Australian Government
Department of Industry, Science and Resources

National Measurement Institute

Proficiency Test Final Report AQA 23-14 PFAS in Soil and Water

March 2024

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ACKNOWLEDGMENTS

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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.

The assistance of the following NMI staff members in the planning, conduct and reporting of the study is acknowledged.

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SUMMARY

This report presents the results of the proficiency test AQA 23-14 PFAS in Soil and Water. This study is focused on the measurement of 32 per- and polyfluorinated alkyl substances (PFAS): PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFDoS, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUdA, PFDoA, PFTrDA, PFTeDA, PFODA, PFOSA, MeFOSAA, EtFOSAA, 6:2FTS, 8:2FTS, 10:2FTS, 8:2diPAP, GenX, ADONA, 9Cl-PF3ONS, 11Cl-PF3OUdS and 5:3FTCA 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. The study also included a trial program of PFAS analytes in moist biosolid.

Thirty-eight laboratories participated and all submitted results.

Five 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 30 individual PFAS components;
- one moist biosolid sample Sample S3, spiked with 30 individual PFAS analytes; and
- two water samples: Sample S4 with incurred PFAS contaminants, and Sample S5 spiked with 29 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 2258 z-scores, 2097 (93%) returned $|z| \leq 2.0$, indicating a satisfactory performance.

Of 2247 E_n-scores, 1751 (78%) returned $|E_n| \leq 1.0$, indicating agreement of the participant's result with the assigned value within their respective expanded uncertainties.

Laboratory **33** reported results for all of the analytes for which z-scores were calculated (78) and returned the highest number of satisfactory z-scores (77 out of 78). All results reported by Laboratories **12** (73), **16** (68), **19** (63), **34** (63), **31** (60), **14** (58), **2** (39) and **1** (4) returned satisfactory z-scores.

Laboratory **12** had the highest number of satisfactory E_n-scores (71 out of 78). Laboratories **1**, **16**, **30**, and **35** returned satisfactory E_n-scores for all analytes reported that were scored.

ii. evaluate the laboratories' methods for PFAS in soil, biosolid and water analysis;

Overall the participants' performance in the soil and water samples was comparable.

Thirteen laboratories reported at least one PFAS analyte that was not spiked into test samples.

The measurement of PFNS and PFDS in soil samples with high PFOS content presents difficulties to laboratories who use PFOS as their mass-labelled internal standard for these tests.

PFODA, 8:2diPAP and 5:3FTCA, were introduced for the first time in the present study based on participants' feedback. Althought a limited number of laboratories reported results for these tests most reported results were in good agreement with each other and with the spike value.

Sample S3 was part of a pilot study designed to assess whether the methods used by laboratories for PFAS measurement in biosolid would produce compatible results. Although participants used a wide variety of methods, most produced compatible results for most analytes. PFDoS, PFODA followed by EtFOSAA and 5:3FTCA in biosolid were the tests which challenged most participants' analytical techniques when compared to the soil sample.

The most popular method used for the biosolid sample analysis consisted of: SLE extraction, a sample size of 1 or 2 g, methanol base as extraction solvent, an extraction temperature of 40°C and SPE cleanup.

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

Over the last 9 years, laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the reported results have been compatible with each other.

AQA 15- 03 was conducted in 2015 and included 12 analytes. Of the 78 results for which a z-score was calculated, 62 (79%) returned a satisfactory z-scores. The present study includes 89 tests, and has had 2258 numerical results reported for which a z-score was calculated; of these, 2097 (93%) returned satisfactory z-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 2913 numerical results, 2600 (89%) were reported with an associated estimate of expanded measurement uncertainty.

A large number of laboratories still report potentially unrealistically small or large relative uncertainties for routine PFAS. The magnitude of the reported expanded uncertainties was within the range 0% to 200% of the reported value. Additionally, some laboratories are still reporting numeric estimates of uncertainties for non-numeric results

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;
- chlorophyll a in water; and
- controlled drug assay, drugs in wipes and clandestine laboratory.

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;
- assess laboratories' capabilities in correctly identifying PFAS analytes in soil and water;
- evaluate the laboratories' test methods for PFAS in soil, biosolid and water;
- 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 17043[1] 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.[1] This study falls within the scope of NMI's accreditation, except for Sample S3 (biosolid) which is outside the scope of NMI's accreditation.

2 STUDY INFORMATION

2.1 Study Timetable

The timetable of the study was:

Invitation issued	10 July 2023
Samples dispatched	04 September 2023
Results due	10 November 2023
Interim report issued	16 November 2023
Preliminary report issued	01 December 2023

The results due date was extended to 10 November 2023 due to delays in sample delivery to one of our overseas participants.

2.2 Test Material Preparation

Five 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 30 individual PFAS components.
- One biosolid sample S3 containing 20 g of autoclaved, moist biosolid spiked with 30 individual PFAS components;
- Two water samples S4 and S5 each containing 2 x 50 mL:
    - Sample S4 containing incurred PFAS contaminants; and
    - Sample S5 milli-Q water spiked with 29 individual PFAS components.
- The bulk water sample S5 was spiked with 21 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, PFDoS, and PFOSA, with the aim of minimising the loss of these analytes during preparation (see details in Appendix 1).
- The analytical standards used for spiking these samples were purchased from HPC Standards GmbH, Toronto Research Chemicals, Wellington Laboratories Canada and Sigm-Aldrich.
- 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	S3 Biosolid (Spiked) µg/kg	S5 Water (Spiked) µg/L
PFBS*	8.11	10.7	0.0397
PFPeS*	9.47	12.5	0.0233
PFHxS*	4.76	6.25	0.0376
PFHxS_L*	4.76	6.25	0.0376
PFHpS*	1.91	2.44	0.00378
PFOS*	5.77	10.1	0.00950
PFOS_L*	5.77	10.1	0.00950
PFNS*	0.966	1.92	0.0381
PFDS*	33.9	44.4	0.0958
PFDoS*	29.3	38.4	0.0816
PFBA	9.42	12.4	0.232
PFPeA	4.01	5.30	0.0399
PFHxA	5.00	6.62	0.0297
PFHpA	3.00	3.97	0.0249
PFOA	10.1	13.3	0.0347
PFNA	6.02	7.97	0.00498
PFDA	11.2	14.9	0.0281
PFUdA	Not Spiked	Not Spiked	0.0488

PFAS	S2 Soil (Spiked) µg/kg	S3 Biosolid (Spiked) µg/kg	S5 Water (Spiked) µg/L
PFDoA	Not Spiked	Not Spiked	0.0595
PFTrDA	15.2	15.1	0.124
PFTeDA	Not Spiked	Not Spiked	0.148
PFODA	20.2	25.6	Not Spiked
PFOSA	13.4	17.8	0.0476
MeFOSAA	10.1	14.2	Not Spiked
EtFOSAA	10.1	13.4	Not Spiked
6:2FTS*	Not Spiked	Not Spiked	0.0376
8:2FTS*	6.68	8.93	Not Spiked
10:2FTS*	48.7	64.2	0.0383
8:2diPAP	50.3	66.6	Not Spiked
GenX	15.2	19.9	0.0696
ADONA*	23.7	31.4	0.0561
9Cl-PF3ONS*	23.5	31.0	0.0926
11Cl-PF3OUdS*	23.7	31.4	0.139
5:3FTCA	35.2	29.2	0.119

* Values for these analytes are the anion concentration.

2.3 Participation

Thirty-eight laboratories participated in this study, and all submitted results. A confidential laboratory code number was assigned to each of these 38 participants.

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, stored 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 previously used analytes.

As this is the first time that biosolid have been introduced in a PT study, a full homogeneity and stability study was conducted for this sample except for 5:3FTCA, 8:2diPAP and PFODA.

As in previous years the same low recovery was noticed for GenX in soil Sample S2. An assigned value was set for this test because as in the previous 3 studies, the reported results were in excellent agreement with each other, with a between-laboratory CV of only 15% (Table 125). In addition, no relationship was evident between the reported results and the date when the sample was received or analysed.

A low recovery of the spiked value was also observed for PFNS and PFDS in S5 indicating a possible stability issue. However, no relationship was evident between the reported results and the date when the sample was received or analysed. The reported results were variable hence no assigned value could be set for these analytes.

2.5 Sample Storage, Dispatch and Receipt

Before dispatch, soil, and water samples were refrigerated at 4ºC, while the biosolid samples were stored frozen at -20ºC.

The samples were packed in a foam box with a cooler brick and sent by courier on 04 September 2023.

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.

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 for PFAS in the moist biosolid Sample S3 and in units of µg/L for PFAS in water Samples S4 and S5.
- To avoid loss of moisture, do not leave the moist biosolid sample S3 uncovered.
- For the water Samples S4 and S5, use the entire content of the bottle for analysis. The second bottle is provided for repeat analysis.
- If analyses cannot be commenced on the day of receipt, please store the samples chilled.
- 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 0-5000 µg/kg, in S2 is 0-200 µg/kg, in S3 is 0-200 µg/kg, in S4 is 0-5 µg/L, and in S5 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.

2.7 Interim Report and Preliminary Report

An Interim Report was emailed to all participants on 16 November 2023.

A Preliminary Report was emailed to all participants on 1 December 2023. This report included: a summary of results reported by all laboratories, assigned values, performance coefficients of variation, z-scores and E_n-scores for each analyte tested by participants. No data from the Preliminary Report has been changed in the present Final Report with the exception of the spike values for PFOSA in S2, S3 and S5 (Table 2).

A high recovery of spiked values was noticed for PFOSA in the soil Sample S2 and the water Sample S5, of 196% and 159% respectively. Similar recoveries were also observed in the PT study prepared at the same time as AQA 23-14, AQA 23-15 PFAS in Food and Biota. An investigation was conducted and identified problems with the standard used for spiking. The spike values have been adjusted accordingly. Participants results' reported for this test in S2 and S5 were in excellent agreement with each other and with the spike value. An assigned value was set for this analyte and results were scored.

Table 2 PFOSA expected spike values and adjusted spike values

Sample	Analyte	Expected Spike Value	Adjusted Spike Value
S2 AQA 23-14	PFOSA	7.03 ± 0.35 μg/kg	13.43 ± 0.67 μg/kg
S3 AQA 23-14	PFOSA	9.30 ± 0.70 μg/kg	17.8 ± 1.3 μg/kg
S5 AQA 23-14	PFOSA	0.0249 ± 0.012 μg/L	0.0476 ± 0.0023 μg/L

3 PARTICIPANT LABORATORY INFORMATION

3.1 Test Methods Reported by Participants

Participants were requested to provide methodology information. Responses are presented in Appendix 8 for soil, Appendix 9 for biosolid and in Appendix 10 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 3 and 4.

Table 3 Basis of Participants' Uncertainty Estimate

<table>
<tr><th rowspan="2">Lab. Code</th><th rowspan="2">Approach to Estimating MU</th><th colspan="2">Information Sources for MU Estimation*</th><th rowspan="2">Guide Document for Estimating MU</th></tr>
<tr><th>Precision</th><th>Method Bias</th></tr>
<tr><td>1</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - Spare samples of AQA 21-07
Duplicate analysis</td><td>Recoveries of SS
Standard purity</td><td>Eurachem/CITAC Guide</td></tr>
<tr><td>2</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Duplicate analysis</td><td>Recoveries of SS</td><td>NEN7779</td></tr>
<tr><td>3</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS</td><td>Recoveries of SS</td><td>NATA- Estimating and reporting MU of chemical resuts</td></tr>
<tr><td>4</td><td>Standard Deviation of CRM replicate analysis mult by 3</td><td></td><td></td><td>NATA Guide on estmating and reporting MU</td></tr>
<tr><td>5</td><td>Standard deviation of replicate analyses multiplied by 2 or 3</td><td>Control samples - SS</td><td>Laboratory bias from PT studies
Recoveries of SS</td><td>ISO/GUM</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Top Down - precision and estimates of the method and laboratory bias</td><td colspan="2">Standard deviation from PT studies only</td><td rowspan="2">Eurolab Technical Report No1/2007</td></tr>
<tr><td>Control samples - SS
Duplicate analysis</td><td>CRM
Recoveries of SS</td></tr>
<tr><td>7</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS
Duplicate analysis</td><td>CRM
Recoveries of SS</td><td>ISO/GUM</td></tr>
<tr><td rowspan="2">8*</td><td rowspan="2">Standard deviation of replicate analyses multiplied by 2 or 3</td><td colspan="2">Standard deviation from PT studies only</td><td rowspan="2">Eurachem/CITAC Guide</td></tr>
<tr><td>Control samples - SS
Duplicate analysis
Instrument calibration</td><td>Recoveries of SS</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Bottom Up (ISO/GUM, fish bone/cause and effect diagram)</td><td colspan="2">Standard deviation from PT studies only</td><td rowspan="2">Nordtest Report TR537</td></tr>
<tr><td></td><td>CRM</td></tr>
<tr><td>10*</td><td>Standard deviation of replicate analyses multiplied by 2 or 3</td><td>Control samples - SS</td><td></td><td>ISO/GUM</td></tr>
<tr><td>11</td><td></td><td>Control samples - CRM</td><td></td><td>ASTM E2254-13</td></tr>
<tr><td>12</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Duplicate analysis
Instrument calibration</td><td>Instrument calibration
Recoveries of SS
Standard purity</td><td>ISO/GUM</td></tr>
<tr><td>13</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS
Duplicate analysis
Instrument calibration</td><td>Instrument calibration
Recoveries of SS
Standard purity</td><td>Eurachem/CITAC Guide</td></tr>
</table>

<table>
<tr><th rowspan="2">Lab. Code</th><th rowspan="2">Approach to Estimating MU</th><th colspan="2">Information Sources for MU Estimation*</th><th rowspan="2">Guide Document for Estimating MU</th></tr>
<tr><th>Precision</th><th>Method Bias</th></tr>
<tr><td>14</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples
Duplicate analysis
Instrument calibration</td><td>CRM
Instrument calibration
Laboratory bias from PT studies
Recoveries of SS</td><td>Eurachem/CITAC Guide</td></tr>
<tr><td>15*</td><td>Professional judgment</td><td>Control samples - SS
Duplicate analysis</td><td>CRM</td><td></td></tr>
<tr><td>16</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - CRM
Duplicate analysis
Instrument calibration</td><td>CRM
Instrument calibration
Recoveries of SS
Standard purity</td><td>NMI Uncertainty Course</td></tr>
<tr><td>17</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS</td><td>Recoveries of SS</td><td></td></tr>
<tr><td>18</td><td>Professional judgment</td><td>Control samples - RM
Duplicate analysis
Instrument calibration</td><td>Instrument calibration
Laboratory bias from PT studies</td><td></td></tr>
<tr><td>19</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - RM
Duplicate analysis</td><td></td><td>Eurolab Technical Report No1/2007</td></tr>
<tr><td>20*</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS
Duplicate analysis</td><td>Laboratory bias from PT studies
Recoveries of SS</td><td>ISO/GUM</td></tr>
<tr><td rowspan="2">21</td><td rowspan="2">Standard deviation of replicate analyses multiplied by 2 or 3</td><td colspan="2">Standard deviation from PT studies only</td><td rowspan="2">ISO/GUM</td></tr>
<tr><td></td><td>CRM
Recoveries of SS</td></tr>
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<tr><td rowspan="2">23*</td><td rowspan="2"></td><td colspan="2">Standard deviation from PT studies only</td><td rowspan="2">ISO/GUM</td></tr>
<tr><td></td><td>CRM
Instrument calibration</td></tr>
<tr><td>24</td><td>Standard deviation of replicate analyses multiplied by 2 or 3</td><td>Duplicate analysis</td><td>Recoveries of SS</td><td>Nordtest Report TR537</td></tr>
<tr><td>25</td><td>Bottom Up (ISO/GUM, fish bone/cause and effect diagram)</td><td>Duplicate analysis
Instrument calibration</td><td>Instrument calibration
Recoveries of SS</td><td>Eurachem/CITAC Guide</td></tr>
<tr><td>26*</td><td>Standard deviation of replicate analyses multiplied by 2 or 3</td><td>Control samples - SS</td><td></td><td></td></tr>
<tr><td>27*</td><td>Standard deviation of replicate analyses multiplied by 2 or 3</td><td>Control samples - SS
Duplicate analysis
Instrument calibration</td><td>CRM
Instrument calibration
Recoveries of SS
Standard purity</td><td>NATA GAG Etimating and Reporting MU</td></tr>
<tr><td>28</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - RM
Duplicate analysis
Instrument calibration</td><td>Instrument calibration
Recoveries of SS
Standard purity</td><td>NATA - Estimating and reporting MU of chemical test results</td></tr>
<tr><td>29</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS
Duplicate analysis
Instrument calibration</td><td>CRM</td><td>NMI Uncertainty Course</td></tr>
<tr><td>30</td><td>Top Down - precision and estimates of the method and laboratory bias</td><td>Control samples - SS</td><td>Recoveries of SS</td><td>NATA - Estimating and reporting MU of chemical test results</td></tr>
</table>

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
31	Top Down - precision and estimates of the method and laboratory bias	Control samples Duplicate analysis Instrument calibration	CRM Instrument calibration	Eurachem/CITAC Guide
32	Bottom Up (ISO/GUM, fish bone/cause and effect diagram)	Control samples - RM Duplicate analysis Instrument calibration	Instrument calibration Laboratory bias from PT studies Recoveries of SS	ISO/GUM
33*	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples - SS	Recoveries of SS	USEPA SW-846
34	Top Down - precision and estimates of the method and laboratory bias	Control samples - CRM	Recoveries of SS	Eurachem/CITAC Guide
35	Top Down - precision and estimates of the method and laboratory bias	Control samples - CRM	CRM Laboratory bias from PT studies	
36	Top Down - precision and estimates of the method and laboratory bias	Control samples Duplicate analysis Instrument calibration	Instrument calibration Laboratory bias from PT studies	
38		Control samples - SS Duplicate analysis Instrument calibration	Instrument calibration	

*SS = Spiked Samples, RM = Reference Material, CRM = Certified Reference Material. [a]Additional Information in Table 4

Table 4 Uncertainty Estimate Additional Information

Lab Code	Approach to Estimating MU
8	Calculated uncertainty as 3 x SD of replicates
10	The expanded measurement uncertainty values were calculated using a coverage factor (K) value of 2.00 and at the 95% confidence limit.
15	NEN 7777, Environment and food - Performance characteristics of measurement methods
20	The laboratory is accredited for following PFAS in water samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFBS, PFHxS, PFOS, PFOSA. The laboratory is accredited for following PFAS in soil samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFOSA, 4:2 FTS, 8:2 diPAP, HFPO-DA, DONA, PFECHS. No accreditation for PFAS in biosolid.
23	Not avaiable in the tables below means that we do not have the labelled std (C13-isotop labelled) for the substance
26	Measurement Uncertainty (U) estimated from the standard deviation (u) of replicate recovery samples using the expression U = 2 x u. Procedure as set out in Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition
27	Recovery and uncerainty data given for analytes at method limit of reporting.
33	Standard Practice for laboratories utilizing US EPA's SW-846 document.

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 5, along with the study coordinator's response where appropriate.

Table 5 Participants' Comments

Lab Code	Participants' Comments	Study coordinator's response
23	4:2FTS can be considered to be included	Thank you for your feedback. 4:2FTS was included in our past studies and we will include it again in the future.
26	It would be great to have AQA NMI proficiency for dairy products.	Thank you for your feedback. We will include this matrix in our next PFAS study in food and biota.

4 PRESENTATION OF RESULTS AND STATISTICAL ANALYSIS

4.1 Results Summary

Participant results are listed in Tables 6 to 124 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 120. An example chart with interpretation guide is shown in Figure 1.

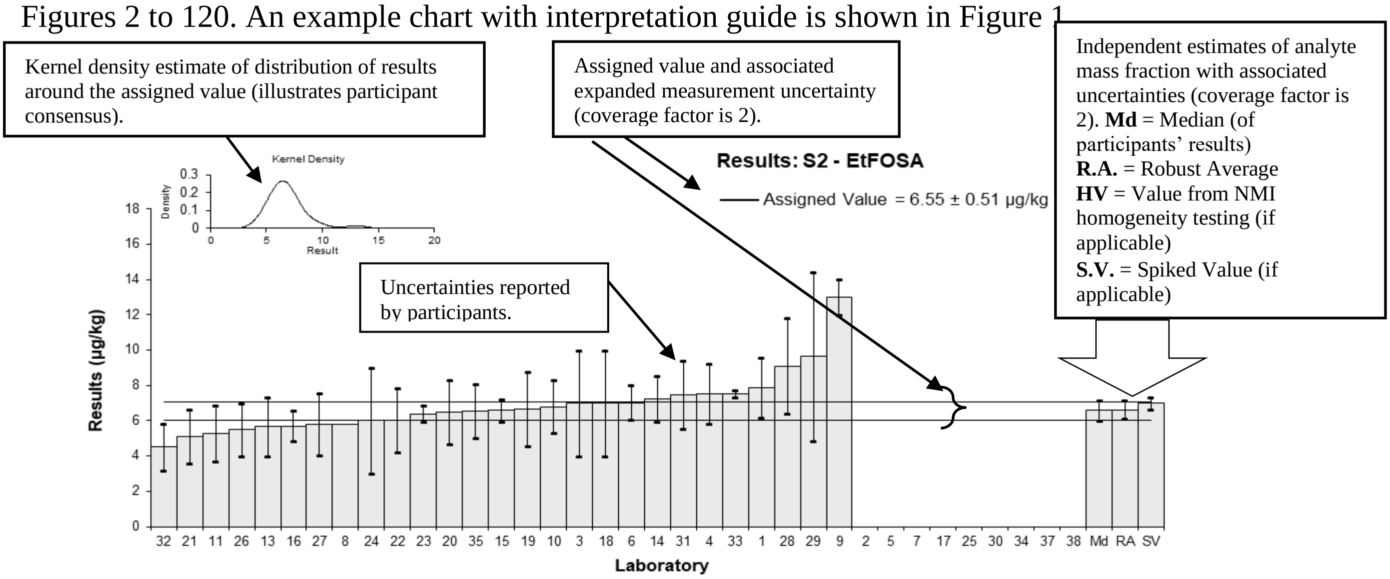


Figure 1 Guide to Presentation of Results

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.[4, 5]

4.3 Assigned Value

An example of the assigned value calculation using data from the present study is given in Appendix 3. 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.[5]

The robust between-laboratory coefficient of variation (robust CV) is a measure of the variability of participants' results and was calculated using the procedure described in ISO13528.[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.

$\sigma = (X) \times \text{PCV}$ 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 3. For each participants' result a z-score is calculated according to Equation 2 below:

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

where:

z is z-score;
χ is participants' result;
X is the study 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.

4.7 E_n-Score

An example of E_n-score calculation using data from the present study is given in Appendix 3. 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:

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

where:

E_n is E_n-score;
χ is a participants' result;
X is the assigned value;
U_χ is the expanded uncertainty of the participants' 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[7] 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 6

Sample Details

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

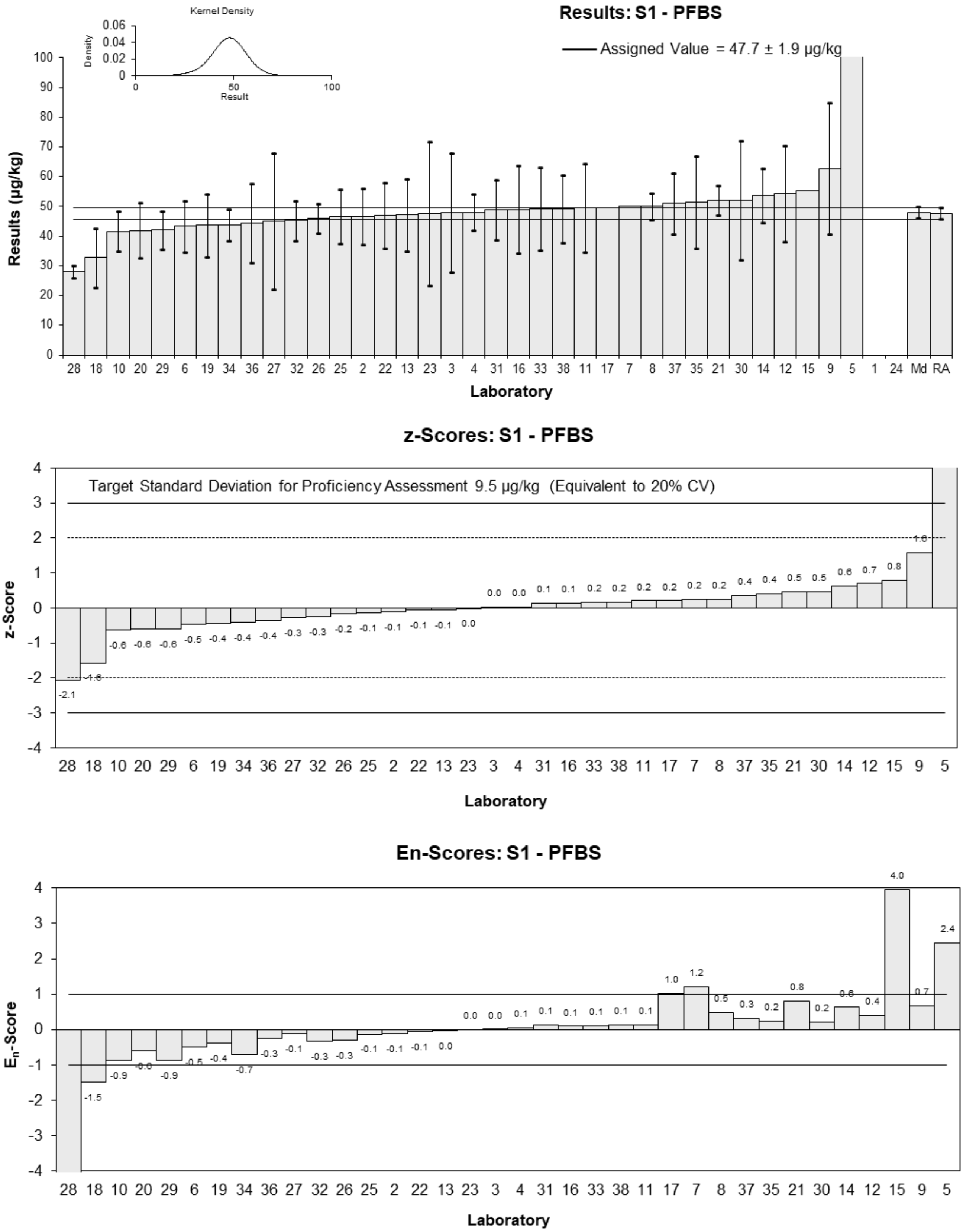
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	46.62	9.324	NR	-0.11	-0.11
3	48	20	83	0.03	0.01
4	48.0	6	95	0.03	0.05
5**	316	110	NR	28.12	2.44
6	43.3	8.7	115	-0.46	-0.49
7	50	NR	98	0.24	1.21
8	50	4.35	104	0.24	0.48
9	62.8	21.98	84	1.58	0.68
10	41.6	6.66	36	-0.64	-0.88
11	49.580	14.87	87	0.20	0.13
12	54.3	16.3	52	0.69	0.40
13	47.2	12.2	99	-0.05	-0.04
14	53.63	9.2	107	0.62	0.63
15	55.2158	NR	95	0.79	3.96
16	49.0	14.7	92	0.14	0.09
17	49.64	NR	NR	0.20	1.02
18	32.7	9.81	91	-1.57	-1.50
19	43.6	10.6	121	-0.43	-0.38
20	41.94	9.23	70	-0.60	-0.61
21	52	5.0	NR	0.45	0.80
22	47	11	NR	-0.07	-0.06
23	47.6	24.3	91.5	-0.01	0.00
24	NS	NS	NS		
25	46.5	9.1	86	-0.13	-0.13
26	46	5.1	112	-0.18	-0.31
27	45	23	99	-0.28	-0.12
28	28	2	67	-2.06	-7.14
29	42	6.3	112	-0.60	-0.87
30	52	20	94	0.45	0.21
31	48.9	10.1	146.05	0.13	0.12
32	45.3	6.71	88.5	-0.25	-0.34
33	49.1	13.9	77	0.15	0.10
34	43.7	5.20	115.44	-0.42	-0.72
35	51.5	15.5	90	0.40	0.24
36	44.3	13.3	86	-0.36	-0.25
37	51	10.2	NR	0.35	0.32
38	49.1778	11.3109	81	0.15	0.13

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	47.7	1.9
Spike Value	Not Spiked	
Robust Average	47.7	1.9
Median	48.0	1.9
Mean	47.3	
N	35	
Max	62.8	
Min	28	
Robust SD	4.5	
Robust CV	9.4%	



Results: S1 - PFBS
Assigned Value = 47.7 ± 1.9 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFBS
Target Standard Deviation for Proficiency Assessment 9.5 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFBS
E_n-Score
Laboratory

Figure 2

Table 7

Sample Details

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

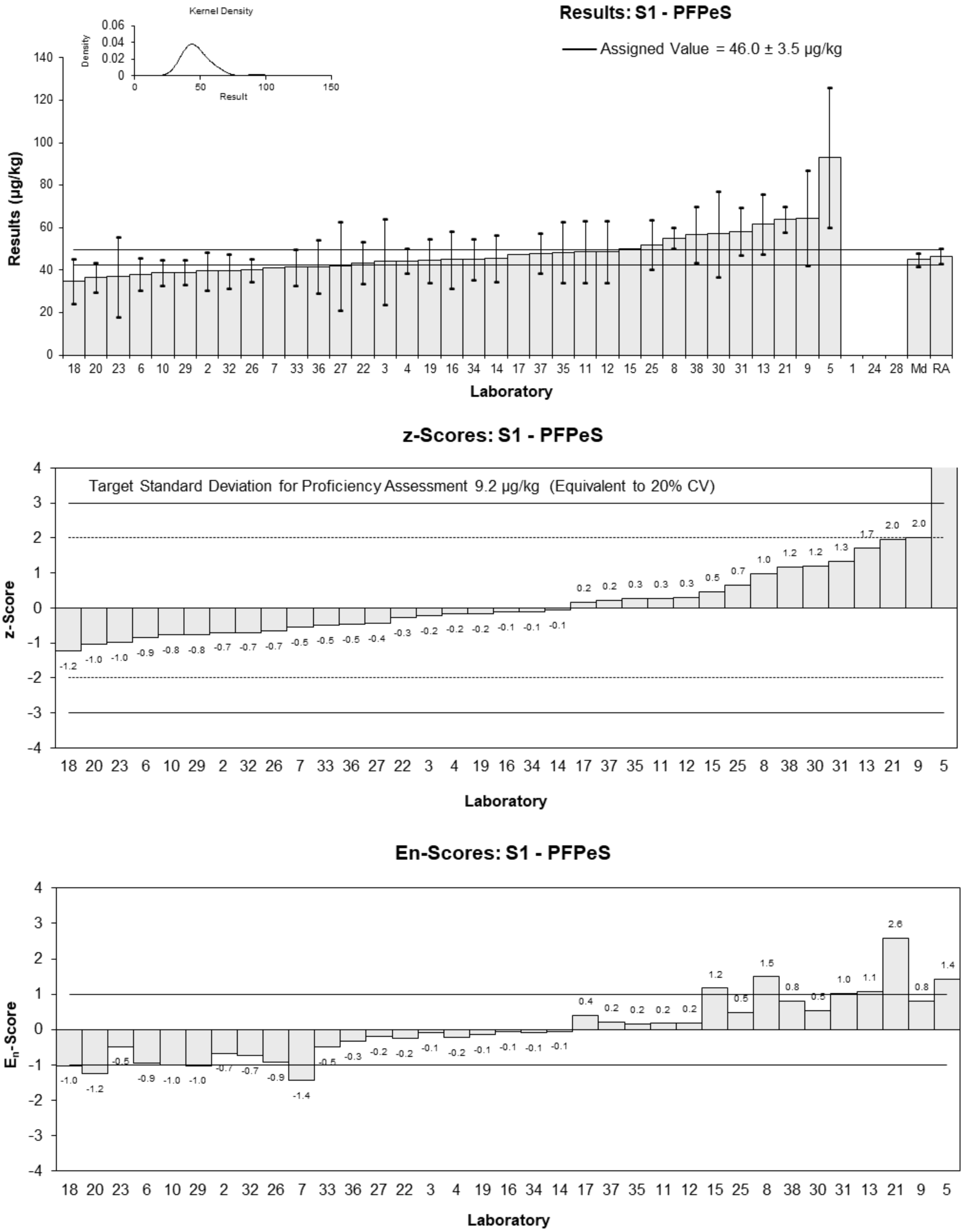
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	39.52	9.090	NR	-0.70	-0.67
3	44	20	93	-0.22	-0.10
4	44.4	6	NR	-0.17	-0.23
5*	93	33	NR	5.11	1.42
6	38.1	7.6	115	-0.86	-0.94
7	41	NR	NR	-0.54	-1.43
8	55	4.93	79	0.98	1.49
9	64.58	22.603	59	2.02	0.81
10	38.8	6.21	43.2	-0.78	-1.01
11	48.580	14.57	87	0.28	0.17
12	48.7	14.6	52	0.29	0.18
13	61.7	14.2	NR	1.71	1.07
14	45.42	11	99	-0.06	-0.05
15	50.1028	NR	91	0.45	1.17
16	45.0	13.5	92	-0.11	-0.07
17	47.37	NR	NR	0.15	0.39
18	34.8	10.44	91	-1.22	-1.02
19	44.5	10.3	121	-0.16	-0.14
20	36.42	6.92	50	-1.04	-1.24
21	64	6.0	NR	1.96	2.59
22	43.5	10	NR	-0.27	-0.24
23	36.9	18.8	NR	-0.99	-0.48
24	NS	NS	NS		
25	52	11.8	NR	0.65	0.49
26	40	5.5	104	-0.65	-0.92
27	42	21	NR	-0.43	-0.19
28	NT	NT	NT		
29	39	5.9	NR	-0.76	-1.02
30	57	20	89	1.20	0.54
31	58.2	11.3	132.48	1.33	1.03
32	39.6	8.08	88.5	-0.70	-0.73
33	41.4	8.61	77	-0.50	-0.49
34	45	9.63	108.61	-0.11	-0.10
35	48.4	14.5	90	0.26	0.16
36	41.6	12.5	84	-0.48	-0.34
37	48	9.6	NR	0.22	0.20
38	56.7746	13.0582	81	1.17	0.80

* Outlier, see Section 4.2

Statistics

Assigned Value	46.0	3.5
Spike Value	Not Spiked	
Robust Average	46.5	3.6
Median	45.0	3.2
Mean	47.8	
N	35	
Max	93	
Min	34.8	
Robust SD	8.5	
Robust CV	18%	



Results: S1 - PFPeS
Assigned Value = 46.0 ± 3.5 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFPeS
Target Standard Deviation for Proficiency Assessment 9.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFPeS
E_n-Score
Laboratory

Figure 3

Table 8

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NT	NT	NT		
3	290	1	93	-0.17	-0.59
4	340.3	35	76	0.67	1.04
5	406	140	NR	1.77	0.75
6	273	54.6	95	-0.45	-0.47
7	330	NR	102	0.50	1.76
8	318	18	79	0.30	0.73
9	412.05	144.218	84	1.87	0.77
10	234.9	28.2	43.2	-1.08	-1.98
11	355.108	106.53	79	0.92	0.51
12	324.3	97.3	52	0.41	0.25
13	150.6	30.1	89	-2.49	-4.32
14	307.75	50	108	0.13	0.15
15	NT	NT	NT		
16	302	90.6	89	0.03	0.02
17	303.5	NR	NR	0.06	0.21
18	209	62.7	81	-1.52	-1.40
19	272	58	121	-0.47	-0.46
20	274.56	63.15	50	-0.42	-0.39
21	290	60.0	NR	-0.17	-0.16
22	300	69	NR	0.00	0.00
23	324.1	165.3	73.5	0.40	0.15
24	NS	NS	NS		
25	310	74	89	0.17	0.13
26	290	69	103	-0.17	-0.14
27	250	125	85	-0.83	-0.40
28*	140	13	48	-2.67	-7.48
29	270	41	103	-0.50	-0.68
30	340	90	89	0.67	0.44
31	301	66	132.48	0.02	0.01
32	279	55.8	95.29	-0.35	-0.36
33	286	49.5	82	-0.23	-0.27
34	268	26.91	108.61	-0.53	-1.01
35	309	93	95	0.15	0.10
36	276	82.7	91	-0.40	-0.28
37	320	64	NR	0.33	0.30
38	354.0074	81.4217	97	0.90	0.65

* Outlier, see Section 4.2

Statistics

Assigned Value	300	17
Spike Value	Not Spiked	
Robust Average	298	18
Median	301	16
Mean	294	
N	34	
Max	412.05	
Min	140	
Robust SD	41	
Robust CV	14%	

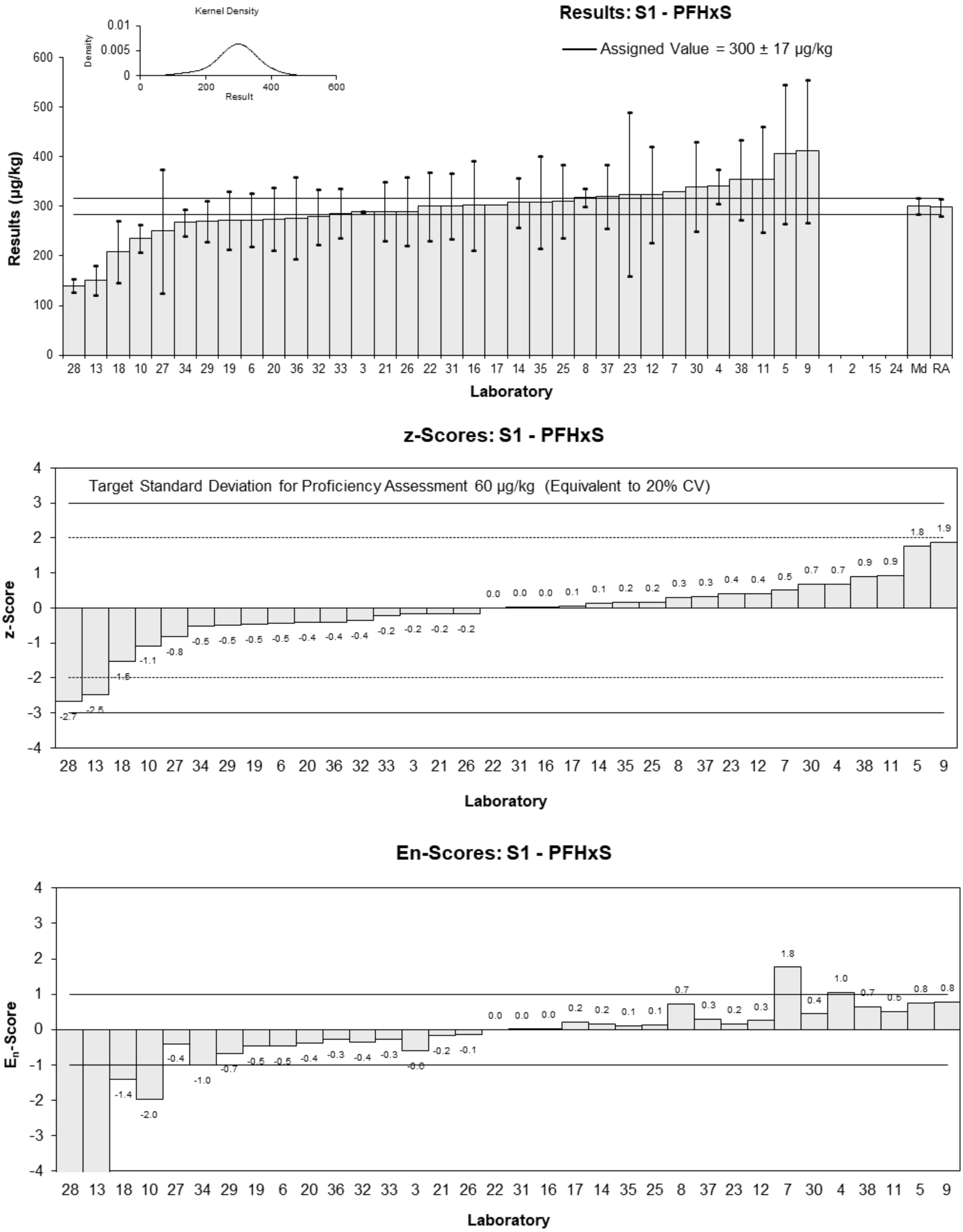

Results: S1 - PFHxS
Assigned Value = 300 ± 17 μg/kg
Kernel Density
Density
Result
Results (μg/kg)
Laboratory
z-Scores: S1 - PFHxS
Target Standard Deviation for Proficiency Assessment 60 μg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFHxS
E_n-Score
Laboratory

Figure 4

Table 9

Sample Details

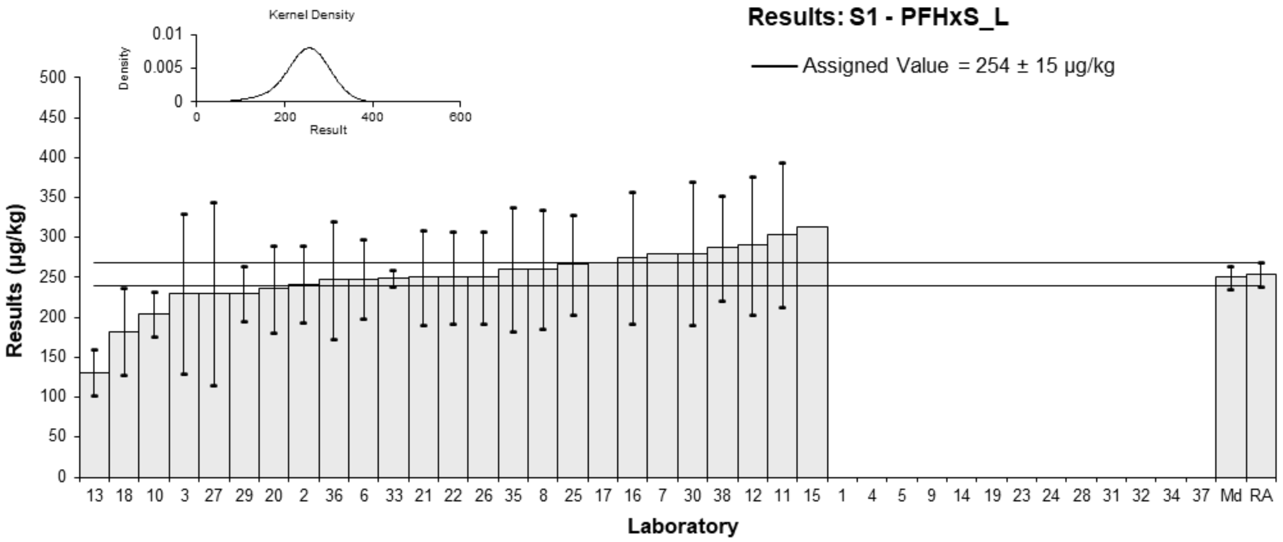
Sample No.	S1
Matrix	Soil
Analyte	PFHxS_L
Unit	µg/kg

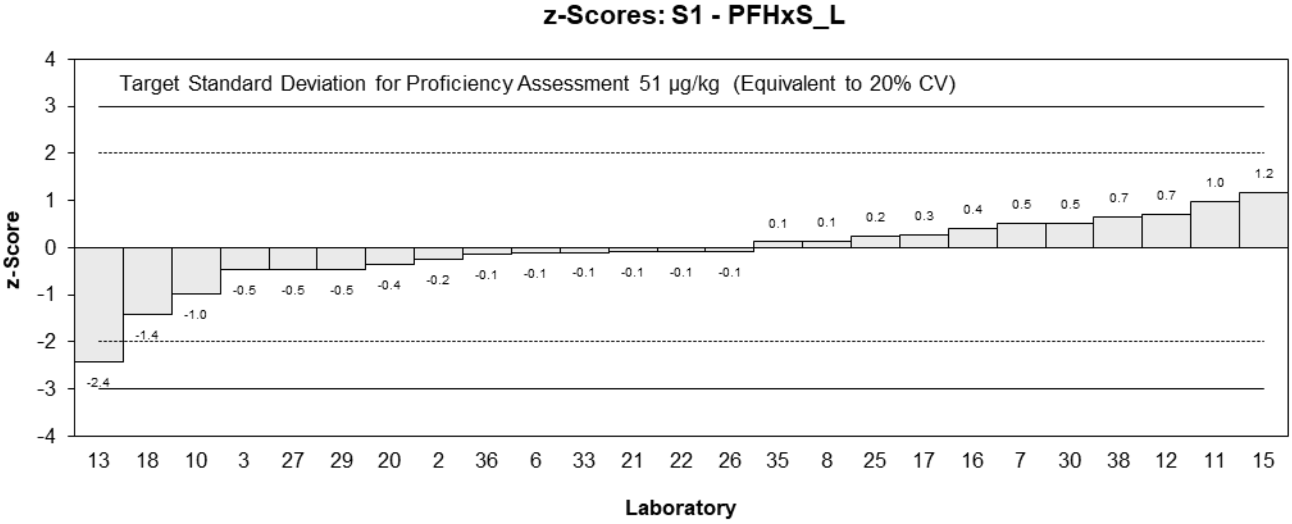
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	241.7	48.34	NR	-0.24	-0.24
3	230	100	93	-0.47	-0.24
4	NR	NR	NR		
5	NT	NT	NT		
6	247.7	49.5	95	-0.12	-0.12
7	280	NR	NR	0.51	1.73
8	261	74.4	79	0.14	0.09
9	NR	NR	NR		
10	203.8	28.2	43.2	-0.99	-1.57
11	303.686	91.11	72	0.98	0.54
12	290	87	52	0.71	0.41
13	131.2	28.9	NR	-2.42	-3.77
14	NT	NT	NT		
15	312.7705	NR	95	1.16	3.92
16	275	82.5	89	0.41	0.25
17	268.4	NR	NR	0.28	0.96
18	182	54.6	81	-1.42	-1.27
19	NT	NR	NT		
20	235.83	54.24	50	-0.36	-0.32
21	250	60.0	NR	-0.08	-0.06
22	250	58	NR	-0.08	-0.07
23	NT	NT	NT		
24	NS	NS	NS		
25	266	63	NR	0.24	0.19
26	250	58	103	-0.08	-0.07
27	230	115	NR	-0.47	-0.21
28	NT	NT	NT		
29	230	35	103	-0.47	-0.63
30	280	90	89	0.51	0.28
31	NT	NT	NT		
32	NT	NT	NT		
33	249	10.3	82	-0.10	-0.27
34	NT	NT	NT		
35	260	78	95	0.12	0.08
36	247	74	91	-0.14	-0.09
37	NT	NT	NT		
38	287.1000	66.0330	NR	0.65	0.49

Statistics

Assigned Value	254	15
Spike Value	Not Spiked	
Robust Average	254	15
Median	250	15
Mean	250	
N	25	
Max	312.7705	
Min	131.2	
Robust SD	31	
Robust CV	12%	


Results: S1 - PFHxS_L
Assigned Value = 254 ± 15 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
13 18 10 3 27 29 20 2 36 6 33 21 22 26 35 8 25 17 16 7 30 38 12 11 15 1 4 5 9 14 19 23 24 28 31 32 34 37 Md RA


z-Scores: S1 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 51 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
13 18 10 3 27 29 20 2 36 6 33 21 22 26 35 8 25 17 16 7 30 38 12 11 15

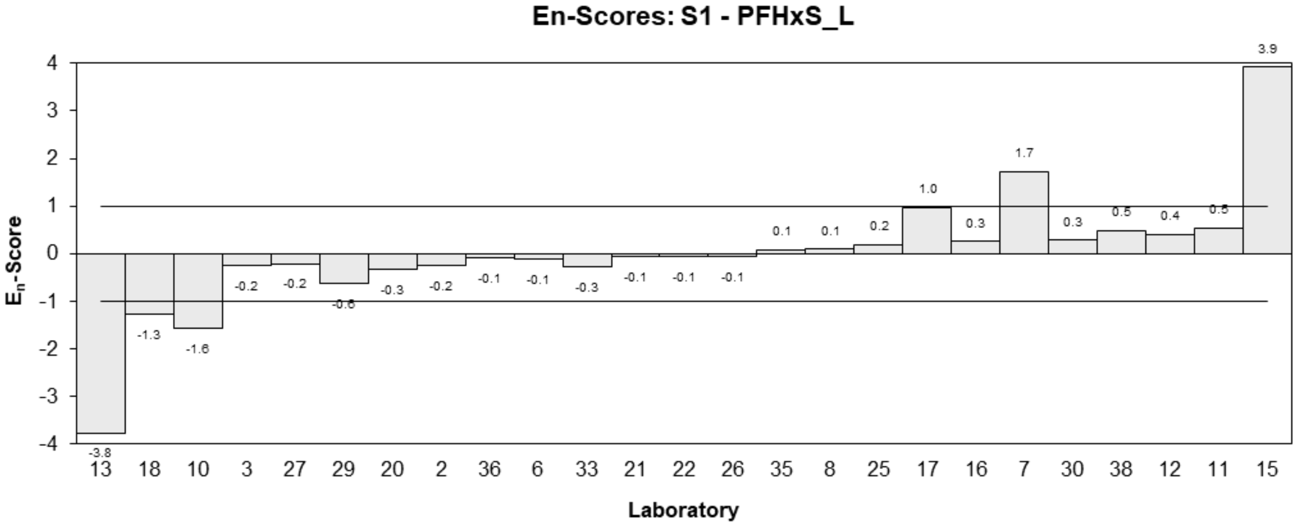

En-Scores: S1 - PFHxS_L
En-Score
Laboratory
13 18 10 3 27 29 20 2 36 6 33 21 22 26 35 8 25 17 16 7 30 38 12 11 15

Figure 5

Table 10

Sample Details

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

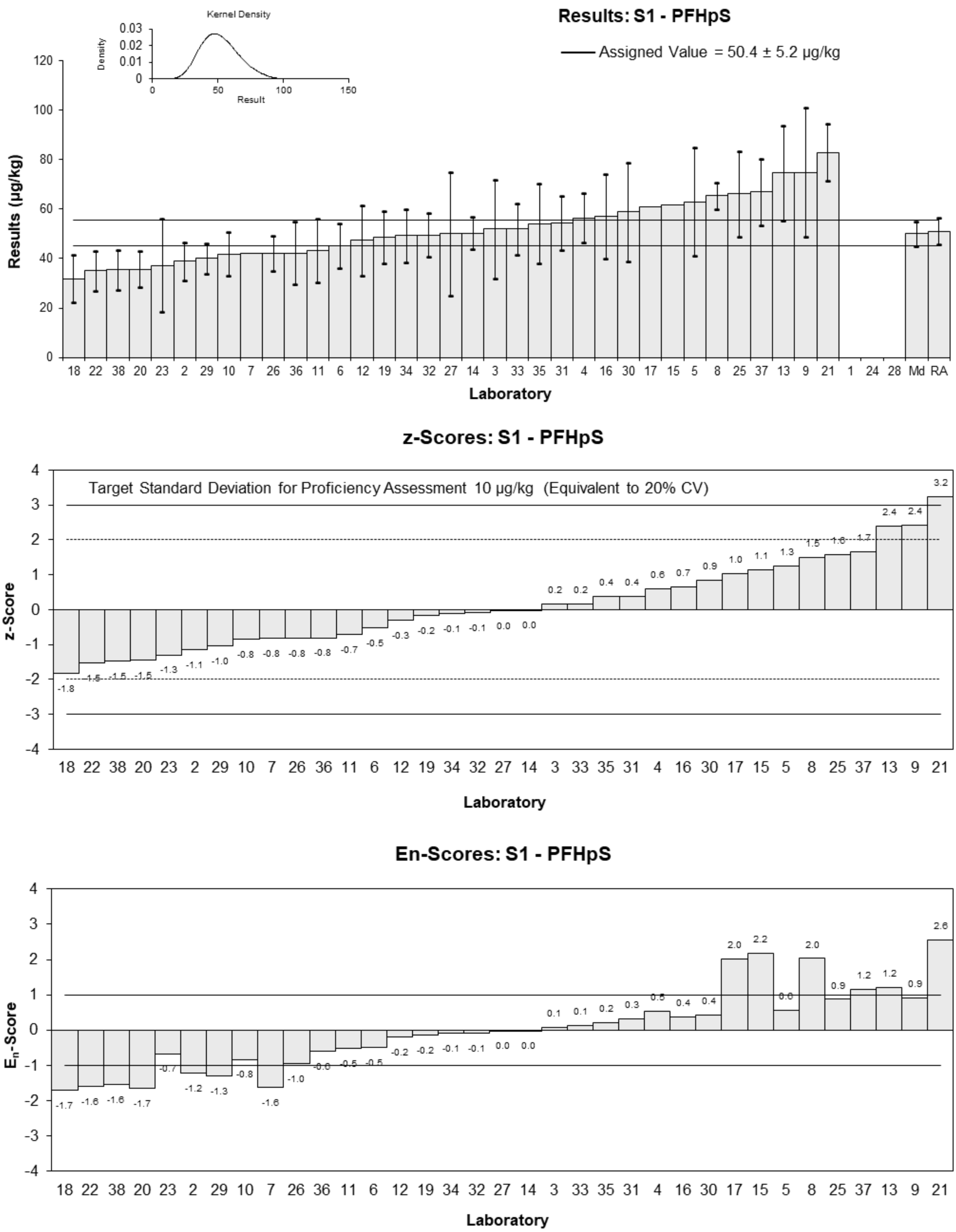
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	38.92	7.784	NR	-1.14	-1.23
3	52	20	93	0.16	0.08
4	56.4	10	NR	0.60	0.53
5	63	22	NR	1.25	0.56
6	45.2	9	95	-0.52	-0.50
7	42	NR	NR	-0.83	-1.62
8	65.5	5.34	79	1.50	2.03
9	74.91	26.219	59	2.43	0.92
10	41.9	8.82	60	-0.84	-0.83
11	43.166	12.95	66	-0.72	-0.52
12	47.4	14.2	56	-0.30	-0.20
13	74.6	19.4	NR	2.40	1.20
14	50.25	6.5	108	-0.01	-0.02
15	61.8012	NR	75	1.13	2.19
16	57.1	17.1	NR	0.66	0.37
17	60.84	NR	NR	1.04	2.01
18	31.9	9.57	81	-1.84	-1.70
19	48.6	10.7	73	-0.18	-0.15
20	35.75	7.15	50	-1.45	-1.66
21*	83	11.6	NR	3.23	2.56
22	35	8.1	NR	-1.53	-1.60
23	37.3	19	NR	-1.30	-0.67
24	NS	NS	NS		
25	66.2	17.4	NR	1.57	0.87
26	42	7.1	103	-0.83	-0.95
27	50	25	NR	-0.04	-0.02
28	NT	NT	NT		
29	40	6.0	NR	-1.03	-1.31
30	59	20	90	0.85	0.42
31	54.3	11.0	111.09	0.39	0.32
32	49.6	8.89	95.29	-0.08	-0.08
33	52.0	10.3	101	0.16	0.14
34	49.3	10.75	108.61	-0.11	-0.09
35	54.2	16.3	95	0.38	0.22
36	42.2	12.7	83	-0.81	-0.60
37	67	13.4	NR	1.65	1.15
38	35.4403	8.1513	97	-1.48	-1.55

* Outlier, see Section 4.2

Statistics

Assigned Value	50.4	5.2
Spike Value	Not Spiked	
Robust Average	51.0	5.4
Median	50.0	5.1
Mean	51.7	
N	35	
Max	83	
Min	31.9	
Robust SD	13	
Robust CV	25%	



Results: S1 - PFHpS
Assigned Value = 50.4 ± 5.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFHpS
Target Standard Deviation for Proficiency Assessment 10 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFHpS
E_n-Score
Laboratory

Figure 6

Table 11

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	3542	885.5	NR	-0.52	-0.43
3	3000	1000	105	-1.20	-0.91
4	4441	500	100	0.62	0.83
5*	802	280	NR	-3.98	-7.54
6	3338.4	667.7	29	-0.77	-0.83
7	4000	2300	100	0.06	0.02
8	3573	788	81	-0.48	-0.45
9	4128	1444.8	84	0.23	0.12
10	3273	523	60	-0.86	-1.11
11	3724.904	1117.47	66	-0.28	-0.19
12	4038	1211.4	86	0.11	0.07
13*	1884	377	32	-2.62	-4.23
14	3878.13	642	101	-0.09	-0.10
15	3627.9906	NR	90	-0.41	-1.04
16	3567	1070	101	-0.48	-0.34
17	5157	NR	NR	1.53	3.89
18**	46700	14010	61	54.11	3.05
19	3810	891	73	-0.18	-0.15
20	4235.99	847.20	18	0.36	0.32
21	3900	400.0	NR	-0.06	-0.10
22**	160	37	NR	-4.80	-12.14
23	5377	2742	120	1.81	0.52
24	NS	NS	NS		
25	4728	1206	89	0.98	0.62
26	4800	1500	90	1.08	0.55
27	5200	2600	112	1.58	0.48
28	2020	320	47	-2.44	-4.33
29	3500	520	106	-0.57	-0.74
30	3900	1200	90	-0.06	-0.04
31	3860	841	111.32	-0.11	-0.10
32	3590	718	96.33	-0.46	-0.46
33	3100	916	101	-1.08	-0.88
34	3930	552	98.27	-0.03	-0.03
35	4620	1390	93	0.85	0.47
36	3410	102	94	-0.68	-1.65
37	NR	NR	NR		
38	4975.0744	1144.2671	79	1.30	0.86

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	3950	310
Spike Value	Not Spiked	
Robust Average	3870	340
Median	3860	240
Mean	3790	
N	33	
Max	5377	
Min	802	
Robust SD	770	
Robust CV	20%	

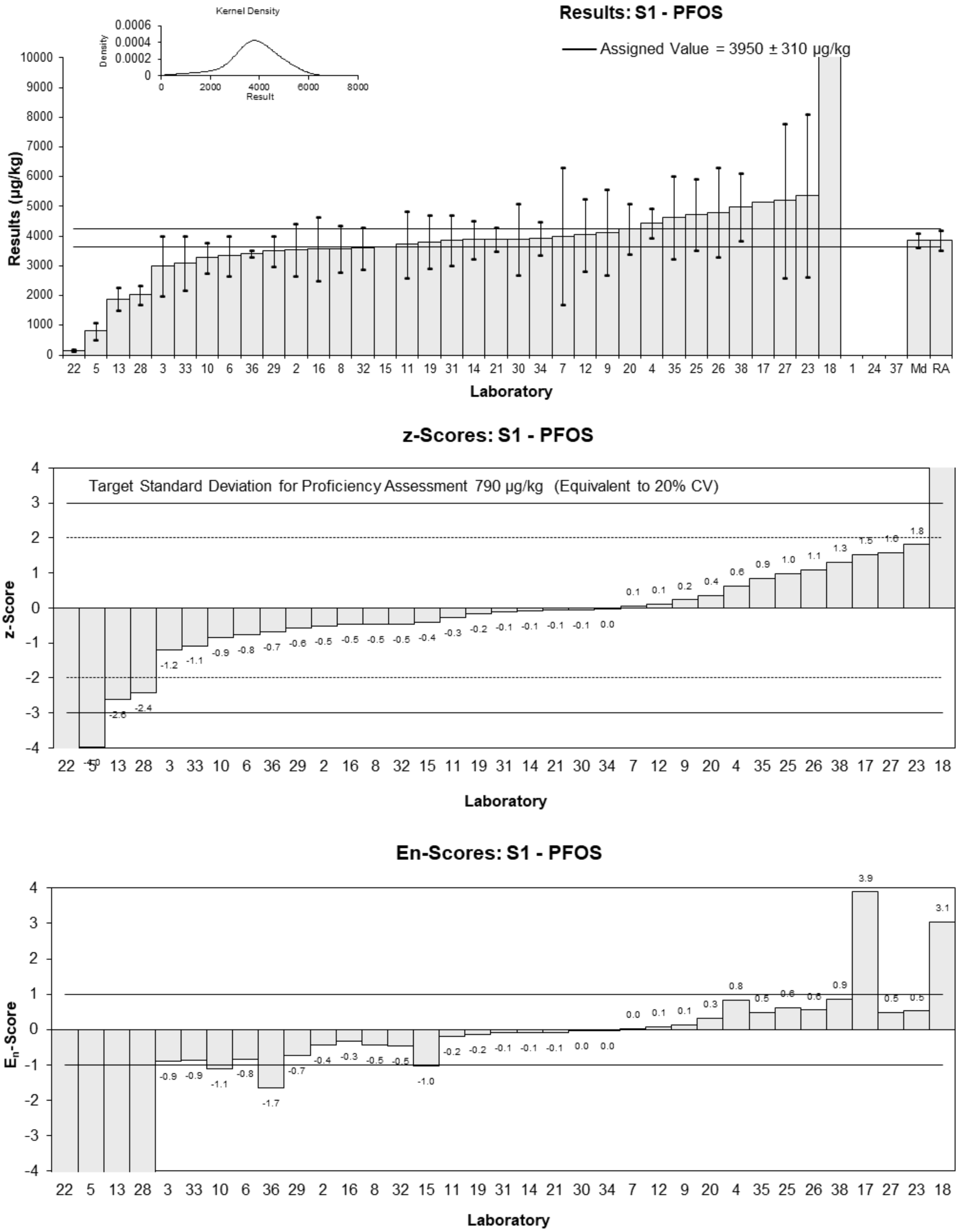

Results: S1 - PFOS
Assigned Value = 3950 ± 310 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFOS
Target Standard Deviation for Proficiency Assessment 790 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFOS
E_n-Score
Laboratory

Figure 7

Table 12

Sample Details

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

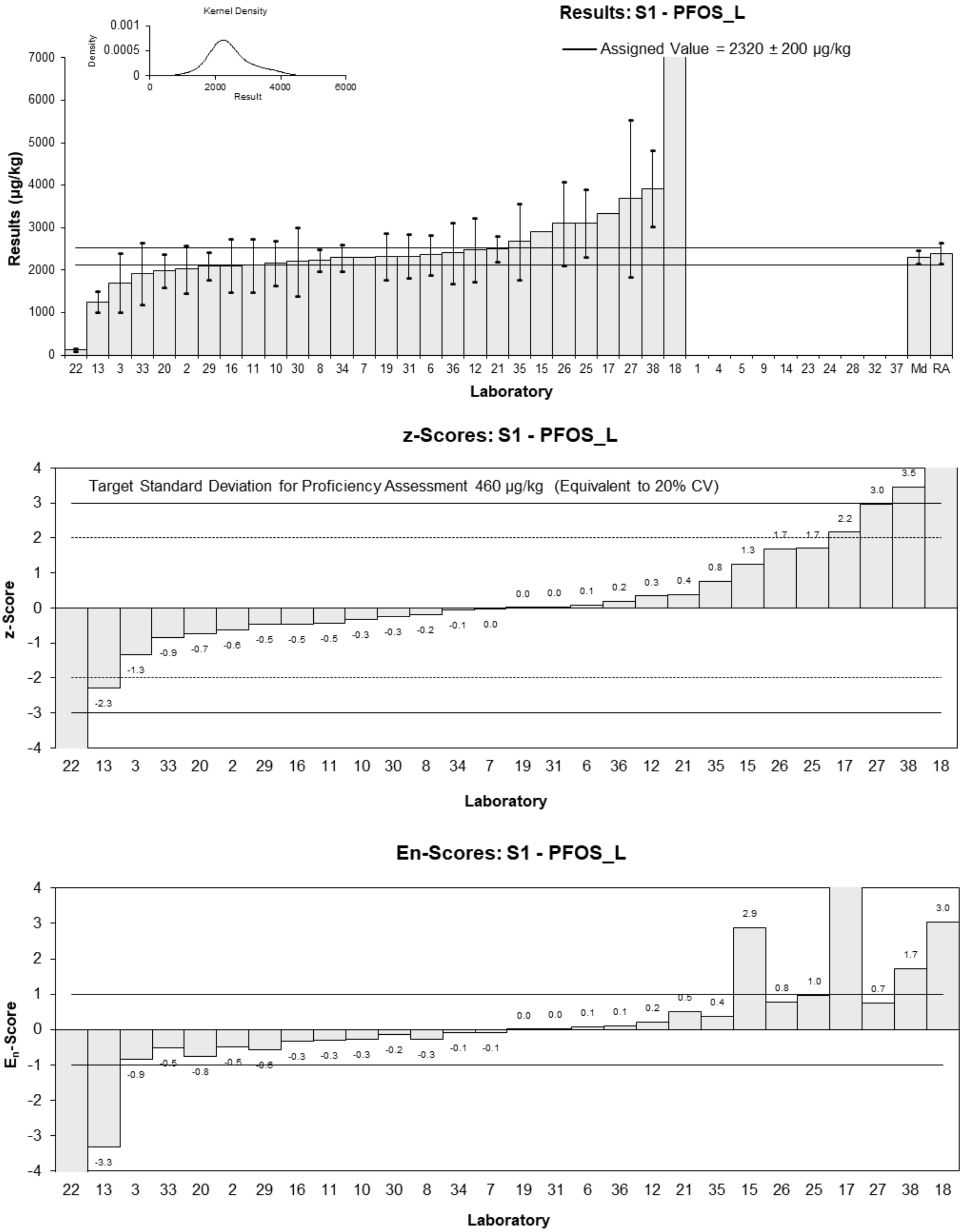
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	2024	566.7	NR	-0.64	-0.49
3	1700	700	105	-1.34	-0.85
4	NR	NR	NR		
5	NT	NT	NT		
6	2360.1	472	29	0.09	0.08
7	2300	NR	NR	-0.04	-0.10
8	2228	254	81	-0.20	-0.28
9	NR	NR	NR		
10	2162	523	60	-0.34	-0.28
11	2111.369	633.41	60	-0.45	-0.31
12	2480	744	79	0.34	0.21
13	1255	251	NR	-2.30	-3.32
14	NT	NT	NT		
15	2897.8269	NR	90	1.25	2.89
16	2106	632	101	-0.46	-0.32
17	3323	NR	NR	2.16	5.01
18**	26100	7830	61	51.25	3.04
19	2324	543	73	0.01	0.01
20	1979.24	395.85	18	-0.73	-0.77
21	2500	300.0	NR	0.39	0.50
22**	125	29	NR	-4.73	-10.86
23	NT	NT	NT		
24	NS	NS	NS		
25	3111	793	NR	1.70	0.97
26	3100	990	90	1.68	0.77
27*	3700	1850	NR	2.97	0.74
28	NT	NT	NT		
29	2100	320	106	-0.47	-0.58
30	2200	800	90	-0.26	-0.15
31	2330	508	111.32	0.02	0.02
32	NT	NT	NT		
33	1920	732	101	-0.86	-0.53
34	2290	322	98.27	-0.06	-0.08
35	2670	900	93	0.75	0.38
36	2404	721	94	0.18	0.11
37	NT	NT	NT		
38*	3920.3586	901.6825	NR	3.45	1.73

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	2320	200
Spike Value	Not Spiked	
Robust Average	2400	250
Median	2310	150
Mean	2440	
N	26	
Max	3920.3586	
Min	1255	
Robust SD	520	
Robust CV	22%	



Results: S1 - PFOS_L
Assigned Value = 2320 ± 200 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFOS_L
Target Standard Deviation for Proficiency Assessment 460 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFOS_L
E_n-Score
Laboratory

Figure 8

Table 13

Sample Details

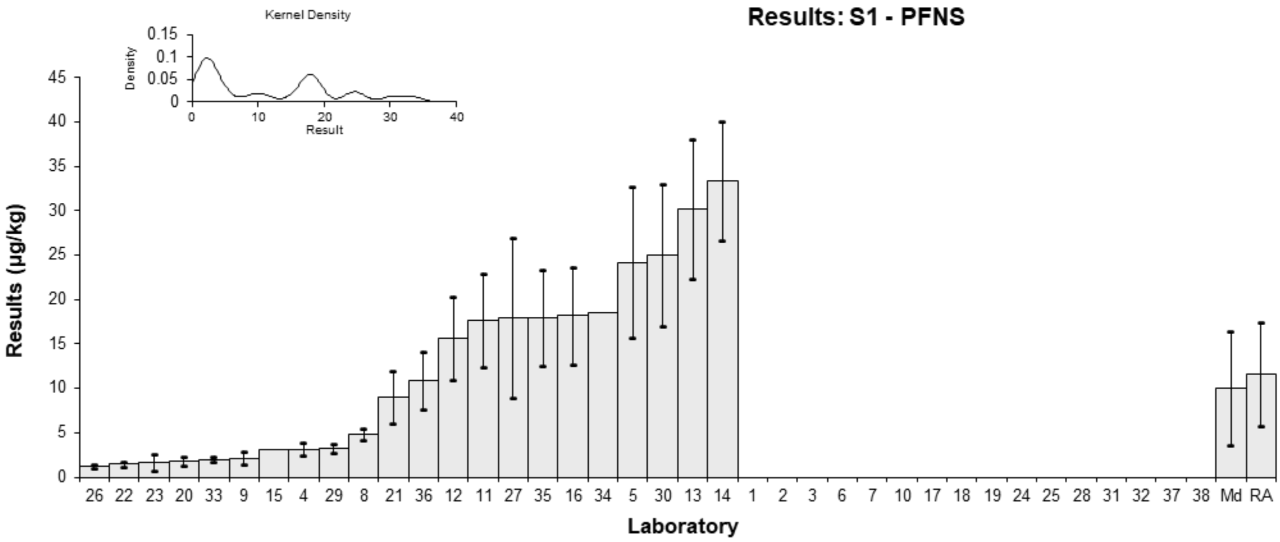
Sample No.	S1
Matrix	Soil
Analyte	PFNS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NT	NT	NT
3	NT	NT	NT
4	3.15	0.75	NR
5	24.2	8.5	NR
6	<10	NR	29
7	<0.5	NR	NR
8	4.86	0.63	81
9	2.144	0.75	59
10	<1.80	0.42	60
11	17.667	5.30	66
12	15.7	4.7	87
13	30.2	7.9	NR
14	33.38	6.7	68
15	3.1372	NR	53
16	18.22	5.47	NR
17	NT	NT	NT
18	< 2.5	NR	100
19	NT	NR	NT
20	1.80	0.45	18
21	9.0	2.9	NR
22	1.5	0.3	NR
23	1.69	0.9	NR
24	NS	NS	NS
25	<1	NR	NR
26	1.2	0.19	90
27	18	9	NR
28	NT	NT	NT
29	3.2	0.5	NR
30	25	8	90
31	NT	NT	NT
32	NT	NT	NT
33	2.01	0.333	101
34	18.6	NR	98.27
35	18.0	5.4	93
36	10.9	3.3	85
37	NT	NT	NT
38	<5	NR	79

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	11.6	5.8
Median	10.0	6.4
Mean	12.0	
N	22	
Max	33.38	
Min	1.2	
Robust SD	11	
Robust CV	94%	



Results: S1 - PFNS
Kernel Density
Density
0.15
0.1
0.05
0
0
10
20
30
40
Result
Results (µg/kg)
45
40
35
30
25
20
15
10
5
0
26 22 23 20 33 9 15 4 29 8 21 36 12 11 27 35 16 34 5 30 13 14 1 2 3 6 7 10 17 18 19 24 25 28 31 32 37 38 Md RA
Laboratory

Figure 9

Table 14

Sample Details

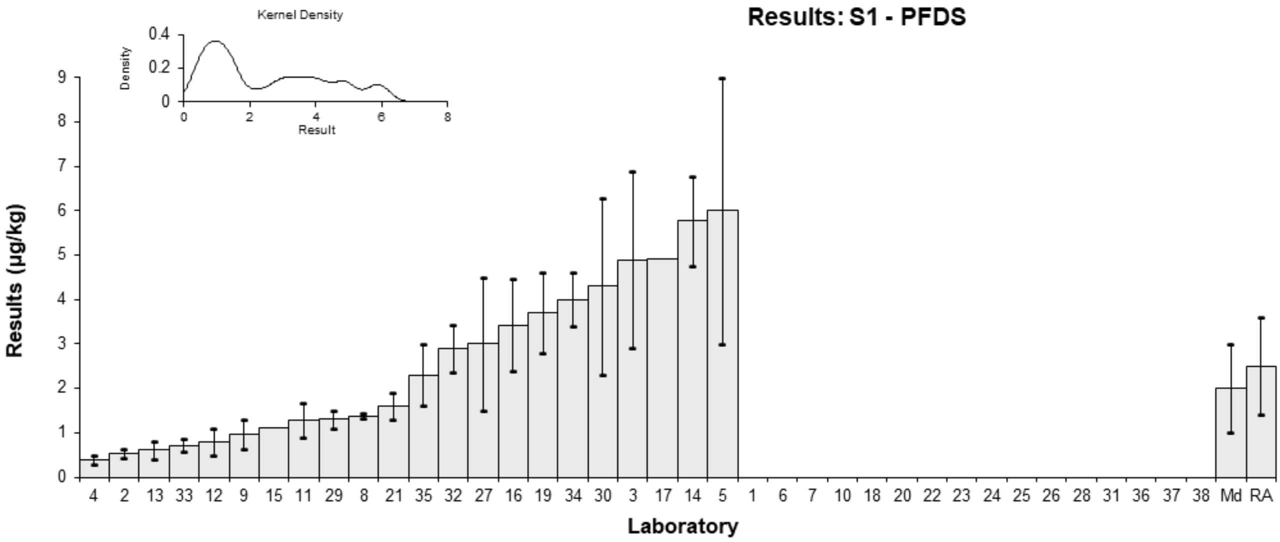
Sample No.	S1
Matrix	Soil
Analyte	PFDS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	0.5425	0.09765	NR
3	4.9	2	87
4	0.391	0.1	NR
5	6.00	3	NR
6	<1	NR	29
7	<0.5	NR	NR
8	1.38	0.05	81
9	0.967	0.338	59
10	<1.80	0.63	60
11	1.281	0.38	66
12	0.8	0.3	110
13	0.61	0.2	NR
14	5.77	1	63
15	1.1142	NR	75
16	3.43	1.03	NR
17	4.908	NR	NR
18	< 2.5	NR	97
19	3.7	0.9	73
20	<1	NR	18
21	1.6	0.3	NR
22	<1	NR	NR
23	< 0.1	NR	NR
24	NS	NS	NS
25	<1	NR	NR
26	< 1.0	NR	90
27	3	1.5	NR
28	NT	NT	NT
29	1.3	0.2	NR
30	4.3	2	90
31	<4.9	NR	111.32
32	2.9	0.53	101.94
33	0.709	0.145	101
34	4	0.61	98.27
35	2.30	0.69	93
36	<0.5	NR	88
37	NT	NT	NT
38	<5	NR	79

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	2.5	1.1
Median	2.0	1.0
Mean	2.54	
N	22	
Max	6	
Min	0.391	
Robust SD	2.0	
Robust CV	80%	



Results: S1 - PFDS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
4 2 13 33 12 9 15 11 29 8 21 35 32 27 16 19 34 30 3 17 14 5 1 6 7 10 18 20 22 23 24 25 26 28 31 36 37 38 Md RA

Figure 10

Table 15

Sample Details

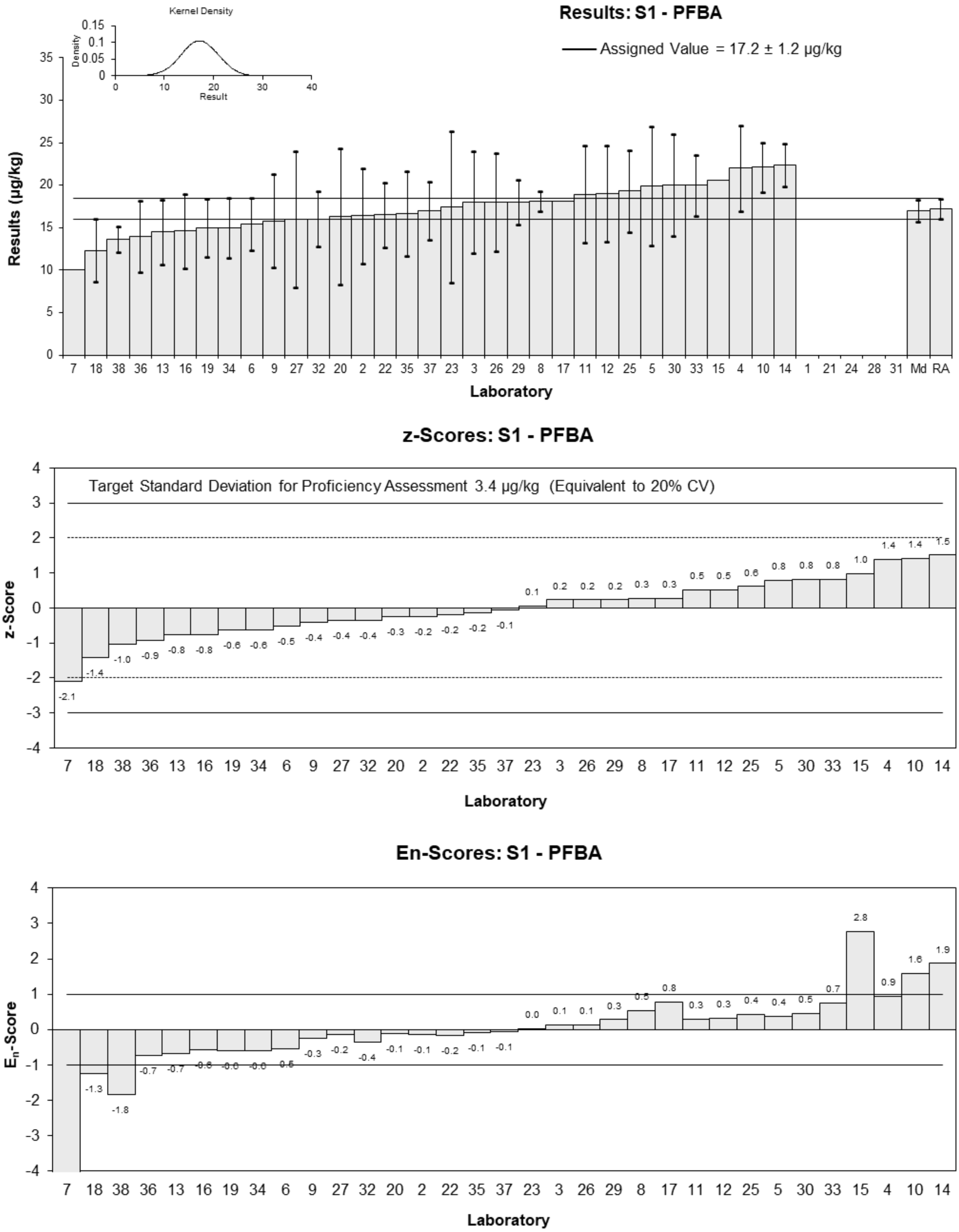
Sample No.	S1
Matrix	Soil
Analyte	PFBA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	16.39	5.573	NR	-0.24	-0.14
3	18	6	88	0.23	0.13
4	21.983	5	85	1.39	0.93
5	19.9	7	NR	0.78	0.38
6	15.4	3.1	110	-0.52	-0.54
7	10	NR	100	-2.09	-6.00
8	18.1	1.15	72	0.26	0.54
9	15.8	5.53	96	-0.41	-0.25
10	22.1	2.87	14	1.42	1.58
11	18.938	5.68	62	0.51	0.30
12	19	5.7	64	0.52	0.31
13	14.5	3.8	86	-0.78	-0.68
14	22.38	2.5	109	1.51	1.87
15	20.5386	NR	95	0.97	2.78
16	14.6	4.37	96	-0.76	-0.57
17	18.12	NR	NR	0.27	0.77
18	12.3	3.69	95	-1.42	-1.26
19	15	3.4	124	-0.64	-0.61
20	16.33	8.00	53	-0.25	-0.11
21	NT	NT	NT		
22	16.5	3.8	NR	-0.20	-0.18
23	17.4	8.9	95.5	0.06	0.02
24	NS	NS	NS		
25	19.3	4.8	102	0.61	0.42
26	18	5.8	111	0.23	0.14
27	16	8	111	-0.35	-0.15
28	NT	NT	NT		
29	18	2.6	120	0.23	0.28
30	20	6	92	0.81	0.46
31	<24	NR	139.95		
32	16	3.24	111.76	-0.35	-0.35
33	20.0	3.58	86	0.81	0.74
34	15	3.51	133.98	-0.64	-0.59
35	16.7	5.0	87	-0.15	-0.10
36	14	4.2	81	-0.93	-0.73
37	17	3.4	NR	-0.06	-0.06
38	13.6618	1.5028	104	-1.03	-1.84

Statistics

Assigned Value	17.2	1.2
Spike Value	Not Spiked	
Robust Average	17.2	1.2
Median	17.0	1.3
Mean	17.2	
N	33	
Max	22.38	
Min	10	
Robust SD	2.8	
Robust CV	16%	



Results: S1 - PFBA
Assigned Value = 17.2 ± 1.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
7 18 38 36 13 16 19 34 6 9 27 32 20 2 22 35 37 23 3 26 29 8 17 11 12 25 5 30 33 15 4 10 14 1 21 24 28 31 Md RA
z-Scores: S1 - PFBA
Target Standard Deviation for Proficiency Assessment 3.4 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFBA
En-Score
Laboratory

Figure 11

Table 16

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	25.46	8.402	NR	-0.20	-0.12
3	27	10	84	0.09	0.05
4	33.542	5	91	1.33	1.35
5*	41	14	NR	2.74	1.03
6	23.9	4.8	111	-0.49	-0.52
7	26	NR	104	-0.09	-0.33
8	30.4	1.39	75	0.74	1.91
9	22.75	7.9625	98	-0.71	-0.46
10	29.7	4.16	18.2	0.60	0.72
11	30.346	9.10	74	0.73	0.42
12	29.1	8.7	61	0.49	0.29
13	24.6	6.2	93	-0.36	-0.30
14	30.69	5	104	0.79	0.80
15	30.3388	NR	96	0.72	2.56
16	23.1	6.93	99	-0.64	-0.48
17	25.35	NR	NR	-0.22	-0.77
18	20.6	6.18	94	-1.11	-0.93
19	23.9	4.6	118	-0.49	-0.54
20	23.73	6.65	73	-0.52	-0.41
21	31	5.0	NR	0.85	0.86
22	24.5	5.6	NR	-0.38	-0.34
23	30.9	15.8	96.5	0.83	0.28
24	NS	NS	NS		
25	26.5	5.3	95	0.00	0.00
26	27	3.6	103	0.09	0.13
27	23	12	107	-0.66	-0.29
28	NT	NT	NT		
29	24	3.5	103	-0.47	-0.66
30	29	9	96	0.47	0.27
31	23.5	4.5	120.11	-0.57	-0.63
32	22.2	3.34	79.21	-0.81	-1.17
33	29.0	7.23	89	0.47	0.34
34	28	3.73	97.01	0.28	0.37
35	27.4	8.2	89	0.17	0.11
36	25.7	7.7	85	-0.15	-0.10
37	26	5.2	NR	-0.09	-0.09
38	23.5375	2.5891	106	-0.56	-0.99

* Outlier, see Section 4.2

Statistics

Assigned Value	26.5	1.5
Spike Value	Not Spiked	
Robust Average	26.7	1.5
Median	26.0	1.6
Mean	26.9	
N	35	
Max	41	
Min	20.6	
Robust SD	3.6	
Robust CV	13%	

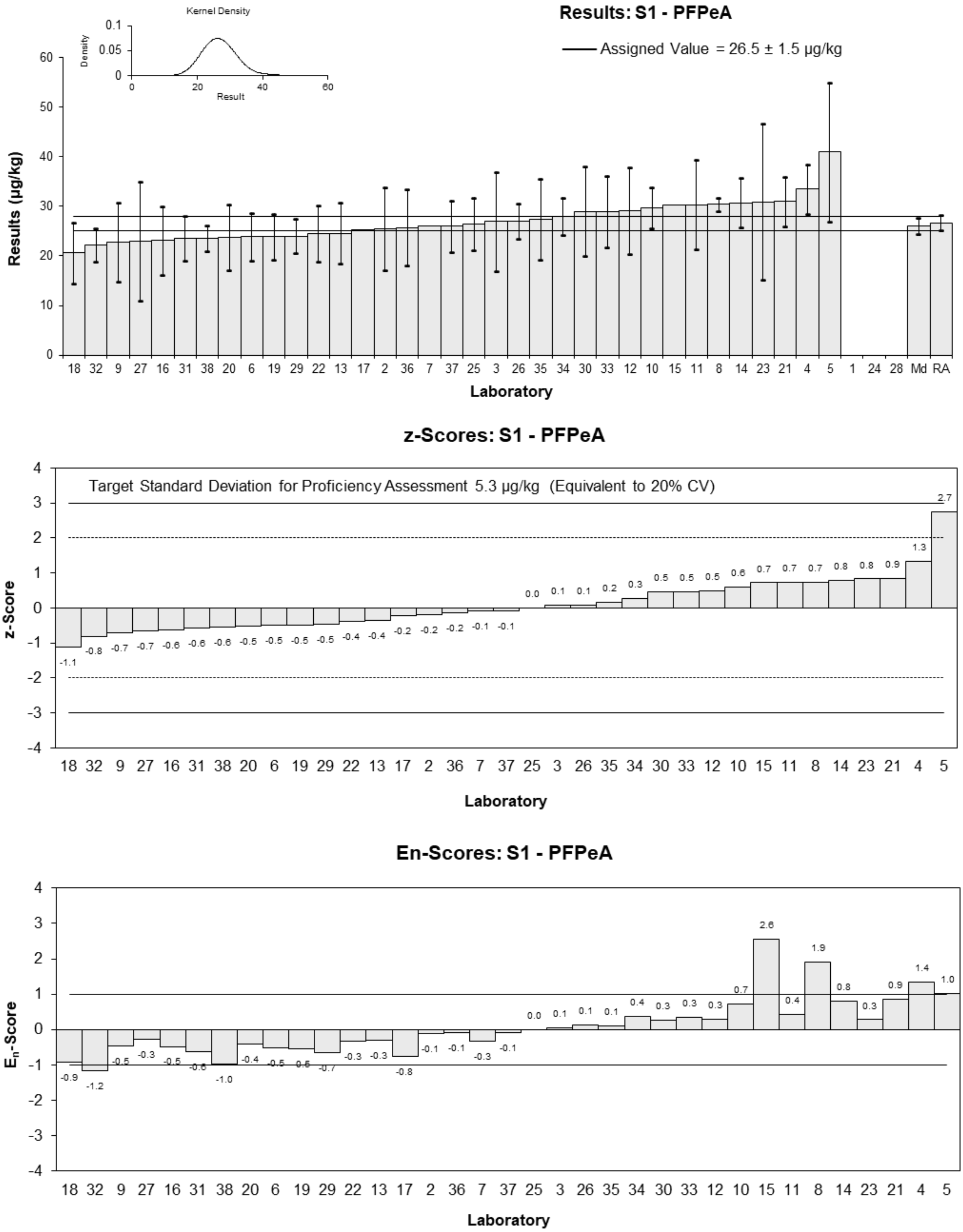

Kernel Density
Density
Result
Results: S1 - PFPeA
Assigned Value = 26.5 ± 1.5 µg/kg
Results (µg/kg)
18 32 9 27 16 31 38 20 6 19 29 22 13 17 2 36 7 37 25 3 26 35 34 30 33 12 10 15 11 8 14 23 21 4 5 1 24 28 Md RA
Laboratory
z-Scores: S1 - PFPeA
Target Standard Deviation for Proficiency Assessment 5.3 µg/kg (Equivalent to 20% CV)
z-Score
18 32 9 27 16 31 38 20 6 19 29 22 13 17 2 36 7 37 25 3 26 35 34 30 33 12 10 15 11 8 14 23 21 4 5
Laboratory
En-Scores: S1 - PFPeA
E_n-Score
18 32 9 27 16 31 38 20 6 19 29 22 13 17 2 36 7 37 25 3 26 35 34 30 33 12 10 15 11 8 14 23 21 4 5
Laboratory

