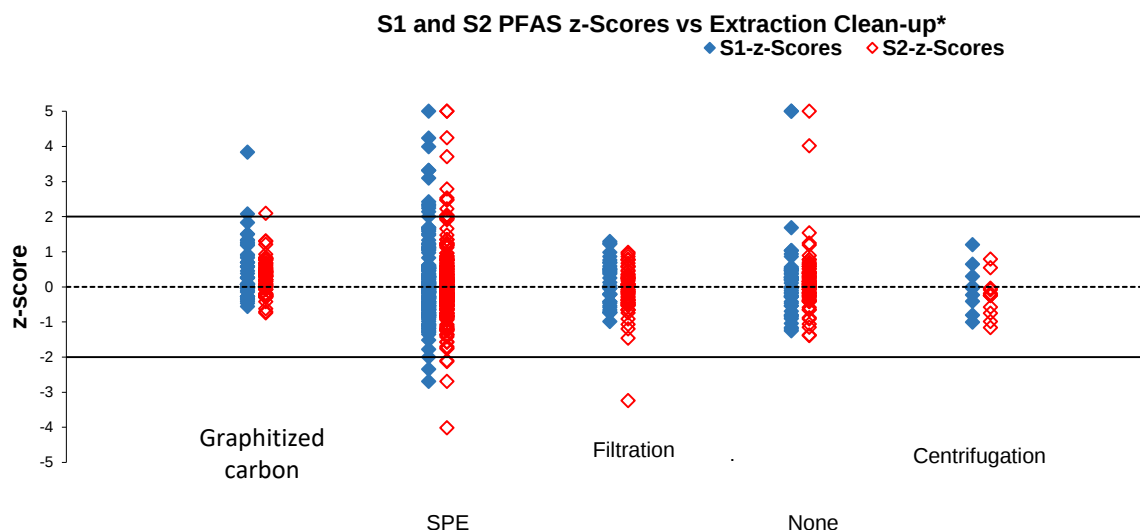
Figure 92 Participants' Performance in S1 and S2 vs. Extraction Reagent



*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

Figure 93 Participants' Performance in S1 and S2 vs Extraction Technique

Clean-up of the crude extracts is an important step in the removal of matrix constituents that may interfere in instrumental determination. Matrix effects have been known to be one of the main causes of variability in results. Most participants used SPE. Three laboratories used filtration to remove solids from the extract, and 4 did not clean up after extraction. There was no correlation evident between participants' reported results for PFAS and the clean-up procedure used (Figure 94).



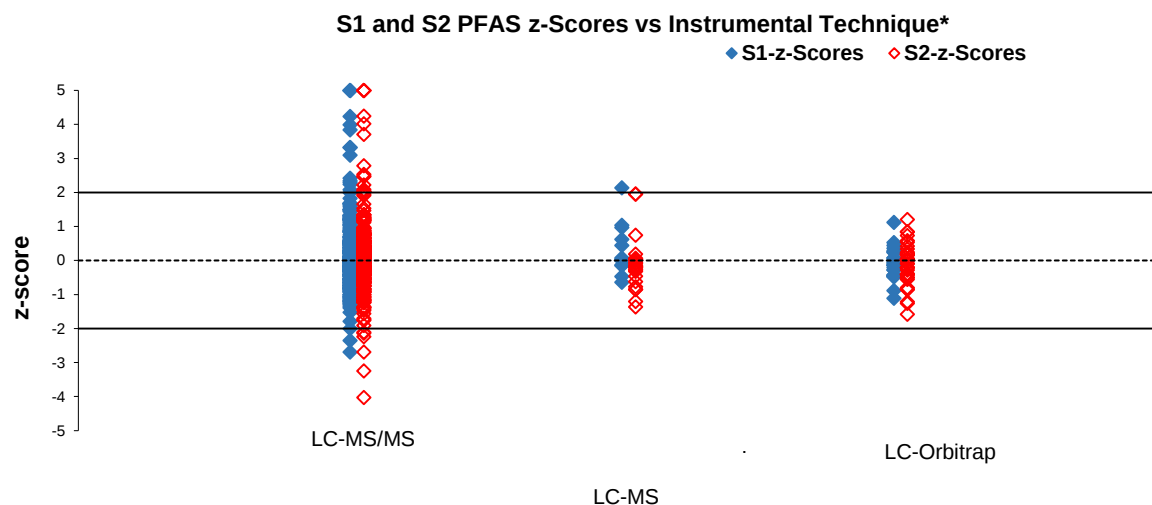
*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

Figure 94 Participants' Performance in S1 and S2 vs Extraction Clean-up Procedure

Instrumental Technique

The analytical detection method of choice was LC-MS (Figure 95). With the exception of three, all participants reported using LC-MS/MS (QQQ) for PFAS measurements. Laboratories 15 and 30 used Orbitrap and laboratory 4 used LC-MS with UHPLC guard column. Most LC-MS/MS users used a C18 based column. All but three participants reported using a delay column.

Eleven laboratories reported diluting both samples before analysis while 2 diluted only sample S1 for PFOS quantification alone.

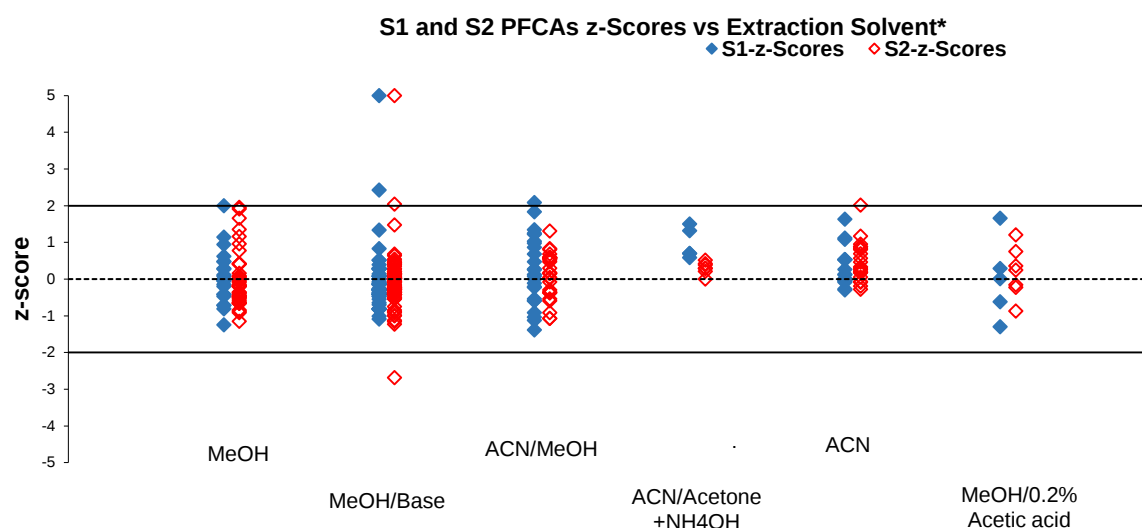


*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

Figure 95 Participants' Performance in S1 and S2 vs Instrumental Technique

6.7.1 Individual PFCA Analytes in Soil

Results reported by participants for PFCAs in S1 and S2 were generally compatible with each other. The between laboratory coefficient of variation was between 11% and 16% for PFCAs results reported in S1, and between 7.8% and 15% for PFCAs results reported in the spiked soil sample S2. PFBA in S1 followed by PFOA in S1 and PFBA in S2 were the analytes with the largest coefficients of variation, of 16% and 15% respectively.



*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

Figure 96 Participants' Performance in S1 and S2 vs Extraction Reagent

Figure 96 presents plots of participants' z-scores for PFCAs in S1 and S2 versus the extraction solvent used. Although there may be a discrepancy between results produced by extraction solvents containing methanol and those produced by other extraction solvents, the limited number of results has hampered our attempt to identify any relationship between them.

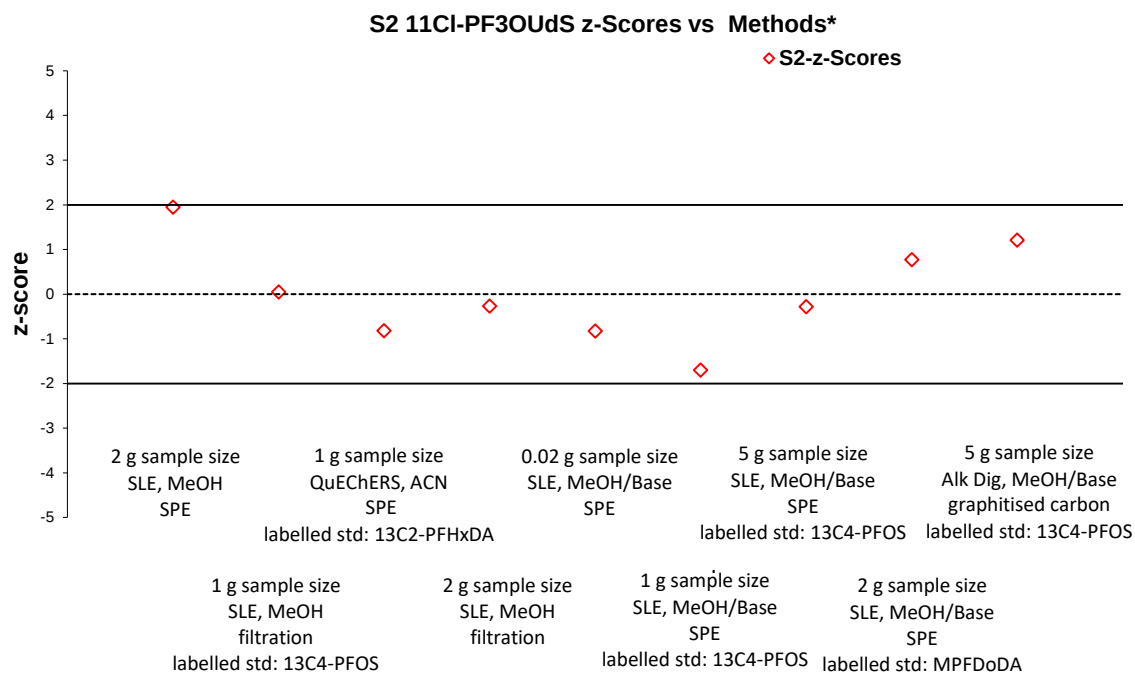
6.7.2 Individual PFECA and PFESA Analytes in Soil

GenX and ADONA and were introduced in a PT study for the first time in 2019 and 2020 respectively. Approximately one third of participants reported results for ADONA and GenX in S2 and most of them performed well; the between laboratory CV for these tests was 22% and 12% respectively.

The same standard solution was used to spike GenX in S2 as for S4. While the results reported for GenX in S2 were low at 49% of the spiked value the results reported for S4 were 91% of the spiked value. Low recovery in S2 may be explained by losses during PT sample preparation or low extraction efficiency due to the high organic content of the soil material used.

9Cl-PF3ONS and 11Cl-PF3OUdS Of 28 participants who reported results in the soil samples, 9 reported results for 9Cl-PF3ONS and 11Cl-PF3OUdS and all performed satisfactorily.

This was the first time that **11Cl-PF3OUdS** has been included in a PT study. Although the spiked recovery for this test was low (58%), an assigned value was still set because there was reasonable consensus between reported results - the between-laboratory CV was 26%. Plots of participants' performance for 11Cl-PF3OUdS in S2 versus method used are presented in Figure 97.

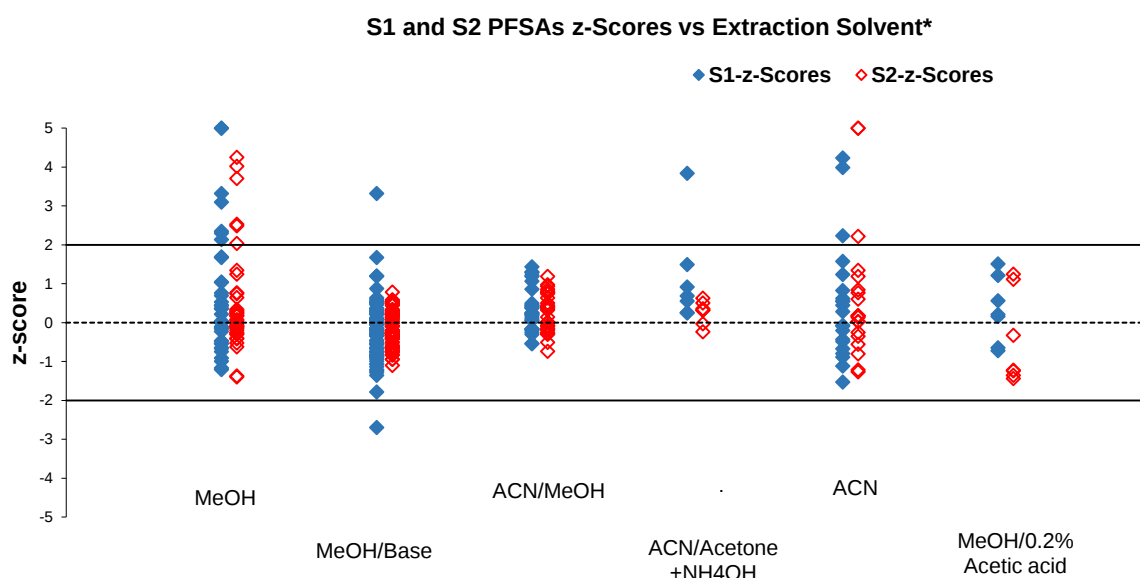


*Laboratory 5 excluded. Labelled standards added before extraction.

Figure 97 S2 11Cl-PF3OUdS z-Scores vs. Methods

6.7.3 Individual PFSA Analytes in Soil

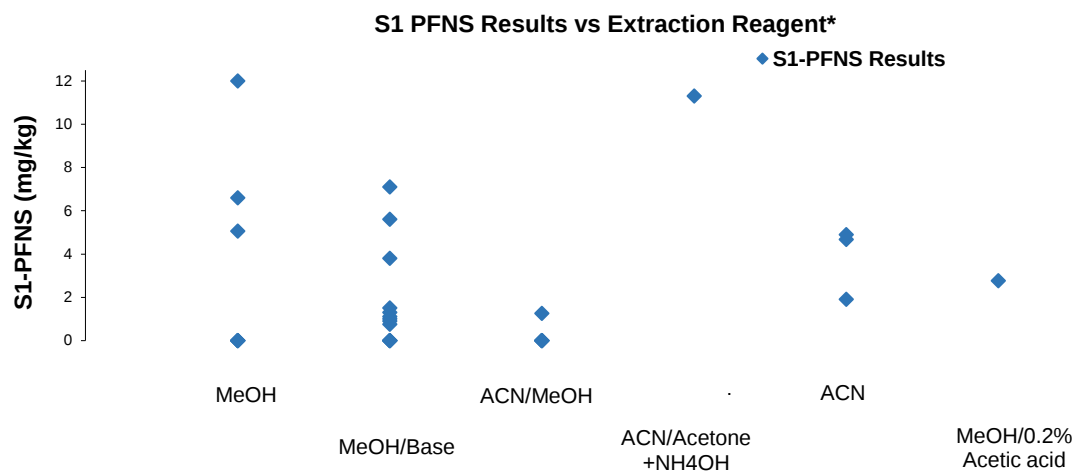
Plots of participants' z-scores for PFSA in S1 and S2 versus the extraction solvent used are presented in Figure 98. No relationship was evident between results from extraction solvents containing methanol and those produced by the other extraction solvents



*Results from laboratory 5 were excluded. Scores greater than 5 have been plotted as 5.

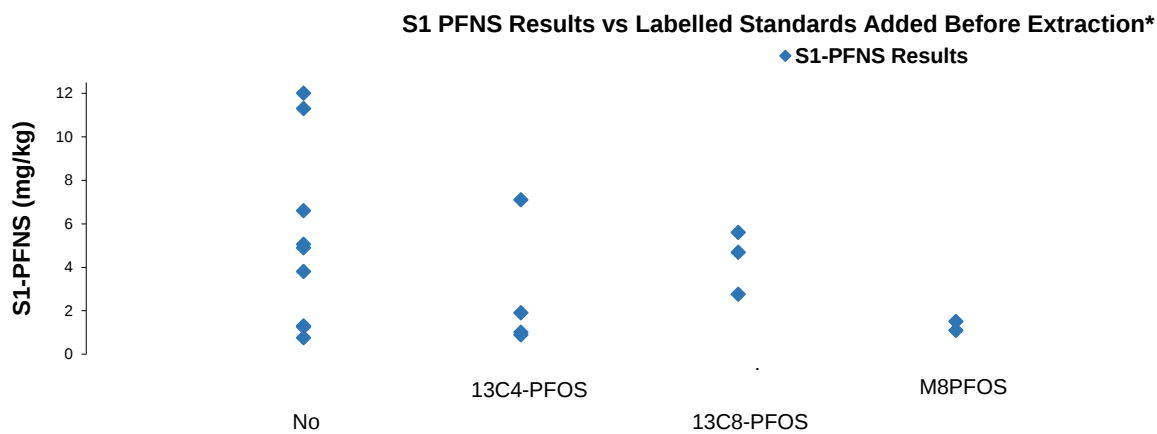
Figure 98 Participants' Performance in S1 and S2 vs Extraction Reagent

PFNS and PFDS No assigned value could be set for PFNS and PFDS in S1 because the results reported for these analytes were not compatible. Plots of participants results and the extraction reagent used or the labelled standards added before and after extraction are presented in Figures 99 to 104. No correlation was evident.



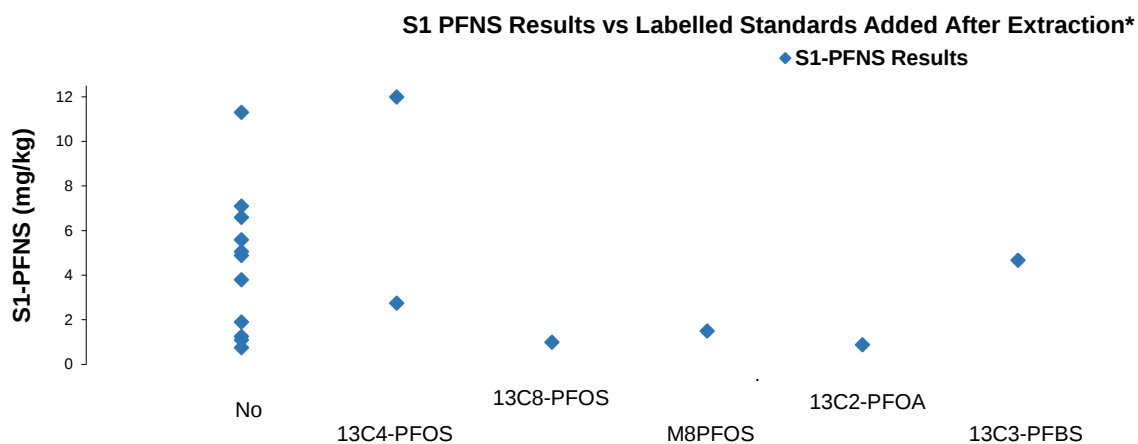
*Results from laboratory 5 were excluded.

Figure 99 S1 PFNS Results vs Extraction Reagent



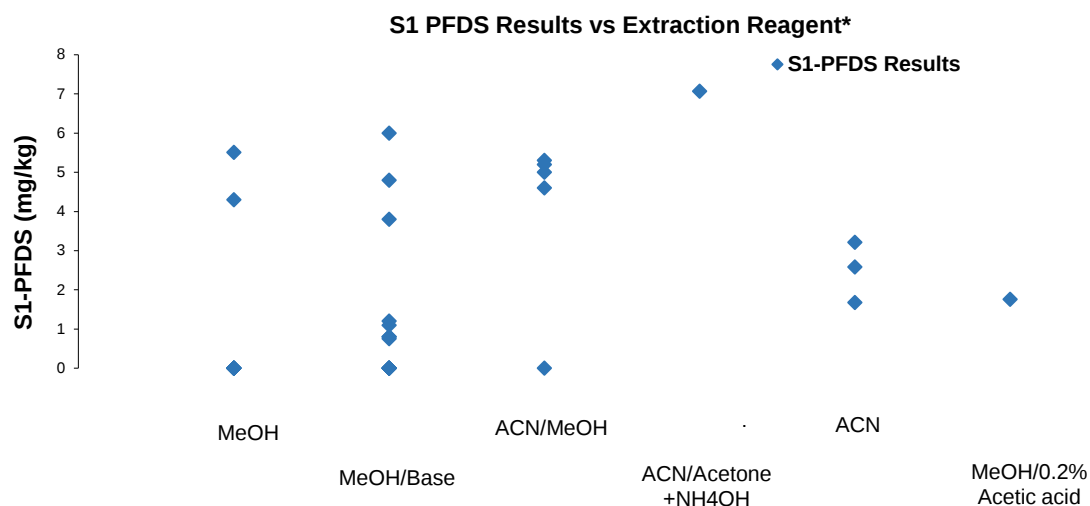
*Results from laboratory 5 were excluded.