Figure 12

Table 17

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	112.6	40.54	NR	-0.19	-0.11
3	110	40	100	-0.30	-0.17
4	141.06	30	85	1.03	0.78
5	131	46	NR	0.60	0.30
6	117.7	23.5	101	0.03	0.03
7	120	NR	92	0.13	0.43
8	139	7.45	68	0.94	2.15
9	110.2	38.57	98	-0.29	-0.17
10	91.8	13.8	19.4	-1.08	-1.63
11	118.675	35.60	85	0.07	0.05
12	124	37.2	62	0.30	0.18
13	72.2	15.9	106	-1.91	-2.58
14	138.31	12.5	110	0.91	1.49
15	130.274	NR	95	0.57	1.90
16	112.3	33.7	99	-0.20	-0.14
17	136.8	NR	NR	0.85	2.83
18	95.4	28.62	92	-0.92	-0.73
19	115	22	109	-0.09	-0.09
20	102.20	22.48	60	-0.63	-0.63
21	150	20.0	NR	1.41	1.56
22	99	23	NR	-0.77	-0.75
23	126.6	64.6	85	0.41	0.15
24	NS	NS	NS		
25	105	26	102	-0.51	-0.45
26	110	15	104	-0.30	-0.42
27	110	55	101	-0.30	-0.13
28*	56	4	61	-2.61	-7.57
29	99	15	97	-0.77	-1.09
30	130	40	84	0.56	0.32
31	128	26	122.77	0.47	0.41
32	120	17.05	104.78	0.13	0.16
33	135	23.9	90	0.77	0.72
34	114	14.52	104.01	-0.13	-0.19
35	110	33	88	-0.30	-0.21
36	113	34	96	-0.17	-0.12
37	120	24	NR	0.13	0.12
38	85.1553	9.3671	95	-1.36	-2.72

* Outlier, see Section 4.2

Statistics

Assigned Value	117	7
Spike Value	Not Spiked	
Robust Average	116	7
Median	115	8
Mean	115	
N	36	
Max	150	
Min	56	
Robust SD	17	
Robust CV	15%	

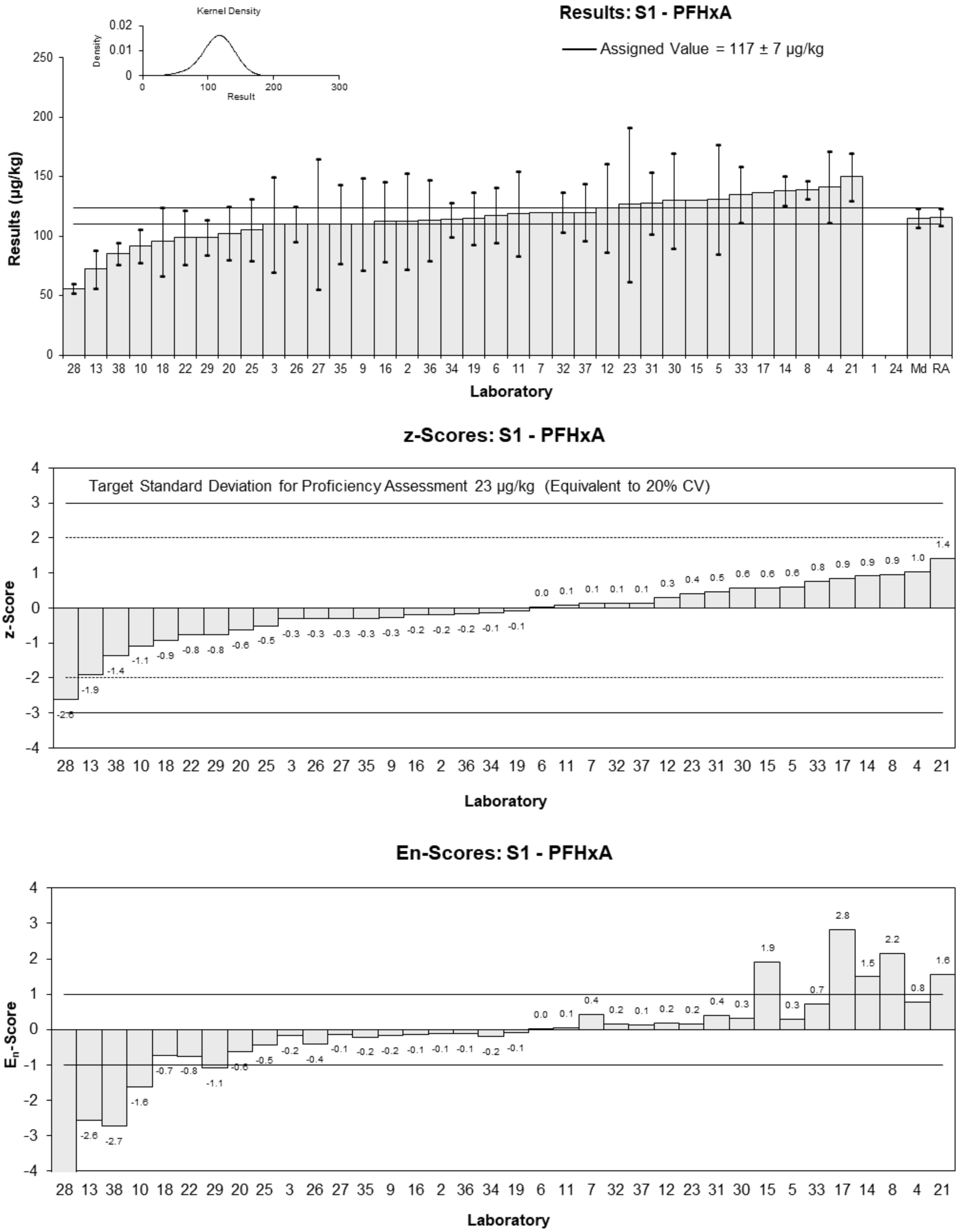

Kernel Density
Results: S1 - PFHxA
Assigned Value = 117 ± 7 µg/kg
Results (µg/kg)
Laboratory
z-Scores: S1 - PFHxA
Target Standard Deviation for Proficiency Assessment 23 µg/kg (Equivalent to 20% CV)
z-Score
En-Scores: S1 - PFHxA
En-Score

Figure 13

Table 18

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	13.34	5.336	NR	-0.61	-0.34
3	18	10	70	0.92	0.28
4*	23.33	3	66	2.67	2.57
5	17.6	6	NR	0.79	0.39
6	16.1	3.2	85	0.30	0.27
7	10	4	90	-1.71	-1.26
8	18.2	2.89	76	0.99	0.98
9	15.51	5.429	107	0.10	0.06
10	13.3	1.73	19.6	-0.62	-0.95
11	16.908	5.07	72	0.56	0.33
12	18.4	5.5	64	1.05	0.57
13	14.1	3.8	96	-0.36	-0.28
14	17.36	1.4	94	0.71	1.26
15	17.1143	NR	97	0.63	1.91
16	14.4	4.33	95	-0.26	-0.18
17	16.43	NR	NR	0.40	1.23
18	12.7	3.81	82	-0.82	-0.63
19	13.2	2.5	120	-0.66	-0.74
20	13.01	3.38	75	-0.72	-0.62
21	9.1	1.5	NR	-2.01	-3.38
22	15	3.5	NR	-0.07	-0.05
23	14.6	7.4	99.5	-0.20	-0.08
24	NS	NS	NS		
25	14.4	3.8	96	-0.26	-0.20
26	14	3.4	110	-0.39	-0.34
27	16	8	91	0.26	0.10
28	13	1	44	-0.72	-1.56
29	14	2	118	-0.39	-0.54
30	18	6	94	0.92	0.46
31	15.6	3.3	116.35	0.13	0.12
32	15.4	2.3	68.57	0.07	0.08
33	15.0	2.47	90	-0.07	-0.08
34	15	1.06	101.78	-0.07	-0.14
35	17.7	5.3	91	0.82	0.46
36	12.4	3.7	94	-0.92	-0.73
37	18	3.6	NR	0.92	0.75
38	13.7751	1.5153	100	-0.47	-0.78

* Outlier, see Section 4.2

Statistics

Assigned Value	15.2	1.0
Spike Value	Not Spiked	
Robust Average	15.3	1.0
Median	15.0	1.1
Mean	15.3	
N	36	
Max	23.33	
Min	9.1	
Robust SD	2.3	
Robust CV	15%	

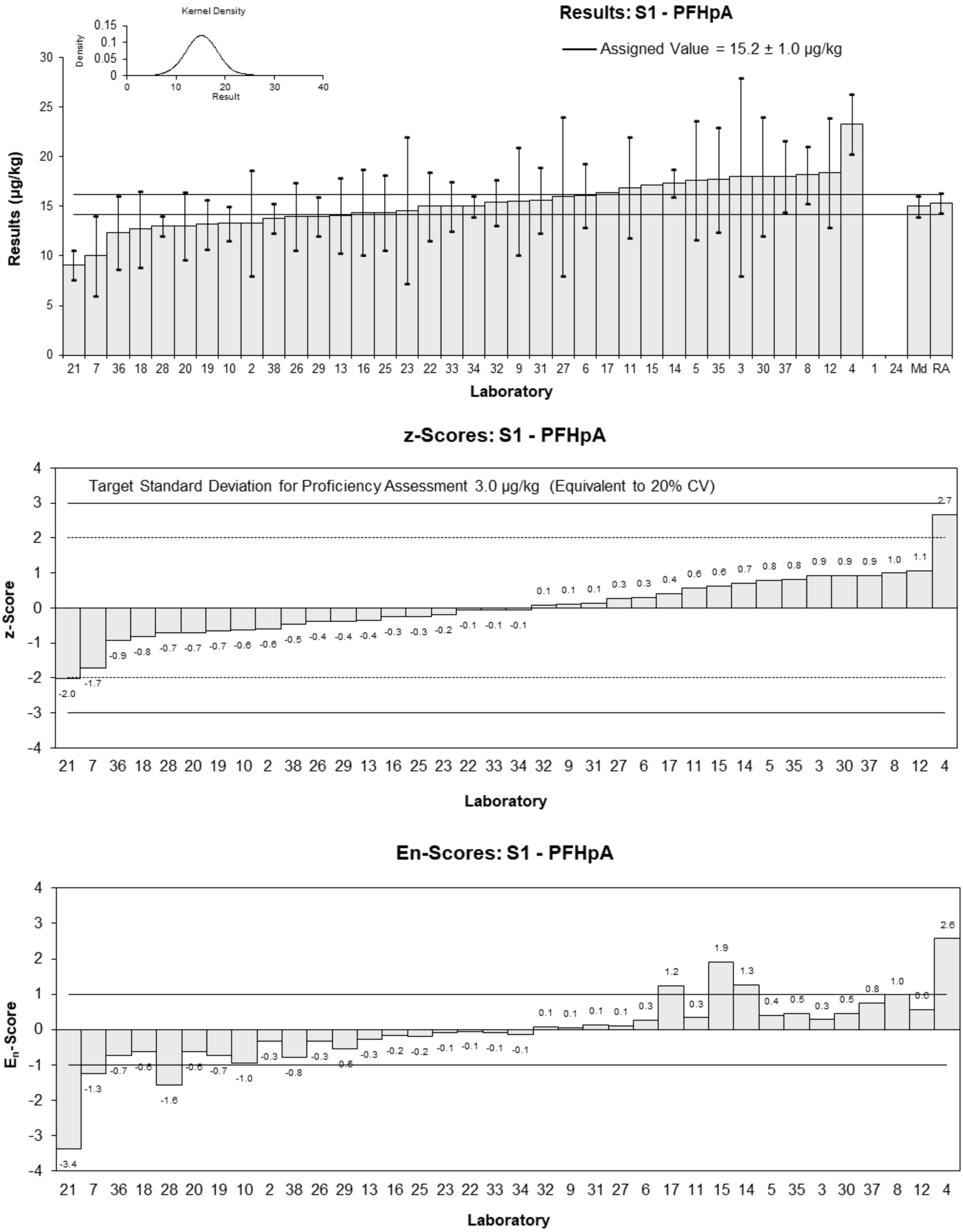

Results: S1 - PFHpA
Assigned Value = 15.2 ± 1.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFHpA
Target Standard Deviation for Proficiency Assessment 3.0 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFHpA
En-Score
Laboratory

Figure 14

Table 19

Sample Details

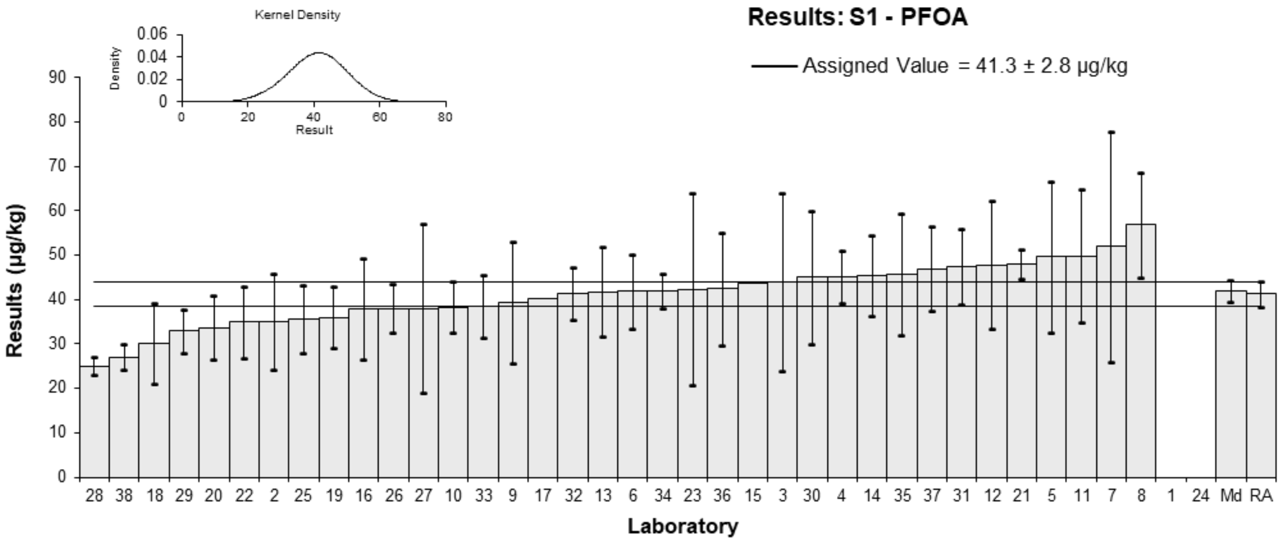
Sample No.	S1
Matrix	Soil
Analyte	PFOA
Unit	µg/kg

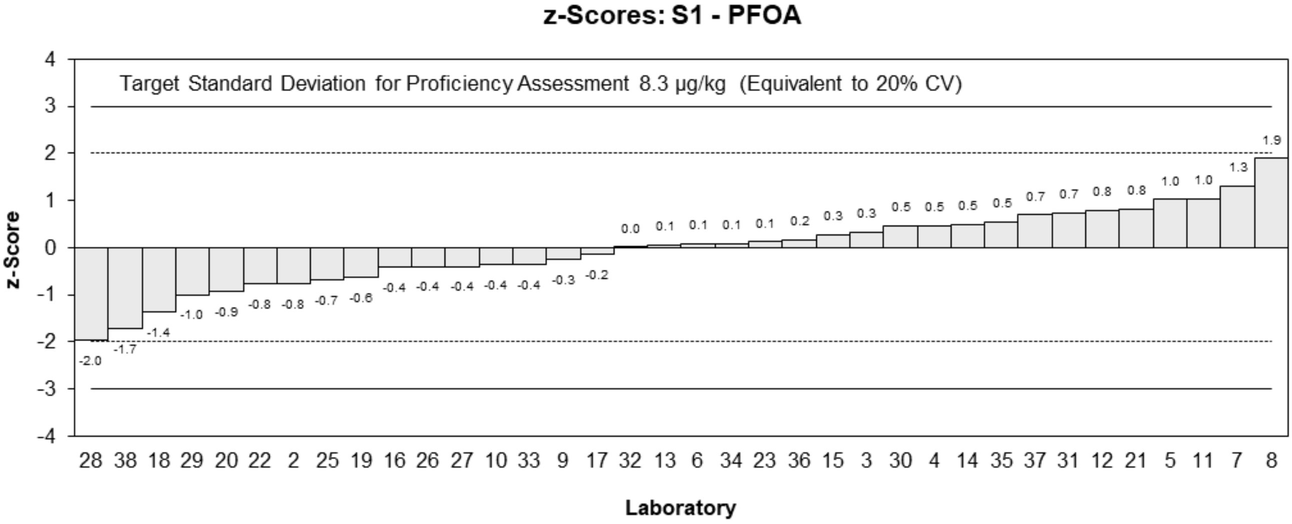
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	35.06	10.87	NR	-0.76	-0.56
3	44	20	73	0.33	0.13
4	45.12	6	81	0.46	0.58
5	49.7	17	NR	1.02	0.49
6	41.9	8.4	110	0.07	0.07
7	52	26	92	1.30	0.41
8	56.9	11.8	68	1.89	1.29
9	39.27	13.745	107	-0.25	-0.14
10	38.3	5.75	22.1	-0.36	-0.47
11	49.864	14.96	74	1.04	0.56
12	47.8	14.4	60	0.79	0.44
13	41.8	10	95	0.06	0.05
14	45.38	9	106	0.49	0.43
15	43.597	NR	97	0.28	0.82
16	37.9	11.4	88	-0.41	-0.29
17	40.09	NR	NR	-0.15	-0.43
18	30.1	9.03	99	-1.36	-1.18
19	36	7	106	-0.64	-0.70
20	33.73	7.08	76	-0.92	-0.99
21	48	3.2	NR	0.81	1.58
22	35	8.1	NR	-0.76	-0.74
23	42.3	21.6	98.5	0.12	0.05
24	NS	NS	NS		
25	35.7	7.7	117	-0.68	-0.68
26	38	5.5	108	-0.40	-0.53
27	38	19	92	-0.40	-0.17
28	25	2	47	-1.97	-4.74
29	33	4.9	122	-1.00	-1.47
30	45	15	93	0.45	0.24
31	47.4	8.6	111.09	0.74	0.67
32	41.4	5.82	67.65	0.01	0.02
33	38.4	7.1	90	-0.35	-0.38
34	41.9	3.81	99.49	0.07	0.13
35	45.8	13.7	95	0.54	0.32
36	42.5	12.7	89	0.15	0.09
37	47	9.4	NR	0.69	0.58
38	27.0822	2.9790	96	-1.72	-3.48

Statistics

Assigned Value	41.3	2.8
Spike Value	Not Spiked	
Robust Average	41.3	2.8
Median	41.9	2.4
Mean	41.1	
N	36	
Max	56.9	
Min	25	
Robust SD	6.6	
Robust CV	16%	


Kernel Density
Results: S1 - PFOA
Assigned Value = 41.3 ± 2.8 µg/kg
Results (µg/kg)
Laboratory
28 38 18 29 20 22 2 25 19 16 26 27 10 33 9 17 32 13 6 34 23 36 15 3 30 4 14 35 37 31 12 21 5 11 7 8 1 24 Md RA


z-Scores: S1 - PFOA
Target Standard Deviation for Proficiency Assessment 8.3 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
28 38 18 29 20 22 2 25 19 16 26 27 10 33 9 17 32 13 6 34 23 36 15 3 30 4 14 35 37 31 12 21 5 11 7 8

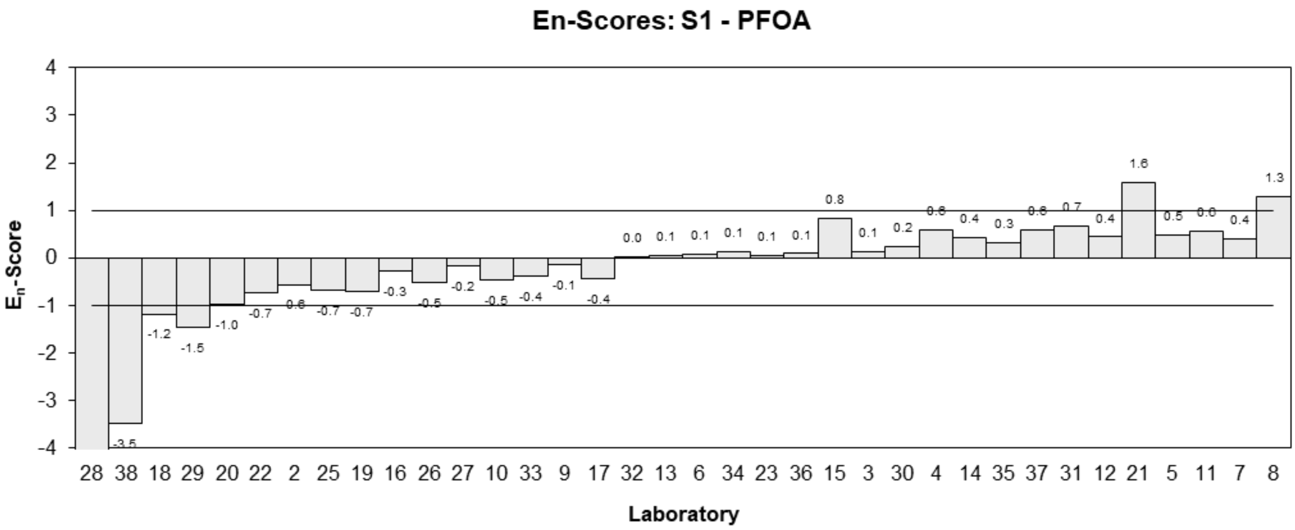

En-Scores: S1 - PFOA
En-Score
Laboratory
28 38 18 29 20 22 2 25 19 16 26 27 10 33 9 17 32 13 6 34 23 36 15 3 30 4 14 35 37 31 12 21 5 11 7 8

Figure 15

Table 20

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFNA
Unit	µg/kg

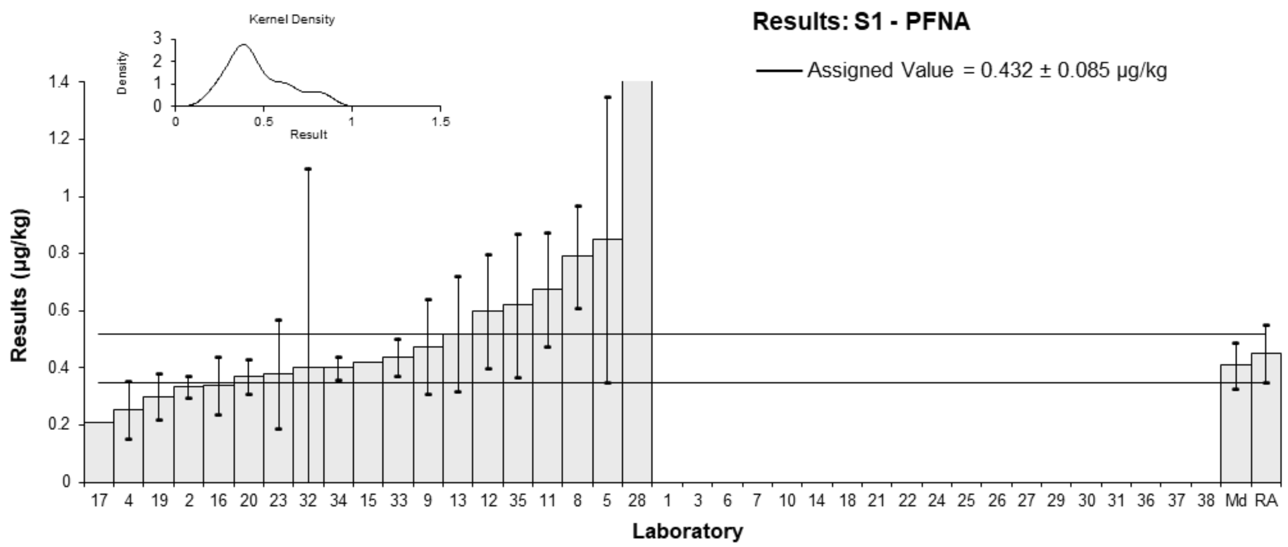
Participant Results

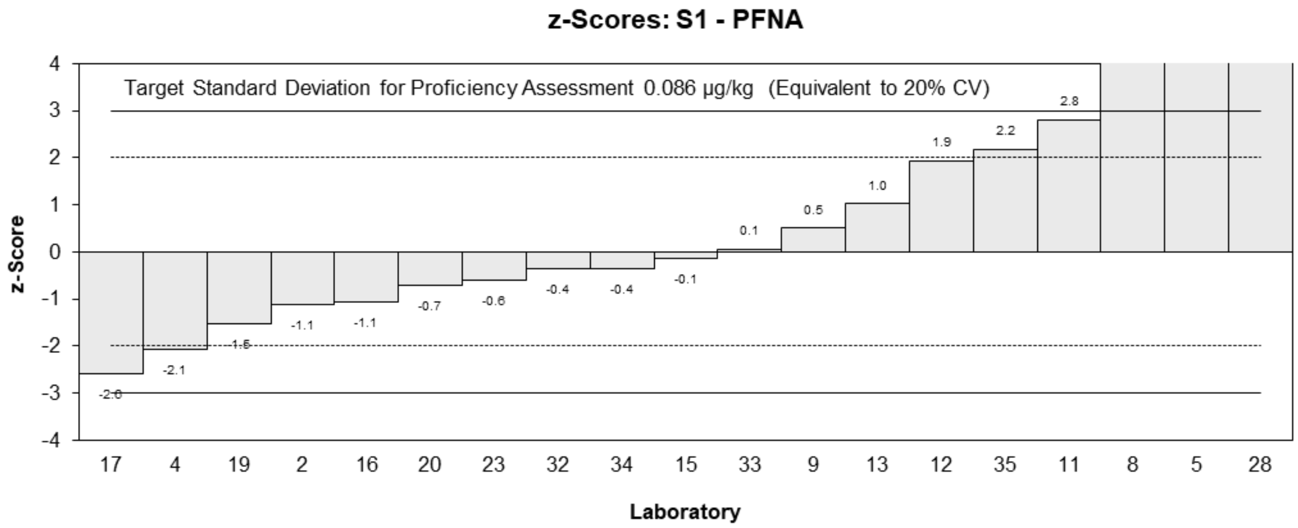
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	0.3346	0.03681	NR	-1.13	-1.05
3	< 0.5	NR	105		
4	0.253	0.1	47	-2.07	-1.36
5*	0.85	0.5	NR	4.84	0.82
6	<1	NR	28		
7	<0.5	NR	94		
8*	0.79	0.18	32	4.14	1.80
9	0.475	0.166	107	0.50	0.23
10	<1.80	0.25	32.2		
11	0.675	0.20	76	2.81	1.12
12	0.6	0.2	73	1.94	0.77
13	0.52	0.2	104	1.02	0.40
14	<1	NR	NR		
15	0.4209	NR	31	-0.13	-0.13
16	0.33937	0.10	93	-1.07	-0.71
17*	0.2082	NR	NR	-2.59	-2.63
18	< 2.5	NR	52		
19	0.3	0.08	103	-1.53	-1.13
20	0.37	0.06	86	-0.72	-0.60
21	<1	0.20	NR		
22	<1	NR	NR		
23	0.38	0.19	42	-0.60	-0.25
24	NS	NS	NS		
25	<1	NR	NR		
26	< 1.0	NR	69		
27	< 1	0.5	57		
28**	5.3	3	38	56.34	1.62
29	NR	NR	NR		
30	< 0.5	NR	82		
31	<4.9	NR	119.21		
32	0.4	0.7	51.54	-0.37	-0.05
33	0.437	0.066	90	0.06	0.05
34	0.4	0.04	90.04	-0.37	-0.34
35	0.62	0.25	104	2.18	0.71
36	<0.5	NR	88		
37	< 0.5	NR	NR		
38	<5	NR	104		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.432	0.085
Spike Value	Not Spiked	
Robust Average	0.45	0.10
Median	0.410	0.081
Mean	0.465	
N	18	
Max	0.85	
Min	0.2082	
Robust SD	0.18	
Robust CV	39%	


Kernel Density
Density
Result
Results: S1 - PFNA
Assigned Value = 0.432 ± 0.085 µg/kg
Results (µg/kg)
Laboratory
17 4 19 2 16 20 23 32 34 15 33 9 13 12 35 11 8 5 28 1 3 6 7 10 14 18 21 22 24 25 26 27 29 30 31 36 37 38 Md RA


z-Scores: S1 - PFNA
Target Standard Deviation for Proficiency Assessment 0.086 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
17 4 19 2 16 20 23 32 34 15 33 9 13 12 35 11 8 5 28

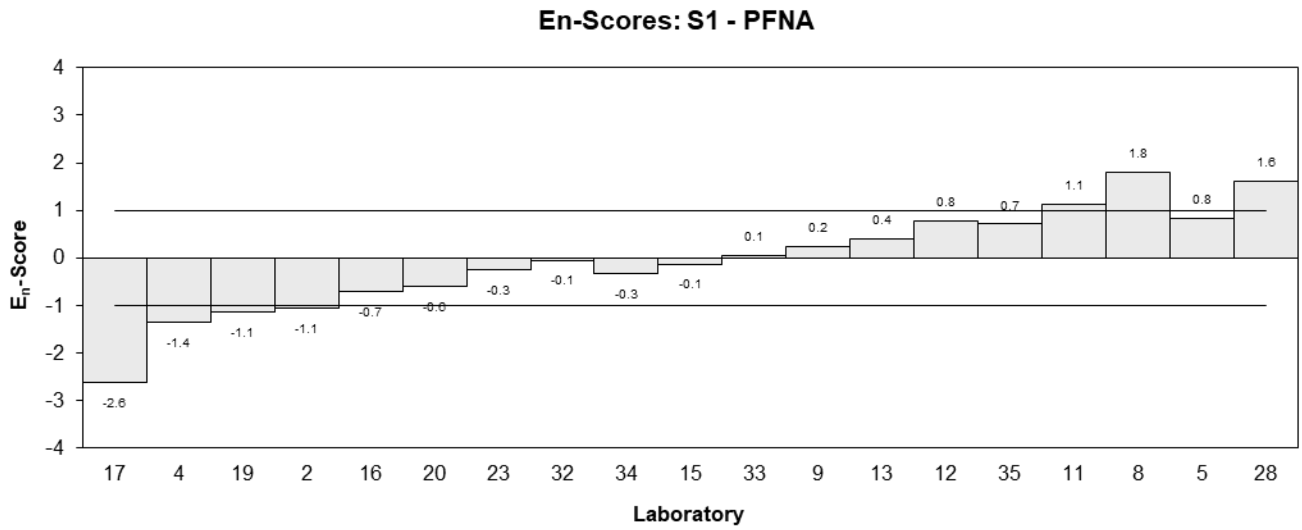

En-Scores: S1 - PFNA
En-Score
Laboratory
17 4 19 2 16 20 23 32 34 15 33 9 13 12 35 11 8 5 28

Figure 16

Table 21

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	0.1019	0.01427	NR
3	< 0.5	NR	76
4	0.097	0.02	76
5	0.31	0.2	NR
6	<0.2	NR	136
7	<0.5	NR	93
8	0.108	0.035	91
9	0.314	0.11	107
10	<1.80	0.31	30.8
11	0.310	0.09	56
12	0.3	0.09	63
13	0.18	0.06	75
14	<0.2	NR	NR
15	0.1159	NR	100
16	0.08315	0.02	69
17	0.1497	NR	NR
18	< 2.5	NR	91
19	<0.5	NR	116
20	0.10	0.02	85
21	<1	0.20	NR
22	<1	NR	NR
23	0.11	0.06	138.5
24	NS	NS	NS
25	<1	NR	NR
26	< 1.0	NR	106
27	< 1	0.5	91
28**	5.8	0.7	49
29	NR	NR	NR
30	< 0.5	NR	95
31	<4.9	NR	123.22
32	<0.2	0.04	103.26
33	<0.971	NR	91
34	<0.4	NR	109.96
35	0.20	0.10	96
36	<0.5	NR	97
37	< 1	NR	NR
38	<5	NR	69

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	0.177	0.070
Median	0.133	0.041
Mean	0.177	
N	14	
Max	0.314	
Min	0.08315	
Robust SD	0.10	
Robust CV	59%	

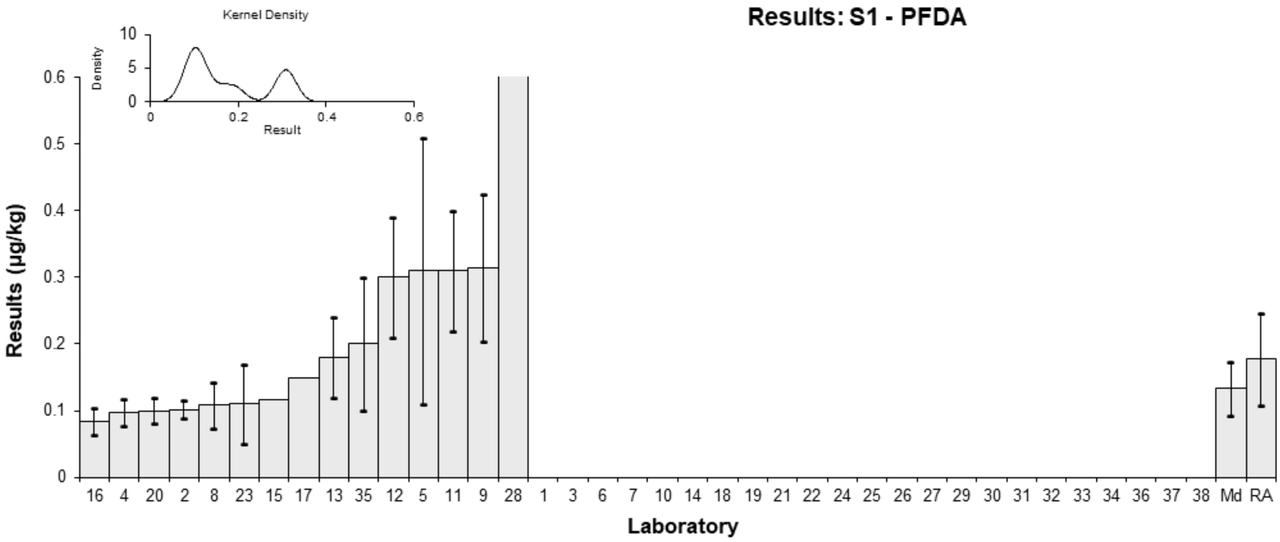

Results: S1 - PFDA
Kernel Density
Density
10
5
0
0
0.2
0.4
0.6
Result
Results (µg/kg)
0.6
0.5
0.4
0.3
0.2
0.1
0
16 4 20 2 8 23 15 17 13 35 12 5 11 9 28 1 3 6 7 10 14 18 19 21 22 24 25 26 27 29 30 31 32 33 34 36 37 38 Md RA
Laboratory

Figure 17

Table 22

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	2.502	0.3753	NR	-1.14	-1.33
3	4	2	84	1.17	0.37
4*	5.099	1.5	63	2.87	1.20
5*	7.0	2.5	NR	5.80	1.48
6	3.1	0.6	86	-0.22	-0.19
7	<1	NR	85		
8	3.86	0.14	65	0.96	1.43
9	3.307	1.157	106	0.10	0.05
10	3.47	0.49	48.8	0.35	0.36
11	3.999	1.20	78	1.17	0.60
12	<0.1	NR	96		
13	4	1	NR	1.17	0.70
14	<0.5	NR	NR		
15	2.1508	NR	97	-1.68	-2.66
16	3.17	0.95	99	-0.11	-0.07
17	2.9959	NR	NR	-0.38	-0.60
18	1.98	0.594	103	-1.94	-1.75
19	3.6	0.83	110	0.56	0.39
20	3.59	0.72	89	0.54	0.42
21	3.7	0.5	NR	0.71	0.71
22	2.15	0.49	NR	-1.68	-1.71
23	NT	NT	NT		
24	NS	NS	NS		
25	<1	NR	NR		
26	2.6	0.31	114	-0.99	-1.25
27	< 10	5	72		
28	NT	NT	NT		
29	2.4	0.4	117	-1.30	-1.47
30	4.7	2	97	2.25	0.72
31	<4.9	NR	100.06		
32	3.2	0.77	98.11	-0.06	-0.05
33	2.36	0.697	81	-1.36	-1.09
34	3.4	0.33	110.84	0.25	0.30
35	3.65	1.10	93	0.63	0.35
36	4.09	1.2	89	1.31	0.67
37	NT	NT	NT		
38	<5	NR	85		

* Outlier, see Section 4.2

Statistics

Assigned Value	3.24	0.41
Spike Value	Not Spiked	
Robust Average	3.36	0.45
Median	3.44	0.41
Mean	3.46	
N	26	
Max	7	
Min	1.98	
Robust SD	0.91	
Robust CV	27%	

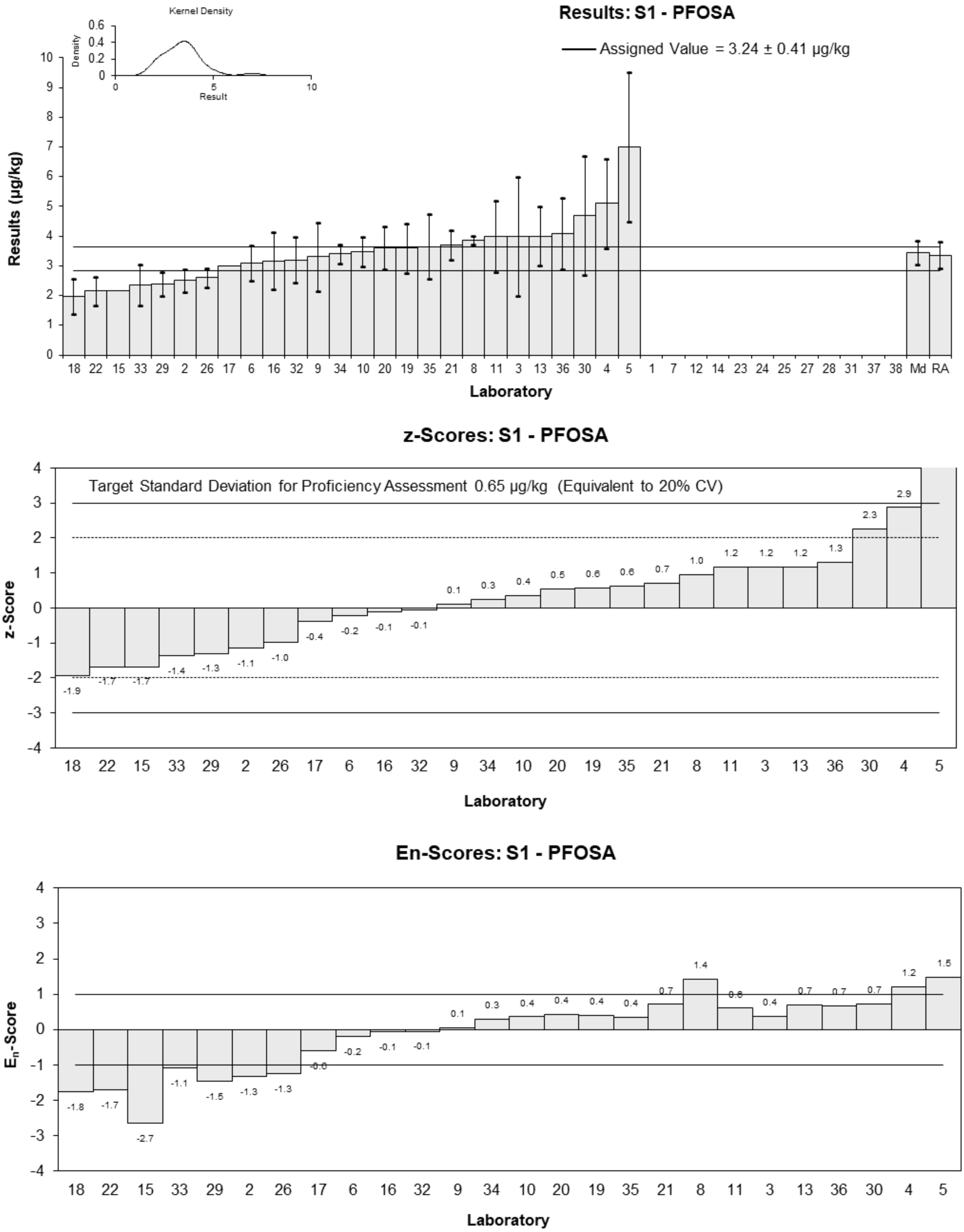

Results: S1 - PFOSA
Assigned Value = 3.24 ± 0.41 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S1 - PFOSA
Target Standard Deviation for Proficiency Assessment 0.65 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S1 - PFOSA
E_n-Score
Laboratory

Figure 18

Table 23

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	6:2FTS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	0.1100	0.01870	NR
3	< 0.1	NR	81
4	2.748	0.5	69
5	<1	NR	NR
6	<0.2	NR	167
7	<1	NR	103
8	< 1	NR	95
9	NR	NR	NR
10	41.5	14.5	21.7
11	< 0.5	NR	75
12	<0.5	NR	95
13	0.11	0.03	NR
14	<0.5	NR	NR
15	0.099	NR	94
16	< 0.5	NR	93
17	<0.1	NR	NR
18	< 2.5	NR	86
19	<0.5	NR	126
20	<0.2	NR	77
21	<1	0.20	NR
22	<5	NR	NR
23	0.28	0.1	71.5
24	NS	NS	NS
25	<1	NR	NR
26	< 1.0	NR	110
27	< 20	10	98
28	27	11	84
29	NR	NR	NR
30	< 0.1	NR	87
31	<4.9	NR	199.71
32	<0.5	0.11	65.61
33	<0.971	NR	93
34	<0.5	NR	76.88
35	<0.5	NR	106
36	<0.5	NR	67
37	< 0.5	NR	NR
38	<5	NR	130

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	9	16
Median	0.28	0.25
Mean	10	
N	7	
Max	41.5	
Min	0.099	
Robust SD	17	
Robust CV	180%	

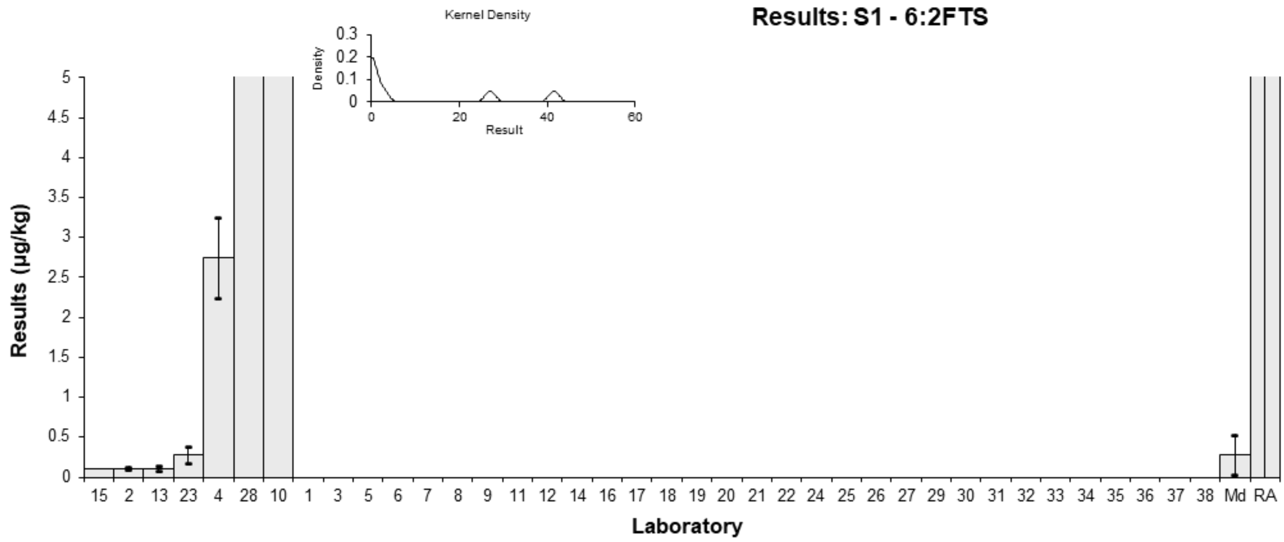

Results: S1 - 6:2FTS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
15 2 13 23 4 28 10 1 3 5 6 7 8 9 11 12 14 16 17 18 19 20 21 22 24 25 26 27 29 30 31 32 33 34 35 36 37 38 Md RA

Figure 19

Table 24

Sample Details

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

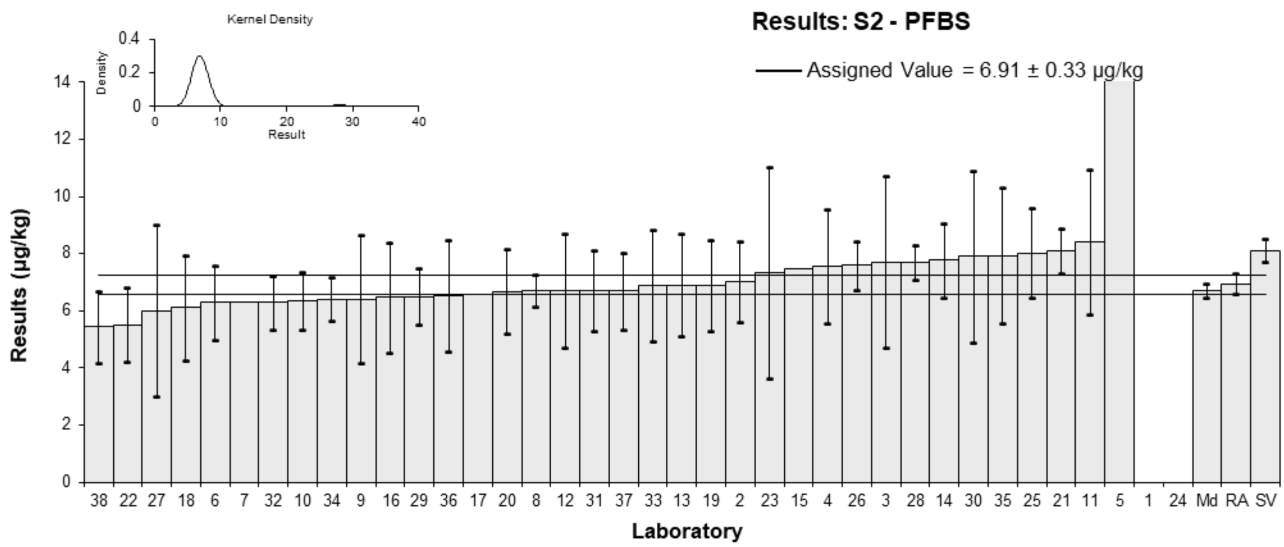
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	7.015	1.403	NR	0.08	0.07
3	7.7	3	98	0.57	0.26
4	7.545	2	85	0.46	0.31
5*	28	9.8	NR	15.26	2.15
6	6.3	1.3	112	-0.44	-0.45
7	6.3	NR	102	-0.44	-1.85
8	6.7	0.57	84	-0.15	-0.32
9	6.408	2.2428	96	-0.36	-0.22
10	6.33	1.01	99.4	-0.42	-0.55
11	8.419	2.53	99	1.09	0.59
12	6.7	2	88	-0.15	-0.10
13	6.9	1.8	104	-0.01	-0.01
14	7.78	1.3	105	0.63	0.65
15	7.4528	NR	101	0.39	1.64
16	6.46	1.94	85	-0.33	-0.23
17	6.578	NR	NR	-0.24	-1.01
18	6.12	1.836	31	-0.57	-0.42
19	6.9	1.6	112	-0.01	-0.01
20	6.68	1.47	81	-0.17	-0.15
21	8.1	0.80	NR	0.86	1.38
22	5.5	1.3	NR	-1.02	-1.05
23	7.32	3.7	83.5	0.30	0.11
24	NS	NS	NS		
25	8.02	1.56	103	0.80	0.70
26	7.6	0.85	108	0.50	0.76
27	6	3.0	104	-0.66	-0.30
28	7.7	0.6	57	0.57	1.15
29	6.5	0.98	117	-0.30	-0.40
30	7.9	3	98	0.72	0.33
31	6.7	1.4	124.5	-0.15	-0.15
32	6.3	0.94	111.34	-0.44	-0.61
33	6.87	1.95	81	-0.03	-0.02
34	6.4	0.76	103.75	-0.37	-0.62
35	7.94	2.37	89	0.75	0.43
36	6.53	1.96	84	-0.27	-0.19
37	6.7	1.34	NR	-0.15	-0.15
38	5.4380	1.2507	121	-1.07	-1.14

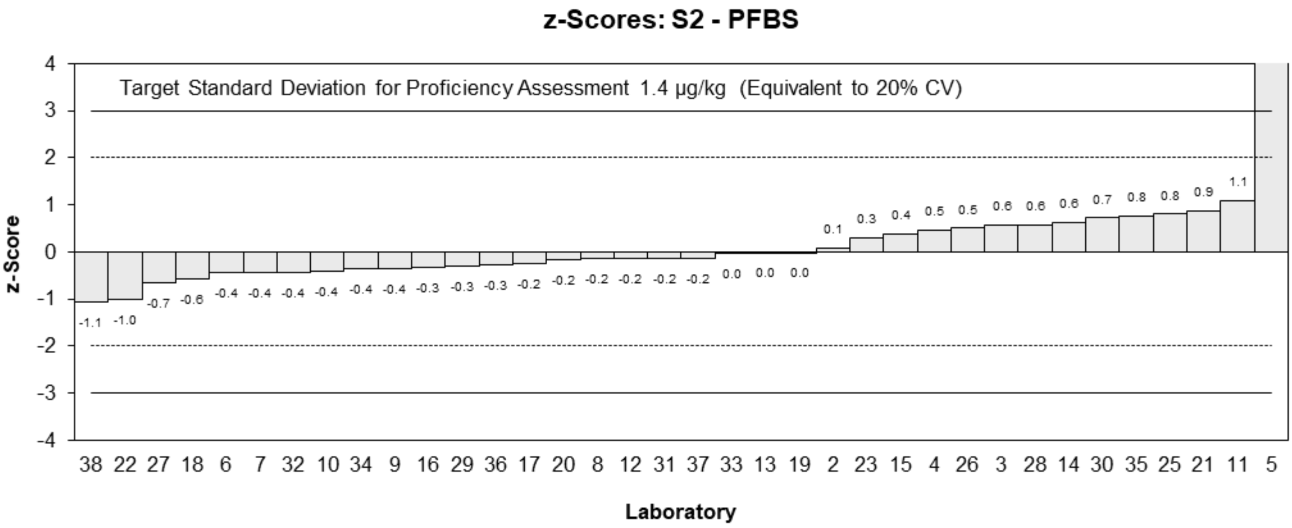
* Outlier, see Section 4.2

Statistics

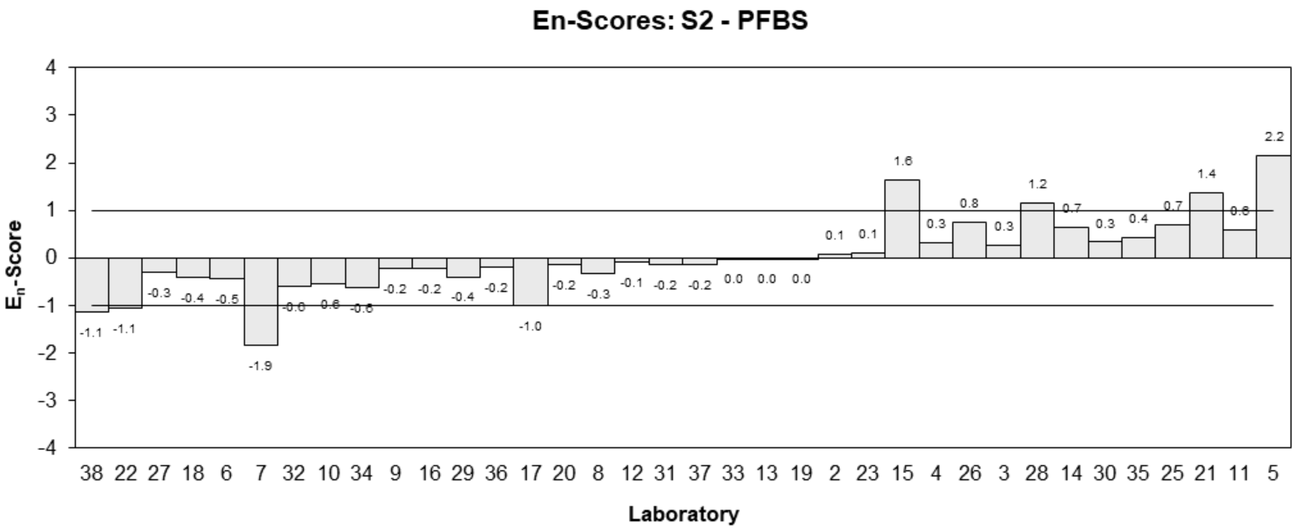
Assigned Value	6.91	0.33
Spike Value	8.11	0.41
Robust Average	6.95	0.34
Median	6.70	0.25
Mean	7.5	
N	36	
Max	28	
Min	5.438	
Robust SD	0.82	
Robust CV	12%	



Results: S2 - PFBS
Assigned Value = 6.91 ± 0.33 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
38 22 27 18 6 7 32 10 34 9 16 29 36 17 20 8 12 31 37 33 13 19 2 23 15 4 26 3 28 14 30 35 25 21 11 5 1 24 Md RA SV



z-Scores: S2 - PFBS
Target Standard Deviation for Proficiency Assessment 1.4 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
38 22 27 18 6 7 32 10 34 9 16 29 36 17 20 8 12 31 37 33 13 19 2 23 15 4 26 3 28 14 30 35 25 21 11 5



En-Scores: S2 - PFBS
E_n-Score
Laboratory
38 22 27 18 6 7 32 10 34 9 16 29 36 17 20 8 12 31 37 33 13 19 2 23 15 4 26 3 28 14 30 35 25 21 11 5

Figure 20

Table 25

Sample Details

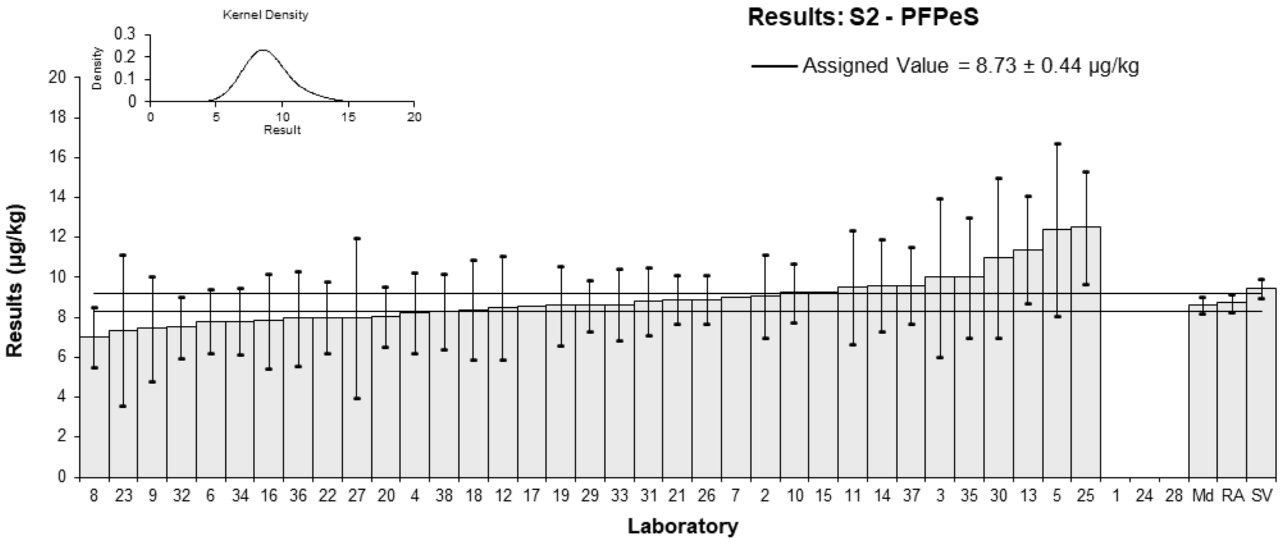
Sample No.	S2
Matrix	Soil
Analyte	PFPeS
Unit	µg/kg

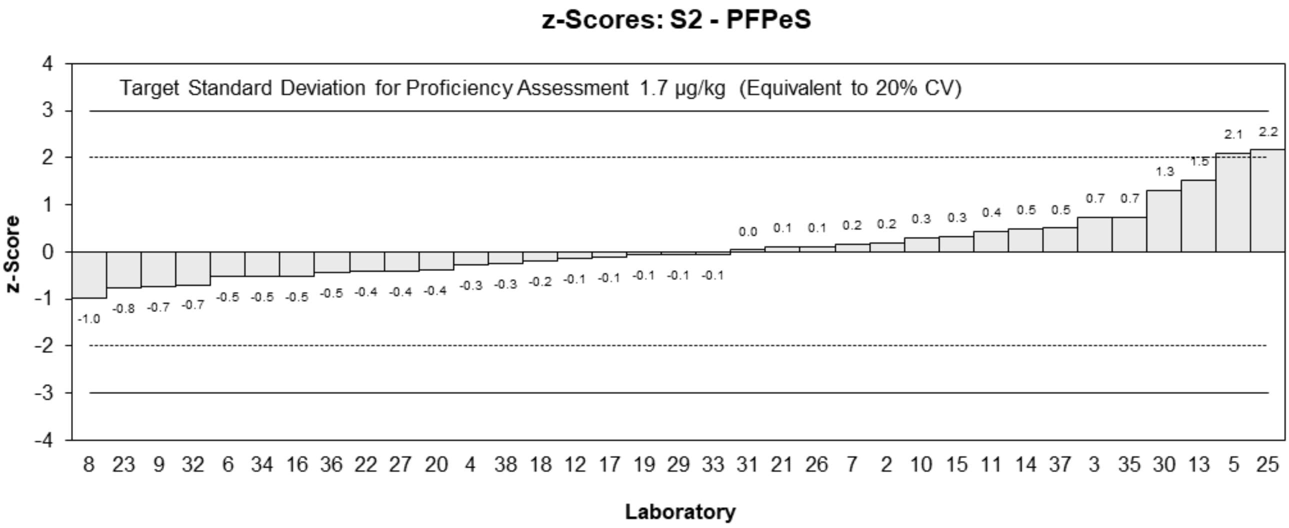
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	9.042	2.080	NR	0.18	0.15
3	10	4	85	0.73	0.32
4	8.247	2	NR	-0.28	-0.24
5	12.4	4.3	NR	2.10	0.85
6	7.8	1.6	112	-0.53	-0.56
7	9	NR	NR	0.15	0.61
8	7	1.5	84	-0.99	-1.11
9	7.437	2.60295	96	-0.74	-0.49
10	9.23	1.48	100	0.29	0.32
11	9.493	2.85	99	0.44	0.26
12	8.5	2.6	92	-0.13	-0.09
13	11.4	2.7	NR	1.53	0.98
14	9.59	2.3	95	0.49	0.37
15	9.2848	NR	99	0.32	1.26
16	7.82	2.35	NR	-0.52	-0.38
17	8.538	NR	NR	-0.11	-0.44
18	8.39	2.517	31	-0.19	-0.13
19	8.6	2	112	-0.07	-0.06
20	8.05	1.53	83	-0.39	-0.43
21	8.9	1.23	NR	0.10	0.13
22	8	1.8	NR	-0.42	-0.39
23	7.36	3.8	NR	-0.78	-0.36
24	NS	NS	NS		
25	12.5	2.8	NR	2.16	1.33
26	8.9	1.2	106	0.10	0.13
27	8	4.0	NR	-0.42	-0.18
28	NT	NT	NT		
29	8.6	1.3	NR	-0.07	-0.09
30	11	4	95	1.30	0.56
31	8.8	1.7	128	0.04	0.04
32	7.5	1.53	111.34	-0.70	-0.77
33	8.63	1.79	81	-0.06	-0.05
34	7.8	1.67	109.83	-0.53	-0.54
35	10.0	3.0	89	0.73	0.42
36	7.95	2.38	82	-0.45	-0.32
37	9.6	1.92	NR	0.50	0.44
38	8.2888	1.9064	121	-0.25	-0.23

Statistics

Assigned Value	8.73	0.44
Spike Value	9.47	0.47
Robust Average	8.73	0.44
Median	8.60	0.41
Mean	8.90	
N	35	
Max	12.5	
Min	7	
Robust SD	1.0	
Robust CV	12%	


Results: S2 - PFPeS
Assigned Value = 8.73 ± 0.44 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
8 23 9 32 6 34 16 36 22 27 20 4 38 18 12 17 19 29 33 31 21 26 7 2 10 15 11 14 37 3 35 30 13 5 25 1 24 28 Md RA SV


z-Scores: S2 - PFPeS
Target Standard Deviation for Proficiency Assessment 1.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
8 23 9 32 6 34 16 36 22 27 20 4 38 18 12 17 19 29 33 31 21 26 7 2 10 15 11 14 37 3 35 30 13 5 25

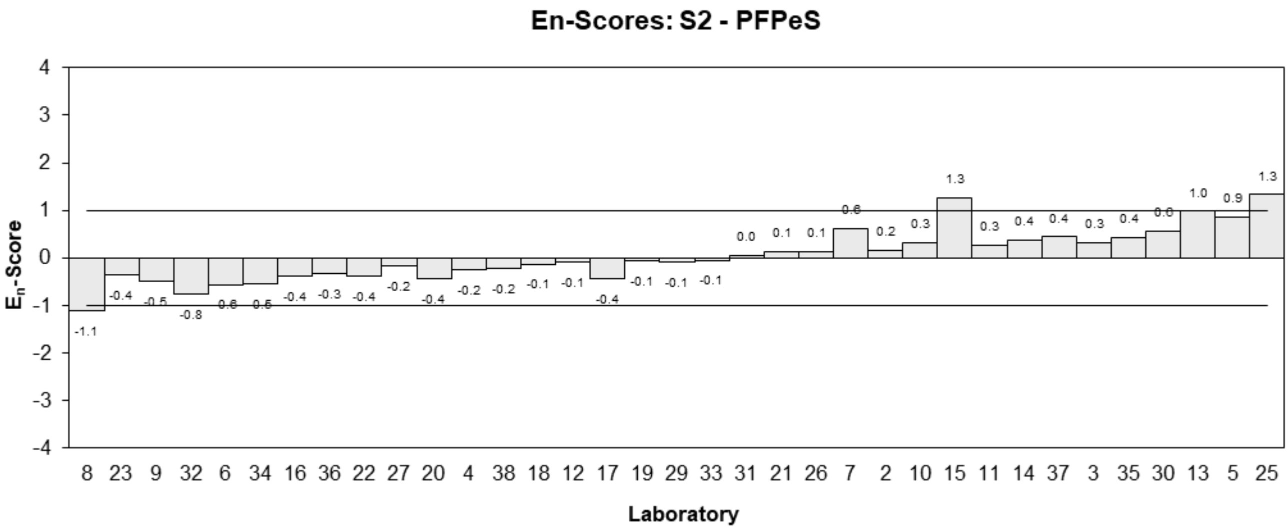

En-Scores: S2 - PFPeS
E_n-Score
Laboratory
8 23 9 32 6 34 16 36 22 27 20 4 38 18 12 17 19 29 33 31 21 26 7 2 10 15 11 14 37 3 35 30 13 5 25

Figure 21

Table 26

Sample Details

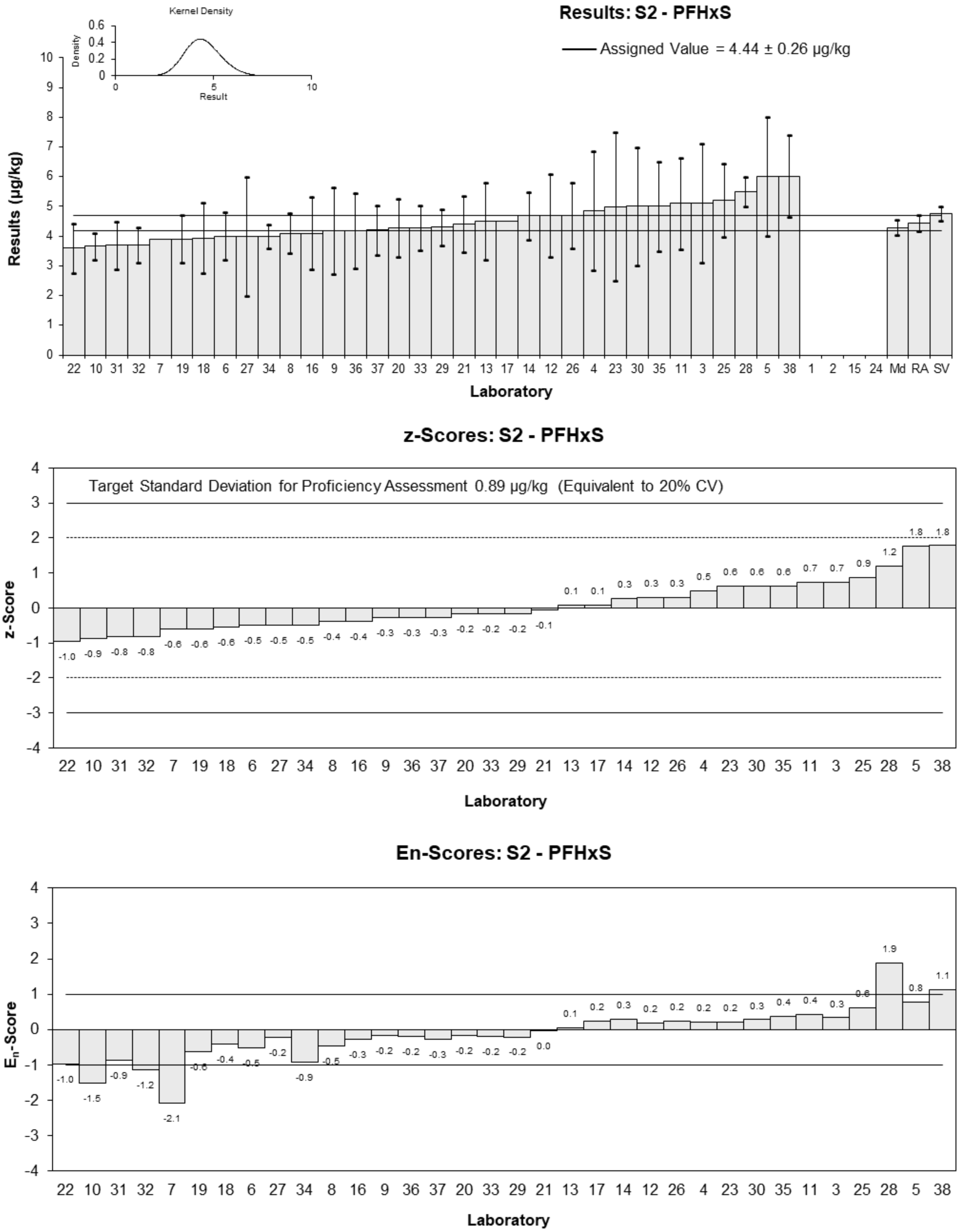
Sample No.	S2
Matrix	Soil
Analyte	PFHxS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NT	NT	NT		
3	5.1	2	85	0.74	0.33
4	4.862	2	83	0.48	0.21
5	6.0	2	NR	1.76	0.77
6	4	0.8	112	-0.50	-0.52
7	3.9	NR	99	-0.61	-2.08
8	4.1	0.68	84	-0.38	-0.47
9	4.179	1.46265	96	-0.29	-0.18
10	3.66	0.44	100	-0.88	-1.53
11	5.097	1.53	107	0.74	0.42
12	4.7	1.4	88	0.29	0.18
13	4.5	1.3	105	0.07	0.05
14	4.69	0.8	94	0.28	0.30
15	NT	NT	NT		
16	4.10	1.23	81	-0.38	-0.27
17	4.501	NR	NR	0.07	0.23
18	3.94	1.182	24	-0.56	-0.41
19	3.9	0.8	120	-0.61	-0.64
20	4.28	0.98	83	-0.18	-0.16
21	4.4	0.94	NR	-0.05	-0.04
22	3.6	0.83	NR	-0.95	-0.97
23	4.99	2.5	86.5	0.62	0.22
24	NS	NS	NS		
25	5.21	1.24	101	0.87	0.61
26	4.7	1.1	103	0.29	0.23
27	4	2	113	-0.50	-0.22
28	5.5	0.5	55	1.19	1.88
29	4.3	0.60	122	-0.16	-0.21
30	5.0	2	95	0.63	0.28
31	3.7	0.8	128	-0.83	-0.88
32	3.7	0.59	107.12	-0.83	-1.15
33	4.28	0.741	75	-0.18	-0.20
34	4	0.40	109.83	-0.50	-0.92
35	5.00	1.50	95	0.63	0.37
36	4.19	1.26	89	-0.28	-0.19
37	4.2	0.84	NR	-0.27	-0.27
38	6.0169	1.3839	115	1.78	1.12

Statistics

Assigned Value	4.44	0.26
Spike Value	4.76	0.24
Robust Average	4.44	0.26
Median	4.29	0.25
Mean	4.48	
N	34	
Max	6.0169	
Min	3.6	
Robust SD	0.61	
Robust CV	14%	



Results: S2 - PFHxS
Assigned Value = 4.44 ± 0.26 μg/kg
Kernel Density
Density
Result
Results (μg/kg)
22 10 31 32 7 19 18 6 27 34 8 16 9 36 37 20 33 29 21 13 17 14 12 26 4 23 30 35 11 3 25 28 5 38 1 2 15 24 Md RA SV
Laboratory
z-Scores: S2 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.89 μg/kg (Equivalent to 20% CV)
z-Score
-1.0 -0.9 -0.8 -0.8 -0.6 -0.6 -0.6 -0.5 -0.5 -0.5 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 0.1 0.1 0.3 0.3 0.3 0.5 0.6 0.6 0.6 0.7 0.7 0.9 1.2 1.8 1.8
22 10 31 32 7 19 18 6 27 34 8 16 9 36 37 20 33 29 21 13 17 14 12 26 4 23 30 35 11 3 25 28 5 38
Laboratory
En-Scores: S2 - PFHxS
En-Score
-1.0 -1.5 -0.9 -1.2 -2.1 -0.6 -0.4 -0.5 -0.2 -0.9 -0.5 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 -0.2 0.0 0.1 0.2 0.3 0.2 0.2 0.2 0.2 0.3 0.4 0.4 0.3 0.6 1.9 0.8 1.1
22 10 31 32 7 19 18 6 27 34 8 16 9 36 37 20 33 29 21 13 17 14 12 26 4 23 30 35 11 3 25 28 5 38
Laboratory

Figure 22

Table 27

Sample Details

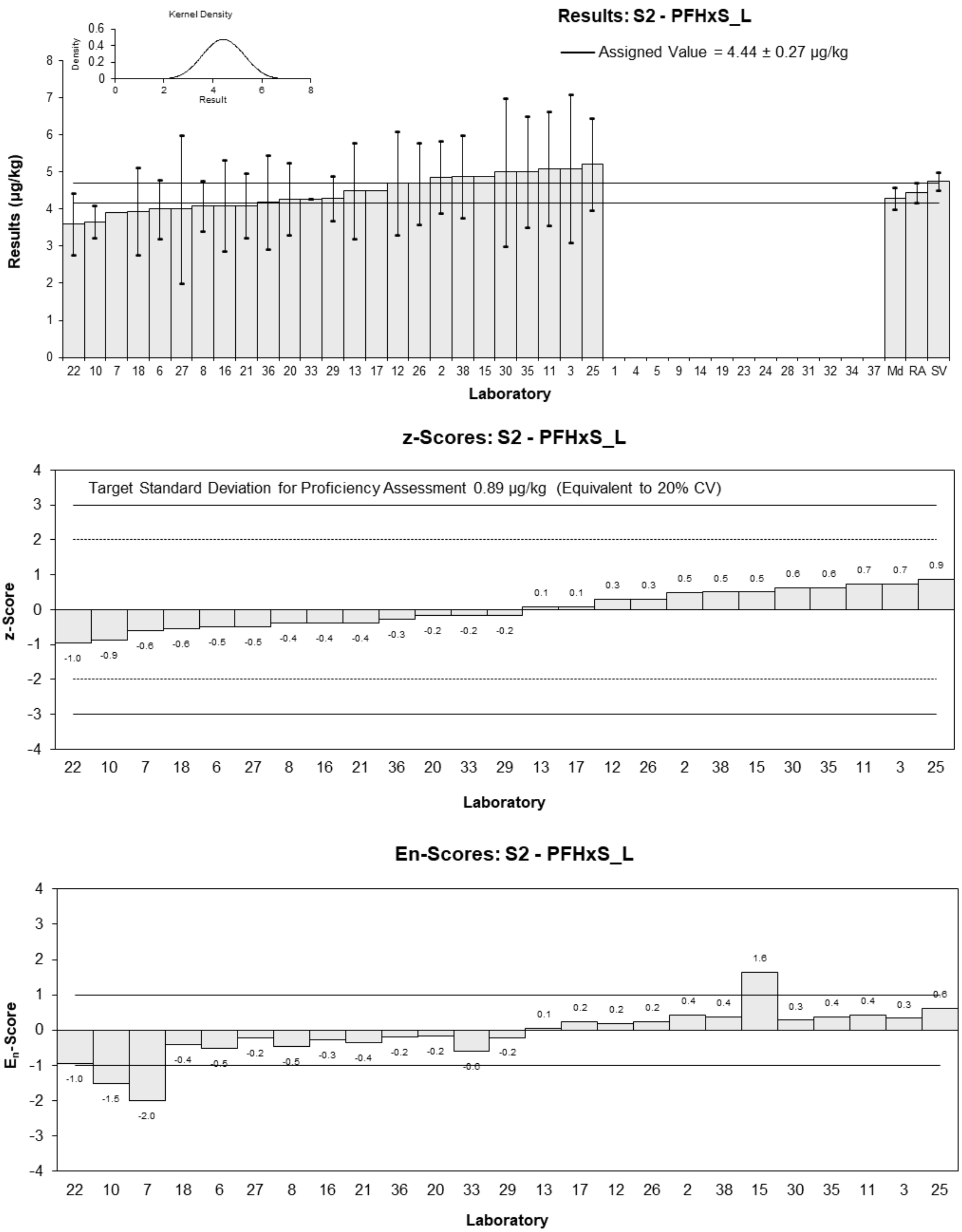
Sample No.	S2
Matrix	Soil
Analyte	PFHxS_L
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	4.864	0.9728	NR	0.48	0.42
3	5.1	2	85	0.74	0.33
4	NR	NR	NR		
5	NT	NT	NT		
6	4	0.8	112	-0.50	-0.52
7	3.9	NR	NR	-0.61	-2.00
8	4.1	0.68	84	-0.38	-0.46
9	NR	NR	NR		
10	3.66	0.44	100	-0.88	-1.51
11	5.097	1.53	107	0.74	0.42
12	4.7	1.4	88	0.29	0.18
13	4.5	1.3	NR	0.07	0.05
14	NT	NT	NT		
15	4.8837	NR	99	0.50	1.64
16	4.10	1.23	NR	-0.38	-0.27
17	4.501	NR	NR	0.07	0.23
18	3.94	1.182	24	-0.56	-0.41
19	NT	NR	NT		
20	4.28	0.98	83	-0.18	-0.16
21	4.1	0.88	NR	-0.38	-0.37
22	3.6	0.83	NR	-0.95	-0.96
23	NT	NT	NT		
24	NS	NS	NS		
25	5.21	1.24	NR	0.87	0.61
26	4.7	1.1	103	0.29	0.23
27	4	2	NR	-0.50	-0.22
28	NT	NT	NT		
29	4.3	0.60	NR	-0.16	-0.21
30	5.0	2	95	0.63	0.28
31	NT	NT	NT		
32	NT	NT	NT		
33	4.28	0.004	75	-0.18	-0.59
34	NT	NT	NT		
35	5.00	1.50	95	0.63	0.37
36	4.19	1.26	89	-0.28	-0.19
37	NT	NT	NT		
38	4.8797	1.1223	NR	0.50	0.38

Statistics

Assigned Value	4.44	0.27
Spike Value	4.76	0.24
Robust Average	4.44	0.27
Median	4.30	0.30
Mean	4.44	
N	25	
Max	5.21	
Min	3.6	
Robust SD	0.54	
Robust CV	12%	



Results: S2 - PFHxS_L
Assigned Value = 4.44 ± 0.27 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
22 10 7 18 6 27 8 16 21 36 20 33 29 13 17 12 26 2 38 15 30 35 11 3 25 1 4 5 9 14 19 23 24 28 31 32 34 37 Md RA SV
z-Scores: S2 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.89 µg/kg (Equivalent to 20% CV)
z-Score
-1.0 -0.9 -0.6 -0.6 -0.5 -0.5 -0.4 -0.4 -0.4 -0.3 -0.2 -0.2 -0.2 0.1 0.1 0.3 0.3 0.5 0.5 0.5 0.6 0.6 0.7 0.7 0.9
22 10 7 18 6 27 8 16 21 36 20 33 29 13 17 12 26 2 38 15 30 35 11 3 25
Laboratory
En-Scores: S2 - PFHxS_L
E_n-Score
-1.0 -1.5 -2.0 -0.4 -0.5 -0.2 -0.5 -0.3 -0.4 -0.2 -0.2 -0.6 -0.2 0.1 0.2 0.2 0.2 0.4 0.4 1.6 0.3 0.4 0.4 0.3 0.6
22 10 7 18 6 27 8 16 21 36 20 33 29 13 17 12 26 2 38 15 30 35 11 3 25
Laboratory

Figure 23

Table 28

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	1.729	0.3458	NR	-0.25	-0.25
3	2.2	1	85	1.04	0.38
4	1.737	0.5	NR	-0.23	-0.16
5	1.8	0.6	NR	-0.05	-0.03
6	1.6	0.3	112	-0.60	-0.70
7	1.7	NR	NR	-0.33	-1.20
8	1.54	0.41	84	-0.77	-0.66
9	1.63	0.5705	96	-0.52	-0.33
10	2.02	0.42	99.4	0.55	0.46
11	2.061	0.62	99	0.66	0.38
12	2.1	0.6	88	0.77	0.46
13*	2.9	0.8	NR	2.97	1.34
14	1.98	0.3	94	0.44	0.51
15	1.998	NR	93	0.49	1.78
16	2.10	0.63	NR	0.77	0.44
17	1.805	NR	NR	-0.04	-0.15
18	< 2.5	NR	24		
19	1.5	0.3	108	-0.88	-1.01
20	1.69	0.34	83	-0.36	-0.37
21*	2.9	0.53	NR	2.97	2.00
22	1.4	0.32	NR	-1.15	-1.25
23	1.64	0.8	NR	-0.49	-0.22
24	NS	NS	NS		
25	1.89	0.57	NR	0.19	0.12
26	1.9	0.32	103	0.22	0.24
27	2	1	NR	0.49	0.18
28	NT	NT	NT		
29	1.8	0.27	NR	-0.05	-0.07
30	2.1	1	98	0.77	0.28
31	1.7	0.4	104.3	-0.33	-0.29
32	1.6	0.29	107.12	-0.60	-0.72
33	1.79	0.354	76	-0.08	-0.08
34	1.8	0.39	109.83	-0.05	-0.05
35	2.16	0.37	95	0.93	0.89
36	1.62	0.49	81	-0.55	-0.40
37	1.7	0.34	NR	-0.33	-0.34
38	<5	NR	115		

* Outlier, see Section 4.2

Statistics

Assigned Value	1.82	0.10
Spike Value	1.91	0.10
Robust Average	1.84	0.11
Median	1.80	0.12
Mean	1.88	
N	33	
Max	2.9	
Min	1.4	
Robust SD	0.25	
Robust CV	14%	

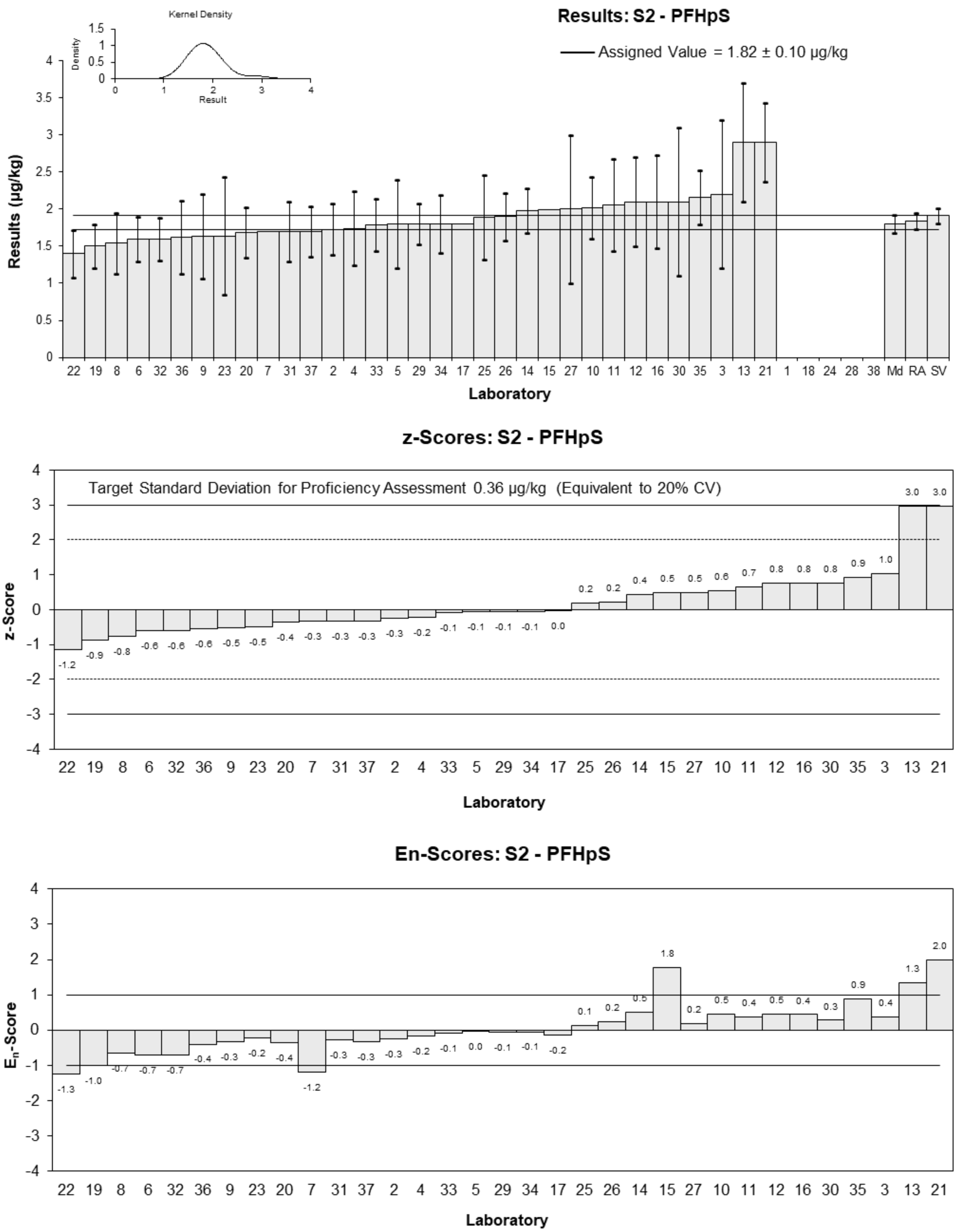

Results: S2 - PFHpS
Assigned Value = 1.82 ± 0.10 μg/kg
Kernel Density
Density
Result
Results (μg/kg)
Laboratory
22 19 8 6 32 36 9 23 20 7 31 37 2 4 33 5 29 34 17 25 26 14 15 27 10 11 12 16 30 35 3 13 21 1 18 24 28 38 Md RA SV
z-Scores: S2 - PFHpS
Target Standard Deviation for Proficiency Assessment 0.36 μg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFHpS
En-Score
Laboratory

Figure 24

Table 29

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	5.249	1.31225	NR	-0.25	-0.21
3	5.5	2	76	-0.03	-0.01
4	7.020	1	67	1.35	1.40
5	3.0	1.1	NR	-2.29	-2.18
6	4.7	0.9	125	-0.75	-0.85
7	5.5	3.3	82	-0.03	-0.01
8	4.8	0.33	79	-0.66	-1.47
9	5.173	1.81055	96	-0.32	-0.19
10	5.43	0.87	99.4	-0.09	-0.11
11	6.318	1.90	101	0.71	0.41
12	6.69	1.7	90	1.05	0.67
13	6.4	1.7	101	0.79	0.50
14	5.49	0.9	98	-0.04	-0.04
15	6.0531	NR	100	0.47	1.41
16	5.89	1.77	51	0.33	0.20
17	6.696	NR	NR	1.05	3.15
18	5.2	1.56	14	-0.30	-0.21
19	4.9	1.1	108	-0.57	-0.54
20	6.25	1.25	84	0.65	0.55
21	5.0	0.49	NR	-0.48	-0.86
22	4.1	0.94	NR	-1.29	-1.42
23	5.99	3.1	96	0.42	0.15
24	NS	NS	NS		
25	6.22	1.58	74	0.62	0.43
26	6.4	2.0	112	0.79	0.43
27	5	2.5	108	-0.48	-0.21
28*	9.7	1.5	54	3.77	2.70
29	5.4	1.1	121	-0.12	-0.11
30	5.4	2	98	-0.12	-0.06
31	4.5	1.0	124.47	-0.93	-0.97
32	4.7	0.077	101.58	-0.75	-2.20
33	5.01	1.48	76	-0.47	-0.34
34	5.1	0.72	108.48	-0.39	-0.53
35	6.81	2.70	93	1.16	0.47
36	5.28	1.58	92	-0.23	-0.15
37	4.5	0.9	NR	-0.93	-1.06
38	6.5671	1.5104	91	0.94	0.67

* Outlier, see Section 4.2

Statistics

Assigned Value	5.53	0.37
Spike Value	5.77	0.29
Robust Average	5.57	0.38
Median	5.42	0.39
Mean	5.61	
N	36	
Max	9.7	
Min	3	
Robust SD	0.91	
Robust CV	16%	