Figure 100 S1 PFNS Results vs Labelled Standards Added Before Extraction



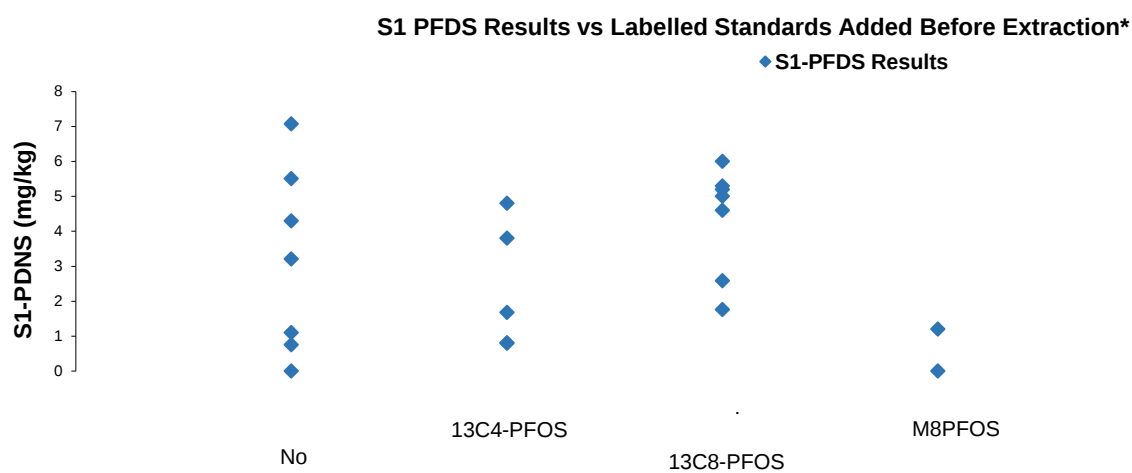
*Results from laboratory 5 were excluded.

Figure 101 S1 PFNS Results vs Labelled Standards Added After Extraction



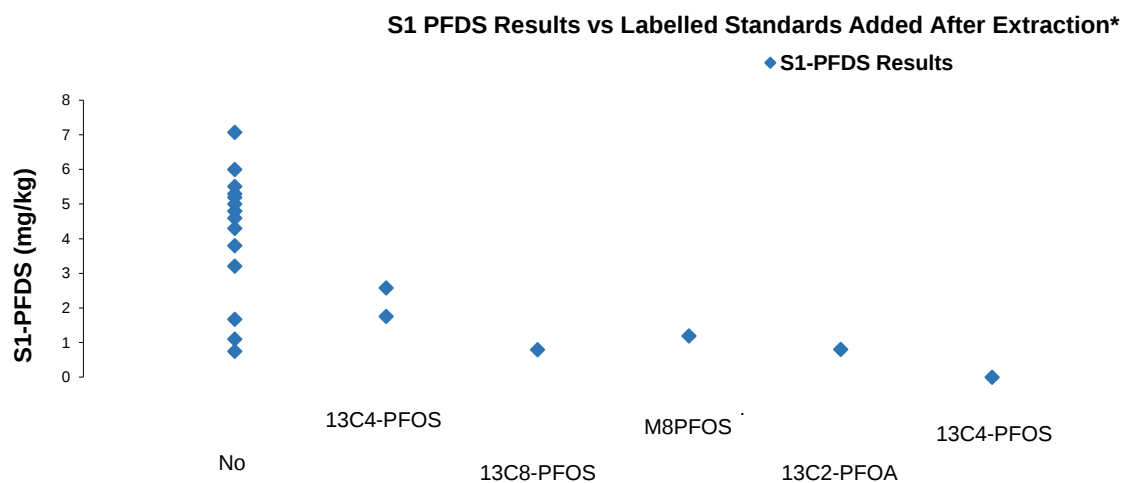
*Results from laboratory 5 were excluded.

Figure 102 S1 PFDS Results vs Extraction Reagent



*Results from laboratory 5 were excluded.

Figure 103 S1 PFDS Results vs Labelled Standards Added Before Extraction



*Results from laboratory 5 were excluded.

Figure 104 S1 PFNS Results vs Labelled Standards Added After Extraction

PFHxS and PFHxS_L and PFOS and PFOS_L For PFAS that contain linear and branched isomers, participants were asked to report total, the sum of linear and branched and for PFOS and PFHxS to report both total (the sum of linear and branched isomers) and linear (the linear isomers only) results.

In the present study, both samples were only spiked with linear PFHxS and linear PFOS standards, and therefore the linear to total ratio was expected to be 100% for both samples.

22 participants reported results for both PFHxS total and linear in S2. The linear to total ratio of the results reported PFHxS isomers was between 72% to 102% (Figure 105). Calculation errors may explain some of the results reported for PFHxS total and linear that did not return a ratio of 100%.

Figure 106 presents bar charts with ratios of PFOS_L results vs PFOS total results as reported by participants who reported results for both tests (25). These ratios were between 78% to 120%. The results reported by Laboratories 5 and 7 for PFOS total and linear in S2 were higher than the assigned value by the same factor of 100 and 2 respectively.

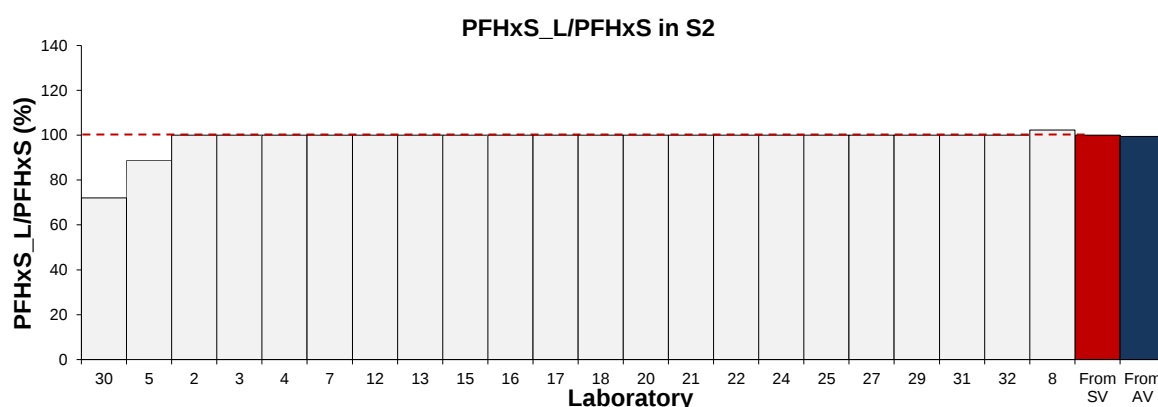


Figure 105 Bar Charts of PFHxS_L/PFHxS

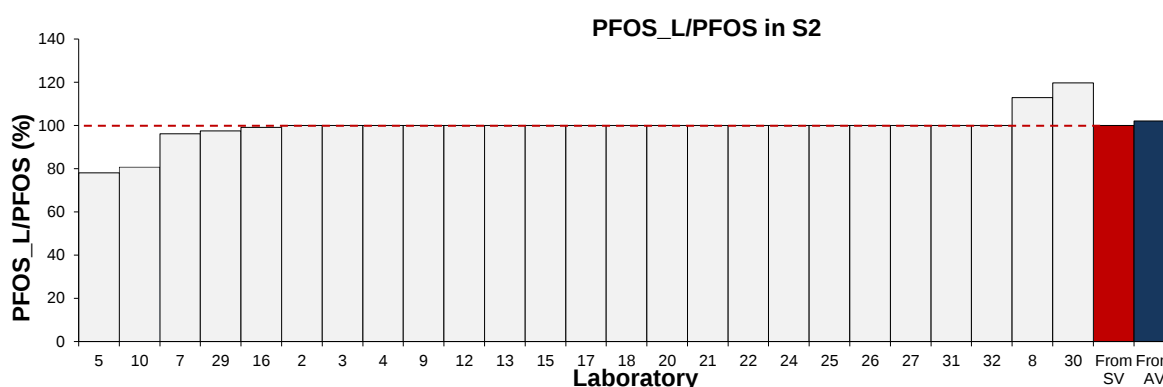


Figure 106 Bar of Charts PFOS_L/PFOS

6.7.4 Individual PFAA Precursors Analytes in Soil

PFOSA level in S1 was 1.7 µg/kg and in S2 was 4.14 µg/kg. Of 31 participants who reported results for the soil samples S1 and S2, 22 reported results for PFOSA in S1 and 25 in S2. All performed satisfactorily, with the exception of one laboratory in S1 and two in S2 (laboratory 5 was not considered).

N-EtFOSA, N-MeFOSA, N-MeFOSE and 8:2 FTS in S2 did not present analytical difficulty to participating laboratories. The between laboratory CVs for these analytes were between 7.7% and 16%.

6.8 Participants' Results and Analytical Methods for PFAS in Water

The method descriptions provided by participants for PFAS measurements in water are presented in Appendix 6.

Extraction

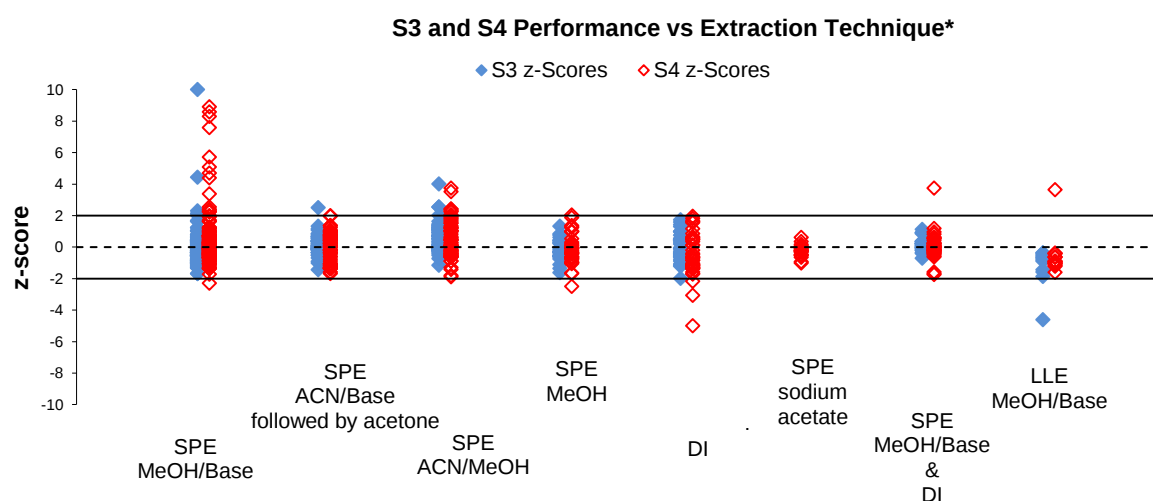
Sample S3 was contaminated water, whereas sample S4 was autoclaved tap water fortified for 26 individual PFAS components. Analyte concentration in S3 was between 0.0096 µg/L and 3.79 µg/L, while concentration in S4 was between 0.00437 and 0.096 µg/L. Of 31 participants who reported results for both water samples, 28 used the same sample size for extraction.

In order to avoid analyte absorption into the wall of the container, participants were instructed to use the entire contents of the bottle for analysis. 20 followed this instruction with the remaining participants taking only a sub-sample. Laboratory 24 reported using 100 mL of the sample; they may have sampled from both containers provided. Laboratories 2 and 4 reported using both 50 mL (or the entire container) and 10 mL samples. Some of the results they reported may have been produced from analyses conducted on the 50 mL sample and others from the 10 mL sample.

Most laboratories chose to enrich the test samples using SPE. Three laboratories reported using direct injection without sample enrichment (Figure 107). Laboratory 24 used SPE extraction only for sample S4. Laboratories 25 and 27 conducted SPE extraction for some analytes and for some only direct injection. Laboratory 20 reported using LLE as extraction technique for the two water samples, but they also reported using base modified methanol as elution solvent.

Base modified methanol was the preferred elution reagent. There was no correlation evident between participants' reported results for PFAS and the solvent used (Figure 107).

The most popular method used for measurements of PFAS water samples S3 and S4 was a SPE extraction procedure which involved a sample size of 50 mL, methanol or methanol base as elution solvent, and no clean-up step.

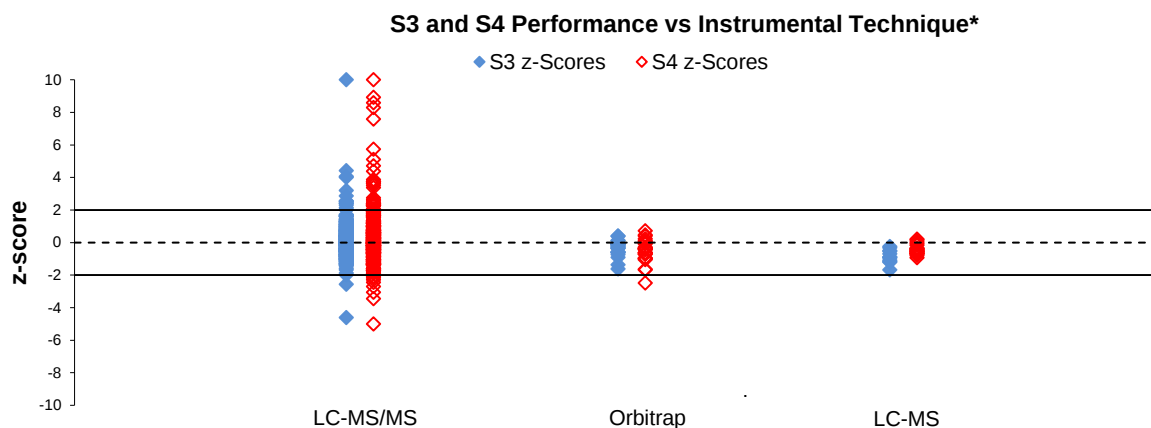


*Laboratory 22 excluded. Scores greater than 10 have been plotted as 10.

Figure 107 S3 and S4 Performance vs Extraction Technique

Instrumental Technique

With the exception of 3 participants, all laboratories reported using LC-MS/MS(QQQ) for PFAS measurements. Laboratories 15 and 30 used Orbitrap while laboratory 16 reported using LC-MS (Figure 108). Most LC-MS/MS users used a C18-based column and all but 3 reported using a delay column.



*Laboratory 22 excluded. Scores greater than 10 have been plotted as 10.

Figure 108 S3 and S4 Performance vs Instrumental Technique

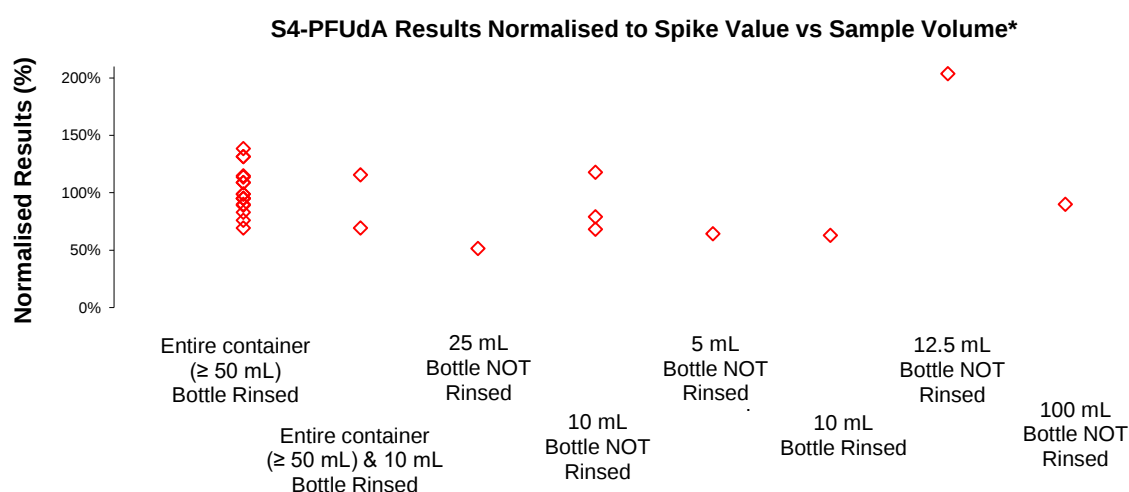
6.8.1 Individual PFCA Analytes in Water

Measurements of some PFCAs in S3 and S4 challenged participants' techniques. The between laboratory coefficient of variation was between 13% and 27% for PFCAs results reported in S3, and between 11% and 55% for PFCAs results reported in S4.

PFNA No assigned value was set for PFNA in S3 because the reported results were not compatible they were approximately 40% more variable than in S4. The level of PFOS in S3 was 3.79 µg/L and in S4 was 0.0138µg/L. Matrix effects from the high level PFOS in S3 may explain this discrepancy.

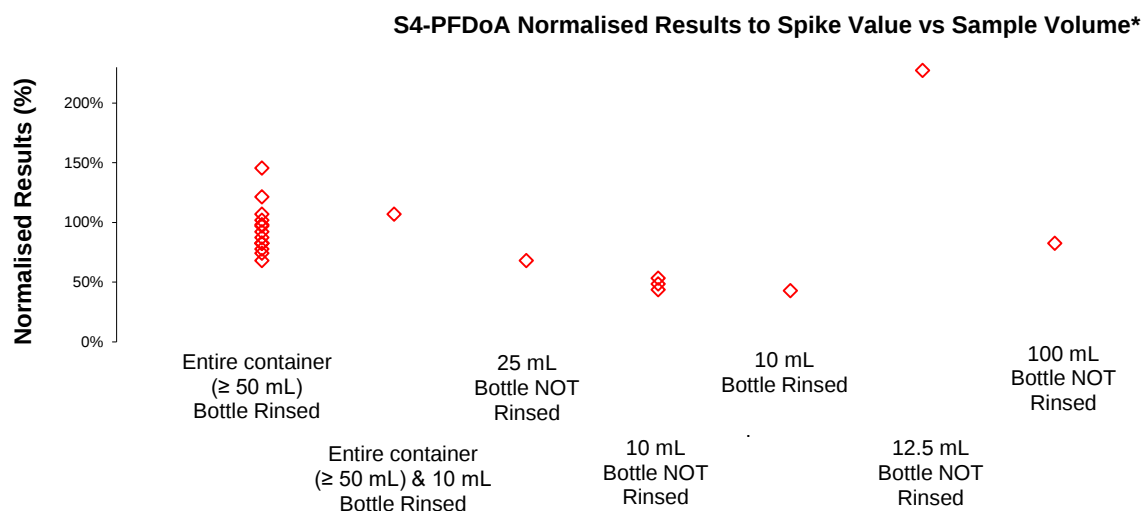
PFUdA, PFDoA, PFTrDA and PFTeDA were identified from literature as well as previous experience as analytes which are at risk of being absorbed into the wall of the container during sample preparation and/or during analysis.¹⁰⁻¹⁴ These long chain PFCAs were spiked directly into each bottle with the aim of minimising loss during preparation. The assigned values for these analytes were between 76% and 95% of the spiked value.

Plots of participants' results (normalised to spike value) versus testing method are presented in Figures 109 to 112. Most participants who used the entire or almost entire content of the container (50 mL or more) for analysis were able to recover more than 69% of the spiked PFUdA and PFDoA in water.