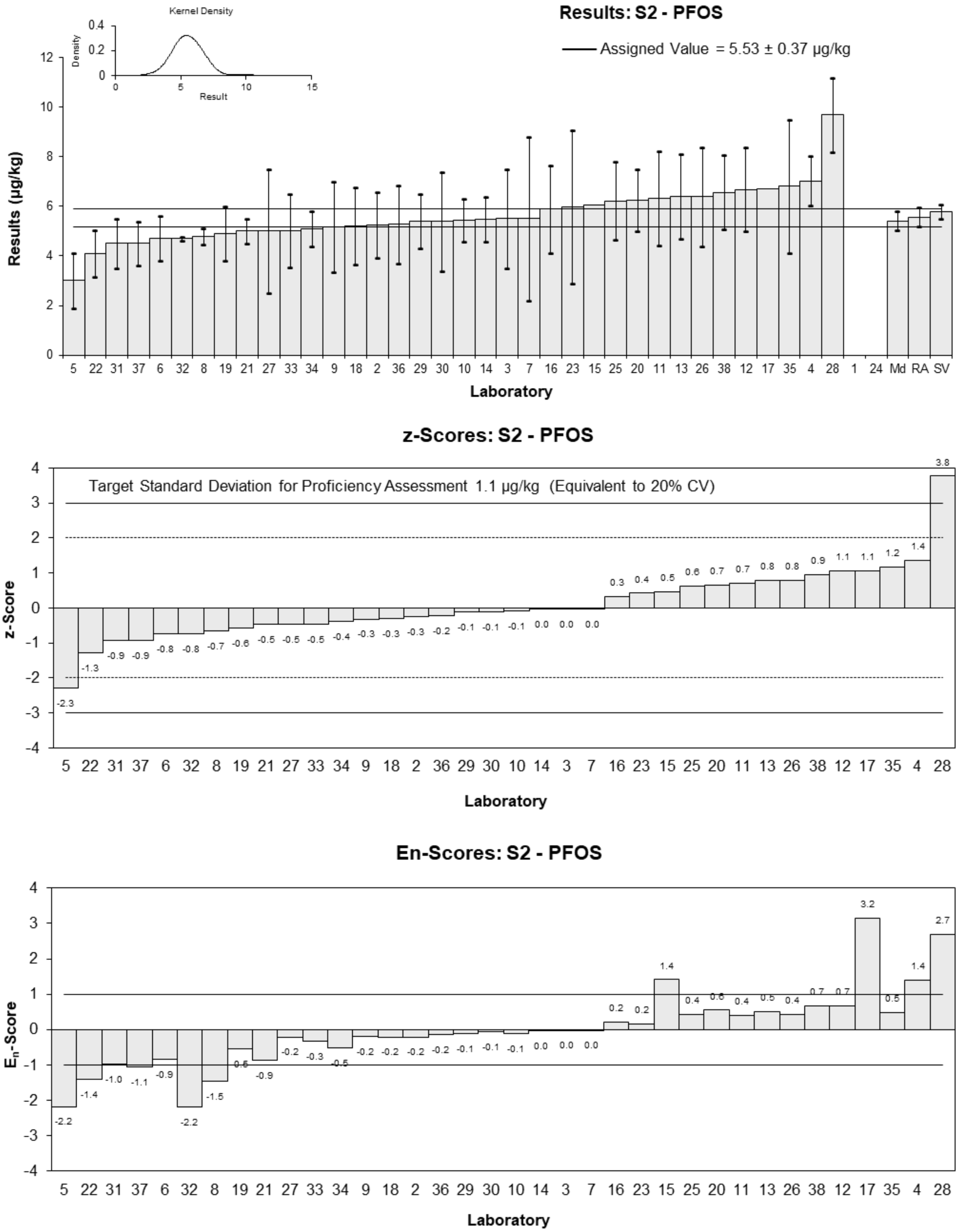

Results: S2 - PFOS
Assigned Value = 5.53 ± 0.37 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
5 22 31 37 6 32 8 19 21 27 33 34 9 18 2 36 29 30 10 14 3 7 16 23 15 25 20 11 13 26 38 12 17 35 4 28 1 24 Md RA SV
z-Scores: S2 - PFOS
Target Standard Deviation for Proficiency Assessment 1.1 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFOS
En-Score
Laboratory

Figure 25

Table 30

Sample Details

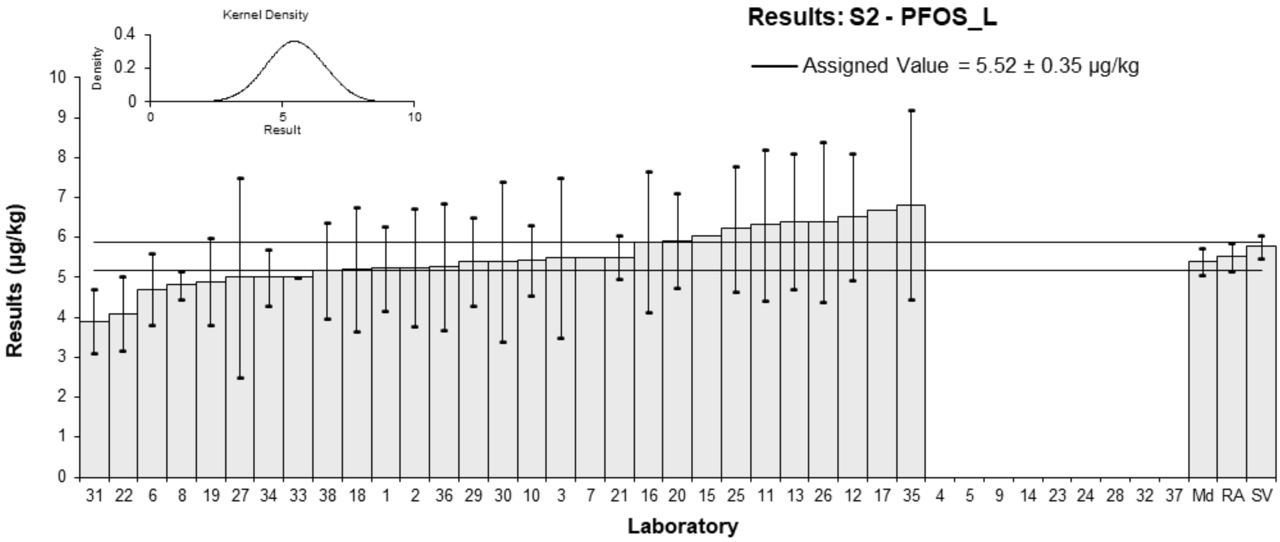
Sample No.	S2
Matrix	Soil
Analyte	PFOS_L
Unit	µg/kg

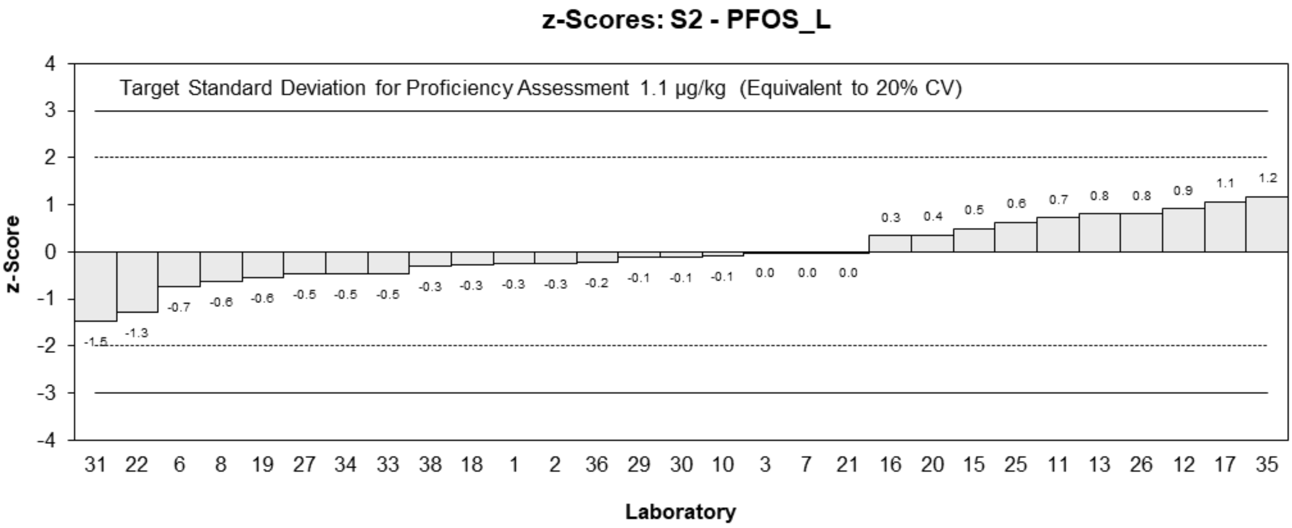
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	5.23	1.05	92.8	-0.26	-0.26
2	5.249	1.470	NR	-0.25	-0.18
3	5.5	2	76	-0.02	-0.01
4	NR	NR	NR		
5	NT	NT	NT		
6	4.7	0.9	125	-0.74	-0.85
7	5.5	NR	NR	-0.02	-0.06
8	4.82	0.35	79	-0.63	-1.41
9	NR	NR	NR		
10	5.43	0.87	99.4	-0.08	-0.10
11	6.318	1.90	101	0.72	0.41
12	6.52	1.6	90	0.91	0.61
13	6.4	1.7	NR	0.80	0.51
14	NT	NT	NT		
15	6.0531	NR	100	0.48	1.52
16	5.89	1.77	51	0.34	0.21
17	6.696	NR	NR	1.07	3.36
18	5.2	1.56	14	-0.29	-0.20
19	4.9	1.1	108	-0.56	-0.54
20	5.92	1.18	84	0.36	0.32
21	5.5	0.54	NR	-0.02	-0.03
22	4.1	0.94	NR	-1.29	-1.42
23	NT	NT	NT		
24	NS	NS	NS		
25	6.22	1.58	NR	0.63	0.43
26	6.4	2.0	112	0.80	0.43
27	5	2.5	NR	-0.47	-0.21
28	NT	NT	NT		
29	5.4	1.1	NR	-0.11	-0.10
30	5.4	2	98	-0.11	-0.06
31	3.9	0.8	124.47	-1.47	-1.86
32	NT	NT	NT		
33	5.01	0.004	76	-0.46	-1.46
34	5.0	0.70	108.48	-0.47	-0.66
35	6.81	2.37	93	1.17	0.54
36	5.28	1.58	92	-0.22	-0.15
37	NT	NT	NT		
38	5.1749	1.1902	NR	-0.31	-0.28

Statistics

Assigned Value	5.52	0.35
Spike Value	5.77	0.29
Robust Average	5.52	0.35
Median	5.40	0.34
Mean	5.50	
N	29	
Max	6.81	
Min	3.9	
Robust SD	0.74	
Robust CV	13%	


Results: S2 - PFOS_L
Assigned Value = 5.52 ± 0.35 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
31 22 6 8 19 27 34 33 38 18 1 2 36 29 30 10 3 7 21 16 20 15 25 11 13 26 12 17 35 4 5 9 14 23 24 28 32 37 Md RA SV
Laboratory


z-Scores: S2 - PFOS_L
Target Standard Deviation for Proficiency Assessment 1.1 µg/kg (Equivalent to 20% CV)
z-Score
-1.5 -1.3 -0.7 -0.6 -0.6 -0.5 -0.5 -0.5 -0.3 -0.3 -0.3 -0.3 -0.2 -0.1 -0.1 -0.1 0.0 0.0 0.0 0.3 0.4 0.5 0.6 0.7 0.8 0.8 0.9 1.1 1.2
31 22 6 8 19 27 34 33 38 18 1 2 36 29 30 10 3 7 21 16 20 15 25 11 13 26 12 17 35
Laboratory

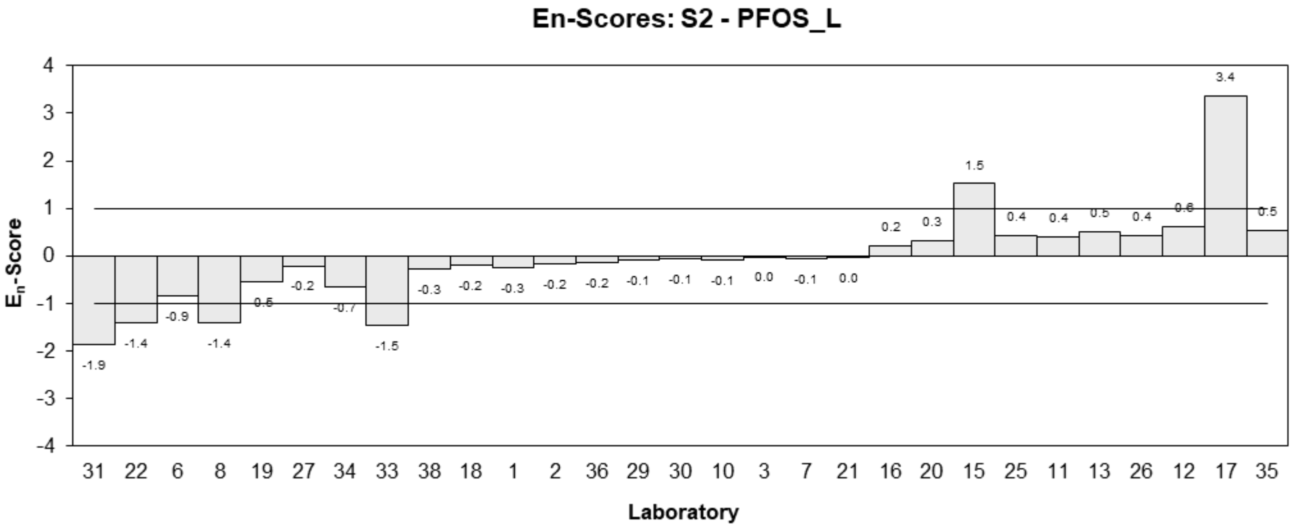

En-Scores: S2 - PFOS_L
E_n-Score
-1.9 -1.4 -0.9 -1.4 -0.5 -0.2 -0.7 -1.5 -0.3 -0.2 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 0.0 -0.1 0.0 0.2 0.3 1.5 0.4 0.4 0.5 0.4 0.6 3.4 0.5
31 22 6 8 19 27 34 33 38 18 1 2 36 29 30 10 3 7 21 16 20 15 25 11 13 26 12 17 35
Laboratory

Figure 26

Table 31

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFNS
Unit	µg/kg

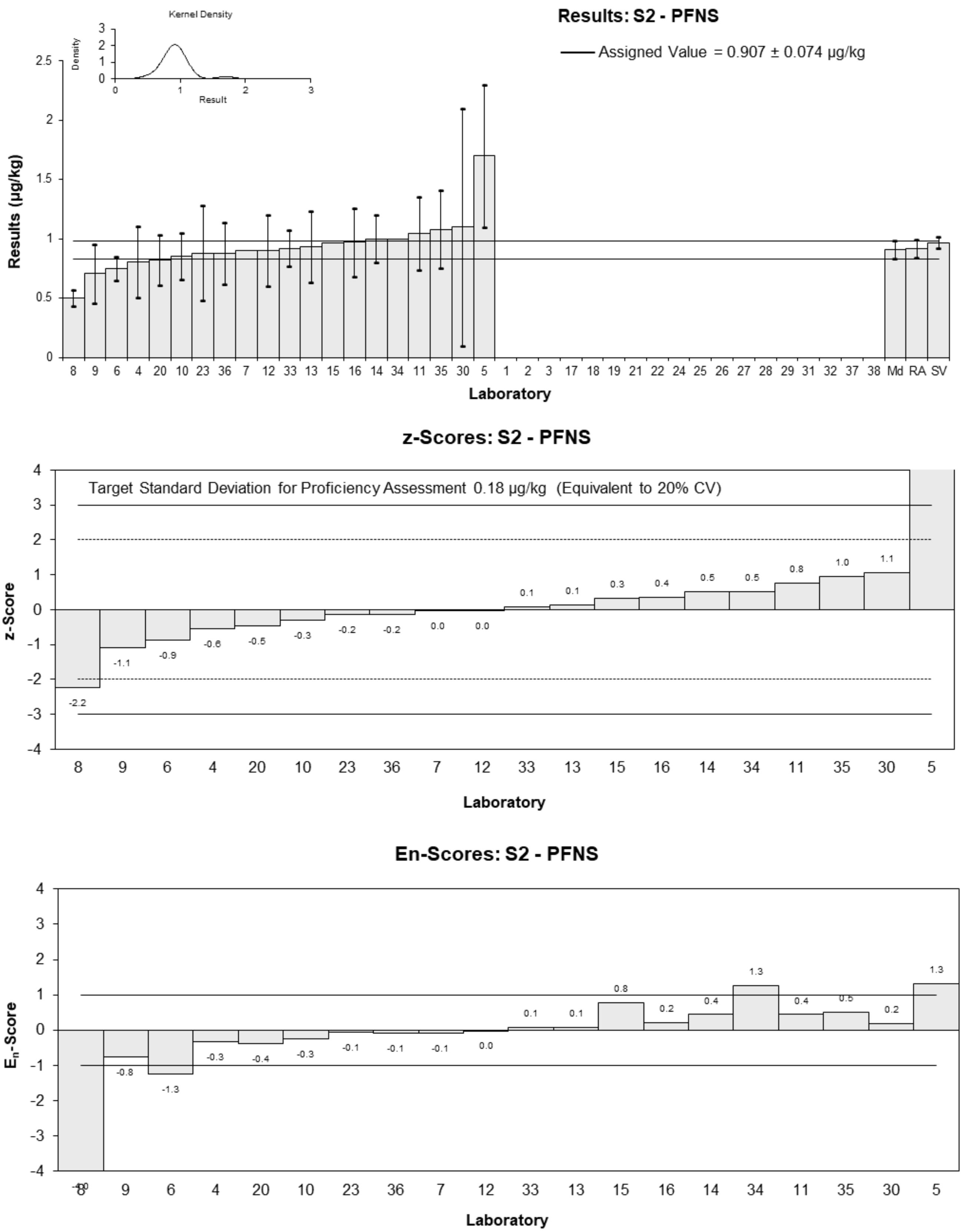
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NT	NT	NT		
3	NT	NT	NT		
4	0.807	0.3	NR	-0.55	-0.32
5*	1.7	0.6	NR	4.37	1.31
6	0.75	0.1	125	-0.87	-1.26
7	0.9	NR	NR	-0.04	-0.09
8	0.5	0.07	79	-2.24	-4.00
9	0.707	0.24745	96	-1.10	-0.77
10	0.852	0.196	99.4	-0.30	-0.26
11	1.046	0.31	99	0.77	0.44
12	0.9	0.3	89	-0.04	-0.02
13	0.93	0.3	NR	0.13	0.07
14	1.00	0.2	98	0.51	0.44
15	0.9646	NR	94	0.32	0.78
16	0.97	0.29	NR	0.35	0.21
17	NT	NT	NT		
18	< 2.5	NR	47		
19	NT	NR	NT		
20	0.82	0.21	84	-0.48	-0.39
21	<1	0.20	NR		
22	<1	NR	NR		
23	0.88	0.4	NR	-0.15	-0.07
24	NS	NS	NS		
25	<1	NR	NR		
26	< 1.0	NR	112		
27	< 1	0.5	NR		
28	NT	NT	NT		
29	NR	NR	NR		
30	1.1	1	98	1.06	0.19
31	NT	NT	NT		
32	NT	NT	NT		
33	0.921	0.153	76	0.08	0.08
34	1	NR	108.48	0.51	1.26
35	1.08	0.33	93	0.95	0.51
36	0.88	0.26	83	-0.15	-0.10
37	NT	NT	NT		
38	<5	NR	91		

* Outlier, see Section 4.2

Statistics

Assigned Value	0.907	0.074
Spike Value	0.966	0.048
Robust Average	0.917	0.077
Median	0.911	0.074
Mean	0.94	
N	20	
Max	1.7	
Min	0.5	
Robust SD	0.14	
Robust CV	15%	



Results: S2 - PFNS
Assigned Value = 0.907 ± 0.074 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - PFNS
Target Standard Deviation for Proficiency Assessment 0.18 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFNS
E_n-Score
Laboratory

Figure 27

Table 32

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFDS
Unit	µg/kg

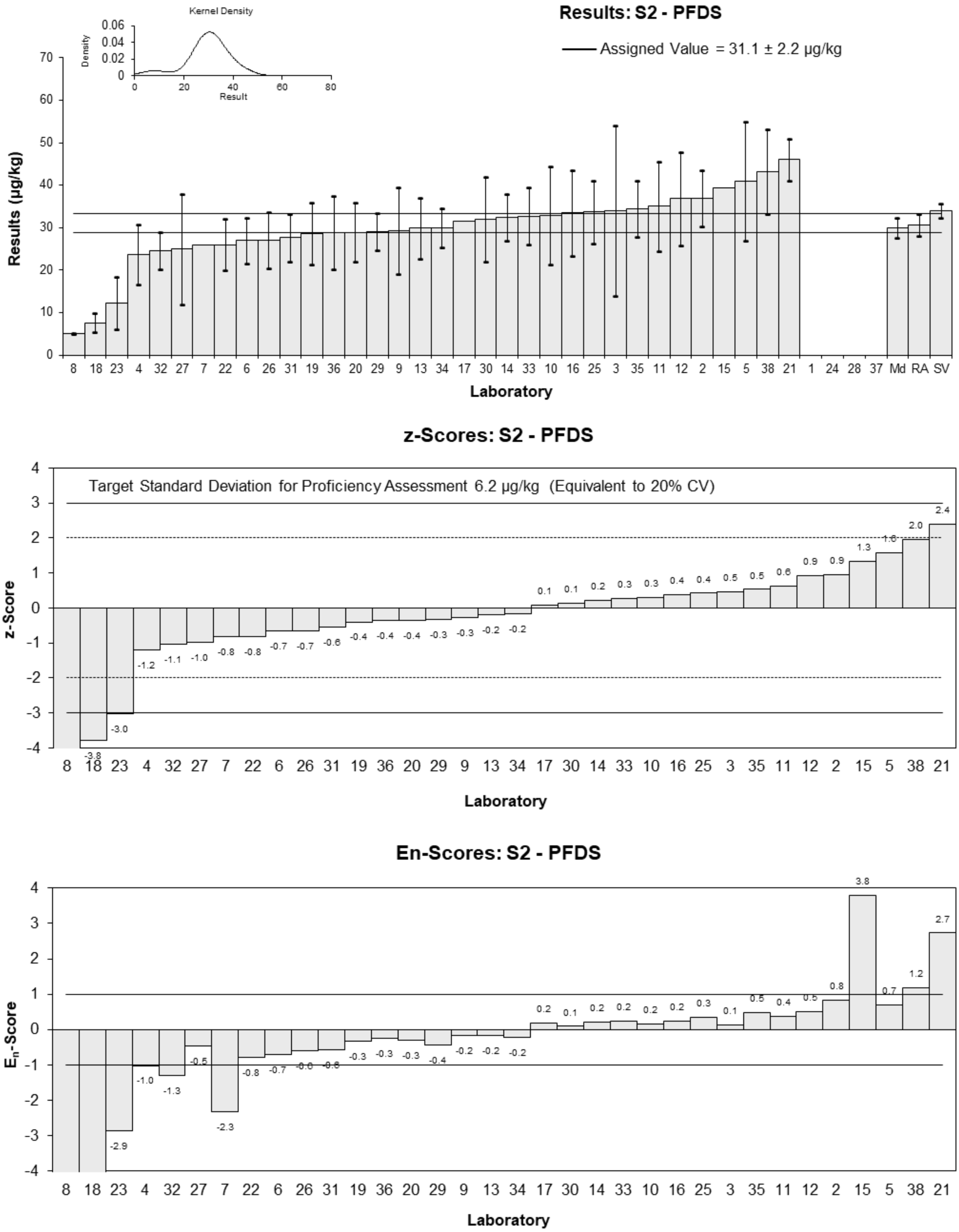
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	36.96	6.653	NR	0.94	0.84
3	34	20	84	0.47	0.14
4	23.633	7	NR	-1.20	-1.02
5	40.9	14	NR	1.58	0.69
6	27	5.4	125	-0.66	-0.70
7	26	NR	NR	-0.82	-2.32
8*	5.1	0.1	79	-4.18	-11.81
9	29.29	10.2515	96	-0.29	-0.17
10	32.9	11.5	99.4	0.29	0.15
11	35.044	10.51	101	0.63	0.37
12	36.8	11	53	0.92	0.51
13	29.9	7.2	NR	-0.19	-0.16
14	32.43	5.5	98	0.21	0.22
15	39.4394	NR	91	1.34	3.79
16	33.48	10.04	NR	0.38	0.23
17	31.52	NR	NR	0.07	0.19
18*	7.56	2.268	33	-3.78	-7.45
19	28.6	7.2	108	-0.40	-0.33
20	28.93	6.94	84	-0.35	-0.30
21*	46	5.00	NR	2.40	2.73
22	26	6.0	NR	-0.82	-0.80
23*	12.23	6.2	NR	-3.03	-2.87
24	NS	NS	NS		
25	33.7	7.4	NR	0.42	0.34
26	27	6.6	112	-0.66	-0.59
27	25	13	NR	-0.98	-0.46
28	NT	NT	NT		
29	29	4.4	NR	-0.34	-0.43
30	32	10	98	0.14	0.09
31	27.6	5.6	124.47	-0.56	-0.58
32	24.6	4.43	111.62	-1.05	-1.31
33	32.7	6.7	76	0.26	0.23
34	30	4.55	108.48	-0.18	-0.22
35	34.4	6.66	93	0.53	0.47
36	28.8	8.65	86	-0.37	-0.26
37	NT	NT	NT		
38	43.2479	9.9470	91	1.95	1.19

* Outlier, see Section 4.2

Statistics

Assigned Value	31.1	2.2
Spike Value	33.9	1.7
Robust Average	30.6	2.6
Median	30.0	2.4
Mean	29.8	
N	34	
Max	46	
Min	5.1	
Robust SD	6.0	
Robust CV	20%	



Results: S2 - PFDS
Assigned Value = 31.1 ± 2.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - PFDS
Target Standard Deviation for Proficiency Assessment 6.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFDS
E_n-Score
Laboratory

Figure 28

Table 33

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFDoS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NT	NT	NT		
3	NT	NT	NT		
4	NR	NR	NR		
5*	59.5	21	NR	7.24	1.67
6	20.5	4.1	125	-0.78	-0.83
7	22	NR	NR	-0.47	-1.15
8	NT	NT	NT		
9	NR	NR	NR		
10	24.4	12.9	99.4	0.02	0.01
11	NT	NT	NT		
12	NT	NT	NT		
13	NT	NT	NT		
14	NT	NT	NT		
15	31.007	NR	93	1.38	3.35
16	NT	NT	NT		
17	NT	NT	NT		
18*	5.47	1.641	27	-3.87	-7.28
19	NT	NR	NT		
20	22.43	8.30	84	-0.38	-0.22
21	26	2.03	NR	0.35	0.60
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	24.1	5.3	NR	-0.04	-0.04
26	NT	NT	NT		
27	22	11	NR	-0.47	-0.21
28	NT	NT	NT		
29	27	4.1	NR	0.56	0.59
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	25.4	7.83	73	0.23	0.14
34	NT	NT	NT		
35	NT	NT	NT		
36	25.1	7.5	87	0.16	0.10
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	24.3	2.0
Spike Value	29.3	1.5
Robust Average	24.5	2.8
Median	24.4	2.5
Mean	25.8	
N	13	
Max	59.5	
Min	5.47	
Robust SD	4.1	
Robust CV	17%	

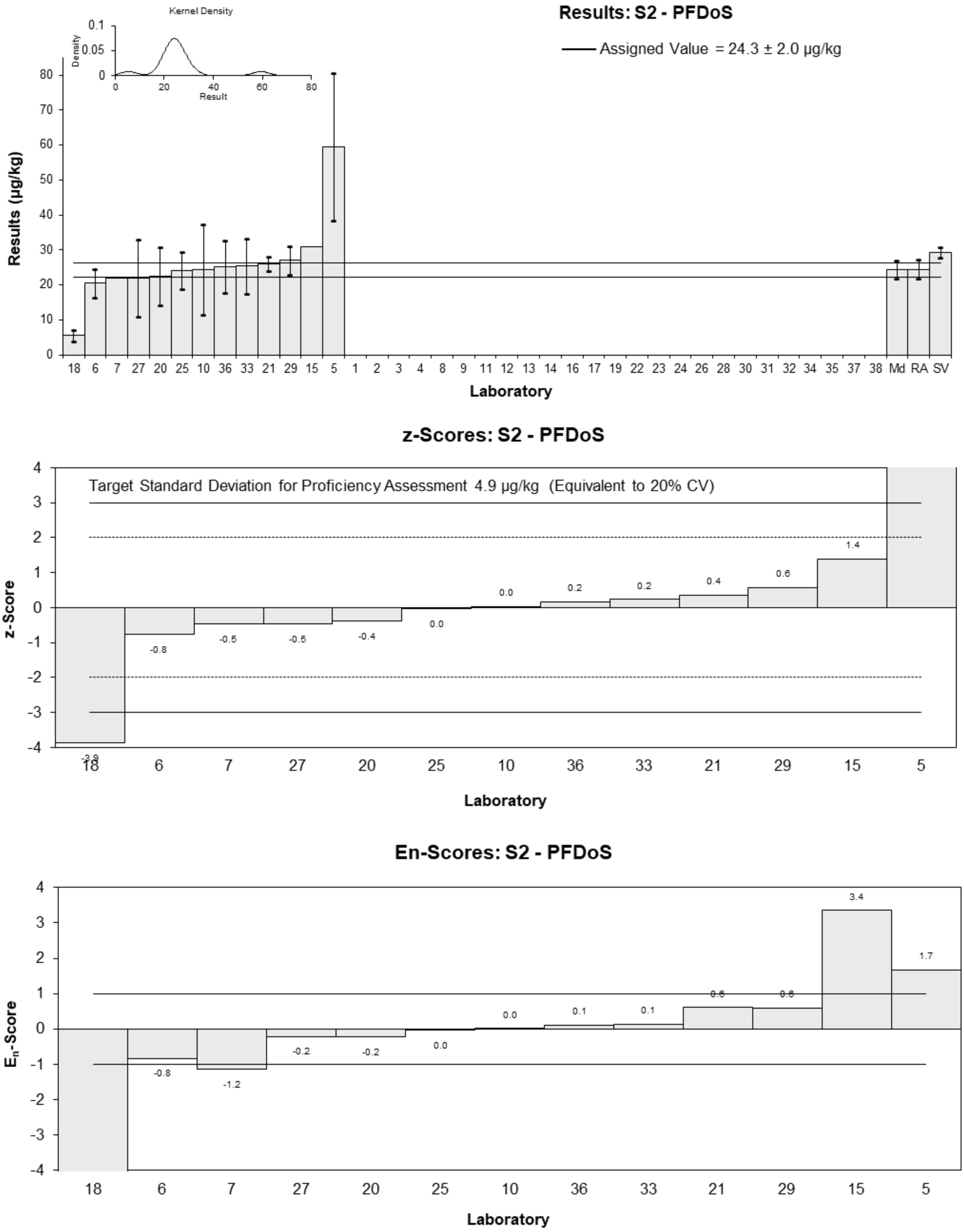

Results: S2 - PFDoS
Assigned Value = 24.3 ± 2.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
18 6 7 27 20 25 10 36 33 21 29 15 5 1 2 3 4 8 9 11 12 13 14 16 17 19 22 23 24 26 28 30 31 32 34 35 37 38 Md RA SV
Laboratory
z-Scores: S2 - PFDoS
Target Standard Deviation for Proficiency Assessment 4.9 µg/kg (Equivalent to 20% CV)
z-Score
-3.9 -0.8 -0.5 -0.5 -0.4 0.0 0.0 0.2 0.2 0.4 0.6 1.4
18 6 7 27 20 25 10 36 33 21 29 15 5
Laboratory
En-Scores: S2 - PFDoS
E_n-Score
-0.8 -1.2 -0.2 -0.2 0.0 0.0 0.1 0.1 0.6 0.6 3.4 1.7
18 6 7 27 20 25 10 36 33 21 29 15 5
Laboratory

Figure 29

Table 34

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	10.80	3.672	NR	0.00	0.00
3	12	4	90	0.56	0.30
4	15.123	4	74	2.00	1.07
5	14.8	5.2	NR	1.85	0.76
6	9.8	2	101	-0.46	-0.48
7	11	NR	100	0.09	0.33
8	10.7	2.43	76	-0.05	-0.04
9	9.728	3.4048	75	-0.50	-0.31
10	11.9	1.55	96.2	0.51	0.66
11	11.922	3.58	84	0.52	0.31
12	10	3	77	-0.37	-0.26
13	10.9	2.8	89	0.05	0.03
14	14.52	1.6	104	1.72	2.18
15	11.863	NR	94	0.49	1.77
16	9.58	2.88	85	-0.56	-0.41
17	10.49	NR	NR	-0.14	-0.52
18	9.08	2.724	48	-0.80	-0.62
19	9	2	123	-0.83	-0.86
20	10.64	5.22	71	-0.07	-0.03
21	NT	NT	NT		
22	8.7	2.0	NR	-0.97	-1.01
23	12	NR	54	0.56	2.00
24	NS	NS	NS		
25	12	3.5	113	0.56	0.34
26	12	3.9	111	0.56	0.30
27	10	5	115	-0.37	-0.16
28	NT	NT	NT		
29	11	1.6	118	0.09	0.12
30	13	4	98	1.02	0.54
31	9	3	112.52	-0.83	-0.59
32	10	2.06	113.52	-0.37	-0.37
33	11.8	2.11	74	0.46	0.46
34	10	2.34	97.89	-0.37	-0.33
35	10.8	3.2	82	0.00	0.00
36	8.9	2.67	79	-0.88	-0.69
37	10	2.0	NR	-0.37	-0.38
38	9.1714	1.0089	123	-0.75	-1.39

Statistics

Assigned Value	10.8	0.6
Spike Value	9.42	0.47
Robust Average	10.8	0.6
Median	10.8	0.7
Mean	10.9	
N	34	
Max	15.123	
Min	8.7	
Robust SD	1.5	
Robust CV	14%	

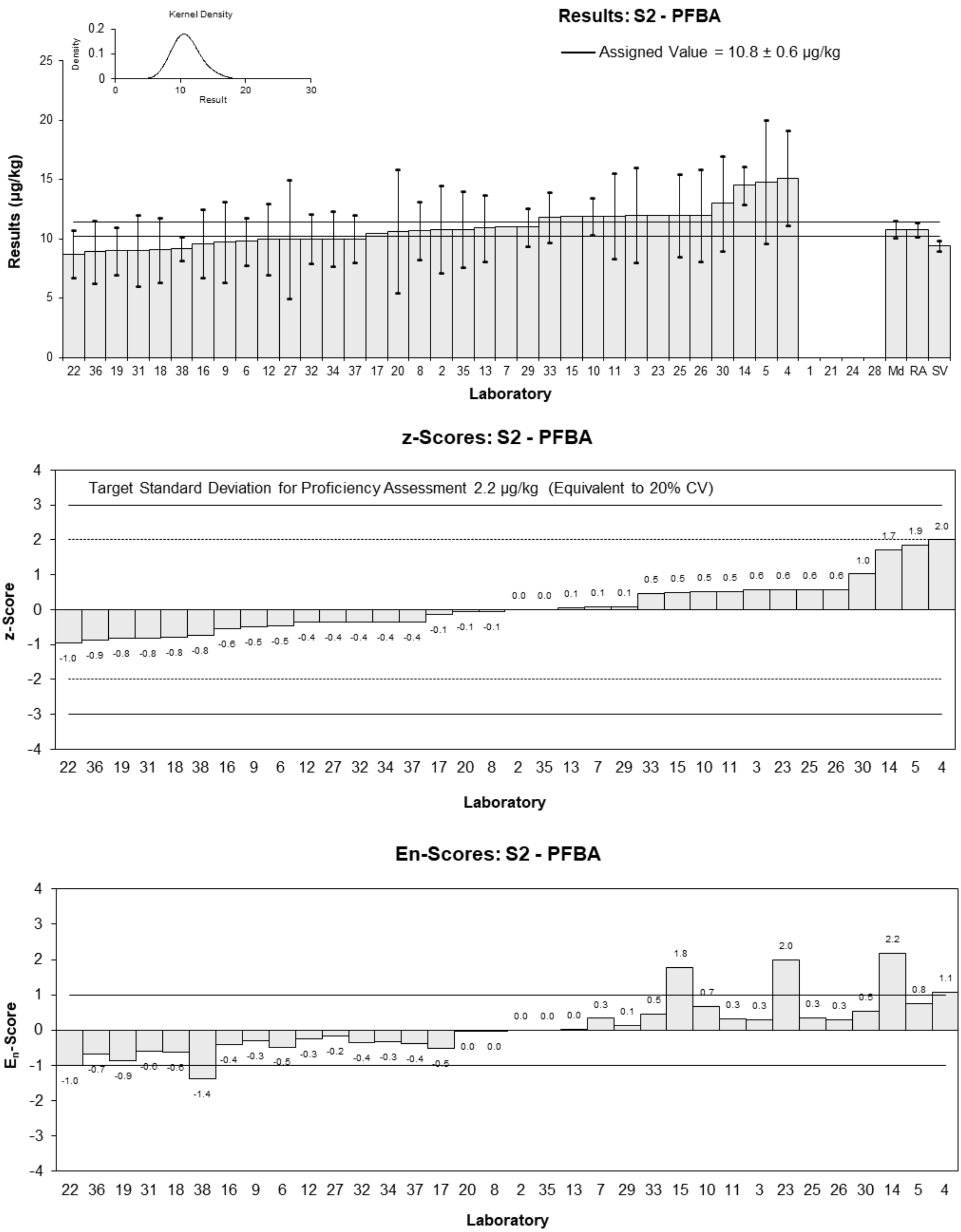

Results: S2 - PFBA
Assigned Value = 10.8 ± 0.6 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
22 36 19 31 18 38 16 9 6 12 27 32 34 37 17 20 8 2 35 13 7 29 33 15 10 11 3 23 25 26 30 14 5 4 1 21 24 28 Md RA SV
Laboratory
z-Scores: S2 - PFBA
Target Standard Deviation for Proficiency Assessment 2.2 µg/kg (Equivalent to 20% CV)
z-Score
22 36 19 31 18 38 16 9 6 12 27 32 34 37 17 20 8 2 35 13 7 29 33 15 10 11 3 23 25 26 30 14 5 4
Laboratory
En-Scores: S2 - PFBA
E_n-Score
22 36 19 31 18 38 16 9 6 12 27 32 34 37 17 20 8 2 35 13 7 29 33 15 10 11 3 23 25 26 30 14 5 4
Laboratory

Figure 30

Table 35

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	3.818	1.260	NR	0.15	0.08
3	4.0	2	97	0.39	0.14
4	4.797	1	87	1.46	1.06
5	5.5	1.9	NR	2.41	0.94
6	3.5	0.7	105	-0.28	-0.29
7	3.3	NR	97	-0.55	-1.95
8	3.83	1.02	79	0.16	0.12
9	3.11	1.0885	79	-0.81	-0.54
10	3.73	0.52	112	0.03	0.04
11	4.158	1.25	98	0.60	0.35
12	3.9	1.2	90	0.26	0.16
13	3.5	1	91	-0.28	-0.21
14	4.52	0.7	97	1.09	1.11
15	4.1415	NR	101	0.58	2.05
16	3.26	0.98	89	-0.61	-0.45
17	3.364	NR	NR	-0.47	-1.65
18	3.41	1.023	49	-0.40	-0.29
19	3.5	0.7	116	-0.28	-0.29
20	3.73	1.05	84	0.03	0.02
21	4.0	0.40	NR	0.39	0.64
22	2.9	0.67	NR	-1.09	-1.15
23	3.68	1.9	NR	-0.04	-0.02
24	NS	NS	NS		
25	4.13	0.98	105	0.57	0.42
26	4.1	0.55	108	0.53	0.66
27	3	1.5	111	-0.96	-0.47
28	NT	NT	NT		
29	3.4	0.68	100	-0.42	-0.44
30	4.6	2	101	1.20	0.44
31	3.4	0.7	105.74	-0.42	-0.42
32	3	0.46	104.72	-0.96	-1.40
33	3.68	0.918	78	-0.04	-0.03
34	3.5	0.47	63.32	-0.28	-0.41
35	3.83	1.14	86	0.16	0.10
36	3.45	1.03	83	-0.35	-0.25
37	3.9	0.78	NR	0.26	0.24
38	<5	NR	108		

Statistics

Assigned Value	3.71	0.21
Spike Value	4.01	0.20
Robust Average	3.71	0.21
Median	3.71	0.19
Mean	3.75	
N	34	
Max	5.5	
Min	2.9	
Robust SD	0.48	
Robust CV	13%	

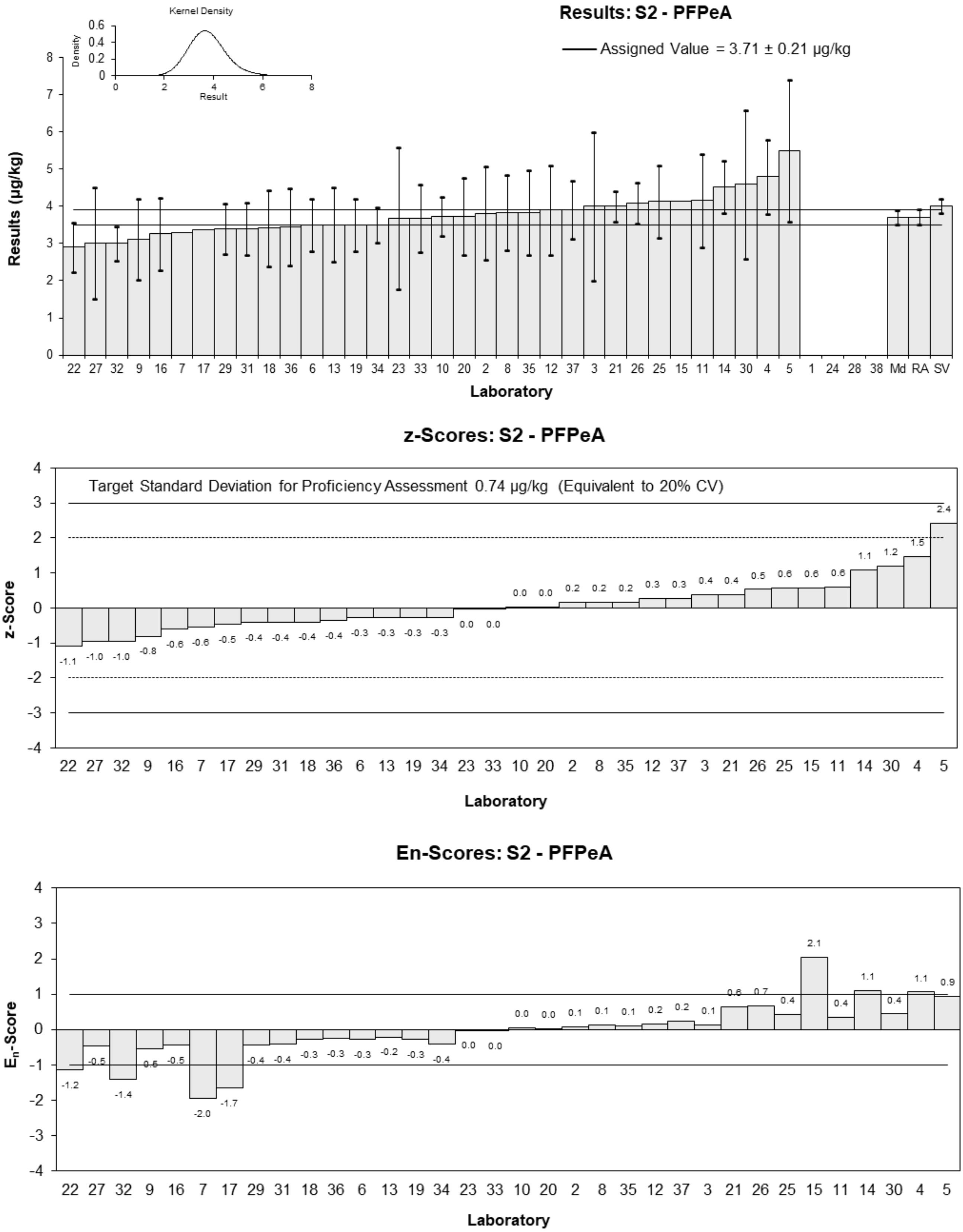

Kernel Density
Density
Result
Results: S2 - PFPeA
Assigned Value = 3.71 ± 0.21 µg/kg
Results (µg/kg)
22 27 32 9 16 7 17 29 31 18 36 6 13 19 34 23 33 10 20 2 8 35 12 37 3 21 26 25 15 11 14 30 4 5 1 24 28 38 Md RA SV
Laboratory
z-Scores: S2 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.74 µg/kg (Equivalent to 20% CV)
z-Score
-1.1 -1.0 -1.0 -0.8 -0.6 -0.6 -0.5 -0.4 -0.4 -0.4 -0.4 -0.3 -0.3 -0.3 -0.3 0.0 0.0 0.0 0.0 0.2 0.2 0.2 0.3 0.3 0.4 0.4 0.5 0.6 0.6 0.6 1.1 1.2 1.5 2.4
22 27 32 9 16 7 17 29 31 18 36 6 13 19 34 23 33 10 20 2 8 35 12 37 3 21 26 25 15 11 14 30 4 5
Laboratory
En-Scores: S2 - PFPeA
E_n-Score
-1.2 -0.5 -1.4 -0.5 -0.5 -2.0 -1.7 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.3 -0.4 0.0 0.0 0.0 0.0 0.1 0.1 0.1 0.2 0.2 0.1 0.6 0.7 0.4 2.1 0.4 1.1 0.4 1.1 0.9
22 27 32 9 16 7 17 29 31 18 36 6 13 19 34 23 33 10 20 2 8 35 12 37 3 21 26 25 15 11 14 30 4 5
Laboratory

Figure 31

Table 36

Sample Details

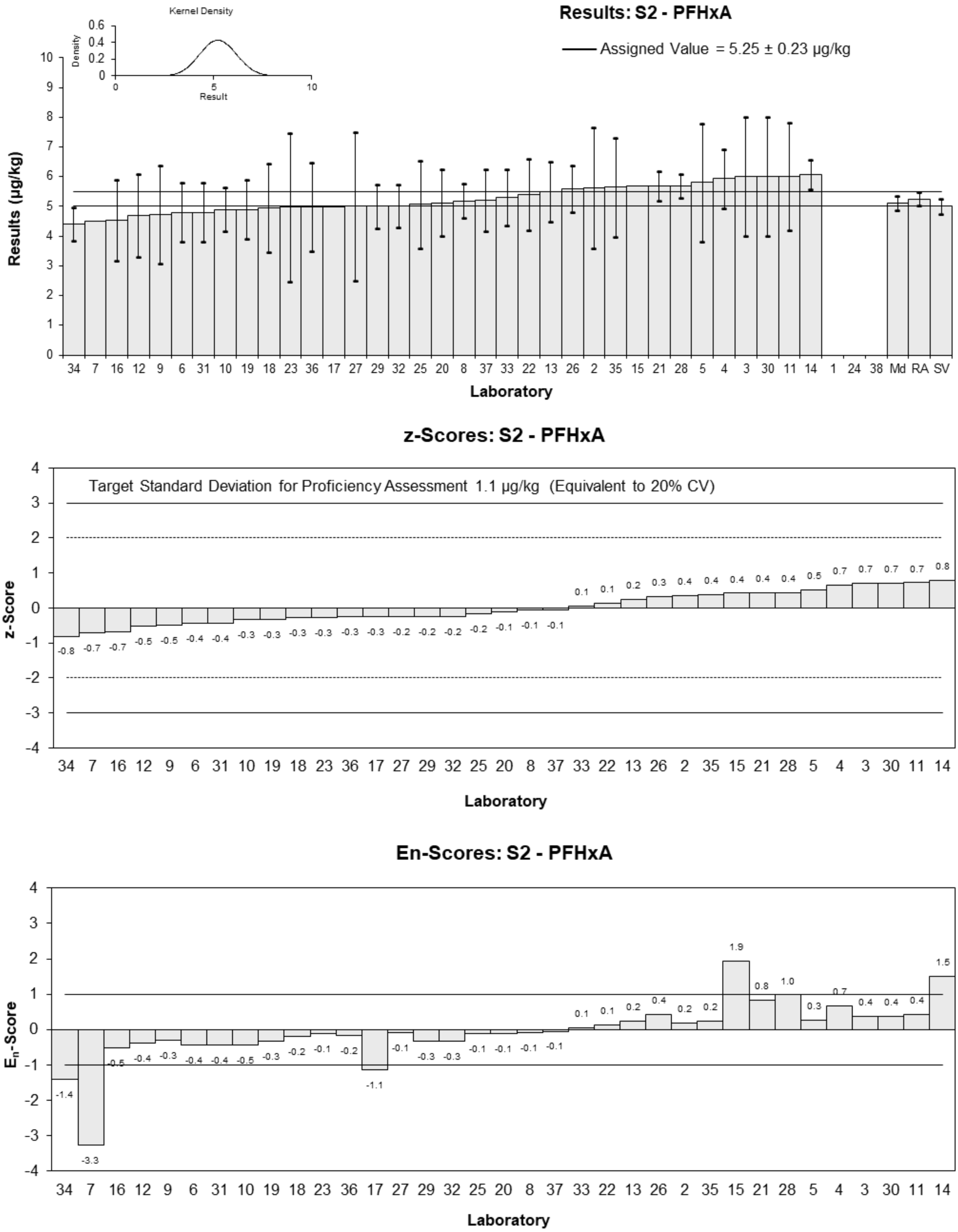
Sample No.	S2
Matrix	Soil
Analyte	PFHxA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	5.628	2.026	NR	0.36	0.19
3	6.0	2	85	0.71	0.37
4	5.930	1	88	0.65	0.66
5	5.8	2	NR	0.52	0.27
6	4.8	1	111	-0.43	-0.44
7	4.5	NR	106	-0.71	-3.26
8	5.19	0.58	77	-0.06	-0.10
9	4.73	1.6555	79	-0.50	-0.31
10	4.9	0.74	93.7	-0.33	-0.45
11	6.009	1.80	91	0.72	0.42
12	4.7	1.4	62	-0.52	-0.39
13	5.5	1	111	0.24	0.24
14	6.08	0.5	101	0.79	1.51
15	5.6936	NR	102	0.42	1.93
16	4.54	1.36	101	-0.68	-0.51
17	4.989	NR	NR	-0.25	-1.13
18	4.96	1.488	49	-0.28	-0.19
19	4.9	1	109	-0.33	-0.34
20	5.12	1.13	80	-0.12	-0.11
21	5.7	0.50	NR	0.43	0.82
22	5.4	1.2	NR	0.14	0.12
23	4.97	2.5	66.5	-0.27	-0.11
24	NS	NS	NS		
25	5.07	1.47	108	-0.17	-0.12
26	5.6	0.79	106	0.33	0.43
27	5	2.5	109	-0.24	-0.10
28	5.7	0.4	64	0.43	0.98
29	5.0	0.74	123	-0.24	-0.32
30	6.0	2	94	0.71	0.37
31	4.8	1.0	103.72	-0.43	-0.44
32	5	0.72	108.78	-0.24	-0.33
33	5.30	0.937	78	0.05	0.05
34	4.4	0.56	65.08	-0.81	-1.40
35	5.64	1.68	89	0.37	0.23
36	4.98	1.5	94	-0.26	-0.18
37	5.2	1.04	NR	-0.05	-0.05
38	<5	NR	96		

Statistics

Assigned Value	5.25	0.23
Spike Value	5.00	0.25
Robust Average	5.25	0.23
Median	5.12	0.24
Mean	5.25	
N	35	
Max	6.08	
Min	4.4	
Robust SD	0.54	
Robust CV	10%	



Results: S2 - PFHxA
Assigned Value = 5.25 ± 0.23 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - PFHxA
Target Standard Deviation for Proficiency Assessment 1.1 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFHxA
E_n-Score
Laboratory

Figure 32

Table 37

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	2.966	1.186	NR	-0.07	-0.04
3	3.3	1	92	0.48	0.29
4	3.445	0.5	89	0.72	0.84
5	3.0	3	NR	-0.02	0.00
6	2.8	0.6	112	-0.35	-0.34
7	2.7	1	106	-0.51	-0.31
8	2.96	0.36	88	-0.08	-0.13
9	2.742	0.9597	85	-0.45	-0.28
10	2.69	0.35	88.9	-0.53	-0.85
11	3.336	1.00	95	0.54	0.32
12	3	0.9	137	-0.02	-0.01
13	3.1	0.9	99	0.15	0.10
14	3.31	0.3	97	0.50	0.91
15	3.3115	NR	99	0.50	2.15
16	2.59	0.78	90	-0.70	-0.53
17	2.727	NR	NR	-0.47	-2.02
18	3.11	0.933	49	0.17	0.11
19	2.5	0.5	119	-0.85	-0.98
20	2.90	0.75	82	-0.18	-0.14
21*	1.1	0.14	NR	-3.17	-9.65
22	2.3	0.53	NR	-1.18	-1.30
23	3.22	1.6	67	0.35	0.13
24	NS	NS	NS		
25	3.39	0.78	100	0.63	0.48
26	3.1	0.77	111	0.15	0.11
27	3	1.5	105	-0.02	-0.01
28	3.4	0.2	63	0.65	1.60
29	2.9	0.43	117	-0.18	-0.24
30	3.5	2	98	0.81	0.24
31	2.6	0.6	109.29	-0.68	-0.67
32	2.8	0.42	102.83	-0.35	-0.47
33	3.06	0.505	76	0.08	0.10
34	2.9	0.21	83.1	-0.18	-0.44
35	3.45	1.02	88	0.73	0.43
36	2.93	0.88	92	-0.13	-0.09
37	3.1	0.62	NR	0.15	0.14
38	<5	NR	101		

* Outlier, see Section 4.2

Statistics

Assigned Value	3.01	0.14
Spike Value	3.00	0.15
Robust Average	2.99	0.14
Median	3.00	0.16
Mean	2.95	
N	35	
Max	3.5	
Min	1.1	
Robust SD	0.34	
Robust CV	11%	

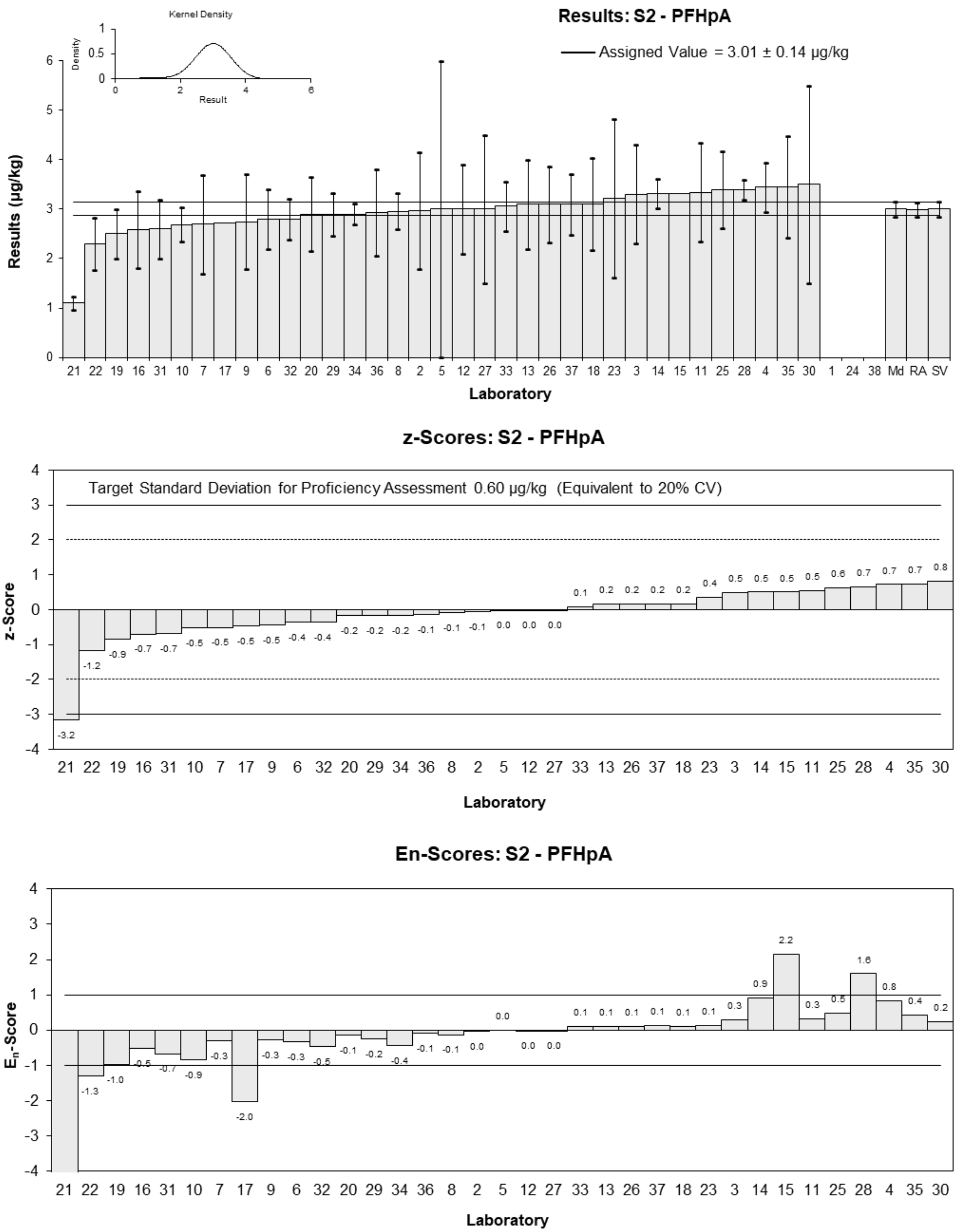

Results: S2 - PFHpA
Assigned Value = 3.01 ± 0.14 µg/kg
Kernel Density
Results (µg/kg)
Laboratory
z-Scores: S2 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.60 µg/kg (Equivalent to 20% CV)
z-Score
En-Scores: S2 - PFHpA
E_n-Score

Figure 33

Table 38

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	10.3	2.1	109	-0.10	-0.09
2	10.45	3.240	NR	-0.02	-0.02
3	11	4	92	0.24	0.12
4	11.873	1.2	84	0.65	1.06
5	12.2	4.3	NR	0.81	0.39
6	11	2.2	107	0.24	0.22
7	11	6.6	110	0.24	0.08
8	10.1	0.045	93	-0.19	-0.80
9	9.546	3.3411	85	-0.45	-0.28
10	10.8	1.62	90.9	0.14	0.18
11	12.804	3.84	84	1.10	0.59
12	9.2	2.8	61	-0.62	-0.46
13	10.9	2.5	99	0.19	0.16
14	11.15	2.23	103	0.31	0.28
15	11.2641	NR	101	0.36	1.53
16	8.96	2.69	90	-0.73	-0.56
17	8.954	NR	NR	-0.74	-3.09
18	9.65	2.895	47	-0.40	-0.29
19	10	2.1	104	-0.24	-0.23
20	9.91	2.08	85	-0.28	-0.28
21	12	1.30	NR	0.71	1.08
22	8.2	1.9	NR	-1.10	-1.17
23	11.36	5.8	94	0.41	0.15
24	NS	NS	NS		
25	11.2	2.4	96	0.33	0.29
26	11	1.6	113	0.24	0.30
27	9	4.5	98	-0.71	-0.33
28	11	0.9	62	0.24	0.49
29	10	1.5	117	-0.24	-0.32
30	12	4	96	0.71	0.37
31	10.4	1.9	104.3	-0.05	-0.05
32	9.6	1.37	97.58	-0.43	-0.62
33	10.5	1.94	73	0.00	0.00
34	9.6	0.87	93.48	-0.43	-0.90
35	11.3	3.4	91	0.38	0.23
36	9.9	2.97	87	-0.29	-0.20
37	10	2.0	NR	-0.24	-0.24
38	8.7364	0.9610	105	-0.84	-1.63

Statistics

Assigned Value	10.5	0.5
Spike Value	10.1	0.5
Robust Average	10.5	0.5
Median	10.5	0.5
Mean	10.5	
N	37	
Max	12.804	
Min	8.2	
Robust SD	1.1	
Robust CV	11%	

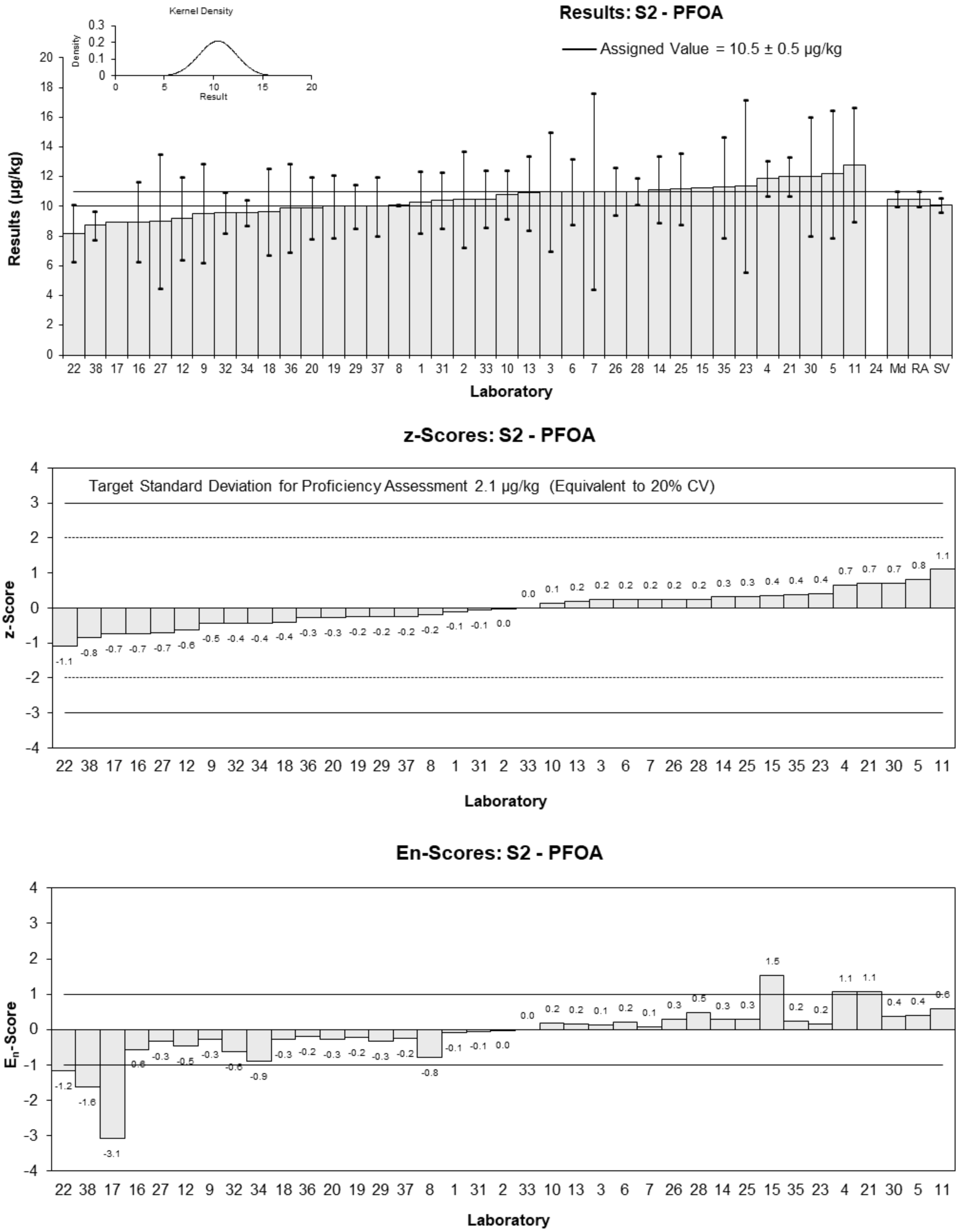

Results: S2 - PFOA
Assigned Value = 10.5 ± 0.5 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
22 38 17 16 27 12 9 32 34 18 36 20 19 29 37 8 1 31 2 33 10 13 3 6 7 26 28 14 25 15 35 23 4 21 30 5 11 24 Md RA SV
Laboratory
z-Scores: S2 - PFOA
Target Standard Deviation for Proficiency Assessment 2.1 µg/kg (Equivalent to 20% CV)
z-Score
-1.1 -0.8 -0.7 -0.7 -0.7 -0.6 -0.5 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.1 -0.1 0.0 0.0 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.3 0.3 0.4 0.4 0.4 0.7 0.7 0.7 0.8 1.1
22 38 17 16 27 12 9 32 34 18 36 20 19 29 37 8 1 31 2 33 10 13 3 6 7 26 28 14 25 15 35 23 4 21 30 5 11
Laboratory
En-Scores: S2 - PFOA
En-Score
-1.2 -1.6 -3.1 -0.6 -0.3 -0.5 -0.3 -0.6 -0.9 -0.3 -0.2 -0.3 -0.2 -0.3 -0.2 -0.8 -0.1 -0.1 0.0 0.0 0.2 0.2 0.1 0.2 0.1 0.3 0.5 0.3 0.3 1.5 0.2 0.2 1.1 1.1 0.4 0.4 0.6
22 38 17 16 27 12 9 32 34 18 36 20 19 29 37 8 1 31 2 33 10 13 3 6 7 26 28 14 25 15 35 23 4 21 30 5 11
Laboratory

Figure 34

Table 39

Sample Details

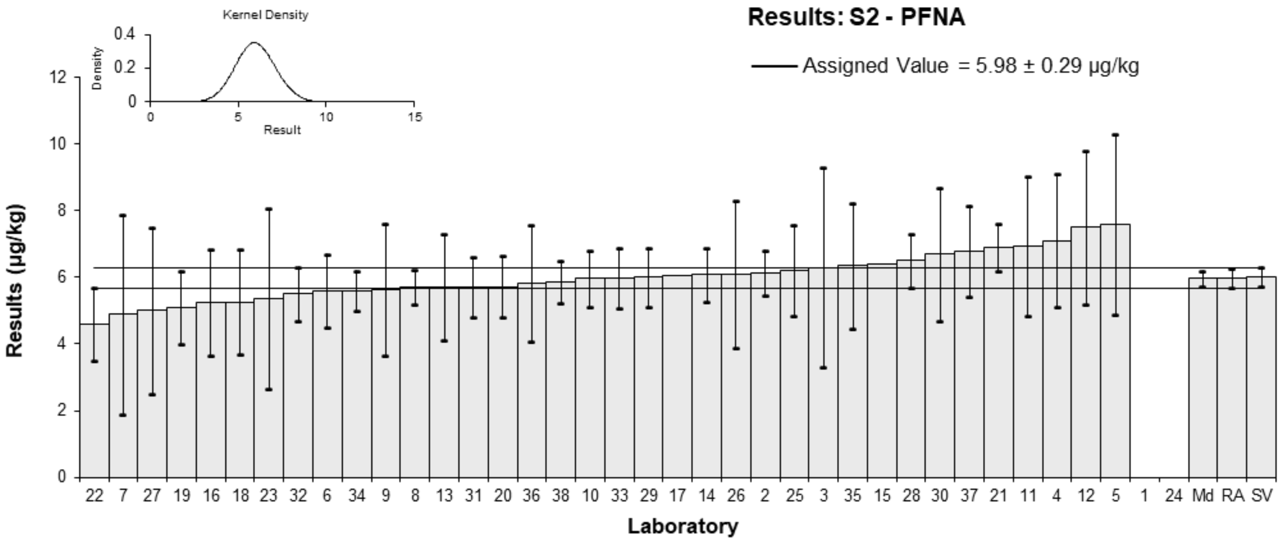
Sample No.	S2
Matrix	Soil
Analyte	PFNA
Unit	µg/kg

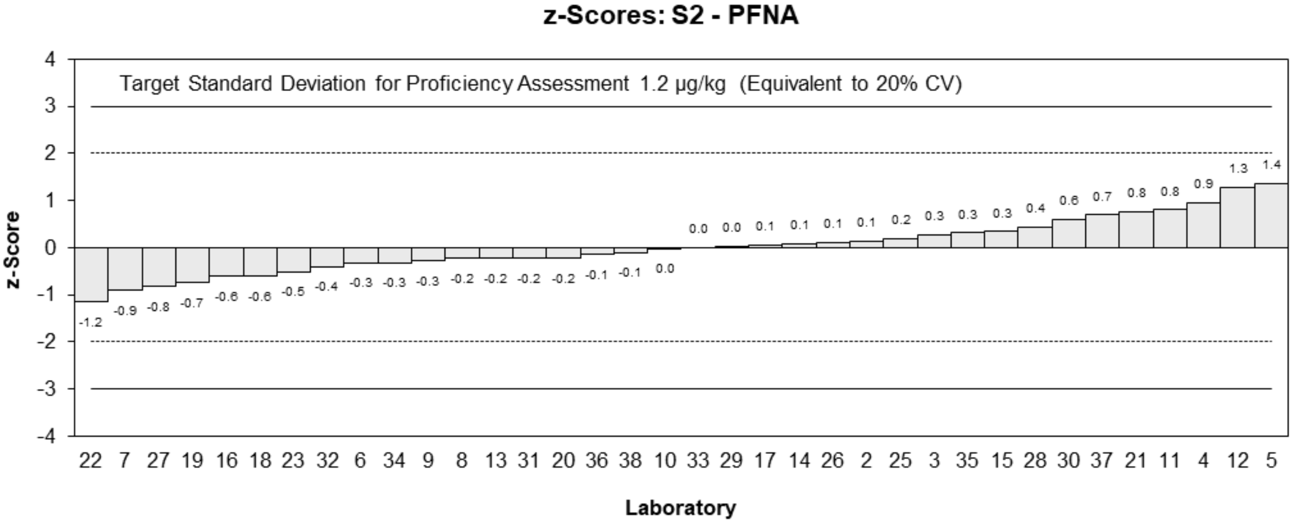
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	6.139	0.6753	NR	0.13	0.22
3	6.3	3	80	0.27	0.11
4	7.100	2	80	0.94	0.55
5	7.6	2.7	NR	1.35	0.60
6	5.6	1.1	138	-0.32	-0.33
7	4.9	3	105	-0.90	-0.36
8	5.7	0.52	82	-0.23	-0.47
9	5.64	1.974	85	-0.28	-0.17
10	5.96	0.83	103	-0.02	-0.02
11	6.937	2.08	81	0.80	0.46
12	7.5	2.3	130	1.27	0.66
13	5.7	1.6	96	-0.23	-0.17
14	6.08	0.8	103	0.08	0.12
15	6.3844	NR	109	0.34	1.39
16	5.25	1.58	89	-0.61	-0.45
17	6.049	NR	NR	0.06	0.24
18	5.26	1.578	35	-0.60	-0.45
19	5.1	1.1	117	-0.74	-0.77
20	5.72	0.92	87	-0.22	-0.27
21	6.9	0.70	NR	0.77	1.21
22	4.6	1.1	NR	-1.15	-1.21
23	5.37	2.7	72	-0.51	-0.22
24	NS	NS	NS		
25	6.21	1.37	97	0.19	0.16
26	6.1	2.2	118	0.10	0.05
27	5	2.5	103	-0.82	-0.39
28	6.5	0.8	58	0.43	0.61
29	6.0	0.90	123	0.02	0.02
30	6.7	2	94	0.60	0.36
31	5.7	0.9	109.62	-0.23	-0.30
32	5.5	0.82	110.68	-0.40	-0.55
33	5.98	0.903	72	0.00	0.00
34	5.6	0.60	106	-0.32	-0.57
35	6.35	1.89	97	0.31	0.19
36	5.82	1.75	86	-0.13	-0.09
37	6.8	1.36	NR	0.69	0.59
38	5.8639	0.6450	112	-0.10	-0.16

Statistics

Assigned Value	5.98	0.29
Spike Value	6.02	0.30
Robust Average	5.98	0.29
Median	5.97	0.23
Mean	6.00	
N	36	
Max	7.6	
Min	4.6	
Robust SD	0.70	
Robust CV	12%	


Results: S2 - PFNA
Assigned Value = 5.98 ± 0.29 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
22 7 27 19 16 18 23 32 6 34 9 8 13 31 20 36 38 10 33 29 17 14 26 2 25 3 35 15 28 30 37 21 11 4 12 5 1 24 Md RA SV


z-Scores: S2 - PFNA
Target Standard Deviation for Proficiency Assessment 1.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
22 7 27 19 16 18 23 32 6 34 9 8 13 31 20 36 38 10 33 29 17 14 26 2 25 3 35 15 28 30 37 21 11 4 12 5

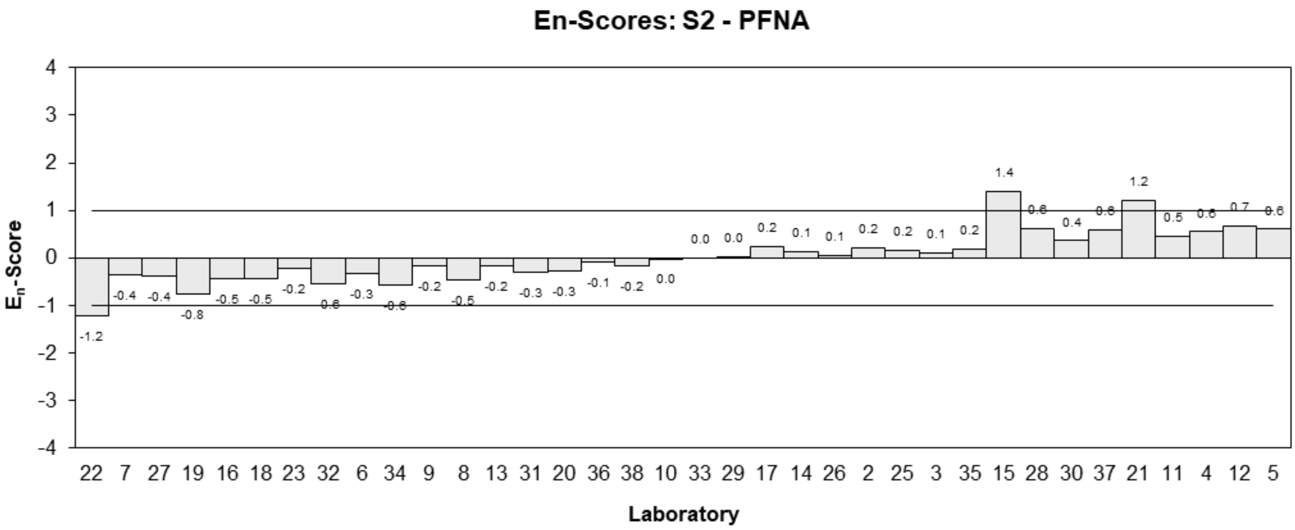

En-Scores: S2 - PFNA
E_n-Score
Laboratory
22 7 27 19 16 18 23 32 6 34 9 8 13 31 20 36 38 10 33 29 17 14 26 2 25 3 35 15 28 30 37 21 11 4 12 5

Figure 35

Table 40

Sample Details

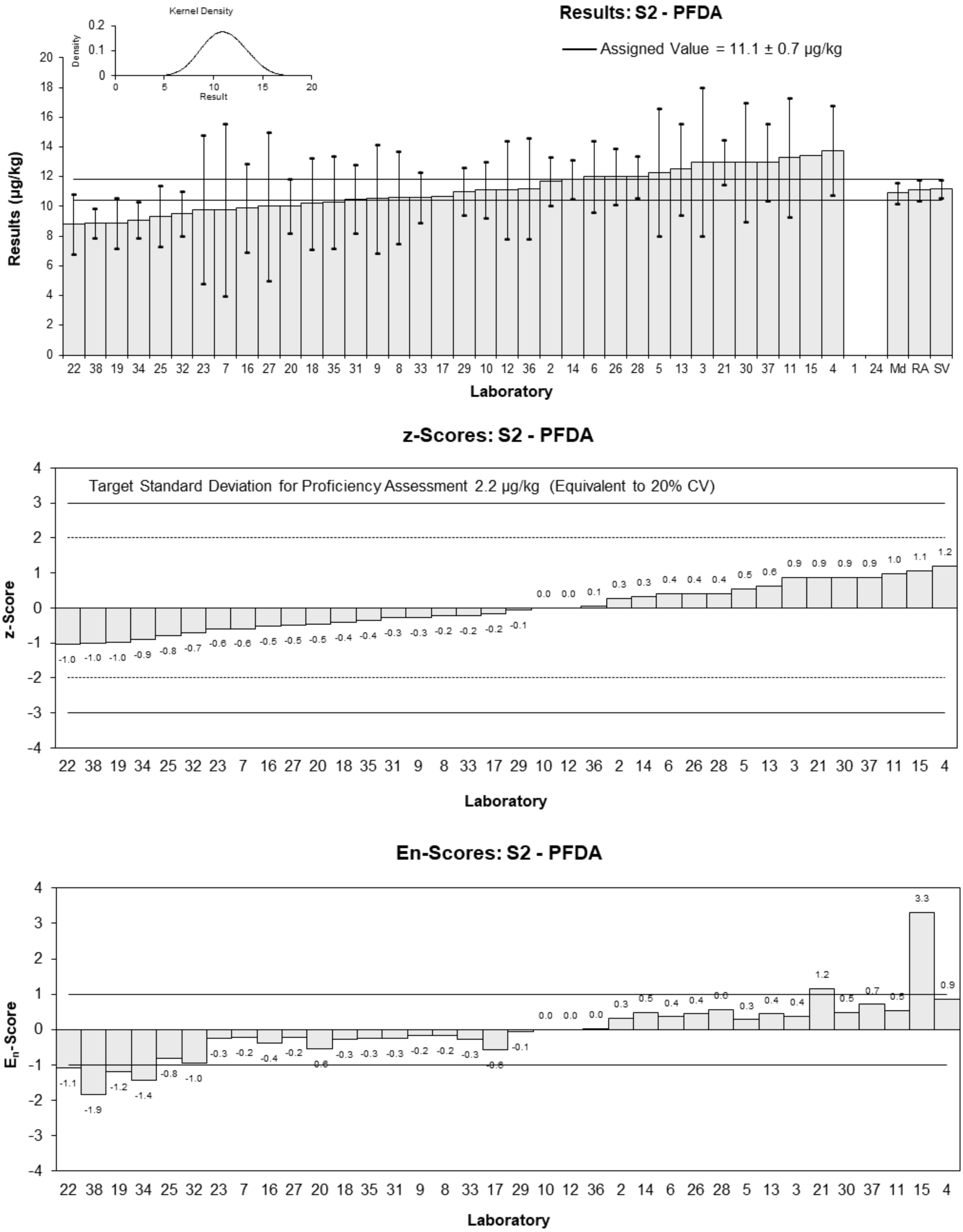
Sample No.	S2
Matrix	Soil
Analyte	PFDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	11.67	1.634	NR	0.26	0.32
3	13	5	78	0.86	0.38
4	13.764	3	76	1.20	0.86
5	12.3	4.3	NR	0.54	0.28
6	12	2.4	104	0.41	0.36
7	9.8	5.8	97	-0.59	-0.22
8	10.6	3.1	58	-0.23	-0.16
9	10.51	3.6785	85	-0.27	-0.16
10	11.1	1.89	94.6	0.00	0.00
11	13.286	3.99	88	0.98	0.54
12	11.1	3.3	115	0.00	0.00
13	12.5	3.1	89	0.63	0.44
14	11.82	1.3	101	0.32	0.49
15	13.4264	NR	96	1.05	3.32
16	9.92	2.98	64	-0.53	-0.39
17	10.70	NR	NR	-0.18	-0.57
18	10.2	3.06	37	-0.41	-0.29
19	8.9	1.7	122	-0.99	-1.20
20	10.03	1.81	87	-0.48	-0.55
21	13	1.50	NR	0.86	1.15
22	8.8	2.0	NR	-1.04	-1.09
23	9.78	5	66	-0.59	-0.26
24	NS	NS	NS		
25	9.34	2.05	78	-0.79	-0.81
26	12	1.9	93	0.41	0.44
27	10	5	100	-0.50	-0.22
28	12	1.4	55	0.41	0.57
29	11	1.6	123	-0.05	-0.06
30	13	4	109	0.86	0.47
31	10.5	2.3	108.81	-0.27	-0.25
32	9.5	1.51	111.52	-0.72	-0.96
33	10.6	1.72	71	-0.23	-0.27
34	9.1	1.20	119.2	-0.90	-1.44
35	10.3	3.1	103	-0.36	-0.25
36	11.2	3.4	95	0.05	0.03
37	13	2.6	NR	0.86	0.71
38	8.8751	0.9763	110	-1.00	-1.85

Statistics

Assigned Value	11.1	0.7
Spike Value	11.2	0.6
Robust Average	11.1	0.7
Median	10.9	0.7
Mean	11.1	
N	36	
Max	13.764	
Min	8.8	
Robust SD	1.6	
Robust CV	15%	



Kernel Density
Density
Result
Results: S2 - PFDA
Assigned Value = 11.1 ± 0.7 µg/kg
Results (µg/kg)
Laboratory
z-Scores: S2 - PFDA
Target Standard Deviation for Proficiency Assessment 2.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFDA
E_n-Score
Laboratory

Figure 36

Table 41

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFTrDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	12.55	2.761	NR	-0.42	-0.39
3	15	8	114	0.47	0.16
4	11.852	3	NR	-0.67	-0.58
5	18.6	6.5	NR	1.79	0.75
6	15	3	99	0.47	0.41
7	12	NR	NR	-0.62	-1.70
8	NT	NT	NT		
9	14.39	5.0365	83	0.25	0.13
10	17.6	3.34	83.6	1.42	1.12
11	16.353	4.91	92	0.97	0.53
12	12.9	3.9	133	-0.29	-0.20
13	10.8	2.8	NR	-1.06	-0.98
14	15.73	1.9	103	0.74	0.95
15	15.4004	NR	103	0.62	1.70
16	14.27	4.28	NR	0.21	0.13
17	14.12	NR	NR	0.15	0.42
18	8.32	2.496	27	-1.96	-2.00
19	11.7	2.8	130	-0.73	-0.67
20	11.77	2.71	83	-0.70	-0.67
21	20	2.00	NR	2.30	2.82
22	11	2.5	NR	-0.99	-1.00
23	NT	NT	NT		
24	NS	NS	NS		
25	14.1	3.2	NR	0.15	0.12
26*	6.7	2.3	81	-2.55	-2.79
27	14	7	73	0.11	0.04
28	NT	NT	NT		
29	NR	NR	NR		
30	14	4	109	0.11	0.07
31	14.6	2.7	93.37	0.33	0.31
32	12.6	2.06	110.93	-0.40	-0.48
33	12.0	2.41	86	-0.62	-0.65
34	12.3	2.39	131.57	-0.51	-0.54
35	13.4	4.0	98	-0.11	-0.07
36	14.7	4.4	96	0.36	0.22
37	NT	NT	NT		
38*	6.1979	0.6818	109	-2.74	-6.20

* Outlier, see Section 4.2

Statistics

Assigned Value	13.7	1.0
Spike Value	15.2	0.8
Robust Average	13.5	1.1
Median	14.0	1.1
Mean	13.4	
N	31	
Max	20	
Min	6.1979	
Robust SD	2.4	
Robust CV	18%	

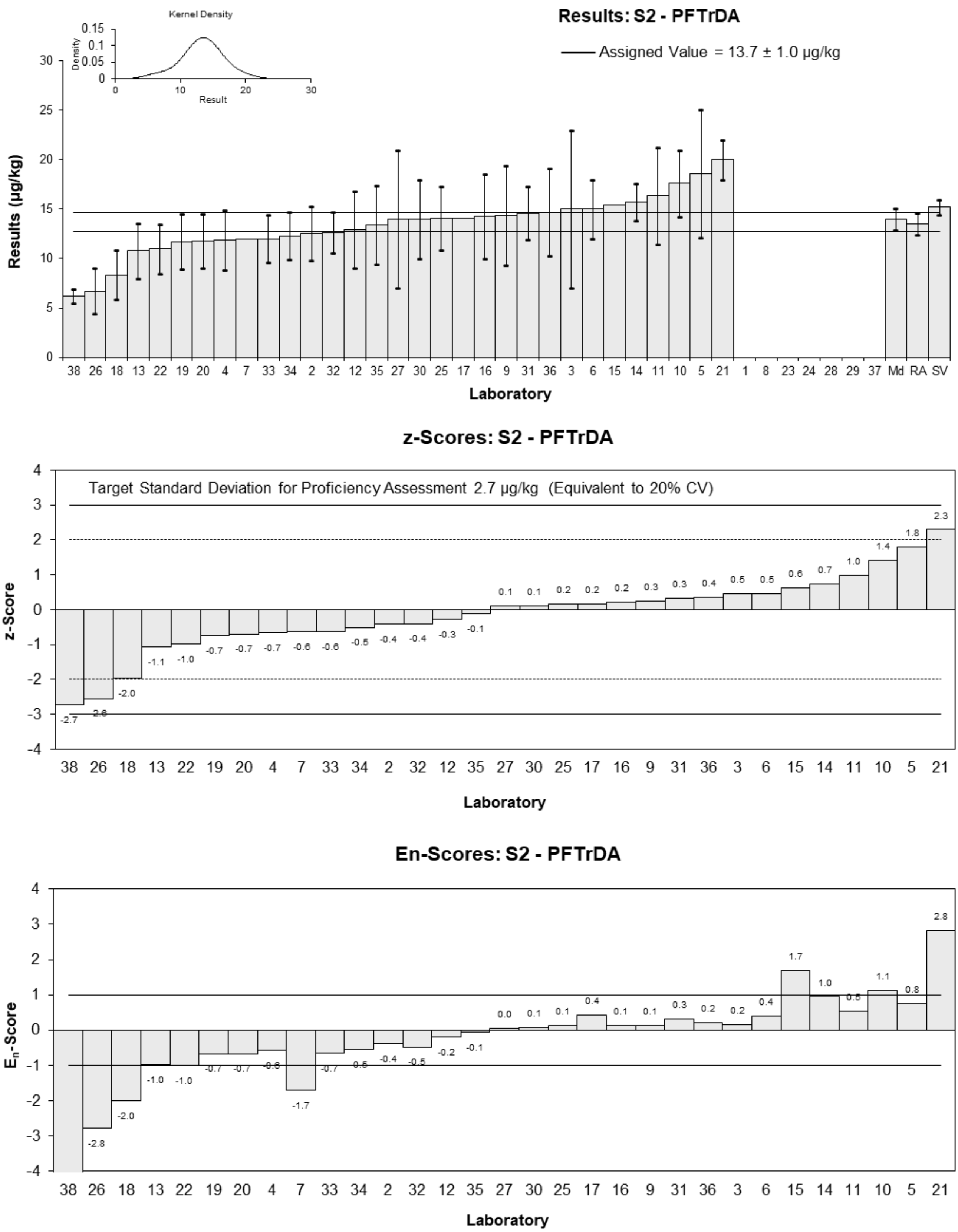

Results: S2 - PFTrDA
Assigned Value = 13.7 ± 1.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - PFTrDA
Target Standard Deviation for Proficiency Assessment 2.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - PFTrDA
E_n-Score
Laboratory