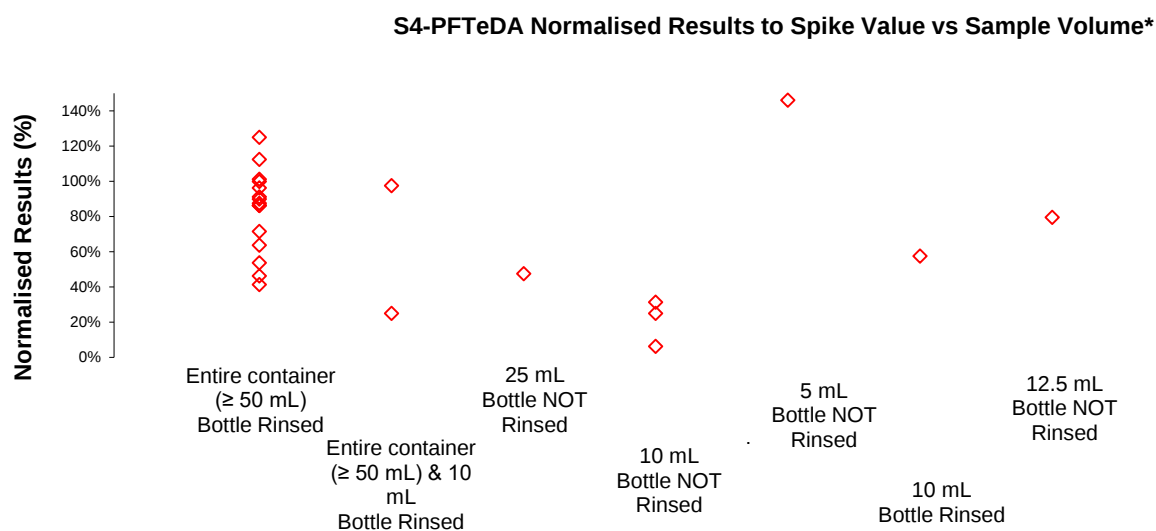
*Laboratory 22 excluded

Figure 109 S4-PFUdA Results Normalised to Spiked Value versus Sample Volume



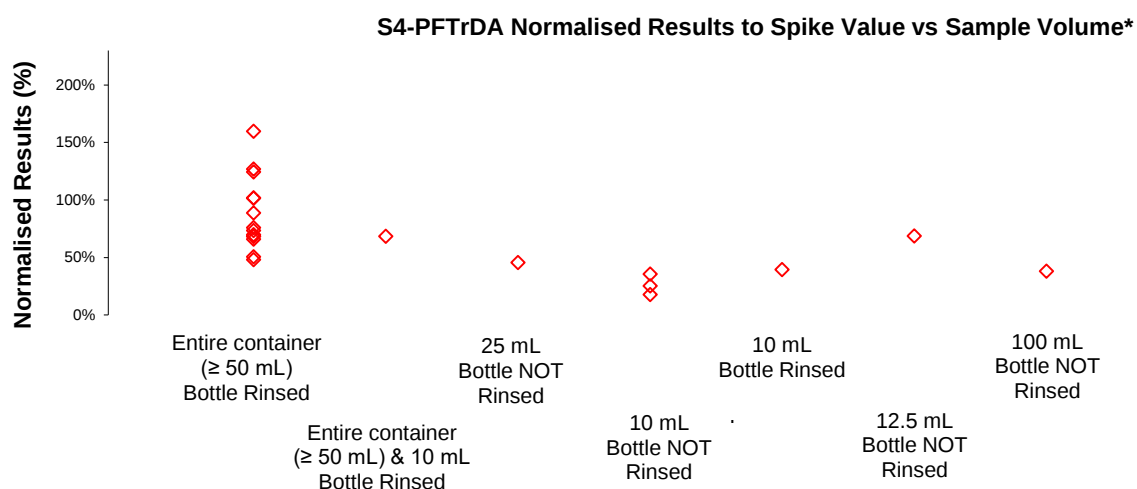
*Laboratory 22 excluded

Figure 110 S4-PFDoA Results Normalised to Spiked Value versus Sample Volume



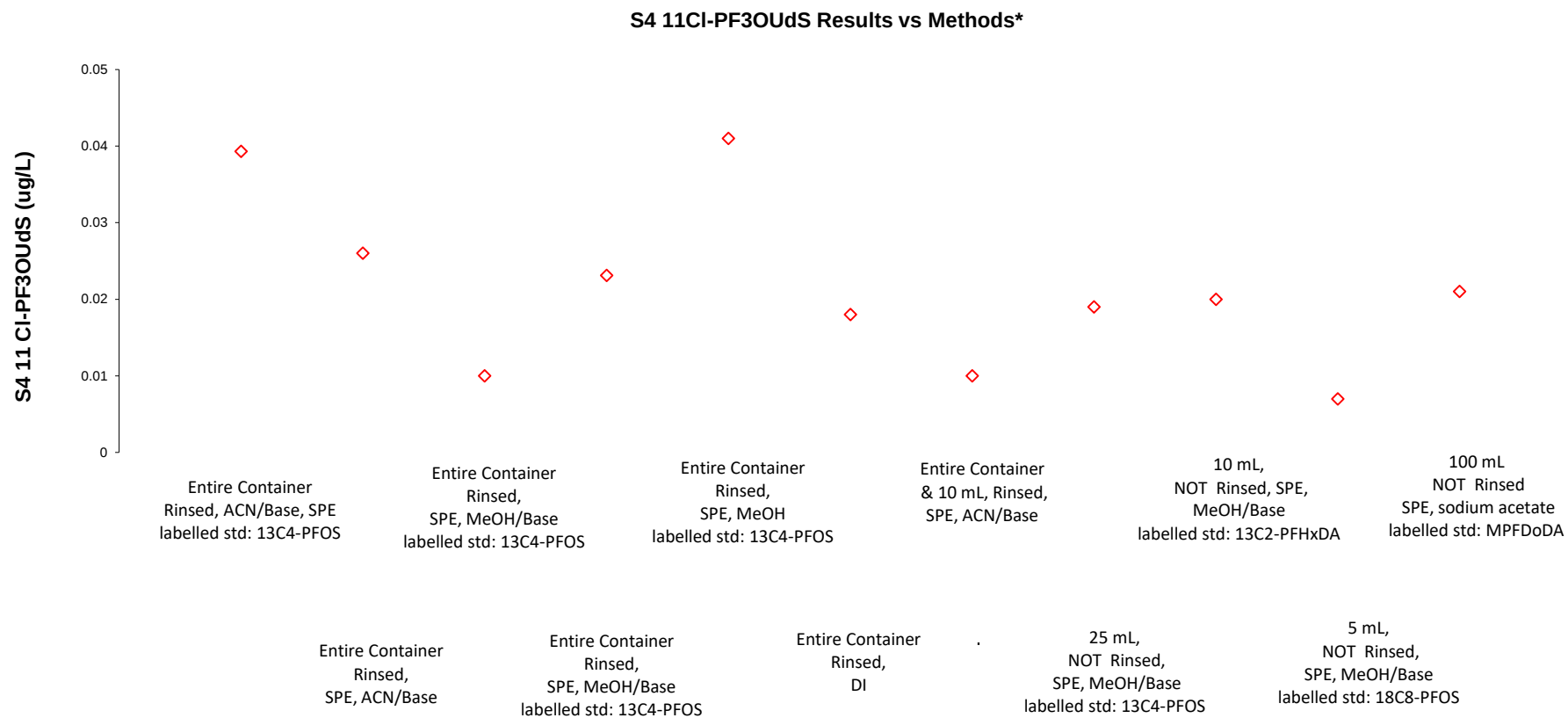
*Laboratory 22 excluded

Figure 111 S4-PFTeDA Results Normalised to Spiked Value versus Sample Volume



*Laboratory 22 excluded

Figure 112 S4-PFTrDA Results Normalised to Spiked Value versus Sample Volume .



*Labelled standards added before extraction

Figure 113 S4 11Cl-PF3OUdS Results vs. Methods

No assigned value could be set for PFTrDA and PFTeDA in S4 because the results were not compatible with each other, with between laboratory CVs of 55% and 53% respectively. Absorption into the surface of the sample container wall during analysis may explain these variations.

There is a correlation between those participants who used the entire or almost entire sample container for analysis, and those who had high recoveries of PFTrDA from the spiked water sample (Figures 112).

6.8.2 Individual PFECA and PFESA Analytes in Water

A limited number of participants provided results for PFECA and PFESA analytes in water. Approximately half reported results for ADONA and GenX and one third for 9Cl-PF3ONS and 11Cl-PF3ONS. Most of these laboratories performed satisfactorily.

11Cl-PF3OUdS The results reported for 11Cl-PF3OUdS in S4 were variable (CV of 58%) and hence no assigned value could be set. This was the first time that 11Cl-PF3OUdS in water was included in a PT.

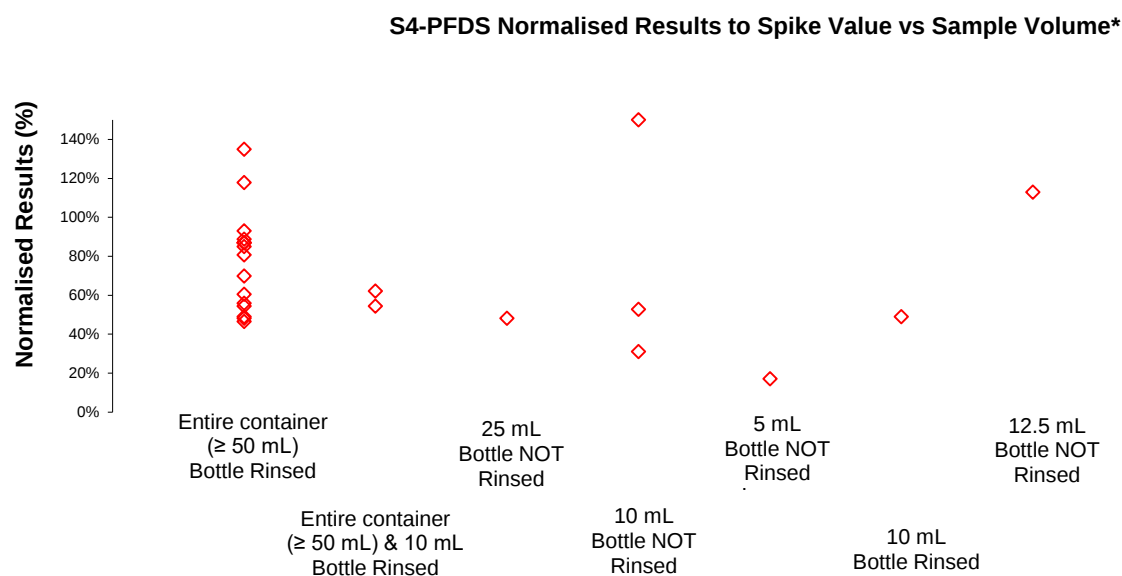
Plots of participants results for 11Cl-PF3OUdS in S4 versus method used are presented in Figure 113

6.8.3 Individual PFSA Analyte in Water Commentary

PFDS robust average in S4 was 73% of the spiked value, however no assigned value could be set because the results reported for this analyte were not compatible.

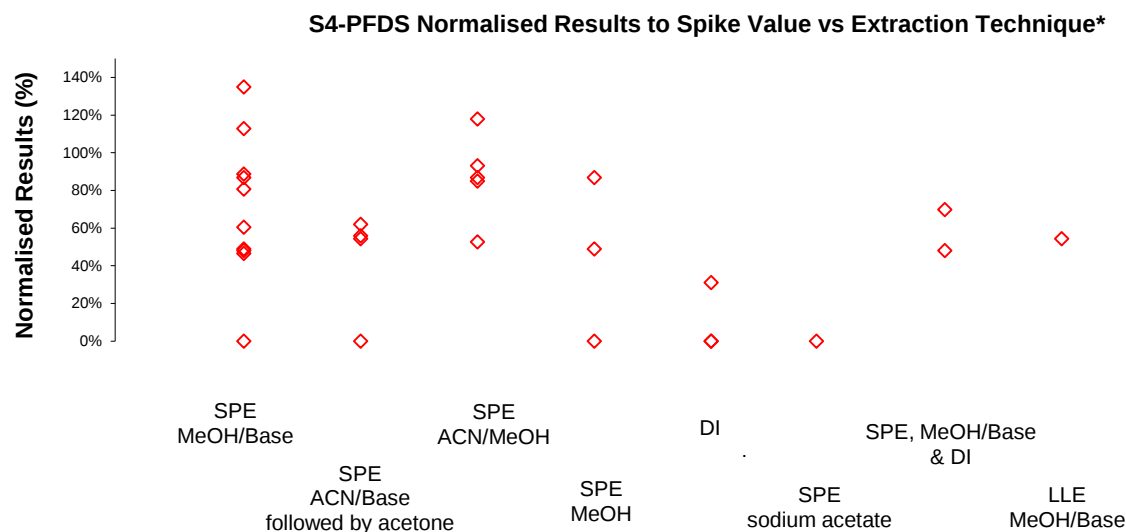
Figure 114 shows the normalised PFDS results (against the spiked concentration) versus the amount of sample taken for analysis for each sample. Most of the normalised results greater than 60% were from participants who reported using the entire container (50 mL or more) and rinsing it.

Plots of participants' results versus extraction technique used are presented in Figure 115. Due to the limited amount of data and the variety of analytical methods used, no significant trends in extraction and sample preparation were identified.



*Laboratory 22 excluded. Laboratory 10's normalised result of 183% has been plotted as 150%

Figure 114 S4-PFDS Results Normalised to Spiked Value versus Sample Volume



*Laboratory 22 excluded. Laboratory 10's normalised result of 183% has been plotted as 150%

Figure 115 S4-PFDS Results Normalised to Spiked Value versus Extraction Technique

PFHxS and PFHxS_L and PFOS and PFOS_L As for the soil samples, for PFOS and PFHxS participants were asked to report both total (the sum of linear and branched isomers) and linear (the linear isomer only) results.

Twenty-three participants reported results for both total and linear PFHxS in S3. The ratios of PFHxS_L versus total PFHxS in S3 were between 65% and 100% while the assigned value ratio between the two isomers was 83% (Figure 116).

The water sample S4 was only spiked with the linear PFHxS standard, and therefore the linear to total ratio was expected to be 100%. 22 participants reported results for both PFHxS total and linear in S4. All reported results for both isomers were similar with the exception of two (Figure 117).

Twenty-five laboratories reported results for the two PFOS isomers in S3. The robust average of these results (outliers excluded) was 3.79 µg/L for total PFOS and 1.63 µg/L for linear PFOS, with the ratio of PFOS_L versus total PFOS being 43%. Figure 118 presents bar charts of PFOS_L results vs total PFOS results as reported by participants

As for PFHxS in S4 the expected ratio of PFOS_L versus total PFOS in S4 was also 100% as only PFOS_L was spiked into the water sample. The linear to total ratio of the results reported for PFOS isomers was between 67% to 100% (Figure 119).

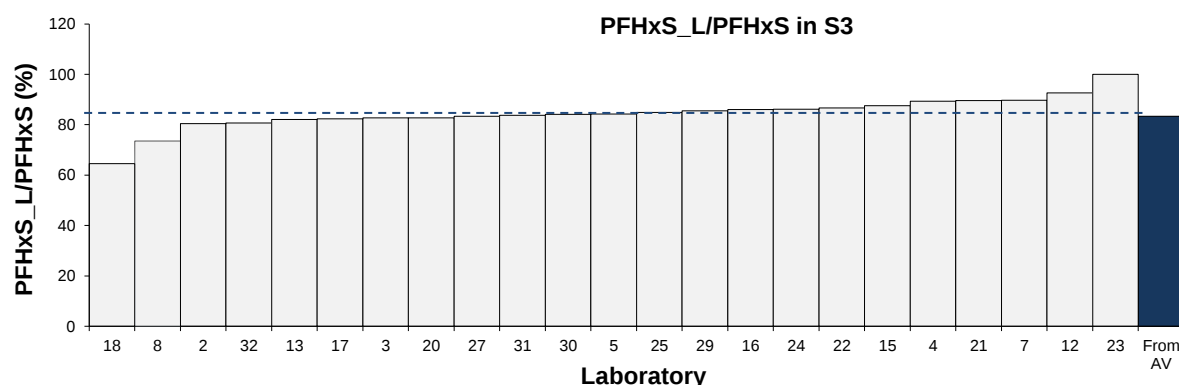


Figure 116 Bar Charts of PFHxS_L/PFHxS in S3

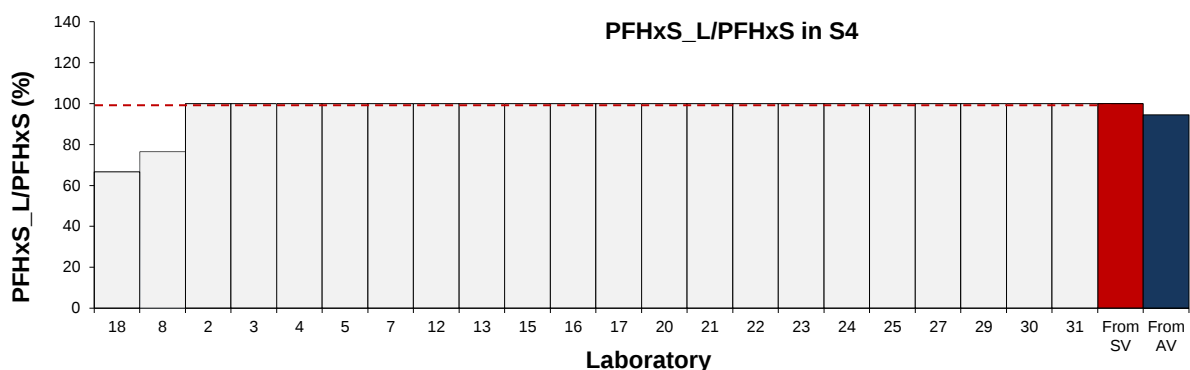


Figure 117 Bar Charts of PFHxS_L/PFHxS in S4

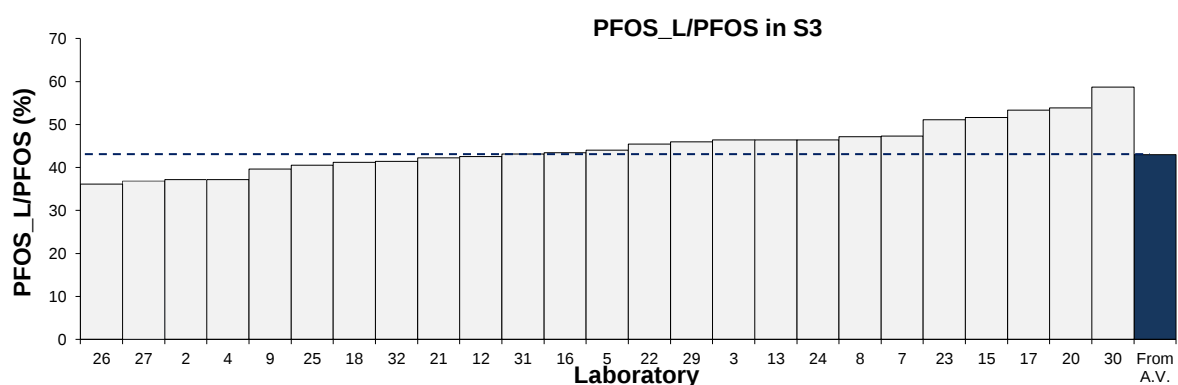


Figure 118 Bar Charts of PFOS_L/PFOS in S3

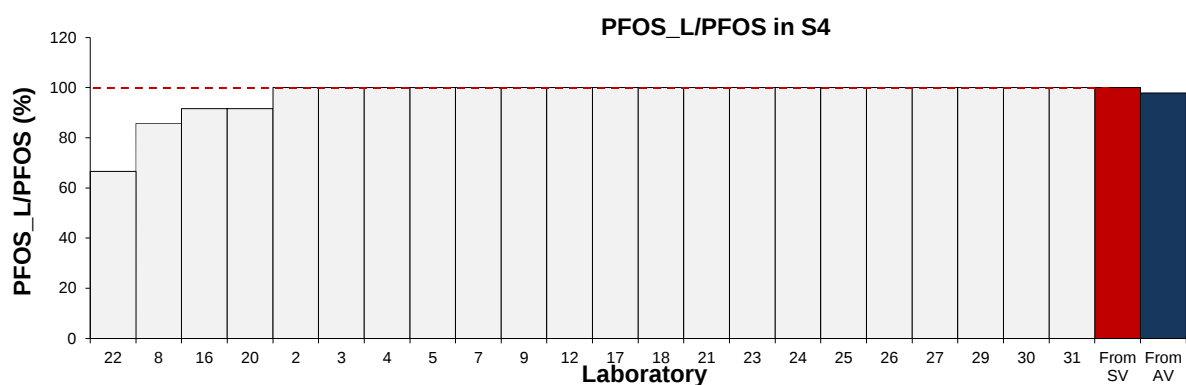


Figure 119 Bar Charts of PFOS_L/PFOS in S4

PFUDs, PFDoS and PFTrDS were spiked directly into each bottle with the aim of minimising the loss of these analytes during preparation. This was the first time that the long chain PFSA, PFUDs, PFDoS and PFTrDS have been included in a PT study. No assigned value could be set for these tests because only a small number of participants reported results.

Only two laboratories (6 and 29), reported results for PFUDs and PFTrDS in S4. These results were in relatively good agreement with each other but at only between 33% and 55% of the spike value respectively. Four laboratories reported results for PFDoS in S4. Plots of normalised results to spike value versus method used are presented in Figure 120.

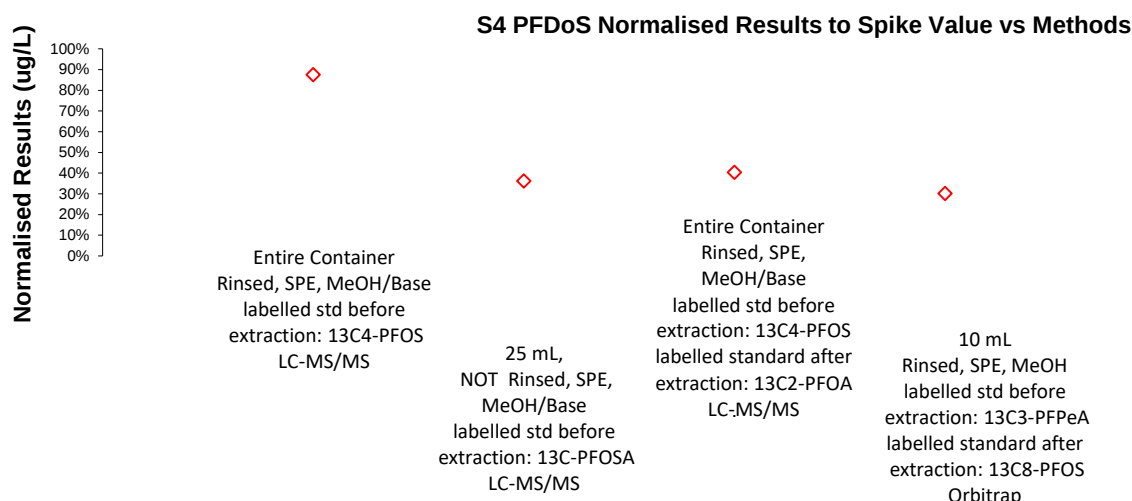


Figure 120 PFDOS Normalised Results to Spike Value vs Methods

6.8.4 Individual PFAA Precursors Analytes in Water

PFOSA As for long chain PFCAAs and PFSAAs, PFOSA was also identified as being an analyte which may potentially absorb into the container wall during sample preparation.^{12,15} This analyte was added directly into the final bottles rather than during bulk sample preparation in order to mitigate loss during preparation. The assigned value for PFOSA in S4 was 72% of the spiked value and the reported results were in relatively good agreement with each other with a between laboratory CV of 18% in S3 and 25% in S4.

6.9 Effects of Sample Matrix

Samples S1 and S2 were soil samples and Samples S3 and S4 were water samples. Spiked water Sample S4 had the lowest percentage of numerical results for which z-scores were calculated, which may be due to low level of some analytes in this sample (below the LOR of some participants).

Sample S1 had a high percentage of satisfactory z-scores, meaning that laboratories were able to overcome matrix effects due to the high level of PFOS in the sample (Table 92).

Table 92 Satisfactory z-Scores for Each Matrix

Sample		Expected number of z-scores	Actual number of z-scores (% of expected no of z-scores)	Satisfactory	Satisfactory (%)
S1 Soil	Incurred	403	354 (88%)	325	92
S2 Soil	Spiked	744	576 (77%)	540	94
S3 Water	Incurred	429	373 (87%)	336	90
S4 Water	Spiked	693	515 (74%)	453	88

6.10 False Negatives

Appendix 4 presents false negative results. These are analytes present in the samples which a participant tested for, but did not report a numerical result (e.g. laboratories reporting a ‘less than’ (<) or NR result when the assigned and spiked value was higher than the participants’ reporting limit, or participants that did not report any value). For analytes where no assigned value was set, results have only been considered to be false negatives where the robust average and spiked value were significantly higher than the participants’ LOR, or if no value was reported.