Figure 37

Table 42

Sample Details

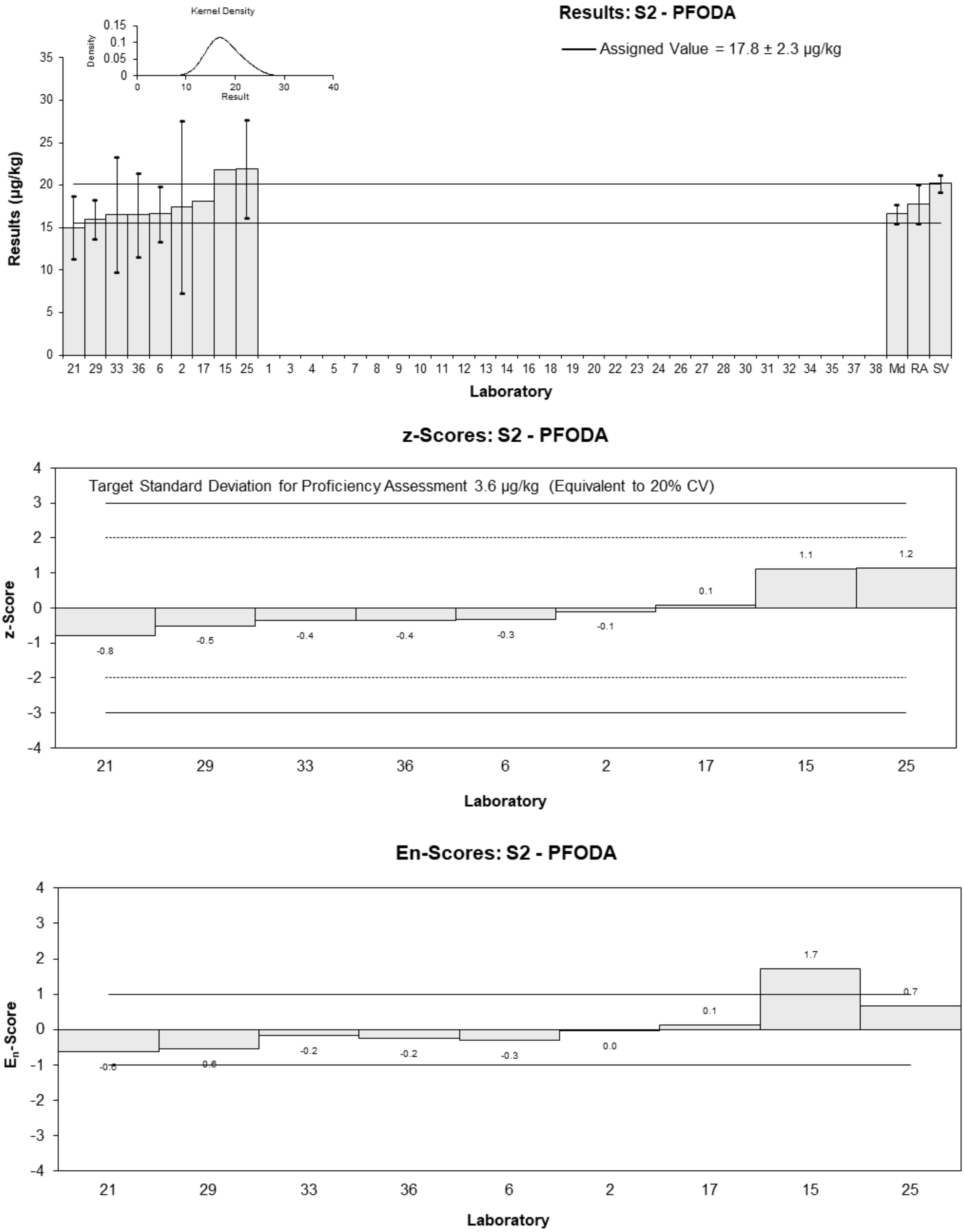
Sample No.	S2
Matrix	Soil
Analyte	PFODA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	17.46	10.13	NR	-0.10	-0.03
3	<0.5	NR	114		
4	NR	NR	NR		
5	NT	NT	NT		
6	16.6	3.3	98	-0.34	-0.30
7	NT	NT	NT		
8	NT	NT	NT		
9	NR	NR	NR		
10	NT	NT	NT		
11	NT	NT	NT		
12	NT	NT	NT		
13	NT	NT	NT		
14	NT	NT	NT		
15	21.7818	NR	93	1.12	1.73
16	NT	NT	NT		
17	18.11	NR	NR	0.09	0.13
18	< 2.5	NR	18		
19	NT	NR	NT		
20	<0.5	NR	14		
21	15	3.69	NR	-0.79	-0.64
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	21.9	5.8	NR	1.15	0.66
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	16	2.3	NR	-0.51	-0.55
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	16.5	6.78	NR	-0.37	-0.18
34	NT	NT	NT		
35	NT	NT	NT		
36	16.5	4.9	98	-0.37	-0.24
37	NT	NT	NT		
38	NT	NT	NT		

Statistics

Assigned Value	17.8	2.3
Spike Value	20.2	1.0
Robust Average	17.8	2.3
Median	16.6	1.1
Mean	17.8	
N	9	
Max	21.9	
Min	15	
Robust SD	2.8	
Robust CV	16%	



Kernel Density
Density
Result
Results: S2 - PFODA
Assigned Value = 17.8 ± 2.3 µg/kg
Results (µg/kg)
Laboratory
21 29 33 36 6 2 17 15 25 1 3 4 5 7 8 9 10 11 12 13 14 16 18 19 20 22 23 24 26 27 28 30 31 32 34 35 37 38 Md RA SV
z-Scores: S2 - PFODA
Target Standard Deviation for Proficiency Assessment 3.6 µg/kg (Equivalent to 20% CV)
z-Score
-0.8 -0.5 -0.4 -0.4 -0.3 -0.1 0.1 1.1 1.2
21 29 33 36 6 2 17 15 25
Laboratory
En-Scores: S2 - PFODA
E_n-Score
-0.6 -0.6 -0.2 -0.2 -0.3 0.0 0.1 1.7 0.7
21 29 33 36 6 2 17 15 25
Laboratory

Figure 38

Table 43

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	13.50	2.025	NR	-0.11	-0.14
3	15	8	81	0.43	0.15
4	15.843	4.5	87	0.74	0.45
5	19.9	7.0	NR	2.21	0.87
6	12.6	2.5	73	-0.43	-0.46
7	10	NR	29	-1.38	-5.43
8	12.6	3.5	21	-0.43	-0.34
9	11.73	4.1055	109	-0.75	-0.50
10	14.01	1.96	121	0.08	0.10
11	14.479	4.34	83	0.25	0.15
12	13.7	4.1	101	-0.04	-0.02
13	16.4	3.9	NR	0.94	0.66
14	14.7	3	99	0.33	0.29
15	14.7246	NR	95	0.33	1.32
16	12.53	3.76	104	-0.46	-0.33
17	13.50	NR	NR	-0.11	-0.43
18	12.86	3.858	69	-0.34	-0.24
19	13.1	2.9	108	-0.25	-0.23
20	13.21	2.64	83	-0.21	-0.22
21	15	1.78	NR	0.43	0.63
22	9.5	2.2	NR	-1.56	-1.86
23	NT	NT	NT		
24	NS	NS	NS		
25	13.8	2.9	80	0.00	0.00
26	14	1.6	113	0.07	0.11
27	10	5	80	-1.38	-0.75
28	NT	NT	NT		
29	14	2.0	121	0.07	0.09
30	16	5	90	0.80	0.44
31	14.8	3.4	95.12	0.36	0.29
32	12.6	2.41	101.09	-0.43	-0.48
33	12.8	3.78	86	-0.36	-0.26
34	14	1.37	104.99	0.07	0.13
35	13.7	4.1	91	-0.04	-0.02
36	13.2	4	87	-0.22	-0.15
37	NT	NT	NT		
38	15.9216	5.2541	91	0.77	0.40

Statistics

Assigned Value	13.8	0.7
Spike Value	13.4	0.7
Robust Average	13.8	0.7
Median	13.7	0.7
Mean	13.7	
N	33	
Max	19.9	
Min	9.5	
Robust SD	1.6	
Robust CV	11%	

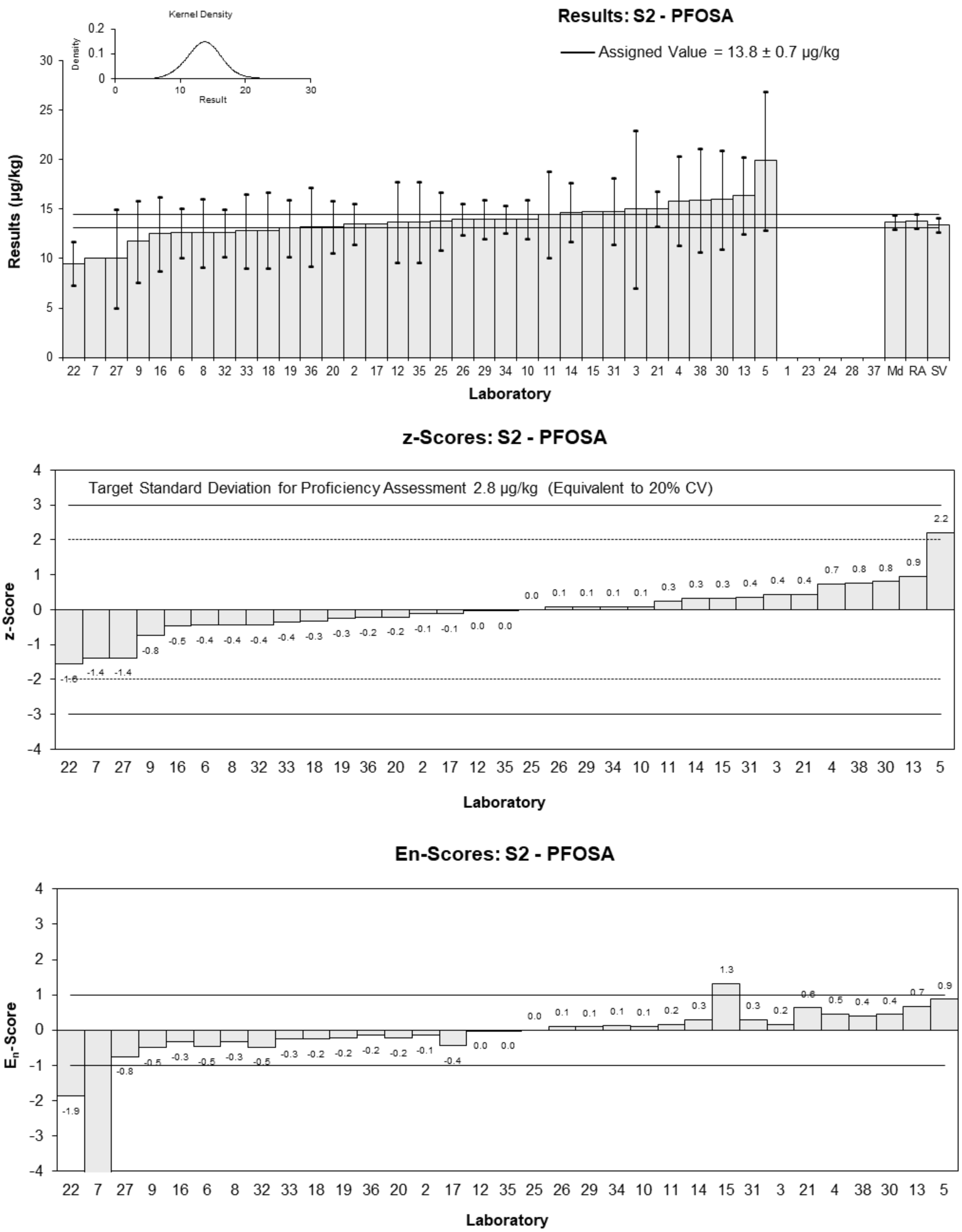

Results: S2 - PFOSA
Assigned Value = 13.8 ± 0.7 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
22 7 27 9 16 6 8 32 33 18 19 36 20 2 17 12 35 25 26 29 34 10 11 14 15 31 3 21 4 38 30 13 5 1 23 24 28 37 Md RA SV
z-Scores: S2 - PFOSA
Target Standard Deviation for Proficiency Assessment 2.8 µg/kg (Equivalent to 20% CV)
z-Score
-1.6 -1.4 -1.4 -0.8 -0.5 -0.4 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 -0.2 -0.1 -0.1 0.0 0.0 0.0 0.1 0.1 0.1 0.1 0.3 0.3 0.3 0.4 0.4 0.4 0.7 0.8 0.8 0.9 2.2
22 7 27 9 16 6 8 32 33 18 19 36 20 2 17 12 35 25 26 29 34 10 11 14 15 31 3 21 4 38 30 13 5
Laboratory
En-Scores: S2 - PFOSA
En-Score
-1.9 -0.8 -0.5 -0.3 -0.5 -0.3 -0.5 -0.3 -0.2 -0.2 -0.2 -0.2 -0.1 -0.4 0.0 0.0 0.0 0.1 0.1 0.1 0.1 0.2 0.3 1.3 0.3 0.2 0.6 0.5 0.4 0.4 0.7 0.9
22 7 27 9 16 6 8 32 33 18 19 36 20 2 17 12 35 25 26 29 34 10 11 14 15 31 3 21 4 38 30 13 5
Laboratory

Figure 39

Table 44

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	8.565	0.9422	NR	0.00	0.00
3	8.6	3	70	0.02	0.01
4*	14.243	2	68	3.31	2.67
5	NT	NT	NT		
6	9.8	2	132	0.72	0.58
7	7	NR	70	-0.92	-2.21
8	NT	NT	NT		
9	NR	NR	NR		
10	10.1	2.53	80.8	0.89	0.58
11	10.832	3.25	56	1.32	0.68
12	9.5	2.9	101	0.54	0.31
13	11.4	3	91	1.65	0.92
14	7.93	1.7	98	-0.37	-0.35
15	9.5173	NR	107	0.55	1.33
16	8.48	2.54	105	-0.05	-0.03
17	6.857	NR	NR	-1.00	-2.41
18	< 2.5	NR	9		
19	7.9	1.9	109	-0.39	-0.33
20	8.26	1.57	84	-0.18	-0.18
21*	14.41	1.66	NR	3.41	3.23
22	6.8	1.6	NR	-1.03	-1.01
23	NT	NT	NT		
24	NS	NS	NS		
25	9.54	2.37	87	0.57	0.39
26	11	2.2	98	1.42	1.05
27	8	4	NR	-0.33	-0.14
28	NT	NT	NT		
29	8.2	1.6	115	-0.22	-0.21
30	9.7	3	95	0.66	0.37
31	6.4	1.4	67.34	-1.27	-1.38
32	6.7	1.33	78.45	-1.09	-1.24
33	9.42	1.62	87	0.50	0.48
34	7.6	1.29	67.58	-0.57	-0.66
35	8.77	2.64	80	0.12	0.07
36	7.99	2.4	99	-0.34	-0.23
37	NT	NT	NT		
38	7.3291	2.4186	74	-0.72	-0.49

* Outlier, see Section 4.2

Statistics

Assigned Value	8.57	0.71
Spike Value	10.1	0.5
Robust Average	8.78	0.78
Median	8.57	0.67
Mean	8.99	
N	29	
Max	14.41	
Min	6.4	
Robust SD	1.7	
Robust CV	19%	

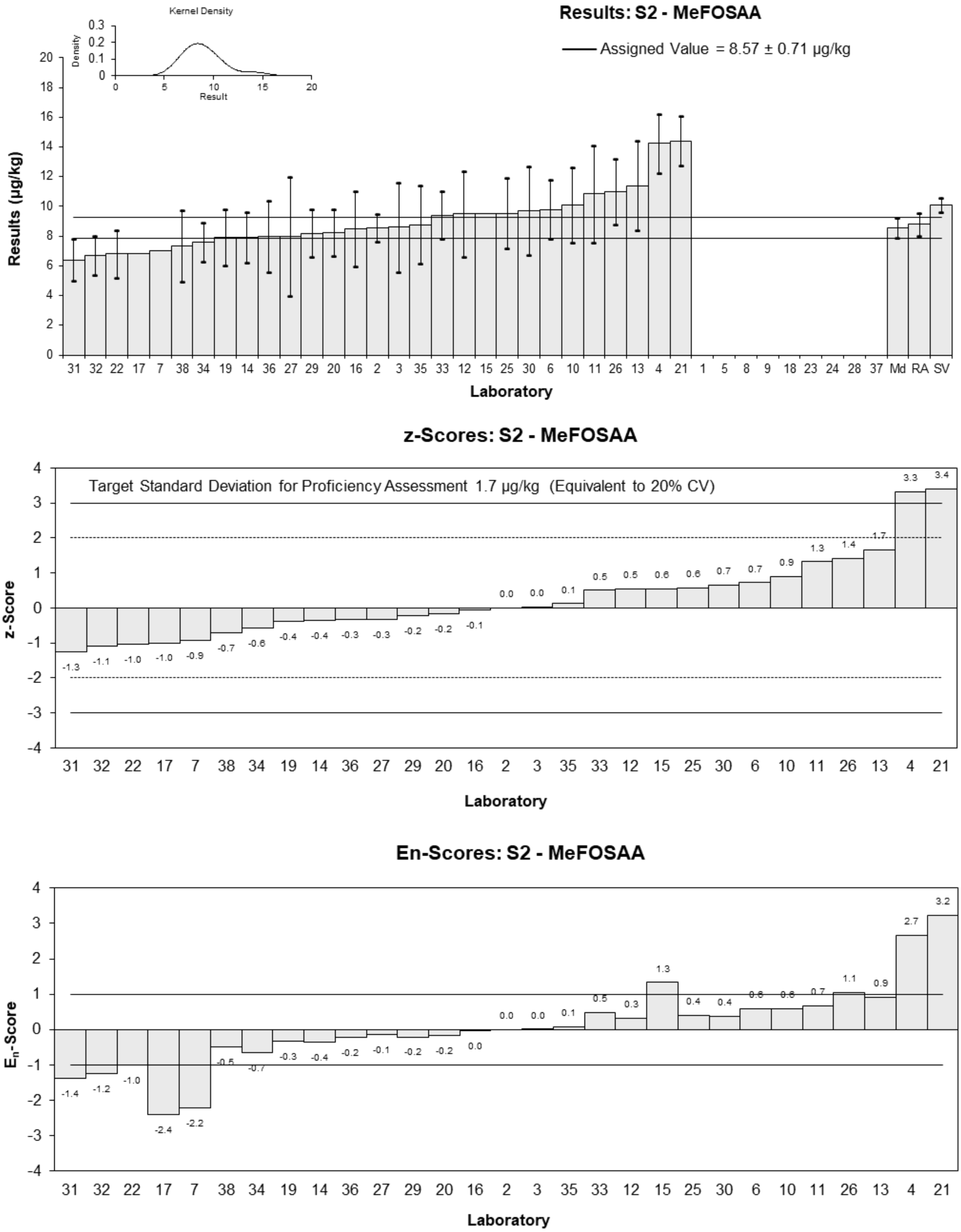

Results: S2 - MeFOSAA
Assigned Value = 8.57 ± 0.71 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
31 32 22 17 7 38 34 19 14 36 27 29 20 16 2 3 35 33 12 15 25 30 6 10 11 26 13 4 21 1 5 8 9 18 23 24 28 37 Md RA SV
z-Scores: S2 - MeFOSAA
Target Standard Deviation for Proficiency Assessment 1.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - MeFOSAA
E_n-Score
Laboratory

Figure 40

Table 45

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	EtFOSAA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	8.203	1.887	NR	-0.21	-0.19
3	9.3	NR	80	0.43	1.33
4*	13.312	2	99	2.77	2.29
5	NT	NT	NT		
6	8.7	1.7	118	0.08	0.07
7	9	NR	72	0.25	0.78
8	NT	NT	NT		
9	NR	NR	NR		
10	10.2	2.55	82.6	0.95	0.62
11	8.943	2.68	65	0.22	0.14
12	7.45	2.2	92	-0.65	-0.49
13	10.1	2.8	95	0.89	0.54
14	7.46	1.6	102	-0.65	-0.66
15	9.0361	NR	100	0.27	0.85
16	7.71	2.31	132	-0.50	-0.36
17	9.529	NR	NR	0.56	1.74
18	< 2.5	NR	11		
19	8	1.7	127	-0.33	-0.32
20	8.26	1.57	83	-0.18	-0.19
21	9.46	0.95	NR	0.52	0.81
22	6.6	1.5	NR	-1.15	-1.23
23	NT	NT	NT		
24	NS	NS	NS		
25	8.22	2.67	100	-0.20	-0.13
26	11	2.4	79	1.42	0.99
27	8	4	76	-0.33	-0.14
28	NT	NT	NT		
29	8.9	1.3	118	0.19	0.23
30	11	3	96	1.42	0.80
31	6.9	1.6	79.42	-0.97	-0.99
32	7.1	1.61	84.6	-0.86	-0.86
33	9.45	2.24	81	0.51	0.38
34	7.6	1.29	76.35	-0.57	-0.69
35	8.59	2.58	83	0.01	0.01
36	8.18	2.45	89	-0.23	-0.16
37	NT	NT	NT		
38	8.3573	2.7579	80	-0.12	-0.08

* Outlier, see Section 4.2

Statistics

Assigned Value	8.57	0.55
Spike Value	10.1	0.5
Robust Average	8.65	0.57
Median	8.59	0.59
Mean	8.78	
N	29	
Max	13.312	
Min	6.6	
Robust SD	1.2	
Robust CV	14%	

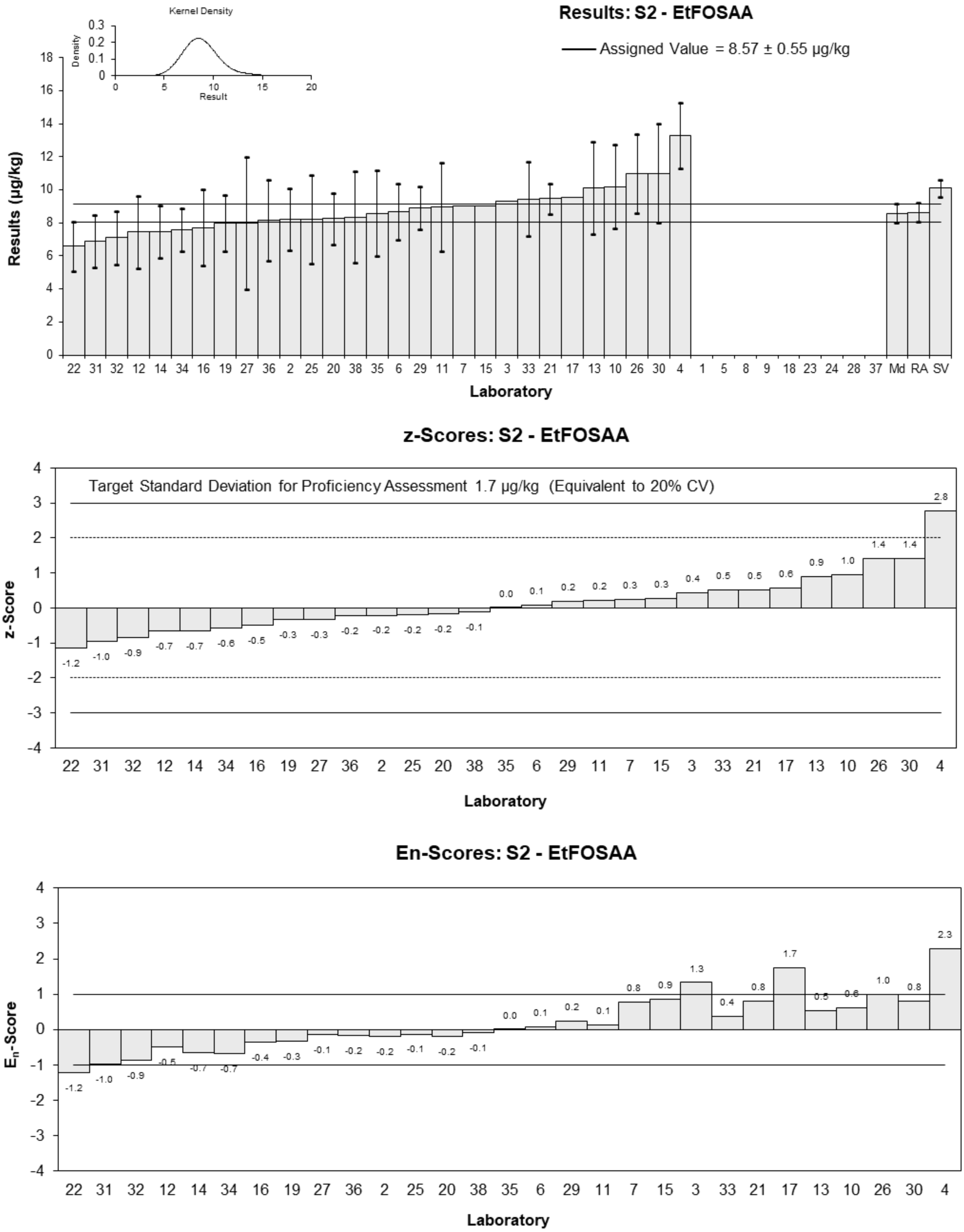

Kernel Density
Density
Result
Results: S2 - EtFOSAA
Assigned Value = 8.57 ± 0.55 µg/kg
Results (µg/kg)
22 31 32 12 14 34 16 19 27 36 2 25 20 38 35 6 29 11 7 15 3 33 21 17 13 10 26 30 4 1 5 8 9 18 23 24 28 37 Md RA SV
Laboratory
z-Scores: S2 - EtFOSAA
Target Standard Deviation for Proficiency Assessment 1.7 µg/kg (Equivalent to 20% CV)
z-Score
-1.2 -1.0 -0.9 -0.7 -0.7 -0.6 -0.5 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.1 0.0 0.1 0.2 0.2 0.3 0.3 0.4 0.5 0.5 0.6 0.9 1.0 1.4 1.4 2.8
22 31 32 12 14 34 16 19 27 36 2 25 20 38 35 6 29 11 7 15 3 33 21 17 13 10 26 30 4
Laboratory
En-Scores: S2 - EtFOSAA
En-Score
-1.2 -1.0 -0.9 -0.5 -0.7 -0.7 -0.4 -0.3 -0.1 -0.2 -0.2 -0.1 -0.2 -0.1 0.0 0.1 0.2 0.1 0.8 0.9 1.3 0.4 0.8 1.7 0.5 0.6 1.0 0.8 2.3
22 31 32 12 14 34 16 19 27 36 2 25 20 38 35 6 29 11 7 15 3 33 21 17 13 10 26 30 4
Laboratory

Figure 41

Table 46

Sample Details

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

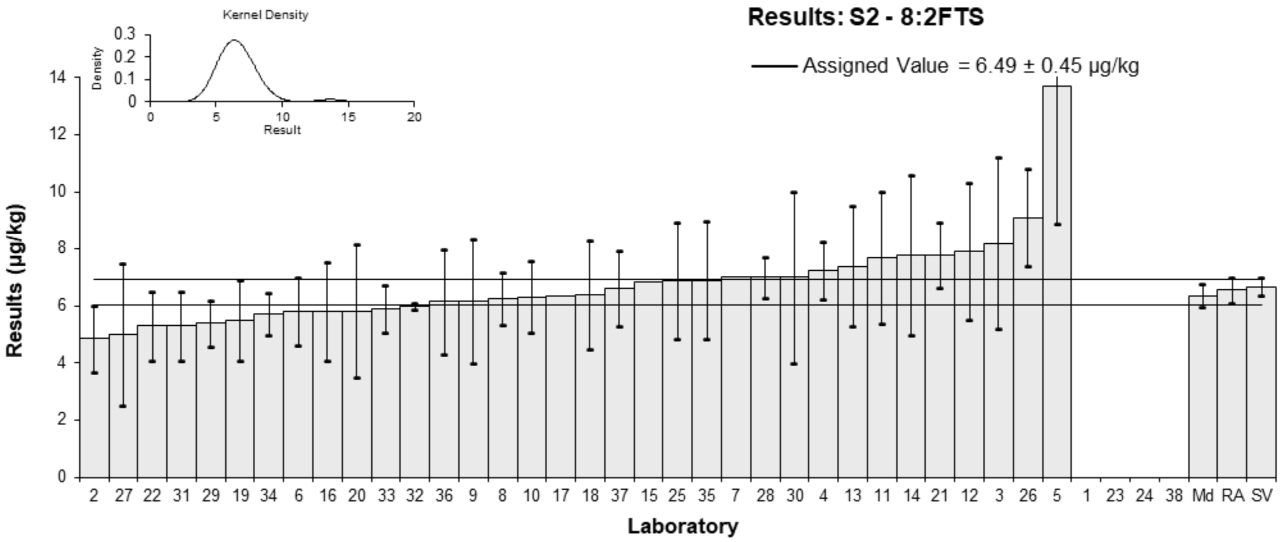
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	4.852	1.164	NR	-1.26	-1.31
3	8.2	3	74	1.32	0.56
4	7.258	1	93	0.59	0.70
5*	13.7	4.8	NR	5.55	1.50
6	5.8	1.2	223	-0.53	-0.54
7	7	NR	107	0.39	1.13
8	6.26	0.91	46	-0.18	-0.23
9	6.177	2.16195	92	-0.24	-0.14
10	6.32	1.27	67.6	-0.13	-0.13
11	7.695	2.31	98	0.93	0.51
12	7.9	2.4	90	1.09	0.58
13	7.4	2.1	107	0.70	0.42
14	7.79	2.8	115	1.00	0.46
15	6.8268	NR	91	0.26	0.75
16	5.81	1.74	109	-0.52	-0.38
17	6.347	NR	NR	-0.11	-0.32
18	6.4	1.92	15	-0.07	-0.05
19	5.5	1.4	142	-0.76	-0.67
20	5.83	2.33	86	-0.51	-0.28
21	7.8	1.14	NR	1.01	1.07
22	5.3	1.2	NR	-0.92	-0.93
23	NT	NT	NT		
24	NS	NS	NS		
25	6.9	2.04	86	0.32	0.20
26	9.1	1.7	94	2.01	1.48
27	5	2.5	108	-1.15	-0.59
28	7	0.7	68	0.39	0.61
29	5.4	0.81	74	-0.84	-1.18
30	7.0	3	94	0.39	0.17
31	5.3	1.2	152.59	-0.92	-0.93
32	6	0.11	134.48	-0.38	-1.06
33	5.89	0.824	81	-0.46	-0.64
34	5.7	0.74	123.76	-0.61	-0.91
35	6.90	2.07	142	0.32	0.19
36	6.15	1.85	100	-0.26	-0.18
37	6.6	1.32	NR	0.08	0.08
38	<5	NR	134		

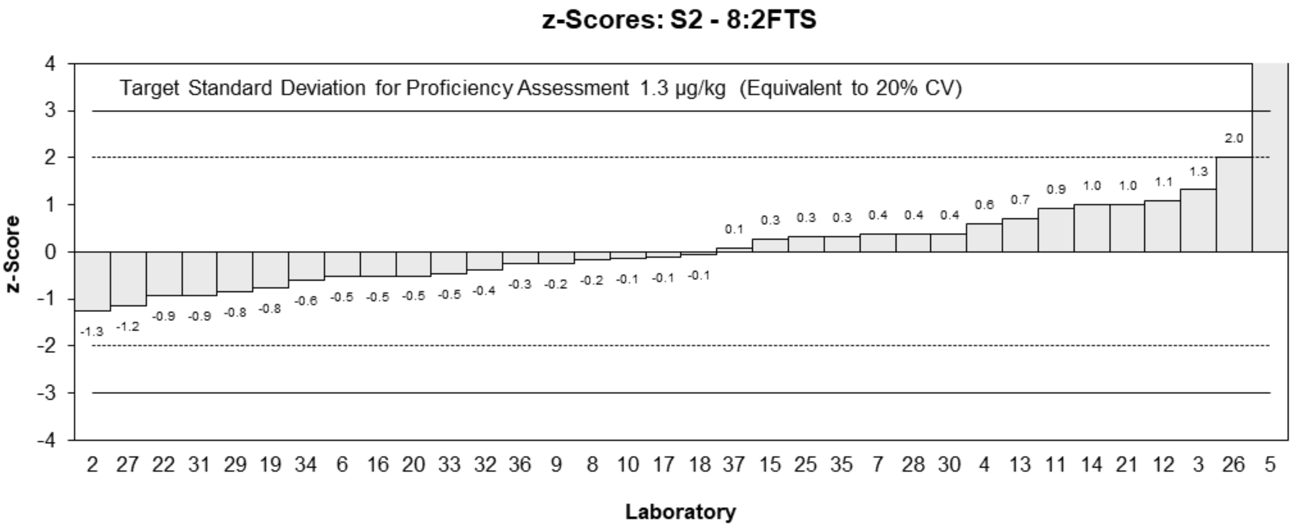
* Outlier, see Section 4.2

Statistics

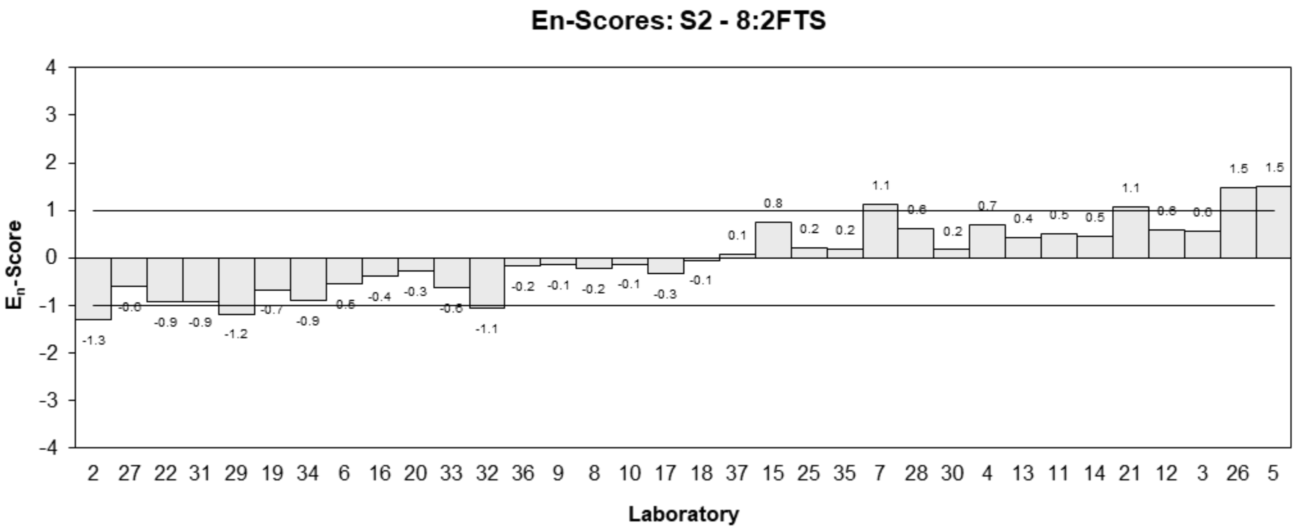
Assigned Value	6.49	0.45
Spike Value	6.68	0.33
Robust Average	6.55	0.47
Median	6.37	0.40
Mean	6.74	
N	34	
Max	13.7	
Min	4.852	
Robust SD	1.1	
Robust CV	17%	



Results: S2 - 8:2FTS
Assigned Value = 6.49 ± 0.45 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
2 27 22 31 29 19 34 6 16 20 33 32 36 9 8 10 17 18 37 15 25 35 7 28 30 4 13 11 14 21 12 3 26 5 1 23 24 38 Md RA SV
Laboratory



z-Scores: S2 - 8:2FTS
Target Standard Deviation for Proficiency Assessment 1.3 µg/kg (Equivalent to 20% CV)
z-Score
-1.3 -1.2 -0.9 -0.9 -0.8 -0.8 -0.6 -0.5 -0.5 -0.5 -0.5 -0.4 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 0.1 0.3 0.3 0.3 0.4 0.4 0.4 0.6 0.7 0.9 1.0 1.0 1.1 1.3 2.0
2 27 22 31 29 19 34 6 16 20 33 32 36 9 8 10 17 18 37 15 25 35 7 28 30 4 13 11 14 21 12 3 26 5
Laboratory



En-Scores: S2 - 8:2FTS
E_n-Score
-1.3 -0.6 -0.9 -0.9 -1.2 -0.7 -0.9 -0.5 -0.4 -0.3 -0.6 -1.1 -0.2 -0.1 -0.2 -0.1 -0.3 -0.1 0.1 0.8 0.2 0.2 1.1 0.6 0.2 0.7 0.4 0.5 0.5 1.1 0.6 0.6 1.5 1.5
2 27 22 31 29 19 34 6 16 20 33 32 36 9 8 10 17 18 37 15 25 35 7 28 30 4 13 11 14 21 12 3 26 5
Laboratory

Figure 42

Table 47

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	10:2FTS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	48.69	9.251	NR	0.50	0.41
3	48	20	74	0.42	0.18
4	54.556	10	NR	1.16	0.91
5	NT	NT	NT		
6	42.5	8.5	122	-0.20	-0.18
7	NT	NT	NT		
8	NT	NT	NT		
9	NR	NR	NR		
10	NT	NT	NT		
11	54.305	16.29	102	1.13	0.59
12	50.6	15.2	104	0.71	0.39
13	55	12.7	NR	1.21	0.78
14	46.36	6.5	115	0.23	0.25
15	55.3367	NR	93	1.25	2.12
16	47.91	14.37	91	0.41	0.24
17	38.20	NR	NR	-0.69	-1.17
18	28.3	8.49	15	-1.81	-1.61
19	34.3	8	142	-1.13	-1.05
20	40.77	19.57	72	-0.40	-0.17
21	45	5.00	NR	0.08	0.10
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	50.3	11.5	108	0.68	0.48
26	67	9.4	81	2.56	2.11
27	24	12	NR	-2.29	-1.55
28	NT	NT	NT		
29*	78	23	NR	3.80	1.43
30	53	20	94	0.98	0.42
31	27.2	9.7	152.59	-1.93	-1.55
32	33.6	8.14	134.48	-1.21	-1.11
33	52.4	12.7	62	0.91	0.59
34	38.4	12.36	123.76	-0.67	-0.44
35	47.6	14.3	140	0.37	0.22
36	37.6	11.3	100	-0.76	-0.54
37	NT	NT	NT		
38	32.5539	4.5575	119	-1.33	-1.70

* Outlier, see Section 4.2

Statistics

Assigned Value	44.3	5.2
Spike Value	48.7	2.4
Robust Average	45.0	5.5
Median	47.6	5.0
Mean	45.6	
N	27	
Max	78	
Min	24	
Robust SD	11	
Robust CV	25%	

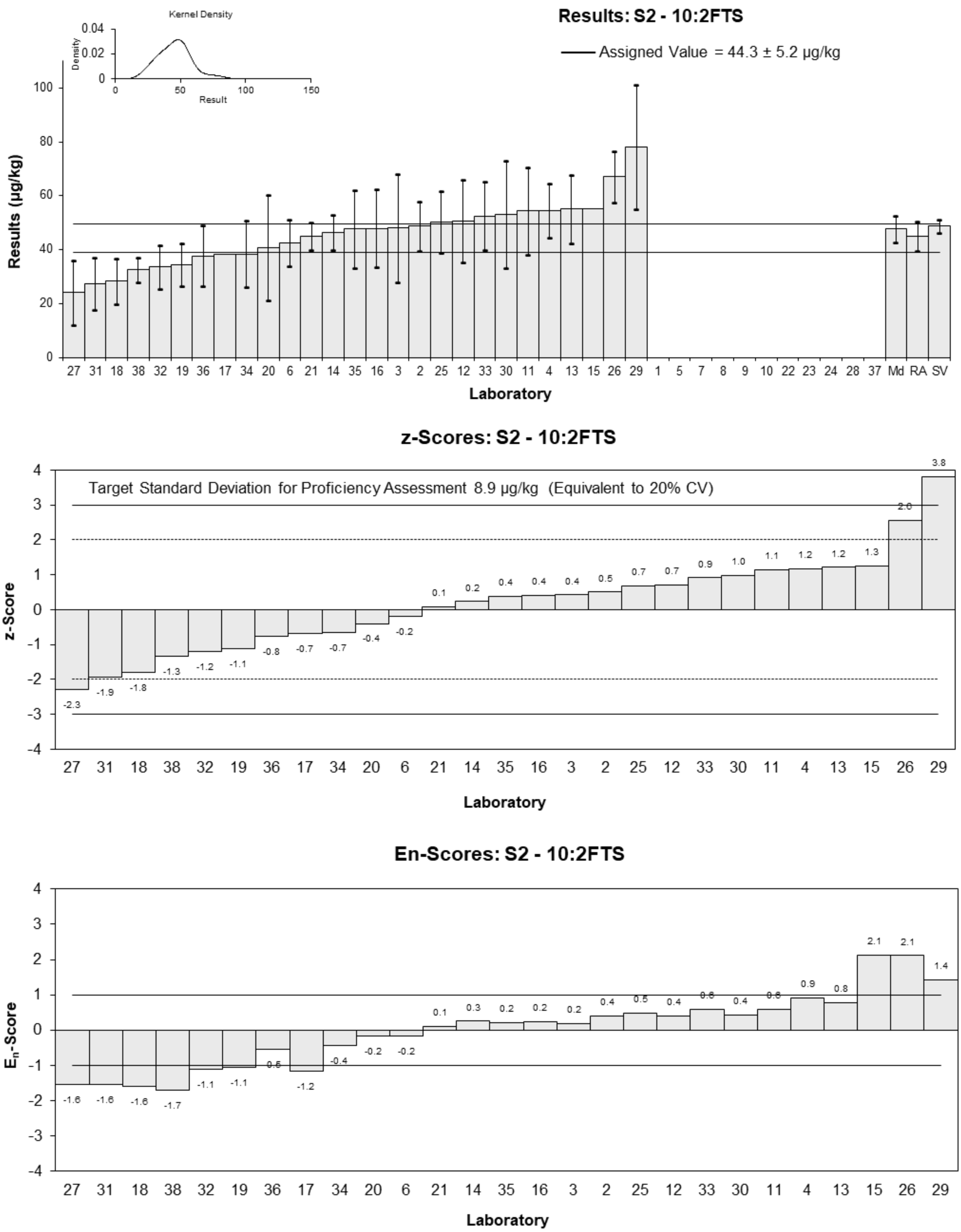

Results: S2 - 10:2FTS
Assigned Value = 44.3 ± 5.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - 10:2FTS
Target Standard Deviation for Proficiency Assessment 8.9 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - 10:2FTS
E_n-Score
Laboratory

Figure 43

Table 48

Sample Details

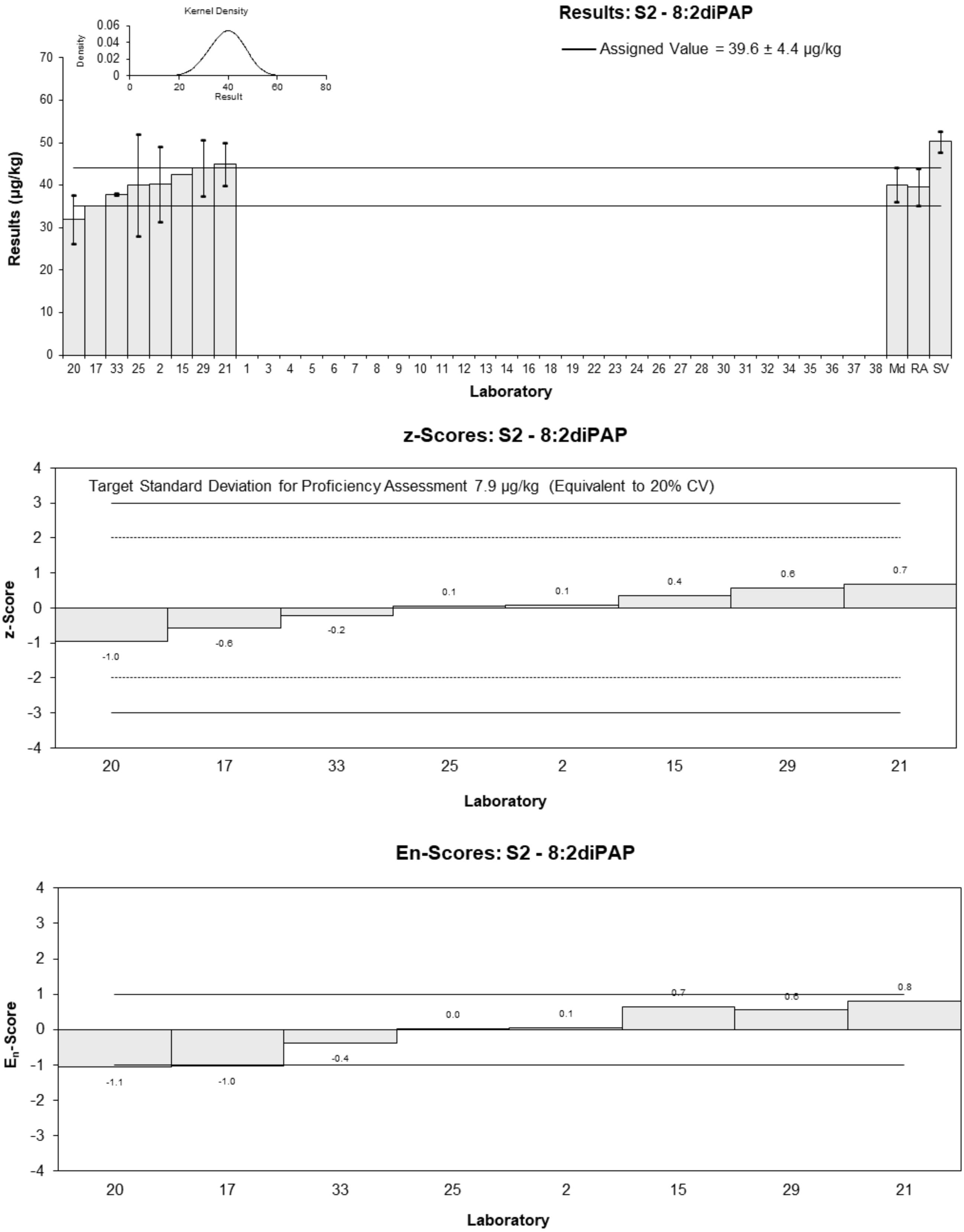
Sample No.	S2
Matrix	Soil
Analyte	8:2diPAP
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	40.23	8.851	NR	0.08	0.06
3	NT	NT	NT		
4	NR	NR	NR		
5	NT	NT	NT		
6	NT	NT	NT		
7	NT	NT	NT		
8	NT	NT	NT		
9	NR	NR	NR		
10	NT	NT	NT		
11	NT	NT	NT		
12	NT	NT	NT		
13	NT	NT	NT		
14	NT	NT	NT		
15	42.453	NR	109	0.36	0.65
16	NT	NT	NT		
17	35.07	NR	NR	-0.57	-1.03
18	NT	NT	NT		
19	NT	NR	NT		
20	31.99	5.76	11	-0.96	-1.05
21	45	5.00	NR	0.68	0.81
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	40	12	119	0.05	0.03
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	44	6.6	68	0.56	0.55
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33	37.9	0.189	31	-0.21	-0.39
34	NT	NT	NT		
35	NT	NT	NT		
36	NT	NT	NT		
37	NT	NT	NT		
38	NT	NT	NT		

Statistics

Assigned Value	39.6	4.4
Spike Value	50.3	2.5
Robust Average	39.6	4.4
Median	40.1	4.1
Mean	39.6	
N	8	
Max	45	
Min	31.99	
Robust SD	5.0	
Robust CV	13%	



Results: S2 - 8:2diPAP
Assigned Value = 39.6 ± 4.4 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
20 17 33 25 2 15 29 21 1 3 4 5 6 7 8 9 10 11 12 13 14 16 18 19 22 23 24 26 27 28 30 31 32 34 35 36 37 38 Md RA SV
z-Scores: S2 - 8:2diPAP
Target Standard Deviation for Proficiency Assessment 7.9 µg/kg (Equivalent to 20% CV)
z-Score
-1.0 -0.6 -0.2 0.1 0.1 0.4 0.6 0.7
20 17 33 25 2 15 29 21
Laboratory
En-Scores: S2 - 8:2diPAP
En-Score
-1.1 -1.0 -0.4 0.0 0.1 0.7 0.6 0.8
20 17 33 25 2 15 29 21
Laboratory

Figure 44

Table 49

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	2.223	0.4224	NR	0.12	0.11
3	NT	NT	NT		
4	2.820	0.5	106	1.50	1.21
5	NT	NT	NT		
6	2	0.4	101	-0.39	-0.38
7	NT	NT	NT		
8	1.93	0.3	71	-0.55	-0.67
9	2.237	0.78295	75	0.15	0.08
10	2.49	0.52	68.3	0.74	0.57
11	NT	NT	NT		
12	1.58	0.5	72	-1.36	-1.10
13	1.8	0.6	97	-0.85	-0.59
14	NT	NT	NT		
15	2.3402	NR	92	0.39	0.85
16	NT	NT	NT		
17	NT	NT	NT		
18	< 2.5	NR	38		
19	NT	NR	NT		
20	2.20	0.64	87	0.07	0.04
21	2.4	0.50	NR	0.53	0.43
22	1.7	0.39	NR	-1.08	-1.07
23	NT	NT	NT		
24	NS	NS	NS		
25	2.43	0.6	114	0.60	0.41
26	2.1	0.22	121	-0.16	-0.24
27	NT	NT	NT		
28	NT	NT	NT		
29	2.2	0.32	112	0.07	0.08
30	< 5	NR	106		
31	NT	NT	NT		
32	NT	NT	NT		
33	2.28	0.609	63	0.25	0.17
34	NT	NT	NT		
35	NT	NT	NT		
36*	0.82	0.25	86	-3.11	-4.22
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	2.17	0.20
Spike Value	15.2	0.8
Robust Average	2.13	0.22
Median	2.20	0.18
Mean	2.09	
N	17	
Max	2.82	
Min	0.82	
Robust SD	0.36	
Robust CV	17%	

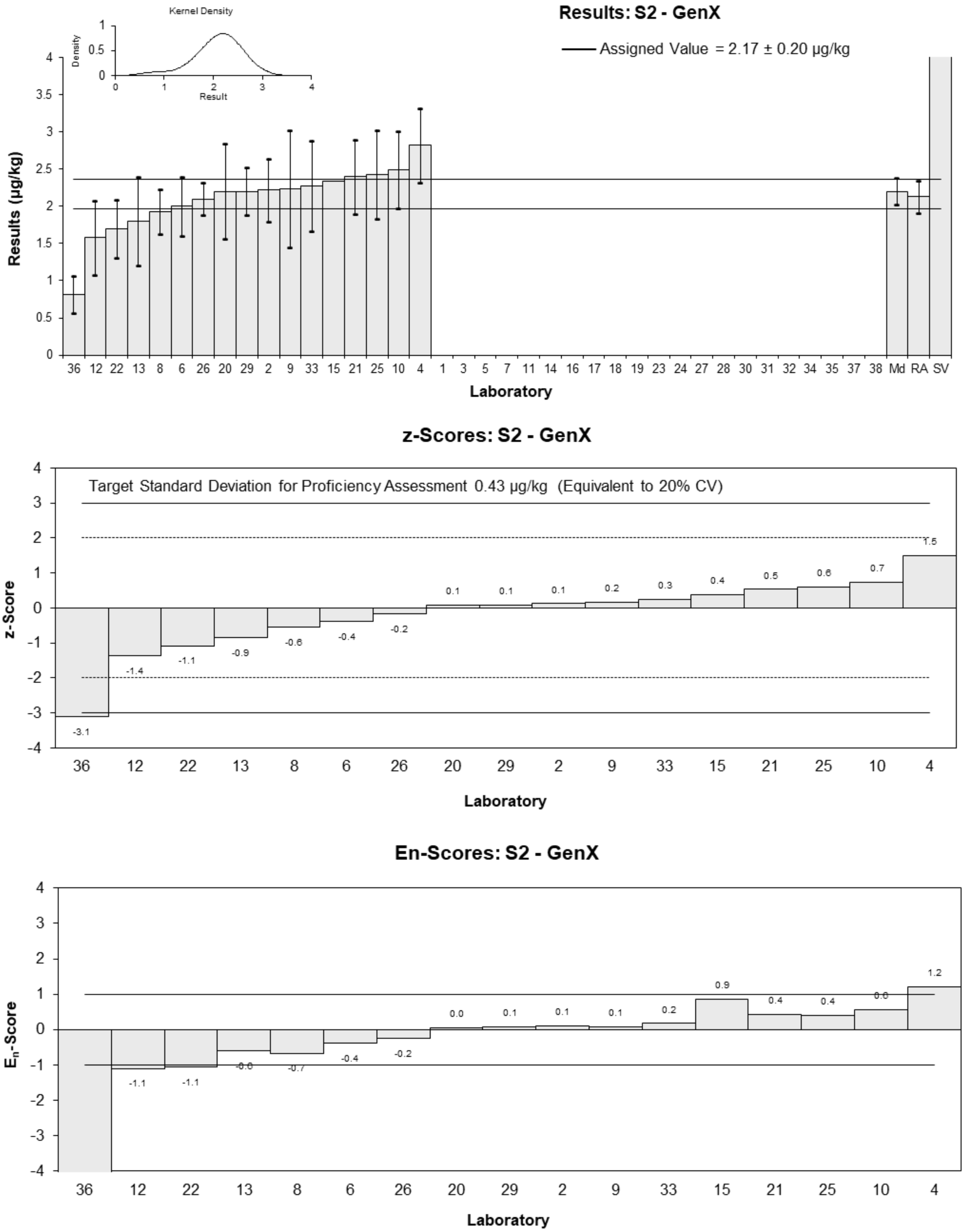

Results: S2 - GenX
Assigned Value = 2.17 ± 0.20 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - GenX
Target Standard Deviation for Proficiency Assessment 0.43 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - GenX
En-Score
Laboratory

Figure 45

Table 50

Sample Details

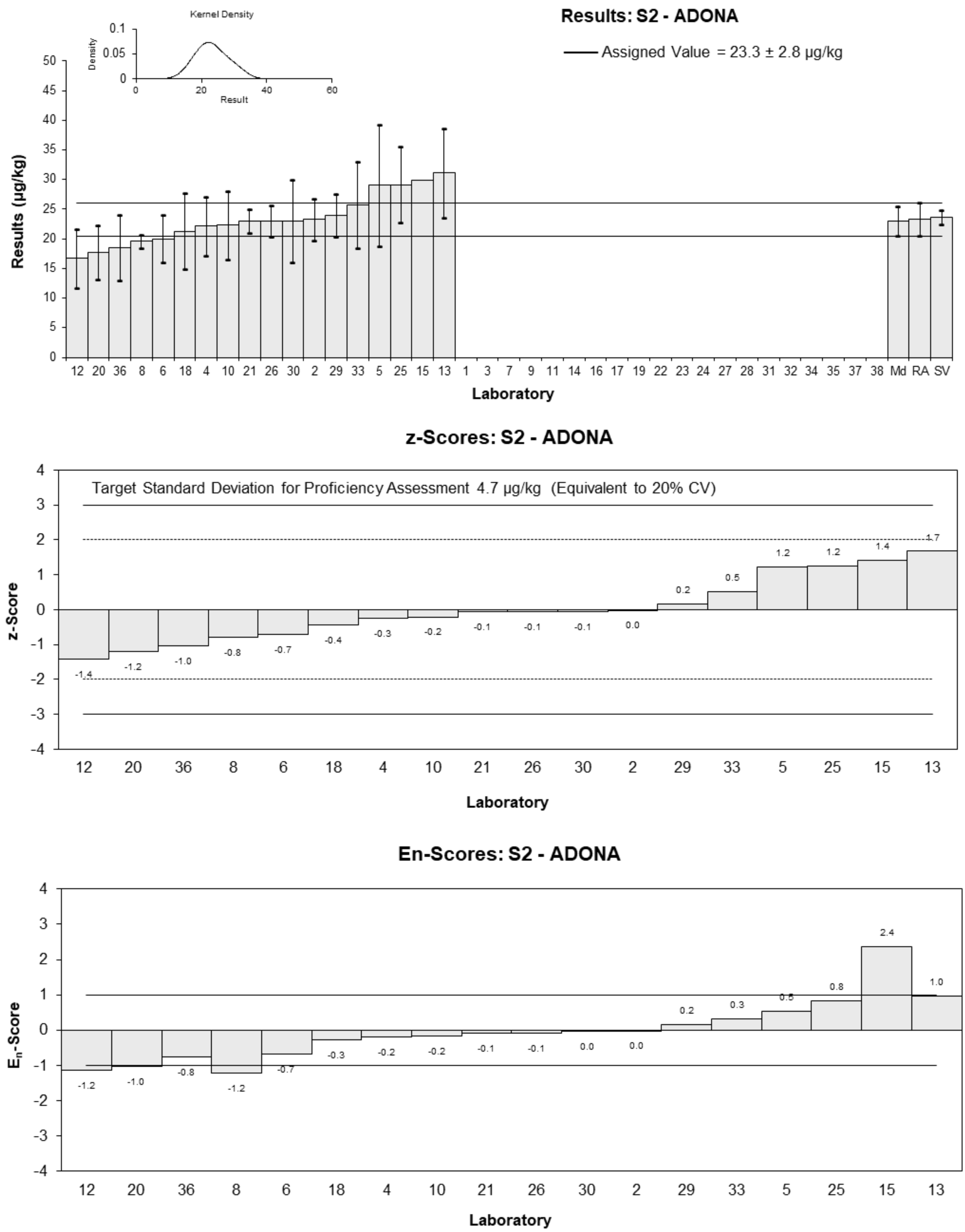
Sample No.	S2
Matrix	Soil
Analyte	ADONA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	23.25	3.4875	NR	-0.01	-0.01
3	NT	NT	NT		
4	22.143	5	NR	-0.25	-0.20
5	29	10.2	NR	1.22	0.54
6	20	4	112	-0.71	-0.68
7	NT	NT	NT		
8	19.6	1.11	56	-0.79	-1.23
9	NR	NR	NR		
10	22.3	5.8	68.3	-0.21	-0.16
11	NT	NT	NT		
12	16.7	5	75	-1.42	-1.15
13	31.1	7.5	NR	1.67	0.97
14	NT	NT	NT		
15	29.9189	NR	95	1.42	2.36
16	NT	NT	NT		
17	NT	NT	NT		
18	21.3	6.39	49	-0.43	-0.29
19	NT	NR	NT		
20	17.72	4.61	85	-1.20	-1.03
21	23	2.00	NR	-0.06	-0.09
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	29.1	6.4	NR	1.24	0.83
26	23	2.6	111	-0.06	-0.08
27	NT	NT	NT		
28	NT	NT	NT		
29	24	3.6	NR	0.15	0.15
30	23	7	98	-0.06	-0.04
31	NT	NT	NT		
32	NT	NT	NT		
33	25.7	7.35	NR	0.52	0.31
34	NT	NT	NT		
35	NT	NT	NT		
36	18.5	5.6	97	-1.03	-0.77
37	NT	NT	NT		
38	NT	NT	NT		

Statistics

Assigned Value	23.3	2.8
Spike Value	23.7	1.2
Robust Average	23.3	2.8
Median	23.0	2.5
Mean	23.3	
N	18	
Max	31.1	
Min	16.7	
Robust SD	4.7	
Robust CV	20%	



Results: S2 - ADONA
Assigned Value = 23.3 ± 2.8 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - ADONA
Target Standard Deviation for Proficiency Assessment 4.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - ADONA
E_n-Score
Laboratory

Figure 46

Table 51

Sample Details

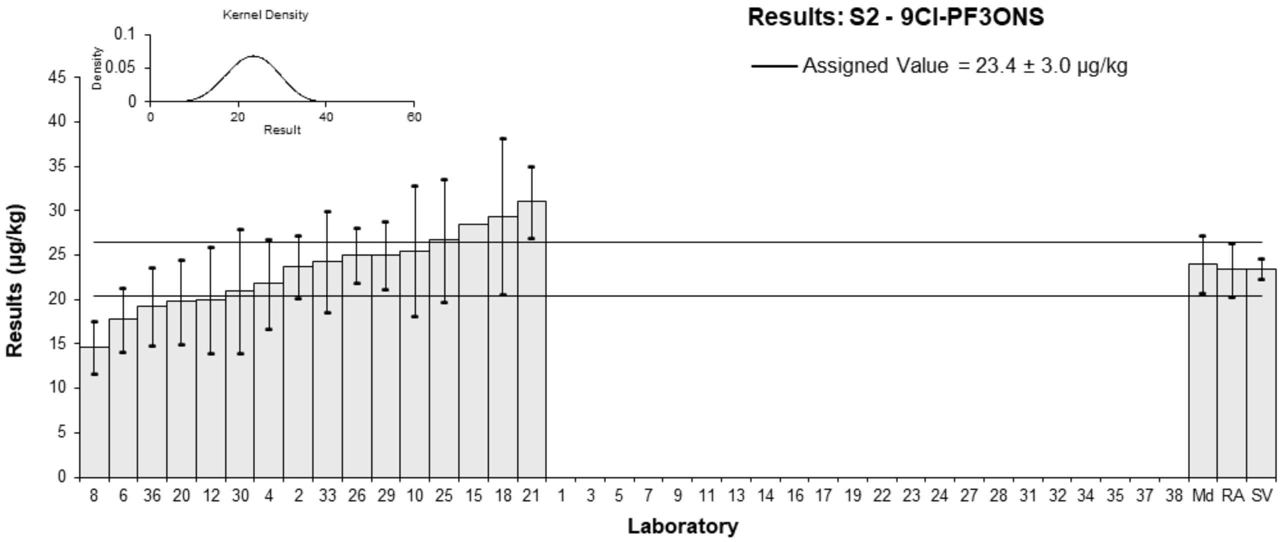
Sample No.	S2
Matrix	Soil
Analyte	9Cl-PF3ONS
Unit	µg/kg

Participant Results

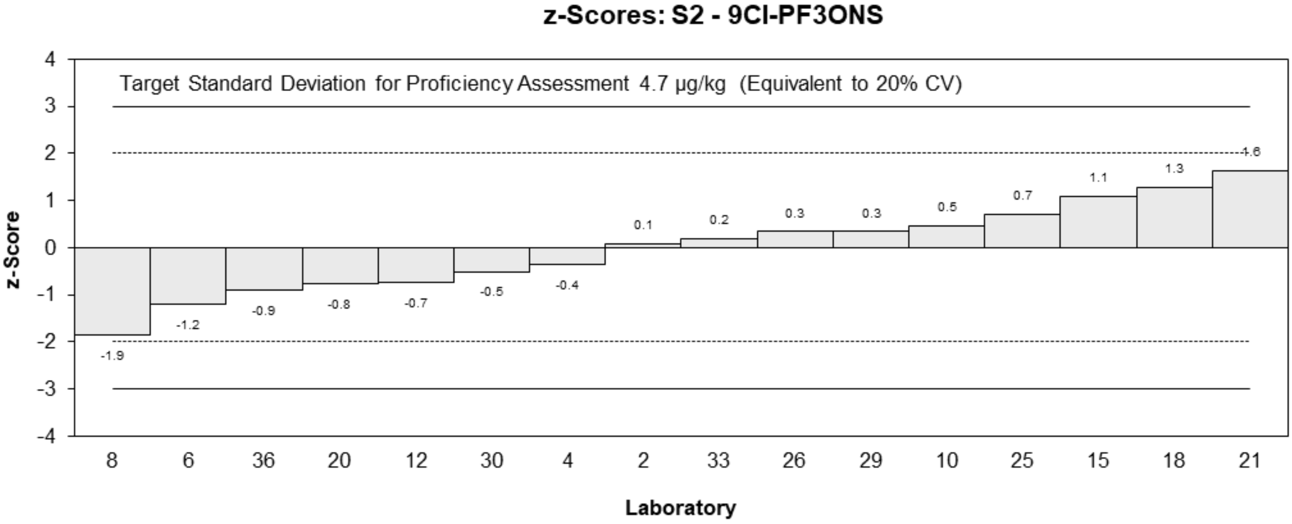
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	23.75	3.563	NR	0.07	0.08
3	NT	NT	NT		
4	21.779	5	NR	-0.35	-0.28
5	NT	NT	NT		
6	17.8	3.6	138	-1.20	-1.20
7	NT	NT	NT		
8	14.7	2.95	79	-1.86	-2.07
9	NR	NR	NR		
10	25.5	7.4	68.3	0.45	0.26
11	NT	NT	NT		
12	20	6	97	-0.73	-0.51
13	NT	NT	NT		
14	NT	NT	NT		
15	28.4946	NR	91	1.09	1.70
16	NT	NT	NT		
17	NT	NT	NT		
18	29.4	8.82	14	1.28	0.64
19	NT	NR	NT		
20	19.81	4.75	84	-0.77	-0.64
21	31	4.00	NR	1.62	1.52
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	26.7	6.9	NR	0.71	0.44
26	25	3.1	112	0.34	0.37
27	NT	NT	NT		
28	NT	NT	NT		
29	25	3.8	NR	0.34	0.33
30	21	7	98	-0.51	-0.32
31	NT	NT	NT		
32	NT	NT	NT		
33	24.3	5.65	NR	0.19	0.14
34	NT	NT	NT		
35	NT	NT	NT		
36	19.2	4.4	86	-0.90	-0.79
37	NT	NT	NT		
38	NT	NT	NT		

Statistics

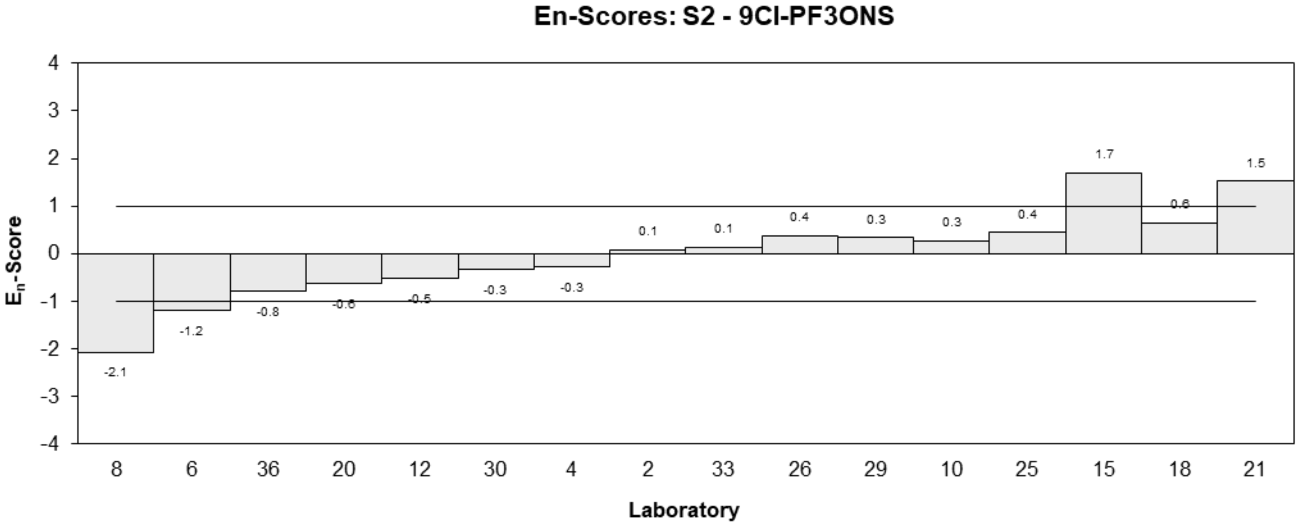
Assigned Value	23.4	3.0
Spike Value	23.5	1.2
Robust Average	23.4	3.0
Median	24.0	3.3
Mean	23.3	
N	16	
Max	31	
Min	14.7	
Robust SD	4.8	
Robust CV	21%	



Results: S2 - 9Cl-PF3ONS
Assigned Value = 23.4 ± 3.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
8 6 36 20 12 30 4 2 33 26 29 10 25 15 18 21 1 3 5 7 9 11 13 14 16 17 19 22 23 24 27 28 31 32 34 35 37 38 Md RA SV



z-Scores: S2 - 9Cl-PF3ONS
Target Standard Deviation for Proficiency Assessment 4.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
8 6 36 20 12 30 4 2 33 26 29 10 25 15 18 21
-1.9 -1.2 -0.9 -0.8 -0.7 -0.5 -0.4 0.1 0.2 0.3 0.3 0.5 0.7 1.1 1.3 1.6



En-Scores: S2 - 9Cl-PF3ONS
E_n-Score
Laboratory
8 6 36 20 12 30 4 2 33 26 29 10 25 15 18 21
-2.1 -1.2 -0.8 -0.6 -0.5 -0.3 -0.3 0.1 0.1 0.4 0.3 0.3 0.4 1.7 0.6 1.5

Figure 47

Table 52

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	13.07	2.614	NR	-1.87	-1.67
3	NT	NT	NT		
4	18.891	4	NR	-0.48	-0.36
5	NT	NT	NT		
6	11.2	2.2	102	-2.32	-2.17
7	NT	NT	NT		
8**	1.47	0.44	79	-4.65	-4.95
9	19.98	6.993	86	-0.22	-0.11
10	25.9	8.3	68.3	1.20	0.55
11	NT	NT	NT		
12	15	4.5	97	-1.41	-0.99
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	NT	NT	NT		
17	NT	NT	NT		
18*	9.79	2.937	27	-2.66	-2.28
19	NT	NR	NT		
20	20.63	4.75	84	-0.06	-0.04
21	26	4.00	NR	1.22	0.91
22	NT	NT	NT		
23	NT	NT	NT		
24	NS	NS	NS		
25	24.2	6.5	NR	0.79	0.44
26*	32	4.8	81	2.66	1.79
27	NT	NT	NT		
28	NT	NT	NT		
29	28	4.1	NR	1.70	1.25
30	24	7	98	0.74	0.39
31	NT	NT	NT		
32	NT	NT	NT		
33	22.6	8.56	NR	0.41	0.18
34	NT	NT	NT		
35	NT	NT	NT		
36	21.1	6.33	98	0.05	0.03
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	20.9	3.9
Spike Value	23.7	1.2
Robust Average	20.8	4.6
Median	21.1	4.6
Mean	20.8	
N	15	
Max	32	
Min	9.79	
Robust SD	7.1	
Robust CV	34%	

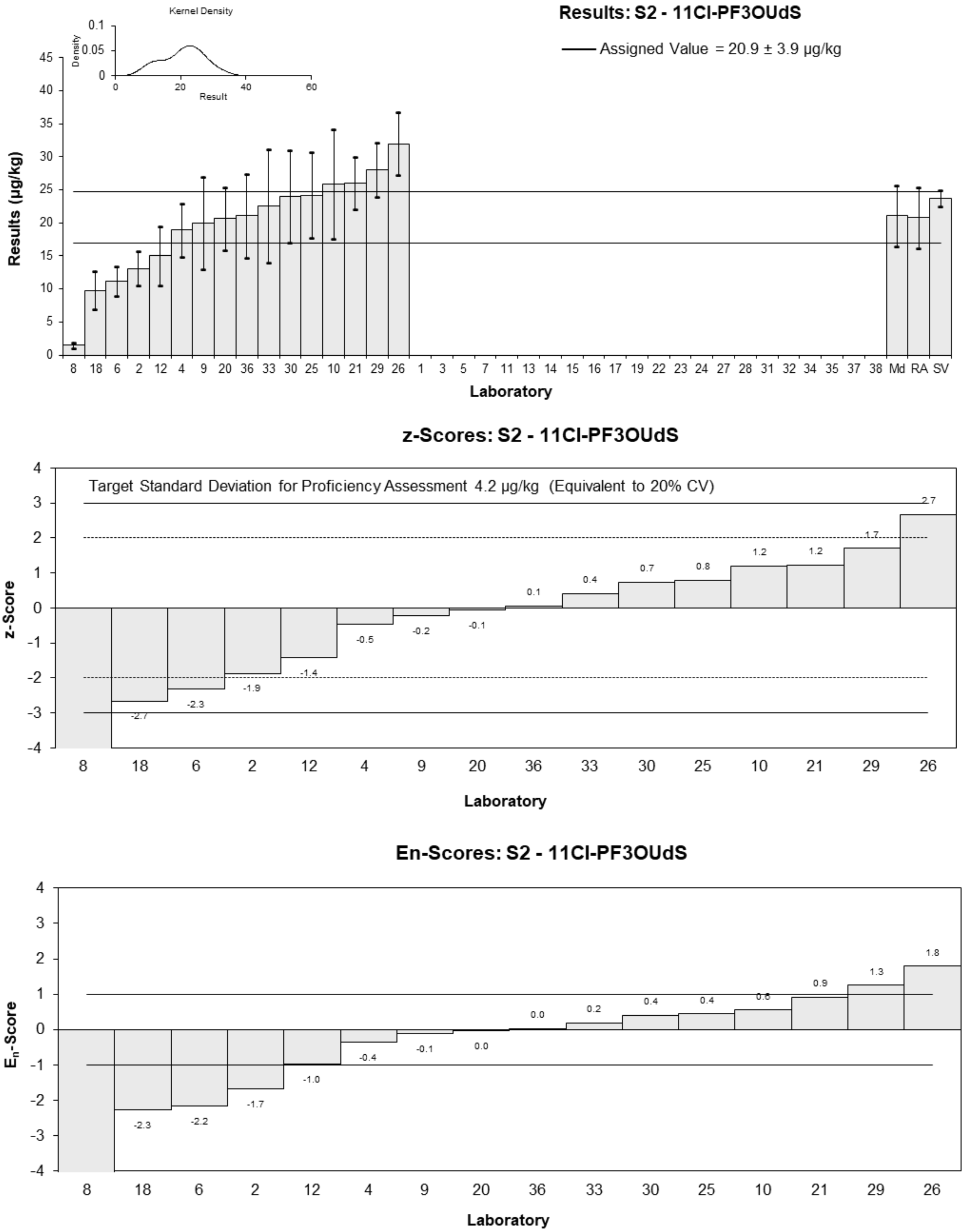

Results: S2 - 11Cl-PF3OUdS
Assigned Value = 20.9 ± 3.9 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
z-Scores: S2 - 11Cl-PF3OUdS
Target Standard Deviation for Proficiency Assessment 4.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S2 - 11Cl-PF3OUdS
E_n-Score
Laboratory

Figure 48

Table 53

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	5:3FTCA
Unit	µg/kg

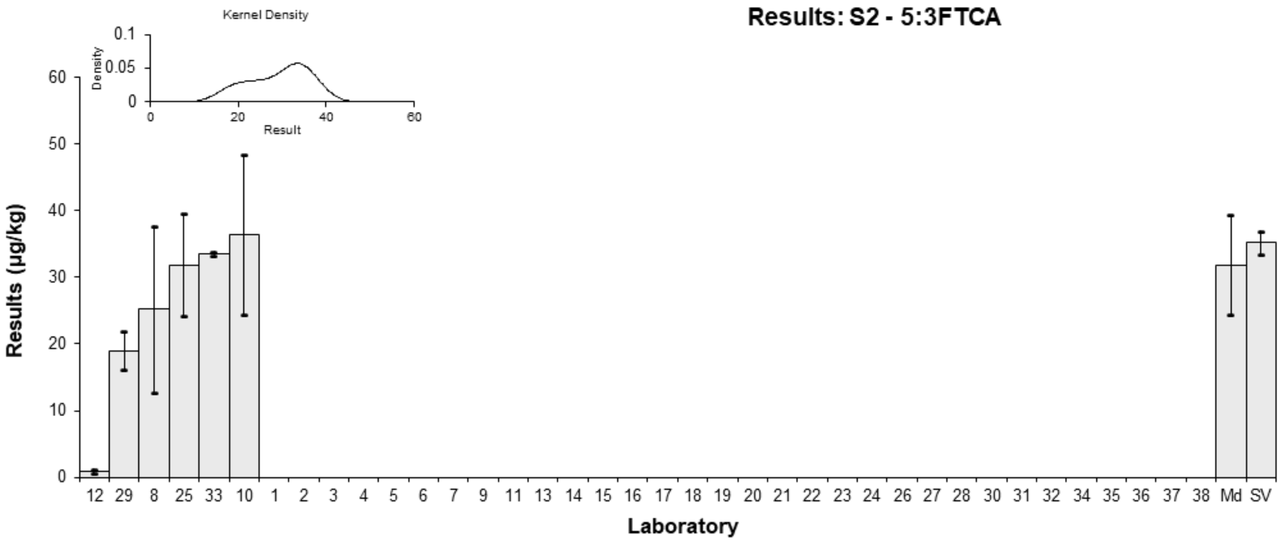
Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NT	NT	NT
3	NT	NT	NT
4	NR	NR	NR
5	NT	NT	NT
6	NT	NT	NT
7	NT	NT	NT
8	25.2	12.5	49
9	NR	NR	NR
10	36.4	12	93.7
11	NT	NT	NT
12**	0.9	0.3	62
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	NR	NT
20	NT	NT	NT
21	NT	NT	NT
22	NT	NT	NT
23	NT	NT	NT
24	NS	NS	NS
25	31.9	7.7	NR
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	19	2.9	NR
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	33.6	0.271	NR
34	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	35.2	1.8
Median	31.9	7.5
Mean	29.2	
N	5	
Max	36.4	
Min	19	



Results: S2 - 5:3FTCA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
12 29 8 25 33 10 1 2 3 4 5 6 7 9 11 13 14 15 16 17 18 19 20 21 22 23 24 26 27 28 30 31 32 34 35 36 37 38 Md SV

Figure 49

Table 54

Sample Details

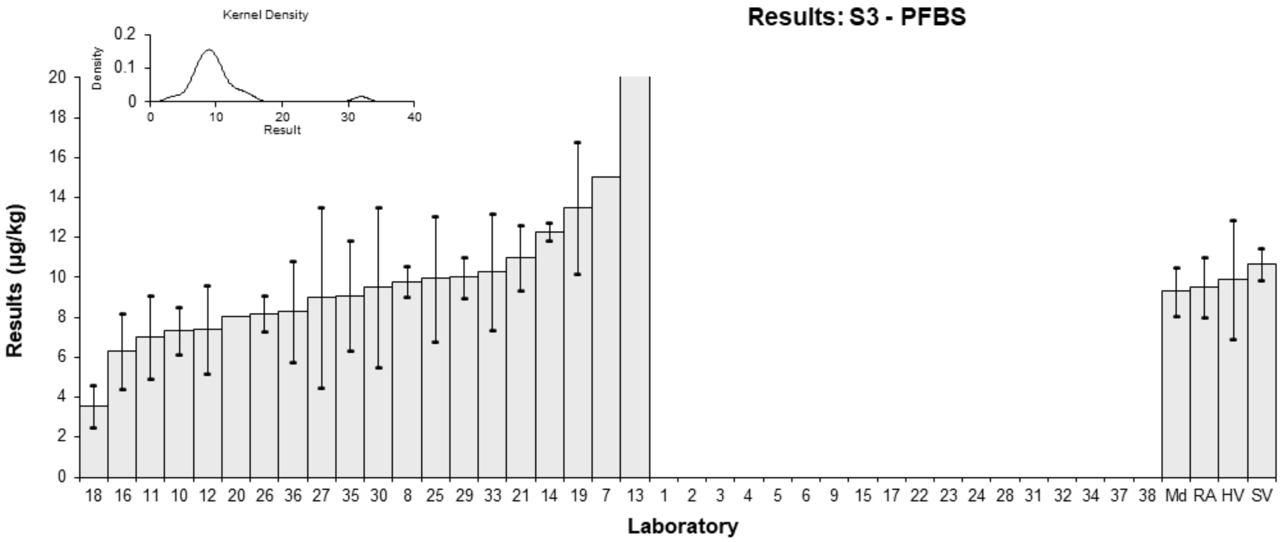
Sample No.	S3
Matrix	Biosolid
Analyte	PFBS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	15	NR	58
8	9.8	0.79	56
9	NS	NS	NS
10	7.35	1.18	60.1
11	7.013	2.1038	114
12	7.4	2.2	74
13	32	8.3	52
14	12.29	0.44	81
15	NS	NS	NS
16	6.33	1.90	NR
17	NS	NS	NS
18	3.56	1.068	78
19	13.5	3.3	104
20	8.07	NR	82
21	11	1.65	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	9.96	3.14	72
26	8.2	0.92	93
27	9	4.5	97
28	NS	NS	NS
29	10	1.0	53
30	9.5	4	90
31	NS	NS	NS
32	NS	NS	NS
33	10.3	2.92	70
34	NS	NS	NS
35	9.10	2.73	107
36	8.3	2.5	101
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	10.7	0.8
Homogeneity Value	9.9	3.0
Robust Average	9.5	1.5
Median	9.3	1.2
Mean	10.4	
N	20	
Max	32	
Min	3.56	
Robust SD	2.7	
Robust CV	28%	



Results: S3 - PFBS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 16 11 10 12 20 26 36 27 35 30 8 25 29 33 21 14 19 7 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 50

Table 55

Sample Details

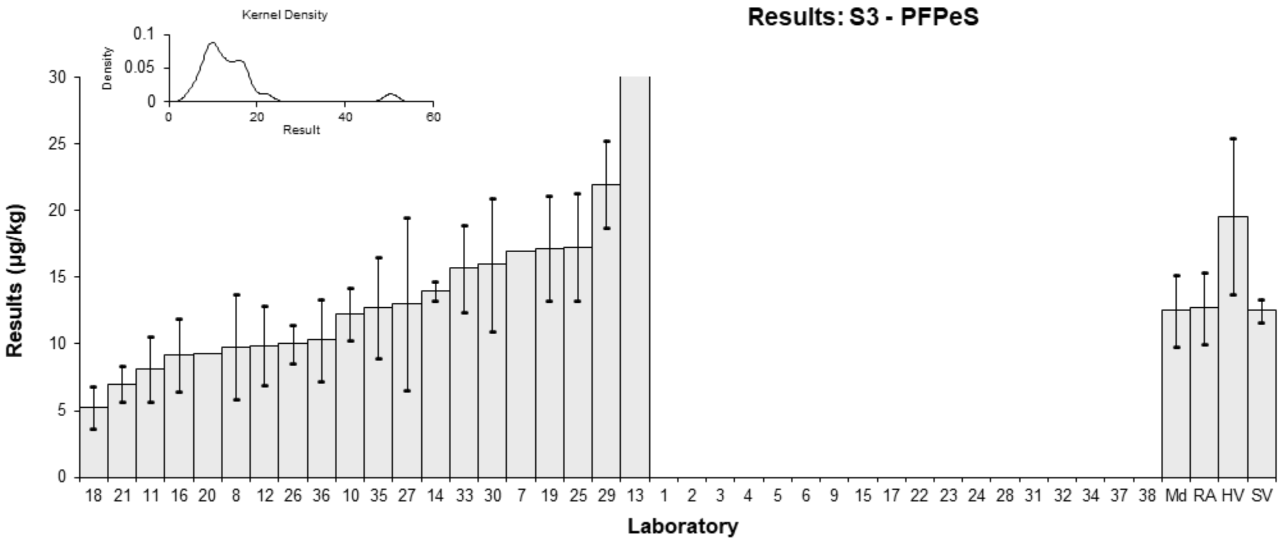
Sample No.	S3
Matrix	Biosolid
Analyte	PFPeS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	17	NR	NR
8	9.8	3.9	82
9	NS	NS	NS
10	12.3	1.97	91.9
11	8.100	2.4301	114
12	9.9	3	74
13	50.4	13.6	NR
14	13.97	0.74	84
15	NS	NS	NS
16	9.16	2.75	NR
17	NS	NS	NS
18	5.27	1.581	78
19	17.2	3.9	104
20	9.30	NR	94
21	7.0	1.37	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	17.3	4	NR
26	10	1.4	85
27	13	6.5	NR
28	NS	NS	NS
29	22	3.3	NR
30	16	5	86
31	NS	NS	NS
32	NS	NS	NS
33	15.7	3.26	70
34	NS	NS	NS
35	12.7	3.8	107
36	10.3	3.1	97
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	12.5	0.9
Homogeneity Value	19.6	5.9
Robust Average	12.7	2.7
Median	12.5	2.7
Mean	14.3	
N	20	
Max	50.4	
Min	5.27	
Robust SD	4.8	
Robust CV	38%	



Results: S3 - PFPeS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18
21
11
16
20
8
12
26
36
10
35
27
14
33
30
7
19
25
29
13
1
2
3
4
5
6
9
15
17
22
23
24
28
31
32
34
37
38
Md
RA
HV
SV

Figure 51

Table 56

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHxS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	7.7	NR	102
8	6.8	0.44	82
9	NS	NS	NS
10	6.03	0.72	91.9
11	5.010	1.5030	120
12	6.3	1.9	83
13	18.8	5.3	70
14	6.65	0.4	84
15	NS	NS	NS
16	4.84	1.45	NR
17	NS	NS	NS
18	2.06	0.618	84
19	9.2	1.9	104
20	5.36	NR	94
21	5.6	0.53	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	11.6	2.9	61
26	5.0	1.2	95
27	6	3	104
28	NS	NS	NS
29	6.9	1.0	133
30	9.7	4	86
31	NS	NS	NS
32	NS	NS	NS
33	6.45	1.12	91
34	NS	NS	NS
35	6.26	1.89	117
36	5.18	1.55	103
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	6.25	0.47
Homogeneity Value	6.8	2.0
Robust Average	6.6	1.1
Median	6.28	0.84
Mean	7.1	
N	20	
Max	18.8	
Min	2.06	
Robust SD	1.9	
Robust CV	29%	

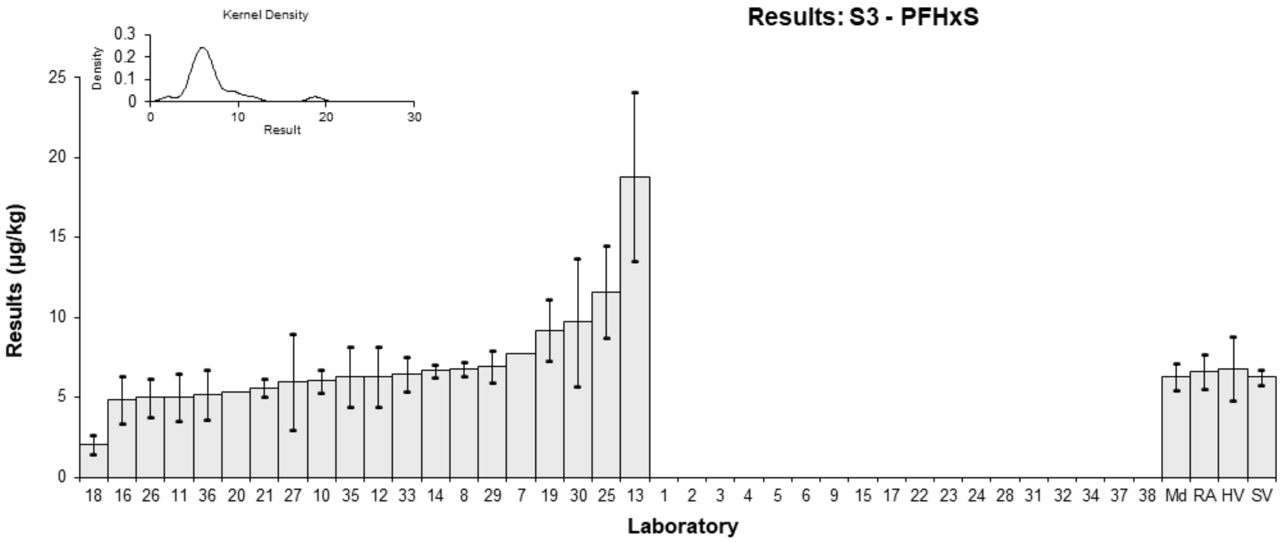

Kernel Density
Density
Result
Results: S3 - PFHxS
Results (µg/kg)
Laboratory
18 16 26 11 36 20 21 27 10 35 12 33 14 8 29 7 19 30 25 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 52

Table 57

Sample Details

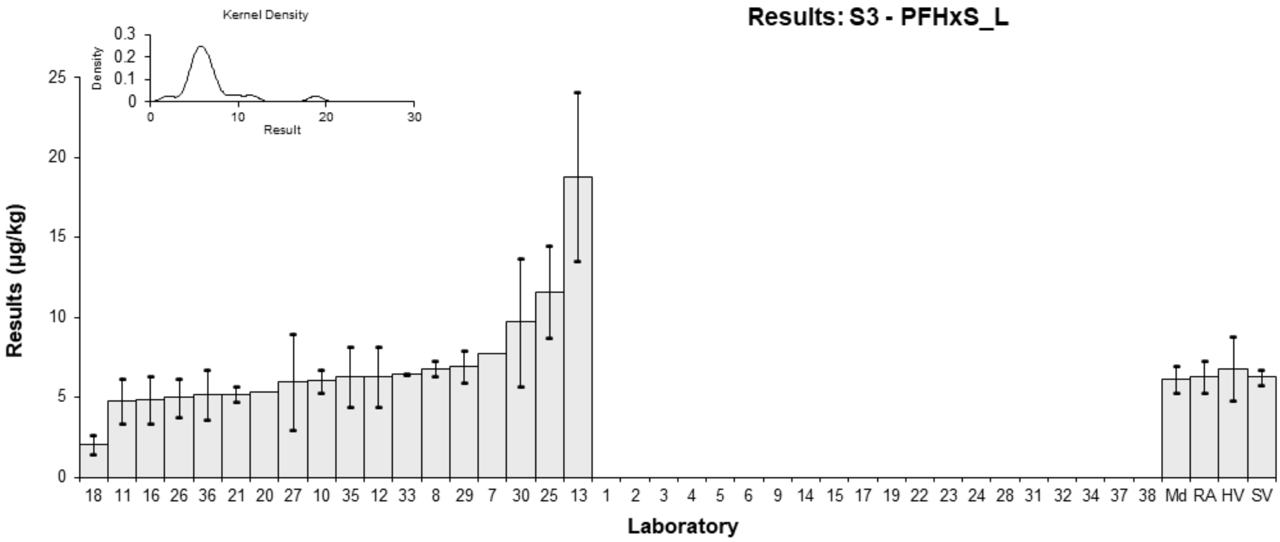
Sample No.	S3
Matrix	Biosolid
Analyte	PFHxS_L
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	7.7	NR	NR
8	6.8	0.49	82
9	NS	NS	NS
10	6.03	0.72	91.9
11	4.763	1.4290	108
12	6.3	1.9	83
13	18.8	5.3	NR
14	NT	NT	NT
15	NS	NS	NS
16	4.84	1.45	NR
17	NS	NS	NS
18	2.06	0.618	84
19	NT	NR	NT
20	5.36	NR	94
21	5.2	0.48	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	11.6	2.9	NR
26	5.0	1.2	95
27	6	3	NR
28	NS	NS	NS
29	6.9	1.0	NR
30	9.7	4	86
31	NS	NS	NS
32	NS	NS	NS
33	6.45	0.0255	91
34	NS	NS	NS
35	6.26	1.89	117
36	5.18	1.55	103
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	6.25	0.47
Homogeneity Value	6.8	2.0
Robust Average	6.27	0.99
Median	6.15	0.83
Mean	6.9	
N	18	
Max	18.8	
Min	2.06	
Robust SD	1.7	
Robust CV	27%	



Results: S3 - PFHxS_L
Kernel Density
Density
0.3
0.2
0.1
0
0
10
20
30
Result
Results (µg/kg)
25
20
15
10
5
0
18 11 16 26 36 21 20 27 10 35 12 33 8 29 7 30 25 13 1 2 3 4 5 6 9 14 15 17 19 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 53

Table 58

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHpS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	3.5	NR	NR
8	1.6	0.92	82
9	NS	NS	NS
10	2.93	0.62	91.7
11	1.538	0.4615	119
12	2.2	0.7	83
13	11.6	3.4	NR
14	3.42	0.2	84
15	NS	NS	NS
16	2.61	0.78	NR
17	NS	NS	NS
18	< 0.72	NR	84
19	5.1	1.1	79
20	1.79	NR	94
21	4.4	0.60	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	<5	NR	NR
26	1.9	0.32	95
27	2	1	NR
28	NS	NS	NS
29	2.8	0.4	NR
30	2.9	2	93
31	NS	NS	NS
32	NS	NS	NS
33	2.30	0.455	97
34	NS	NS	NS
35	<5	NR	117
36	2.15	0.64	95
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	2.44	0.18
Homogeneity Value	2.78	0.84
Robust Average	2.75	0.67
Median	2.61	0.64
Mean	3.2	
N	17	
Max	11.6	
Min	1.538	
Robust SD	1.1	
Robust CV	40%	

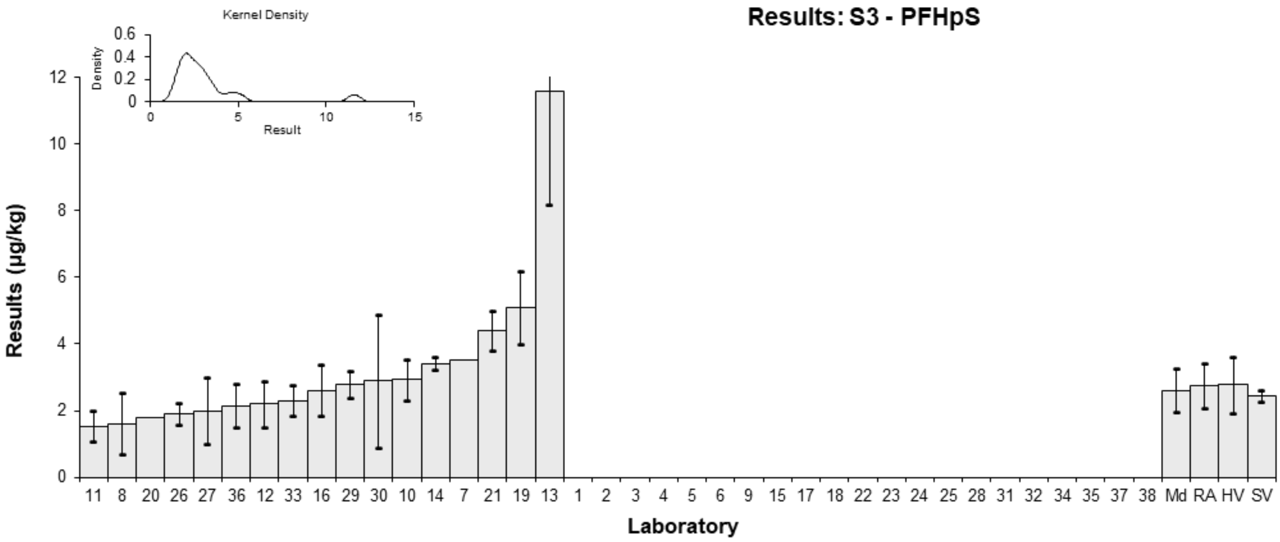

Results: S3 - PFHpS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
11 8 20 26 27 36 12 33 16 29 30 10 14 7 21 19 13 1 2 3 4 5 6 9 15 17 18 22 23 24 25 28 31 32 34 35 37 38 Md RA HV SV

Figure 54

Table 59

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	13	7.8	126
8	10.3	2.3	71
9	NS	NS	NS
10	11.7	1.87	91.7
11	7.668	2.3003	119
12	10	3	130
13	34	8.8	60
14	23.64	0.5	60
15	NS	NS	NS
16	9.66	2.90	NR
17	NS	NS	NS
18	3.33	0.999	92
19	19.3	4.5	79
20	8.02	NR	86
21	7.6	0.92	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	11.9	4.4	85
26	8.5	2.7	105
27	10	5	124
28	NS	NS	NS
29	10	2.0	149
30	11	4	93
31	NS	NS	NS
32	NS	NS	NS
33	10.3	3.04	97
34	NS	NS	NS
35	11.1	3.3	84
36	8.57	2.57	68
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	10.1	0.8
Homogeneity Value	10.8	3.2
Robust Average	10.5	1.5
Median	10.2	1.3
Mean	12.0	
N	20	
Max	34	
Min	3.33	
Robust SD	2.7	
Robust CV	26%	

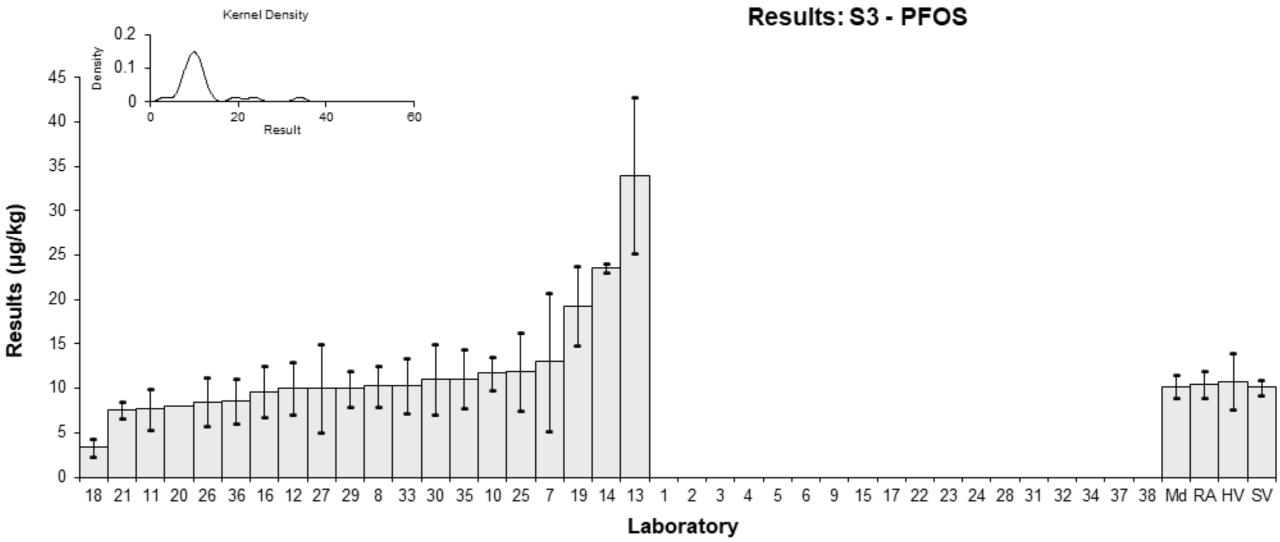

Results: S3 - PFOS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 21 11 20 26 36 16 12 27 29 8 33 30 35 10 25 7 19 14 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 55

Table 60

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOS_L
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	13	NR	NR
8	9.63	1.5	71
9	NS	NS	NS
10	11.3	1.87	91.7
11	7.214	2.1642	108
12	10	3	130
13	34	8.8	NR
14	NT	NT	NT
15	NS	NS	NS
16	9.66	2.90	NR
17	NS	NS	NS
18	3.33	0.999	92
19	19.3	4.5	79
20	7.89	NR	86
21	8.3	1.01	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	11.9	4.4	NR
26	8.5	2.7	105
27	10	5	NR
28	NS	NS	NS
29	10	2.0	NR
30	11	4	93
31	NS	NS	NS
32	NS	NS	NS
33	10.3	0.0374	97
34	NS	NS	NS
35	11.1	3.3	84
36	8.57	2.57	68
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	10.1	0.8
Homogeneity Value	10.8	3.2
Robust Average	10.1	1.3
Median	10.0	1.2
Mean	11.3	
N	19	
Max	34	
Min	3.33	
Robust SD	2.2	
Robust CV	22%	

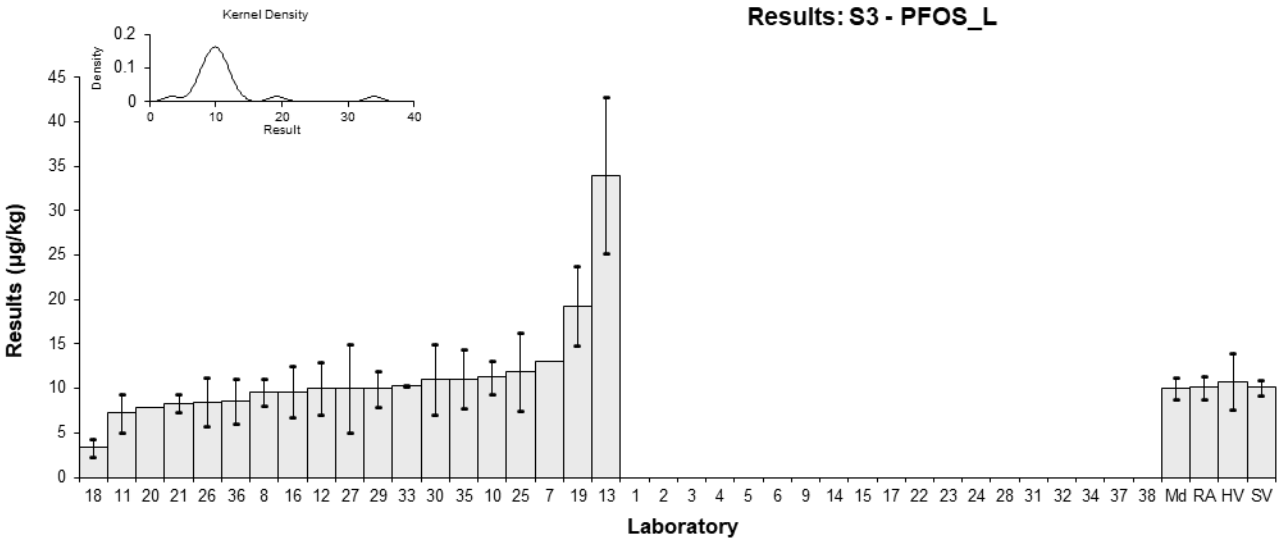

Results: S3 - PFOS_L
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 11 20 21 26 36 8 16 12 27 29 33 30 35 10 25 7 19 13 1 2 3 4 5 6 9 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 56

Table 61

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFNS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	2.5	NR	NR
8	0.9	0.75	70
9	NS	NS	NS
10	1.14	0.26	91.7
11	1.160	0.3480	119
12	1.1	0.3	41
13	4.4	1.4	NR
14	NT	NT	NT
15	NS	NS	NS
16	1.25	0.38	NR
17	NS	NS	NS
18	< 1.0	NR	97
19	NT	NR	NT
20	1.24	NR	86
21	<1	0.20	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	<5	NR	NR
26	< 1.0	NR	105
27	1	0.5	NR
28	NS	NS	NS
29	1.8	0.4	NR
30	2.6	1	93
31	NS	NS	NS
32	NS	NS	NS
33	1.81	0.3	97
34	NS	NS	NS
35	<5	NR	84
36	1.38	0.42	97
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	1.92	0.14
Homogeneity Value	2.32	0.69
Robust Average	1.58	0.50
Median	1.25	0.26
Mean	1.71	
N	13	
Max	4.4	
Min	0.9	
Robust SD	0.72	
Robust CV	45%	

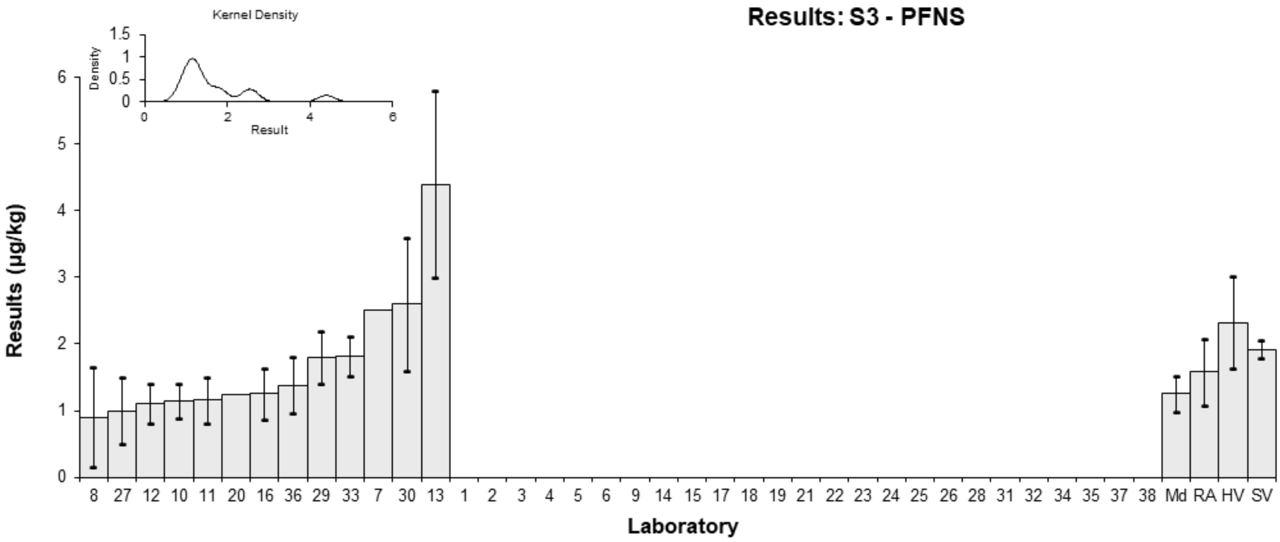

Results: S3 - PFNS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
8 27 12 10 11 20 16 36 29 33 7 30 13 1 2 3 4 5 6 9 14 15 17 18 19 21 22 23 24 25 26 28 31 32 34 35 37 38 Md RA HV SV

Figure 57

Table 62

Sample Details

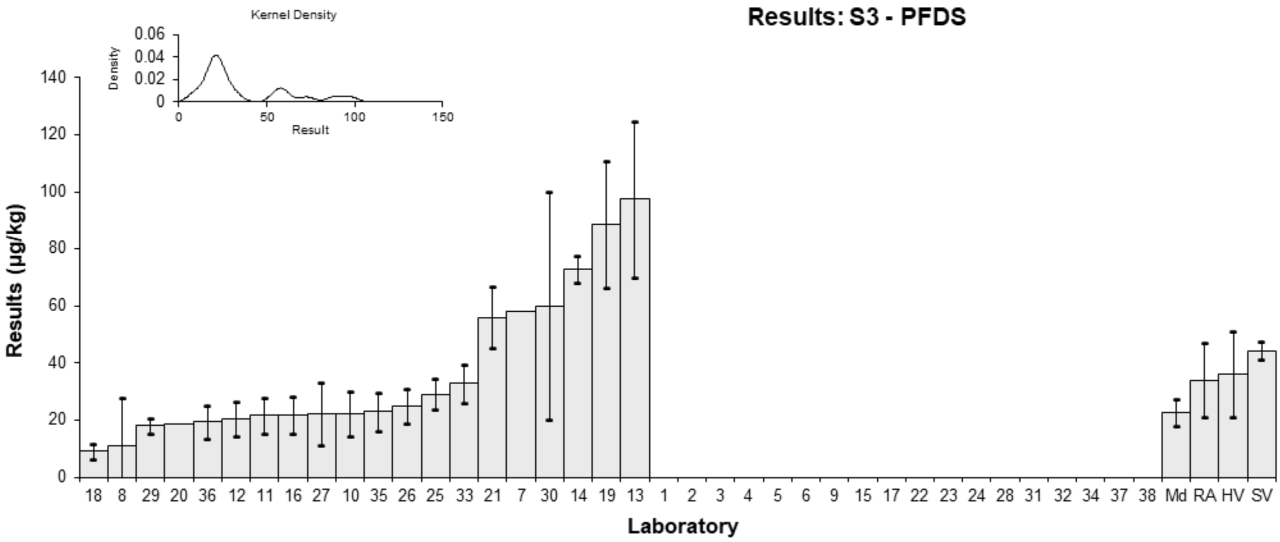
Sample No.	S3
Matrix	Biosolid
Analyte	PFDS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	58	NR	NR
8	11.1	16.8	71
9	NS	NS	NS
10	22.4	7.84	91.7
11	21.550	6.4650	119
12	20.3	6.1	41
13	97.4	27.3	NR
14	72.83	4.6	60
15	NS	NS	NS
16	21.90	6.57	NR
17	NS	NS	NS
18	9.09	2.727	104
19	88.5	22.3	79
20	18.80	NR	86
21	56	10.77	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	29.1	5.5	NR
26	25	6.1	105
27	22	11	NR
28	NS	NS	NS
29	18	2.6	NR
30	60	40	93
31	NS	NS	NS
32	NS	NS	NS
33	32.9	6.74	97
34	NS	NS	NS
35	22.9	6.9	84
36	19.4	5.8	94
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	44.4	3.3
Homogeneity Value	36	15
Robust Average	34	13
Median	22.7	4.6
Mean	36	
N	20	
Max	97.4	
Min	9.09	
Robust SD	24	
Robust CV	70%	



Kernel Density
0.06
0.04
0.02
0
Density
0
50
100
150
Result
Results: S3 - PFDS
140
120
100
80
60
40
20
0
Results (µg/kg)
18 8 29 20 36 12 11 16 27 10 35 26 25 33 21 7 30 14 19 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 58

Table 63

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFDoS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	16	NR	NR
8	28.4	4.2	22
9	NS	NS	NS
10	6.9	3.66	91.7
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	5.04	1.512	93
19	NT	NR	NT
20	6.78	NR	86
21	<1	0.20	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	14.5	4.7	NR
26	NT	NT	NT
27	10	5	NR
28	NS	NS	NS
29	20	3.0	NR
30	NT	NT	NT
31	NS	NS	NS
32	NS	NS	NS
33	29.7	9.15	97
34	NS	NS	NS
35	NT	NT	NT
36	13.5	4.1	94
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	38.4	2.9
Homogeneity Value	32	13
Robust Average	15.1	7.8
Median	14.0	7.7
Mean	15.1	
N	10	
Max	29.7	
Min	5.04	
Robust SD	9.9	
Robust CV	65%	

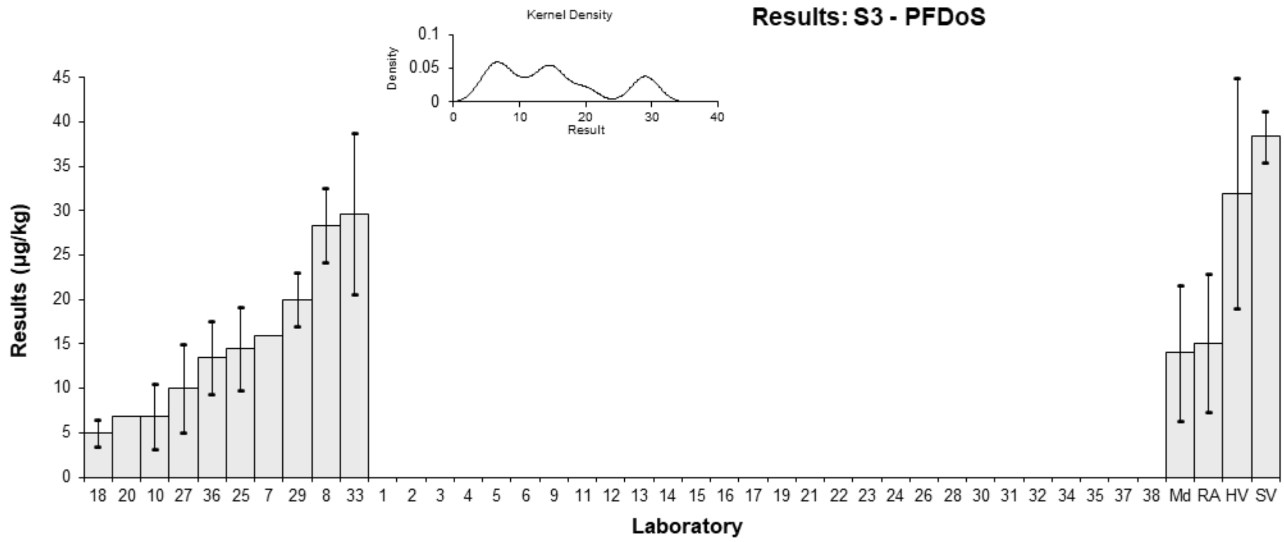

Results: S3 - PFDoS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 20 10 27 36 25 7 29 8 33 1 2 3 4 5 6 9 11 12 13 14 15 16 17 19 21 22 23 24 26 28 30 31 32 34 35 37 38 Md RA HV SV

Figure 59

Table 64

Sample Details

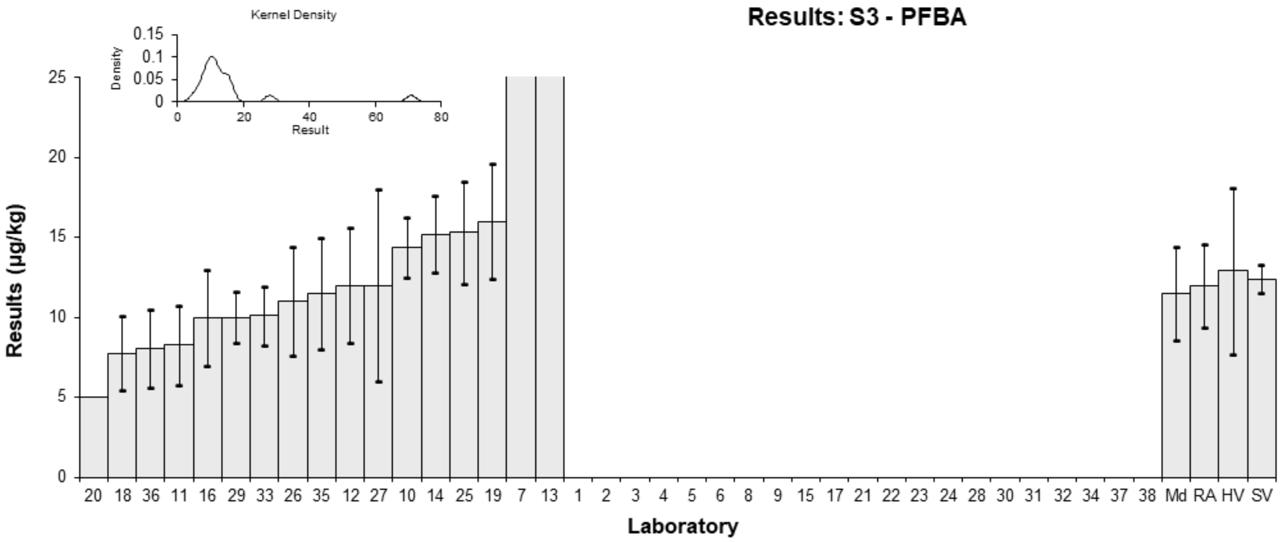
Sample No.	S3
Matrix	Biosolid
Analyte	PFBA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	28	NR	55
8	NT	NT	NT
9	NS	NS	NS
10	14.4	1.87	1.88
11	8.265	2.4796	98
12	12	3.6	54
13	70.8	19.1	15
14	15.21	2.4	90
15	NS	NS	NS
16	9.98	2.99	87
17	NS	NS	NS
18	7.74	2.322	86
19	16	3.6	132
20	5.03	NR	22
21	NT	NT	NT
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	15.3	3.2	95
26	11	3.4	94
27	12	6	92
28	NS	NS	NS
29	10	1.6	48
30	< 1	NR	50
31	NS	NS	NS
32	NS	NS	NS
33	10.1	1.81	27
34	NS	NS	NS
35	11.5	3.5	102
36	8.05	2.41	92
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	12.4	0.9
Homogeneity Value	12.9	5.2
Robust Average	12.0	2.6
Median	11.5	2.9
Mean	15.6	
N	17	
Max	70.8	
Min	5.03	
Robust SD	4.3	
Robust CV	36%	



Kernel Density
Density
0.15
0.1
0.05
0
0
20
40
60
80
Result
Results: S3 - PFBA
Results (µg/kg)
25
20
15
10
5
0
20 18 36 11 16 29 33 26 35 12 27 10 14 25 19 7 13 1 2 3 4 5 6 8 9 15 17 21 22 23 24 28 30 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 60

Table 65

Sample Details

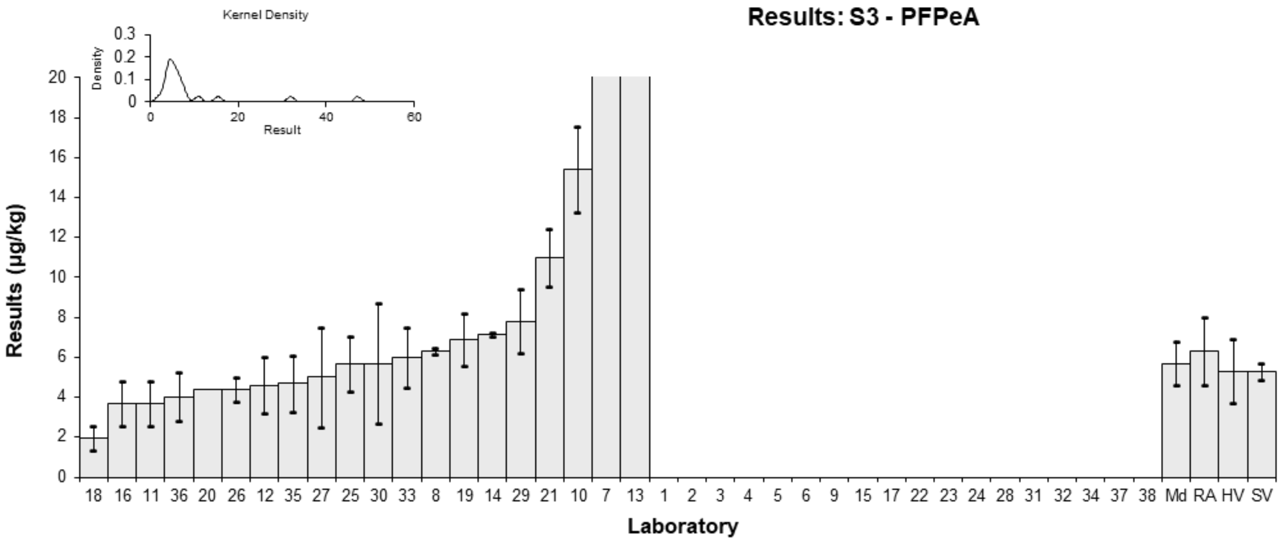
Sample No.	S3
Matrix	Biosolid
Analyte	PFPeA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	32	NR	29
8	6.33	0.16	77
9	NS	NS	NS
10	15.4	2.16	12.6
11	3.702	1.1105	93
12	4.6	1.4	54
13	47.2	13.2	20
14	7.12	0.09	75
15	NS	NS	NS
16	3.69	1.11	115
17	NS	NS	NS
18	1.97	0.591	95
19	6.9	1.3	132
20	4.38	NR	69
21	11	1.45	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	5.7	1.38	88
26	4.4	0.60	88
27	5	2.5	106
28	NS	NS	NS
29	7.8	1.6	47
30	5.7	3	71
31	NS	NS	NS
32	NS	NS	NS
33	6.00	1.5	48
34	NS	NS	NS
35	4.70	1.41	102
36	4.03	1.21	115
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	5.30	0.40
Homogeneity Value	5.3	1.6
Robust Average	6.3	1.7
Median	5.7	1.1
Mean	9.4	
N	20	
Max	47.2	
Min	1.97	
Robust SD	3.1	
Robust CV	49%	



Results: S3 - PFPeA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 16 11 36 20 26 12 35 27 25 30 33 8 19 14 29 21 10 7 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 61

Table 66

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHxA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	11	NR	66
8	9.12	0.96	80
9	NS	NS	NS
10	8.28	1.24	54.6
11	5.577	1.6731	110
12	6.6	3	53
13	23.6	7.1	54
14	11.01	0.2	88
15	NS	NS	NS
16	6.38	1.91	60
17	NS	NS	NS
18	2.79	0.837	93
19	10.9	2.1	106
20	5.94	NR	72
21	8.3	1.46	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	8.02	1.87	103
26	6.7	0.94	85
27	7	3.5	118
28	NS	NS	NS
29	7.4	1.1	60
30	9.5	4	88
31	NS	NS	NS
32	NS	NS	NS
33	8.19	1.45	74
34	NS	NS	NS
35	6.26	2.19	90
36	6.32	1.9	103
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	6.62	0.50
Homogeneity Value	8.3	2.5
Robust Average	7.9	1.3
Median	7.7	1.2
Mean	8.4	
N	20	
Max	23.6	
Min	2.79	
Robust SD	2.3	
Robust CV	29%	

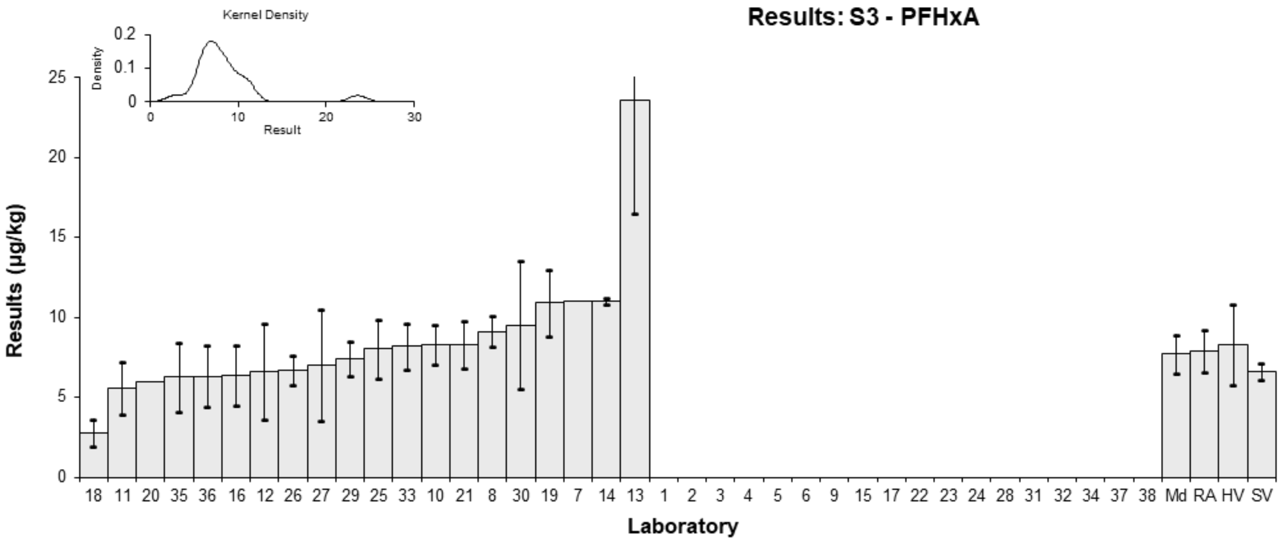

Results: S3 - PFHxA
Kernel Density
Density
Result
0.2
0.1
0
0
10
20
30
Results (µg/kg)
25
20
15
10
5
0
18 11 20 35 36 16 12 26 27 29 25 33 10 21 8 30 19 7 14 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 62

Table 67

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHpA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	6	2.4	96
8	4.97	0.098	86
9	NS	NS	NS
10	4.55	0.59	64.8
11	2.788	0.8364	123
12	3.5	1	72
13	12.5	4	58
14	5.47	0.3	63
15	NS	NS	NS
16	3.23	0.97	83
17	NS	NS	NS
18	1.62	0.486	88
19	5.8	1.4	107
20	3.39	NR	76
21	1.1	0.33	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	6.32	1.42	105
26	3.4	0.83	93
27	4	2	125
28	NS	NS	NS
29	4.4	0.66	92
30	5.4	3	101
31	NS	NS	NS
32	NS	NS	NS
33	4.30	0.709	91
34	NS	NS	NS
35	4.30	1.29	99
36	3.39	1.02	95
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	3.97	0.30
Homogeneity Value	4.7	1.4
Robust Average	4.29	0.86
Median	4.30	0.82
Mean	4.5	
N	20	
Max	12.5	
Min	1.1	
Robust SD	1.5	
Robust CV	36%	

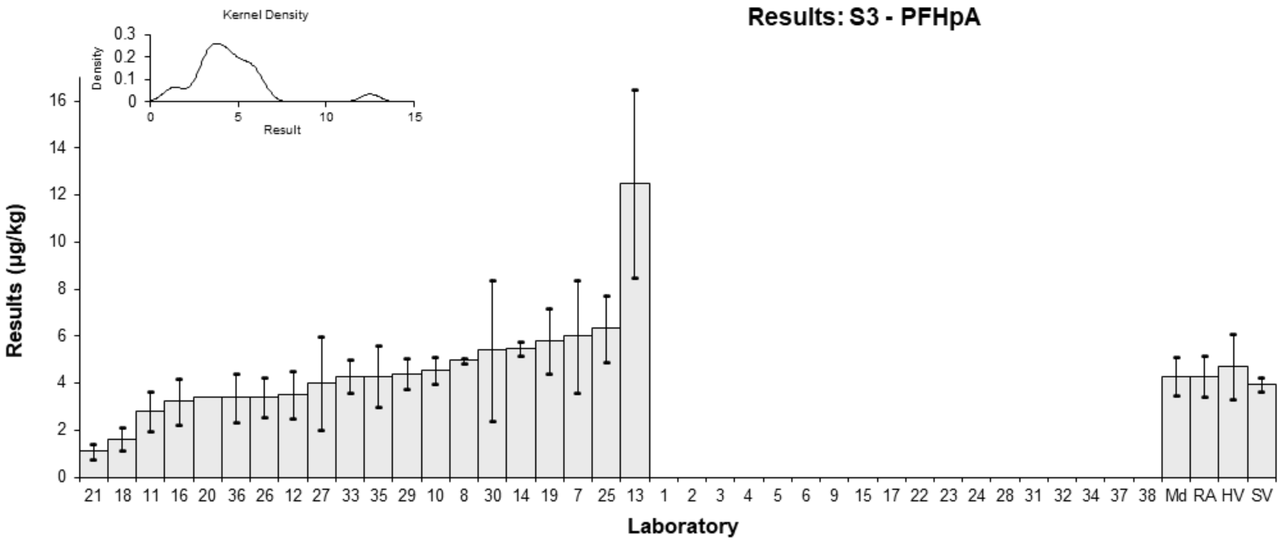

Results: S3 - PFHpA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
21 18 11 16 20 36 26 12 27 33 35 29 10 8 30 14 19 7 25 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 63

Table 68

Sample Details

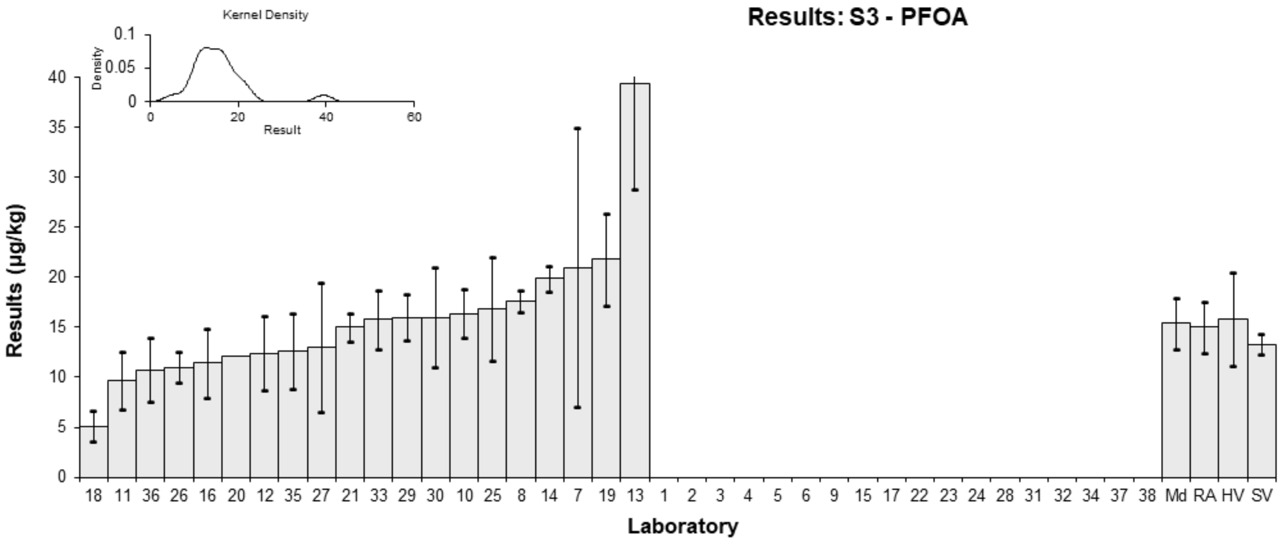
Sample No.	S3
Matrix	Biosolid
Analyte	PFOA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	21	14	105
8	17.6	1.1	154
9	NS	NS	NS
10	16.4	2.46	75.3
11	9.701	2.9103	113
12	12.4	3.7	77
13	39.4	10.6	55
14	19.9	1.3	76
15	NS	NS	NS
16	11.44	3.43	98
17	NS	NS	NS
18	5.1	1.53	97
19	21.8	4.6	110
20	12.14	NR	81
21	15	1.41	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	16.9	5.2	98
26	11	1.5	104
27	13	6.5	129
28	NS	NS	NS
29	16	2.3	114
30	16	5	103
31	NS	NS	NS
32	NS	NS	NS
33	15.8	2.92	87
34	NS	NS	NS
35	12.6	3.8	102
36	10.71	3.21	93
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	13.3	1.0
Homogeneity Value	15.8	4.7
Robust Average	15.0	2.6
Median	15.4	2.6
Mean	15.7	
N	20	
Max	39.4	
Min	5.1	
Robust SD	4.6	
Robust CV	31%	



Results: S3 - PFOA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 11 36 26 16 20 12 35 27 21 33 29 30 10 25 8 14 7 19 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 64

Table 69

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFNA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	9.4	6	100
8	7.46	1.5	54
9	NS	NS	NS
10	8.75	1.23	92.1
11	5.238	1.5713	115
12	6.3	1.9	81
13	22.8	5.9	69
14	<25	NR	NR
15	NS	NS	NS
16	6.75	2.02	88
17	NS	NS	NS
18	3.04	0.912	65
19	11.3	2.4	86
20	6.52	NR	84
21	7.5	0.32	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	9.37	2.72	96
26	6.6	2.3	102
27	7	3.5	155
28	NS	NS	NS
29	8.5	1.3	119
30	9.4	3	96
31	NS	NS	NS
32	NS	NS	NS
33	8.92	1.35	97
34	NS	NS	NS
35	5.79	1.65	92
36	5.2	1.56	85
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	7.97	0.60
Homogeneity Value	9.5	2.9
Robust Average	7.6	1.2
Median	7.5	1.2
Mean	8.2	
N	19	
Max	22.8	
Min	3.04	
Robust SD	2.1	
Robust CV	28%	

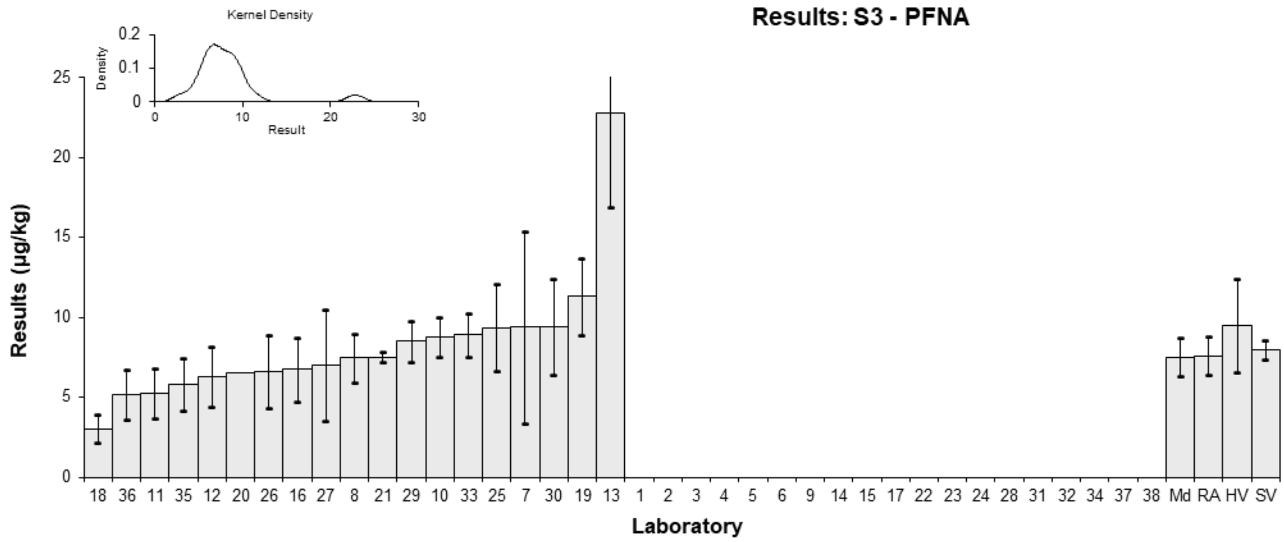

Kernel Density
Density
Result
Results: S3 - PFNA
Results (µg/kg)
Laboratory
18 36 11 35 12 20 26 16 27 8 21 29 10 33 25 7 30 19 13 1 2 3 4 5 6 9 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 65

Table 70

Sample Details

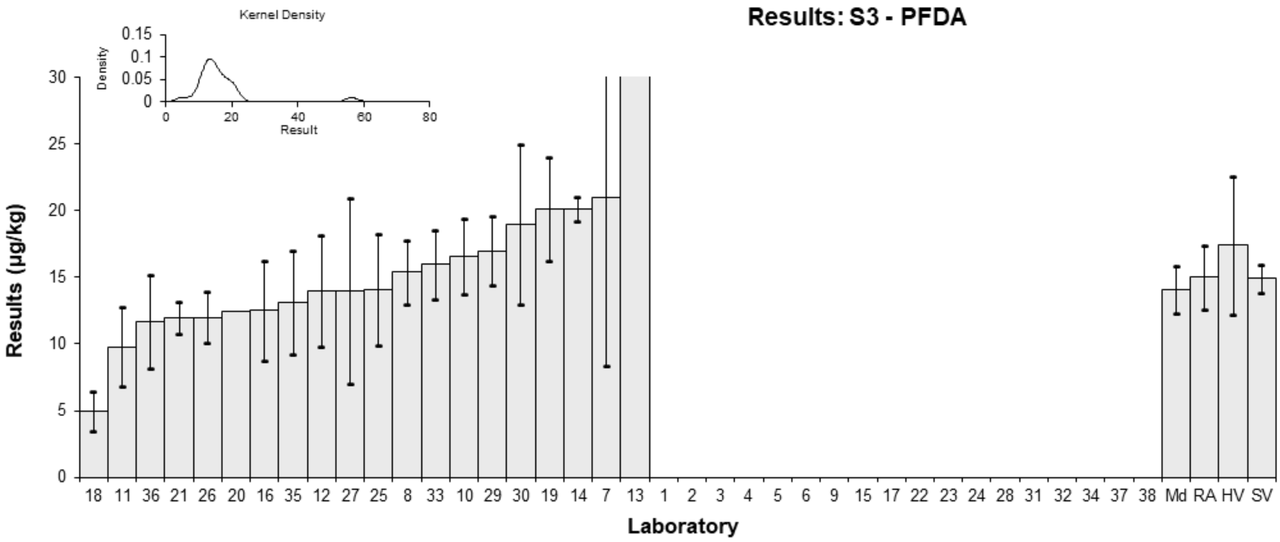
Sample No.	S3
Matrix	Biosolid
Analyte	PFDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	21	12.6	96
8	15.4	2.4	24
9	NS	NS	NS
10	16.6	2.83	77.5
11	9.805	2.9414	121
12	14	4.2	65
13	56.3	16.4	39
14	20.13	0.9	54
15	NS	NS	NS
16	12.53	3.76	55
17	NS	NS	NS
18	4.93	1.479	99
19	20.1	3.9	119
20	12.41	NR	71
21	12	1.20	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	14.1	4.2	86
26	12	1.9	94
27	14	7	135
28	NS	NS	NS
29	17	2.6	138
30	19	6	95
31	NS	NS	NS
32	NS	NS	NS
33	16.0	2.6	89
34	NS	NS	NS
35	13.1	3.9	128
36	11.71	3.51	93
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	14.9	1.1
Homogeneity Value	17.4	5.2
Robust Average	15.0	2.4
Median	14.1	1.8
Mean	16.6	
N	20	
Max	56.3	
Min	4.93	
Robust SD	4.3	
Robust CV	28%	



Results: S3 - PFDA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 11 36 21 26 20 16 35 12 27 25 8 33 10 29 30 19 14 7 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 66

Table 71

Sample Details

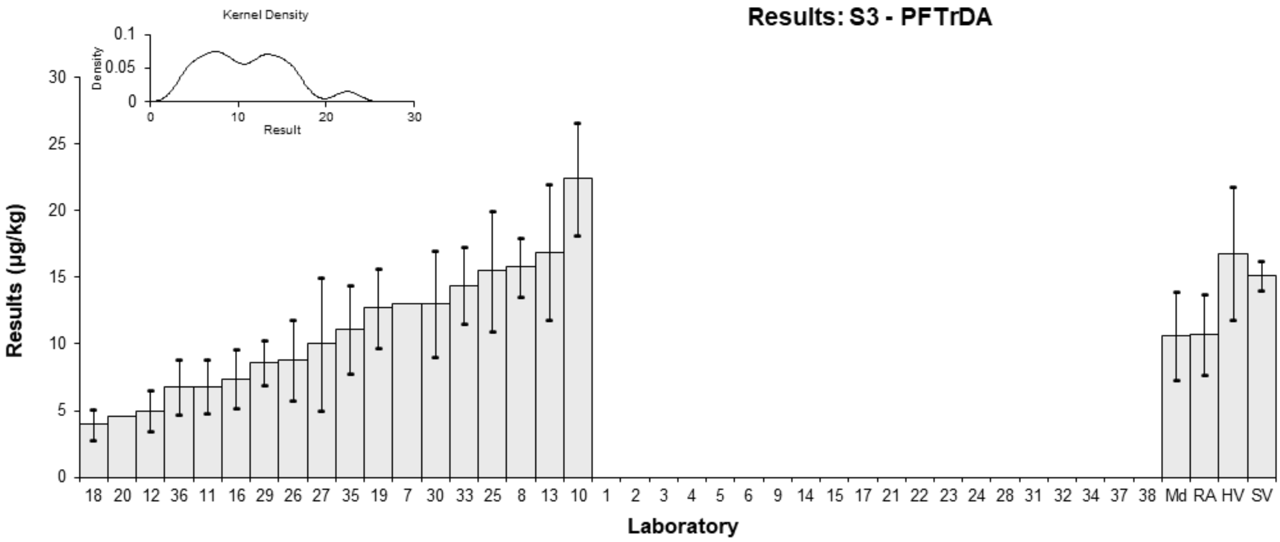
Sample No.	S3
Matrix	Biosolid
Analyte	PFTrDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	13	NR	NR
8	15.8	2.2	10
9	NS	NS	NS
10	22.4	4.25	17.3
11	6.823	2.0470	100
12	5	1.5	67
13	16.9	5.1	NR
14	<25	NR	NR
15	NS	NS	NS
16	7.36	2.21	NR
17	NS	NS	NS
18	3.95	1.185	93
19	12.7	3	95
20	4.57	NR	42
21	<1	0.20	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	15.5	4.5	NR
26	8.8	3.0	120
27	10	5	NR
28	NS	NS	NS
29	8.6	1.7	NR
30	13	4	64
31	NS	NS	NS
32	NS	NS	NS
33	14.4	2.89	NR
34	NS	NS	NS
35	11.1	3.3	136
36	6.78	2.04	81
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	15.1	1.1
Homogeneity Value	16.8	5.0
Robust Average	10.7	3.0
Median	10.6	3.3
Mean	10.9	
N	18	
Max	22.4	
Min	3.95	
Robust SD	5.1	
Robust CV	47%	



Results: S3 - PFTrDA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 20 12 36 11 16 29 26 27 35 19 7 30 33 25 8 13 10 1 2 3 4 5 6 9 14 15 17 21 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 67

Table 72

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFODA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	NT	NT	NT
9	NS	NS	NS
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	7.33	2.199	108
19	NT	NR	NT
20	7.32	NR	37
21	3.7	0.81	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	21.7	7.8	NR
26	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	17	2.6	NR
30	NT	NT	NT
31	NS	NS	NS
32	NS	NS	NS
33	18.8	7.73	NR
34	NS	NS	NS
35	NT	NT	NT
36	5.08	1.52	98
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	25.6	1.9
Robust Average	11.6	7.9
Median	7.3	5.1
Mean	11.6	
N	7	
Max	21.7	
Min	3.7	
Robust SD	8.3	
Robust CV	72%	

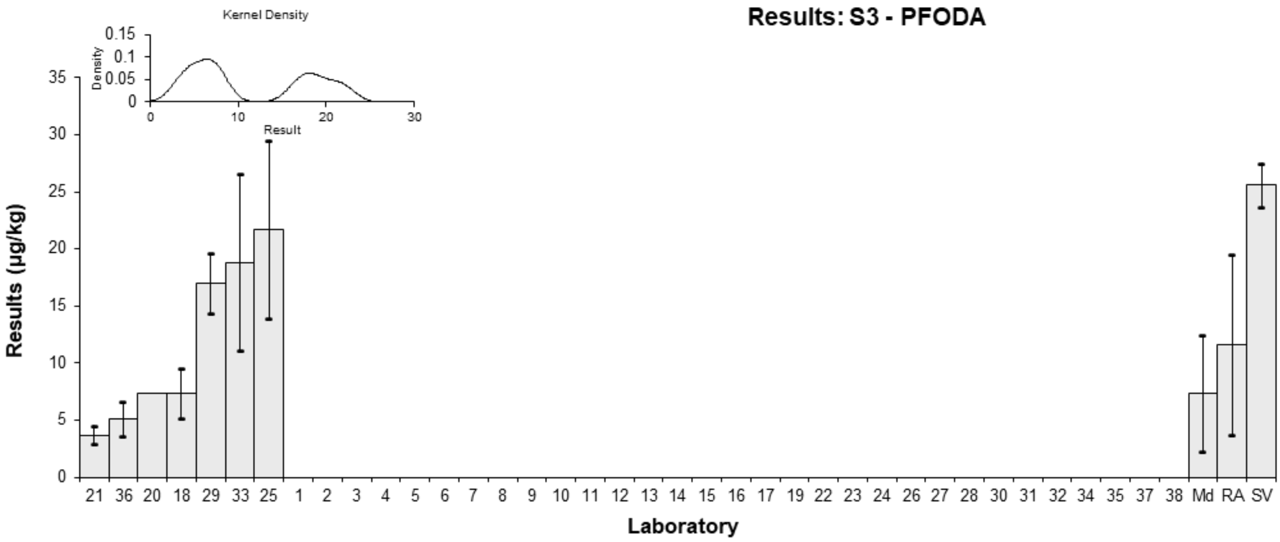

Results: S3 - PFODA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
21 36 20 18 29 33 25 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 19 22 23 24 26 27 28 30 31 32 34 35 37 38 Md RA SV

Figure 68

Table 73

Sample Details

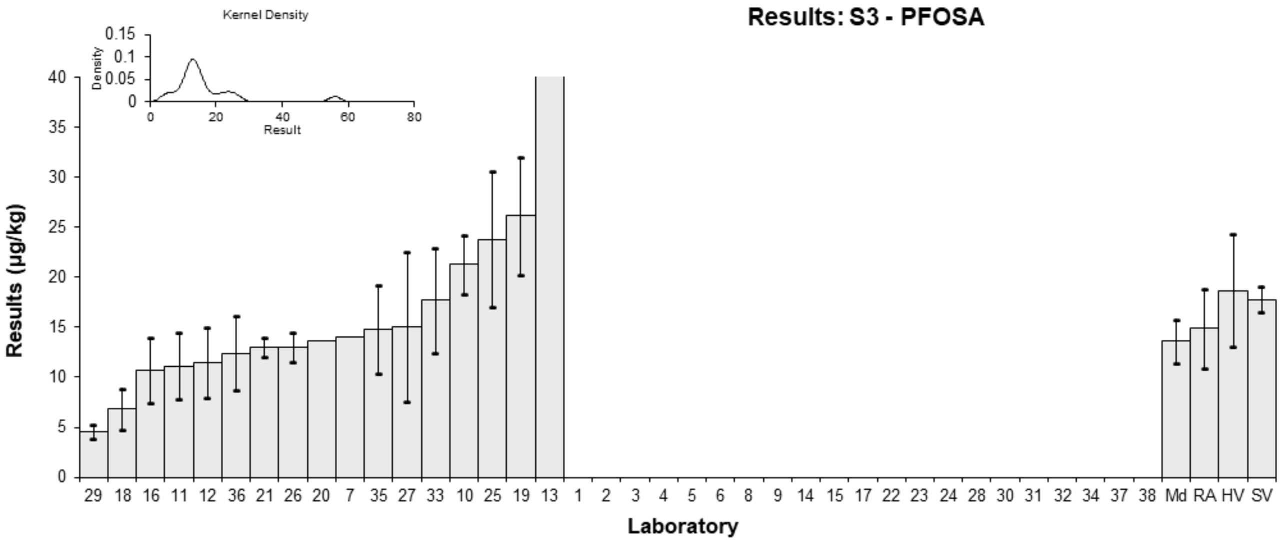
Sample No.	S3
Matrix	Biosolid
Analyte	PFOSA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	14	NR	58
8	NT	NT	NT
9	NS	NS	NS
10	21.3	2.98	111
11	11.141	3.3422	67
12	11.5	3.5	83
13	56	15.7	NR
14	<50	NR	NR
15	NS	NS	NS
16	10.70	3.21	66
17	NS	NS	NS
18	6.83	2.049	71
19	26.2	5.9	71
20	13.60	NR	56
21	13	1.00	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	23.8	6.8	69
26	13	1.5	105
27	15	7.5	25
28	NS	NS	NS
29	4.6	0.7	23
30	< 50	NR	55
31	NS	NS	NS
32	NS	NS	NS
33	17.7	5.23	87
34	NS	NS	NS
35	14.8	4.4	105
36	12.4	3.7	96
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	17.8	1.3
Homogeneity Value	18.7	5.6
Robust Average	14.9	4.0
Median	13.6	2.2
Mean	16.8	
N	17	
Max	56	
Min	4.6	
Robust SD	6.7	
Robust CV	45%	



Kernel Density
0.15
0.1
0.05
0
Density
0
20
40
60
80
Result
Results: S3 - PFOSA
Results (µg/kg)
40
35
30
25
20
15
10
5
0
29 18 16 11 12 36 21 26 20 7 35 27 33 10 25 19 13 1 2 3 4 5 6 8 9 14 15 17 22 23 24 28 30 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 69

Table 74

Sample Details

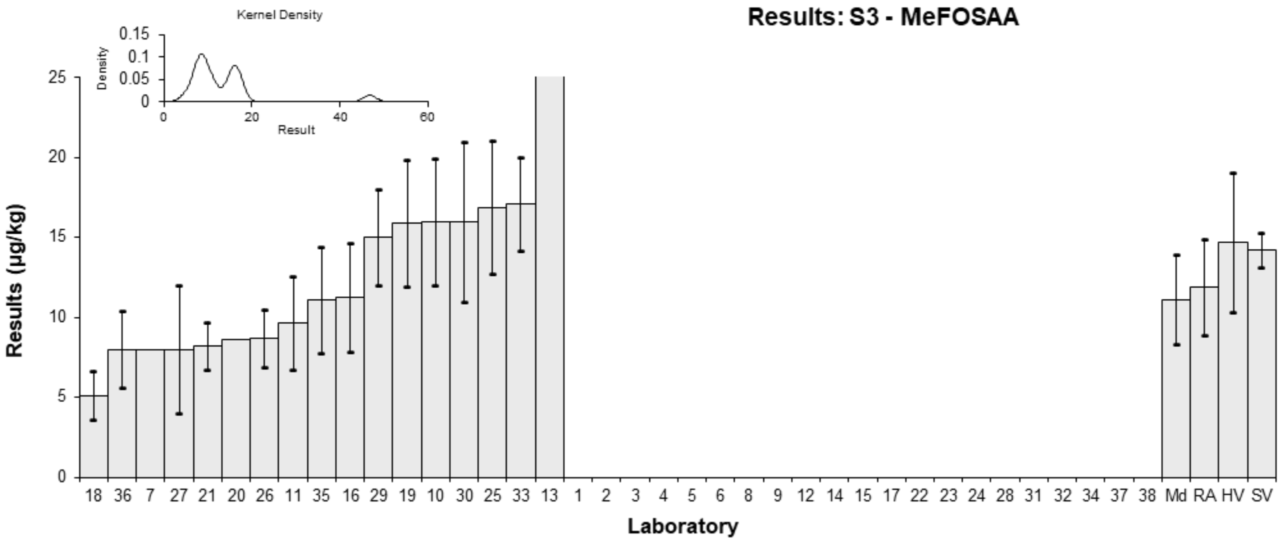
Sample No.	S3
Matrix	Biosolid
Analyte	MeFOSAA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	8	NR	58
8	NT	NT	NT
9	NS	NS	NS
10	15.98	4	23.6
11	9.650	2.8951	70
12	<0.5	NR	22
13	46.8	13.1	14
14	<50	NR	NR
15	NS	NS	NS
16	11.26	3.38	51
17	NS	NS	NS
18	5.12	1.536	76
19	15.9	4	112
20	8.65	NR	38
21	8.2	1.50	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	16.9	4.2	70
26	8.7	1.8	154
27	8	4	NR
28	NS	NS	NS
29	15	3.0	86
30	16	5	93
31	NS	NS	NS
32	NS	NS	NS
33	17.1	2.95	88
34	NS	NS	NS
35	11.1	3.3	100
36	7.99	2.4	95
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	14.2	1.1
Homogeneity Value	14.7	4.4
Robust Average	11.9	3.0
Median	11.1	2.8
Mean	13.6	
N	17	
Max	46.8	
Min	5.12	
Robust SD	4.9	
Robust CV	41%	



Results: S3 - MeFOSAA
Kernel Density
Density
0.15
0.1
0.05
0
0
20
40
60
Result
Results (µg/kg)
25
20
15
10
5
0
18 36 7 27 21 20 26 11 35 16 29 19 10 30 25 33 13 1 2 3 4 5 6 8 9 12 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 70

Table 75

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	EtFOSAA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	9	NR	62
8	NT	NT	NT
9	NS	NS	NS
10	14.25	3.56	9.73
11	9.951	2.9852	65
12	<0.5	NR	74
13	37.8	10.6	7
14	<50	NR	NR
15	NS	NS	NS
16	9.36	2.81	131
17	NS	NS	NS
18	4.23	1.269	89
19	15.6	3.4	90
20	7.99	NR	10
21	3.9	0.80	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	14.4	4.2	36
26	7.8	1.8	158
27	9	4.5	102
28	NS	NS	NS
29	14	2.0	24
30	16	5	66
31	NS	NS	NS
32	NS	NS	NS
33	14.4	3.41	54
34	NS	NS	NS
35	10.3	3.1	121
36	5.68	1.7	92
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	13.4	1.0
Homogeneity Value	14.0	4.2
Robust Average	10.8	3.0
Median	10.0	3.8
Mean	12.0	
N	17	
Max	37.8	
Min	3.9	
Robust SD	4.9	
Robust CV	45%	

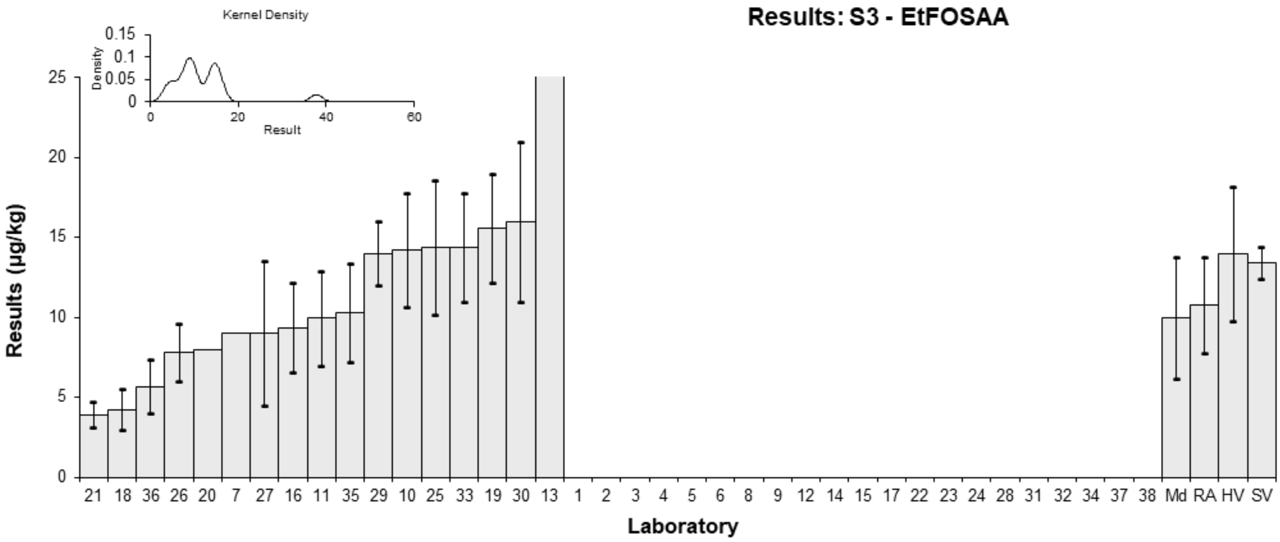

Kernel Density
Results: S3 - EtFOSAA
Density
Result
Results (µg/kg)
Laboratory
21 18 36 26 20 7 27 16 11 35 29 10 25 33 19 30 13 1 2 3 4 5 6 8 9 12 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

Figure 71

Table 76

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	8:2FTS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	12	NR	97
8	8.9	0.31	48
9	NS	NS	NS
10	9.17	1.83	46.5
11	5.895	1.7684	189
12	5.4	1.6	164
13	29.3	8.2	60
14	11.62	2.6	220
15	NS	NS	NS
16	6.74	2.02	100
17	NS	NS	NS
18	2.88	0.864	141
19	10.4	2.6	102
20	6.27	NR	161
21	7.7	0.90	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	10.6	3.2	84
26	8.1	1.5	121
27	7	3.5	160
28	NS	NS	NS
29	8.2	1.2	211
30	9.8	3	84
31	NS	NS	NS
32	NS	NS	NS
33	8.41	1.18	176
34	NS	NS	NS
35	7.41	2.22	128
36	6.33	1.9	90
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	8.93	0.67
Homogeneity Value	10.5	3.2
Robust Average	8.3	1.4
Median	8.2	1.4
Mean	9.1	
N	20	
Max	29.3	
Min	2.88	
Robust SD	2.5	
Robust CV	30%	

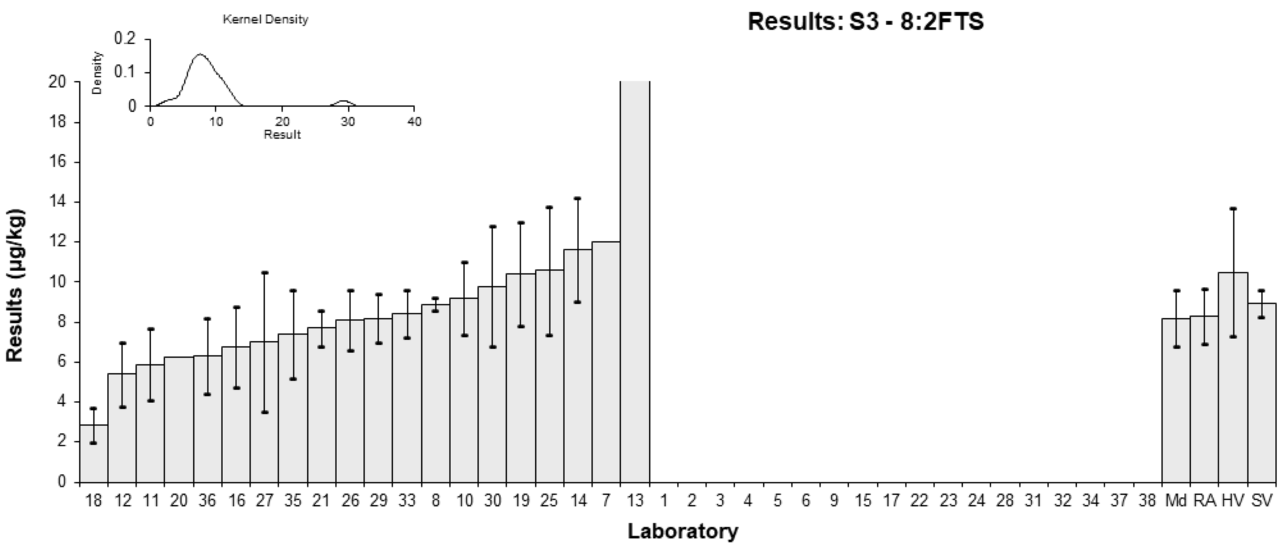

Kernel Density
Density
0.2
0.1
0
0
10
20
30
40
Result
Results: S3 - 8:2FTS
Results (µg/kg)
20
18
16
14
12
10
8
6
4
2
0
18 12 11 20 36 16 27 35 21 26 29 33 8 10 30 19 25 14 7 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 72

Table 77

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	10:2FTS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	NT	NT	NT
9	NS	NS	NS
10	NT	NT	NT
11	60.765	18.2294	140
12	35.9	10.8	67
13	107	28.9	NR
14	34.77	13.8	220
15	NS	NS	NS
16	45.44	13.63	58
17	NS	NS	NS
18	18.9	5.67	141
19	35.3	8.2	102
20	40.92	NR	47
21	8.0	1.23	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	68.8	19.9	41
26	50	7.0	120
27	14	7	NR
28	NS	NS	NS
29	310	93	NR
30	150	50	84
31	NS	NS	NS
32	NS	NS	NS
33	47.8	NR	83
34	NS	NS	NS
35	52.3	15.7	141
36	25.4	7.6	95
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	64.2	4.8
Homogeneity Value	58	23
Robust Average	48	19
Median	45	14
Mean	65	
N	17	
Max	310	
Min	8	
Robust SD	31	
Robust CV	63%	

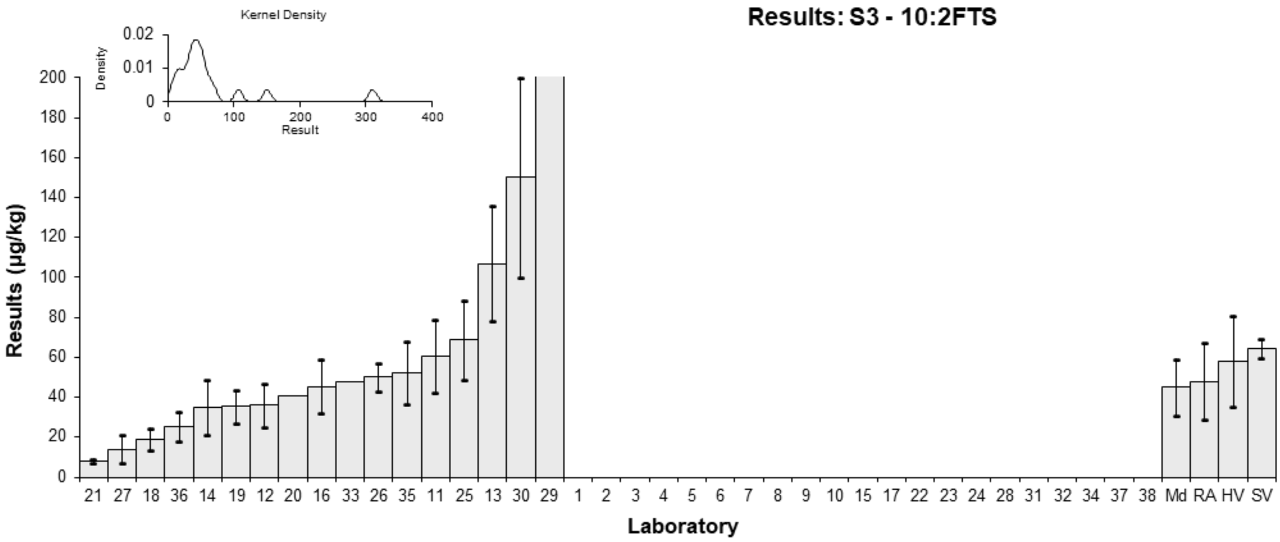

Results: S3 - 10:2FTS
Kernel Density
Density
0.02
0.01
0
0
100
200
300
400
Result
Results (µg/kg)
200
180
160
140
120
100
80
60
40
20
0
21 27 18 36 14 19 12 20 16 33 26 35 11 25 13 30 29 1 2 3 4 5 6 7 8 9 10 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

Figure 73

Table 78

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	8:2diPAP
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	NT	NT	NT
9	NS	NS	NS
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	NT	NT	NT
19	NT	NR	NT
20	37.69	NR	80
21	NT	NT	NT
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	62.2	14.5	34
26	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	70	11	63
30	NT	NT	NT
31	NS	NS	NS
32	NS	NS	NS
33	70.0	0.162	62
34	NS	NS	NS
35	NT	NT	NT
36	NT	NT	NT
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	66.6	5.0
Median	66.1	7.2
Mean	60	
N	4	
Max	70	
Min	37.69	

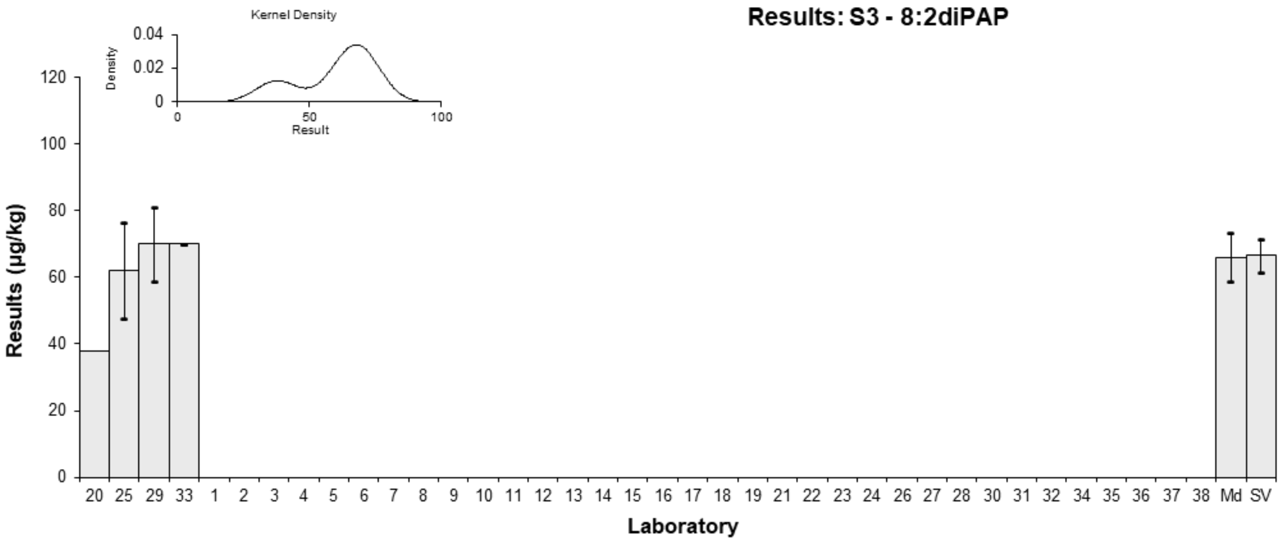

Results: S3 - 8:2diPAP
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
20 25 29 33 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 26 27 28 30 31 32 34 35 36 37 38 Md SV

Figure 74

Table 79

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	GenX
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	< 0.5	NR	69
9	NS	NS	NS
10	23.9	5.03	57.3
11	NT	NT	NT
12	14.2	4.3	48
13	49.8	15.9	49
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	10.4	3.12	69
19	NT	NR	NT
20	18.01	NR	38
21	15	3.00	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	25.3	6.8	94
26	19	1.9	82
27	NT	NT	NT
28	NS	NS	NS
29	22	3.2	63
30	27	9	82
31	NS	NS	NS
32	NS	NS	NS
33	21.0	5.6	64
34	NS	NS	NS
35	NT	NT	NT
36	6.4	1.9	63
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	19.9	1.5
Homogeneity Value	22.5	6.8
Robust Average	19.6	5.7
Median	20.0	5.5
Mean	21.0	
N	12	
Max	49.8	
Min	6.4	
Robust SD	7.9	
Robust CV	40%	

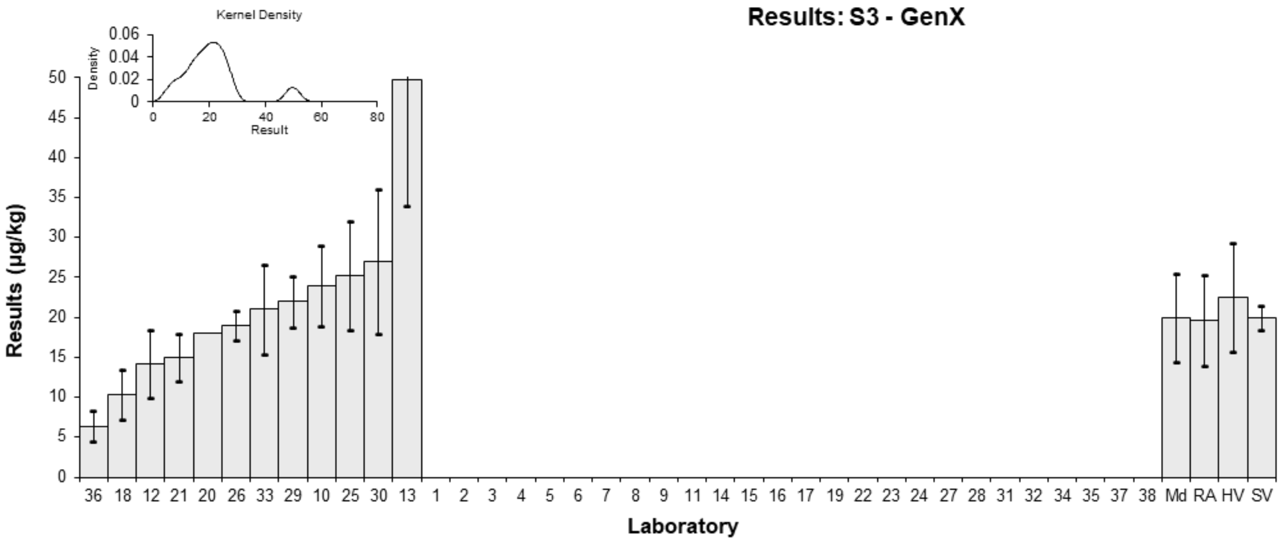

Results: S3 - GenX
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
36 18 12 21 20 26 33 29 10 25 30 13 1 2 3 4 5 6 7 8 9 11 14 15 16 17 19 22 23 24 27 28 31 32 34 35 37 38 Md RA HV SV

Figure 75

Table 80

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	ADONA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	28.9	8.5	42
9	NS	NS	NS
10	52.9	13.8	57.3
11	NT	NT	NT
12	29.7	8.9	130
13	112	28	NR
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	9.99	2.997	88
19	NT	NR	NT
20	23.17	NR	81
21	32	10.00	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	36.3	7.3	NR
26	23	2.6	93
27	NT	NT	NT
28	NS	NS	NS
29	36	5.3	NR
30	31	10	101
31	NS	NS	NS
32	NS	NS	NS
33	26.9	7.69	NR
34	NS	NS	NS
35	NT	NT	NT
36	19.5	5.9	80
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	31.4	2.4
Homogeneity Value	25.4	7.6
Robust Average	30.3	7.5
Median	29.7	6.7
Mean	35	
N	13	
Max	112	
Min	9.99	
Robust SD	11	
Robust CV	36%	

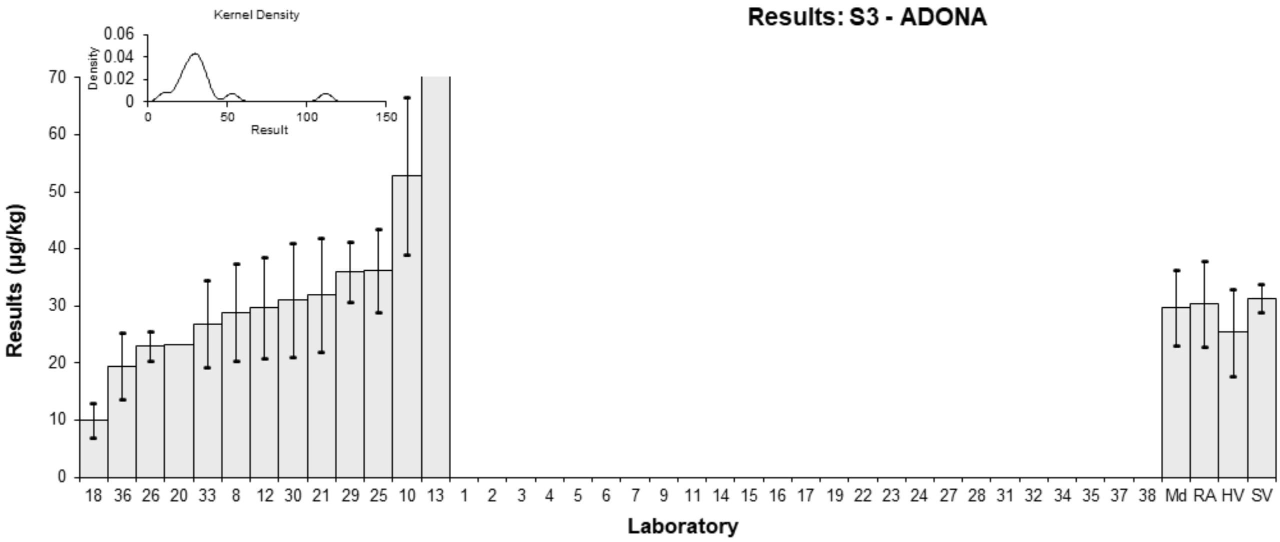

Kernel Density
0.06
0.04
0.02
0
Density
0
50
100
150
Result
Results: S3 - ADONA
Results (µg/kg)
70
60
50
40
30
20
10
0
18 36 26 20 33 8 12 30 21 29 25 10 13 1 2 3 4 5 6 7 9 11 14 15 16 17 19 22 23 24 27 28 31 32 34 35 37 38 Md RA HV SV
Laboratory

Figure 76

Table 81

Sample Details

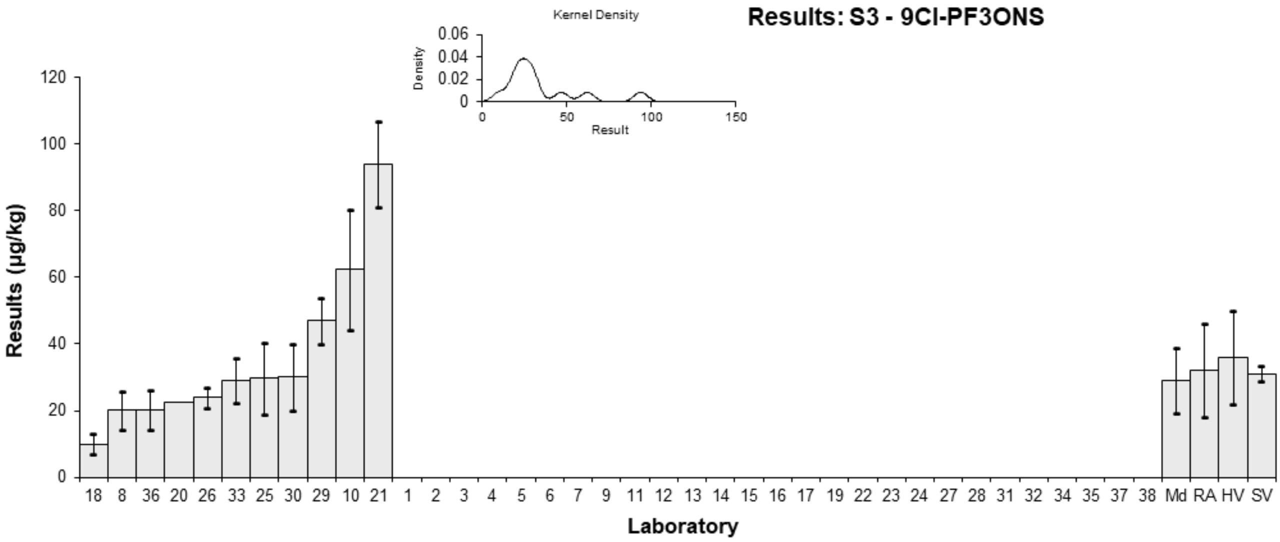
Sample No.	S3
Matrix	Biosolid
Analyte	9Cl-PF3ONS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	20.1	5.7	71
9	NS	NS	NS
10	62.4	18.1	57.3
11	NT	NT	NT
12	<0.5	NR	130
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	10	3	92
19	NT	NR	NT
20	22.54	NR	86
21	94	13.00	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	29.7	10.7	NR
26	24	3.1	105
27	NT	NT	NT
28	NS	NS	NS
29	47	7.0	NR
30	30	10	93
31	NS	NS	NS
32	NS	NS	NS
33	29.0	6.74	NR
34	NS	NS	NS
35	NT	NT	NT
36	20.1	6	87
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	31.0	2.3
Homogeneity Value	36	14
Robust Average	32	14
Median	29.0	9.9
Mean	35	
N	11	
Max	94	
Min	10	
Robust SD	19	
Robust CV	59%	



Results: S3 - 9Cl-PF3ONS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 8 36 20 26 33 25 30 29 10 21 1 2 3 4 5 6 7 9 11 12 13 14 15 16 17 19 22 23 24 27 28 31 32 34 35 37 38 Md RA HV SV

Figure 77

Table 82

Sample Details

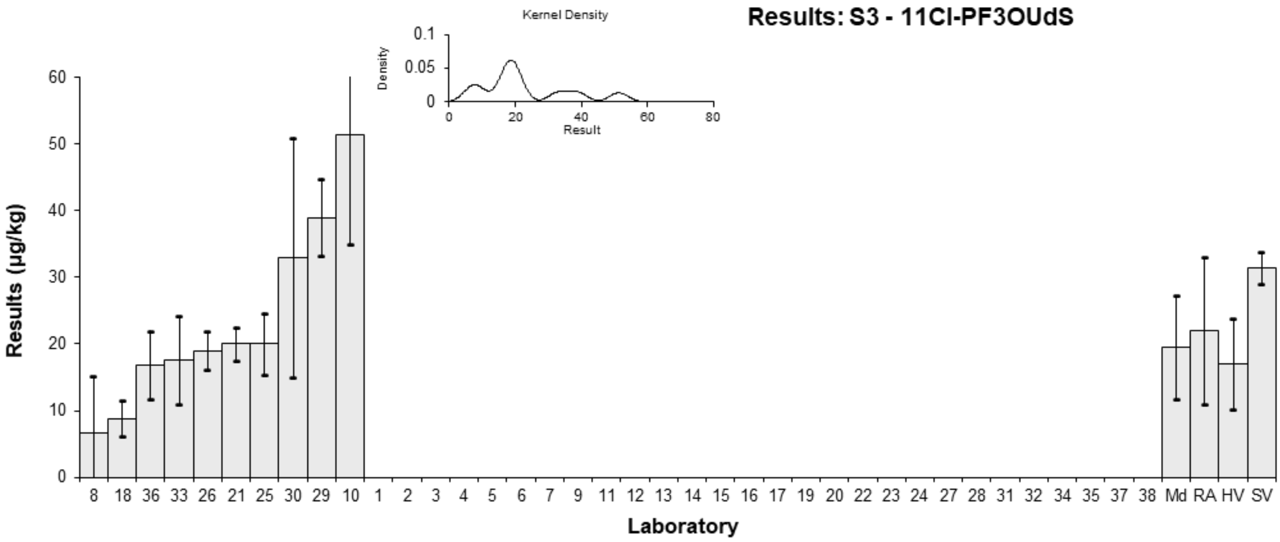
Sample No.	S3
Matrix	Biosolid
Analyte	11Cl-PF3OUdS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	6.57	8.6	71
9	NS	NS	NS
10	51.4	16.5	57.3
11	NT	NT	NT
12	<0.5	NR	130
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	8.81	2.643	93
19	NT	NR	NT
20	<0.1	NR	86
21	20	2.50	NR
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	20	4.7	NR
26	19	2.9	120
27	NT	NT	NT
28	NS	NS	NS
29	39	5.8	NR
30	33	18	93
31	NS	NS	NS
32	NS	NS	NS
33	17.5	6.63	NR
34	NS	NS	NS
35	NT	NT	NT
36	16.9	5.1	89
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	31.4	2.4
Homogeneity Value	17.0	6.8
Robust Average	22	11
Median	19.5	7.8
Mean	23.2	
N	10	
Max	51.4	
Min	6.57	
Robust SD	14	
Robust CV	61%	