6.11 Comparison with Previous PFAS in Soil and Water

In the first study conducted by NMI for PFAS analytes in soil and water AQA 15-03, participants were asked to report results for total and linear PFOS and PFOA only. 11 laboratories enrolled and 10 reported results. The lack of mass-labelled linear and branched standards was the main problem encountered by participants. Since then, a large number of high-quality standards and labelled standards have become available and so more analytes have been added each year to follow-up PT studies. Laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the reported results were compatible, showing that the mass-labelled standards are capable of correcting for the differences between these methods. A summary of participation and reported results rates in PFAS in soil and water over the last 7 studies (2015 to 2021) is presented in Figure 121.

AQA 21-07 is the seventh NMI proficiency test of PFAS analytes in soil and water. For all analytes, the same fixed target standard deviation was used in the present study as in previous studies. This allows for a comparison of participants' performance over time and provides a benchmark for progressive improvement. Participants' performance in the measurement of PFAS analytes in soil and water over time is presented in Figure 122.

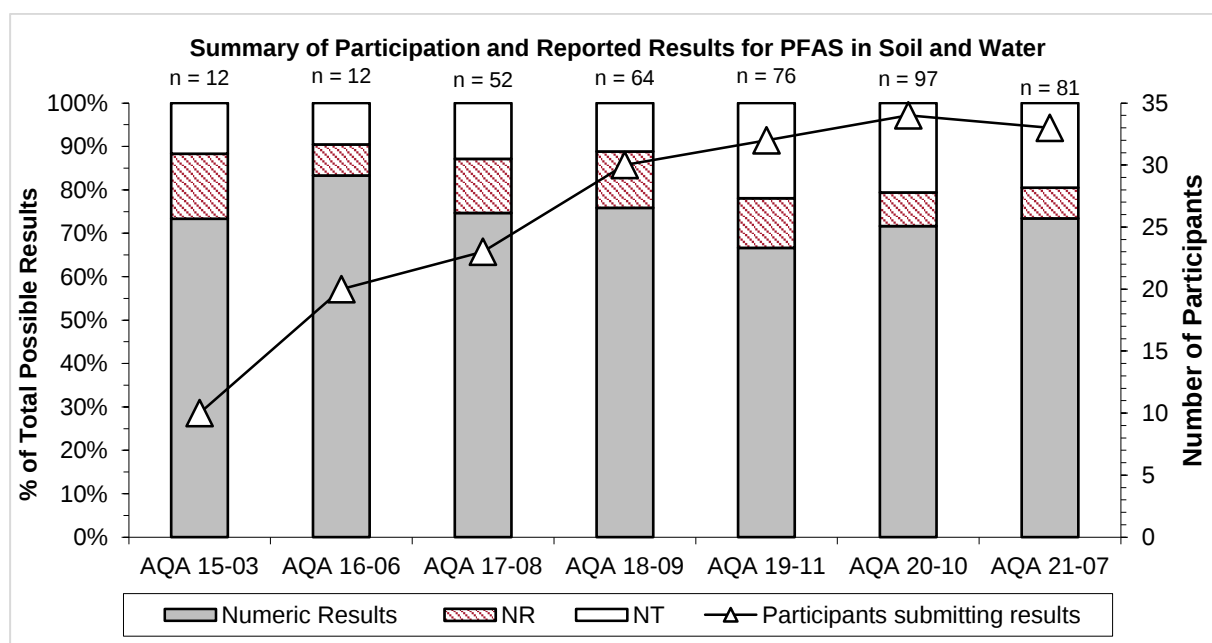


Figure 121 Summary of Participation and Reported Results for PFAS in Soil and Water PT Studies (n = number of analytes).

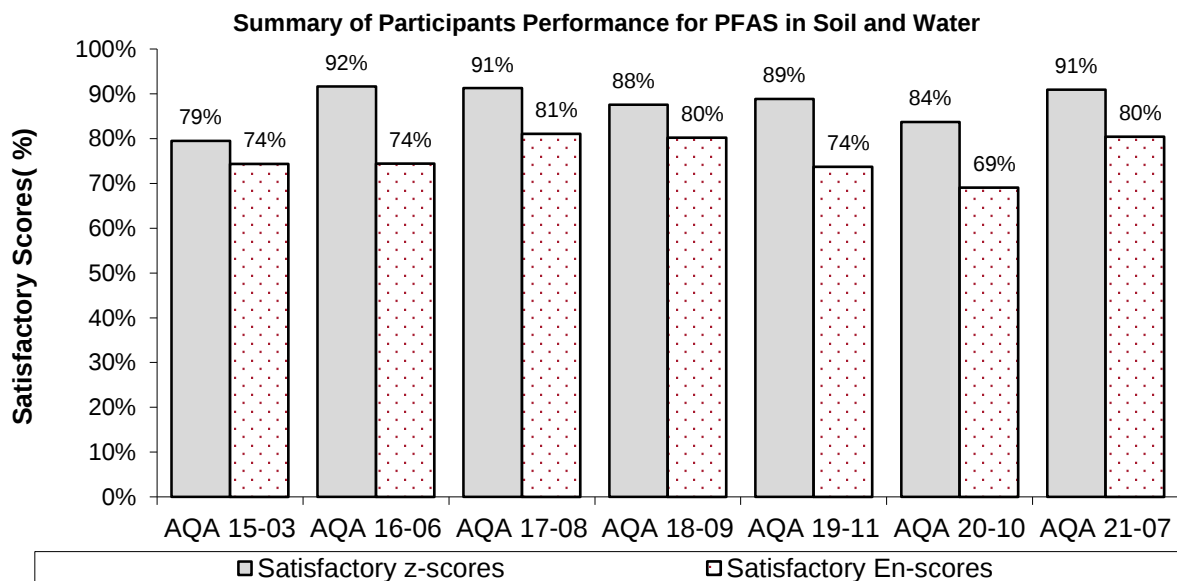


Figure 122 Summary of Participants' Performance for PFAS in in Soil and Water PT Studies

Over time, laboratories should expect at least 95% of their scores to lay within the range $|z| \leq 2.0$. Scores in the range $2.0 < |z| < 3.0$ can occasionally occur, however these should be interpreted in conjunction with the other scores obtained by that laboratory. For example, a trend of z-scores on one side of the zero line is an indication of method or laboratory bias. Individual performance history reports are emailed to each participant at the end of the study; the consideration of z-scores for an analyte over time provides much more useful information than a single z-score.

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APPENDIX 1 – SAMPLE PREPARATION

A1.1 Sample Preparation

Sample S1: Two contaminated soils were separately dried and sieved through a 850 µm sieve and collected on a 355 µm sieve. The two contaminated soil materials were mixed, divided into 20 – 25 g portions, packed into labelled Greiner tubes and shrink-wrapped.

Sample S2: 1300 g of dried and sieved uncontaminated soil was placed in a 3 L round bottom flask. A slurry was produced by adding acetone. The slurry was spiked with a composite solution that had been prepared from stock solutions. Vials of Wellington Laboratories standards solutions were individually spiked. The slurry was placed on the Rotavap, and the acetone was evaporated off with a slight vacuum, with the heater being to no more than 40°C. The dry soil was divided into 20 – 25 g portions, packed into labelled Greiner tubes and shrink-wrapped.

Sample S3: Two contaminated water samples were filtered through a sterile 0.2 µm pore size filter into a pre-weighed 10 litre Schott Bottle. The final mass of filtered contaminated water was 6400 g. The water was autoclaved and then dispensed through a sterile 0.2 µm pore size filter into 60 mL HDPE bottles. The bottles were labelled, shrink-wrapped and refrigerated

Sample S4: 6000 g of autoclaved milli-Q water was spiked with a composite spike solution containing 18 analytes prepared in methanol. The spiked water was mixed for approximately 2 hours, and dispensed into labelled 65 mL HDPE bottles. Each bottle was then spiked with a composite solution containing PFUnA, PFDoA, PFTrA, PFTeDA, PFOSA, PFUDS, PFDoS and PFTrDS to minimise the loss of these analytes during preparation. The bottles were labelled, shrink-wrapped and refrigerated.

Soil and water samples were stored at 4°C prior to dispatch to participants.

APPENDIX 2– ROBUST AVERAGE AND ASSOCIATED UNCERTAINTY, Z-SCORE AND E_N-SCORE CALCULATIONS

A2.1 Robust Average and Associated Uncertainty

The robust average was calculated using the procedure described in ISO 13528:2015 Annex C.⁵ The uncertainty was estimated as:

$$u_{\text{rob average}} = 1.25 \times S_{\text{rob average}} / \sqrt{p} \quad \text{Equation 4}$$

where:

$u_{\text{rob average}}$ is the standard uncertainty of the robust average

$S_{\text{rob average}}$ is the standard deviation of the robust average

p is the number of results

The expanded uncertainty ($U_{\text{rob average}}$) is the standard uncertainty multiplied by a coverage factor of 2 at approximately 95% confidence level.

A worked example is set out below in Table 93.

Table 93 Uncertainty Estimate for PFHxA in Sample S1

No. results (p)	30
Robust Average	12.8 µg/kg
$S_{\text{rob av}}$	1.35 µg/kg
$u_{\text{rob av}}$	0.3 µg/kg
k	2
$U_{\text{rob av}}$	0.6 µg/kg

Therefore, the robust average for PFHxA in Sample S1 is **12.8 ± 0.6 µg/kg**.

A2.2 z-Score and E_n-Score Calculations

For each participant's result, a z-score and E_n-score are calculated according to Equations 2 and 3 respectively (see page 12).

A worked example is set out below in Table 94.

Table 94 z-Score and E_n-Score for Sample S1 PFHxA Result Reported by Laboratory 3

Participant Result (µg/kg)	Assigned Value (µg/kg)	Target Standard Deviation	z-Score	E _n -Score
12 ± 2.5	12.8 ± 0.6	20% as PCV, or: 0.2 × 12.8 = 2.6 µg/kg	$z\text{-Score} = \frac{12 - 12.8}{2.6}$ = -0.31	$E_n\text{-Score} = \frac{12 - 12.8}{\sqrt{2.5^2 + 0.6^2}}$ = -0.31

APPENDIX 3 – ADDITIONAL ANALYTES

Table 95 Additional Analytes

Lab. Code	Sample	Analyte	Result S1 & S2 (µg/kg) S3 & S4 (µg/L)	Uncertainty S1 & S2 (µg/kg) S3 & S4 (µg/L)	Recovery (%)
2	S3	PFNS	0.008	0.001	NR
		6:2 FTS	0.005	0.001	188
5	S1	PFNA	6.91	0.47	69
		PFDA	19.1	3.2	77
		N-MeFOSA	6.98	1.04	81
		N-EtFOSA	10.4	1.67	79
		N-MeFOSAA	15.8	1.4	64
		N-MeFOSE	7.99	1.93	59
		8:2 FTS	8.99	1.8	62
		GenX	7.10	0.99	76
		ADONA	52.5	10.4	69
		9Cl-PF3ONS	41.9	12.7	69
		11Cl-PF3OUdS	35.9	8.5	69
	S2	PFNS	1.07	0.31	43
		PFDS	0.874	0.273	43
		PFDoS	0.333	0.153	43
7	S3	6:2 FTS	0.006	0.0018	NR
8	S1	PFDoS	0.904	0.271	105
10	S1	ADONA	6.74	0.32	NR
	S3	PFTeDA	0.069	0.026	NR
		ADONA	0.4425	0.035	NR
	S4	PFNS	0.014	0.09	NR
		N-MeFOSAA	0.0011	0.001	NR
19	S3	PFDS	0.007	0.002	NR
		PFUdA	0.004	0.001	NR
		PFDoS	0.006	0.002	NR
		PFTrDA	0.009	0.003	NR
		PFTeDA	0.005	0.001	NR
		N-MeFOSA	0.006	0.002	NR
		N-EtFOSAA	0.002	0.001	NR
		6:2 FTS	0.016	0.006	NR
		10:2 FTS	0.005	0.002	NR
	S4	N-MeFOSA	0.005	0.002	NR
		N-MeFOSAA	0.016	0.006	NR
		N-EtFOSAA	0.017	0.004	NR
		8:2 FTS	0.010	0.004	NR
		10:2 FTS	0.030	0.011	NR

Lab. Code	Sample	Analyte	Result S1 & S2 (µg/kg) S3 & S4 (µg/L)	Uncertainty S1 & S2 (µg/kg) S3 & S4 (µg/L)	Recovery (%)
21	S1	PFDoS	0.352	0.106	85
		PFUDa	0.317	0.095	84
		PFTTrDA	0.165	0.05	78
	S2	PFUDa	0.023	0.007	84
		PFDaA	0.023	0.007	84
	S4	PFNS	0.0008	0.00024	94
23	S3	6:2 FTS	0.005	0.01	NR
25	S3	6:2 FTS	0.005	0.003	98
27	S3	6:2 FTS	0.005	0.003	117
30	S1	PFDoS	1.58	0.39	77
		PFDA	0.01	0.003	87
	S3	PFNS	0.0025	0.00062	77
		PFDA	0.00098	0.00025	79
		6:2 FTS	0.0038	0.00095	70
31	S1	PFDoS	0.60	0.12	NR
32	S1	N-MeFOSAA	2.84	0.852	82.3
	S2	N-EtFOSAA	3.85	1.16	61.5

APPENDIX 4 – FALSE NEGATIVES

Table 96 False Negatives

Lab. Code	Sample	Analyte	Assigned Value S1 & S2 (µg/kg) S3 & S4 (µg/L)	Spiked Value S1 & S2 (µg/kg) S3 & S4 (µg/L)	Reported Result** S1 & S2 (µg/kg) S3 & S4 (µg/L)
3	S1	PFHpA	1.20	Not Spiked	<1.0
4	S4	PFDoA	0.0176	0.0206	<0.01
		PFTTrDA	0.0299*	0.0394	<0.01
5	S2	PFNA	6.12	6.06	<0.197
		PFDA	19.9	19.9	<0.197
		N-MeFOSA	6.98	6.92	<0.197
		N-EtFOSA	9.82	10.0	<0.197
		N-MeFOSE	7.71	8.08	<0.197
		8:2 FTS	9.02	9.58	<0.197
		GenX	7.41	15.0	<0.197
		ADONA	42.1	47.1	<0.197
		9Cl-PF3ONS	34.5	37.3	<0.197
		11Cl-PF3OUdS	33.8	58.1	<0.197
10	S2	PFHxS	18.0	18.9	NR
	S3	PFHxS_L	2.60	Not Spiked	NR
		PFOS_L	1.63	Not Spiked	NR
	S4	PFHxS_L	0.0259	0.0284	NR
		PFOS	0.0138	0.0143	NR
		PFOS_L	0.0135	0.0143	<0.01
16	S1	PFOSA	1.70	Not Spiked	NR
	S2	N-MeFOSA	6.98	6.92	NR
		N-EtFOSA	9.82	10.0	NR
		N-MeFOSE	7.71	8.08	NR
	S3	PFOSA	0.0096	Not Spiked	NR
19	S1	PFOSA	1.70	Not Spiked	NR
	S2	PFOSA	4.14	4.96	NR
		N-MeFOSA	6.98	6.92	NR
		N-EtFOSA	9.82	10.0	NR
		N-MeFOSAA	12.9	15.0	NR
		8:2 FTS	9.02	9.58	NR
20	S1	PFHpA	1.20	Not Spiked	<0.2
	S3	PFHpA	0.0927	Not Spiked	<0.004
	S4	6:2 FTS	0.0151	0.0142	<0.004
22	S2	N-MeFOSE	7.71	8.08	<1
23	S4	PFDoA	0.0176	0.0206	NR
		PFTTrDA	Not Set	0.0394	NR
24	S2	ADONA	42.1	47.1	NR
	S4	PFDS	Not Set	0.0645	NR
		PFTeDA	Not Set	0.0801	NR
		6:2 FTS	0.0151	0.0142	NR

Lab. Code	Sample	Analyte	Assigned Value S1 & S2 (µg/kg) S3 & S4 (µg/L)	Spiked Value S1 & S2 (µg/kg) S3 & S4 (µg/L)	Reported Result** S1 & S2 (µg/kg) S3 & S4 (µg/L)
		9Cl-PF3ONS	0.068	0.0839	NR
31	S3	PFOSA	0.0096	Not Spiked	<0.008
	S4	PFDoS	Not Set	0.0387	<0.002
32	S1	PFBA	2.27	Not Spiked	<2.26
	S2	PFHpS	2.00	2.01	<1.91
	S4	PFHxS	0.0274	0.0284	<0.025
		PFHxS_L	0.0259	0.0284	<0.025
34	S3	PFPeS	0.375	Not Spiked	NR
		PFHxS_L	2.60	Not Spiked	NR
		PFHpS	0.196	Not Spiked	NR
		PFOS_L	1.63	Not Spiked	NR
	S4	PFPeS	0.0343	0.0328	NR
		PFHxS_L	0.0259	0.0284	NR
		PFHpS	0.00437	0.00500	NR
		PFOS_L	0.0135	0.0143	NR
		PFDS	0.047**	0.0645	NR
		PFUdS	Not Set	0.0966	NR
		PFDoS	Not Set	0.0387	NR
		PFTTrDS	Not Set	0.0582	NR
		GenX	0.0632	0.0698	NR
		ADONA	0.0681	0.0659	NR
		9Cl-PF3ONS	0.068	0.0839	NR
		11Cl-PF3OUdS	0.0212**	0.0565	NR

**Robust Average (assigned value not set for this analyte); ** Results reported as NR may or may not be false negatives, depending on the participant's actual LOR.

APPENDIX 5 – PARTICIPANTS’ TEST METHODS FOR SOIL SAMPLES

Participants’ methods for soil samples are presented in Tables 97 to 139.

Table 97 Participant Methodology – Extraction

Lab. Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Pre-treatment	Extraction Technique	Extraction Solvent	Extraction Temperature	Extraction Time	Extraction Clean Up
2	2	2		Solid-Liquid Extraction	1:1 ACN/Acetone, 1.5% v.v amm. Hydrox	ambient	30	Graphitized carbon
3	5	5	None	Solid-Liquid Extraction	1% ammonia in methanol	Ambient	1 hour	Solid-Phase Extraction
4	2	2	Homogenisation	Solid-Liquid Extraction	4:1 MeOH:Water	Ambient	30mins	Solid-Phase Extraction
5	5.09	5.08	Homogenisation	Alkaline Digestion	KOH/Methanol	Room Temperature	1 hour	Solid-Phase Extraction
6	1g	1g	Homogenisation	Solid-Liquid Extraction	Methanol	40°C	1h	Filtration
7*	0.1	0.01	Homogenisation	Solid-Liquid Extraction	Methanol	RT	30min	Solid-Phase Extraction
8	1	1	Homogenisation	QuEChERS	Acetonitrile	Room temperature		Solid-Phase Extraction
9	2	2	Homogenisation	QuEChERS	Acetonitrile / Methanol	Ambient	30 minutes	Filtration
10	0.5	0.5	Homogenisation	QuEChERS	Acetonitrile			Solid-Phase Extraction
11	0.5	0.5	Homogenisation	Alkaline Digestion	Ammonium hydroxide in methanol	Room temperature	2 x 20 minutes	Carbon SPE
12	2	2	Homogenisation	Solid-Liquid Extraction	4:1 MeOH:WATER	Ambient	30 mins	Filtration
13	1	1	Homogenisation	Alkaline Digestion	KOH in methanol solution	ambient	2	NA
14	2	2	pH Adjustment	QuEChERS	Acetonitrile/Methanol	Ambient	30 mins	C18/GCB

Lab. Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Pre-treatment	Extraction Technique	Extraction Solvent	Extraction Temperature	Extraction Time	Extraction Clean Up
15*	1	1	pH Adjustment	Solid-Liquid Extraction	Extraction with MeOH/Ammonium hydroxide 99:1	Sonicate 30 min at 30-35 degrees	3x 5mL Extraction with MeOH/Ammonium hydroxide	Solid-Phase Extraction
16	0.02	0.02	Homogenisation	Solid-Liquid Extraction	Ammonia-Methanol			Solid-Phase Extraction
17*	1.0025	1.0032	Homogenisation	Solid-Liquid Extraction	99/1 methanol/ammonium hydroxide (v/v)	Room temp (25 min)	6 hrs	Bond-Elut Carbon SPE
18*	5	5	Homogenisation	Solid-Liquid Extraction	Methanol	ambient	30 min sonication	none
19	2	2	Homogenisation	Alkaline Digestion	KOH in Methanol	Room temp	16 hours	Centrifugation
20*	1	1	Homogenisation	Solid-Liquid Extraction	Methanol/0.25% Ammonia	Ambient	30 minutes	Solid-Phase Extraction
21	0.51	5.02	Homogenisation	Solid-Liquid Extraction	0.4% KOH in MeOH	Ambient	3 hour	Solid-Phase Extraction
22	2	2		QuEChERS	1% ammonia in methanol			
24*	2.0	2.0	NA	Solid-Liquid Extraction	200mM NaOH, MeOH	Room temperature	30 min	dSPE (graphitised carbon)
25	5	5	Homogenisation	Alkaline Digestion	Basified MeOH	Room	60 mins	Envicarb if needed
26	2	2	pH Adjustment	QuEChERS	Acetonitrile & Methanol	Shaking	Room Temperature	None
27	5	5	Homogenisation	Alkaline Digestion	Basified MeOH	Room	60 mins	Envicarb if needed
28	2	2	Homogenisation	QuEChERS	60:40 ACN:MeOH	Ambient	2 x 30mins	Graphitized carbon
29	5 g	5 g	Homogenisation	Solid-Liquid Extraction	MeOH/ACN (1:1)	laboratory temperature	10 min	
30	5	5	Homogenisation	QuEChERS	ACN	Room	30 minutes	Solid-Phase Extraction

Lab. Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Pre-treatment	Extraction Technique	Extraction Solvent	Extraction Temperature	Extraction Time	Extraction Clean Up
31	5g	5g	Homogenisation	Solid-Liquid Extraction	0.2% acetic acid in Methanol	Ambient	3 hours	Solid-Phase Extraction
32	0,2 g	0,2 g	If combination or other, please type here.	Ultra sonic	Methanol	40 °C	20 min	none
33	NA	0.2 g, 1 g	Homogenisation	Sonication	Methanol	Room temperature	30 min x 3 times	Solid-Phase Extraction

*Additional Information in Table 114.