Results: S3 - 11Cl-PF3OUdS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
8 18 36 33 26 21 25 30 29 10 1 2 3 4 5 6 7 9 11 12 13 14 15 16 17 19 20 22 23 24 27 28 31 32 34 35 37 38 Md RA HV SV

Figure 78

Table 83

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	5:3FTCA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NS	NS	NS
2	NS	NS	NS
3	NT	NT	NT
4	NS	NS	NS
5	NS	NS	NS
6	NS	NS	NS
7	NT	NT	NT
8	15.1	13.7	35
9	NS	NS	NS
10	92.03	30.37	54.6
11	NT	NT	NT
12	2.5	0.8	53
13	NT	NT	NT
14	NT	NT	NT
15	NS	NS	NS
16	NT	NT	NT
17	NS	NS	NS
18	NT	NT	NT
19	NT	NR	NT
20	NT	NT	NT
21	NT	NT	NT
22	NS	NS	NS
23	NS	NS	NS
24	NS	NS	NS
25	39.9	10.1	NR
26	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	30	4.4	NR
30	NT	NT	NT
31	NS	NS	NS
32	NS	NS	NS
33	29.9	0.112	NR
34	NS	NS	NS
35	NT	NT	NT
36	NT	NT	NT
37	NS	NS	NS
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	29.2	2.2
Robust Average	32	27
Median	30	19
Mean	35	
N	6	
Max	92.03	
Min	2.5	
Robust SD	27	
Robust CV	85%	

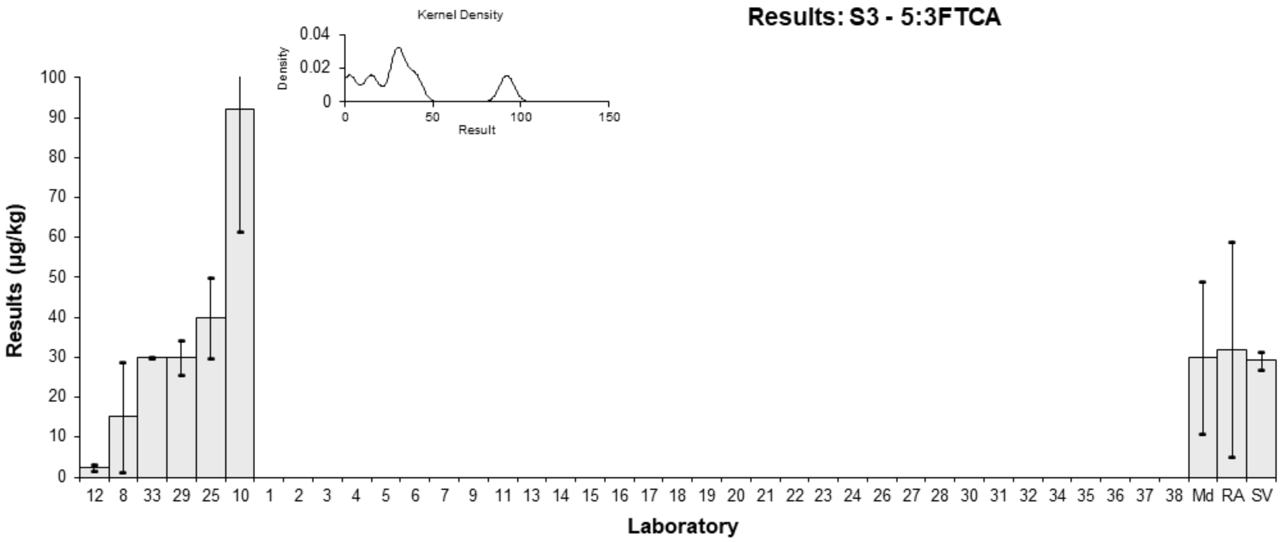

Results: S3 - 5:3FTCA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
12 8 33 29 25 10 1 2 3 4 5 6 7 9 11 13 14 15 16 17 18 19 20 21 22 23 24 26 27 28 30 31 32 34 35 36 37 38 Md RA SV

Figure 79

Table 84

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.02	0.02	83	-0.31	-0.06
4	0.021	0.005	106.6	-0.07	-0.06
5	0.027	0.009	NR	1.34	0.63
6	0.021	0.00063	116	-0.07	-0.32
7	0.02	NR	107	-0.31	-1.86
8	0.022	0.002	81	0.16	0.33
9	0.021	0.00735	96	-0.07	-0.04
10	0.0193	0.0027	92.9	-0.47	-0.72
11	0.026	0.0077	123	1.10	0.61
12	0.023	0.007	72	0.40	0.24
13	0.02	0.005	70	-0.31	-0.26
14	0.023	0.005	86	0.40	0.34
15**	24.3156	NR	82	5,702.89	34,706.14
16	0.019	0.006	89	-0.54	-0.38
17	0.01666	NR	NR	-1.09	-6.63
18	< 0.025	NR	86		
19	0.022	0.007	105	0.16	0.10
20	0.021	0.0050	77	-0.07	-0.06
21	0.019	0.0043	NR	-0.54	-0.53
22	0.0205	0.0059	89	-0.19	-0.13
23	NS	NS	NS		
24	0.0208	NR	NR	-0.12	-0.71
25	0.023	0.004	101	0.40	0.42
26	0.021	0.0023	100	-0.07	-0.12
27	< 0.02	0.01	113		
28	0.022	0.004	79	0.16	0.17
29	0.024	0.0035	101	0.63	0.76
30	0.022	0.01	85	0.16	0.07
31	0.0216	0.0045	72.29	0.07	0.07
32	0.0205	0.00477	81.82	-0.19	-0.17
33	0.0215	0.00441	102	0.05	0.04
34	0.021	0.0036	65.05	-0.07	-0.08
35	0.0230	0.0069	52	0.40	0.25
36	0.018	0.005	98	-0.77	-0.65
37	0.022	0.0044	NR	0.16	0.16
38	0.022	0.0022	134	0.16	0.30

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0213	0.0007
Spike Value	Not Spiked	
Robust Average	0.0213	0.0007
Median	0.0210	0.0007
Mean	0.0214	
N	32	
Max	0.027	
Min	0.01666	
Robust SD	0.0017	
Robust CV	7.9%	

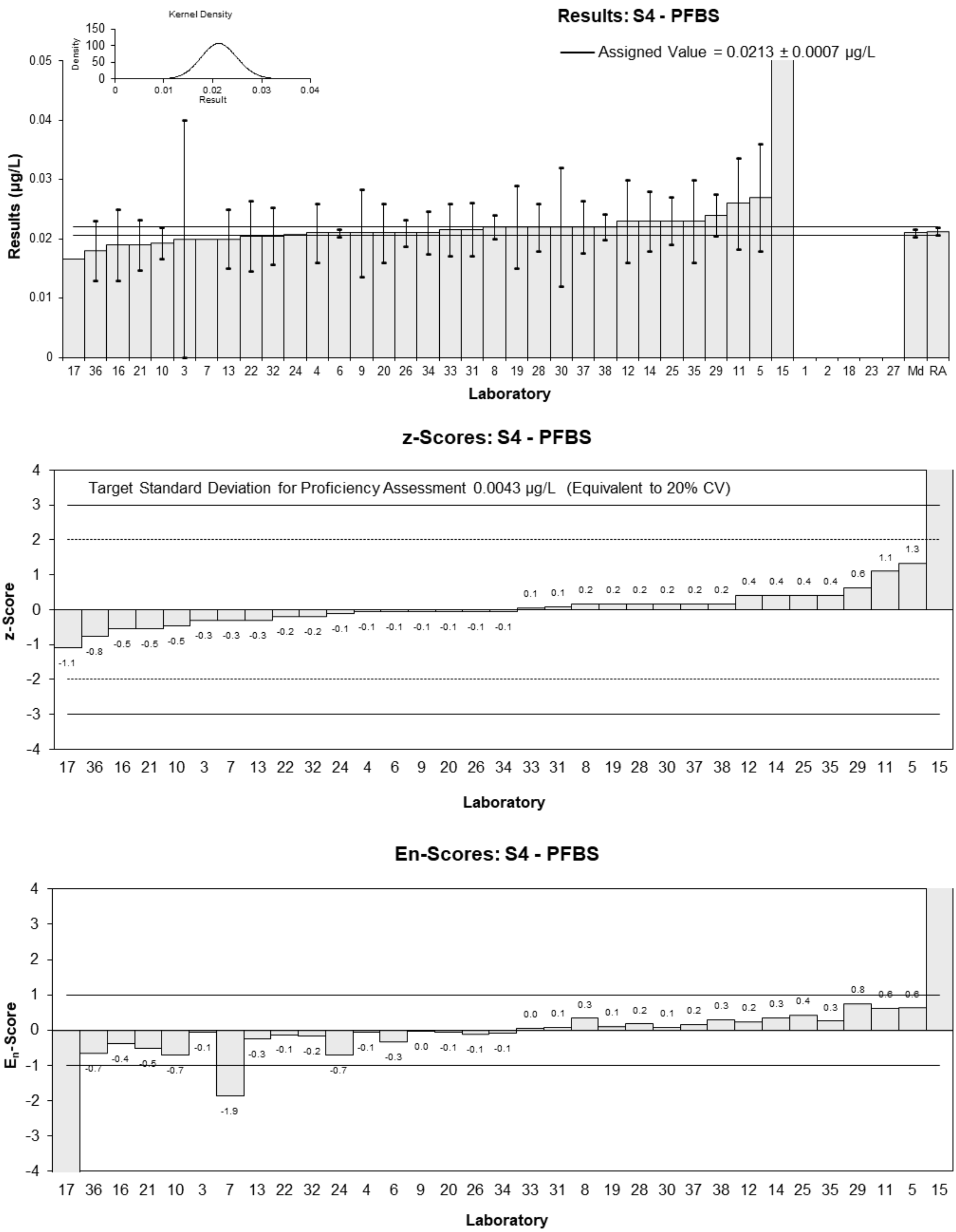

Results: S4 - PFBS
Assigned Value = 0.0213 ± 0.0007 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S4 - PFBS
Target Standard Deviation for Proficiency Assessment 0.0043 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFBS
En-Score
Laboratory

Figure 80

Table 85

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.02	0.02	87	-0.61	-0.14
4	0.019	0.008	NR	-0.83	-0.47
5	0.033	0.012	NR	2.24	0.85
6	0.024	0.00072	116	0.26	0.81
7	0.024	NR	NR	0.26	0.92
8	0.022	0.006	77	-0.18	-0.13
9	0.024	0.0084	96	0.26	0.14
10	0.0223	0.0031	98.5	-0.11	-0.15
11	0.025	0.0075	123	0.48	0.29
12	0.024	0.0077	90	0.26	0.15
13	0.029	0.007	NR	1.36	0.87
14	0.022	0.003	93	-0.18	-0.24
15**	25.2526	NR	81	5,532.85	19,407.54
16	0.021	0.006	NR	-0.39	-0.29
17	0.01752	NR	NR	-1.16	-4.06
18	0.025	0.0075	86	0.48	0.29
19	0.022	0.008	118	-0.18	-0.10
20	0.021	0.0059	78	-0.39	-0.30
21	0.017	0.0032	NR	-1.27	-1.68
22	0.0215	0.0062	89	-0.29	-0.21
23	NS	NS	NS		
24	0.0246	NR	NR	0.39	1.38
25	0.029	0.005	NR	1.36	1.20
26	0.022	0.0059	91	-0.18	-0.13
27	< 0.02	0.01	NR		
28	NT	NT	NT		
29	0.023	0.0034	NR	0.04	0.05
30	0.029	0.01	85	1.36	0.61
31	0.0196	0.0050	107.9	-0.70	-0.62
32	0.0212	0.00533	93.66	-0.35	-0.29
33	0.0227	0.00494	102	-0.02	-0.02
34	0.021	0.0048	98.62	-0.39	-0.36
35	0.0258	0.0077	52	0.66	0.38
36	0.021	0.006	100	-0.39	-0.29
37	NT	NT	NT		
38	0.023	0.0035	134	0.04	0.05

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0228	0.0013
Spike Value	Not Spiked	
Robust Average	0.0228	0.0013
Median	0.0223	0.0011
Mean	0.0231	
N	31	
Max	0.033	
Min	0.017	
Robust SD	0.0028	
Robust CV	12%	

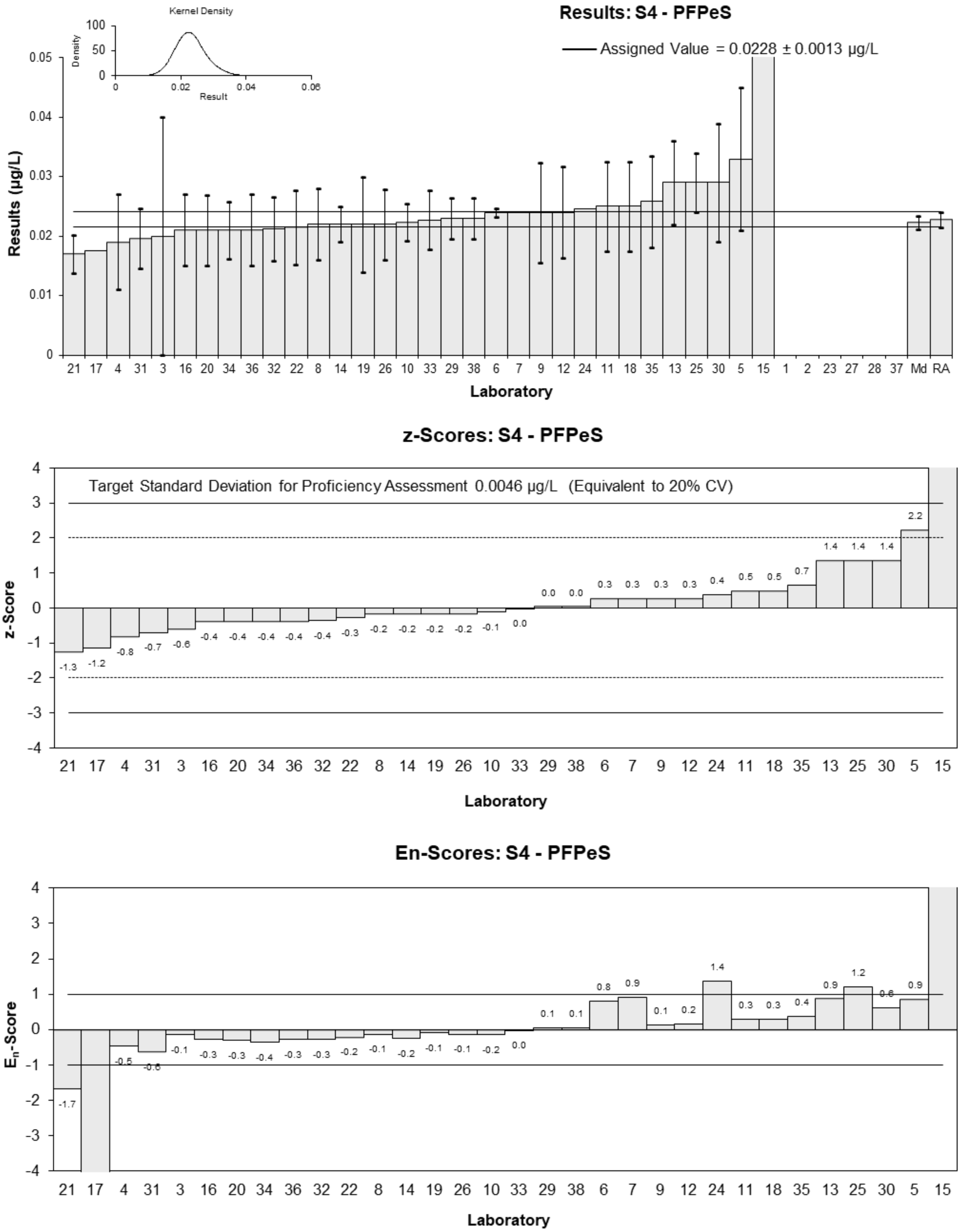

Results: S4 - PFPeS
Assigned Value = 0.0228 ± 0.0013 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S4 - PFPeS
Target Standard Deviation for Proficiency Assessment 0.0046 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFPeS
En-Score
Laboratory

Figure 81

Table 86

Sample Details

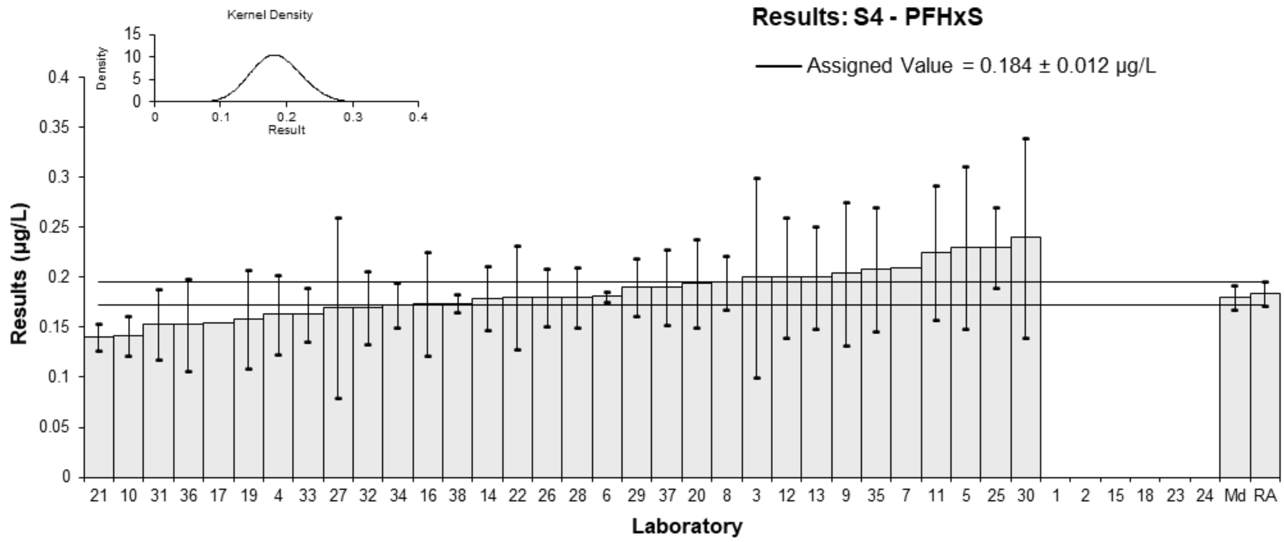
Sample No.	S4
Matrix	Water
Analyte	PFHxS
Unit	µg/L

Participant Results

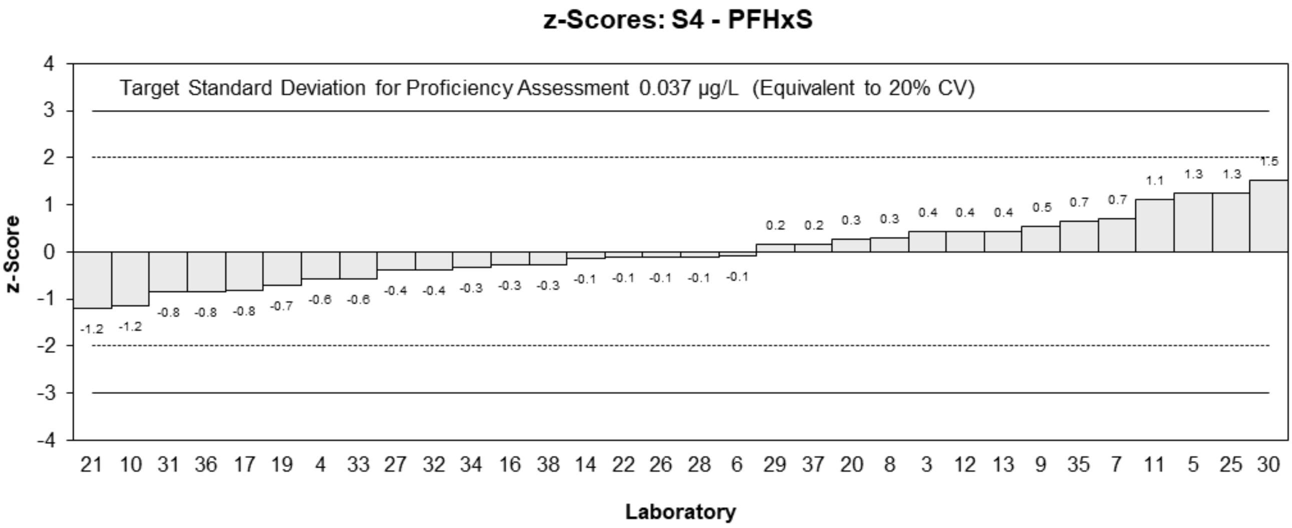
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.20	0.1	82	0.43	0.16
4	0.163	0.04	97.6	-0.57	-0.50
5	0.23	0.081	NR	1.25	0.56
6	0.181	0.00543	124	-0.08	-0.23
7	0.21	NR	92	0.71	2.17
8	0.195	0.027	77	0.30	0.37
9	0.204	0.0714	96	0.54	0.28
10	0.1415	0.0198	98.5	-1.15	-1.84
11	0.225	0.0676	106	1.11	0.60
12	0.2	0.06	87	0.43	0.26
13	0.2	0.051	81	0.43	0.31
14	0.179	0.032	93	-0.14	-0.15
15	NT	NT	NT		
16	0.174	0.052	97	-0.27	-0.19
17	0.1539	NR	NR	-0.82	-2.51
18	NR	NR	96		
19	0.158	0.049	118	-0.71	-0.52
20	0.194	0.0446	78	0.27	0.22
21	0.14	0.0137	NR	-1.20	-2.42
22	0.18	0.052	89	-0.11	-0.07
23	NS	NS	NS		
24	NT	NT	NT		
25	0.23	0.04	105	1.25	1.10
26	0.18	0.029	107	-0.11	-0.13
27	0.17	0.09	120	-0.38	-0.15
28	0.18	0.03	88	-0.11	-0.12
29	0.19	0.029	92	0.16	0.19
30	0.24	0.1	85	1.52	0.56
31	0.153	0.035	107.9	-0.84	-0.84
32	0.17	0.03693	93.66	-0.38	-0.36
33	0.163	0.0273	96	-0.57	-0.70
34	0.172	0.0224	98.62	-0.33	-0.47
35	0.208	0.062	52	0.65	0.38
36	0.153	0.046	95	-0.84	-0.65
37	0.19	0.038	NR	0.16	0.15
38	0.174	0.0087	96	-0.27	-0.67

Statistics

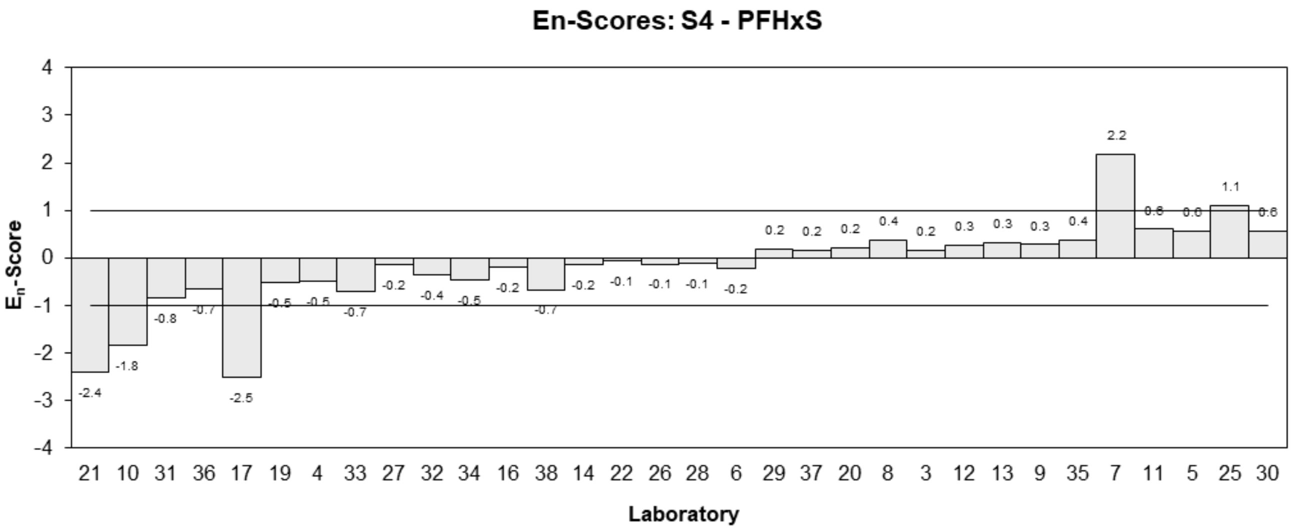
Assigned Value	0.184	0.012
Spike Value	Not Spiked	
Robust Average	0.184	0.012
Median	0.180	0.012
Mean	0.184	
N	32	
Max	0.24	
Min	0.14	
Robust SD	0.027	
Robust CV	15%	



Kernel Density
Density
Result
Results: S4 - PFHxS
Assigned Value = 0.184 ± 0.012 µg/L
Results (µg/L)
Laboratory



z-Scores: S4 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.037 µg/L (Equivalent to 20% CV)
z-Score
Laboratory



En-Scores: S4 - PFHxS
En-Score
Laboratory

Figure 82

Table 87

Sample Details

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

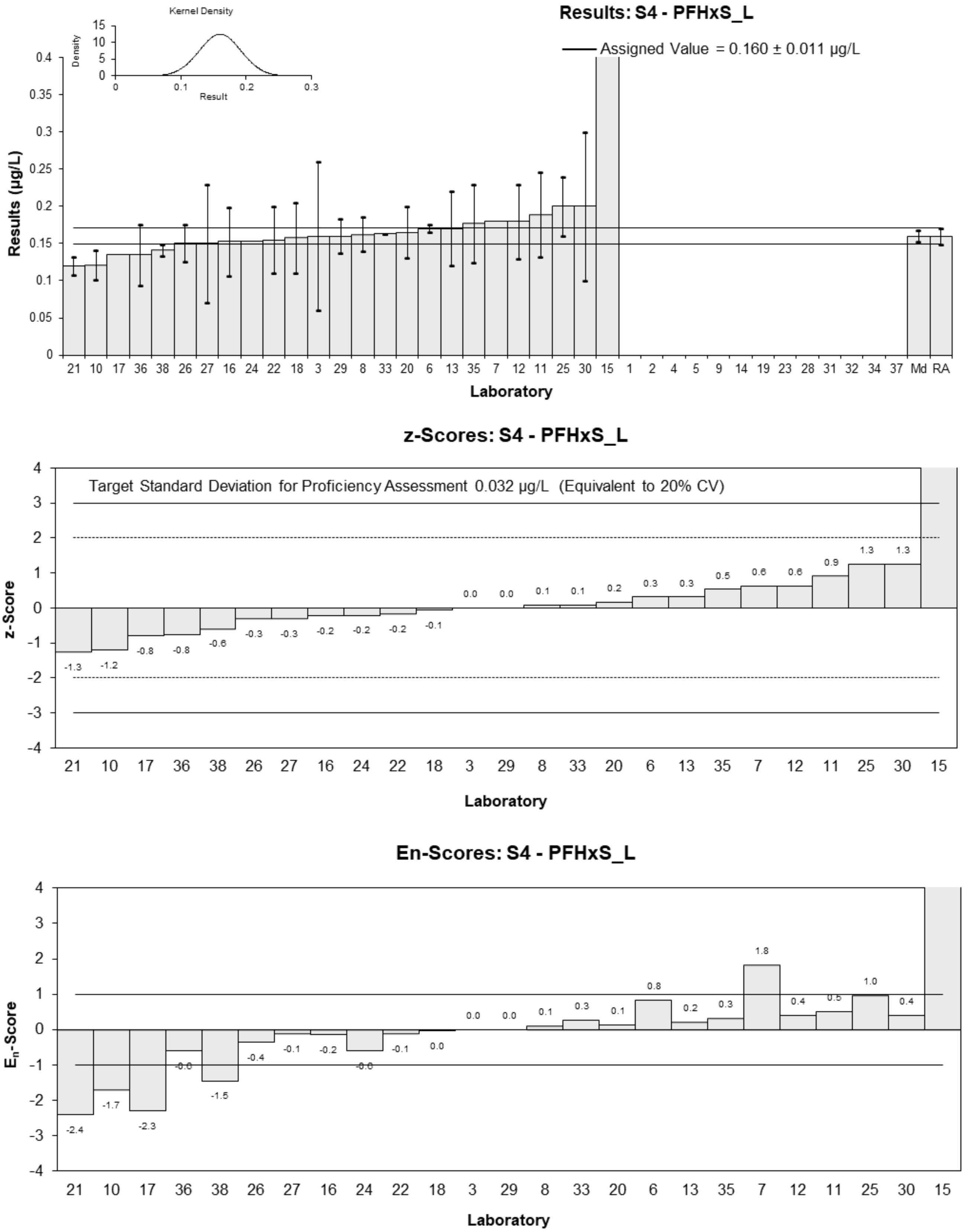
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.16	0.1	82	0.00	0.00
4	NR	NR	NR		
5	NT	NT	NT		
6	0.17	0.0051	124	0.31	0.82
7	0.18	NR	NR	0.62	1.82
8	0.1627	0.023	77	0.08	0.11
9	NR	NR	NR		
10	0.1213	0.0198	98.5	-1.21	-1.71
11	0.189	0.0568	96	0.91	0.50
12	0.18	0.05	87	0.62	0.39
13	0.17	0.05	NR	0.31	0.20
14	NT	NT	NT		
15**	189.1754	NR	81	5,906.73	17,183.22
16	0.153	0.046	97	-0.22	-0.15
17	0.1346	NR	NR	-0.79	-2.31
18	0.158	0.0474	96	-0.06	-0.04
19	NT	NR	NT		
20	0.165	0.0347	78	0.16	0.14
21	0.12	0.0123	NR	-1.25	-2.42
22	0.155	0.045	89	-0.16	-0.11
23	NS	NS	NS		
24	0.1533	NR	NR	-0.21	-0.61
25	0.2	0.04	NR	1.25	0.96
26	0.15	0.025	107	-0.31	-0.37
27	0.15	0.08	NR	-0.31	-0.12
28	NT	NT	NT		
29	0.16	0.023	NR	0.00	0.00
30	0.20	0.1	85	1.25	0.40
31	NT	NT	NT		
32	NT	NT	NT		
33	0.163	0.00001	96	0.09	0.27
34	NT	NT	NT		
35	0.177	0.053	52	0.53	0.31
36	0.135	0.041	85	-0.78	-0.59
37	NT	NT	NT		
38	0.141	0.0071	NR	-0.59	-1.45

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.160	0.011
Spike Value	Not Spiked	
Robust Average	0.160	0.011
Median	0.160	0.008
Mean	0.160	
N	24	
Max	0.2	
Min	0.12	
Robust SD	0.022	
Robust CV	13%	



Results: S4 - PFHxS_L
Assigned Value = 0.160 ± 0.011 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
21 10 17 36 38 26 27 16 24 22 18 3 29 8 33 20 6 13 35 7 12 11 25 30 15 1 2 4 5 9 14 19 23 28 31 32 34 37 Md RA
z-Scores: S4 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.032 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFHxS_L
E_n-Score
Laboratory

Figure 83

Table 88

Sample Details

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

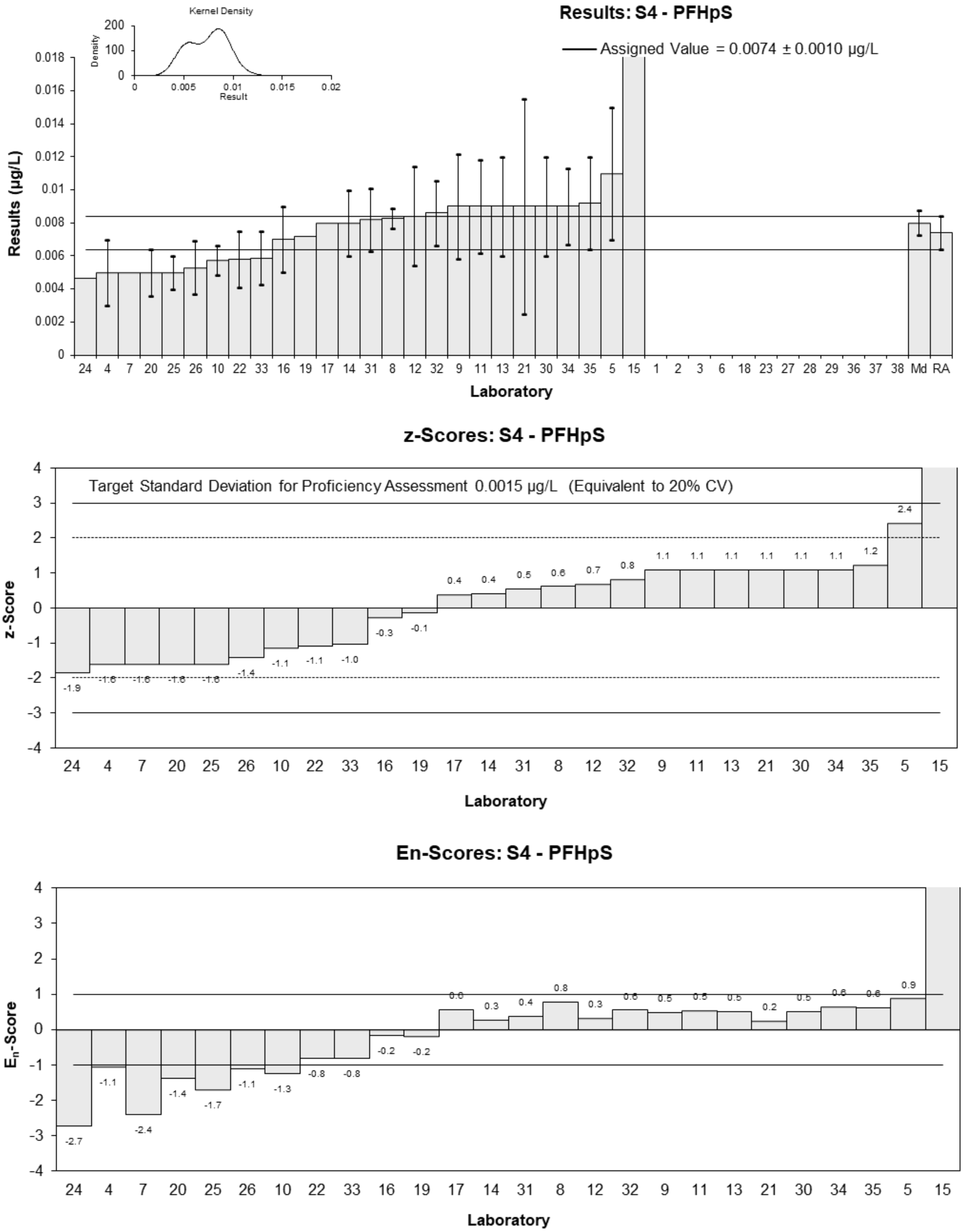
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	82		
4	0.005	0.002	NR	-1.62	-1.07
5	0.011	0.004	NR	2.43	0.87
6	<0.01	NR	124		
7	0.005	NR	NR	-1.62	-2.40
8	0.0083	0.0006	77	0.61	0.77
9	0.009	0.00315	96	1.08	0.48
10	0.00572	0.0009	100	-1.14	-1.25
11	0.009	0.0028	112	1.08	0.54
12	0.0084	0.003	87	0.68	0.32
13	0.009	0.003	NR	1.08	0.51
14	0.008	0.002	93	0.41	0.27
15**	6.5969	NR	77	4,452.36	6,589.50
16	0.007	0.002	NR	-0.27	-0.18
17	0.007971	NR	NR	0.39	0.57
18	< 0.025	NR	96		
19	0.0072	NR	105	-0.14	-0.20
20	0.005	0.0014	78	-1.62	-1.39
21	0.009	0.0065	NR	1.08	0.24
22	0.0058	0.0017	89	-1.08	-0.81
23	NS	NS	NS		
24	0.00466	NR	NR	-1.85	-2.74
25	0.005	0.001	NR	-1.62	-1.70
26	0.0053	0.0016	107	-1.42	-1.11
27	< 0.02	0.01	NR		
28	NT	NT	NT		
29	NR	NR	NR		
30	0.009	0.003	95	1.08	0.51
31	0.0082	0.0019	106.76	0.54	0.37
32	0.0086	0.00194	93.66	0.81	0.55
33	0.00587	0.0016	98	-1.03	-0.81
34	0.009	0.0023	98.62	1.08	0.64
35	0.0092	0.0028	52	1.22	0.61
36	<0.01	NR	102		
37	NT	NT	NT		
38	<0.01	NR	96		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0074	0.0010
Spike Value	Not Spiked	
Robust Average	0.0074	0.0010
Median	0.00800	0.00074
Mean	0.00741	
N	25	
Max	0.011	
Min	0.00466	
Robust SD	0.0020	
Robust CV	27%	



Kernel Density
Density
Result
Results: S4 - PFHpS
Assigned Value = 0.0074 ± 0.0010 µg/L
Results (µg/L)
Laboratory
z-Scores: S4 - PFHpS
Target Standard Deviation for Proficiency Assessment 0.0015 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFHpS
E_n-Score
Laboratory

Figure 84

Table 89

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.12	0.05	80	0.50	0.22
4	0.099	0.05	94.9	-0.46	-0.20
5	0.10	0.035	NR	-0.41	-0.25
6	0.085	0.0026	121	-1.10	-2.56
7	0.1	0.06	109	-0.41	-0.15
8	0.063	0.001	76	-2.11	-5.08
9	0.112	0.0392	96	0.14	0.07
10	0.107	0.0299	100	-0.09	-0.06
11	0.144	0.0431	112	1.61	0.79
12	0.13	0.04	90	0.96	0.51
13	0.11	0.03	83	0.05	0.03
14	0.127	0.015	70	0.83	1.03
15**	78.7819	NR	77	3,608.85	8,741.43
16	0.122	0.037	NR	0.60	0.34
17	0.1001	NR	NR	-0.41	-0.99
18	NR	NR	81		
19	0.117	0.043	105	0.37	0.18
20	0.137	0.0466	69	1.28	0.59
21	0.074	0.0266	NR	-1.61	-1.25
22	0.11	0.032	84	0.05	0.03
23	NS	NS	NS		
24	0.0906	NR	NR	-0.84	-2.04
25	0.11	0.02	105	0.05	0.05
26	0.10	0.035	116	-0.41	-0.25
27	0.098	0.05	99	-0.50	-0.22
28	0.14	0.03	69	1.42	0.99
29	0.11	0.026	97	0.05	0.04
30	0.12	0.04	95	0.50	0.27
31	0.128	0.027	99.01	0.87	0.67
32	0.11	0.02004	92.72	0.05	0.05
33	0.0610	0.0119	98	-2.20	-3.22
34	0.109	0.015	131.66	0.00	0.00
35	0.129	0.039	60	0.92	0.50
36	0.083	0.025	97	-1.19	-0.98
37	0.089	0.0178	NR	-0.92	-1.00
38	0.131	0.0092	182	1.01	1.71

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.109	0.009
Spike Value	Not Spiked	
Robust Average	0.109	0.009
Median	0.110	0.008
Mean	0.108	
N	33	
Max	0.144	
Min	0.061	
Robust SD	0.021	
Robust CV	19%	

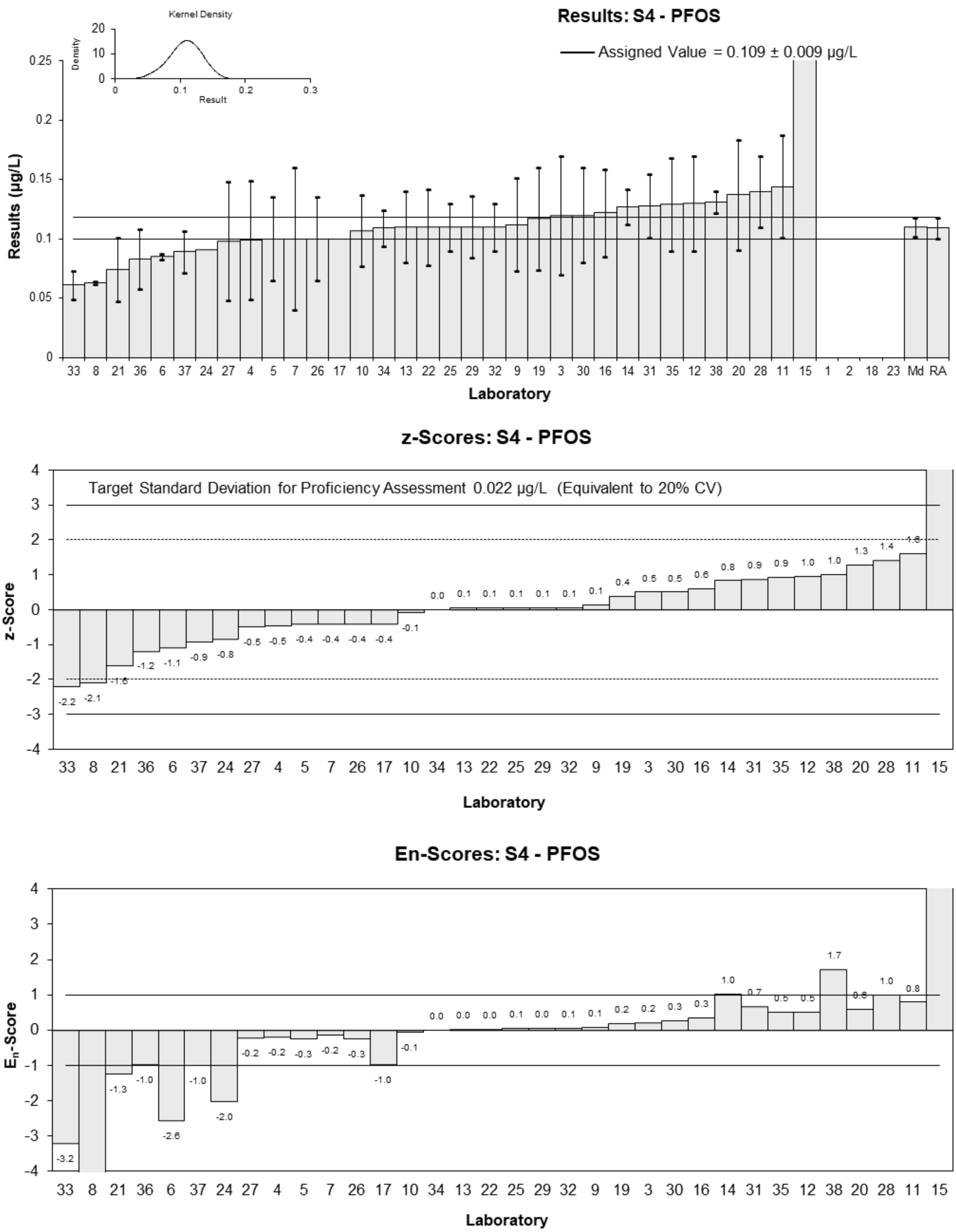

Results: S4 - PFOS
Assigned Value = 0.109 ± 0.009 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S4 - PFOS
Target Standard Deviation for Proficiency Assessment 0.022 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFOS
En-Score
Laboratory

Figure 85

Table 90

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.05	0.03	80	-0.64	-0.24
4	NR	NR	NR		
5	NT	NT	NT		
6	0.053	0.0016	121	-0.38	-1.33
7	0.051	NR	NR	-0.55	-2.25
8	0.061	0.006	76	0.32	0.56
9	NR	NR	NR		
10	0.0603	0.0299	100	0.26	0.10
11	0.070	0.0209	102	1.11	0.60
12	0.063	0.02	90	0.50	0.28
13	0.06	0.02	NR	0.24	0.13
14	NT	NT	NT		
15**	65.2573	NR	77	5,689.35	23,285.71
16	0.060	0.018	98	0.24	0.15
17	0.05216	NR	NR	-0.45	-1.84
18	0.0858	0.02574	81	2.49	1.10
19	0.0576	NR	105	0.03	0.11
20	0.058	0.0174	69	0.06	0.04
21	0.039	0.0158	NR	-1.60	-1.14
22	0.06	0.017	84	0.24	0.16
23	NS	NS	NS		
24	0.0498	NR	NR	-0.65	-2.68
25	0.056	0.009	NR	-0.11	-0.14
26	0.057	0.019	116	-0.03	-0.02
27	0.059	0.03	NR	0.15	0.06
28	NT	NT	NT		
29	0.062	0.0093	NR	0.41	0.48
30	0.056	0.02	95	-0.11	-0.06
31	0.0564	0.0120	99.01	-0.08	-0.07
32	NT	NT	NT		
33	0.0610	0	98	0.32	1.32
34	0.053	0.0074	131.66	-0.38	-0.54
35	0.0633	0.0190	60	0.52	0.31
36	0.05	0.015	97	-0.64	-0.48
37	NT	NT	NT		
38*	0.104	0.0073	NR	4.08	5.97

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0573	0.0028
Spike Value	Not Spiked	
Robust Average	0.0577	0.0030
Median	0.0580	0.0029
Mean	0.0596	
N	27	
Max	0.104	
Min	0.039	
Robust SD	0.0062	
Robust CV	11%	

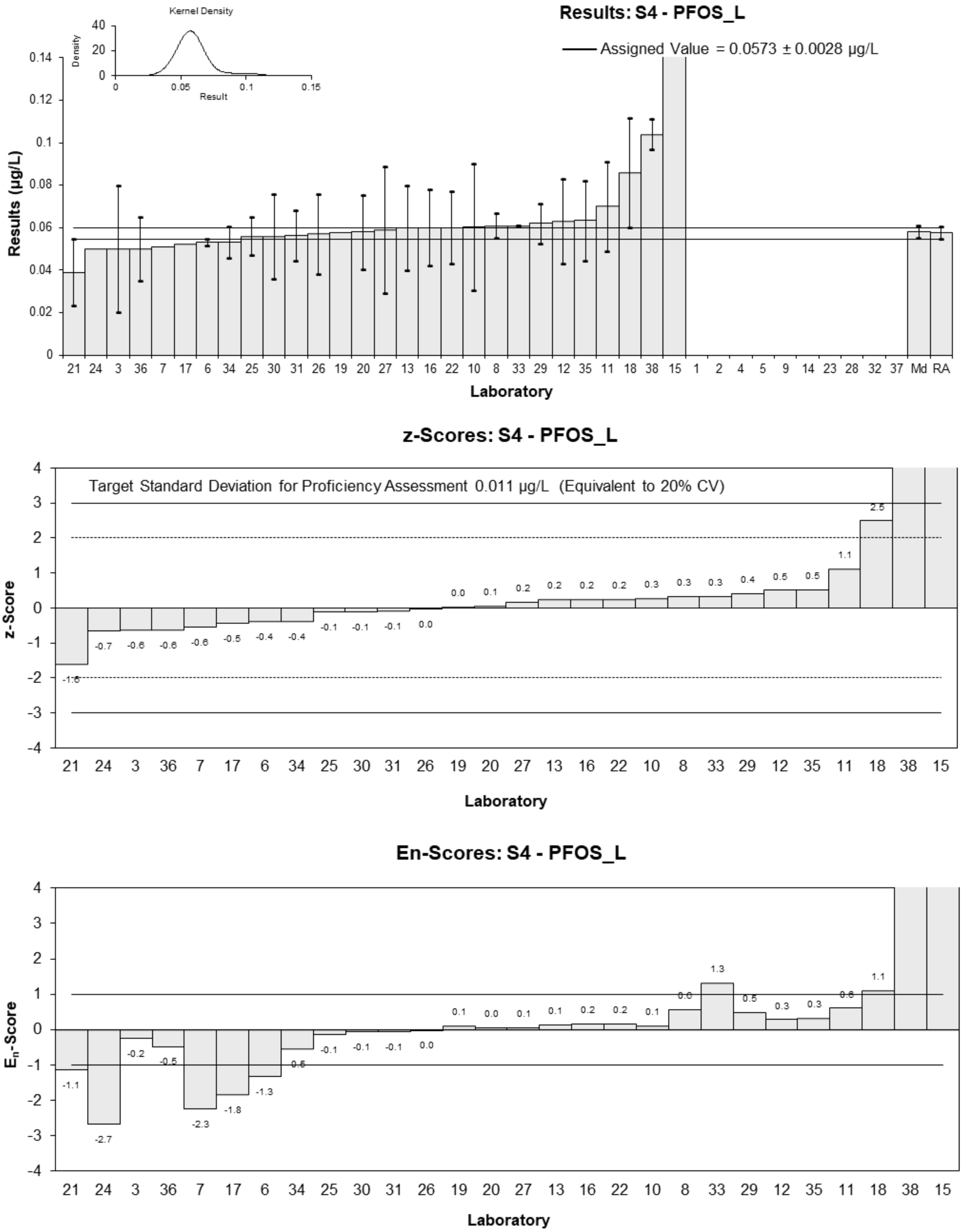

Results: S4 - PFOS_L
Assigned Value = 0.0573 ± 0.0028 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
21 24 3 36 7 17 6 34 25 30 31 26 19 20 27 13 16 22 10 8 33 29 12 35 11 18 38 15 1 2 4 5 9 14 23 28 32 37 Md RA
z-Scores: S4 - PFOS_L
Target Standard Deviation for Proficiency Assessment 0.011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFOS_L
En-Score
Laboratory

Figure 86

Table 91

Sample Details

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

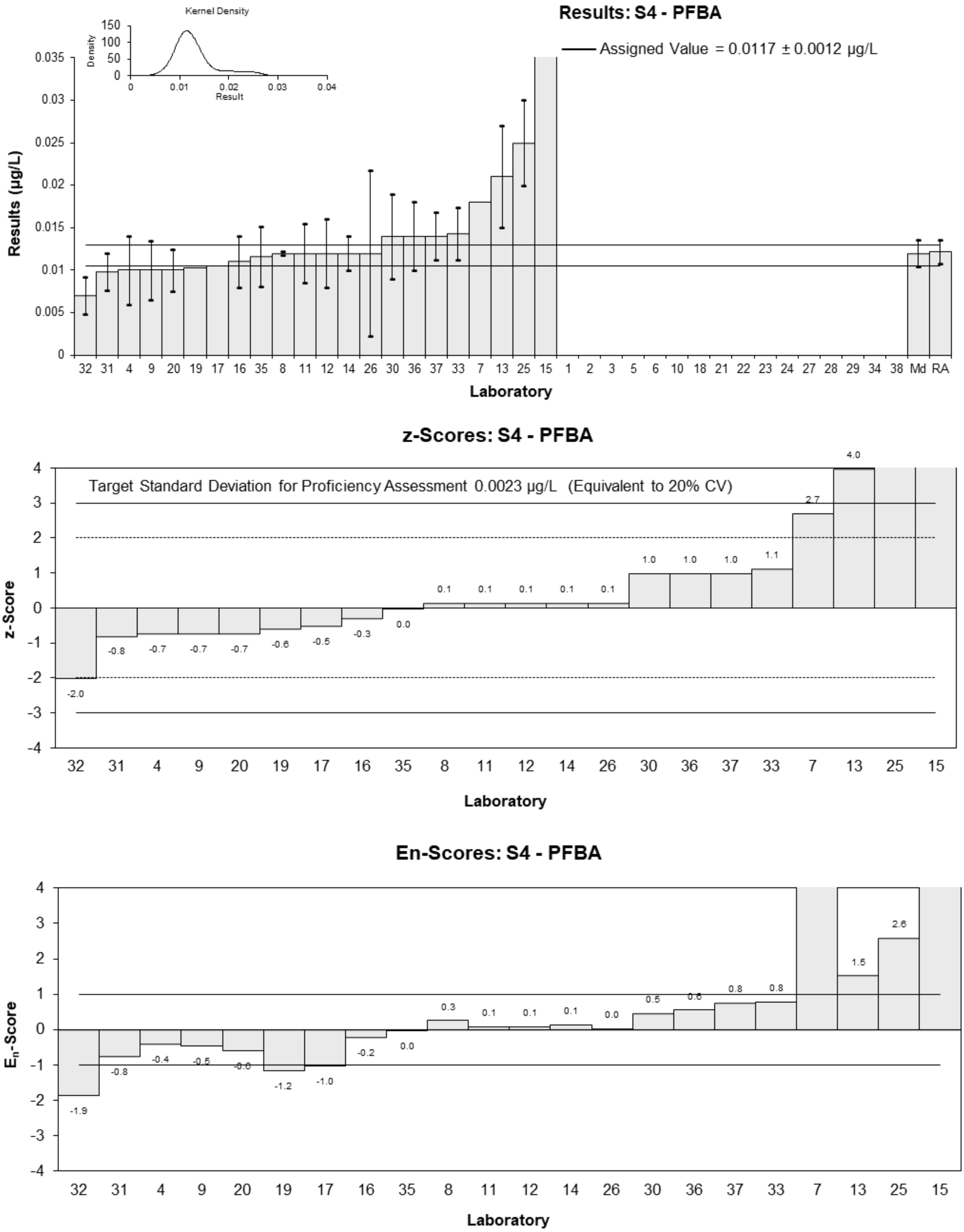
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.02	NR	81		
4	0.010	0.004	78.5	-0.73	-0.41
5	<0.05	NR	NR		
6	<0.05	NR	38		
7	0.018	NR	98	2.69	5.25
8	0.012	0.0002	67	0.13	0.25
9	0.01	0.0035	71	-0.73	-0.46
10	<0.01566	0.0017	95.8		
11	0.012	0.0035	95	0.13	0.08
12	0.012	0.004	75	0.13	0.07
13*	0.021	0.006	70	3.97	1.52
14	0.012	0.002	40	0.13	0.13
15**	11.6948	NR	86	4,992.78	9,735.92
16	0.011	0.003	56	-0.30	-0.22
17	0.01045	NR	NR	-0.53	-1.04
18	< 0.017	NR	83		
19	0.0103	NR	89	-0.60	-1.17
20	0.010	0.0025	63	-0.73	-0.61
21	NT	NT	NT		
22	<0.001	NR	84		
23	NS	NS	NS		
24	<0.05	NR	NR		
25*	0.025	0.005	102	5.68	2.59
26	0.012	0.0098	94	0.13	0.03
27	< 0.05	0.03	110		
28	NT	NT	NT		
29	NR	NR	NR		
30	0.014	0.005	80	0.98	0.45
31	0.0098	0.0022	91.39	-0.81	-0.76
32	0.007	0.0022	63.1	-2.01	-1.88
33	0.0143	0.00312	91	1.11	0.78
34	<0.01	NR	56.36		
35	0.0116	0.0035	73	-0.04	-0.03
36	0.014	0.004	94	0.98	0.55
37	0.014	0.0028	NR	0.98	0.76
38	<0.05	NR	63		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0117	0.0012
Spike Value	Not Spiked	
Robust Average	0.0122	0.0014
Median	0.0120	0.0016
Mean	0.0129	
N	21	
Max	0.025	
Min	0.007	
Robust SD	0.0026	
Robust CV	21%	



Results: S4 - PFBA
Assigned Value = 0.0117 ± 0.0012 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
32 31 4 9 20 19 17 16 35 8 11 12 14 26 30 36 37 33 7 13 25 15 1 2 3 5 6 10 18 21 22 23 24 27 28 29 34 38 Md RA
z-Scores: S4 - PFBA
Target Standard Deviation for Proficiency Assessment 0.0023 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFBA
E_n-Score
Laboratory

Figure 87

Table 92

Sample Details

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

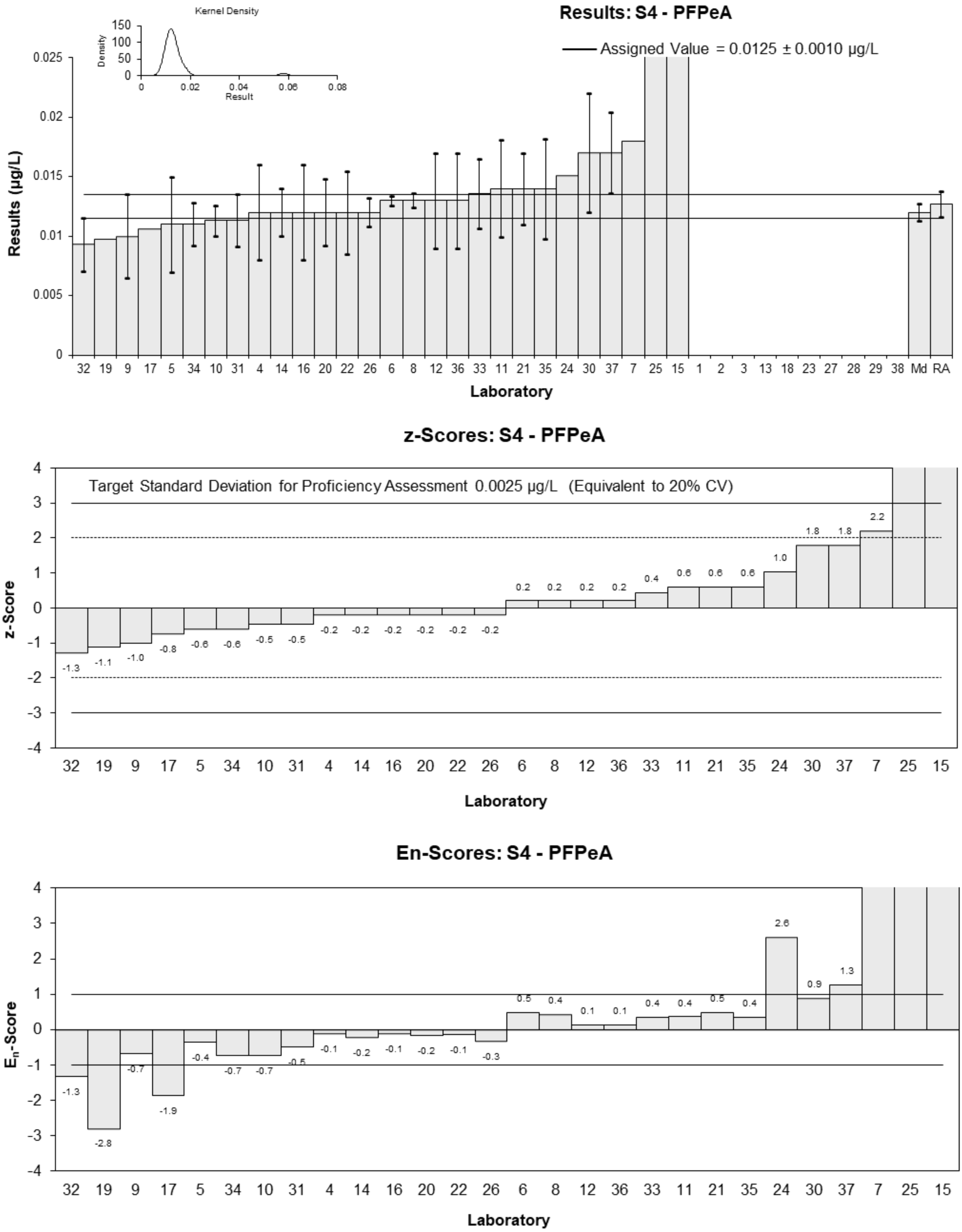
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.02	NR	86		
4	0.012	0.004	93.5	-0.20	-0.12
5	0.011	0.004	NR	-0.60	-0.36
6	0.013	0.00039	127	0.20	0.47
7	0.018	NR	101	2.20	5.50
8	0.013	0.0006	70	0.20	0.43
9	0.01	0.0035	107	-1.00	-0.69
10	0.0113	0.0013	106	-0.48	-0.73
11	0.014	0.0041	96	0.60	0.36
12	0.013	0.004	73	0.20	0.12
13	<0.002	NR	68		
14	0.012	0.002	50	-0.20	-0.22
15**	15.1316	NR	84	6,047.64	15,119.10
16	0.012	0.004	57	-0.20	-0.12
17	0.01063	NR	NR	-0.75	-1.87
18	< 0.017	NR	82		
19	0.0097	NR	88	-1.12	-2.80
20	0.012	0.0028	83	-0.20	-0.17
21	0.014	0.0030	NR	0.60	0.47
22	0.012	0.0035	98	-0.20	-0.14
23	NS	NS	NS		
24	0.0151	NR	NR	1.04	2.60
25*	0.058	0.01	102	18.20	4.53
26	0.012	0.0012	98	-0.20	-0.32
27	< 0.03	0.02	110		
28	NT	NT	NT		
29	NR	NR	NR		
30	0.017	0.005	89	1.80	0.88
31	0.0113	0.0022	93.27	-0.48	-0.50
32	0.0093	0.00221	59.43	-1.28	-1.32
33	0.0136	0.00294	92	0.44	0.35
34	0.011	0.0018	22.51	-0.60	-0.73
35	0.0140	0.0042	100	0.60	0.35
36	0.013	0.004	108	0.20	0.12
37	0.017	0.0034	NR	1.80	1.27
38	<0.01	NR	120		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0125	0.0010
Spike Value	Not Spiked	
Robust Average	0.0127	0.0011
Median	0.0120	0.0007
Mean	0.0144	
N	27	
Max	0.058	
Min	0.0093	
Robust SD	0.0022	
Robust CV	18%	



Results: S4 - PFPeA
Assigned Value = 0.0125 ± 0.0010 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
32 19 9 17 5 34 10 31 4 14 16 20 22 26 6 8 12 36 33 11 21 35 24 30 37 7 25 15 1 2 3 13 18 23 27 28 29 38 Md RA
z-Scores: S4 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.0025 µg/L (Equivalent to 20% CV)
z-Score
-1.3 -1.1 -1.0 -0.8 -0.6 -0.6 -0.5 -0.5 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 0.2 0.2 0.2 0.2 0.4 0.6 0.6 0.6 1.0 1.8 1.8 2.2
Laboratory
32 19 9 17 5 34 10 31 4 14 16 20 22 26 6 8 12 36 33 11 21 35 24 30 37 7 25 15
En-Scores: S4 - PFPeA
E_n-Score
-1.3 -2.8 -0.7 -1.9 -0.4 -0.7 -0.7 -0.5 -0.1 -0.2 -0.1 -0.2 -0.1 -0.3 0.5 0.4 0.1 0.1 0.4 0.4 0.5 0.4 2.6 0.9 1.3
Laboratory
32 19 9 17 5 34 10 31 4 14 16 20 22 26 6 8 12 36 33 11 21 35 24 30 37 7 25 15

Figure 88

Table 93

Sample Details

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

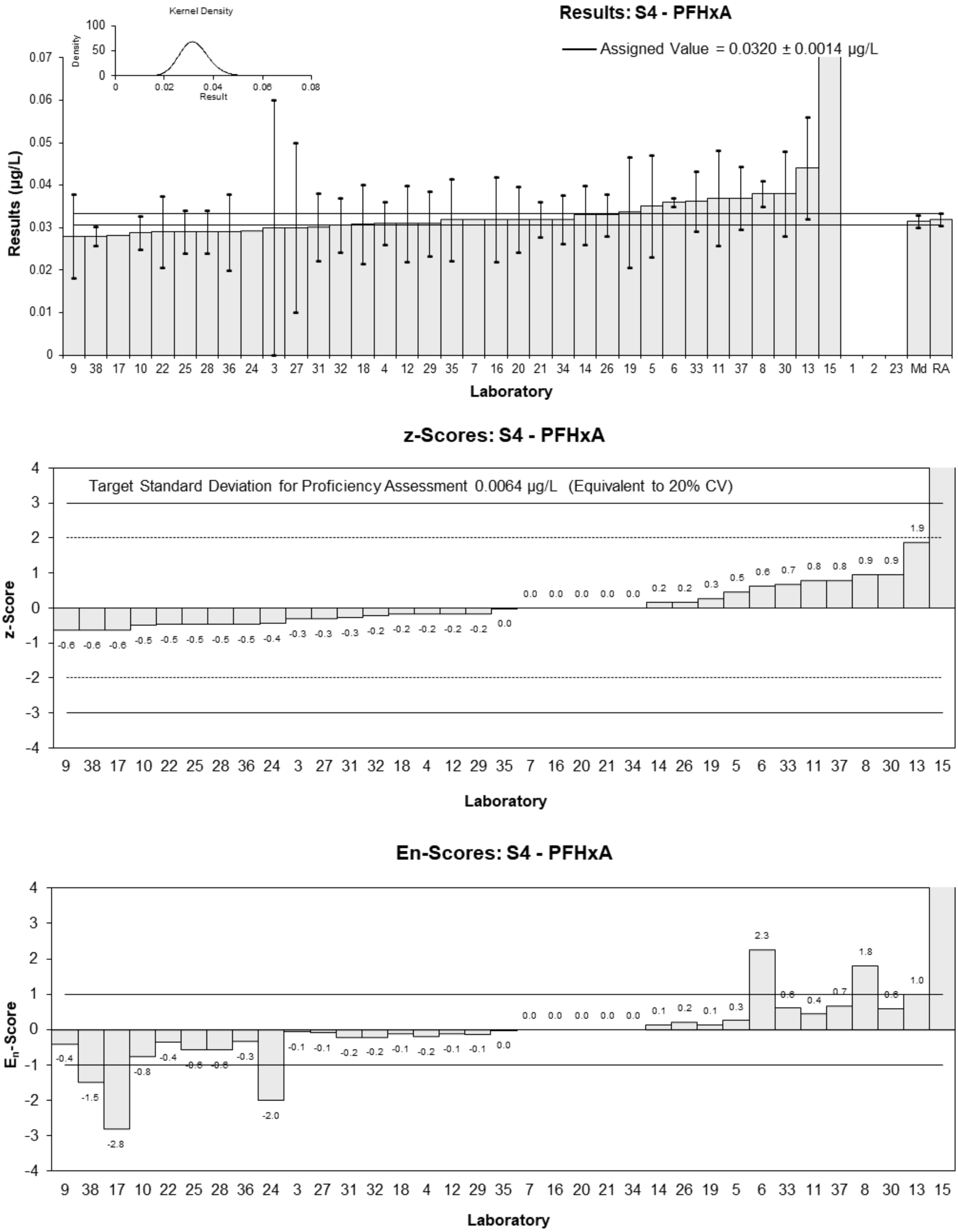
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.03	0.03	85	-0.31	-0.07
4	0.031	0.005	103.2	-0.16	-0.19
5	0.035	0.012	NR	0.47	0.25
6	0.036	0.0011	119	0.62	2.25
7	0.032	NR	99	0.00	0.00
8	0.038	0.003	74	0.94	1.81
9	0.028	0.0098	107	-0.62	-0.40
10	0.0288	0.004	91	-0.50	-0.76
11	0.037	0.0112	111	0.78	0.44
12	0.031	0.009	86	-0.16	-0.11
13	0.044	0.012	77	1.87	0.99
14	0.033	0.007	71	0.16	0.14
15**	35.5054	NR	84	5,542.72	25,338.14
16	0.032	0.010	79	0.00	0.00
17	0.02806	NR	NR	-0.62	-2.81
18	0.0309	0.00927	88	-0.17	-0.12
19	0.0337	0.013	99	0.27	0.13
20	0.032	0.0077	77	0.00	0.00
21	0.032	0.0041	NR	0.00	0.00
22	0.029	0.0084	96	-0.47	-0.35
23	NS	NS	NS		
24	0.0292	NR	NR	-0.44	-2.00
25	0.029	0.005	100	-0.47	-0.58
26	0.033	0.0049	91	0.16	0.20
27	0.03	0.02	102	-0.31	-0.10
28	0.029	0.005	87	-0.47	-0.58
29	0.031	0.0076	84	-0.16	-0.13
30	0.038	0.01	90	0.94	0.59
31	0.0302	0.0079	59.8	-0.28	-0.22
32	0.0306	0.00644	66.37	-0.22	-0.21
33	0.0363	0.00707	90	0.67	0.60
34	0.032	0.0057	45.18	0.00	0.00
35	0.0319	0.0096	55	-0.02	-0.01
36	0.029	0.009	95	-0.47	-0.33
37	0.037	0.0074	NR	0.78	0.66
38	0.028	0.0023	168	-0.62	-1.49

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0320	0.0014
Spike Value	Not Spiked	
Robust Average	0.0320	0.0014
Median	0.0315	0.0014
Mean	0.0322	
N	34	
Max	0.044	
Min	0.028	
Robust SD	0.0034	
Robust CV	11%	



Results: S4 - PFHxA
Assigned Value = 0.0320 ± 0.0014 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S4 - PFHxA
Target Standard Deviation for Proficiency Assessment 0.0064 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFHxA
En-Score
Laboratory

Figure 89

Table 94

Sample Details

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

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	87		
4	0.004	0.002	105.0	-1.49	-0.82
5	0.007	0.002	NR	1.14	0.63
6	<0.01	NR	122		
7	0.0049	0.0034	96	-0.70	-0.23
8	0.007	0.0006	68	1.14	1.64
9	0.006	0.0021	101	0.26	0.14
10	0.00577	0.0008	90.6	0.06	0.07
11	0.007	0.0022	118	1.14	0.58
12	0.0065	0.002	122	0.70	0.39
13*	0.014	0.004	77	7.28	2.06
14	0.005	0.0008	84	-0.61	-0.73
15**	6.0707	NR	83	5,320.18	11,663.46
16	0.005	0.002	96	-0.61	-0.34
17	0.006250	NR	NR	0.48	1.06
18	< 0.017	NR	80		
19	0.0049	NR	106	-0.70	-1.54
20	<0.006	NR	80		
21	0.005	0.0010	NR	-0.61	-0.62
22	0.00535	0.0016	100	-0.31	-0.21
23	NS	NS	NS		
24**	0.0573	NR	NR	45.26	99.23
25	0.007	0.001	105	1.14	1.15
26	0.0055	0.00075	94	-0.18	-0.22
27	< 0.02	0.01	105		
28	<0.01	NR	94		
29	NR	NR	NR		
30	0.006	0.003	88	0.26	0.10
31	0.0045	0.0010	73.53	-1.05	-1.06
32	0.0054	0.00113	68.79	-0.26	-0.24
33	0.00564	0.00114	97	-0.05	-0.05
34	0.005	0.0008	82.01	-0.61	-0.73
35	0.0070	0.0021	56	1.14	0.60
36	<0.01	NR	95		
37	0.0051	0.00102	NR	-0.53	-0.52
38	<0.01	NR	152		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.00570	0.00052
Spike Value	Not Spiked	
Robust Average	0.00576	0.00054
Median	0.00557	0.00047
Mean	0.00603	
N	24	
Max	0.014	
Min	0.004	
Robust SD	0.0011	
Robust CV	18%	

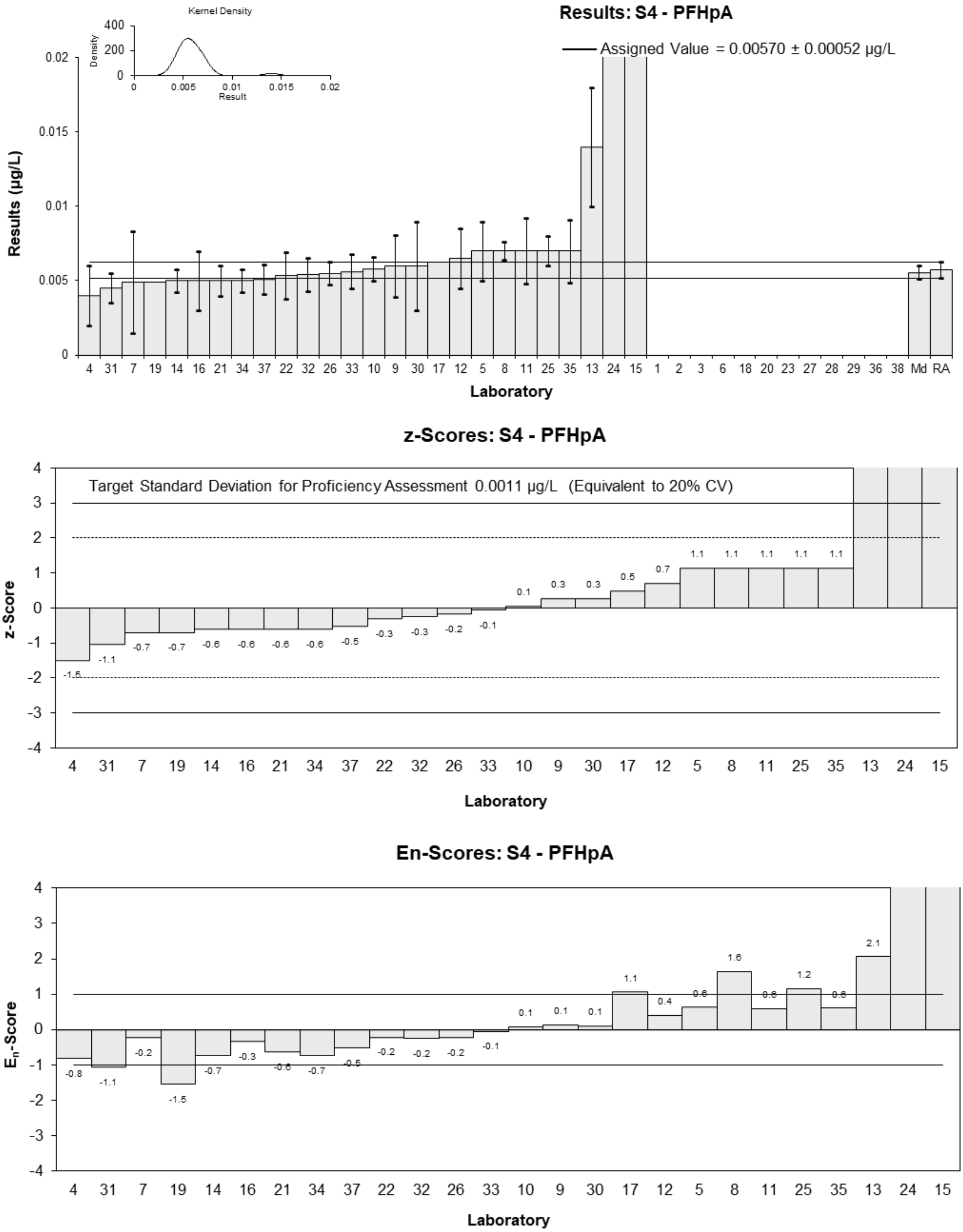

Results: S4 - PFHpA
Assigned Value = 0.00570 ± 0.00052 µg/L
Kernel Density
Results (µg/L)
Laboratory
z-Scores: S4 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.0011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S4 - PFHpA
En-Score
Laboratory

Figure 90

Table 95

Sample Details

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

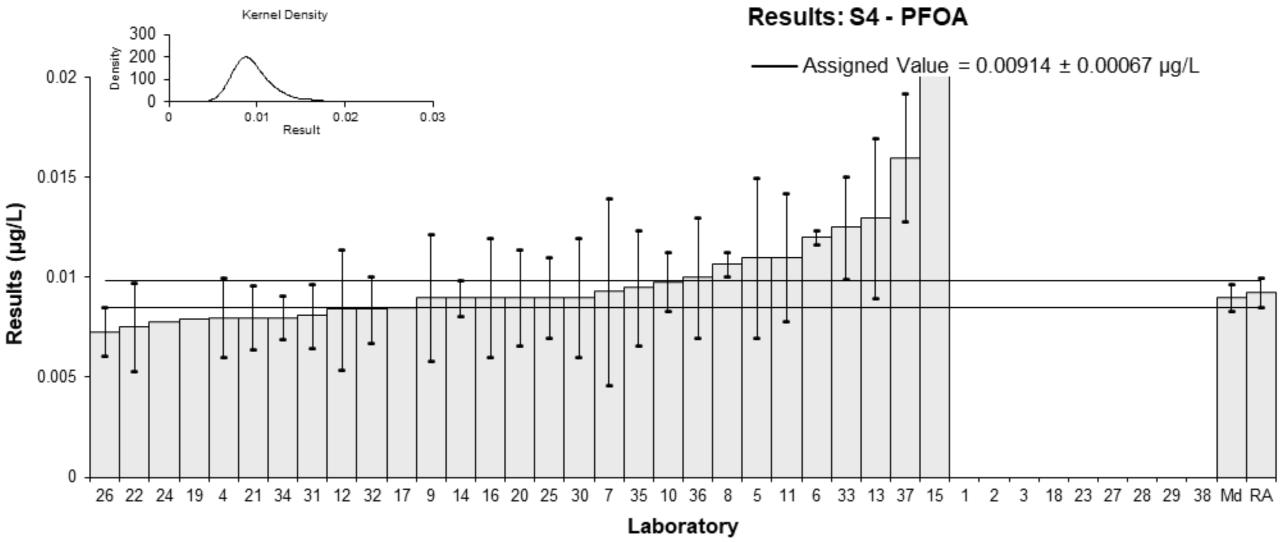
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	86		
4	0.008	0.002	103.2	-0.62	-0.54
5	0.011	0.004	NR	1.02	0.46
6	0.012	0.00036	130	1.56	3.76
7	0.0093	0.0047	96	0.09	0.03
8	0.01065	0.0006	88	0.83	1.68
9	0.009	0.00315	101	-0.08	-0.04
10	0.0098	0.0015	92.6	0.36	0.40
11	0.011	0.0032	112	1.02	0.57
12	0.0084	0.003	58	-0.40	-0.24
13	0.013	0.004	78	2.11	0.95
14	0.009	0.0009	93	-0.08	-0.12
15**	8.519	NR	83	4,655.28	12,701.28
16	0.009	0.003	85	-0.08	-0.05
17	0.008468	NR	NR	-0.37	-1.00
18	< 0.017	NR	92		
19	0.0079	NR	117	-0.68	-1.85
20	0.009	0.0024	86	-0.08	-0.06
21	0.008	0.0016	NR	-0.62	-0.66
22	0.00755	0.0022	100	-0.87	-0.69
23	NS	NS	NS		
24	0.00781	NR	NR	-0.73	-1.99
25	0.009	0.002	100	-0.08	-0.07
26	0.0073	0.0012	101	-1.01	-1.34
27	< 0.03	0.02	96		
28	<0.01	NR	91		
29	NR	NR	NR		
30	0.009	0.003	98	-0.08	-0.05
31	0.0081	0.0016	106.76	-0.57	-0.60
32	0.0084	0.00165	95.81	-0.40	-0.42
33	0.0125	0.00259	97	1.84	1.26
34	0.008	0.0011	97.29	-0.62	-0.89
35	0.0095	0.0029	58	0.20	0.12
36	0.01	0.003	94	0.47	0.28
37*	0.016	0.0032	NR	3.75	2.10
38	<0.01	NR	139		

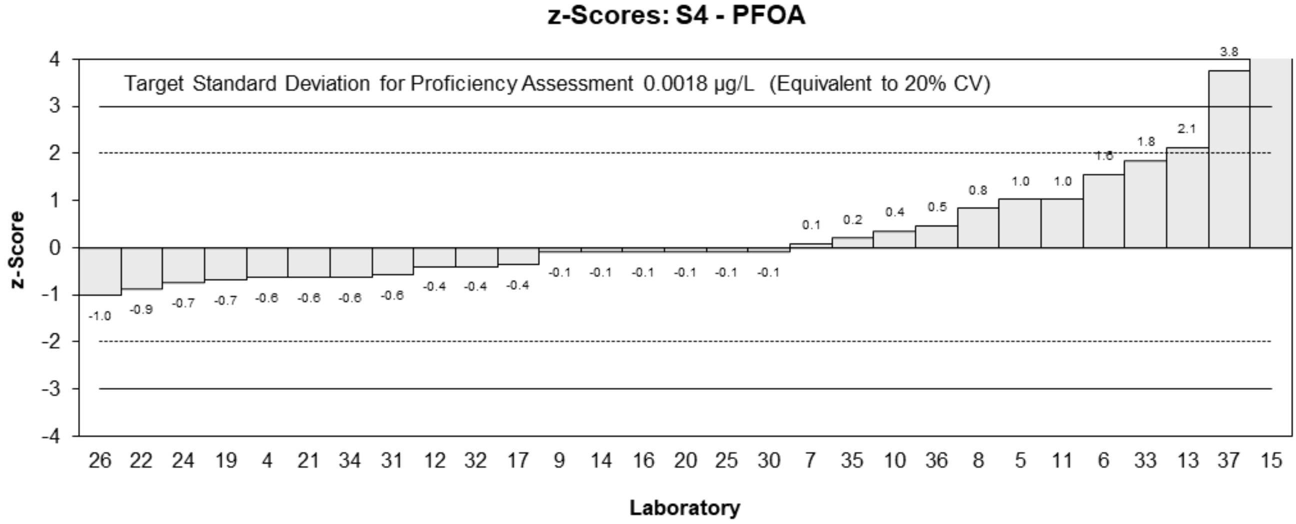
* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

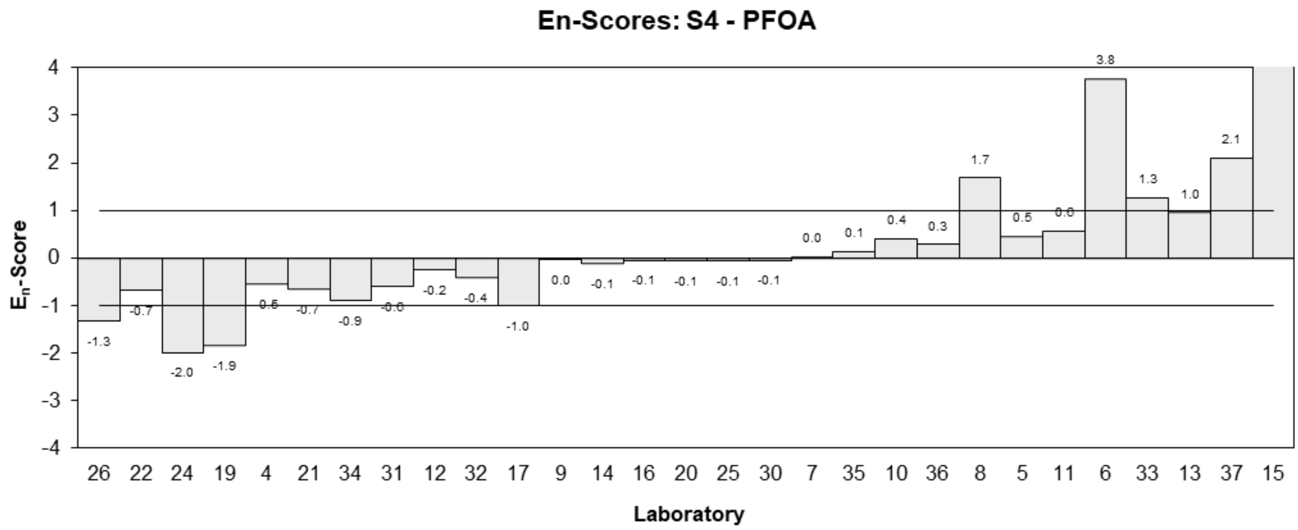
Assigned Value	0.00914	0.00067
Spike Value	Not Spiked	
Robust Average	0.00926	0.00072
Median	0.00900	0.00070
Mean	0.00952	
N	28	
Max	0.016	
Min	0.0073	
Robust SD	0.0015	
Robust CV	17%	



Results: S4 - PFOA
Assigned Value = 0.00914 ± 0.00067 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory



z-Scores: S4 - PFOA
Target Standard Deviation for Proficiency Assessment 0.0018 µg/L (Equivalent to 20% CV)
z-Score
Laboratory



En-Scores: S4 - PFOA
E_n-Score
Laboratory

Figure 91

Table 96

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFBS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.04	0.03	82	0.85	0.19
4	0.036	0.01	107.7	0.26	0.18
5*	0.052	0.018	NR	2.60	0.98
6	0.032	0.001	115	-0.32	-1.07
7	0.036	NR	102	0.26	1.00
8	0.037	0.0002	82	0.41	1.55
9	0.036	0.0126	90	0.26	0.14
10	0.0315	0.004	94.8	-0.39	-0.62
11	0.042	0.0127	108	1.14	0.61
12	0.04	0.01	65	0.85	0.57
13	0.033	0.009	61	-0.18	-0.13
14	0.036	0.008	98	0.26	0.22
15**	38.4993	NR	83	5,623.55	21,369.50
16	0.033	0.010	89	-0.18	-0.12
17	0.02089	NR	NR	-1.95	-7.39
18	0.0294	0.00882	75	-0.70	-0.53
19	0.0302	0.0099	135	-0.58	-0.40
20	0.032	0.0077	89	-0.32	-0.28
21	0.035	0.0025	NR	0.12	0.26
22	0.032	0.0093	90	-0.32	-0.23
23	NS	NS	NS		
24	0.0325	NR	NR	-0.25	-0.94
25	0.038	0.006	95	0.56	0.61
26	0.036	0.0039	99	0.26	0.42
27	0.032	0.016	117	-0.32	-0.14
28	0.032	0.006	110	-0.32	-0.35
29	0.038	0.0056	99	0.56	0.65
30	0.039	0.02	97	0.70	0.24
31	0.0334	0.0070	121.62	-0.12	-0.11
32	0.0312	0.00725	101.26	-0.44	-0.40
33	0.0396	0.00812	98	0.79	0.65
34	0.032	0.0076	111.26	-0.32	-0.28
35	0.0367	0.0110	66	0.37	0.22
36	0.028	0.009	84	-0.91	-0.68
37	0.035	0.007	NR	0.12	0.11
38	0.026	0.0026	179	-1.20	-2.59

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0342	0.0018
Spike Value	0.0397	0.0020
Robust Average	0.0344	0.0018
Median	0.0342	0.0015
Mean	0.0345	
N	34	
Max	0.052	
Min	0.02089	
Robust SD	0.0043	
Robust CV	12%	

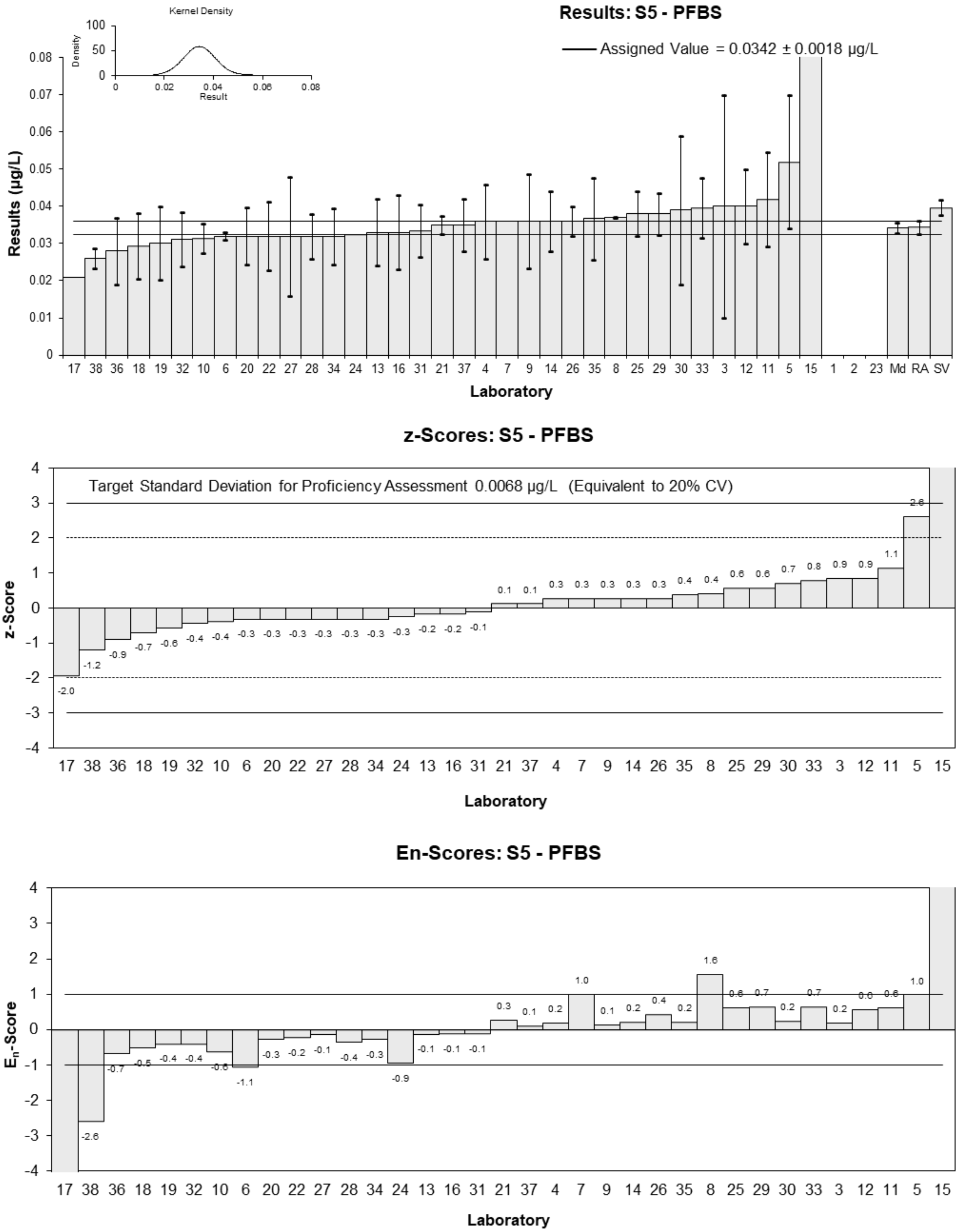

Results: S5 - PFBS
Assigned Value = 0.0342 ± 0.0018 µg/L
Kernel Density
Results (µg/L)
Laboratory
z-Scores: S5 - PFBS
Target Standard Deviation for Proficiency Assessment 0.0068 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFBS
En-Score
Laboratory

Figure 92

Table 97

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFPeS
Unit	µg/L

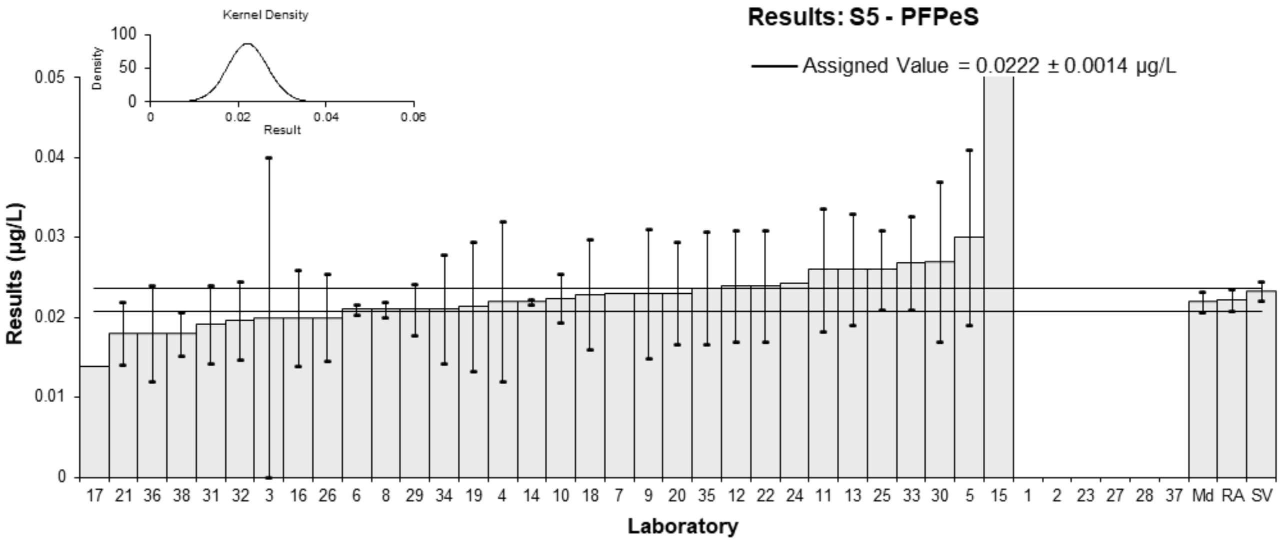
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.02	0.02	86	-0.50	-0.11
4	0.022	0.01	NR	-0.05	-0.02
5	0.030	0.011	NR	1.76	0.70
6	0.021	0.0006	115	-0.27	-0.79
7	0.023	NR	NR	0.18	0.57
8	0.021	0.001	77	-0.27	-0.70
9	0.023	0.00805	90	0.18	0.10
10	0.0224	0.003	96.9	0.05	0.06
11	0.026	0.0077	108	0.86	0.49
12	0.024	0.007	90	0.41	0.25
13	0.026	0.007	NR	0.86	0.53
14	0.022	0.0003	93	-0.05	-0.14
15**	25.4253	NR	83	5,721.42	18,145.07
16	0.020	0.006	NR	-0.50	-0.36
17	0.01385	NR	NR	-1.88	-5.96
18	0.0229	0.00687	75	0.16	0.10
19	0.0214	0.0081	123	-0.18	-0.10
20	0.023	0.0064	86	0.18	0.12
21	0.018	0.0039	NR	-0.95	-1.01
22	0.024	0.0070	90	0.41	0.25
23	NS	NS	NS		
24	0.0243	NR	NR	0.47	1.50
25	0.026	0.005	NR	0.86	0.73
26	0.020	0.0054	98	-0.50	-0.39
27	< 0.02	0.01	NR		
28	NT	NT	NT		
29	0.021	0.0032	NR	-0.27	-0.34
30	0.027	0.01	85	1.08	0.48
31	0.0192	0.0049	133.21	-0.68	-0.59
32	0.0196	0.00493	99.84	-0.59	-0.51
33	0.0269	0.00586	NR	1.06	0.78
34	0.021	0.0068	107.35	-0.27	-0.17
35	0.0237	0.0071	66	0.34	0.21
36	0.018	0.006	82	-0.95	-0.68
37	NT	NT	NT		
38	0.018	0.0027	179	-0.95	-1.38

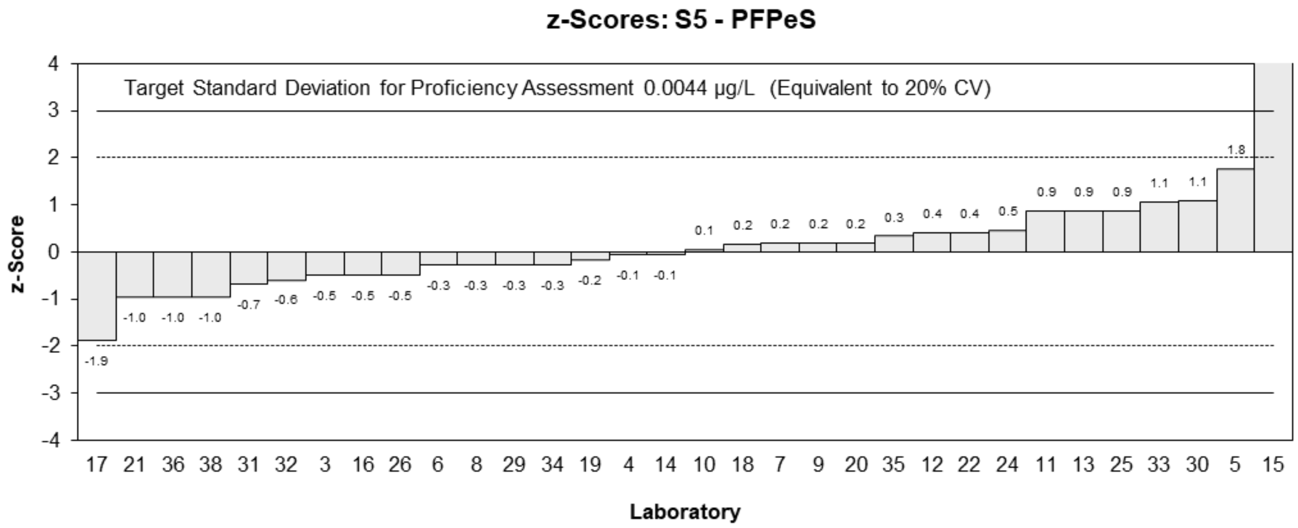
** Extreme Outlier, see Section 4.2

Statistics

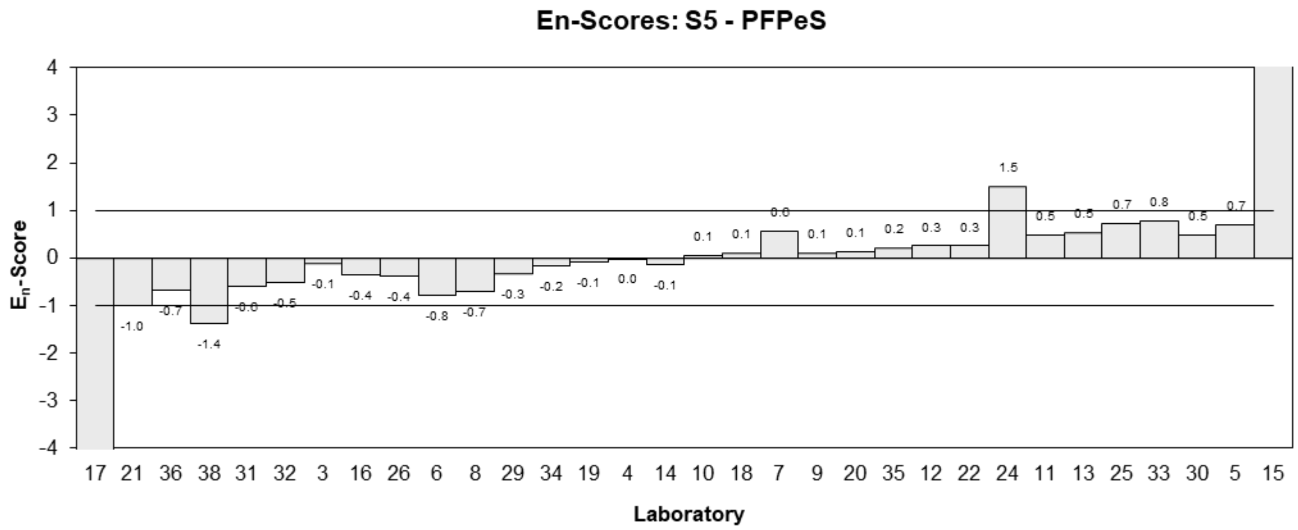
Assigned Value	0.0222	0.0014
Spike Value	0.0233	0.0012
Robust Average	0.0222	0.0014
Median	0.0220	0.0013
Mean	0.0222	
N	31	
Max	0.03	
Min	0.01385	
Robust SD	0.0032	
Robust CV	14%	



Results: S5 - PFPeS
Assigned Value = 0.0222 ± 0.0014 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
17 21 36 38 31 32 3 16 26 6 8 29 34 19 4 14 10 18 7 9 20 35 12 22 24 11 13 25 33 30 5 15 1 2 23 27 28 37 Md RA SV



z-Scores: S5 - PFPeS
Target Standard Deviation for Proficiency Assessment 0.0044 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
17 21 36 38 31 32 3 16 26 6 8 29 34 19 4 14 10 18 7 9 20 35 12 22 24 11 13 25 33 30 5 15



En-Scores: S5 - PFPeS
En-Score
Laboratory
17 21 36 38 31 32 3 16 26 6 8 29 34 19 4 14 10 18 7 9 20 35 12 22 24 11 13 25 33 30 5 15

Figure 93

Table 98

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFHxS
Unit	µg/L

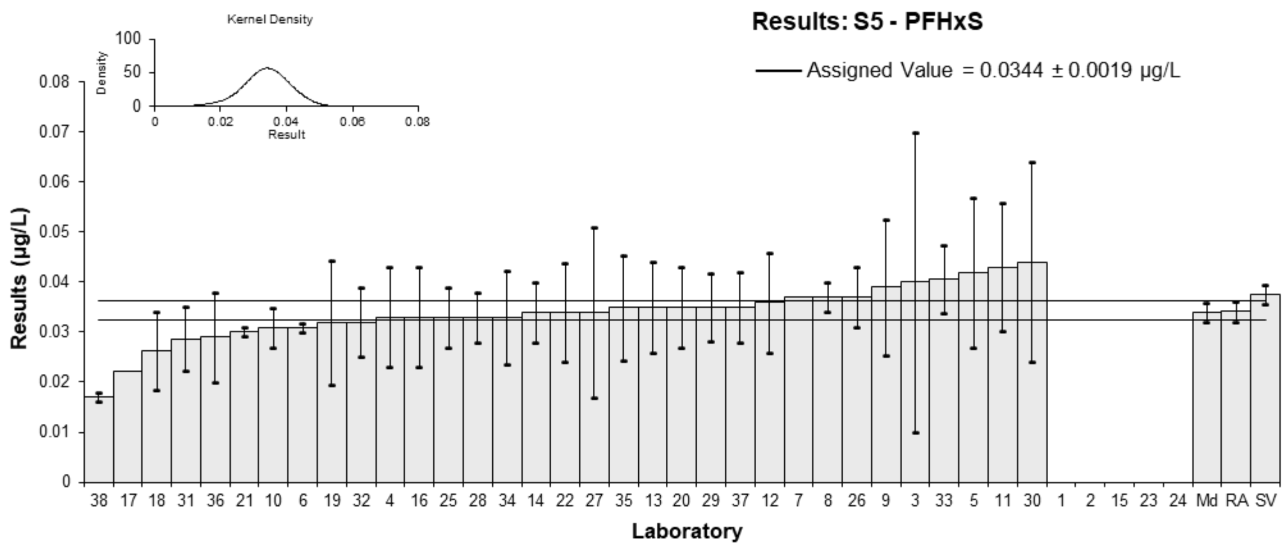
Participant Results

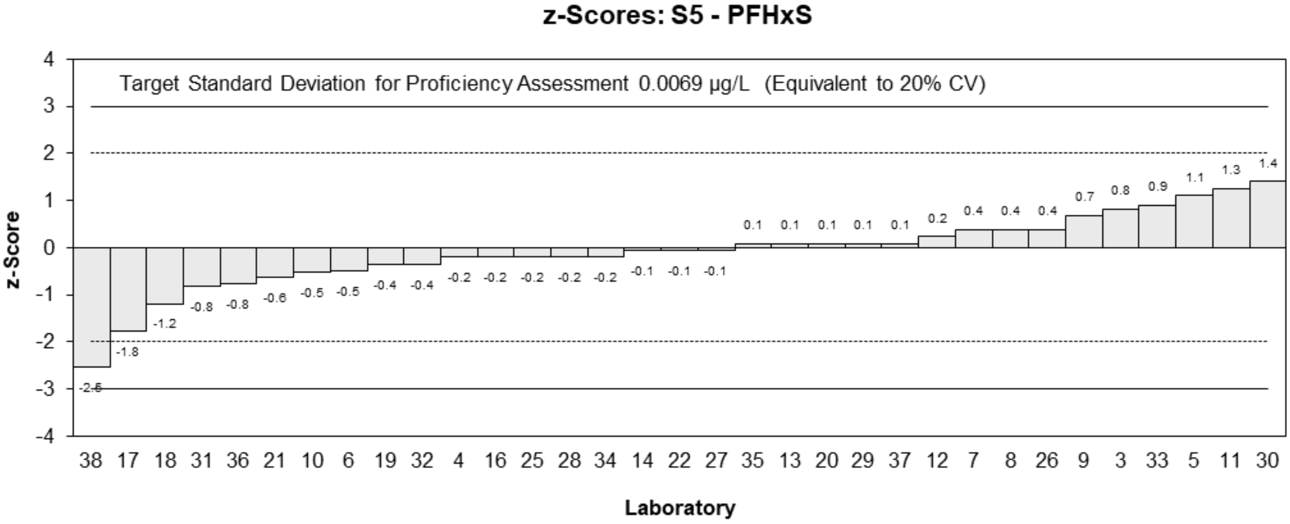
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.04	0.03	84	0.81	0.19
4	0.033	0.01	99.3	-0.20	-0.14
5	0.042	0.015	NR	1.10	0.50
6	0.031	0.0009	124	-0.49	-1.62
7	0.037	NR	103	0.38	1.37
8	0.037	0.003	77	0.38	0.73
9	0.039	0.01365	90	0.67	0.33
10	0.0308	0.004	96.9	-0.52	-0.81
11	0.043	0.0128	106	1.25	0.66
12	0.036	0.01	110	0.23	0.16
13	0.035	0.009	69	0.09	0.07
14	0.034	0.006	93	-0.06	-0.06
15	NT	NT	NT		
16	0.033	0.010	92	-0.20	-0.14
17	0.02221	NR	NR	-1.77	-6.42
18	0.0262	0.00786	76	-1.19	-1.01
19	0.0319	0.0125	123	-0.36	-0.20
20	0.035	0.0081	86	0.09	0.07
21	0.03	0.0009	NR	-0.64	-2.09
22	0.034	0.0099	86	-0.06	-0.04
23	NS	NS	NS		
24	NT	NT	NT		
25	0.033	0.006	89	-0.20	-0.22
26	0.037	0.0061	90	0.38	0.41
27	0.034	0.017	100	-0.06	-0.02
28	0.033	0.005	114	-0.20	-0.26
29	0.035	0.0069	91	0.09	0.08
30	0.044	0.02	85	1.40	0.48
31	0.0287	0.0065	133.21	-0.83	-0.84
32	0.032	0.0070	99.84	-0.35	-0.33
33	0.0406	0.00681	NR	0.90	0.88
34	0.033	0.0093	107.35	-0.20	-0.15
35	0.0349	0.0105	63	0.07	0.05
36	0.029	0.009	89	-0.78	-0.59
37	0.035	0.007	NR	0.09	0.08
38*	0.017	0.0009	187	-2.53	-8.28

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0344	0.0019
Spike Value	0.0376	0.0019
Robust Average	0.0341	0.0020
Median	0.0340	0.0019
Mean	0.0338	
N	33	
Max	0.044	
Min	0.017	
Robust SD	0.0046	
Robust CV	13%	


Results: S5 - PFHxS
Assigned Value = 0.0344 ± 0.0019 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
38 17 18 31 36 21 10 6 19 32 4 16 25 28 34 14 22 27 35 13 20 29 37 12 7 8 26 9 3 33 5 11 30 1 2 15 23 24 Md RA SV


z-Scores: S5 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.0069 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
38 17 18 31 36 21 10 6 19 32 4 16 25 28 34 14 22 27 35 13 20 29 37 12 7 8 26 9 3 33 5 11 30

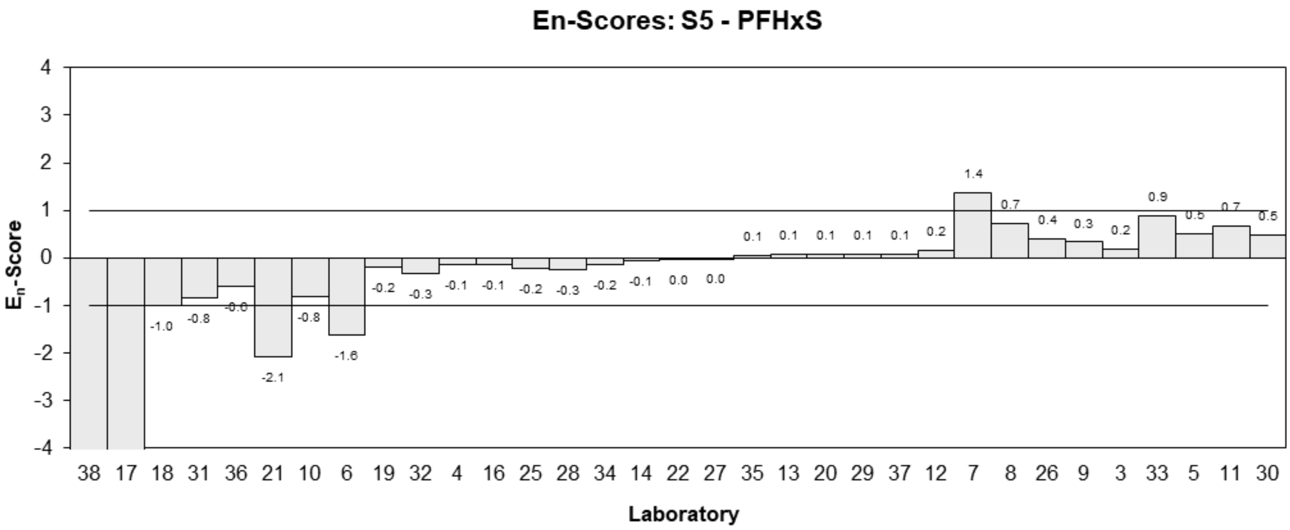

En-Scores: S5 - PFHxS
E_n-Score
Laboratory
38 17 18 31 36 21 10 6 19 32 4 16 25 28 34 14 22 27 35 13 20 29 37 12 7 8 26 9 3 33 5 11 30

Figure 94

Table 99

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFHxS_L
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.04	0.03	84	0.78	0.18
4	NR	NR	NR		
5	NT	NT	NT		
6	0.03	0.0009	124	-0.66	-1.62
7	0.037	NR	NR	0.35	0.89
8	0.036	0.003	77	0.20	0.35
9	NR	NR	NR		
10	0.0308	0.004	96.9	-0.55	-0.79
11	0.043	0.0128	106	1.21	0.64
12	0.036	0.01	110	0.20	0.14
13	NR	NR	NR		
14	NT	NT	NT		
15**	43.755	NR	83	6,317.98	16,192.74
16	0.033	0.010	92	-0.23	-0.15
17	0.02221	NR	NR	-1.79	-4.59
18	0.0262	0.00786	76	-1.21	-1.01
19	NT	NR	NT		
20	0.035	0.0074	86	0.06	0.05
21	0.03	0.0008	NR	-0.66	-1.63
22	0.034	0.0099	86	-0.09	-0.06
23	NS	NS	NS		
24	0.0378	NR	NR	0.46	1.19
25	0.033	0.006	NR	-0.23	-0.24
26	0.037	0.0061	90	0.35	0.36
27	0.034	0.017	NR	-0.09	-0.03
28	NT	NT	NT		
29	0.035	0.0069	NR	0.06	0.05
30	0.044	0.02	85	1.36	0.47
31	NT	NT	NT		
32	NT	NT	NT		
33	0.0406	0	97	0.87	2.22
34	NT	NT	NT		
35	0.0349	0.0105	63	0.04	0.03
36	0.029	0.009	89	-0.81	-0.60
37	NT	NT	NT		
38*	0.014	0.0007	NR	-2.98	-7.39

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0346	0.0027
Spike Value	0.0376	0.0019
Robust Average	0.0342	0.0029
Median	0.0349	0.0022
Mean	0.0336	
N	23	
Max	0.044	
Min	0.014	
Robust SD	0.0056	
Robust CV	16%	

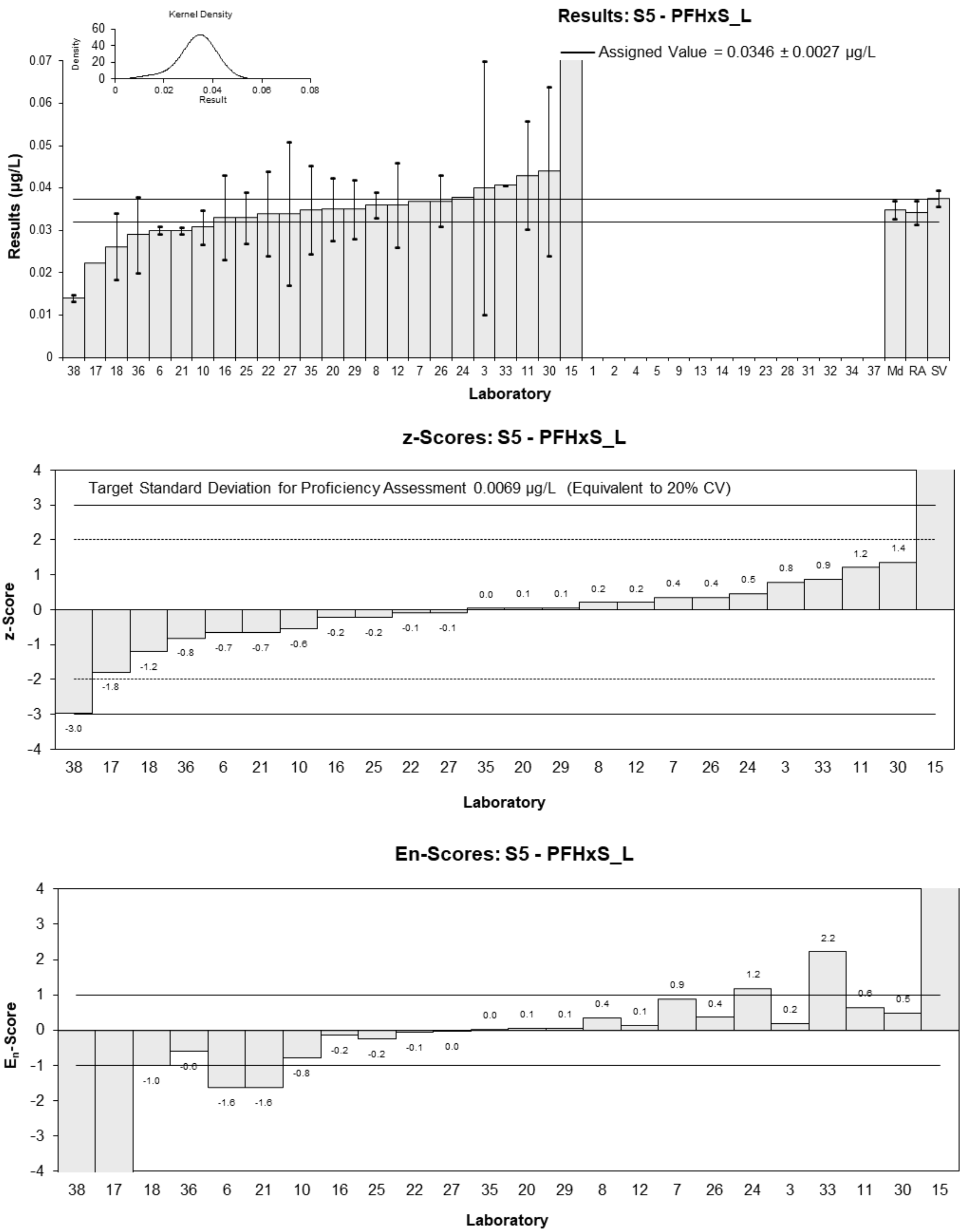

Results: S5 - PFHxS_L
Assigned Value = 0.0346 ± 0.0027 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.0069 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFHxS_L
En-Score
Laboratory

Figure 95

Table 100

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFHpS
Unit	µg/L

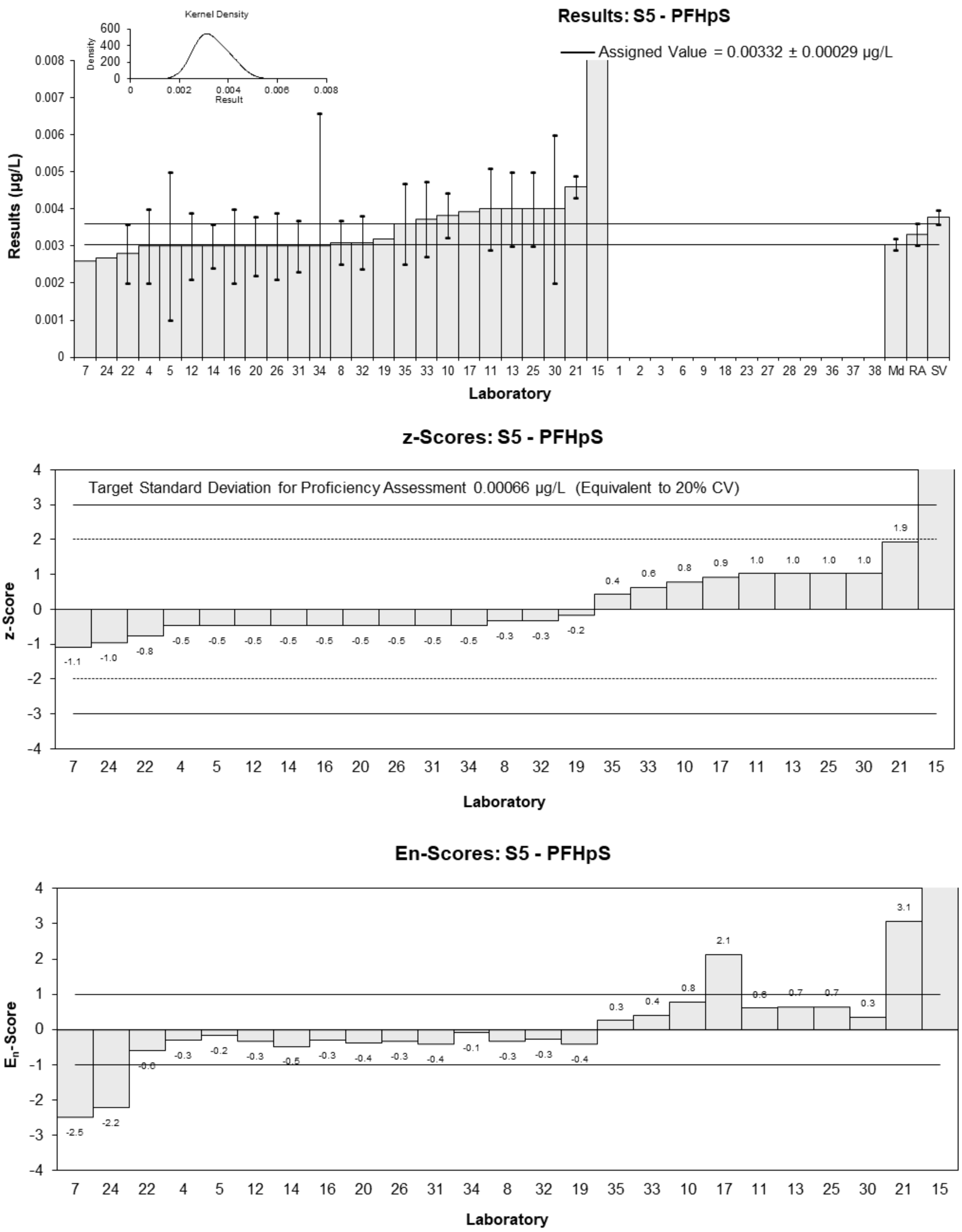
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	84		
4	0.003	0.001	NR	-0.48	-0.31
5	0.003	0.002	NR	-0.48	-0.16
6	<0.01	NR	124		
7	0.0026	NR	NR	-1.08	-2.48
8	0.0031	0.0006	77	-0.33	-0.33
9	<0.01	NR	90		
10	0.00384	0.0006	107	0.78	0.78
11	0.004	0.0011	103	1.02	0.60
12	0.003	0.0009	110	-0.48	-0.34
13	0.004	0.001	NR	1.02	0.65
14	0.003	0.0006	93	-0.48	-0.48
15**	3.5165	NR	79	5,290.93	12,114.41
16	0.003	0.001	NR	-0.48	-0.31
17	0.003936	NR	NR	0.93	2.12
18	< 0.025	NR	76		
19	0.0032	NR	121	-0.18	-0.41
20	0.003	0.0008	86	-0.48	-0.38
21	0.0046	0.0003	NR	1.93	3.07
22	0.0028	0.0008	86	-0.78	-0.61
23	NS	NS	NS		
24	0.00268	NR	NR	-0.96	-2.21
25	0.004	0.001	NR	1.02	0.65
26	0.0030	0.00089	90	-0.48	-0.34
27	< 0.02	0.01	NR		
28	NT	NT	NT		
29	NR	NR	NR		
30	0.004	0.002	96	1.02	0.34
31	0.0030	0.0007	120.78	-0.48	-0.42
32	0.0031	0.00071	99.84	-0.33	-0.29
33	0.00373	0.00102	NR	0.62	0.39
34	0.003	0.0036	107.35	-0.48	-0.09
35	0.0036	0.0011	63	0.42	0.25
36	<0.01	NR	81		
37	NT	NT	NT		
38	<0.01	NR	187		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.00332	0.00029
Spike Value	0.00378	0.00019
Robust Average	0.00332	0.00029
Median	0.00305	0.00015
Mean	0.00334	
N	24	
Max	0.0046	
Min	0.0026	
Robust SD	0.00056	
Robust CV	17%	



Results: S5 - PFHpS
Assigned Value = 0.00332 ± 0.00029 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
7 24 22 4 5 12 14 16 20 26 31 34 8 32 19 35 33 10 17 11 13 25 30 21 15 1 2 3 6 9 18 23 27 28 29 36 37 38 Md RA SV
z-Scores: S5 - PFHpS
Target Standard Deviation for Proficiency Assessment 0.00066 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFHpS
E_n-Score
Laboratory

Figure 96

Table 101

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFOS
Unit	µg/L

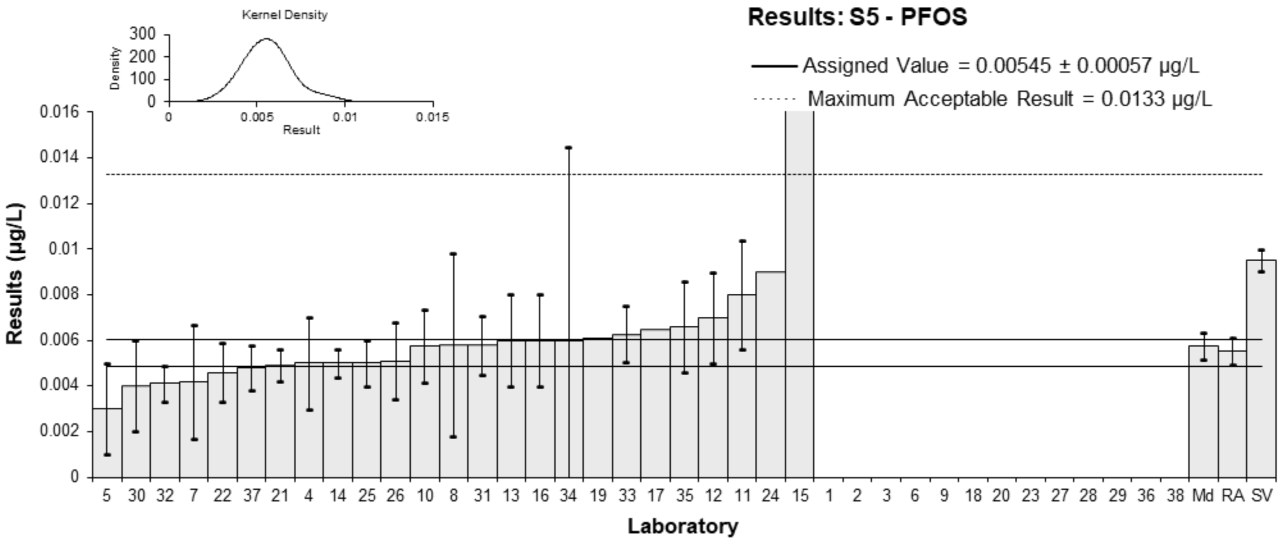
Participant Results

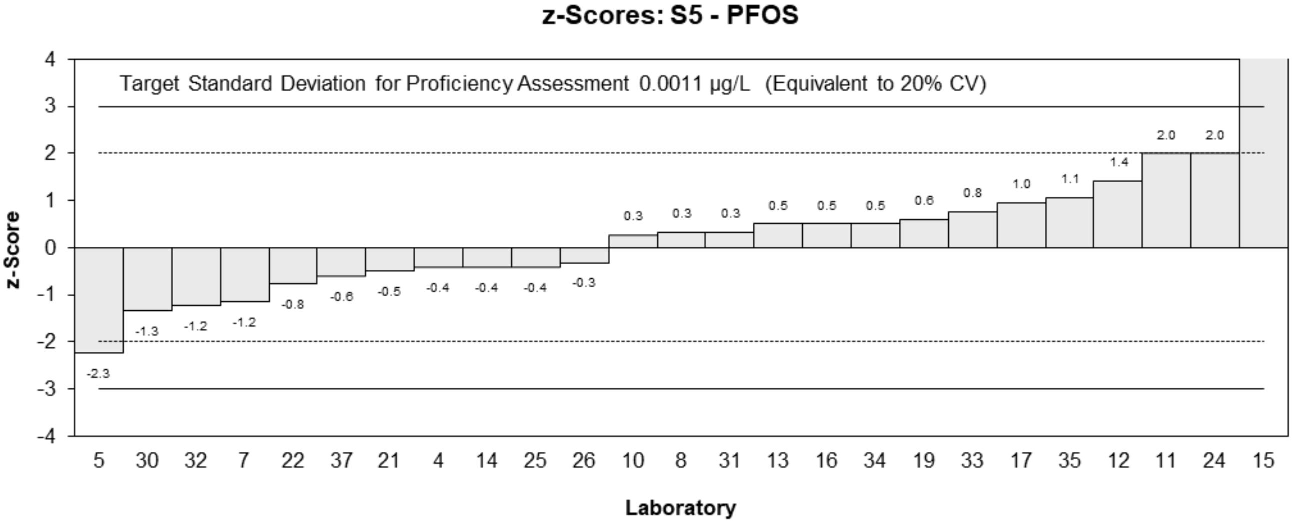
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	81		
4	0.005	0.002	91.7	-0.41	-0.22
5	0.003	0.002	NR	-2.25	-1.18
6	<0.01	NR	119		
7	0.0042	0.0025	115	-1.15	-0.49
8	0.0058	0.004	79	0.32	0.09
9	<0.01	NR	90		
10	0.00576	0.0016	107	0.28	0.18
11	0.008	0.0024	103	2.00▼	
12	0.007	0.002	83	1.42	0.75
13	0.006	0.002	81	0.50	0.26
14	0.005	0.0006	76	-0.41	-0.54
15**	6.2925	NR	79	5,767.94	11,029.91
16	0.006	0.002	88	0.50	0.26
17	0.006501	NR	NR	0.96	1.84
18	< 0.017	NR	57		
19	0.0061	NR	121	0.60	1.14
20	<0.007	NR	73		
21	0.0049	0.0007	NR	-0.50	-0.61
22	0.0046	0.0013	78	-0.78	-0.60
23	NS	NS	NS		
24*	0.00901	NR	NR	2.00▼	
25	0.005	0.001	89	-0.41	-0.39
26	0.0051	0.0017	76	-0.32	-0.20
27	< 0.02	0.01	109		
28	<0.01	NR	85		
29	NR	NR	NR		
30	0.004	0.002	96	-1.33	-0.70
31	0.0058	0.0013	112.98	0.32	0.25
32	0.0041	0.00081	98.38	-1.24	-1.36
33	0.00628	0.00123	NR	0.76	0.61
34	0.006	0.0085	115.28	0.50	0.06
35	0.0066	0.0020	60	1.06	0.55
36	<0.01	NR	92		
37	0.0048	0.00096	NR	-0.60	-0.58
38	<0.01	NR	126		

* Outlier, ** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.00545	0.00057
Spike Value	0.00950	0.00048
Robust Average	0.00554	0.00059
Max Acceptable Result	0.0133	
Median	0.00578	0.00059
Mean	0.00561	
N	24	
Max	0.00901	
Min	0.003	
Robust SD	0.0012	
Robust CV	21%	


Results: S5 - PFOS
Assigned Value = 0.00545 ± 0.00057 µg/L
Maximum Acceptable Result = 0.0133 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
5 30 32 7 22 37 21 4 14 25 26 10 8 31 13 16 34 19 33 17 35 12 11 24 15 1 2 3 6 9 18 20 23 27 28 29 36 38 Md RA SV


z-Scores: S5 - PFOS
Target Standard Deviation for Proficiency Assessment 0.0011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
5 30 32 7 22 37 21 4 14 25 26 10 8 31 13 16 34 19 33 17 35 12 11 24 15

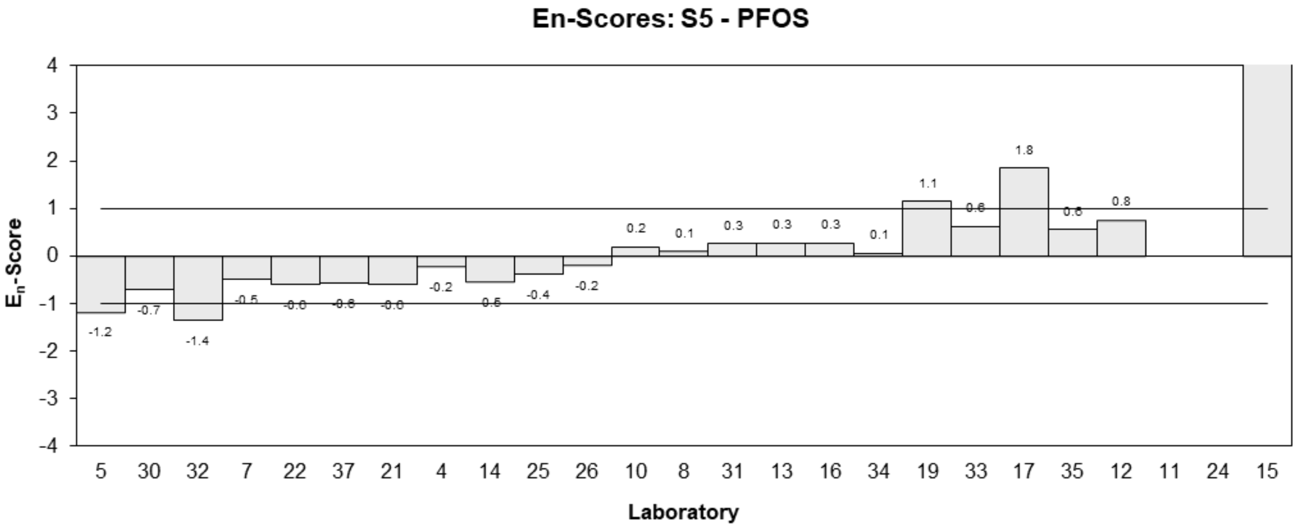

En-Scores: S5 - PFOS
E_n-Score
Laboratory
5 30 32 7 22 37 21 4 14 25 26 10 8 31 13 16 34 19 33 17 35 12 11 24 15

Figure 97

Table 102

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFOS_L
Unit	µg/L

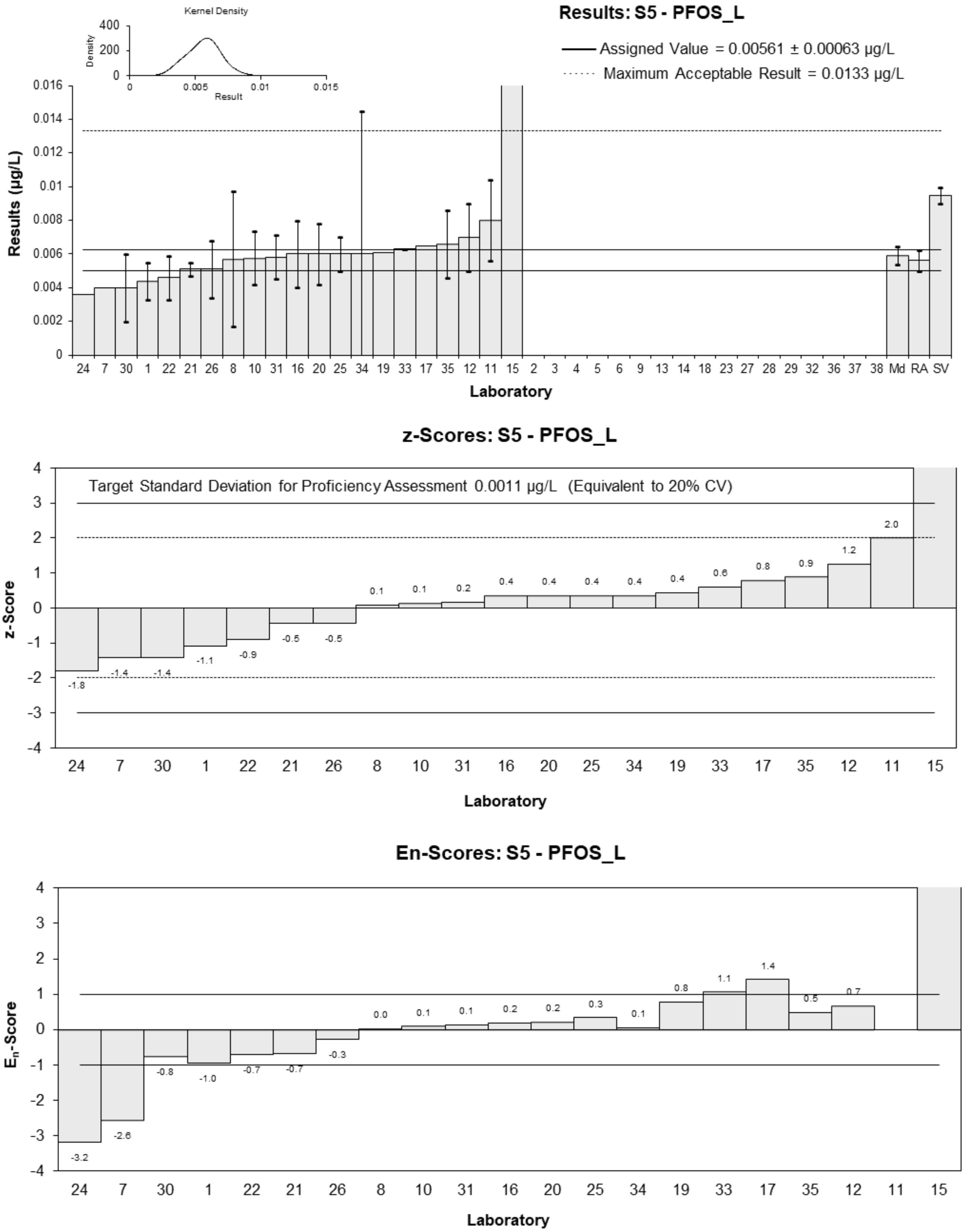
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0044	0.0011	95.1	-1.08	-0.95
2	NS	NS	NS		
3	<0.01	NR	81		
4	NR	NR	NR		
5	NT	NT	NT		
6	<0.01	NR	119		
7	0.004	NR	NR	-1.43	-2.56
8	0.0057	0.004	79	0.08	0.02
9	NR	NR	NR		
10	0.00576	0.0016	107	0.13	0.09
11	0.008	0.0024	103	2.00▼	
12	0.007	0.002	83	1.24	0.66
13	NR	NR	NR		
14	NT	NT	NT		
15**	6.2925	NR	79	5,603.29	9,979.19
16	0.006	0.002	88	0.35	0.19
17	0.006501	NR	NR	0.79	1.41
18	< 0.017	NR	57		
19	0.0061	NR	121	0.44	0.78
20	0.006	0.0018	73	0.35	0.20
21	0.0051	0.0004	NR	-0.45	-0.68
22	0.0046	0.0013	78	-0.90	-0.70
23	NS	NS	NS		
24	0.0036	NR	NR	-1.79	-3.19
25	0.006	0.001	NR	0.35	0.33
26	0.0051	0.0017	76	-0.45	-0.28
27	< 0.02	0.01	NR		
28	NT	NT	NT		
29	NR	NR	NR		
30	0.004	0.002	96	-1.43	-0.77
31	0.0058	0.0013	112.98	0.17	0.13
32	NT	NT	NT		
33	0.00628	0	101	0.60	1.06
34	0.006	0.0085	115.28	0.35	0.05
35	0.0066	0.0020	60	0.88	0.47
36	<0.01	NR	92		
37	NT	NT	NT		
38	<0.01	NR	NR		

** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.00561	0.00063
Spike Value	0.00950	0.00048
Robust Average	0.00561	0.00063
Max Acceptable Result	0.0133	
Median	0.00590	0.00054
Mean	0.00563	
N	20	
Max	0.008	
Min	0.0036	
Robust SD	0.0011	
Robust CV	20%	



Results: S5 - PFOS_L
Assigned Value = 0.00561 ± 0.00063 µg/L
Maximum Acceptable Result = 0.0133 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFOS_L
Target Standard Deviation for Proficiency Assessment 0.0011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFOS_L
E_n-Score
Laboratory

Figure 98

Table 103

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFNS
Unit	µg/L

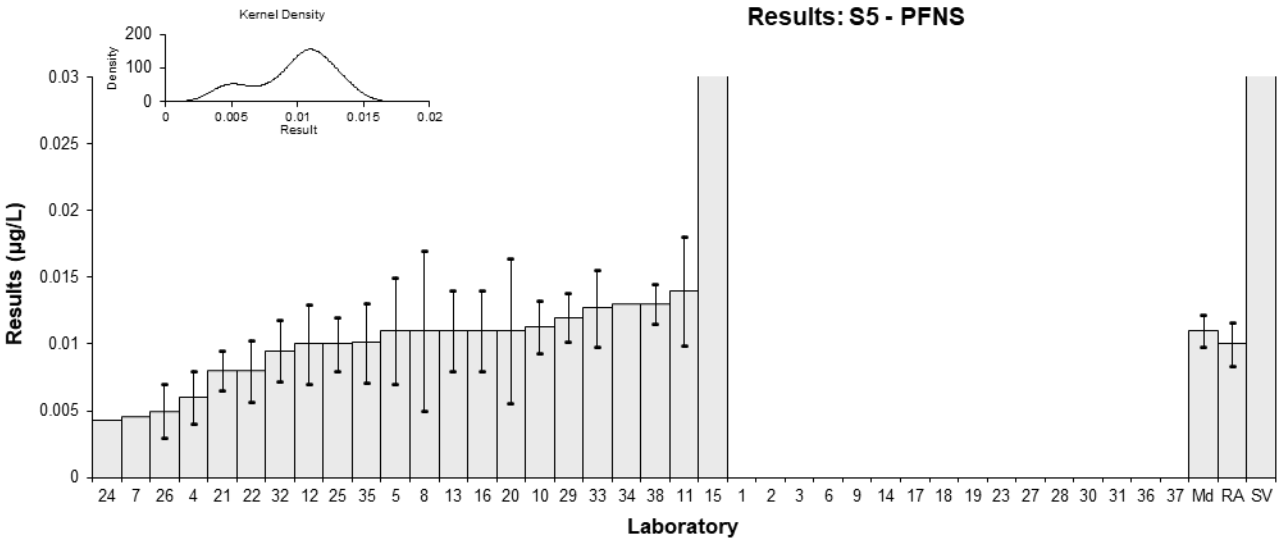
Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	NT	NT	NT
4	0.006	0.002	NR
5	0.011	0.004	NR
6	<0.02	NR	119
7	0.0046	NR	NR
8	0.011	0.006	79
9	<0.01	NR	90
10	0.0113	0.002	107
11	0.014	0.0041	103
12	0.01	0.003	83
13	0.011	0.003	NR
14	NT	NT	NT
15**	7.4114	NR	83
16	0.011	0.003	NR
17	NT	NT	NT
18	< 17.0	NR	76
19	NT	NR	NT
20	0.011	0.0054	73
21	0.008	0.0015	NR
22	0.008	0.0023	78
23	NS	NS	NS
24	0.00426	NR	NR
25	0.01	0.002	NR
26	0.0050	0.0020	76
27	< 0.02	0.01	NR
28	NT	NT	NT
29	0.012	0.0018	NR
30	< 0.04	NR	96
31	NT	NT	NT
32	0.0095	0.00232	98.38
33	0.0127	0.00286	NR
34	0.013	NR	115.28
35	0.0101	0.0030	60
36	<0.01	NR	83
37	NT	NT	NT
38	0.013	0.0015	126

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	0.0381	0.0019
Robust Average	0.0100	0.0016
Median	0.0110	0.0012
Mean	0.0098	
N	21	
Max	0.014	
Min	0.00426	
Robust SD	0.0030	
Robust CV	30%	



Kernel Density
Density
200
100
0
0
0.005
0.01
0.015
0.02
Result
Results: S5 - PFNS
Results (µg/L)
0.03
0.025
0.02
0.015
0.01
0.005
0
24 7 26 4 21 22 32 12 25 35 5 8 13 16 20 10 29 33 34 38 11 15 1 2 3 6 9 14 17 18 19 23 27 28 30 31 36 37 Md RA SV
Laboratory

Figure 99

Table 104

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFDS
Unit	µg/L

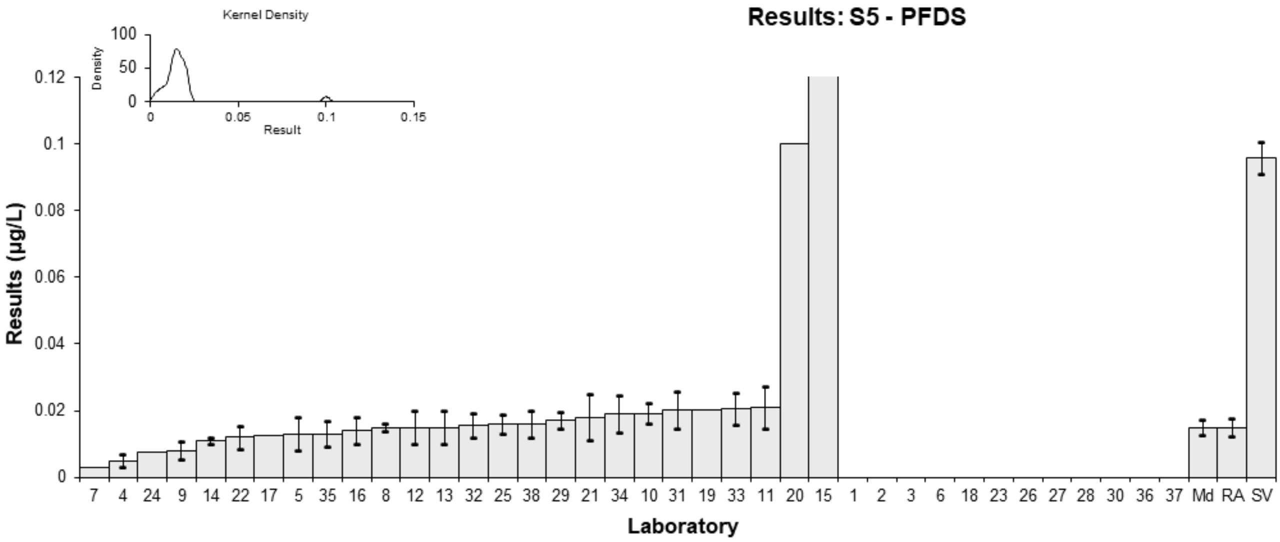
Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	<0.02	NR	85
4	0.005	0.002	NR
5	0.013	0.005	NR
6	<0.02	NR	119
7	0.0028	NR	NR
8	0.015	0.001	79
9	0.008	0.0028	51
10	0.0192	0.003	107
11	0.021	0.0063	103
12	0.015	0.005	85
13	0.015	0.005	NR
14	0.011	0.001	76
15**	5.5171	NR	79
16	0.014	0.004	NR
17	0.01233	NR	NR
18	< 0.025	NR	43
19	0.0203	NR	121
20	0.1	NR	73
21	0.018	0.0070	NR
22	0.012	0.0035	78
23	NS	NS	NS
24	0.00749	NR	NR
25	0.016	0.003	NR
26	< 0.0050	NR	76
27	< 0.09	0.045	NR
28	NT	NT	NT
29	0.017	0.0025	NR
30	< 0.02	NR	96
31	0.0202	0.0057	112.98
32	0.0156	0.00376	98.38
33	0.0205	0.00485	NR
34	0.019	0.0055	115.28
35	0.0130	0.0039	60
36	<0.01	NR	86
37	NT	NT	NT
38	0.016	0.0041	126

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	0.0958	0.0048
Robust Average	0.0150	0.0026
Median	0.0150	0.0022
Mean	0.0179	
N	25	
Max	0.1	
Min	0.0028	
Robust SD	0.0052	
Robust CV	34%	



Kernel Density
Density
Result
Results: S5 - PFDS
Results (µg/L)
Laboratory
7
4
24
9
14
22
17
5
35
16
8
12
13
32
25
38
29
21
34
10
31
19
33
11
20
15
1
2
3
6
18
23
26
27
28
30
36
37
Md
RA
SV

Figure 100

Table 105

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFDoS
Unit	µg/L

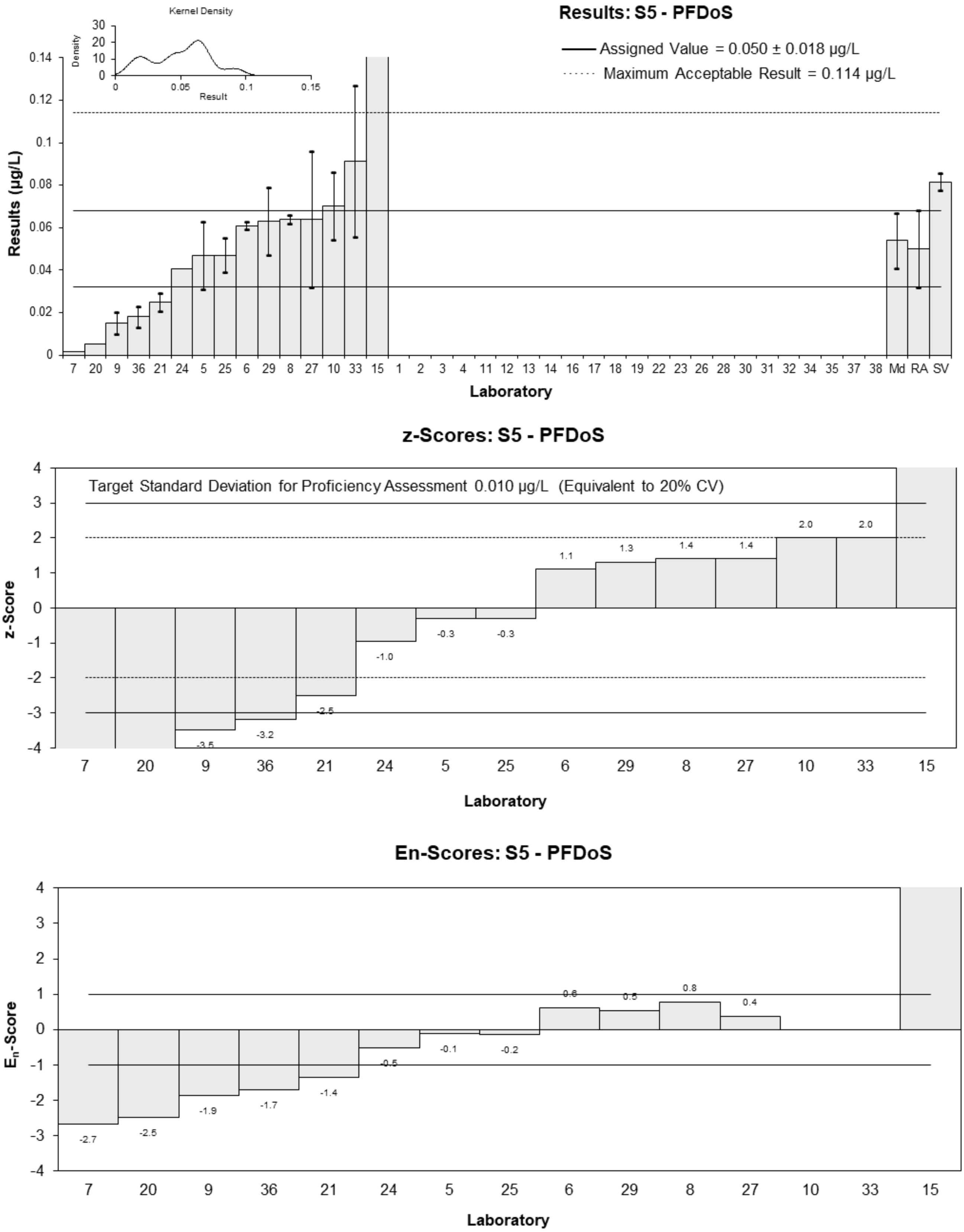
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	NT	NT	NT		
4	NR	NR	NR		
5	0.047	0.016	NR	-0.30	-0.12
6	0.061	0.0018	119	1.10	0.61
7**	0.0018	NR	NR	-4.82	-2.68
8	0.064	0.002	56	1.40	0.77
9*	0.015	0.00525	51	-3.50	-1.87
10	0.0701	0.016	107	2.00▼	
11	NT	NT	NT		
12	NT	NT	NT		
13	NT	NT	NT		
14	NT	NT	NT		
15**	10.4535	NR	83	1,040.35	577.97
16	NT	NT	NT		
17	NT	NT	NT		
18	< 17.0	NR	39		
19	NT	NR	NT		
20**	0.005	NR	73	-4.50	-2.50
21*	0.025	0.0042	NR	-2.50	-1.35
22	NT	NT	NT		
23	NS	NS	NS		
24	0.0404	NR	NR	-0.96	-0.53
25	0.047	0.008	NR	-0.30	-0.15
26	NT	NT	NT		
27	0.064	0.032	NR	1.40	0.38
28	NT	NT	NT		
29	0.063	0.016	NR	1.30	0.54
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
33*	0.0912	0.0357	NR	2.00▼	
34	NT	NT	NT		
35	NT	NT	NT		
36*	0.018	0.005	87	-3.20	-1.71
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, ** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.050	0.018
Spike Value	0.0816	0.0041
Robust Average	0.050	0.018
Max Acceptable Result	0.114	
Median	0.054	0.013
Mean	0.050	
N	12	
Max	0.0912	
Min	0.015	
Robust SD	0.025	
Robust CV	51%	



Results: S5 - PFDoS
Assigned Value = 0.050 ± 0.018 µg/L
Maximum Acceptable Result = 0.114 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFDoS
Target Standard Deviation for Proficiency Assessment 0.010 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFDoS
En-Score
Laboratory

Figure 101

Table 106

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFBA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3*	0.03	0.03	87	-4.34	-6.09
4	0.239	0.06	103.1	0.22	0.16
5	0.24	0.084	NR	0.24	0.13
6	0.25	0.0075	40	0.46	1.40
7	0.24	NR	99	0.24	0.85
8	0.24	0.009	76	0.24	0.70
9	0.212	0.0742	96	-0.37	-0.23
10	0.251	0.0276	94.7	0.48	0.72
11	0.268	0.0803	89	0.85	0.48
12	0.24	0.07	69	0.24	0.15
13	0.238	0.057	66	0.20	0.15
14	0.261	0.04	108	0.70	0.76
15**	263.3792	NR	88	5,745.64	20,242.32
16	0.218	0.065	54	-0.24	-0.17
17	0.1620	NR	NR	-1.46	-5.15
18	0.211	0.0633	71	-0.39	-0.28
19	0.1932	0.08	179	-0.78	-0.44
20	0.226	0.0565	99	-0.07	-0.05
21	NT	NT	NT		
22	0.22	0.064	96	-0.20	-0.14
23	NS	NS	NS		
24	0.2147	NR	NR	-0.31	-1.10
25	0.24	0.04	100	0.24	0.26
26	0.24	0.20	100	0.24	0.05
27	0.22	0.11	106	-0.20	-0.08
28	NT	NT	NT		
29	0.27	0.040	98	0.90	0.97
30	0.28	0.1	89	1.11	0.51
31	0.215	0.046	121.64	-0.31	-0.29
32	0.211	0.0571	111.5	-0.39	-0.31
33	0.282	0.0615	91	1.16	0.84
34	0.2	0.05	138.26	-0.63	-0.56
35	0.2055	0.0617	50	-0.51	-0.37
36	0.199	0.06	79	-0.66	-0.49
37	0.22	0.044	NR	-0.20	-0.20
38	0.190	0.0247	108	-0.85	-1.40

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.229	0.013
Spike Value	0.232	0.012
Robust Average	0.228	0.013
Median	0.223	0.011
Mean	0.223	
N	32	
Max	0.282	
Min	0.03	
Robust SD	0.029	
Robust CV	13%	

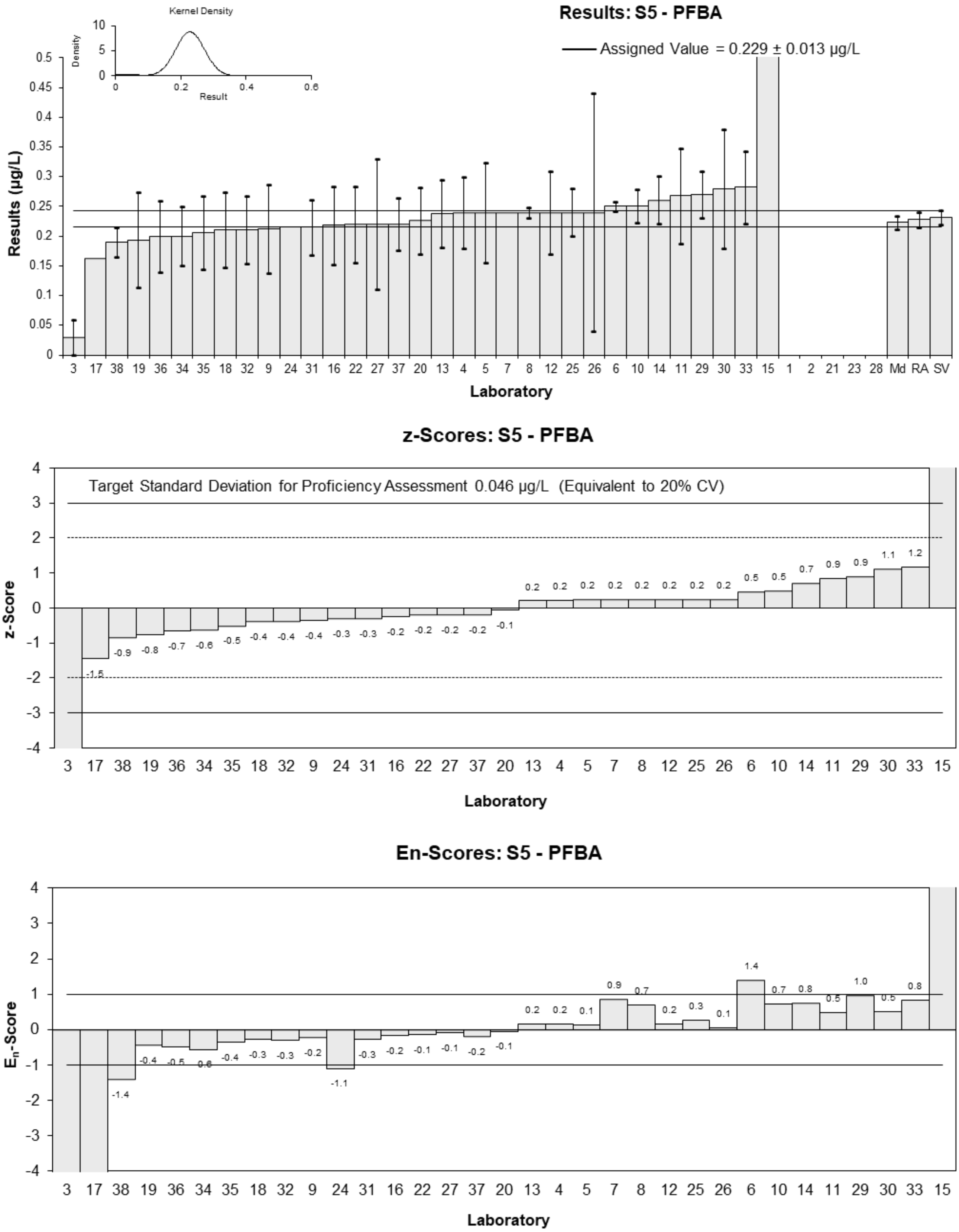

Results: S5 - PFBA
Assigned Value = 0.229 ± 0.013 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
3 17 38 19 36 34 35 18 32 9 24 31 16 22 27 37 20 13 4 5 7 8 12 25 26 6 10 14 11 29 30 33 15 1 2 21 23 28 Md RA SV
z-Scores: S5 - PFBA
Target Standard Deviation for Proficiency Assessment 0.046 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFBA
En-Score
Laboratory

Figure 102

Table 107

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFPeA
Unit	µg/L

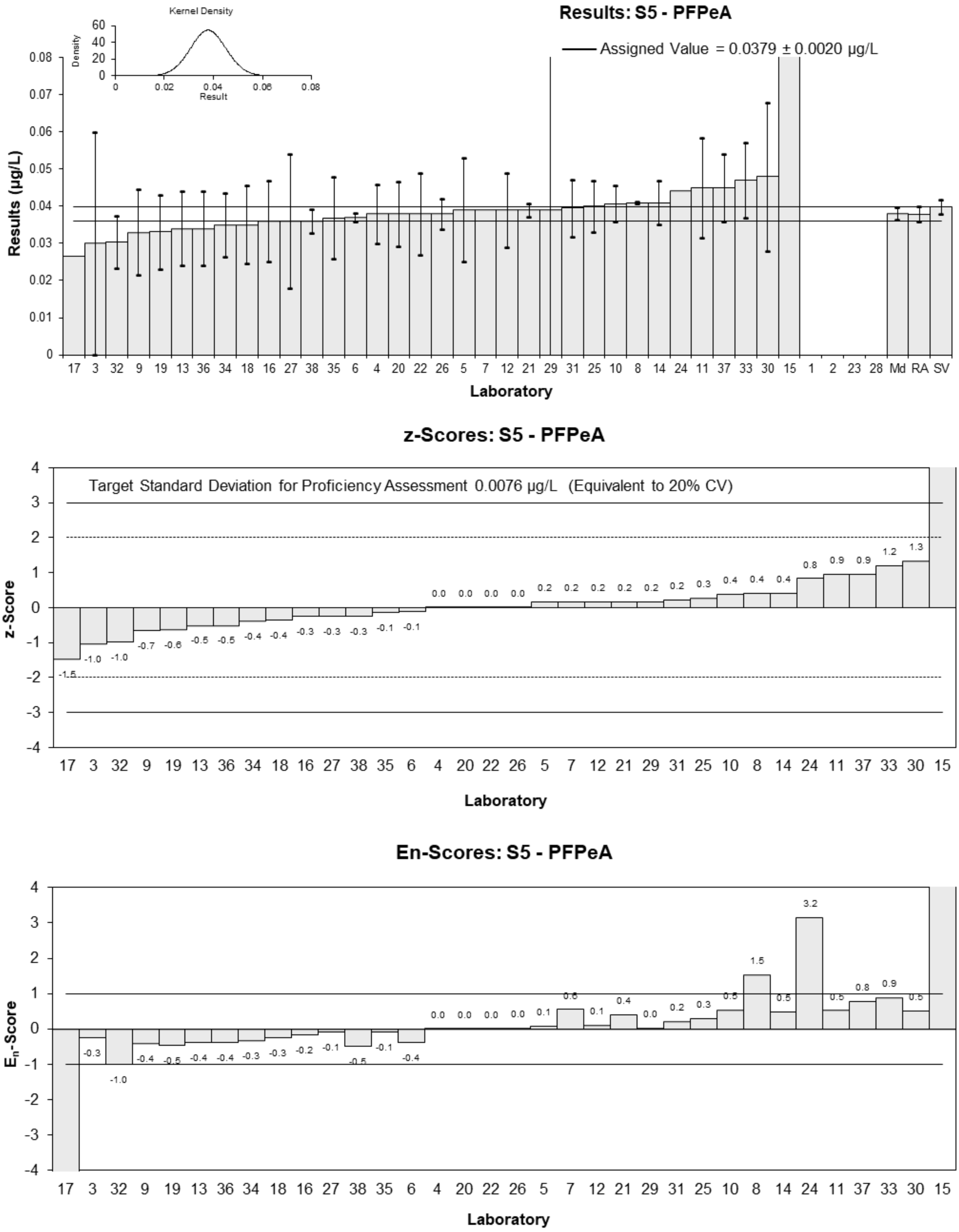
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.03	0.03	85	-1.04	-0.26
4	0.038	0.008	103.5	0.01	0.01
5	0.039	0.014	NR	0.15	0.08
6	0.037	0.0011	135	-0.12	-0.39
7	0.039	NR	103	0.15	0.55
8	0.041	0.0002	78	0.41	1.54
9	0.033	0.01155	105	-0.65	-0.42
10	0.0407	0.00488	103	0.37	0.53
11	0.045	0.0135	98	0.94	0.52
12	0.039	0.01	131	0.15	0.11
13	0.034	0.01	60	-0.51	-0.38
14	0.041	0.006	97	0.41	0.49
15**	44.403	NR	85	5,852.92	22,182.55
16	0.036	0.011	73	-0.25	-0.17
17	0.02665	NR	NR	-1.48	-5.63
18	0.0351	0.01053	70	-0.37	-0.26
19	0.0331	0.01	139	-0.63	-0.47
20	0.038	0.0087	96	0.01	0.01
21	0.039	0.0018	NR	0.15	0.41
22	0.038	0.011	100	0.01	0.01
23	NS	NS	NS		
24	0.0442	NR	NR	0.83	3.15
25	0.04	0.007	122	0.28	0.29
26	0.038	0.0041	104	0.01	0.02
27	0.036	0.018	108	-0.25	-0.10
28	NT	NT	NT		
29	0.039	0.058	99	0.15	0.02
30	0.048	0.02	87	1.33	0.50
31	0.0395	0.0077	106.82	0.21	0.20
32	0.0304	0.00715	109.24	-0.99	-1.01
33	0.0470	0.0102	91	1.20	0.88
34	0.035	0.0087	117.61	-0.38	-0.32
35	0.0369	0.0111	72	-0.13	-0.09
36	0.034	0.01	83	-0.51	-0.38
37	0.045	0.009	NR	0.94	0.77
38	0.036	0.0032	176	-0.25	-0.50

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0379	0.0020
Spike Value	0.0399	0.0020
Robust Average	0.0379	0.0020
Median	0.0380	0.0017
Mean	0.0379	
N	33	
Max	0.048	
Min	0.02665	
Robust SD	0.0045	
Robust CV	12%	



Kernel Density
Results: S5 - PFPeA
Assigned Value = 0.0379 ± 0.0020 µg/L
Results (µg/L)
Laboratory
z-Scores: S5 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.0076 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFPeA
E_n-Score
Laboratory

Figure 103

Table 108

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFHxA
Unit	µg/L

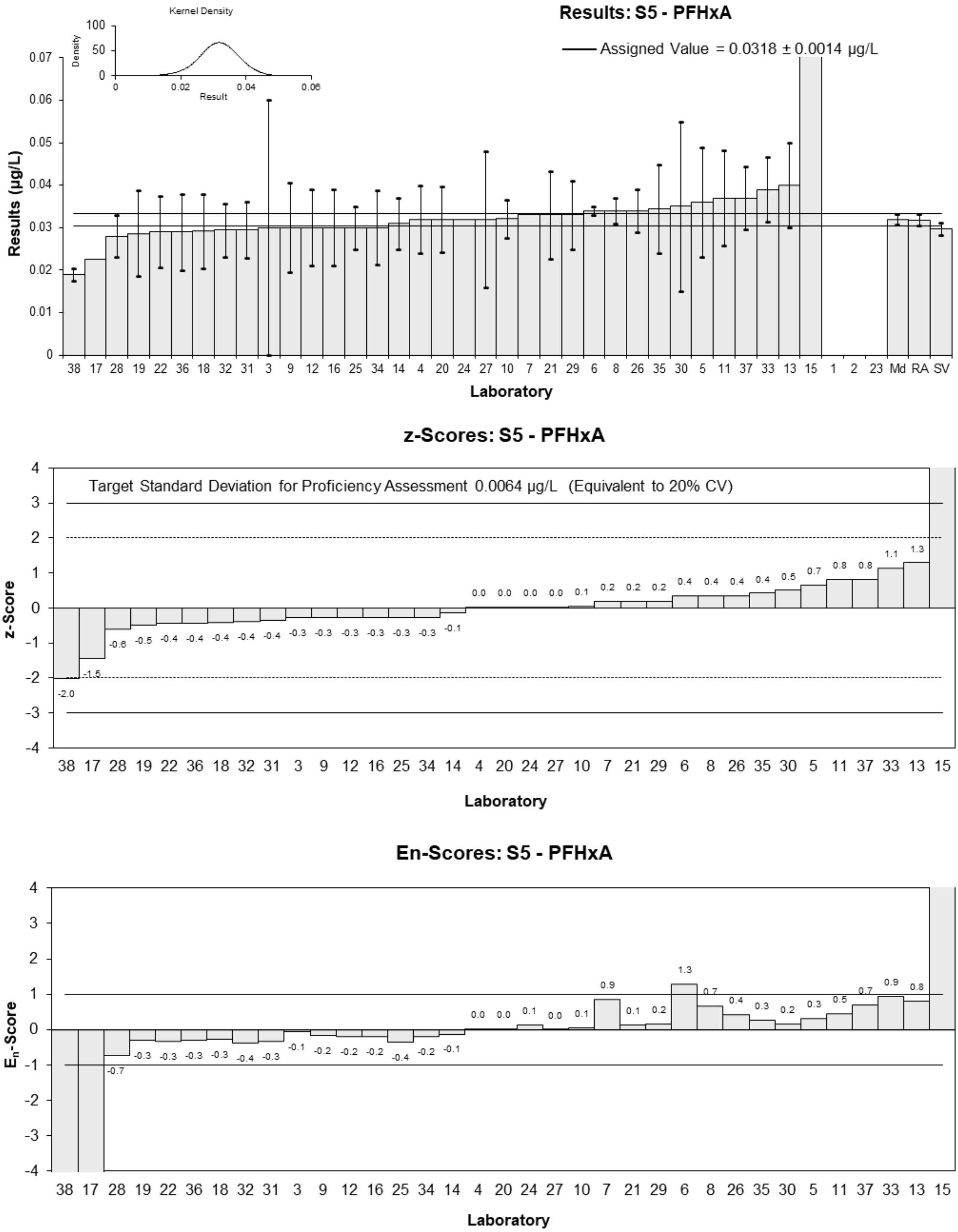
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.03	0.03	86	-0.28	-0.06
4	0.032	0.008	101.4	0.03	0.02
5	0.036	0.013	NR	0.66	0.32
6	0.034	0.001	115	0.35	1.28
7	0.033	NR	95	0.19	0.86
8	0.034	0.003	77	0.35	0.66
9	0.03	0.0105	105	-0.28	-0.17
10	0.0321	0.0045	92.1	0.05	0.06
11	0.037	0.0112	103	0.82	0.46
12	0.03	0.009	71	-0.28	-0.20
13	0.04	0.01	61	1.29	0.81
14	0.031	0.006	92	-0.13	-0.13
15**	37.0735	NR	86	5,824.17	26,458.36
16	0.030	0.009	78	-0.28	-0.20
17	0.02252	NR	NR	-1.46	-6.63
18	0.0292	0.00876	74	-0.41	-0.29
19	0.0287	0.01	130	-0.49	-0.31
20	0.032	0.0077	93	0.03	0.03
21	0.033	0.0103	NR	0.19	0.12
22	0.029	0.0084	100	-0.44	-0.33
23	NS	NS	NS		
24	0.032	NR	NR	0.03	0.14
25	0.03	0.005	105	-0.28	-0.35
26	0.034	0.0051	98	0.35	0.42
27	0.032	0.016	101	0.03	0.01
28	0.028	0.005	103	-0.60	-0.73
29	0.033	0.0081	87	0.19	0.15
30	0.035	0.02	87	0.50	0.16
31	0.0295	0.0067	97.45	-0.36	-0.34
32	0.0294	0.00619	104.77	-0.38	-0.38
33	0.0390	0.0076	93	1.13	0.93
34	0.03	0.0088	114.96	-0.28	-0.20
35	0.0345	0.0104	75	0.42	0.26
36	0.029	0.009	94	-0.44	-0.31
37	0.037	0.0074	NR	0.82	0.69
38	0.019	0.0015	171	-2.01	-6.24

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0318	0.0014
Spike Value	0.0297	0.0015
Robust Average	0.0318	0.0014
Median	0.0320	0.0013
Mean	0.0316	
N	34	
Max	0.04	
Min	0.019	
Robust SD	0.0033	
Robust CV	10%	



Results: S5 - PFHxA
Assigned Value = 0.0318 ± 0.0014 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFHxA
Target Standard Deviation for Proficiency Assessment 0.0064 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFHxA
En-Score
Laboratory

Figure 104

Table 109

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFHpA
Unit	µg/L

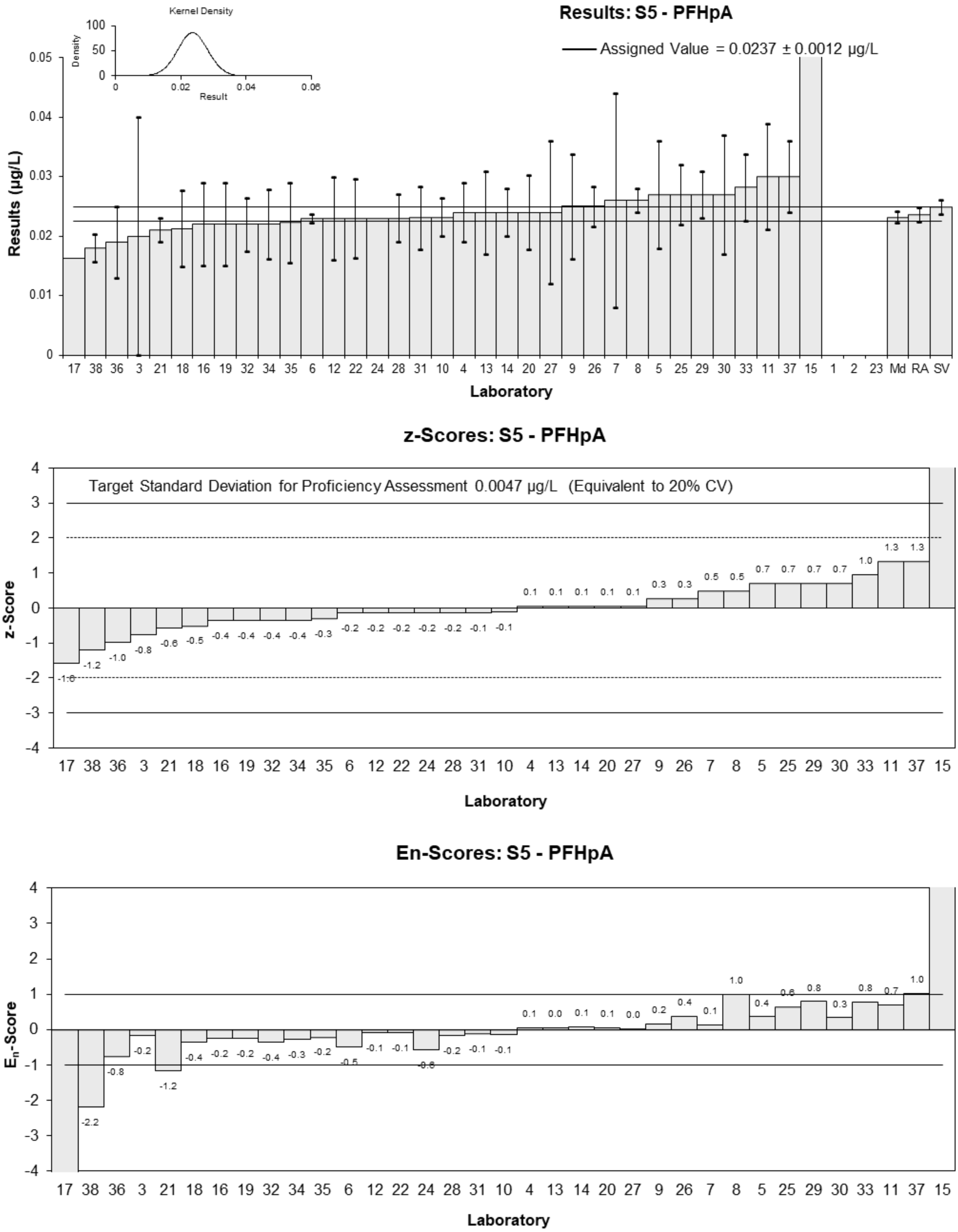
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.02	0.02	85	-0.78	-0.18
4	0.024	0.005	102.6	0.06	0.06
5	0.027	0.009	NR	0.70	0.36
6	0.023	0.0007	119	-0.15	-0.50
7	0.026	0.018	94	0.49	0.13
8	0.026	0.002	78	0.49	0.99
9	0.025	0.00875	105	0.27	0.15
10	0.0232	0.00325	81.8	-0.11	-0.14
11	0.030	0.0089	98	1.33	0.70
12	0.023	0.007	70	-0.15	-0.10
13	0.024	0.007	66	0.06	0.04
14	0.024	0.004	96	0.06	0.07
15**	27.7204	NR	85	5,843.19	23,080.58
16	0.022	0.007	81	-0.36	-0.24
17	0.01622	NR	NR	-1.58	-6.23
18	0.0213	0.00639	69	-0.51	-0.37
19	0.022	0.007	133	-0.36	-0.24
20	0.024	0.0062	91	0.06	0.05
21	0.021	0.0020	NR	-0.57	-1.16
22	0.023	0.0067	110	-0.15	-0.10
23	NS	NS	NS		
24	0.023	NR	NR	-0.15	-0.58
25	0.027	0.005	96	0.70	0.64
26	0.025	0.0033	95	0.27	0.37
27	0.024	0.012	101	0.06	0.02
28	0.023	0.004	102	-0.15	-0.17
29	0.027	0.004	90	0.70	0.79
30	0.027	0.01	92	0.70	0.33
31	0.0231	0.0053	114.56	-0.13	-0.11
32	0.022	0.00447	97.69	-0.36	-0.37
33	0.0282	0.00568	99	0.95	0.78
34	0.022	0.0058	125.62	-0.36	-0.29
35	0.0223	0.0067	68	-0.30	-0.21
36	0.019	0.006	92	-0.99	-0.77
37	0.03	0.006	NR	1.33	1.03
38	0.018	0.0023	186	-1.20	-2.20

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0237	0.0012
Spike Value	0.0249	0.0012
Robust Average	0.0237	0.0012
Median	0.0232	0.0010
Mean	0.0237	
N	34	
Max	0.03	
Min	0.01622	
Robust SD	0.0029	
Robust CV	12%	



Results: S5 - PFHpA
Assigned Value = 0.0237 ± 0.0012 µg/L
Kernel Density
Results (µg/L)
Laboratory
z-Scores: S5 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.0047 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFHpA
En-Score
Laboratory