Table 98 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
7	Methanol extract blown to near dryness then resuspended in water before SPE.
15	Strata X-AW 33um polymeric Weak Anion
17	Centrifuged extracts before analysis
18	Solvent exchange to water
20	WAX cartridges
24	Vortex, shaking

Table 99 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
2	LC-MSMS or LC-QQQ		C18 1.9uM porous, 50 x 2.1mm	0.375 standard; 7.5 rerun for PFOS	Yes	No	In house
3	LC-MSMS or LC-QQQ	None	reverse phase, 100mm x 2.1mm	No	Yes	No	No

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
4	LC-MS	UHPLC guard column; AU; InfinityLabPoroshell 120; EC-C18; 4.6 mm; 4 um	LC column; AU; Poroshell 120 HPH C18; 2.1x50 mm; 2.7 um; narrow bore	No	Yes	No	Isotope dilutions
5	LC-MSMS or LC-QQQ		C18 10cm x 3.0 mm x 3 um	No	Yes	No	No
6	LC-MSMS or LC-QQQ	C18 5 x 2.1 mm	C18 100 x 2.1 mm	no	Yes	No	DIN 38414-14 (S 14) (2011-08)
7	LC-MSMS or LC-QQQ	NA	C18 1.8um 2.1x100mm	6.25	Yes	No	
8	LC-MSMS or LC-QQQ	C18 2.1 mm	C18 3mm	10-100	Yes	No	
9	LC-MSMS or LC-QQQ	C18 2.2um, 3 x 30mm	C18 1.6um, 2 x 50mm	Yes- Sample S1 was diluted x 20 for PFOS and PFHxS	Yes	No	In House
10	LC-MSMS or LC-QQQ	yes	C18 100 *2.1	no	Yes	No	
11	LC-MSMS or LC-QQQ	Nil	Shimadzu Shim-pack XR-ODS III (1.6 µm , 50 mm x 2.0 mm)	No	Yes	No	No
12	LC-MSMS or LC-QQQ	UHPLC guard column; AU; InfinityLabPoroshell 120; EC-C18; 4.6 mm; 4 um	LC column; AU; Poroshell 120 HPH C18; 2.1x50 mm; 2.7 um; narrow bore	NO	Yes	No	Isotope dilution
13	LC-MSMS or LC-QQQ	NA	C18 1.7 um, 2.1 x 50mm	2	No	No	EPA draft sludge method
14	LC-MSMS or LC-QQQ	C18 2.2um, 3 x 30mm	C18 1.6um, 2 x 50mm	No	Yes	No	In House
15	Orbitrap	C18 3mm	Kinetex C18 100x3mm x 2.6um	no	Yes	Yes	In house
16	LC-MSMS or LC-QQQ		Shim-pack XR-ODSIII 2x50 (1.6um)		Yes	No	
17	LC-MSMS or LC-QQQ	Phenomenex Evo C18 (2 mm x 2.1 mm)	Phenomenex Evo C18 (100 mm x 2.1 mm x 2.6 um)	Only sample 1 was diluted for	Yes	No	No

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
				quafying PFOS			
18	LC-MSMS or LC-QQQ		C18 1.6 x 50	yes (1:10)	Yes	No	
19	LC-MSMS or LC-QQQ	C18, 5mm x 2.1mm, 2.7um	C18, 100mm x 2.1mm, 2.7um	No	Yes	No	No
20	LC-MSMS or LC-QQQ	0.2µm Filter	C18 1.6µm 50mm x 2mm	NA	Yes	No	
21	LC-MSMS or LC-QQQ	C18 5u, 4x10mm	Gemini C18 3u, 3x10mm	No	Yes	No	Modified EPA Method 537
22	LC-MSMS or LC-QQQ	C18 4.6 x 50 3.5um	C18 3.0 x 50 1.8um	2 X	Yes	No	
24	LC-MSMS or LC-QQQ	NA	Zorbax XDB-C18, 100 mm x 2.1 mm, 1.8µm	NA	Yes	No	No
25	LC-MSMS or LC-QQQ	Pre-column Filter 0.2µm	C18 50mm x 2.1mm x 1.8µm	10 for both samples S1 and S2.	Yes	No	No. In-house
26	LC-MSMS or LC-QQQ	nil	C18 1.6µm, 2.0mm x 50mm	No	Yes	No	QuEChERS
27	LC-MSMS or LC-QQQ	Pre-column Filter 0.2µm	C18 50mm x 2.1mm x 1.8µm	10 for both samples S1 and S2.	Yes	No	No. In-house
28	LC-MSMS or LC-QQQ		C18 1.6um, 2.1 x 50mm	x10 x100	Yes	No	N/A
29	LC-MSMS or LC-QQQ	ACQUITY UPLC BEH C18 2.1x5mm	ACQUITY UPLC BEH C18 2.1x100mm	100 x	No	No	
30	Orbitrap	C18	C18	DF20 & DF40	Yes	No	
31	LC-MSMS or LC-QQQ		2.1 X 50mm X 2.7um		Yes	No	
32	UHPLC	UltraShield UHPLC 0.2 µm Restek	Raptor C18 1.8 µm 50 x 2.1 mm Restek		yes	no	
33	LC-MSMS or LC-QQQ	C8, 2.1 x 12.5mm, 5 micron	C8, 3.0 x 100mm, 3.5 micron	No	No	No	NA

Table 100 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Labelled Standards Additional Information
2	Wellington	Yes	
3	Wellington	Yes	
4	Wellington Laboratories	Yes	
5	Wellington Labs	Yes	
6	Wellington	Yes	
7	Wellington	Yes	
8	Wellington	No	
9	Wellington Laboratories	Yes	
11	Wellington	Yes	
12	Wellington Laboratories	Yes	
13	Wellington	Yes	
14	Wellington Laboratories	Yes	
15	Wellington	Yes	
16	Wellington	Yes	
17	Wellington	Yes	
18	Wellington	Yes	
19	Wellington	Yes	Isotope dilution
20	Wellington	Yes	
21	Wellington Laboratories	Yes	
22	Wellington Labs	No	
24	Wellington Laboratory	Yes	NA
25	Wellington	Yes	
26	Wellington Laboratories	Yes	

Lab. Code	Labelled Standard Source	Recovery Correction?	Labelled Standards Additional Information
27	Wellington	Yes	
28	Wellington	Yes	
29	Wellington	Yes	
30	Wellington	Yes	Results corrected by ISTD added before instrumentation
31	Wellington Laboratories	No	
32		Yes	
33	Wellington	No	NA

Table 101 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C3-PFBS	
5	13C3 PFBS	--
6	13C-PFOS	
7	M3PFBS	
8	PFBS-13C3	
9	13C3-PFBS	
10	yes	
11	13C3-PFBS	13C8-PFOS
12	13C3-PFBS	
13	M3PFBS	MPFDA
14	13C3-PFBS	
15	Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS	
16	M3PFBS	
17	13C3-PFBS	13C3-PFHxS
18		18O2 PFHxS
19		
20	PFBS M3	
21	13C3 PFBS	13C2 PFOA
22	13C3-PFBS	
23	Not applicable	Not applicable
24	M3PFBS	NA
25	13C3-PFBS	N/A
26	13C3-PFBS	
27	13C3-PFBS	N/A
28	13C3-PFBS	
29	MPFBS	
30	PFOS-C8	PFBS-13C3
31	PFBS - 13C3	PFHxS-18O2
32	13C3-PFBS	13C4-PFOA
33		
34		

Table 102 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C3 PFBS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	16O2-PFHxS	
10		
11		
12		
13	M3PFBS	MPFDA
14	16O2-PFHxS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		
19		
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFBS	
23	Not applicable	Not applicable
24	M5PFHxA	NA
25	18O2-PFHxS	N/A
26	16O2-PFHxS	
27	18O2-PFHxS	N/A
28	16O2-PFHxS	
29		
30	PFOS-C8	PFOS-C4
31	PFHxS - 13C3	PFHxS-18O2
32	13C3-PFBS	13C4-PFOA
33		
34		

Table 103 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	N/A	N/A
4	18O2-PFHxS	
5	18O2 PFHxS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	16O2-PFHxS	
10		
11	18O2-PFHxS	13C8-PFOS
12	18O2-PFHxS	
13	M3PFHxS	MPFDA
14	16O2-PFHxS	
15	Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS	
16	M3PFHxS	MPFHxS
17	18O2-PFHxS	13C3-PFHxS
18		18O2 PFHxS
19	Yes	
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFHxS	
23	Not applicable	Not applicable
24	M3PFHxS	NA
25	18O2-PFHxS	N/A
26	16O2-PFHxS	
27	18O2-PFHxS	N/A
28	16O2-PFHxS	
29		
30	PFOS-C8	PFHxS-18O2
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 104 Labelled Standards for PFHxS
(linear)

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	18O2-PFHxS	
5	18O2 PFHxS	--
6	NT	
7	M3PFHxS	
8	PFHxS-18O2	
9	16O2-PFHxS	
10	yes	
11		
12	18O2-PFHxS	
13	M3PFHxS	MPFDA
14	16O2-PFHxS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		18O2 PFHxS
19		
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFHxS	
23	Not applicable	Not applicable
24	M3PFHxS	NA
25	18O2-PFHxS	N/A
26	NT	
27	18O2-PFHxS	N/A
28		
29	MPFHxS	
30	PFOS-C8	PFHxS-18O2
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 105 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	13C8-PFOS	
10		
11		
12		
13	M3PFHxS	MPFDA
14	13C8-PFOS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		13C4 PFOS
19		
20	PFHxS M3	
21	13C4 PFOS	13C2 PFOA
22	13C3-PHxS	
23	Not applicable	Not applicable
24	M3PFHxS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	16O2-PFHxS	
29		
30	PFOS-C8	PFOS-C4
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 106 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	N/A	N/A
4	13C8-PFOS	
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11	13C4-PFOS	13C8-PFOS
12	13C8-PFOS	
13	M8PFOS	MPFOS
14	13C8-PFOS	
15	Sodium perfluoro-1-[13C8] octanesulfonate M8PFOS	
16	MPFOS	M8PFOS
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19	Yes	
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	Not applicable	Not applicable
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFOS-C8	PFOS-C4
31	PFOS - 13C8	PFOS-13C4
32	13C4-PFOS	13C4-PFOA
33	[13C4]-PFOS	[13C4]-PFOS
34		

Table 107 Labelled Standards for PFOS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	YES
4	13C8-PFOS	
5	13C4 PFOS	--
6	NT	
7	M8PFOS	
8	PFOS-13O4	
9	13C8-PFOS	
10	yes	
11		
12	13C8-PFOS	
13	M8PFOS	MPFOS
14	13C8-PFOS	
15		
16		
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19		
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	Not applicable	Not applicable
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28		
29	MPFOS	
30	PFOS-C8	PFOS-C4
31	PFOS - 13C8	PFOS-13C4
32	13C4-PFOS	13C4-PFOA
33		
34		

Table 108 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11		
12		
13	M8PFOS	MPFOS
14		
15		
16		
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19		
20		
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	Not applicable	Not applicable
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFOS-C8	PFBS-13C3
31	PFOS - 13C8	PFOS-13C4
32		
33		
34		

Table 109 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11		
12		
13	M8PFOS	MPFOS
14	13C8-PFOS	
15		
16		
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19		
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	Not applicable	Not applicable
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFOS-C8	PFBA-13C4
31	PFOS - 13C8	PFOS-13C4
32	13C2-PFUnA	13C4-PFOA
33		
34		

Table 110 Labelled Standards for PFUDS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	--	--
6	13C-PFOSA	
7		
8	NT	
9	--	
10		
11		
12	13C4-PFBA	
13	NT	NT
14	--	
15		
16		
17		
18		
19		
20		
21	NT	
22	NA	
23	Not applicable	Not applicable
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30		
31		
32		
33		
34		

Table 111 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOSA	
7		
8	PFOS-13O4	
9	--	
10		
11		
12	13C5-PFPeA	
13	NT	NT
14	--	
15		
16		
17		
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23	Not applicable	Not applicable
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30	PFOS-C8	PFPeA-13C3
31		
32		
33		
34		

Table 112 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	--	--
6	13C-PFOSA	
7		
8	NT	
9	--	
10		
11		
12	13C2-PFHXA	
13	NT	NT
14	--	
15		
16		
17		
18		
19		
20		
21	NT	
22	NA	
23	Not applicable	Not applicable
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30		
31		
32		
33		
34		

Table 113 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C4-PFBA	
5	13C4 PFBA	--
6	13C-PFBA	
7	MPFBA	
8	PFBA-13C3	
9	13C4-PFBA	
10	yes	
11		
12	13C4-PFHpA	
13	MPFBA	M3PFBA
14	13C4-PFBA	
15	Perfluoro-n-[13C4]butanoic acid MPFBA	
16	MPFBA	
17	13C4-PFBA	13C3-PFBA
18		13C4 PFBA
19	Yes	
20	PFBA M4	
21	13C4 PFBA	13C2 PFOA
22	13C4-PFBA	
23	Not applicable	Not applicable
24	M4PFBA	NA
25	13C4-PFBA	N/A
26	13C4-PFBA	
27	13C4-PFBA	N/A
28	13C4-PFBA	
29	MPFBA	
30	PFOS-C8	PFBA-13C4
31	PFBA-13C4	PFBA-13C3
32	13C4-PFBA	13C4-PFOA
33		
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Table 114 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C5-PFPeA	
5	13C5 PFPeA	--
6	13C-PFHxA	
7	M5PFPeA	
8	PFPeA-13C3	
9	13C5-PFPeA	
10	yes	
11		
12	13C8-PFOA	
13	M5PFPeA	M3PFBA
14	13C5-PFPeA	
15	Perfluoro-n-[13C5]pentanoic acid M5PFPeA	
16	M5PFPeA	
17	13C4-PFPeA	13C5 -PFPeA
18		13C4 PFBA
19		
20	PFPeA M5	
21	13C5 PFPeA	13C2 PFOA
22	13C5-PFPeA	
23	Not applicable	Not applicable
24	M5PFPeA	NA
25	13C3-PFPeA	N/A
26	13C5-PFPeA	
27	13C3-PFPeA	N/A
28	13C5-PFPeA	
29		
30	PFOS-C8	PFPeA-13C3
31	PFPeA - 13C5	PFBA-13C3
32	13C5-PFPeA	13C4-PFOA
33		
34		

Table 115 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-PFHxA	
5	13C2 PFHxA	--
6	13C-PFHxA	
7	M5PFHxA	
8	PFHxA-13C2	
9	13C5-PFHxA	
10	yes	
11	13C2-PFHxA	13C8-PFOA
12	13C5-PFNA	
13	M5PFHxA	M3PFBA
14	13C5-PFHxA	
15	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA	
16	M5PFHxA	
17	13C2-PFHxA	13C8-PFOA
18		13C2 PFHxA
19	Yes	
20	PFHxA M6	
21	13C2 PFHxA	13C2 PFOA
22	13C5-PFHxA	
23	Not applicable	Not applicable
24	M5PFHxA	NA
25	13C2-PFHxA	N/A
26	13C5-PFHxA	
27	13C2-PFHxA	N/A
28	13C5-PFHxA	
29	MPFHxA	
30	PFOS-C8	PFHxA-13C2
31	PFHxA - 13C5	PFOA-13C2
32	13C2-PFHxA	13C4-PFOA
33		
34		

Table 116 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C4-PFHpA	
5	13C4 PFHpA	--
6	13C-PFOA	
7	M4PFHpA	
8	PFHpA-13C4	
9	13C4-PFHpA	
10	yes	
11	13C4-PFHpA	13C8-PFOA
12	13C6-PFDA	
13	M4PFHpA	M3PFBA
14	13C4-PFHpA	
15	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA	
16	M4PFHpA	
17	13C3-PFHpA	13C8-PFOA
18		13C2 PFHxA
19		
20	PFHpA M4	
21	13C4 PFHpA	13C2 PFOA
22	13C4-PFHpA	
23	Not applicable	Not applicable
24	MPFHpA	NA
25	13C4-PFHpA	N/A
26	13C4-PFHpA	
27	13C4-PFHpA	N/A
28	13C4-PFHpA	
29	MPFHpA	
30	PFOS-C8	PFHpA-13C4
31	PFHpA - 13C4	PFOA-13C2
32	13C4-PFHpA	13C4-PFOA
33		
34		

Table 117 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	YES
4	13C8-PFOA	
5	13C4 PFOA	--
6	13C-PFOA	
7	M8PFOA	
8	PFOA-13C4	
9	13C4-PFOA	
10	yes	
11	13C4-PFOA	13C8-PFOA
12	13C2-PFUnA	
13	M8PFOA	M2PFOA
14	13C4-PFOA	
15	Perfluoro-n-[13C8]octanoic acid M8PFOA	
16	M8PFOA	M2PFOA
17	13C4-PFOA	13C8-PFOA
18		13C4 PFOA
19	Yes	
20	PFOA M8	
21	13C4 PFOA	13C2 PFOA
22	13C8-PFOA	
23	Not applicable	Not applicable
24	M8PFOA	NA
25	13C4-PFOA	N/A
26	13C4-PFOA	
27	13C4-PFOA	N/A
28	13C4-PFOA	
29	MPFOA	
30	PFOS-C8	PFOA-13C4
31	PFOA - 13C4	PFOA-13C2
32	13C8-PFOA	13C4-PFOA
33	[13C4]-PFOA	[13C4]-PFOA
34		

Table 118 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C5-PFNA	
5	13C5 PFNA	--
6	13C-PFOA	
7	M9PFNA	
8	PFNA-13C5	
9	13C5-PFNA	
10	yes	
11	13C5-PFNA	13C8-PFOA
12	13C2-PFDoA	
13	M9PFNA	M2PFOA
14	13C5-PFNA	
15	Perfluoro-n-[13C9]nonanoic acid M9PFNA	
16	M9PFNA	
17	13C5-PFNA	13C8-PFOA
18		
19	Yes	
20	PFNA M9	
21	13C5 PFNA	13C2 PFOA
22	13C9-PFNA	
23	Not applicable	Not applicable
24	M9PFNA	NA
25	13C5-PFNA	N/A
26	13C5-PFNA	
27	13C5-PFNA	N/A
28	13C5-PFNA	
29	MPFNA	
30	PFOS-C8	PFNA-13C5
31	PFNA - 13C9	PFNA-13C5
32	13C5-PFNA	13C4-PFOA
33		
34		

Table 119 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C6-PFDA	
5	13C2 PFDA	--
6	13C-PFOA	
7		
8	PFDA-13C2	
9	13C6-PFDA	
10	yes	
11	13C2-PFDA	13C8-PFOA
12		
13	M6PFDA	MPFDA
14	13C6-PFDA	
15	Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA	
16	M6PFDA	MPFDA
17	13C2-PFDA	13C8-PFOA
18		13C2PFDA
19	Yes	
20	PFDA M6	
21	13C2 PFDA	13C2 PFOA
22	13C6-PFDA	
23	Not applicable	Not applicable
24	M6PFDA	NA
25	13C2-PFDA	N/A
26	13C6-PFDA	
27	13C2-PFDA	N/A
28	13C6-PFDA	
29	MPFDA	
30	PFOS-C8	PFDA-13C2
31	PFDA - 13C6	PFDA-13C2
32	13C2-PFDA	13C4-PFOA
33		
34		

Table 120 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-PFUnA	
5	13C2 PFUdA	--
6	13C-PFOA	
7	M7PFUdA	
8	PFUdA-13C2	
9	13C2-PFUnDA	
10	yes	
11		
12	13C2-PFTeDA	
13	M7PFUdA	MPFDA
14	13C2-PFUnDA	
15	Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA	
16	M7PFUda	
17	13C2-PFUdA	13C8-PFOA
18		13C2PFUnDA
19	Yes	
20	PFUnDA M7	
21	13C2 PFUdA	13C2 PFOA
22	13C9-PFUdA	
23	Not applicable	Not applicable
24	M7PFUnDA	NA
25	13C2-PFUdA	N/A
26	13C2-PFUnDA	
27	13C2-PFUdA	N/A
28	13C2-PFUnDA	
29	MPFUdA	
30	PFOS-C8	PFUNDA-13C2
31	PFUdA - 13C7	PFDA-13C2
32	13C2-PFUnA	13C4-PFOA
33		
34		

Table 121 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-PFDoA	
5	13C2 PFDoA	--
6	13C-PFDoA	
7	MPFDoA	
8	PFDoA-13C2	
9	13C2-PFDoDA	
10	yes	
11		
12	13C8-FOSA	
13	MPFDoA	MPFDA
14	13C2-PFDoDA	
15	Perfluoro-n-[1,2-13C2]dodecanoic acid MPFDoA	
16	MPFDoA	
17	13C2-PFDoA	13C8-PFOA
18		13C2PFDoDA
19	Yes	
20	PFDoDA M2	
21	13C2 PFDoA	13C2 PFOA
22	13C2-PFDoA	
23	Not applicable	Not applicable
24	MPFDoDA	NA
25	13C2-PFDoDA	N/A
26	13C2-PFDoDA	
27	13C2-PFDoDA	N/A
28	13C2-PFDoDA	
29	MPFDoA	
30	PFOS-C8	PFDoDA-13C2
31	PFDoA - 13C2	PFDA-13C2
32	13C2-PFDoA	13C4-PFOA
33		
34		

Table 122 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C2 PFD _o A	--
6	13C-PFD _o A	
7		
8	PFTeDA-13C2	
9	13C2-PFD _o DA	
10	yes	
11		
12	d3-MeFOSA	
13	MPFD _o A	MPFDA
14	13C2-PFD _o DA	
15		
16		
17	13C2-PFTeDA	13C8-PFOA
18		
19		
20	PFD _o DA M2	
21	13C2 PFD _o A	13C2 PFOA
22	13C2-PFTeDA	
23	Not applicable	Not applicable
24	MPFD _o DA	NA
25	13C2-PFTeDA	N/A
26	13C2-PFTeDA	
27	13C2-PFTeDA	N/A
28	13C2-PFD _o DA	
29		
30	PFOS-C8	PFTeDA-13C2
31	PFTeDA - 13C2	PFDA-13C2
32	13C2-PFTeDA	13C4-PFOA
33		
34		

Table 123 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-PFTeDA	
5	13C2 PFTeDA	--
6	13C-PFD _o A	
7	M2PFTeDA	
8	PFTeDA-13C2	
9	13C2-PFTeDA	
10	yes	
11		
12	d5-EtFOSA	
13	M2PFTeDA	MPFDA
14	13C2-PFTeDA	
15	Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA	
16		
17	13C2-PFTeDA	13C8-PFOA
18		
19		
20	PFTeDA M2	
21	13C2 PFTeDA	13C2 PFOA
22	13C2-PFTeDA	
23	Not applicable	Not applicable
24	MPFTeDA	NA
25	13C2-PFTeDA	N/A
26	13C2-PFTeDA	
27	13C2-PFTeDA	N/A
28	13C2-PFTeDA	
29	MPFTeDA	
30	PFOS-C8	PFTeDA-13C2
31	PFTeDA - 13C2	PFDA-13C2
32	13C2-PFTeDA	13C4-PFOA
33		
34		

Table 124 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C8-FOSA	
5	13C8 PFOSA	--
6	13C-PFOSA	
7	M8FOSA	
8	FOSA-13C8	
9	13C8-FOSA	
10	yes	
11		
12	d3-N-MeFOSAA	
13	M8FOSA-I	MPFOS
14	13C8-FOSA	
15	Perfluoro-1- [13C8]otanesulfonamide	
16	M8PFOSA-I	
17	13C8-FOSA	
18		
19		
20	M8FOSA	
21	13C8 FOSA	13C2 PFOA
22	D3-N-MeFOSA	
23	Not applicable	Not applicable
24	MPFOSA	NA
25	13C8-FOSA	N/A
26	13C8-FOSA	
27	13C8-FOSA	N/A
28	13C8-FOSA	
29		
30	PFOS-C8	FOSA-13C8
31	PFOSA - 13C8	PFOS-13C4
32	13C8-PFOSA	13C4-PFOA
33		
34		

Table 125 Labelled Standards for N-MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d3-MeFOSA	
5	d3 N-MeFOSA	--
6	NT	
7	d-N-MeFOSA-M	
8	MeFOSA-D3	
9	d3-MeFOSA	
10		
11		
12	d5-N-EtFOSAA	
13	d-N-MeFOSA-M	MPFOS
14	d3-MeFOSA	
15	N-methyl-d3-perfluoro-1-octanesulfonamide	
16	d-N-MeFOSA-M	
17	D3-N-Me FOSA	
18		
19	Yes	
20	d3-N-MeFOSAA	
21	NT	
22	D3-N-MeFOSA	
23	Not applicable	Not applicable
24	d-NMeFOSA-M	NA
25	D3-M PFOSA	N/A
26	d3-MeFOSA	
27	D3-M PFOSA	N/A
28	d3-MeFOSA	
29		
30	PFOS-C8	MeFOSA-D3
31	N-MeFOSA - 2H3	PFOS-13C4
32	d3-N-MeFOSA	13C4-PFOA
33		
34		

Table 126 Labelled Standards for N-EtFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d5-EtFOSA	
5	d5 N-EtFOSA	--
6	NT	
7	d-N-EtFOSA-M	
8	EtFOSA-D5	
9	d5-EtFOSA	
10		
11		
12	d7-MeFOSE	
13	d-N-EtFOSA-M	MPFOS
14	d5-EtFOSA	
15	N-ethyl-d5-perfluoro-1-octanesulfonamide	
16	d-N-Et-FOSA-M	
17	D5-N-Et FOSA	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D3-N-MeFOSA	
23	Not applicable	Not applicable
24	d-NEtFOSA-M	NA
25	D5-E PFOSA	N/A
26	d5-EtFOSA	
27	D5-E PFOSA	N/A
28	d5-EtFOSA	
29	MEtFOSA	
30	PFOS-C8	EtFOSA-D5
31	N-EtFOSA - D5	PFOS-13C4
32	d5-N-EtFOSA	13C4-PFOA
33		
34		

Table 127 Labelled Standards for N-MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d3-N-MeFOSAA	
5	d3 N-MeFOSAA	--
6	13C-PFOA	
7	d3-N-MeFOSAA	
8	MeFOSAA-D3	
9	d3-MeFOSAA	
10	yes	
11		
12	d9-EtFOSE	
13	d3-N-MeFOSAA	MPFOS
14	d3-MeFOSAA	
15		
16	d3-N-MeFOSAA	
17	D3-N-Me FOSAA	
18		
19		
20	d3-N-MeFOSAA	
21	d3-NMeFOSAA	13C2 PFOA
22	D3-N-MeFOSAA	
23	Not applicable	Not applicable
24	d3-NMeFOSAA	NA
25	D3-Me-FOSAA	N/A
26	d3-MeFOSAA	
27	D3-Me-FOSAA	N/A
28	d3-MeFOSAA	
29		
30	PFOS-C8	MeFOSAA-D3
31	N-MeFOSAA - 2H3	PFOS-13C4
32	d3-N-MeFOSAA	13C4-PFOA
33		
34		

Table 128 Labelled Standards for N-EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d5-N-EtFOSAA	
5	d5 N-EtFOSAA	--
6	13C-PFOA	
7	d5-N-EtFOSAA	
8	EtFOSAA-D5	
9	d5-EtFOSAA	
10	yes	
11		
12	13C2-42FTS	
13	d5-N-EtFOSAA	MPFOS
14	d5-EtFOSAA	
15	N-ethyl-d5-perfluoro-1-octanesulfonamide	
16	d5-N-EtFOSAA	
17	D5-N-Et FOSAA	
18		
19	Yes	
20	d5-N-EtFOSAA	
21	d5-NEtFOSAA	13C2 PFOA
22	D5-N-EtFOSAA	
23	Not applicable	Not applicable
24	d5-NEtFOSAA	NA
25	D5-Et-FOSAA	N/A
26	d5-EtFOSAA	
27	D5-Et-FOSAA	N/A
28	d5-EtFOSAA	
29		
30	PFOS-C8	EtFOSAA-D5
31	N-EtFOSA - 2H5	PFOS-13C4
32	d5-N-EtFOSAA	13C4-PFOA
33		
34		

Table 129 Labelled Standards for N-MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d7-MeFOSE	
5	d7 N-MeFOSE	--
6	NT	
7	d7-N-MeFOSE-M	
8	MeFOSE-D7	
9	d7-MeFOSE	
10	yes	
11		
12	13C2-62FTS	
13	d7-N-MeFOSE-M	MPFOS
14	d7-MeFOSE	
15	d7-N-MeFOSE-M 2-(N-methyl-d3-perfluoro-1-octanesulfonamido) ethand4-ol	
16	d7-N-MeFOSE-M	
17	D7-N-Me FOSE	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D9-N-EtFOSE	
23	Not applicable	Not applicable
24	d7-NMeFOSE-M	NA
25	D7-Me-FOSE	N/A
26	d7-MeFOSE	
27	D7-Me-FOSE	N/A
28	d7-MeFOSE	
29		
30	PFOS-C8	MeFOSE-D3
31	N-MeFOSE - D7	PFOS-13C4
32	d7-MeFOSE	13C4-PFOA
33		
34		

Table 130 Labelled Standards for N-EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	d9-EtFOSE	
5	d9 N-EtFOSE	--
6	NT	
7	d9-N-EtFOSE-M	
8	EtFOSE-D9	
9	d3EtFOSE	
10	yes	
11		
12	13C2-82FTS	
13	d9-N-EtFOSE-M	MPFOS
14	d3EtFOSE	
15	d9-N-EtFOSE-M 2-(N-ethyl-d5-perfluoro-1-octanesulfonamido) ethan-d4-ol	
16	d9-N-EtFOSE-M	
17	D9-N-Et FOSE	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D9-N-EtFOSE	
23	Not applicable	Not applicable
24	d9-NEtFOSE-M	NA
25	D9-Et-FOSE	N/A
26	d3-EtFOSE	
27	D9-Et-FOSE	N/A
28	d3-EtFOSE	
29		
30	PFOS-C8	EtFOSE-D9
31	N-EtFOSE - 2H9	PFOS-13C4
32	d9-N-EtFOSE	13C4-PFOA
33		
34		

Table 131 Labelled Standards for 4:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-42FTS	
5	13C2 4:2 FTS	--
6	13C-6:2 FTS	
7	M2-4:2FTS	
8	4:2 FTS-13C2	
9	13C2-4:2 FTS	
10	yes	
11		
12	13C2d4 10:2 FTS	
13	M2-4:2 FTS	MPFOS
14	13C2-4:2 FTS	
15	M2-4:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-hexane sulfonate (4:2)	
16		M2-4,2FTS_S
17	13C2-4:2 FTS	
18		
19		
20	M2-4:2FTS	
21	M2-4:2 FTS	13C2 PFOA
22	13C2-6:2 FTS	
23	Not applicable	Not applicable
24	M4:2 FTS	NA
25	13C2 4:2-FTS	N/A
26	13C2-4:2 FTS	
27	13C2 4:2-FTS	N/A
28	13C2-4:2 FTS	
29	M4:2FTS	
30	PFOS-C8	4:2 FTS-13C2
31		
32	13C2-4:2 FTS	13C4-PFOA
33		
34		

Table 132 Labelled Standards for 6:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-62FTS	
5	13C2 6:2 FTS	--
6	13C-6:2 FTS	
7	M2-6:2FTS	
8	6:2 FTS-13C2	
9	13C2-6:2 FTS	
10	yes	
11	13C2-6:2 FTS	13C8-PFOS
12	13C3-GenX (MHFPA)	
13	M2-6:2 FTS	MPFOS
14	13C2-6:2 FTS	
15	M2-6:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-octane sulfonate (6:2)	
16	M2-6,2FTS	
17	13C2-6:2 FTS	
18		13C2 6:2 FTS
19		
20	M2-6:2FTS	
21	M2-6:2 FTS	13C2 PFOA
22	13C2-6:2 FTS	
23	Not applicable	Not applicable
24	M6:2 FTS	NA
25	13C2,12C6 6:2-FTS	N/A
26	13C2-6:2 FTS	
27	13C2,12C6 6:2-FTS	N/A
28	13C2-6:2 FTS	
29	M6:2FTS	
30	PFOS-C8	6:2 FTS-13C2
31	6:2 FTS - 13C2	PFHxS-18O2
32	13C2-6:2FTS	13C4-PFOA
33		
34		

Table 133 Labelled Standards for 8:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NO	YES
4	13C2-82FTS	
5	13C2 8:2 FTS	--
6	13C-6:2 FTS	
7	M2-8:2FTS	
8	8:2 FTS-13C2	
9	13C2-8:2 FTS	
10	yes	
11	13C2-8:2 FTS	13C8-PFOS
12		
13	M2-8:2 FTS	MPFOS
14	13C2-8:2 FTS	
15	M2-8:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-decane sulfonate (8:2)	
16		
17	13C2-8:2 FTS	
18		13C2 6:2 FTS
19		
20	M2-8:2FTS	
21	M2-8:2 FTS	13C2 PFOA
22	13C2-8:2FTS	
23	Not applicable	Not applicable
24	M8:2 FTS	NA
25	13C2 8:2-FTS	N/A
26	13C2-8:2 FTS	
27	13C2 8:2-FTS	N/A
28	13C2-8:2 FTS	
29	M8:2FTS	
30	PFOS-C8	8:2 FTS-13C2
31	8:2 FTS - 13C2	PFHxS-18O3
32	13C2-8:2 FTS	13C4-PFOA
33		
34		

Table 134 Labelled Standards for 10:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NT	NT
4	13C2d4 10:2 FTS	
5	13C2 10:2 FTS	--
6	NT	
7		
8	10:2 FTS-13C2-D4	
9	13C2-8:2 FTS	
10		
11		
12		
13	M2-8:2 FTS	MPFOS
14	13C2-8:2 FTS	
15		
16		
17	13C2-8:2 FTS	
18		
19		
20	M2-8:2FTS	
21	M2-8:2 FTS	13C2 PFOA
22	13C2-8:2FTS	
23	Not applicable	Not applicable
24	MPFDoDA	NA
25	13C2 8:2-FTS	N/A
26	13C2-8:2 FTS	
27	13C2 8:2-FTS	N/A
28	13C2-8:2 FTS	
29		
30	PFOS-C8	10:2 FTS-13C2
31		
32	13C2-8:2 FTS	13C4-PFOA
33		
34		

Table 135 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NO	YES
4		
5	13C3 GenX	--
6	13C-PFHxA	
7		
8	HFPO-DA-13C3	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16	M3HFPO-DA	
17	13C4-PFOA	
18		
19		
20		
21	13C3 HFPO-DA	13C2 PFOA
22	13C3-GenX	
23	Not applicable	Not applicable
24	M3HFPO-DA	NA
25	13C312C3HF11O3	N/A
26	NT	
27	13C312C3HF11O3	N/A
28		
29		
30	PFOS-C8	PFPeA-13C3
31		
32		
33		
34		

Table 136 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFHxA	
7		
8	PFHxS-18O2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOA	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	13C4-PFHpA	
23	Not applicable	Not applicable
24	MPFHpA	NA
25	13C4-PFHpA	N/A
26	NT	
27	13C4-PFHpA	N/A
28		
29		
30	PFOS-C8	FOSA-13C8
31		
32		
33		
34		

Table 137 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFDA-13C2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOS	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23	Not applicable	Not applicable
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	NT	
27	13C4-PFOS	N/A
28		
29		
30	PFOS-C8	
31		
32		
33		
34		

Table 138 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFHxDA-13C2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOS	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23	Not applicable	Not applicable
24	MPFDoDA	NA
25	13C4-PFOS	N/A
26	NT	
27	13C4-PFOS	N/A
28		
29		
30	PFOS-C8	
31		
32		
33		
34		

Table 139 Participant Methodology for Soil Samples– Additional Information

Lab. Code	Sample	Additional Information
6	S1 and S2	ALL submitted data are based on the anion-basis
7	S1 and S2	A note on these results: Instrument failure resulted in the extraction of these samples being halted midway (sample loaded onto SPE) they were held there for two weeks.
15	S1	Extra compounds detected < LOR ; PFOSA 2.2 ug/kg
	S2	Extra compounds < LOR; PFOSA 4.7 ug/kg
17	S1	PFOS concentrations based on 10x dilution of extract. PFOS recovery is based on the undiluted extract.
24	S1	PFTeDA and 8:2 FTS are not reported (NR) because of a high internal standard recovery. ADONA is not reported (NR) because of a poor recovery of our QC sample.
	S2	PFTeDA is not reported (NR) because of a high internal standard recovery. ADONA is not reported (NR) because of a poor recovery of our QC sample.
25	S1	All linear and branched have been reported although some branched peaks are not confirmed by traceable standards.
27	S1	All linear and branched have been reported although some branched peaks are not confirmed by traceable standards
30	S1	PFNS, PFDS, PFDoS, FOSA, Branched Isomers detected, reported total. Isomers confirmed by Obirt-Trap DDMS.

APPENDIX 6 – PARTICIPANTS’ TEST METHODS FOR WATER SAMPLES

Participants’ methods for water samples are presented in Tables 140 to 182.

Table 140 Participant Methodology for Water Samples – Extraction

Lab. Code	S3 Entire Container/ Volume (mL)	S4 Entire Container/ Volume (mL)	Bottle Rinsed	Rinsing Solvent (if applicable)	Sample Pretreatment	Extraction Technique (Clean-Up)	Extraction Solvent	Elution Solvent (if applicable)	Extraction Temperature	Extraction Time
2	Entire container & 10mL	Entire container & 10mL	Yes	1:1 MeOH/DIW with 1% formic acid		Solid-Phase Extraction: Strata -X-AW		ACN 3% v/v amm hydrox; acetone	ambient	
3	Yes	Yes	Yes	0.3% Ammonia in methanol	None	Solid-Phase Extraction: Strata -PFAS	0.3% Ammonia in methanol	0.3% Ammonia in methanol	Ambient	N/A
4	50mL & 10mL	50mL & 10mL	Yes	Methanol	Homogenisation	Solid-Phase Extraction: C18	3mL Basic ACN followed by 2mL Acetone	3mL Basic ACN followed by 2mL Acetone	Ambient	N/A
5	Y (54.2)	Y (54.6)	Yes	Reagent water, followed with elution solvent.	None	Solid-Phase Extraction: Oasis WAX	NA	0.3% NH ₄ OH: Methanol	Room	NA
6	25ml	25ml			pH Adjustment	Solid-Phase Extraction: Strata -X-AW		Methanol/ NH ₃	room temperature	15min
7	Entire	Entire	Yes	Methanol		Telos WAX SPE		Methanol		
8	10	10	No		pH Adjustment	Solid-Phase Extraction: Oasis HLB	No	Methanol plus acetonitrile	Room temperature	
9	Entire container (~60mL)	Entire container (~60mL)	Yes	Acetonitrile / Methanol	pH Adjustment	Solid Phase Extraction (SPE)	Acetonitrile / Methanol	Acetonitrile / Methanol	Ambient	Approximately 1 hour

Lab. Code	S3 Entire Container/ Volume (mL)	S4 Entire Container/ Volume (mL)	Bottle Rinsed	Rinsing Solvent (if applicable)	Sample Pretreatment	Extraction Technique (Clean-Up)	Extraction Solvent	Elution Solvent (if applicable)	Extraction Temperature	Extraction Time
10	10ml	10ml				Solid-Phase Extraction: Strata -X-AW				
11	50	50	No	Nil	Nil	Solid Phase Extraction (SPE)	Ammonium hydroxide in methanol		Room temperature	n/a
12	53.66	55.24	Yes	MeOH	Homogenisation	Solid-Phase Extraction: Strata -X-AW	3mL Basic ACN followed by 2mL Acetone		Ambient	N/A
13	53.4	54.63	Yes	MeOH/H2O	pH Adjustment	Solid-Phase Extraction: Strata -X-AW	Ammonia in methanol solution	Ammonia in methanol solution	Ambient	
14	Entire container (~60mL)	Entire container (~60mL)	Yes	Acetonitrile/ Methanol	pH Adjustment	Solid-Phase Extraction	Acetonitrile/ Methanol	Acetonitrile/ Methanol	Ambient	Approximately 1 hour
15			Yes	Eluting solvent	pH Adjustment	Solid-Phase Extraction: Strata -X-AW		Eluting solvent 10:89:1 IPA/ACN/ Ammonium hydroxide	Room	
16	Yes	Yes	Yes	Methanol	Acetic acid	Water	Ammonia-Methanol			
17	49.4 mL extracted , 0.6mL direct injection	49.4 mL extracted , 0.6mL direct injection	Yes	ultra pure water	Homogenisation	Solid-Phase Extraction: Strata -X-AW	Ammonium hydroxide in methanol	Ammonium hydroxide in methanol	Room temperature	1 day

Lab. Code	S3 Entire Container/ Volume (mL)	S4 Entire Container/ Volume (mL)	Bottle Rinsed	Rinsing Solvent (if applicable)	Sample Pretreatment	Extraction Technique (Clean-Up)	Extraction Solvent	Elution Solvent (if applicable)	Extraction Temperature	Extraction Time
18*	0.5 mL	0.5 mL			None	none	None	None	ambient	none
19	Yes	Yes	Yes	MeOH with 0.1% ammonia		Solid-Phase Extraction: Oasis WAX	none	MeOH followed by MeOH with 0.1% ammonia	Room temp	N/A
20	Entire Container	Entire Container	Yes	Methanol	Homogenisation	Liquid-Liquid Extraction		Methanol with 0.3% ammonia	ambient	NA
21	53.7	54.1	Yes	Basic Methanol	Homogenisation	Solid-Phase Extraction: Oasis WAX	Basic Methanol	Basic Methanol	Ambient	20-30 minute load time
22*	Yes	Yes	Yes	methanol	pH Adjustment	Direct Injection				
23	5mL	5mL	No		pH Adjustment	Solid-Phase Extraction: Oasis WAX			RT	
24*	1	100	No	NA	NA	Solid-Phase Extraction: Oasis WAX	No	25 mM sodium acetate solution (pH4)	NA	NA
25	Yes	Yes	Yes	Methanol	pH Adjustment	SPE and Direct Injection	MeOH	Basified MeOH and MeOH	Room	60 mins
26	54	55	Yes	Methanol & Acetonitrile	pH Adjustment	Solid Phase Extraction	Methanol & Acetonitrile	Methanol & Acetonitrile	Room	N/A
27	Yes	Yes	Yes	Methanol	pH Adjustment	SPE and Direct Injection	MeOH	Basified MeOH and MeOH	Room	60 mins

Lab. Code	S3 Entire Container/ Volume (mL)	S4 Entire Container/ Volume (mL)	Bottle Rinsed	Rinsing Solvent (if applicable)	Sample Pretreatment	Extraction Technique (Clean-Up)	Extraction Solvent	Elution Solvent (if applicable)	Extraction Temperature	Extraction Time
28	entire container, 54.04	entire container, 54.68	Yes	60:40 ACN:MeOH	pH Adjustment	Solid-Phase Extraction: Strata -X-AW	60:40 ACN:MeOH	60:40 ACN:MeOH	Ambient	30 mins
29	9 ml	9 ml			Homogenisation	Direct Injection			laboratory temperature	
30	10	10	Yes	MEOH	Homogenisation	Solid-Phase Extraction: Oasis HLB		MEOH		
31*	10	10			pH Adjustment	Direct Injection	Methanol		Ambient	0
32	5 ml + 1 ml	12,5 ml			pH Adjustment	Solid-Phase Extraction: HR-XAW	Water	Methanol-Ammoniak	room temperature	-
33	NA	25 mL, 50 mL	Yes	Water	Homogenisation	Solid-Phase Extraction: Oasis WAX	Methanol	NA	Room temperature	NA

*Additional Information in Table 151.

Table 141 Participant Methodology for Water Samples – Extraction Additional Information

Lab. Code	Extraction Additional Information
18	Direct injection of sample into LC-QQQ
22	Large volume injection
24	Only sample S4 extracted by SPE
31	Clean up On-Line SPE method

Table 142 Participant Methodology for Water Samples – Instrumental Technique and Analysis

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
2	LC-MSMS or LC-QQQ		C18 1.9uM porous, 50 x 2.1mm	0.005; 0.0125	Yes	No	In house
3	LC-MSMS or LC-QQQ	None	reverse phase, 100mm x 2.1mm	Yes, D20 for S3	Yes	No	No
4	LC-MSMS or LC-QQQ	UHPLC guard column; AU; InfinityLabPoroshell 120; EC-C18; 4.6 mm; 4 um	LC column; AU; Poroshell 120 HPH C18; 2.1x50 mm; 2.7 um; narrow bore	No	Yes	No	Isotope dilutions
5	LC-MSMS or LC-QQQ	None	C18 10cm x 3.0 mm x 3 um	None	Yes	No	No
6	LC-MSMS or LC-QQQ	C18 5 x 2.1 mm	C18 100 x 2.1 mm	no	Yes	No	DIN 38407-42 (F 42) (2011-03)
7	LC-MSMS or LC-QQQ	NA	C18 1.8um 2.1x100mm	6.25	Yes	No	
8	LC-MSMS or LC-QQQ	C18 2.1mm	C18 3mm	10	Yes	No	
9	LC-MSMS or LC-QQQ	C18 2.2um, 3 x 30mm	C18 1.6um, 2 x 50mm	Yes S3 was diluted x 5 for PFOS and PFHxS	Yes	No	In house
10	LC-MSMS or LC-QQQ		C18 100*2.1		Yes	No	
11	LC-MSMS or LC-QQQ	Nil	Shimadzu Shim-pack XR-ODS III (1.6 µm , 50 mm x 2.0 mm)	No	Yes	No	No
12	LC-MSMS or LC-QQQ	UHPLC guard column; AU; InfinityLabPoroshell 120; EC-C18; 4.6 mm; 4 um	LC column; AU; Poroshell 120 HPH C18; 2.1x50 mm; 2.7 um; narrow bore	NO	Yes	No	Isotope Dilution
13	LC-MSMS or LC-QQQ	NA	C18 1.7 um, 2.1 x 50mm	No	No	No	USEPA 537
14	LC-MSMS or LC-QQQ	C18 2.2um, 3 x 30mm	C18 1.6um, 2 x 50mm	No	Yes	No	In House

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
15	Orbitrap	C18 3mm	Kinetex C18 100x3mm 2.6 um	x10	Yes	Yes	Method 537 modified
16	LC-MS		Shim-pack XR-ODSIII 2x50 (1.6um)		Yes	No	
17	LC-MSMS or LC-QQQ	Evo C18 2 x 2.1mm	Evo C18 2.6 u 100x2.1 mm	No	Yes	No	Isotopic Dilution
18	LC-MSMS or LC-QQQ		C18 1.6 x 50	yes (1:10)	Yes	No	
19	LC-MSMS or LC-QQQ	C18, 5mm x 2.1mm, 2.7um	C18, 100mm x 2.1mm, 2.7um	No	Yes	No	US EPA 533
20	LC-MSMS or LC-QQQ	0.2µm Filter	C18 1.6µm 50mm x 2mm	NA	Yes	No	USEPA533
21	LC-MSMS or LC-QQQ	C18 5u, 4x10mm	Gemini C18 3u, 3x10mm	No	Yes	No	Modified EPA Method 537
22	LC-MSMS or LC-QQQ	C18 4.6 x 50 3.5um	C18 3.0 x 50 1.8um	2 X	Yes	No	
23	LC-MSMS or LC-QQQ	PFP 5mm×2.1mm×1.8µm	PFP 150mm×2.1mm×1.8µm	No	Yes	Yes	
24	LC-MSMS or LC-QQQ	NA	Zorbax XDB-C18, 100 mm x 2.1 mm, 1.8µm	NA	Yes	No	No
25	LC-MSMS or LC-QQQ	Pre-column Filter 0.2µm	C18 50mm x 2.1mm x 1.8µm	No	Yes	No	No. In-house
26	LC-MSMS or LC-QQQ	nil	C18 1.6µm, 2.0mm x 50mm	No	Yes	No	No
27	LC-MSMS or LC-QQQ	Pre-column Filter 0.2µm	C18 50mm x 2.1mm x 1.8µm	No	Yes	No	No. In-house
28	LC-MSMS or LC-QQQ		C18 1.6um, 2.1 x 50mm	x10 x100	Yes	No	N/A
29	LC-MSMS or LC-QQQ	ACQUITY UPLC BEH C18 2.1x5mm	ACQUITY UPLC BEH C18 2.1x100mm	10x	No	No	
30	Orbitrap	C18	C18		Yes		
31	LC-MSMS or LC-QQQ		2.1 X 50mm X 2.7um		Yes	No	

Lab. Code	Instrument	Guard Column	Instrument Column	Dilution Factor	Delay Column?	Blank Correction?	Standard Method?
32	UHPLC	UltraShield UHPLC 0.2 µm Restek	Raptor C18 1.8 µm 50 x 2.1 mm Restek		yes	no	
33	LC-MSMS or LC-QQQ	C8, 2.1 x 12.5mm, 5 micron	C8, 3.0 x 100mm, 3.5 micron	No	No	No	NA

Table 143 Participant Methodology for Water Samples – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Labelled Standards Additional Information
2	Wellington	Yes	
3	Wellington	Yes	
4	Wellington Laboratories	Yes	
5	Wellington Labs	Yes	
6	Wellington	Yes	
7	Wellington	Yes	
8	Wellington	No	
9	Wellington Laboratories	Yes	
10	Wellington	No	
11	Wellington	Yes	
12	Wellington Laboratories	Yes	
13	Wellington	Yes	
14	Wellington Laboratories	Yes	
15	Wellington	Yes	
16	Wellington	Yes	
17	Wellington	Yes	
18	Wellington	Yes	

Lab. Code	Labelled Standard Source	Recovery Correction?	Labelled Standards Additional Information
19	Wellington	Yes	Isotope dilution
20	Wellington	Yes	
21	Wellington Laboratories	Yes	
22	Wellington Labs	No	
23	Wellington	No	
24	Wellington Laboratory	Yes	NA
25	Wellington	Yes	
26	Wellington Laboratories	Yes	
27	Wellington	Yes	
28	Wellington	Yes	
29	Wellington	Yes	
30	Wellington	Yes	Results corrected by ISTD added before extraction
31	Wellington Laboratories	No	
32		Yes	
33	Wellington	No	NA

Table 144 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C3-PFBS	
5	13C3 PFBS	--
6	13C-PFOS	
7	M3PFBS	
8	PFBS-13C3	
9	13C3-PFBS	
10	yes	
11	13C3-PFBS	13C8-PFOS
12	13C3-PFBS	
13	M3PFBS	MPFDA
14	13C3-PFBS	
15	Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS	
16	M3PFBS	
17	13C3-PFBS	13C3-PFHxS
18		18O2 PFHxS
19		
20	PFBS M3	
21	13C3 PFBS	13C2 PFOA
22	13C3-PFBS	
23	13C3-PFBS	
24	M3PFBS	NA
25	13C3-PFBS	N/A
26	13C3-PFBS	
27	13C3-PFBS	N/A
28	13C3-PFBS	
29	MPFBS	
30	PFBS-13C3	PFOS-13C8
31	PFBS - 13C3	PFHxS-18O2
32	13C3-PFBS	13C4-PFOA
33		
34		

Table 145 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C3 PFBS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	16O2-PFHxS	
10		
11		
12		
13	M3PFBS	MPFDA
14	16O2-PFHxS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		18O2 PFHxS
19		
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFBS	
23	13C3-PFBS	
24	M5PFHxA	NA
25	18O2-PFHxS	N/A
26	16O2-PFHxS	
27	18O2-PFHxS	N/A
28	16O2-PFHxS	
29		
30	PFOS-C4	PFOS-13C8
31	PFHxS - 13C3	PFHxS-18O2
32	13C3-PFBS	13C4-PFOA
33		
34		

Table 146 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	N/A	N/A
4	18O2-PFHxS	
5	18O2 PFHxS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	16O2-PFHxS	
10		
11	18O2-PFHxS	13C8-PFOS
12	18O2-PFHxS	
13	M3PFHxS	MPFDA
14	16O2-PFHxS	
15	Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS	
16	M3PFHxS	MPFHxS
17	18O2-PFHxS	13C3-PFHxS
18		18O2 PFHxS
19	Yes	
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFHxS	
23	13C3-PFHxS	
24	M3PFHxS	NA
25	18O2-PFHxS	N/A
26	16O2-PFHxS	
27	18O2-PFHxS	N/A
28	16O2-PFHxS	
29		
30	PFHxS-18O2	PFOS-13C8
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 147 Labelled Standards for PFHxS
(linear)

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	18O2-PFHxS	
5	18O2 PFHxS	--
6	NT	
7	M3PFHxS	
8	PFHxS-18O2	
9	16O2-PFHxS	
10	yes	
11		
12	18O2-PFHxS	
13	M3PFHxS	MPFDA
14	16O2-PFHxS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		18O2 PFHxS
19		
20	PFHxS M3	
21	18O2 PFHxS	13C2 PFOA
22	13C3-PFHxS	
23	13C3-PFHxS	
24	M3PFHxS	NA
25	18O2-PFHxS	N/A
26	NT	
27	18O2-PFHxS	N/A
28		
29	MPFHxS	
30	PFHxS-18O2	PFOS-13C8
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 148 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFHxS-18O2	
9	13C8-PFOS	
10		
11		
12		
13	M3PFHxS	MPFDA
14	13C8-PFOS	
15		
16		
17	18O2-PFHxS	13C3-PFHxS
18		13C4 PFOS
19		
20	PFHxS M3	
21	13C4 PFOS	13C2 PFOA
22	13C3-PHxS	
23	13C3-PFHxS	
24	M3PFHxS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	16O2-PFHxS	
29		
30	PFOS-C4	PFOS-13C8
31	PFHxS - 13C3	PFHxS-18O2
32	18O2-PFHxS	13C4-PFOA
33		
34		

Table 149 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	N/A	N/A
4	13C8-PFOS	
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11	13C4-PFOS	13C8-PFOS
12	13C8-PFOS	
13	M8PFOS	MPFOS
14	13C8-PFOS	
15	Sodium perfluoro-1-[13C8] octanesulfonate M8PFOS	
16	MPFOS	M8PFOS
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19	Yes	
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	13C8-PFOS	
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFOS-C4	PFOS-13C8
31	PFOS - 13C8	PFOS-13C4
32	13C4-PFOS	13C4-PFOA
33	[13C4]-PFOS	[13C4]-PFOS
34		

Table 150 Labelled Standards for PFOS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C8-PFOS	
5	13C4 PFOS	--
6	NT	
7	M8PFOS	
8	PFOS-13O4	
9	13C8-PFOS	
10	yes	
11		
12	13C8-PFOS	
13	M8PFOS	MPFOS
14	13C8-PFOS	
15		
16		
17	13C4-PFOS	13C8-PFOS
18		13C4 PFOS
19		
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	13C8-PFOS	
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28		
29	MPFOS	
30	PFOS-C4	PFOS-13C8
31	PFOS - 13C8	PFOS-13C4
32	13C4-PFOS	13C4-PFOA
33		
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Table 151 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11		
12		
13	M8PFOS	MPFOS
14		
15		
16		
17	13C4-PFOS	13C8-PFOS
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	13C8-PFOS	
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFBS-13C3	PFOS-13C8
31	PFOS - 13C8	PFOS-13C4
32		
33		
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Table 152 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFOS-13O4	
9	13C8-PFOS	
10		
11		
12		
13	M8PFOS	MPFOS
14	13C8-PFOS	
15		
16		
17	13C4-PFOS	13C8-PFOS
18		
19		
20	PFOS M8	
21	13C4 PFOS	13C2 PFOA
22	13C8-PFOS	
23	13C8-PFOS	
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	13C8-PFOS	
27	13C4-PFOS	N/A
28	13C8-PFOS	
29		
30	PFBA-13C4	PFOS-13C8
31	PFOS - 13C8	PFOS-13C4
32	13C2-PFUnA	13C4-PFOA
33		
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Table 153 Labelled Standards for PFUDs

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	--	--
6	13C-PFOSA	
7		
8	NT	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17		
18		
19		
20		
21	NT	
22	NA	
23		
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30		
31		
32		
33		
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Table 154 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOSA	
7		
8	PFOS-13O4	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOS	13C8-PFOS
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23		
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30	PFPeA-13C3	PFOS-13C8
31		
32		
33		
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Table 155 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	--	--
6	13C-PFOSA	
7		
8	NT	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17		
18		
19		
20		
21	NT	
22	NA	
23		
24	NT	NA
25	NT	N/A
26	NT	
27	NT	N/A
28		
29		
30		
31		
32		
33		
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Table 156 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C4-PFBA	
5	13C4 PFBA	--
6	13C-PFBA	
7	MPFBA	
8	PFBA-13C3	
9	13C4-PFBA	
10	yes	
11		
12	13C4-PFBA	
13	MPFBA	M3PFBA
14	13C4-PFBA	
15	Perfluoro-n-[13C4]butanoic acid MPFBA	
16	MPFBA	
17	13C4-PFBA	13C3-PFBA
18		13C4 PFBA
19	Yes	
20	PFBA M4	
21	13C4 PFBA	13C2 PFOA
22	13C4-PFBA	
23	13C4-PFBA	
24	M4PFBA	NA
25	13C4-PFBA	N/A
26	13C4-PFBA	
27	13C4-PFBA	N/A
28	13C4-PFBA	
29	MPFBA	
30	PFBA-13C4	PFOS-13C8
31	PFBA-13C4	PFBA-13C3
32	13C4-PFBA	13C4-PFOA
33		
34		

Table 157 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C5-PFPeA	
5	13C5 PFPeA	--
6	13C-PFHxA	
7	M5PFPeA	
8	PFPeA-13C3	
9	13C5-PFPeA	
10	yes	
11		
12	13C5-PFPeA	
13	M5PFPeA	M3PFBA
14	13C5-PFPeA	
15	Perfluoro-n-[13C5]pentanoic acid M5PFPeA	
16	M5PFPeA	
17	13C4-PFPeA	13C5 -PFPeA
18		13C4 PFBA
19		
20	PFPeA M5	
21	13C5 PFPeA	13C2 PFOA
22	13C5-PFPeA	
23	13C5-PFPeA	
24	M5PFPeA	NA
25	13C3-PFPeA	N/A
26	13C5-PFPeA	
27	13C3-PFPeA	N/A
28	13C5-PFPeA	
29		
30	PFPeA-13C3	PFOS-13C8
31	PFPeA - 13C5	PFBA-13C3
32	13C5-PFPeA	13C4-PFOA
33		
34		

Table 158 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-PFHxA	
5	13C2 PFHxA	--
6	13C-PFHxA	
7	M5PFHxA	
8	PFHxA-13C2	
9	13C5-PFHxA	
10	yes	
11	13C2-PFHxA	13C8-PFOA
12	13C2-PFHxA	
13	M5PFHxA	M3PFBA
14	13C5-PFHxA	
15	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA	
16	M5PFHxA	
17	13C2-PFHxA	13C8-PFOA
18		13C2 PFHxA
19	Yes	
20	PFHxA M6	
21	13C2 PFHxA	13C2 PFOA
22	13C5-PFHxA	
23	13C5-PFHxA	
24	M5PFHxA	NA
25	13C2-PFHxA	N/A
26	13C5-PFHxA	
27	13C2-PFHxA	N/A
28	13C5-PFHxA	
29	MPFHxA	
30	PFHxA-13C2	PFOS-13C8
31	PFHxA - 13C5	PFOA-13C2
32	13C2-PFHxA	13C4-PFOA
33		
34		

Table 159 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C4-PFHpA	
5	13C4 PFHpA	--
6	13C-PFOA	
7	M4PFHpA	
8	PFHpA-13C4	
9	13C4-PFHpA	
10	yes	
11	13C4-PFHpA	13C8-PFOA
12	13C4-PFHpA	
13	M4PFHpA	M3PFBA
14	13C4-PFHpA	
15	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA	
16	M4PFHpA	
17	13C3-PFHpA	13C8-PFOA
18		13C2 PFHxA
19		
20	PFHpA M4	
21	13C4 PFHpA	13C2 PFOA
22	13C4-PFHpA	
23	13C4-PFHpA	
24	MPFHpA	NA
25	13C4-PFHpA	N/A
26	13C4-PFHpA	
27	13C4-PFHpA	N/A
28	13C4-PFHpA	
29	MPFHpA	
30	PFHpA-13C4	PFOS-13C8
31	PFHpA - 13C4	PFOA-13C2
32	13C4-PFHpA	13C4-PFOA
33		
34		

Table 160 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C8-PFOA	
5	13C4 PFOA	--
6	13C-PFOA	
7	M8PFOA	
8	PFOA-13C4	
9	13C4-PFOA	
10	yes	
11	13C4-PFOA	13C8-PFOA
12	13C8-PFOA	
13	M8PFOA	M2PFOA
14	13C4-PFOA	
15	Perfluoro-n-[13C8]octanoic acid M8PFOA	
16	M8PFOA	M2PFOA
17	13C4-PFOA	13C8-PFOA
18		13C4 PFOA
19	Yes	
20	PFOA M8	
21	13C4 PFOA	13C2 PFOA
22	13C8-PFOA	
23	13C8-PFOA	
24	M8PFOA	NA
25	13C4-PFOA	N/A
26	13C4-PFOA	
27	13C4-PFOA	N/A
28	13C4-PFOA	
29	MPFOA	
30	PFOA-13C4	PFOS-13C8
31	PFOA - 13C4	PFOA-13C2
32	13C8-PFOA	13C4-PFOA
33	[13C4]-PFOA	[13C4]-PFOA
34		

Table 161 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C5-PFNA	
5	13C5 PFNA	--
6	13C-PFOA	
7	M9PFNA	
8	PFNA-13C5	
9	13C5-PFNA	
10	yes	
11	13C5-PFNA	13C8-PFOA
12	13C5-PFNA	
13	M9PFNA	M2PFOA
14	13C5-PFNA	
15	Perfluoro-n-[13C9]nonanoic acid M9PFNA	
16	M9PFNA	
17	13C5-PFNA	13C8-PFOA
18		
19	Yes	
20	PFNA M9	
21	13C5 PFNA	13C2 PFOA
22	13C9-PFNA	
23	13C9-PFNA	
24	M9PFNA	NA
25	13C5-PFNA	N/A
26	13C5-PFNA	
27	13C5-PFNA	N/A
28	13C5-PFNA	
29	MPFNA	
30	PFNA-13C5	PFOS-13C8
31	PFNA - 13C9	PFNA-13C5
32	13C5-PFNA	13C4-PFOA
33		
34		

Table 162 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C6-PFDA	
5	13C2 PFDA	--
6	13C-PFOA	
7		
8	PFDA-13C2	
9	13C6-PFDA	
10	yes	
11	13C2-PFDA	13C8-PFOA
12	13C6-PFDA	
13	M6PFDA	MPFDA
14	13C6-PFDA	
15	Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA	
16	M6PFDA	MPFDA
17	13C2-PFDA	13C8-PFOA
18		
19	Yes	
20	PFDA M6	
21	13C2 PFDA	13C2 PFOA
22	13C6-PFDA	
23	13C6-PFDA	
24	M6PFDA	NA
25	13C2-PFDA	N/A
26	13C6-PFDA	
27	13C2-PFDA	N/A
28	13C6-PFDA	
29	MPFDA	
30	PFDA-13C2	PFOS-13C8
31	PFDA - 13C6	PFDA-13C2
32	13C2-PFDA	13C4-PFOA
33		
34		

Table 163 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-PFUdA	
5	13C2 PFUdA	--
6	13C-PFOA	
7	M7PFUdA	
8	PFUdA-13C2	
9	13C2-PFUdA	
10	yes	
11		
12	13C2-PFUdA	
13	M7PFUdA	MPFDA
14	13C2-PFUdA	
15	Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA	
16	M7PFUdA	
17	13C2-PFUdA	13C8-PFOA
18		
19	Yes	
20	PFUdA M7	
21	13C2 PFUdA	13C2 PFOA
22	13C9-PFUdA	
23	13C7-PFUdA	
24	M7PFUdA	NA
25	13C2-PFUdA	N/A
26	13C2-PFUdA	
27	13C2-PFUdA	N/A
28	13C2-PFUdA	
29	MPFUdA	
30	PFUdA-13C2	PFOS-13C8
31	PFUdA - 13C7	PFDA-13C2
32	13C2-PFUdA	13C4-PFOA
33		
34		

Table 164 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-PFDoA	
5	13C2 PFDoA	--
6	13C-PFDoA	
7	MPFDoA	
8	PFDoA-13C2	
9	13C2-PFDoDA	
10	yes	
11		
12	13C2-PFDoA	
13	MPFDoA	MPFDA
14	13C2-PFDoDA	
15	Perfluoro-n-[1,2-13C2]dodecanoic acid MPFDoA	
16	MPFDoA	
17	13C2-PFDoA	13C8-PFOA
18		
19	Yes	
20	PFDoDA M2	
21	13C2 PFDoA	13C2 PFOA
22	13C2-PFDoA	
23	13C2-PFDoA	
24	MPFDoDA	NA
25	13C2-PFDoDA	N/A
26	13C2-PFDoDA	
27	13C2-PFDoDA	N/A
28	13C2-PFDoDA	
29	MPFDoA	
30	PFDoDA-13C2	PFOS-13C8
31	PFDoA - 13C2	PFDA-13C2
32	13C2-PFDoA	13C4-PFOA
33		
34		

Table 165 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C2 PFD _o A	--
6	13C-PFD _o A	
7		
8	PFTeDA-13C2	
9	13C2-PFD _o DA	
10		
11		
12		
13	MPFD _o A	MPFDA
14	13C2-PFD _o DA	
15		
16		
17	13C2-PFTeDA	13C8-PFOA
18		
19		
20	PFD _o DA M2	
21	13C2 PFD _o A	13C2 PFOA
22	13C2-PFTeDA	
23	13C2-PFD _o A	
24	MPFD _o DA	NA
25	13C2-PFTeDA	N/A
26	13C2-PFTeDA	
27	13C2-PFTeDA	N/A
28	13C2-PFD _o DA	
29		
30	PFTeDA-13C2	PFOS-13C8
31	PFTeDA - 13C2	PFDA-13C2
32	13C2-PFTeDA	13C4-PFOA
33		
34		

Table 166 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-PFTeDA	
5	13C2 PFTeDA	--
6	13C-PFD _o A	
7	M2PFTeDA	
8	PFTeDA-13C2	
9	13C2-PFTeDA	
10	yes	
11		
12	13C2-PFTeDA	
13	M2PFTeDA	MPFDA
14	13C2-PFTeDA	
15	Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA	
16		
17	13C2-PFTeDA	13C8-PFOA
18		
19		
20	PFTeDA M2	
21	13C2 PFTeDA	13C2 PFOA
22	13C2-PFTeDA	
23	13C2-PFTeDA	
24	MPFTeDA	NA
25	13C2-PFTeDA	N/A
26	13C2-PFTeDA	
27	13C2-PFTeDA	N/A
28	13C2-PFTeDA	
29	MPFTeDA	
30	PFTeDA-13C2	PFOS-13C8
31	PFTeDA - 13C2	PFDA-13C2
32	13C2-PFTeDA	13C4-PFOA
33		
34		

Table 167 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C8-FOSA	
5	13C8 PFOSA	--
6	13C-PFOSA	
7	M8FOSA	
8	FOSA-13C8	
9	13C8-FOSA	
10		
11		
12	13C8-FOSA	
13	M8FOSA-I	MPFOS
14	13C8-FOSA	
15	Perfluoro-1- [13C8]otanesulfonamide	
16	M8PFOSA-I	
17	13C8-FOSA	
18		
19		
20	M8FOSA	
21	13C8 FOSA	13C2 PFOA
22	D3-N-MeFOSA	
23	13C8-FOSA	
24	MPFOSA	NA
25	13C8-FOSA	N/A
26	13C8-FOSA	
27	13C8-FOSA	N/A
28	13C8-FOSA	
29		
30	FOSA-13C8	PFOS-13C8
31	PFOSA - 13C8	PFOS-13C4
32	13C8-PFOSA	13C4-PFOA
33		
34		

Table 168 Labelled Standards for N-MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d3-MeFOSA	
5	d3 N-MeFOSA	--
6	NT	
7	d-N-MeFOSA-M	
8	MeFOSA-D3	
9	d3-MeFOSA	
10		
11		
12	d3-MeFOSA	
13	d-N-MeFOSA-M	MPFOS
14	d3-MeFOSA	
15	N-methyl-d3-perfluoro-1-octanesulfonamide	
16	d-N-MeFOSA-M	
17	D3-N-Me FOSA	
18		
19	Yes	
20	d3-N-MeFOSAA	
21	NT	
22	D3-N-MeFOSA	
23		
24	d-NMeFOSA-M	NA
25	D3-M PFOSA	N/A
26	d3-MeFOSA	
27	D3-M PFOSA	N/A
28	d3-MeFOSA	
29		
30	MeFOSA-D3	PFOS-13C8
31	N-MeFOSA - 2H3	PFOS-13C4
32	d3-N-MeFOSA	13C4-PFOA
33		
34		

Table 169 Labelled Standards for N-EtFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d5-EtFOSA	
5	d5 N-EtFOSA	--
6	NT	
7	d-N-EtFOSA-M	
8	EtFOSA-D5	
9	d5-EtFOSA	
10		
11		
12	d5-EtFOSA	
13	d-N-EtFOSA-M	MPFOS
14	d5-EtFOSA	
15	N-ethyl-d5-perfluoro-1-octanesulfonamide	
16	d-N-Et-FOSA-M	
17	D5-N-Et FOSA	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D3-N-MeFOSA	
23		
24	d-NEtFOSA-M	NA
25	D5-E PFOSA	N/A
26	d5-EtFOSA	
27	D5-E PFOSA	N/A
28	d5-EtFOSA	
29	MEtFOSA	
30	EtFOSA-D5	PFOS-13C8
31	N-EtFOSA - D5	PFOS-13C4
32	d5-N-EtFOSA	13C4-PFOA
33		
34		

Table 170 Labelled Standards for N-MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d3-N-MeFOSAA	
5	d3 N-MeFOSAA	--
6	13C-PFOA	
7	d3-N-MeFOSAA	
8	MeFOSAA-D3	
9	d3-MeFOSAA	
10	yes	
11		
12	d3-N-MeFOSAA	
13	d3-N-MeFOSAA	MPFOS
14	d3-MeFOSAA	
15		
16	d3-N-MeFOSAA	
17	D3-N-Me FOSAA	
18		
19		
20	d3-N-MeFOSAA	
21	d3-NMeFOSAA	13C2 PFOA
22	D3-N-MeFOSAA	
23	d-NMeFOSAA	
24	d3-NMeFOSAA	NA
25	D3-Me-FOSAA	N/A
26	d3-MeFOSAA	
27	D3-Me-FOSAA	N/A
28	d3-MeFOSAA	
29		
30	MeFOSAA-D3	PFOS-13C8
31	N-MeFOSAA - 2H3	PFOS-13C4
32	d3-N-MeFOSAA	13C4-PFOA
33		
34		

Table 171 Labelled Standards for N-EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d5-N-EtFOSAA	
5	d5 N-EtFOSAA	--
6	13C-PFOA	
7	d5-N-EtFOSAA	
8	EtFOSAA-D5	
9	d5-EtFOSAA	
10	yes	
11		
12	d5-N-EtFOSAA	
13	d5-N-EtFOSAA	MPFOS
14	d5-EtFOSAA	
15	N-ethyl-d5-perfluoro-1-octanesulfonamide	
16	d5-N-EtFOSAA	
17	D5-N-Et FOSAA	
18		
19	Yes	
20	d5-N-EtFOSAA	
21	d5-NEtFOSAA	13C2 PFOA
22	D5-N-EtFOSAA	
23	d-NEtFOSAA	
24	d5-NEtFOSAA	NA
25	D5-Et-FOSAA	N/A
26	d5-EtFOSAA	
27	D5-Et-FOSAA	N/A
28	d5-EtFOSAA	
29		
30	EtFOSAA-D5	PFOS-13C8
31	N-EtFOSA - 2H5	PFOS-13C4
32	d5-N-EtFOSAA	13C4-PFOA
33		
34		

Table 172 Labelled Standards for N-MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d7-MeFOSE	
5	d7 N-MeFOSE	--
6	NT	
7	d7-N-MeFOSE-M	
8	MeFOSE-D7	
9	d7-MeFOSE	
10	yes	
11		
12	d7-MeFOSE	
13	d7-N-MeFOSE-M	MPFOS
14	d7-MeFOSE	
15	d7-N-MeFOSE-M 2-(N-methyl-d3-perfluoro-1-octanesulfonamido) ethand4-ol	
16	d7-N-MeFOSE-M	
17	D7-N-Me FOSE	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D9-N-EtFOSE	
23		
24	d7-NMeFOSE-M	NA
25	D7-Me-FOSE	N/A
26	d7-MeFOSE	
27	D7-Me-FOSE	N/A
28	d7-MeFOSE	
29		
30	MeFOSE-D3	PFOS-13C8
31	N-MeFOSE - D7	PFOS-13C4
32	d7-MeFOSE	13C4-PFOA
33		
34		

Table 173 Labelled Standards for N-EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	d9-EtFOSE	
5	d9 N-EtFOSE	--
6	NT	
7	d9-N-EtFOSE-M	
8	EtFOSE-D9	
9	d3EtFOSE	
10	yes	
11		
12	d9-EtFOSE	
13	d9-N-EtFOSE-M	MPFOS
14	d3EtFOSE	
15	d9-N-EtFOSE-M 2-(N-ethyl-d5-perfluoro-1-octanesulfonamido) ethan-d4-ol	
16	d9-N-EtFOSE-M	
17	D9-N-Et FOSE	
18		
19		
20	d3-N-MeFOSAA	
21	NT	
22	D9-N-EtFOSE	
23		
24	d9-NEtFOSE-M	NA
25	D9-Et-FOSE	N/A
26	d3-EtFOSE	
27	D9-Et-FOSE	N/A
28	d3-EtFOSE	
29		
30	EtFOSE-D9	PFOS-13C8
31	N-EtFOSE - 2H9	PFOS-13C4
32	d9-N-EtFOSE	13C4-PFOA
33		
34		

Table 174 Labelled Standards for 4:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-42FTS	
5	13C2 4:2 FTS	--
6	13C-6:2 FTS	
7	M2-4:2FTS	
8	4:2 FTS-13C2	
9	13C2-4:2 FTS	
10	yes	
11		
12	13C2-42FTS	
13	M2-4:2 FTS	MPFOS
14	13C2-4:2 FTS	
15	M2-4:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-hexane sulfonate (4:2)	
16		M2-4,2FTS_S
17	13C2-4:2 FTS	
18		
19		
20	M2-4:2FTS	
21	M2-4:2 FTS	13C2 PFOA
22	13C2-6:2 FTS	
23	13C2-4:2FTS	
24	M4:2 FTS	NA
25	13C2 4:2-FTS	N/A
26	13C2-4:2 FTS	
27	13C2 4:2-FTS	N/A
28	13C2-4:2 FTS	
29	M4:2FTS	
30	4:2 FTS-13C2	PFOS-13C8
31		
32	13C2-4:2 FTS	13C4-PFOA
33		
34		

Table 175 Labelled Standards for 6:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-62FTS	
5	13C2 6:2 FTS	--
6	13C-6:2 FTS	
7	M2-6:2FTS	
8	6:2 FTS-13C2	
9	13C2-6:2 FTS	
10	yes	
11	13C2-6:2 FTS	13C8-PFOS
12	13C2-62FTS	
13	M2-6:2 FTS	MPFOS
14	13C2-6:2 FTS	
15	M2-6:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-octane sulfonate (6:2)	
16	M2-6,2FTS	
17	13C2-6:2 FTS	
18		13C2 6:2 FTS
19		
20	M2-6:2FTS	
21	M2-6:2 FTS	13C2 PFOA
22	13C2-6:2 FTS	
23	13C2-6:2FTS	
24	M6:2 FTS	NA
25	13C2,12C6 6:2-FTS	N/A
26	13C2-6:2 FTS	
27	13C2,12C6 6:2-FTS	N/A
28	13C2-6:2 FTS	
29	M6:2FTS	
30	6:2 FTS-13C2	PFOS-13C8
31	6:2 FTS - 13C2	PFHxS-18O2
32	13C2-6:2FTS	13C4-PFOA
33		
34		

Table 176 Labelled Standards for 8:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	YES	No
4	13C2-82FTS	
5	13C2 8:2 FTS	--
6	13C-6:2 FTS	
7	M2-8:2FTS	
8	8:2 FTS-13C2	
9	13C2-8:2 FTS	
10	yes	
11	13C2-8:2 FTS	13C8-PFOS
12	13C2-82FTS	
13	M2-8:2 FTS	MPFOS
14	13C2-8:2 FTS	
15	M2-8:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-decane sulfonate (8:2)	
16		
17	13C2-8:2 FTS	
18		13C2 6:2 FTS
19		
20	M2-8:2FTS	
21	M2-8:2 FTS	13C2 PFOA
22	13C2-8:2FTS	
23	13C2-8:2FTS	
24	M8:2 FTS	NA
25	13C2 8:2-FTS	N/A
26	13C2-8:2 FTS	
27	13C2 8:2-FTS	N/A
28	13C2-8:2 FTS	
29	M8:2FTS	
30	8:2 FTS-13C2	PFOS-13C8
31	8:2 FTS - 13C2	PFHxS-18O3
32	13C2-8:2 FTS	13C4-PFOA
33		
34		

Table 177 Labelled Standards for 10:2 FTS

Lab. Code	Before Extraction	Before Instrument Analysis
2	Yes	
3	NT	NT
4	13C2d4 10:2 FTS	
5	13C2 10:2 FTS	--
6	NT	
7		
8	10:2 FTS-13C2-D4	
9	13C2-8:2 FTS	
10		
11		
12	13C2d4 10:2 FTS	
13	M2-8:2 FTS	MPFOS
14	13C2-8:2 FTS	
15		
16		
17	13C2-8:2 FTS	
18		
19		
20	M2-8:2FTS	
21	M2-8:2 FTS	13C2 PFOA
22	13C2-8:2FTS	
23	13C2-8:2FTS	
24	MPFDODA	NA
25	13C2 8:2-FTS	N/A
26	13C2-8:2 FTS	
27	13C2 8:2-FTS	N/A
28	13C2-8:2 FTS	
29		
30	10:2 FTS-13C2	PFOS-13C8
31		
32	13C2-8:2 FTS	13C4-PFOA
33		
34		

Table 178 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	YES	No
4		
5	13C3 GenX	--
6	13C-PFHxA	
7		
8	HFPO-DA-13C3	
9	--	
10		
11		
12	13C3-GenX (MHFPA)	
13	NT	NT
14	--	
15		
16	M3HFPO-DA	
17	13C4-PFOA	
18		
19		
20		
21	13C3 HFPO-DA	13C2 PFOA
22	13C3-GenX	
23		
24	M3HFPO-DA	NA
25	13C312C3HF11O3	N/A
26	NT	
27	13C312C3HF11O3	N/A
28		
29		
30	PFPeA-13C3	PFOS-13C8
31		
32		
33		
34		

Table 179 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFHxA	
7		
8	PFHxS-18O2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOA	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	13C4-PFHpA	
23	13C8-PFOA	
24	MPFHpA	NA
25	13C4-PFHpA	N/A
26	NT	
27	13C4-PFHpA	N/A
28		
29		
30	FOSA-13C8	PFOS-13C8
31		
32		
33		
34		

Table 180 Labelled Standards for
9Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFDA-13C2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOS	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23	13C8-PFOS	
24	M8PFOS	NA
25	13C4-PFOS	N/A
26	NT	
27	13C4-PFOS	N/A
28		
29		
30		
31		
32		
33		
34		

Table 181 Labelled Standards for
11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
2		
3	NT	NT
4		
5	13C4 PFOS	--
6	13C-PFOS	
7		
8	PFHxDA-13C2	
9	--	
10		
11		
12		
13	NT	NT
14	--	
15		
16		
17	13C4-PFOS	
18		
19		
20		
21	13C4 PFOS	13C2 PFOA
22	NA	
23	13C8-PFOS	
24	MPFDoDA	NA
25	13C4-PFOS	N/A
26	NT	
27	13C4-PFOS	N/A
28		
29		
30		
31		
32		
33		
34		

Table 182 Participant Methodology for Water Samples – Additional Information

Lab. Code	Sample	Additional Information
4	S4	PFDS from 50mL sample
6	S3 and S4	ALL submitted data are based on anion-basis
7	S3 and S4	A note on these results: Instrument failure resulted in the extraction of these samples being halted midway (sample loaded onto SPE) they were held there for two weeks.
15	S3	Extra compounds detected < LOR; PFOSA at 0.01 ug/L
	S4	Extra compounds detected < LOR; PFOA at 0.03 ug/L, PFDA at 0.04 ug/L, PFDoA at 0.02 ug/L, PFTrDA at 0.01 ug/L, PFOS at 0.01 ug/L, PFDS 0.04 ug/L
17	S3	PFOS (Total), PFHxS (Linear) and PFHxS (Total) were quantified using a direct injection sample. Other analytes were quantified using SPE extract
19	S3	This sample also required analysis by direct injection for PFOS and PFHxS (0.5mL diluted 1:1 with MeOH) as they were outside the calibration range of the SPE method
24	S4	PFNS, PFDS, PFTeDA, 6:2 FTS and 9Cl-PF3ONS are not reported (NR) because of a poor recovery of our QC sample
25	S3	All linear and branched present have been reported although some branched peaks are not confirmed by traceable standards.
27	S3	All linear and branched present have been reported although some branched peaks are not confirmed by traceable standards.
30	S3	S3: PFNS Isomer detected, report total. Isomers confirmed by Obirt-Trap DDMS.

APPENDIX 7 – ACRONYMS AND ABBREVIATIONS

10:2 FTS	1H, 1H, 2H, 2H-perfluorododecane sulfonate
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
4:2 FTS	1H, 1H, 2H, 2H-perfluorohexane sulfonate
6:2 FTS	1H, 1H, 2H, 2H-perfluorooctane sulfonate
8:2 FTS	1H, 1H, 2H, 2H-perfluorodecane sulfonate
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ACN	Acetonitrile
ADONA	Ammonium 4,8-dioxa-3H-perfluorononanoate
Alk Dig	Alkaline Digestion
ASE	Accelerated Solvent Extraction
ASLP	Australian Standard Leaching Protocol
AQA	Analytical and Quality Assurance
AV	Assigned Value
CRM	Certified Reference Material
CV	Coefficient of Variation
EPA	Environment Protection Authority
EtFOSA	N-Ethyl perfluorooctane sulfonamide
EtFOSAA	N-Ethyl perfluorooctane sulfonamido acetic acid
EtFOSE	N-Ethyl perfluorooctane sulfonamidoethanol
FOSA	Perfluoro-1-octanesulfonamide
GenX	Ammonium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propanoate
GUM	Guide for Uncertainty Measurement
HV	Homogeneity Value
IPE	Ion Pair Extraction
ISO	International Standards Organisation
ISTD	Internal Standard
LC	Liquid Chromatography
LC-MSMS	Liquid Chromatography with Tandem Mass Spectrometry
LCS	Laboratory Control Sample
LLE	Liquid-Liquid Extraction
LOR	Limit of Reporting
LSE	Liquid-Solid Extraction
Max	Maximum value in a set of results
Md	Median
MeFOSA	N-Methyl perfluorooctane sulfonamide
MeFOSAA	N-Methyl perfluorooctane sulfonamidoacetic acid
MeFOSE	N-Methyl perfluorooctane sulfonamidoethanol
MeOH	Methanol

MeOH/Base	Base modified methanol
Min	Minimum value in a set of results
MS	Mass Spectrometry
MTBE	Methyl tert-butyl ether
MU	Measurement Uncertainty
NATA	National Association of Testing Authorities, Australia
NMI	National Measurement Institute (of Australia)
NR	Not Reported
NT	Not Tested
PCV	Performance Coefficient of Variation
PFAA	Perfluoroalkyl acids
PFAS	Per- and poly fluorinated alkyl substances
PFBA	Perfluoro-n-butanoic acid
PFBS	Potassium perfluoro-1-butanefulfonate
PFCA	Perfluorinated carboxylic acids
PFDA	Perfluoro-n-decanoic acid
PFDoA	Perfluorododecanoic acid
PFDoS	Perfluorododecane sulfonate
PFDS	Perfluorodecane sulfonate
PFECA	Perfluoroalkyl ether carboxylic acid
PFESA	Polyfluorinated ether sulfonic acid
PFHpA	Perfluoro-n-heptanoic acid
PFHpS	Perfluoroheptane sulfonate
PFHxA	Perfluoro-n-hexanoic acid
PFHxS	Potassium perfluorohexanesulfonate
PFHxS_L	Potassium perfluorohexanesulfonate linear
PFNA	Perfluoro-n-nonanoic acid
PFNS	Perfluorononane sulfonate
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PFOS_L	Perfluorooctane sulfonate linear
PFOSA	Perfluoro-1-octanesulfonamide
PFPeA	Perfluoro-n-pentanoic acid
PFPeS	Perfluoropentane sulfonate
PFSA	Perfluorosulfonic acid
PFTeDA	Perfluorotetradecanoic acid
PFTTrDA	Perfluorotridecanoic acid
PFTTrDS	Perfluorotridecane sulfonate
PFUdA	Perfluoroundecanoic acid
PFUdS	Perfluoroundecane sulfonate

PLE	Pressurised Liquid Extraction
PT	Proficiency Test
PTFE	Polytetrafluoroethylene
Q	Quadrupole mass analyser
QC	Quality Control
QQQ	Triple Quadrupole (mass spectrometry)
QuEChERS	Quick, Easy, Cheap, Effective, Rugged and Safe extraction method
RA	Robust Average
RM	Reference Material
Robust CV	Robust Coefficient of Variation
Robust SD	Robust Standard Deviation
SD	Standard Deviation
SLE	Solid-Liquid Extraction
SPE	Solid Phase Extraction
SS	Spiked Samples
SV	Spiked or formulated concentration of a PT sample (Spike Value)
Target SD	Target standard deviation
TBA	Tert-butanol
TCLP	Toxicity characteristic leaching procedure
UHPLC	Ultra-High-Performance Liquid Chromatography
US EPA	United States Environmental Protection Agency
WAX	Weak Anion Exchange

END OF REPORT