Figure 105

Table 110

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFOA
Unit	µg/L

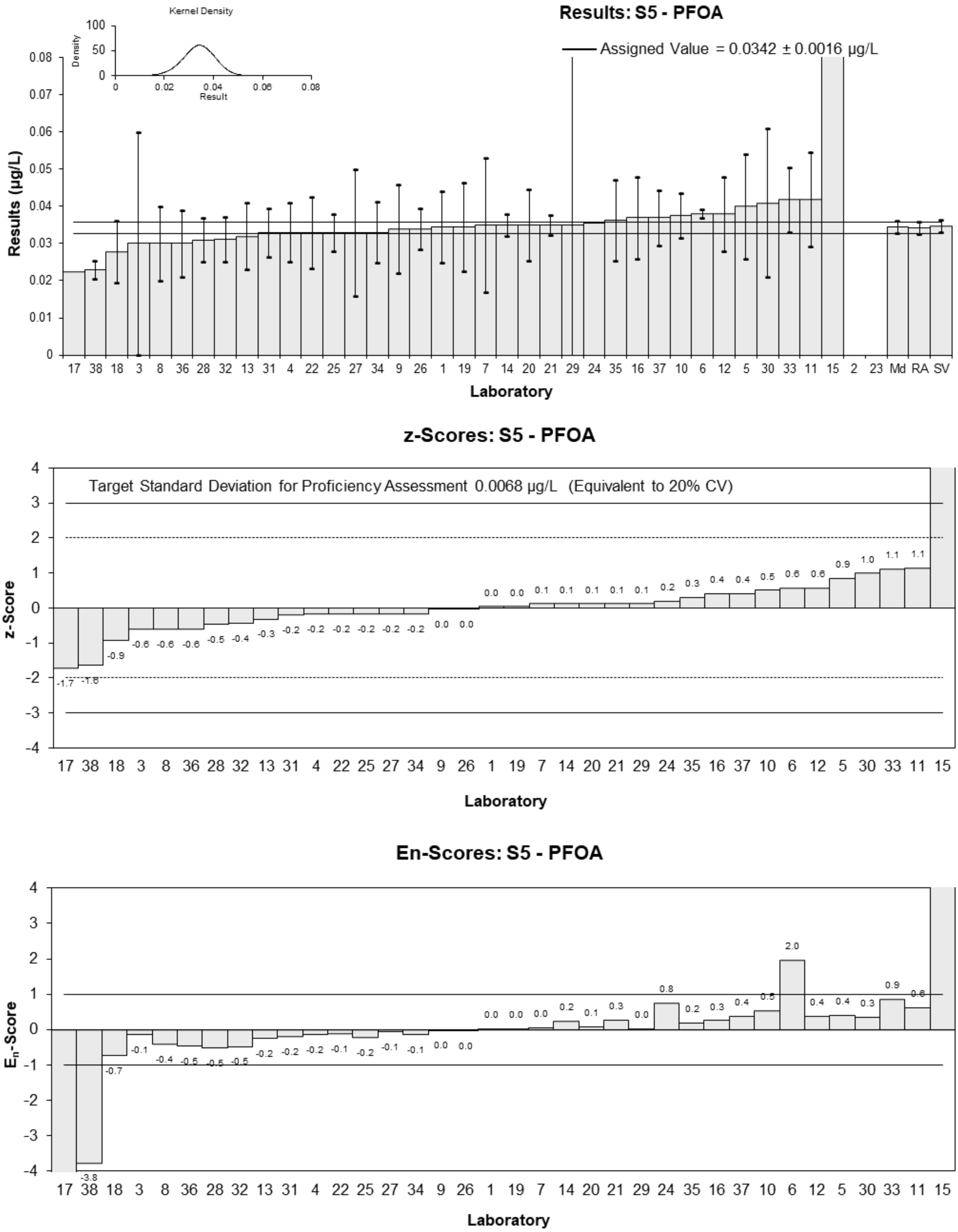
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0345	0.0097	108	0.04	0.03
2	NS	NS	NS		
3	0.03	0.03	87	-0.61	-0.14
4	0.033	0.008	101.7	-0.18	-0.15
5	0.040	0.014	NR	0.85	0.41
6	0.038	0.0011	128	0.56	1.96
7	0.035	0.018	99	0.12	0.04
8	0.03	0.01	96	-0.61	-0.41
9	0.034	0.0119	105	-0.03	-0.02
10	0.0376	0.00603	86.4	0.50	0.54
11	0.042	0.0127	97	1.14	0.61
12	0.038	0.01	135	0.56	0.38
13	0.032	0.009	74	-0.32	-0.24
14	0.035	0.003	97	0.12	0.24
15**	39.0902	NR	84	5,709.94	24,410.00
16	0.037	0.011	111	0.41	0.25
17	0.022478	NR	NR	-1.71	-7.33
18	0.0279	0.00837	76	-0.92	-0.74
19	0.0345	0.012	122	0.04	0.02
20	0.035	0.0095	92	0.12	0.08
21	0.035	0.0026	NR	0.12	0.26
22	0.033	0.0096	98	-0.18	-0.12
23	NS	NS	NS		
24	0.0354	NR	NR	0.18	0.75
25	0.033	0.005	90	-0.18	-0.23
26	0.034	0.0055	96	-0.03	-0.03
27	0.033	0.017	93	-0.18	-0.07
28	0.031	0.006	96	-0.47	-0.52
29	0.035	0.052	92	0.12	0.02
30	0.041	0.02	91	0.99	0.34
31	0.0329	0.0065	120.78	-0.19	-0.19
32	0.0312	0.00602	108.62	-0.44	-0.48
33	0.0418	0.00864	94	1.11	0.86
34	0.033	0.0082	124.71	-0.18	-0.14
35	0.0362	0.0109	69	0.29	0.18
36	0.03	0.009	87	-0.61	-0.46
37	0.037	0.0074	NR	0.41	0.37
38	0.023	0.0025	157	-1.64	-3.77

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0342	0.0016
Spike Value	0.0347	0.0017
Robust Average	0.0342	0.0016
Median	0.0345	0.0016
Mean	0.0340	
N	35	
Max	0.042	
Min	0.022478	
Robust SD	0.0038	
Robust CV	11%	



Results: S5 - PFOA
Assigned Value = 0.0342 ± 0.0016 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
17 38 18 3 8 36 28 32 13 31 4 22 25 27 34 9 26 1 19 7 14 20 21 29 24 35 16 37 10 6 12 5 30 33 11 15 2 23 Md RA SV
z-Scores: S5 - PFOA
Target Standard Deviation for Proficiency Assessment 0.0068 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFOA
En-Score
Laboratory

Figure 106

Table 111

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFNA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.01	NR	86		
4	0.004	0.001	93.0	-0.39	-0.32
5*	0.007	0.002	NR	3.06	1.31
6	<0.01	NR	123		
7	0.003	0.0018	98	-1.54	-0.73
8	0.0047	0.001	79	0.41	0.34
9	0.004	0.0014	105	-0.39	-0.24
10	0.0049	0.00093	97.8	0.65	0.57
11	0.006	0.0019	89	1.91	0.86
12	0.005	0.002	134	0.76	0.33
13*	0.007	0.002	76	3.06	1.31
14	0.005	0.0005	93	0.76	1.12
15	<10	NR	NR		
16	0.004	0.001	90	-0.39	-0.32
17	0.004109	NR	NR	-0.27	-0.75
18	< 0.017	NR	51		
19	0.0041	NR	152	-0.28	-0.77
20	0.005	0.0012	90	0.76	0.53
21	0.004	0.0002	NR	-0.39	-0.92
22	0.0039	0.0011	99	-0.51	-0.39
23	NS	NS	NS		
24	0.00352	NR	NR	-0.94	-2.65
25	0.004	0.001	75	-0.39	-0.32
26	0.0042	0.00081	97	-0.16	-0.16
27	< 0.03	0.015	104		
28	<0.02	NR	90		
29	NR	NR	NR		
30	0.004	0.002	91	-0.39	-0.17
31	0.0046	0.0010	107.17	0.30	0.25
32	0.0045	0.00082	101.19	0.18	0.18
33	0.00587	0.00101	98	1.76	1.45
34	0.004	0.0023	123.87	-0.39	-0.15
35	0.0044	0.0013	67	0.07	0.04
36	<0.01	NR	86		
37	NT	NT	NT		
38	<0.01	NR	121		

* Outlier, see Section 4.2

Statistics

Assigned Value	0.00434	0.00031
Spike Value	0.00498	0.00025
Robust Average	0.00446	0.00037
Median	0.00420	0.00022
Mean	0.00459	
N	25	
Max	0.007	
Min	0.003	
Robust SD	0.00074	
Robust CV	17%	

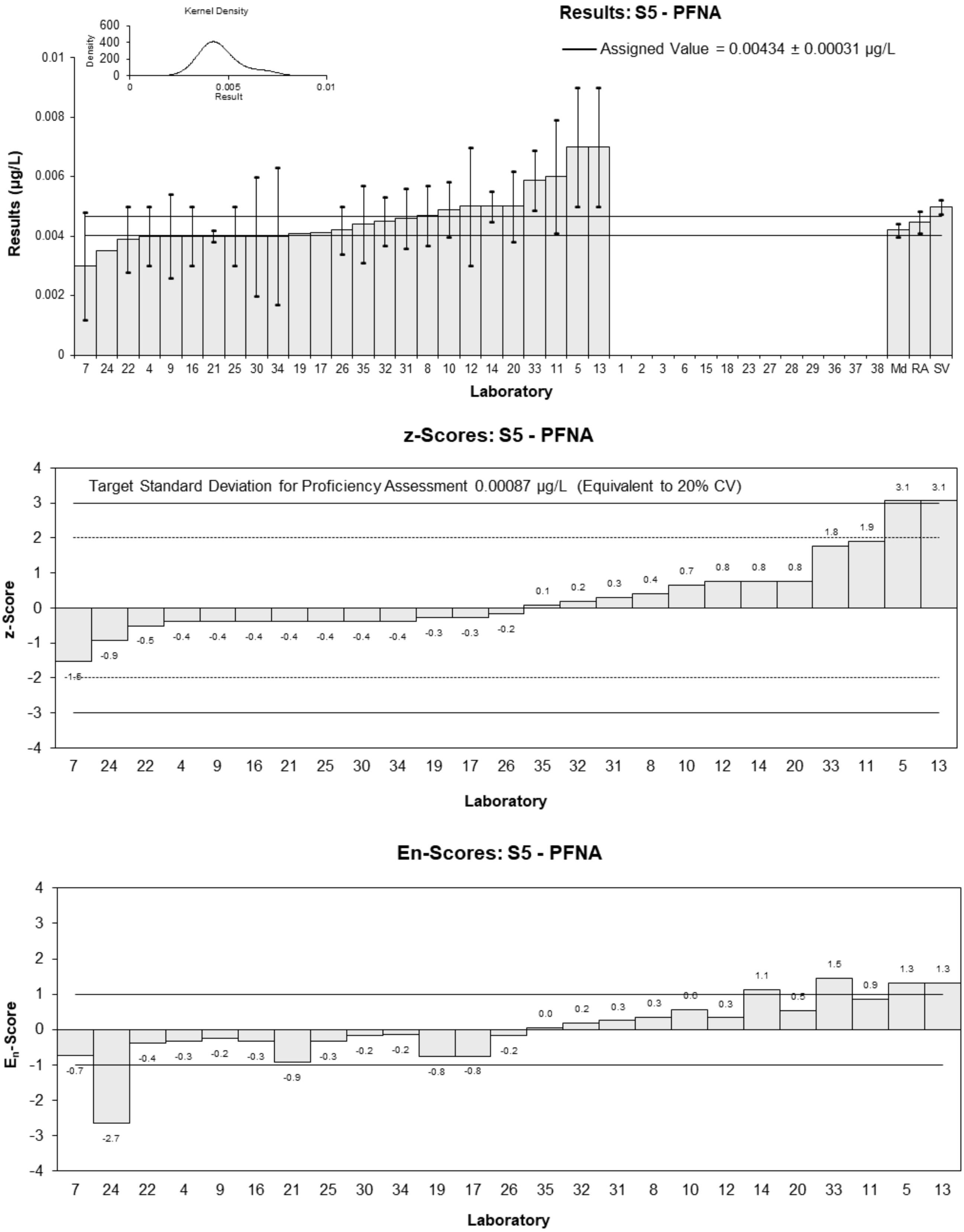

Results: S5 - PFNA
Assigned Value = 0.00434 ± 0.00031 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
7 24 22 4 9 16 21 25 30 34 19 17 26 35 32 31 8 10 12 14 20 33 11 5 13 1 2 3 6 15 18 23 27 28 29 36 37 38 Md RA SV
z-Scores: S5 - PFNA
Target Standard Deviation for Proficiency Assessment 0.00087 µg/L (Equivalent to 20% CV)
z-Score
-1.5 -0.9 -0.5 -0.4 -0.4 -0.4 -0.4 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 0.1 0.2 0.3 0.4 0.7 0.8 0.8 0.8 1.8 1.9 3.1 3.1
Laboratory
7 24 22 4 9 16 21 25 30 34 19 17 26 35 32 31 8 10 12 14 20 33 11 5 13
En-Scores: S5 - PFNA
E_n-Score
-0.7 -2.7 -0.4 -0.3 -0.2 -0.3 -0.9 -0.3 -0.2 -0.2 -0.8 -0.8 -0.2 0.0 0.2 0.3 0.3 0.6 0.3 1.1 0.5 1.5 0.9 1.3 1.3
Laboratory
7 24 22 4 9 16 21 25 30 34 19 17 26 35 32 31 8 10 12 14 20 33 11 5 13

Figure 107

Table 112

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFDA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.02	NR	80		
4	0.017	0.005	78.7	-0.62	-0.44
5	0.017	0.006	NR	-0.62	-0.38
6	0.014	0.00043	114	-1.39	-2.52
7	0.016	0.01	99	-0.88	-0.33
8	0.022	0.01	89	0.67	0.25
9	0.014	0.0049	105	-1.39	-1.01
10	0.0239	0.0038	87.7	1.16	1.04
11	0.029	0.0086	101	2.00▼	
12	0.021	0.006	114	0.41	0.25
13	0.021	0.006	80	0.41	0.25
14	0.022	0.003	79	0.67	0.71
15**	20.4123	NR	81	5,255.90	9,710.90
16	0.020	0.005	91	0.15	0.11
17	0.01273	NR	NR	-1.72	-3.18
18	< 0.017	NR	52		
19	0.0216	0.01	130	0.57	0.22
20	0.023	0.0058	86	0.93	0.58
21	0.019	0.0024	NR	-0.10	-0.13
22	0.018	0.0052	85	-0.36	-0.25
23	NS	NS	NS		
24	0.011	NR	NR	-2.16	-4.00
25	0.019	0.003	83	-0.10	-0.11
26	0.017	0.0045	100	-0.62	-0.48
27	< 0.05	0.025	103		
28	NT	NT	NT		
29	0.022	0.0033	88	0.67	0.66
30	0.025	0.01	98	1.44	0.55
31	0.0227	0.0056	101.92	0.85	0.55
32	0.02	0.004	102.23	0.15	0.13
33	0.0244	0.00484	96	1.29	0.95
34	0.022	0.0057	129.37	0.67	0.43
35	0.0219	0.0066	67	0.64	0.36
36	0.015	0.004	95	-1.13	-0.97
37	NT	NT	NT		
38	0.013	0.0040	148	-1.65	-1.42

** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.0194	0.0021
Spike Value	0.0281	0.0014
Robust Average	0.0194	0.0021
Max Acceptable Result	0.0393	
Median	0.0200	0.0021
Mean	0.0195	
N	29	
Max	0.029	
Min	0.011	
Robust SD	0.0044	
Robust CV	23%	

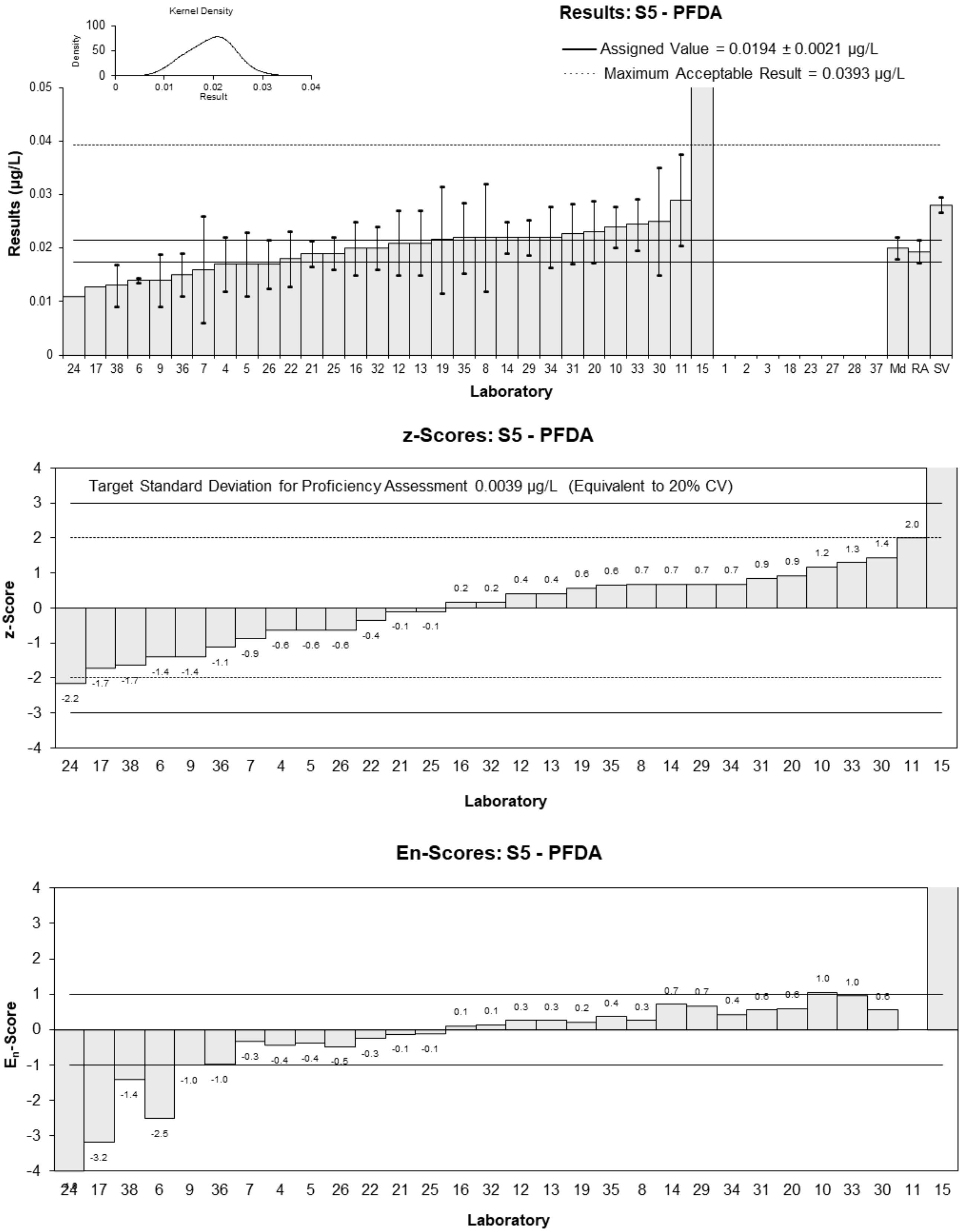

Results: S5 - PFDA
Assigned Value = 0.0194 ± 0.0021 µg/L
Maximum Acceptable Result = 0.0393 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFDA
Target Standard Deviation for Proficiency Assessment 0.0039 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFDA
En-Score
Laboratory

Figure 108

Table 113

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFUdA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.03	0.03	78	-1.39	-0.38
4	0.024	0.005	84.8	-2.12	-2.42
5	0.047	0.016	NR	0.65	0.32
6	0.029	0.0009	129	-1.51	-2.34
7	0.025	NR	88	-2.00	-3.13
8	0.048	0.004	83	0.77	0.96
9	0.021	0.00735	75	-2.48	-2.27
10	0.0486	0.0073	94.1	0.84	0.78
11	0.058	0.0173	94	1.97	0.91
12	0.052	0.02	114	1.25	0.50
13	0.051	0.013	78	1.13	0.67
14	0.042	0.008	77	0.05	0.04
15**	27.7378	NR	74	3,328.87	5,225.70
16	0.044	0.013	71	0.29	0.17
17	0.02947	NR	NR	-1.46	-2.29
18	0.0298	0.00894	43	-1.42	-1.14
19	0.0515	NR	122	1.19	1.87
20	0.048	0.0110	72	0.77	0.52
21	0.039	0.0034	NR	-0.31	-0.41
22	0.041	0.012	87	-0.07	-0.05
23	NS	NS	NS		
24	0.0235	NR	NR	-2.18	-3.42
25	0.046	0.011	89	0.53	0.36
26	0.034	0.016	104	-0.91	-0.45
27	0.05	0.025	92	1.01	0.33
28	NT	NT	NT		
29	0.048	0.0072	89	0.77	0.72
30	0.034	0.02	104	-0.91	-0.37
31	0.0521	0.0106	114.99	1.26	0.89
32	0.0482	0.00904	97.88	0.79	0.63
33	0.0563	0.0112	94	1.77	1.19
34	0.05	0.015	125.5	1.01	0.53
35	0.0468	0.0140	54	0.63	0.35
36	<0.01	NR	97		
37	NT	NT	NT		
38	0.039	0.0106	147	-0.31	-0.22

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0416	0.0053
Spike Value	0.0488	0.0024
Robust Average	0.0416	0.0053
Median	0.0460	0.0040
Mean	0.0415	
N	31	
Max	0.058	
Min	0.021	
Robust SD	0.012	
Robust CV	28%	

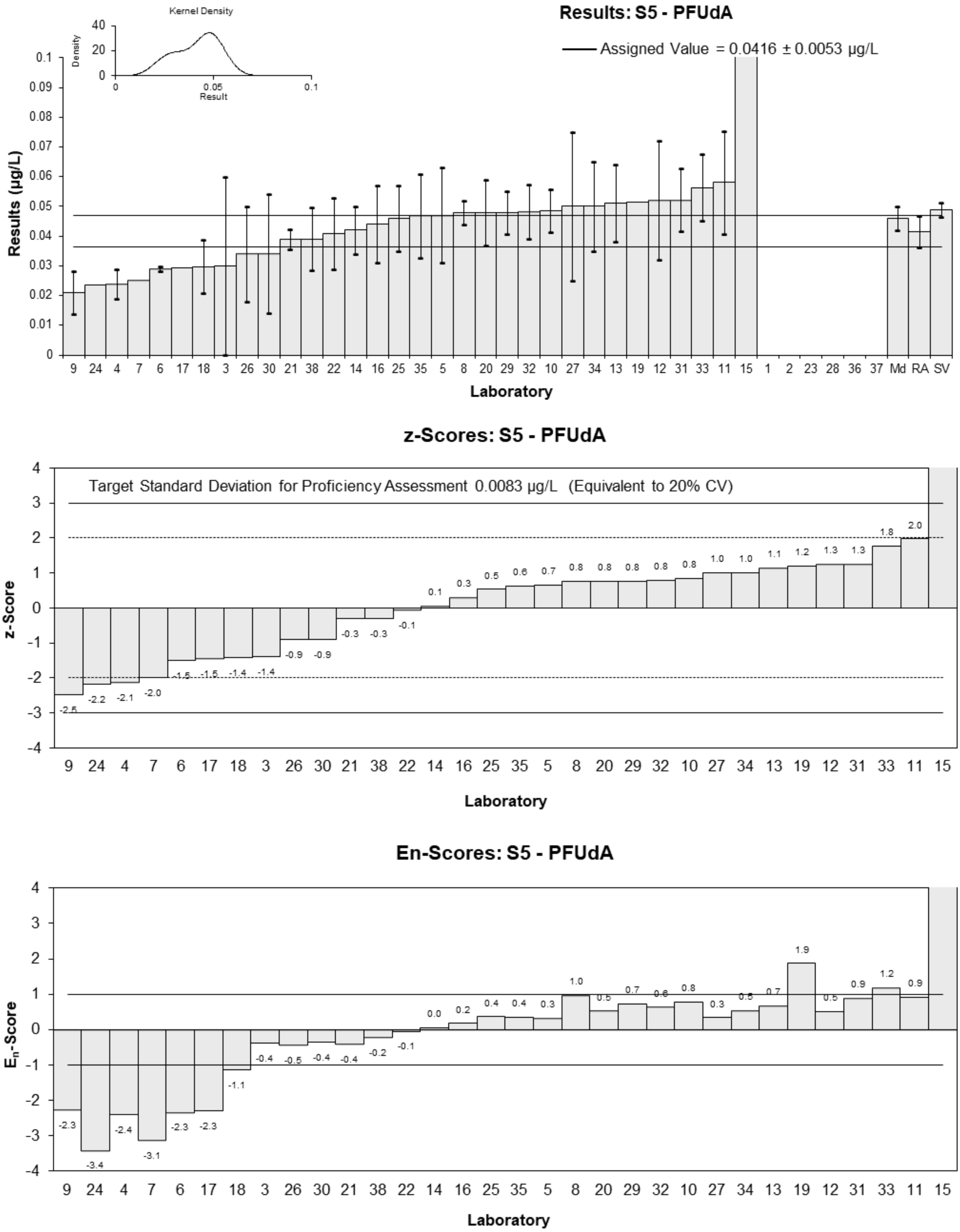

Results: S5 - PFUdA
Assigned Value = 0.0416 ± 0.0053 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFUdA
Target Standard Deviation for Proficiency Assessment 0.0083 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFUdA
En-Score
Laboratory

Figure 109

Table 114

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFDoA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.05	NR	77		
4*	0.021	0.005	79.6	-2.75	-3.18
5	0.056	0.020	NR	1.01	0.45
6	0.04	0.0012	132	-0.71	-1.03
7*	0.006	NR	95	-4.36	-6.44
8	0.052	0.004	87	0.58	0.72
9*	0.019	0.00665	51	-2.96	-3.01
10	0.0568	0.01	92.8	1.09	0.86
11	0.063	0.0190	108	1.76	0.82
12	0.051	0.02	114	0.47	0.21
13	0.053	0.015	78	0.69	0.39
14	0.035	0.004	69	-1.24	-1.55
15**	11.5051	NR	66	1,229.45	1,818.81
16	0.047	0.014	122	0.04	0.03
17	0.02924	NR	NR	-1.86	-2.76
18	0.0328	0.00984	39	-1.48	-1.18
19	0.0575	NR	113	1.17	1.73
20	0.051	0.0133	48	0.47	0.30
21	NT	NT	NT		
22	0.034	0.0099	75	-1.35	-1.07
23	NS	NS	NS		
24	0.0262	NR	NR	-2.19	-3.24
25	0.042	0.007	NR	-0.49	-0.49
26	0.025	0.015	102	-2.32	-1.33
27	< 0.09	0.045	92		
28	NT	NT	NT		
29	0.049	0.010	103	0.26	0.20
30	< 0.05	NR	91		
31	0.0621	0.0132	98.65	1.66	1.06
32	0.0485	0.00952	97.4	0.20	0.17
33	0.0595	0.0123	106	1.38	0.93
34	0.054	0.0133	122.91	0.79	0.50
35	0.0466	0.0140	50	0.00	0.00
36	<0.01	NR	102		
37	NT	NT	NT		
38	0.042	0.0072	126	-0.49	-0.48

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0466	0.0063
Spike Value	0.0595	0.0030
Robust Average	0.0436	0.0073
Median	0.0470	0.0070
Mean	0.0429	
N	27	
Max	0.063	
Min	0.006	
Robust SD	0.015	
Robust CV	35%	

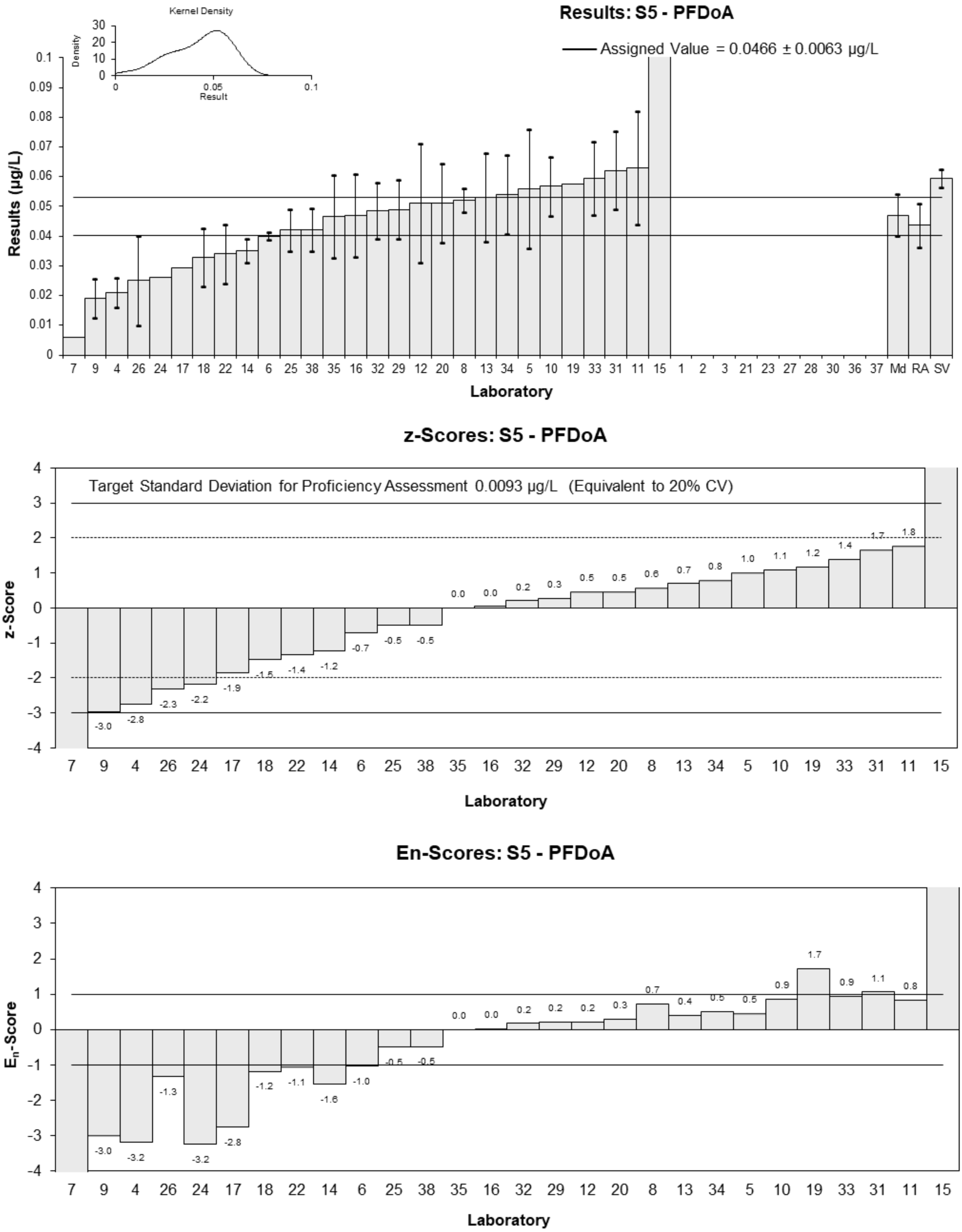

Results: S5 - PFDoA
Assigned Value = 0.0466 ± 0.0063 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - PFDoA
Target Standard Deviation for Proficiency Assessment 0.0093 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFDoA
En-Score
Laboratory

Figure 110

Table 115

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFTrDA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.1	NR	77		
4*	0.032	0.008	NR	-3.32	-3.91
5	0.10	0.035	NR	0.26	0.13
6	0.1	0.0031	116	0.26	0.35
7**	0.005	NR	NR	-4.74	-6.43
8	0.12	0.0006	87	1.32	1.78
9*	0.033	0.01155	51	-3.26	-3.42
10*	0.142	0.0241	87.2	2.00▼	
11	0.126	0.0379	77	1.63	0.77
12	0.12	0.04	93	1.32	0.59
13	0.097	0.023	NR	0.11	0.07
14	0.071	0.008	69	-1.26	-1.49
15**	11.4096	NR	66	595.51	808.19
16	0.111	0.033	NR	0.84	0.45
17	0.05574	NR	NR	-2.07	-2.80
18	0.0889	0.02667	39	-0.32	-0.20
19	0.116	NR	113	1.11	1.50
20	0.047	NR	48	-2.53	-3.43
21	0.064	0.0109	NR	-1.63	-1.75
22	0.072	0.021	75	-1.21	-0.91
23	NS	NS	NS		
24	0.0888	NR	NR	-0.33	-0.44
25	0.075	0.013	NR	-1.05	-1.05
26*	0.013	0.012	102	-4.32	-4.45
27	< 0.23	0.12	NR		
28	NT	NT	NT		
29	0.10	0.026	NR	0.26	0.17
30	< 0.1	NR	58		
31*	0.141	0.041	97.69	2.00▼	
32	0.115	0.0311	97.4	1.05	0.59
33	0.128	0.0363	NR	1.74	0.85
34	0.109	0.0302	122.91	0.74	0.42
35*	0.145	0.044	50	2.00▼	
36*	0.026	0.008	96	-3.63	-4.28
37	NT	NT	NT		
38	0.073	0.0219	64	-1.16	-0.85

* Outlier, ** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.095	0.014
Spike Value	0.124	0.006
Robust Average	0.090	0.019
Max Acceptable Result	0.173	
Median	0.099	0.018
Mean	0.090	
N	28	
Max	0.145	
Min	0.013	
Robust SD	0.040	
Robust CV	45%	

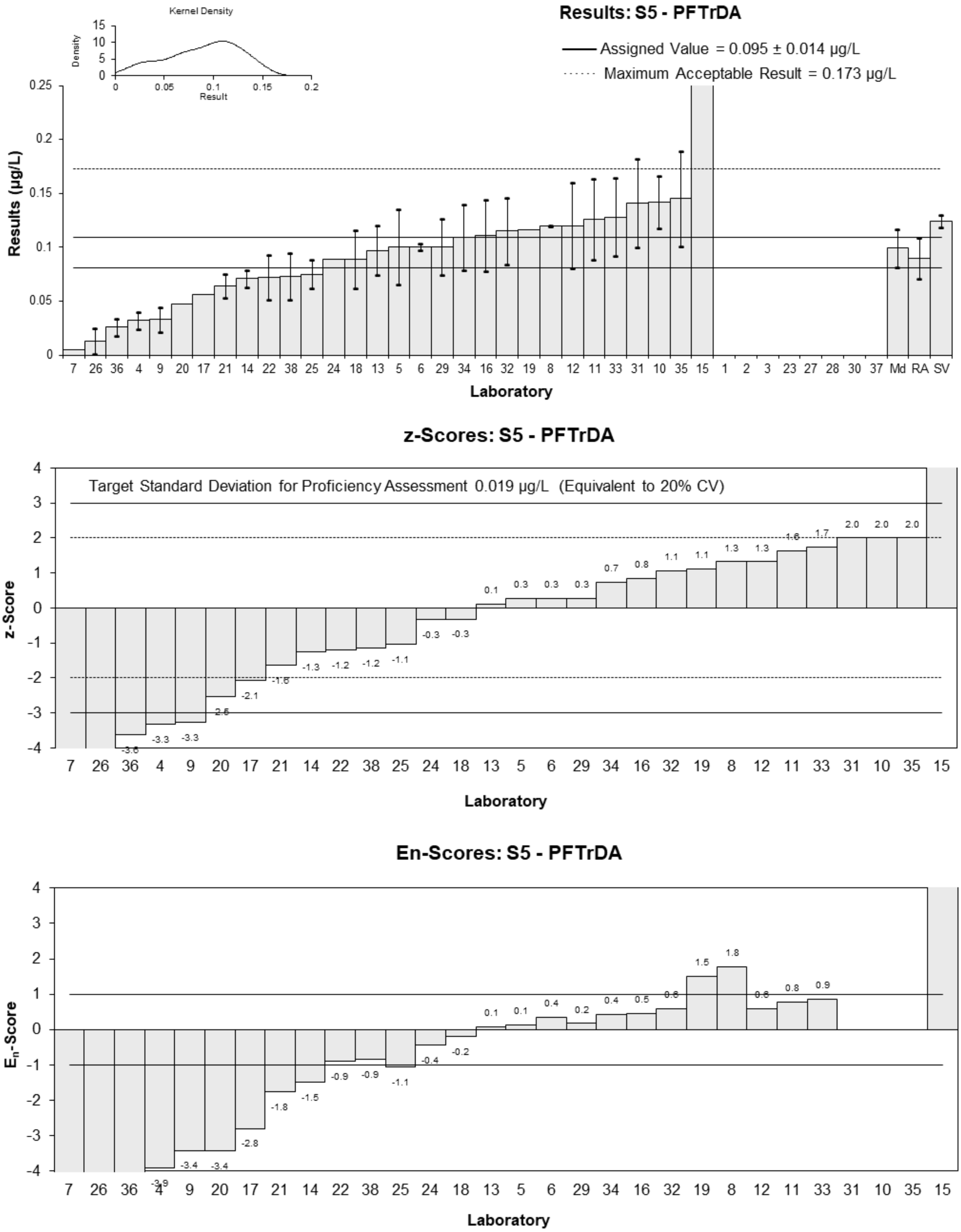

Kernel Density
Density
Result
Results: S5 - PFTrDA
Assigned Value = 0.095 ± 0.014 µg/L
Maximum Acceptable Result = 0.173 µg/L
Results (µg/L)
Laboratory
7 26 36 4 9 20 17 21 14 22 38 25 24 18 13 5 6 29 34 16 32 19 8 12 11 33 31 10 35 15 1 2 3 23 27 28 30 37 Md RA SV
z-Scores: S5 - PFTrDA
Target Standard Deviation for Proficiency Assessment 0.019 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFTrDA
En-Score
Laboratory

Figure 111

Table 116

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFTeDA
Unit	µg/L

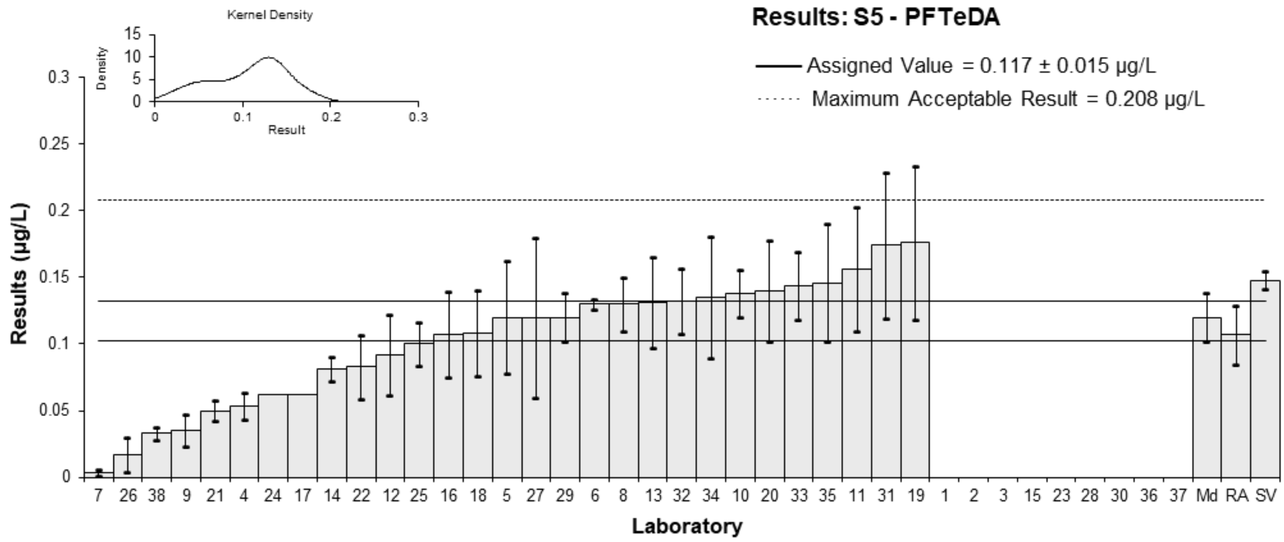
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.5	NR	66		
4*	0.053	0.01	66.0	-2.74	-3.55
5	0.12	0.042	NR	0.13	0.07
6	0.13	0.0038	116	0.56	0.84
7**	0.003	0.0024	90	-4.87	-7.50
8	0.13	0.02	56	0.56	0.52
9*	0.035	0.01225	51	-3.50	-4.23
10	0.138	0.0178	81.7	0.90	0.90
11	0.156	0.0467	77	1.67	0.80
12	0.092	0.03	49	-1.07	-0.75
13	0.131	0.034	82	0.60	0.38
14	0.081	0.009	67	-1.54	-2.06
15	<20	NR	NR		
16	0.107	0.032	69	-0.43	-0.28
17	0.06166	NR	NR	-2.36	-3.69
18	0.108	0.0324	39	-0.38	-0.25
19*	0.176	0.058	69	2.00▼	
20	0.14	0.0378	5	0.98	0.57
21*	0.050	0.0080	NR	-2.86	-3.94
22	0.083	0.024	72	-1.45	-1.20
23	NS	NS	NS		
24	0.0616	NR	NR	-2.37	-3.69
25	0.1	0.016	100	-0.73	-0.78
26*	0.017	0.013	79	-4.27	-5.04
27	0.12	0.06	108	0.13	0.05
28	NT	NT	NT		
29	0.12	0.018	97	0.13	0.13
30	< 0.5	NR	58		
31*	0.174	0.055	97.4	2.00▼	
32	0.132	0.0248	83.16	0.64	0.52
33	0.144	0.0256	116	1.15	0.91
34	0.135	0.046	117.69	0.77	0.37
35	0.146	0.044	52	1.24	0.62
36	<0.01	NR	105		
37	NT	NT	NT		
38*	0.033	0.0049	64	-3.59	-5.32

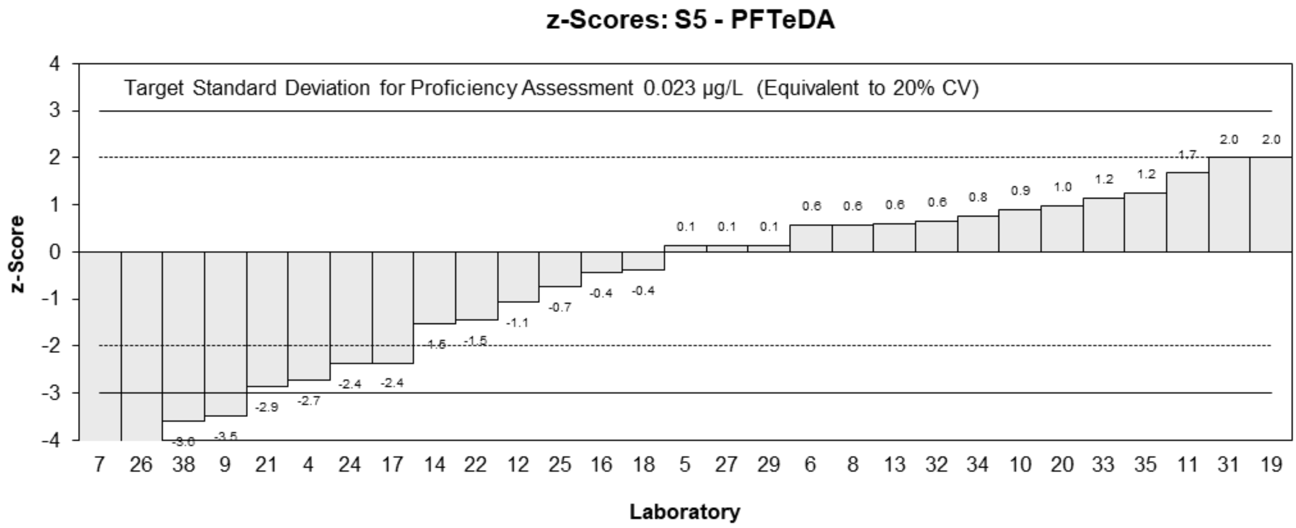
* Outlier, ** Extreme Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

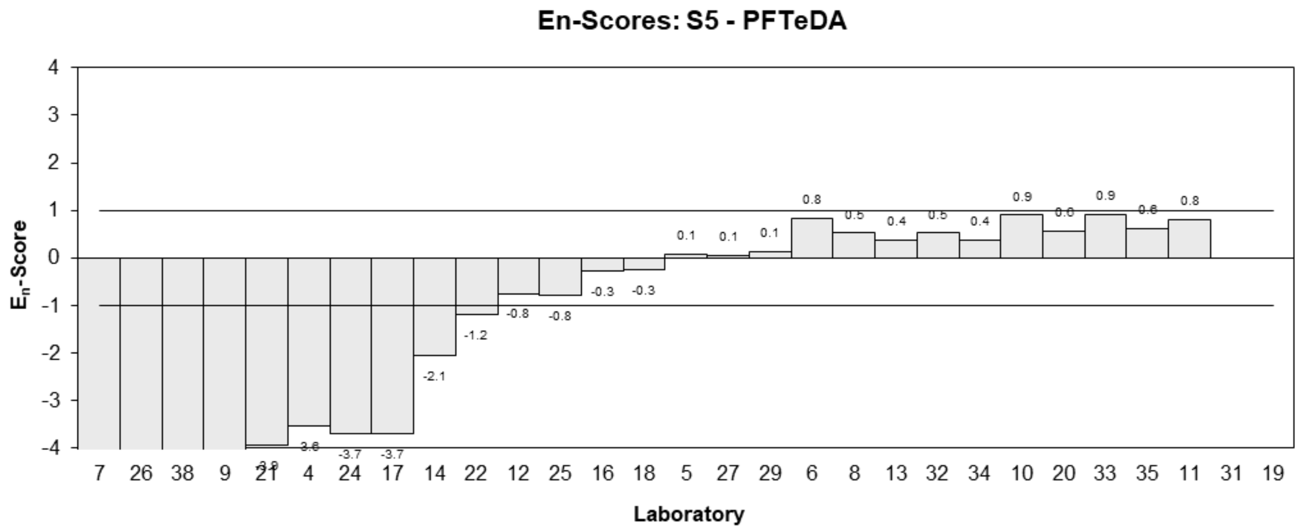
Assigned Value	0.117	0.015
Spike Value	0.148	0.007
Robust Average	0.107	0.022
Max Acceptable Result	0.208	
Median	0.120	0.018
Mean	0.106	
N	28	
Max	0.176	
Min	0.017	
Robust SD	0.047	
Robust CV	44%	



Results: S5 - PFTeDA
Assigned Value = 0.117 ± 0.015 µg/L
Maximum Acceptable Result = 0.208 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory



z-Scores: S5 - PFTeDA
Target Standard Deviation for Proficiency Assessment 0.023 µg/L (Equivalent to 20% CV)
z-Score
Laboratory



En-Scores: S5 - PFTeDA
E_n-Score
Laboratory

Figure 112

Table 117

Sample Details

Sample No.	S5
Matrix	Water
Analyte	PFOSA
Unit	µg/L

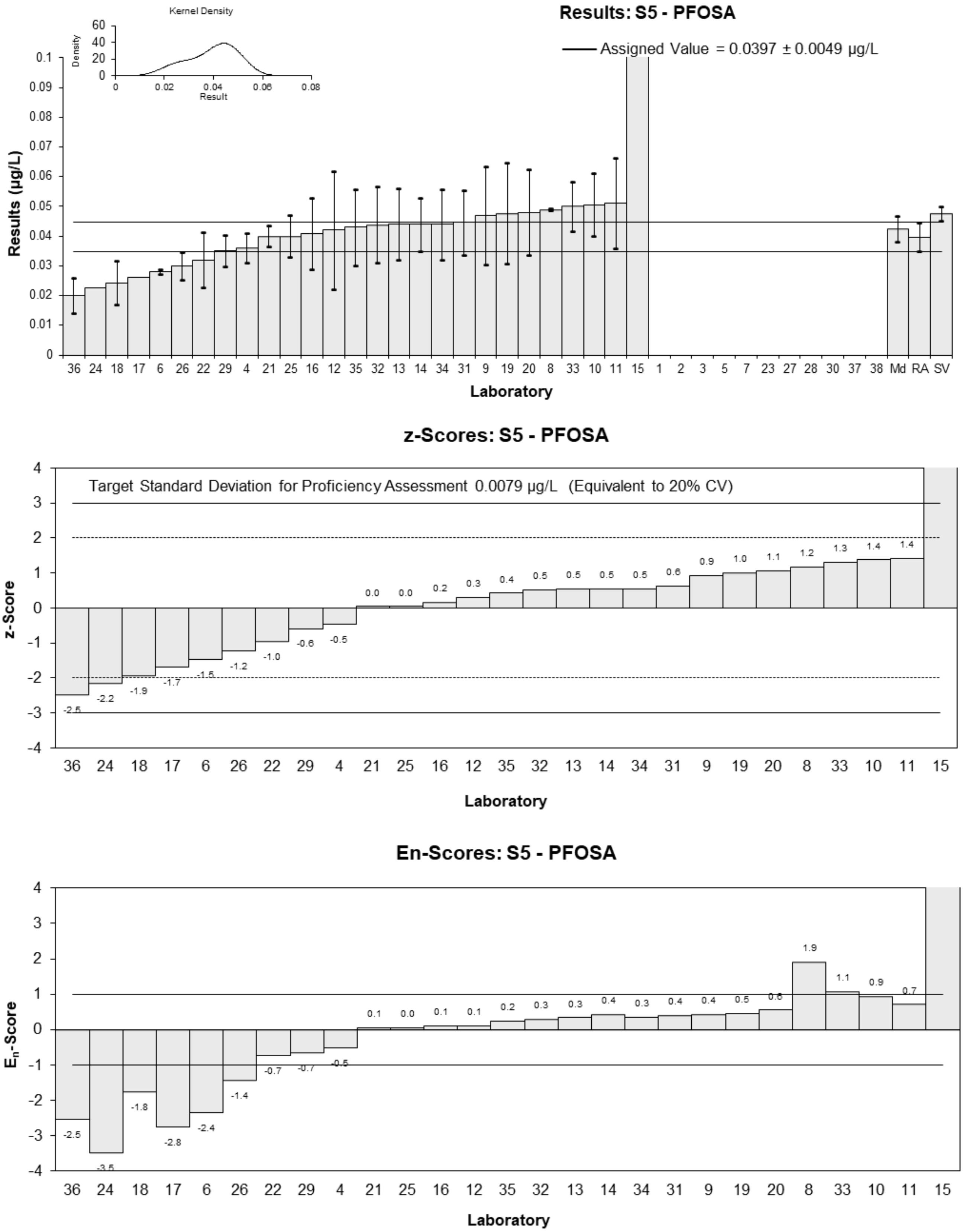
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	<0.1	NR	92		
4	0.036	0.005	81.6	-0.47	-0.53
5	< 0.005	NR	NR		
6	0.028	0.0008	113	-1.47	-2.36
7	<0.002	NR	140		
8	0.049	0.0002	101	1.17	1.90
9	0.047	0.01645	48	0.92	0.43
10	0.0506	0.0106	131	1.37	0.93
11	0.051	0.0152	89	1.42	0.71
12	0.042	0.02	57	0.29	0.11
13	0.044	0.012	NR	0.54	0.33
14	0.044	0.009	70	0.54	0.42
15**	20.3941	NR	75	2,563.53	4,153.96
16	0.041	0.012	70	0.16	0.10
17	0.02621	NR	NR	-1.70	-2.75
18	0.0243	0.00729	8	-1.94	-1.75
19	0.0477	0.017	115	1.01	0.45
20	0.048	0.0144	66	1.05	0.55
21	0.040	0.0036	NR	0.04	0.05
22	0.032	0.0093	82	-0.97	-0.73
23	NS	NS	NS		
24	0.0226	NR	NR	-2.15	-3.49
25	0.04	0.007	72	0.04	0.04
26	0.030	0.0047	71	-1.22	-1.43
27	< 0.18	0.09	84		
28	NT	NT	NT		
29	0.035	0.0053	74	-0.59	-0.65
30	< 0.1	NR	94		
31	0.0446	0.0109	82.03	0.62	0.41
32	0.0438	0.01277	91.18	0.52	0.30
33	0.0501	0.00837	93	1.31	1.07
34	0.044	0.0118	112.93	0.54	0.34
35	0.0430	0.0129	50	0.42	0.24
36	0.02	0.006	87	-2.48	-2.54
37	NT	NT	NT		
38	<0.05	NR	97		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0397	0.0049
Spike Value	0.0476	0.0023
Robust Average	0.0397	0.0049
Median	0.0425	0.0044
Mean	0.0394	
N	26	
Max	0.051	
Min	0.02	
Robust SD	0.0099	
Robust CV	25%	



Kernel Density
Density
Result
Results: S5 - PFOSA
Assigned Value = 0.0397 ± 0.0049 µg/L
Results (µg/L)
Laboratory
z-Scores: S5 - PFOSA
Target Standard Deviation for Proficiency Assessment 0.0079 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - PFOSA
E_n-Score
Laboratory

Figure 113

Table 118

Sample Details

Sample No.	S5
Matrix	Water
Analyte	6:2FTS
Unit	µg/L

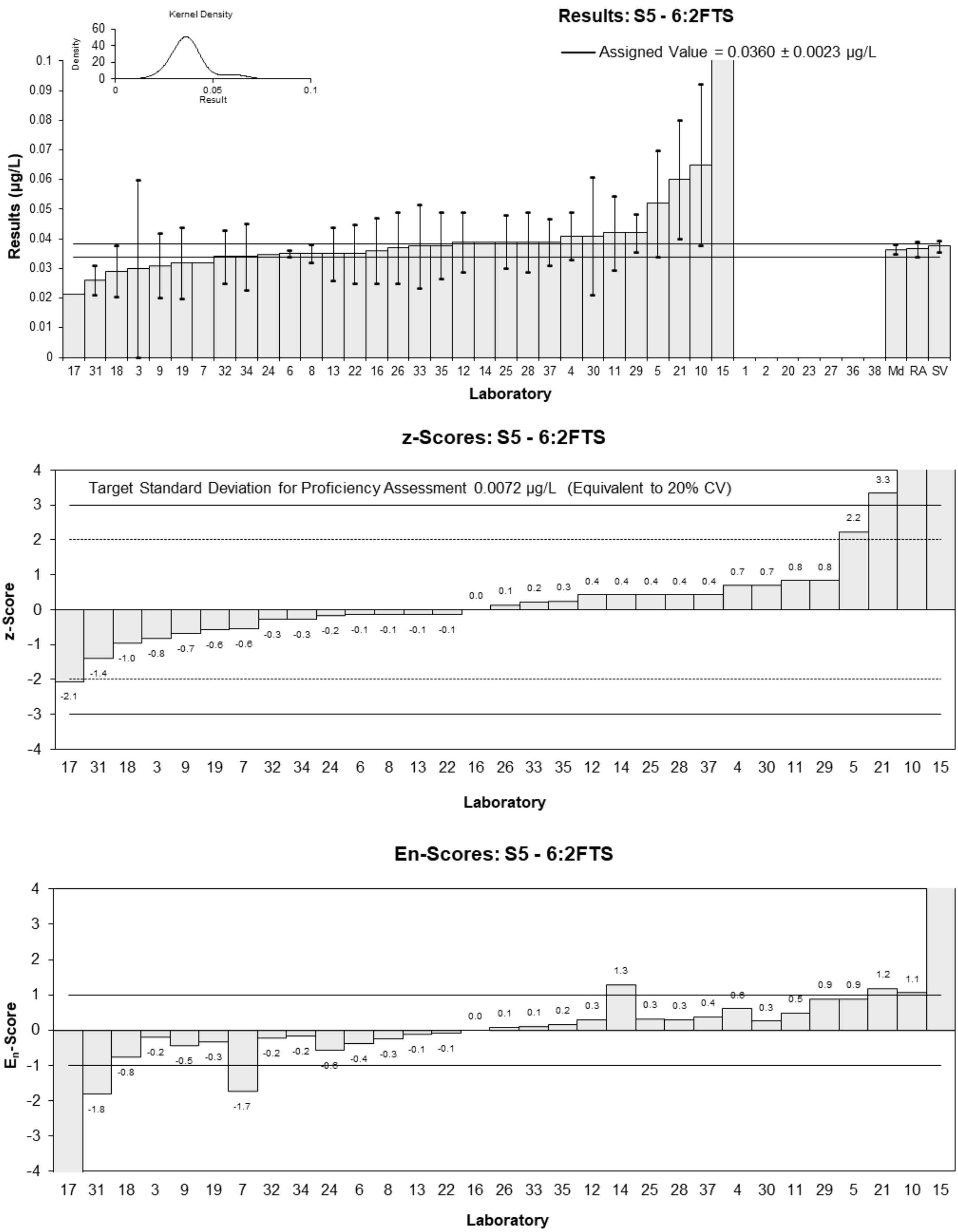
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	0.03	0.03	84	-0.83	-0.20
4	0.041	0.008	95.4	0.69	0.60
5	0.052	0.018	NR	2.22	0.88
6	0.035	0.0011	188	-0.14	-0.39
7	0.032	NR	112	-0.56	-1.74
8	0.035	0.003	156	-0.14	-0.26
9	0.031	0.01085	120	-0.69	-0.45
10*	0.065	0.0272	87.6	4.03	1.06
11	0.042	0.0125	89	0.83	0.47
12	0.039	0.01	86	0.42	0.29
13	0.035	0.009	NR	-0.14	-0.11
14	0.039	NR	102	0.42	1.30
15**	38.907	NR	82	5,398.75	16,900.43
16	0.036	0.011	68	0.00	0.00
17	0.02120	NR	NR	-2.06	-6.43
18	0.0291	0.00873	66	-0.96	-0.76
19	0.0318	0.012	235	-0.58	-0.34
20	<0.2	NR	98		
21*	0.060	0.0200	NR	3.33	1.19
22	0.035	0.010	87	-0.14	-0.10
23	NS	NS	NS		
24	0.0347	NR	NR	-0.18	-0.57
25	0.039	0.009	125	0.42	0.32
26	0.037	0.012	101	0.14	0.08
27	< 0.04	0.02	106		
28	0.039	0.01	156	0.42	0.29
29	0.042	0.0063	59	0.83	0.89
30	0.041	0.02	99	0.69	0.25
31	0.026	0.005	148.65	-1.39	-1.82
32	0.034	0.0090	99.91	-0.28	-0.22
33	0.0376	0.0141	135	0.22	0.11
34	0.034	0.0111	108.55	-0.28	-0.18
35	0.0378	0.0113	72	0.25	0.16
36	<0.01	NR	65		
37	0.039	0.0078	NR	0.42	0.37
38	<0.05	NR	101		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0360	0.0023
Spike Value	0.0376	0.0019
Robust Average	0.0366	0.0025
Median	0.0365	0.0017
Mean	0.0377	
N	30	
Max	0.065	
Min	0.0212	
Robust SD	0.0054	
Robust CV	15%	



Results: S5 - 6:2FTS
Assigned Value = 0.0360 ± 0.0023 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
17 31 18 3 9 19 7 32 34 24 6 8 13 22 16 26 33 35 12 14 25 28 37 4 30 11 29 5 21 10 15 1 2 20 23 27 36 38 Md RA SV
z-Scores: S5 - 6:2FTS
Target Standard Deviation for Proficiency Assessment 0.0072 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - 6:2FTS
E_n-Score
Laboratory

Figure 114

Table 119

Sample Details

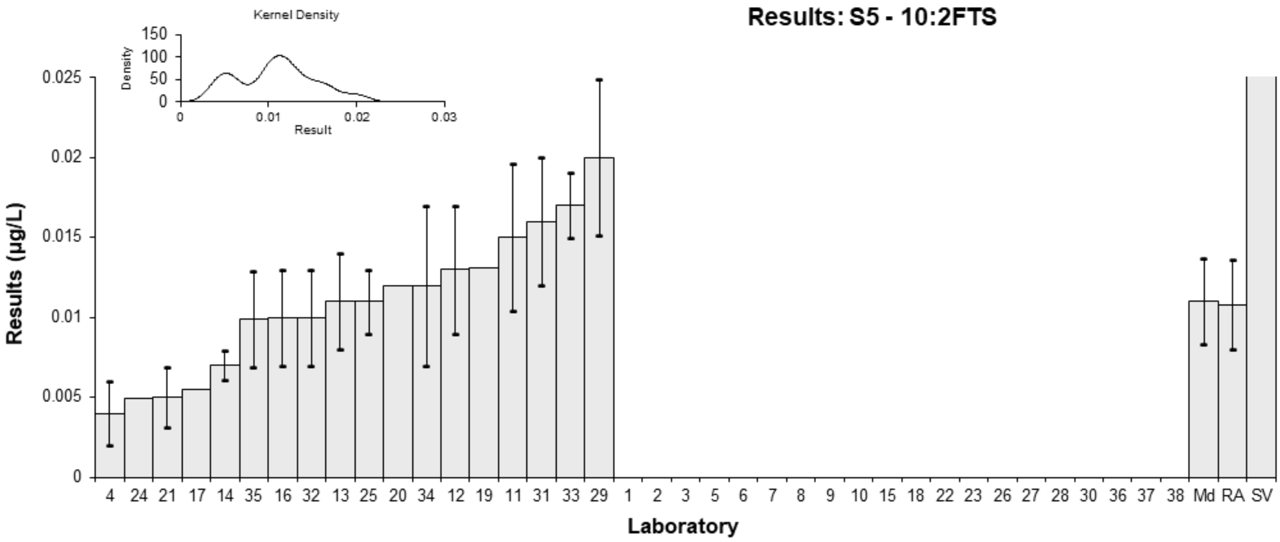
Sample No.	S5
Matrix	Water
Analyte	10:2FTS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	<0.02	NR	66
4	0.004	0.002	NR
5	NT	NT	NT
6	<0.02	NR	172
7	NT	NT	NT
8	NT	NT	NT
9	NR	NR	NR
10	NT	NT	NT
11	0.015	0.0046	92
12	0.013	0.004	99
13	0.011	0.003	NR
14	0.007	0.0009	109
15	<10	NR	NR
16	0.010	0.003	75
17	0.005470	NR	NR
18	< 0.017	NR	47
19	0.0131	NR	146
20	0.012	NR	62
21	0.005	0.0019	NR
22	NT	NT	NT
23	NS	NS	NS
24	0.00494	NR	NR
25	0.011	0.002	89
26	NR	NR	102
27	< 0.02	0.01	NR
28	NT	NT	NT
29	0.020	0.0049	NR
30	< 0.02	NR	123
31	0.016	0.004	154.42
32	0.01	0.003	104.67
33	0.0170	0.00204	104
34	0.012	0.0050	111.76
35	0.0099	0.0030	50
36	<0.01	NR	100
37	NT	NT	NT
38	<0.01	NR	126

Statistics

Assigned Value	Not Set	
Spike Value	0.0383	0.0019
Robust Average	0.0108	0.0028
Median	0.0110	0.0027
Mean	0.0109	
N	18	
Max	0.02	
Min	0.004	
Robust SD	0.0048	
Robust CV	45%	



Kernel Density
Density
150
100
50
0
0
0.01
0.02
0.03
Result
Results: S5 - 10:2FTS
Results (µg/L)
0.025
0.02
0.015
0.01
0.005
0
4 24 21 17 14 35 16 32 13 25 20 34 12 19 11 31 33 29 1 2 3 5 6 7 8 9 10 15 18 22 23 26 27 28 30 36 37 38 Md RA SV
Laboratory

Figure 115

Table 120

Sample Details

Sample No.	S5
Matrix	Water
Analyte	GenX
Unit	µg/L

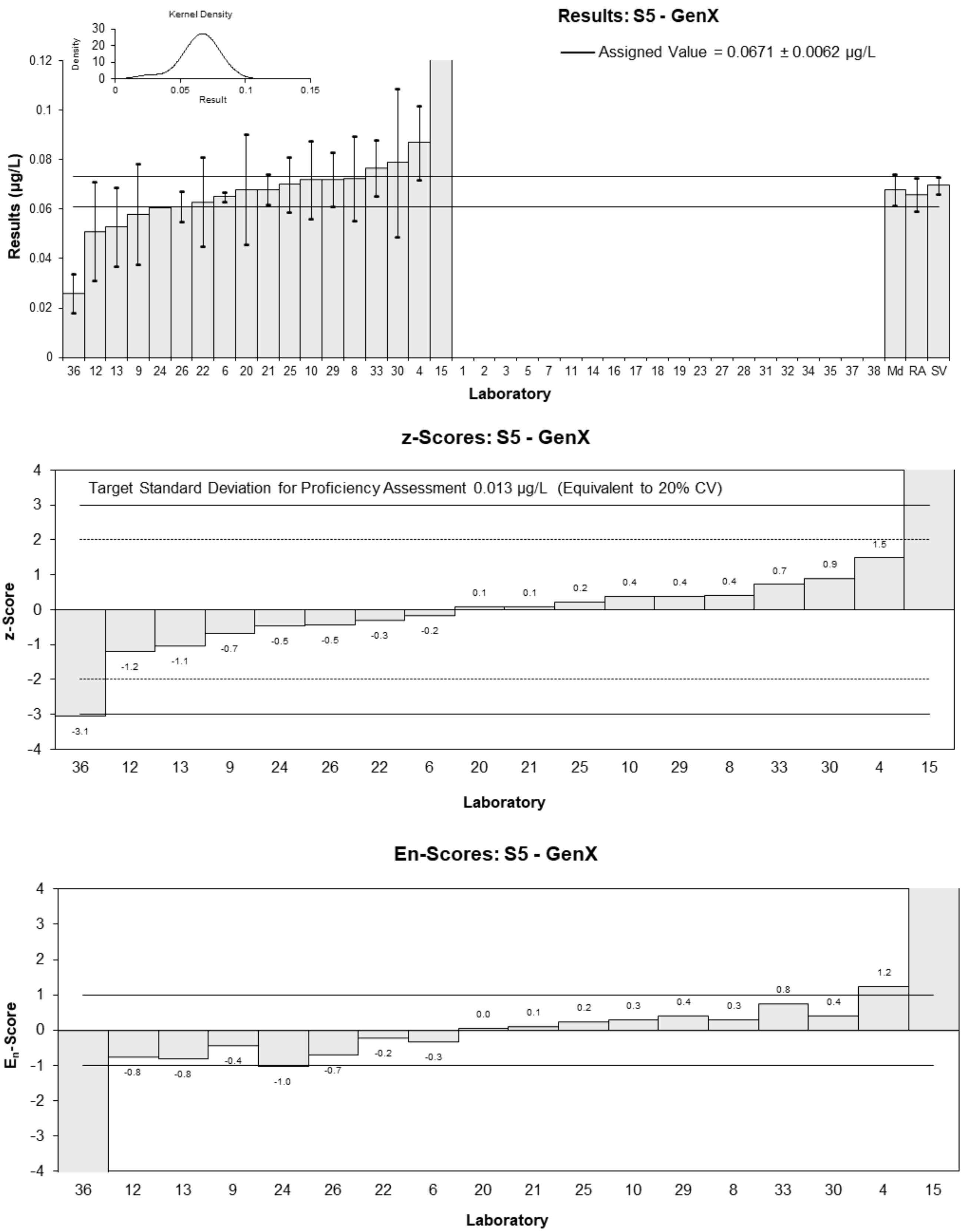
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	NT	NT	NT		
4	0.087	0.015	94.80	1.48	1.23
5	NT	NT	NT		
6	0.065	0.002	104	-0.16	-0.32
7	NT	NT	NT		
8	0.0725	0.017	93	0.40	0.30
9	0.058	0.0203	105	-0.68	-0.43
10	0.072	0.0158	78	0.37	0.29
11	NT	NT	NT		
12	0.051	0.02	82	-1.20	-0.77
13	0.053	0.016	NR	-1.05	-0.82
14	NT	NT	NT		
15**	76.065	NR	83	5,663.03	12,257.73
16	NT	NT	NT		
17	NT	NT	NT		
18	< 17.0	NR	65		
19	NT	NR	NT		
20	0.068	0.0224	93	0.07	0.04
21	0.068	0.0062	NR	0.07	0.10
22	0.063	0.018	96	-0.31	-0.22
23	NS	NS	NS		
24	0.0607	NR	NR	-0.48	-1.03
25	0.07	0.011	130	0.22	0.23
26	0.061	0.0062	102	-0.45	-0.70
27	NT	NT	NT		
28	NT	NT	NT		
29	0.072	0.011	99	0.37	0.39
30	0.079	0.03	96	0.89	0.39
31	NT	NT	NT		
32	NT	NT	NT		
33	0.0768	0.0114	74	0.72	0.75
34	NT	NT	NT		
35	NT	NT	NT		
36*	0.026	0.008	86	-3.06	-4.06
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0671	0.0062
Spike Value	0.0696	0.0035
Robust Average	0.0660	0.0066
Median	0.0680	0.0063
Mean	0.0649	
N	17	
Max	0.087	
Min	0.026	
Robust SD	0.011	
Robust CV	17%	



Results: S5 - GenX
Assigned Value = 0.0671 ± 0.0062 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
z-Scores: S5 - GenX
Target Standard Deviation for Proficiency Assessment 0.013 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - GenX
En-Score
Laboratory

Figure 116

Table 121

Sample Details

Sample No.	S5
Matrix	Water
Analyte	ADONA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NS	NS	NS		
3	NT	NT	NT		
4	0.054	0.01	NR	0.07	0.06
5	NT	NT	NT		
6	0.05	0.0015	119	-0.31	-0.62
7	NT	NT	NT		
8	0.047	0.005	99	-0.59	-0.88
9	0.051	0.01785	105	-0.22	-0.12
10	0.0739	0.0154	78	1.93	1.27
11	NT	NT	NT		
12	0.05	0.02	83	-0.31	-0.16
13	0.065	0.018	NR	1.10	0.63
14	NT	NT	NT		
15**	72.1384	NR	85	6,762.20	14,134.33
16	NT	NT	NT		
17	NT	NT	NT		
18	< 17.0	NR	69		
19	NT	NR	NT		
20	0.053	0.0159	92	-0.03	-0.02
21	0.039	0.0054	NR	-1.34	-1.93
22	NT	NT	NT		
23	NS	NS	NS		
24	0.0504	NR	NR	-0.27	-0.57
25	0.052	0.008	NR	-0.12	-0.14
26	0.056	0.0068	95	0.25	0.32
27	NT	NT	NT		
28	NT	NT	NT		
29	0.060	0.0089	NR	0.63	0.65
30	0.057	0.03	92	0.35	0.12
31	NT	NT	NT		
32	NT	NT	NT		
33	0.0603	0.0242	NR	0.66	0.28
34	NT	NT	NT		
35	NT	NT	NT		
36	0.036	0.011	97	-1.62	-1.43
37	NT	NT	NT		
38	NT	NT	NT		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0533	0.0051
Spike Value	0.0561	0.0028
Robust Average	0.0533	0.0051
Median	0.0525	0.0037
Mean	0.0534	
N	16	
Max	0.0739	
Min	0.036	
Robust SD	0.0082	
Robust CV	15%	

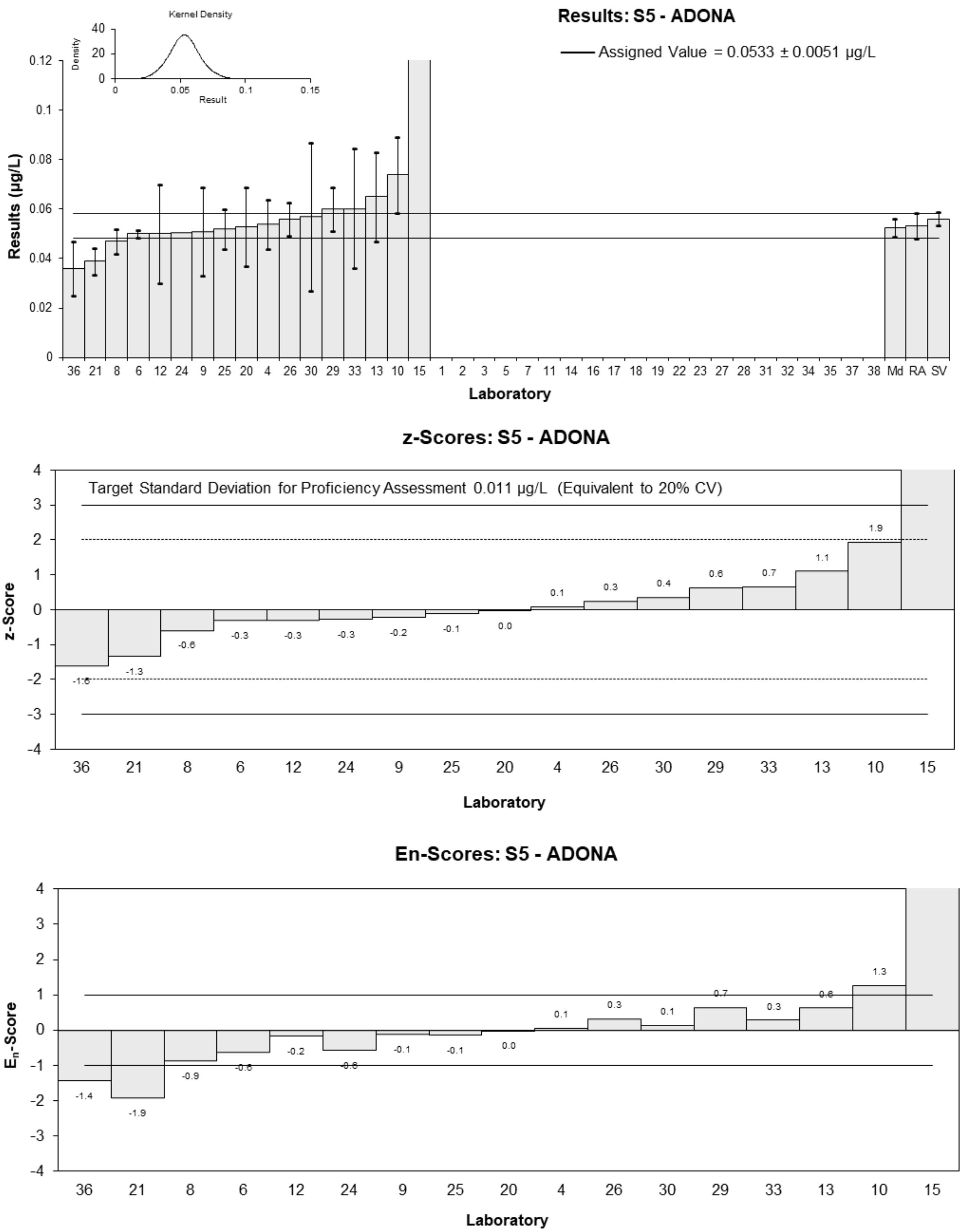

Results: S5 - ADONA
Assigned Value = 0.0533 ± 0.0051 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
36 21 8 6 12 24 9 25 20 4 26 30 29 33 13 10 15 1 2 3 5 7 11 14 16 17 18 19 22 23 27 28 31 32 34 35 37 38 Md RA SV
z-Scores: S5 - ADONA
Target Standard Deviation for Proficiency Assessment 0.011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
En-Scores: S5 - ADONA
En-Score
Laboratory

Figure 117

Table 122

Sample Details

Sample No.	S5
Matrix	Water
Analyte	9Cl-PF3ONS
Unit	µg/L

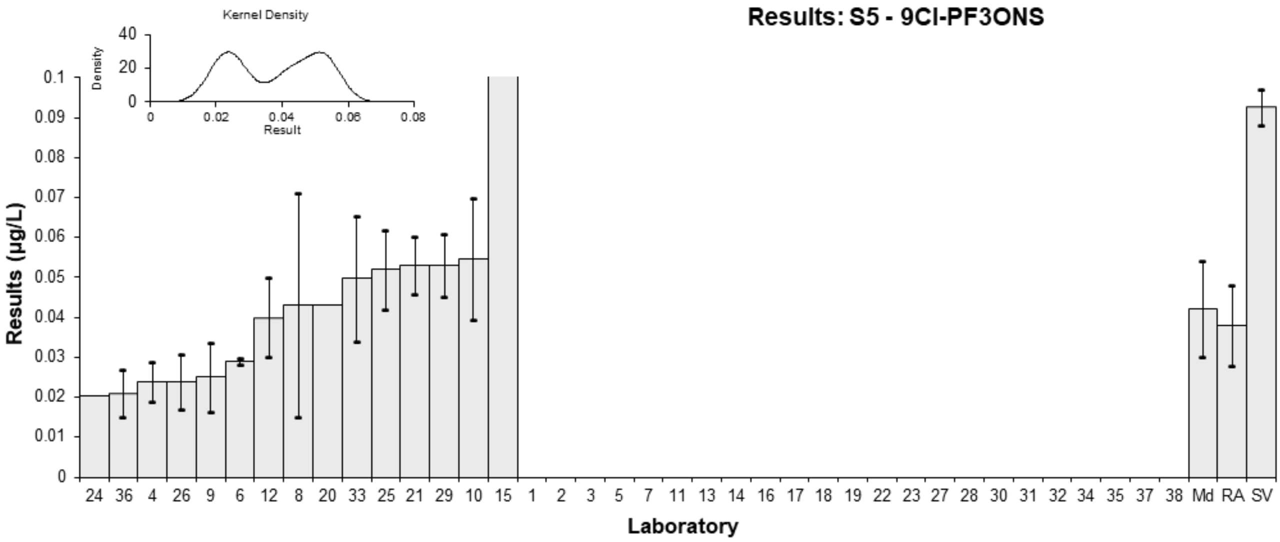
Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	NT	NT	NT
4	0.024	0.005	NR
5	NT	NT	NT
6	0.029	0.0009	123
7	NT	NT	NT
8	0.043	0.028	79
9	0.025	0.00875	90
10	0.0547	0.0153	78
11	NT	NT	NT
12	0.04	0.01	83
13	NT	NT	NT
14	NT	NT	NT
15**	44.812	NR	79
16	NT	NT	NT
17	NT	NT	NT
18	< 17.0	NR	57
19	NT	NR	NT
20	0.043	NR	73
21	0.053	0.0071	NR
22	NT	NT	NT
23	NS	NS	NS
24	0.0205	NR	NR
25	0.052	0.01	NR
26	0.024	0.0069	76
27	NT	NT	NT
28	NT	NT	NT
29	0.053	0.0079	NR
30	< 0.1	NR	96
31	NT	NT	NT
32	NT	NT	NT
33	0.0497	0.0157	NR
34	NT	NT	NT
35	NT	NT	NT
36	0.021	0.006	86
37	NT	NT	NT
38	NT	NT	NT

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	0.0926	0.0046
Robust Average	0.038	0.010
Median	0.042	0.012
Mean	0.0380	
N	14	
Max	0.0547	
Min	0.0205	
Robust SD	0.015	
Robust CV	40%	



Results: S5 - 9Cl-PF3ONS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
24 36 4 26 9 6 12 8 20 33 25 21 29 10 15 1 2 3 5 7 11 13 14 16 17 18 19 22 23 27 28 30 31 32 34 35 37 38 Md RA SV

Figure 118

Table 123

Sample Details

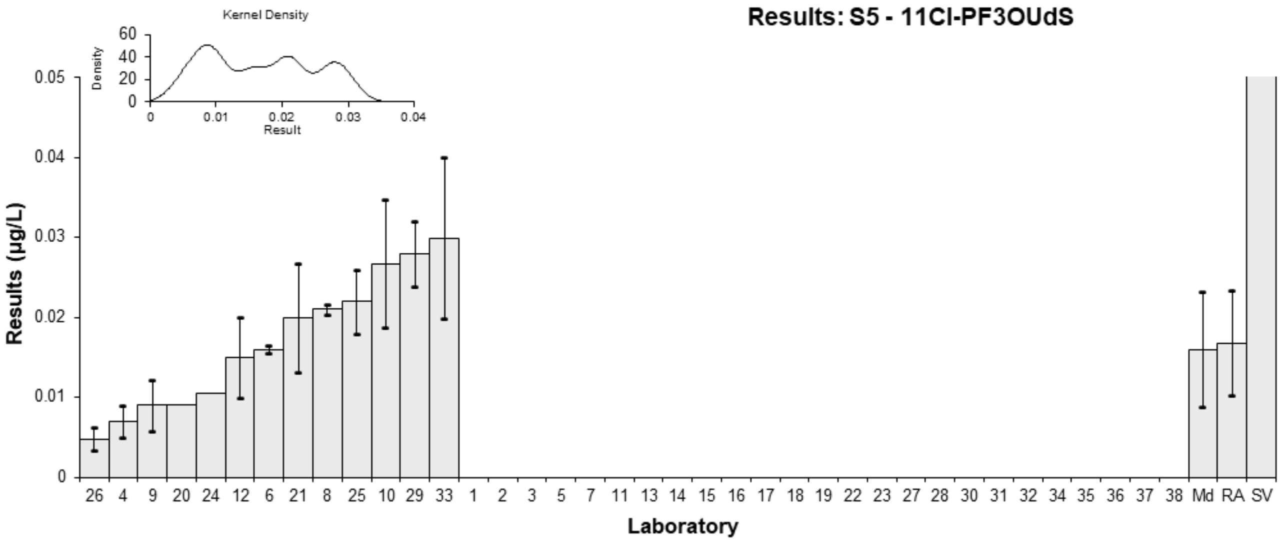
Sample No.	S5
Matrix	Water
Analyte	11Cl-PF3OUdS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	NT	NT	NT
4	0.007	0.002	NR
5	NT	NT	NT
6	0.016	0.0005	132
7	NT	NT	NT
8	0.021	0.0006	79
9	0.009	0.00315	51
10	0.0267	0.008	78
11	NT	NT	NT
12	0.015	0.005	83
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NT	NT	NT
17	NT	NT	NT
18	< 17.0	NR	39
19	NT	NR	NT
20	0.009	NR	73
21	0.020	0.0068	NR
22	NT	NT	NT
23	NS	NS	NS
24	0.0105	NR	NR
25	0.022	0.004	NR
26	0.0048	0.0014	102
27	NT	NT	NT
28	NT	NT	NT
29	0.028	0.0041	NR
30	< 0.1	NR	96
31	NT	NT	NT
32	NT	NT	NT
33	0.0299	0.0101	NR
34	NT	NT	NT
35	NT	NT	NT
36	<0.01	NR	98
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.139	0.007
Robust Average	0.0168	0.0066
Median	0.0160	0.0072
Mean	0.0168	
N	13	
Max	0.0299	
Min	0.0048	
Robust SD	0.0096	
Robust CV	57%	



Results: S5 - 11Cl-PF3OUdS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
26 4 9 20 24 12 6 21 8 25 10 29 33 1 2 3 5 7 11 13 14 15 16 17 18 19 22 23 27 28 30 31 32 34 35 36 37 38 Md RA SV

Figure 119

Table 124

Sample Details

Sample No.	S5
Matrix	Water
Analyte	5:3FTCA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NS	NS	NS
3	NT	NT	NT
4	NR	NR	NR
5	NT	NT	NT
6	NT	NT	NT
7	NT	NT	NT
8	0.1	0.011	117
9	NR	NR	NR
10	0.123	0.0197	92.1
11	NT	NT	NT
12	0.17	0.05	71
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	NR	NT
20	NT	NT	NT
21	NT	NT	NT
22	NT	NT	NT
23	NS	NS	NS
24	0.113	NR	NR
25	0.1	0.02	NR
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	0.054	0.0081	NR
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	0.128	0.0367	NR
34	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.119	0.006
Robust Average	0.113	0.038
Median	0.113	0.018
Mean	0.113	
N	7	
Max	0.17	
Min	0.054	
Robust SD	0.040	
Robust CV	35%	

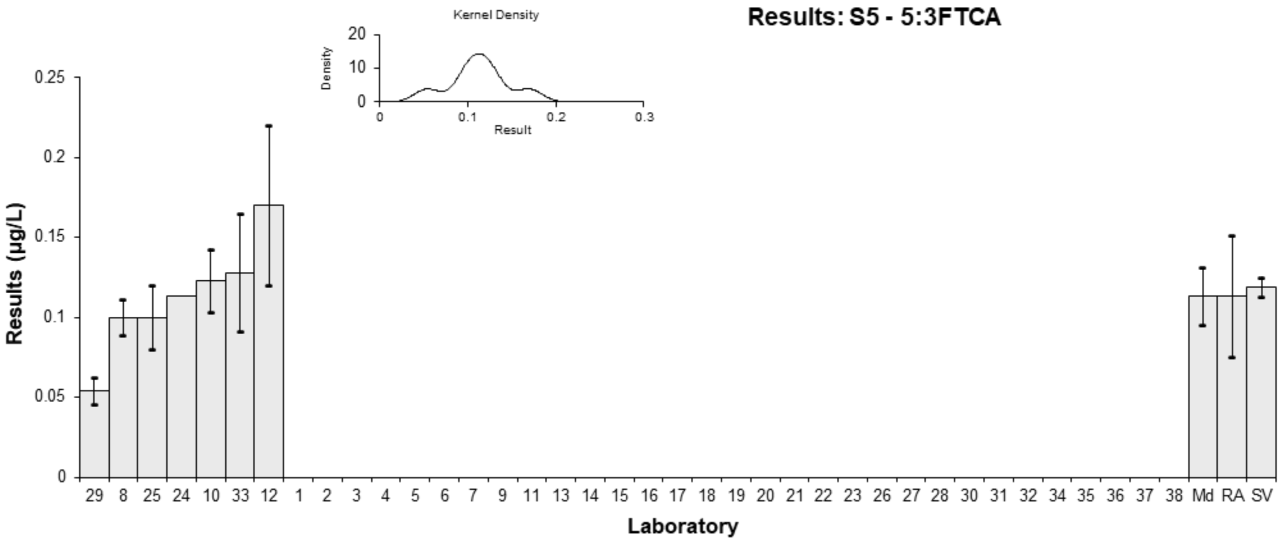

Kernel Density
Results: S5 - 5:3FTCA
Density
Result
Results (µg/L)
Laboratory
29 8 25 24 10 33 12 1 2 3 4 5 6 7 9 11 13 14 15 16 17 18 19 20 21 22 23 26 27 28 30 31 32 34 35 36 37 38 Md RA SV

Figure 120

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. Results less than 50% or more than 150% of the robust average were removed before calculation of the assigned value.[5] Appendix 3 sets out the calculation for the expanded uncertainty of the robust average of PFPeA in S2.

No assigned values were set for 6:2FTS, PFDA, PFDS and PFNS in S1 and for 10:2FTS, 9Cl-PF3ONS and 11Cl-PF3OUdS, in S5 because the results were too variable. No assigned value was also set for 5:3FTCA in S2 and S5 because too few results were reported.

A low recovery of the spiked value was noticed for PFNS (28%) and PFDS (17%) in S5 indicating a possible stability issue. However, no relationship was evident between the reported results and the date when the sample was received or analysed. The results were also variable and so no assigned value was set for these tests either.

Although a low recovery of the spiked value was observed for GenX in soil, an assigned value was still set for this test because, as in previous years the reported results were in excellent agreement with each-other. The between-laboratory CV was only 15% lower than that predicted by Thomson and Horwitz.

A low recovery of the spiked value and variable results were observed for 10:2FTS, 9Cl-PF3ONS and 11Cl-PF3OUdS in the water sample S5, indicating possible stability issues.

Recoveries of the spiked values for all spiked analytes in S2 (soil), S3 (biosolid) and S5 (water) samples are presented in Table 125.

Sample S3 was part of a pilot study designed to assess whether the methods used by laboratories for PFAS measurement in biosolids produce compatible results. No individual assessment was conducted for this sample and so no assigned value was set for any of the PFAS analytes in S3. However participants can still compare their results against those of other participants as well as the median and robust average of reported results in Chapter 5. Participants can also assess whether their reported results fall within what the study coordinator considers to be "an acceptable range" as shown in Appendix 7, where "acceptable range" is defined as an acceptable departure from the best estimate of the true value of each S3 analyte.

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.

Table 125 Comparison of Assigned Value and Spiked Concentration.

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	PFBS	µg/kg	8.11	6.91	85
S2	Soil	PFPeS	µg/kg	9.47	8.73	92
S2	Soil	PFHxS	µg/kg	4.76	4.44	93
S2	Soil	PFHxS_L	µg/kg	4.76	4.44	93
S2	Soil	PFHpS	µg/kg	1.91	1.82	95
S2	Soil	PFOS	µg/kg	5.77	5.53	96

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	PFOS_L	µg/kg	5.77	5.52	96
S2	Soil	PFNS	µg/kg	0.966	0.907	94
S2	Soil	PFDS	µg/kg	33.9	31.1	92
S2	Soil	PFDoS	µg/kg	29.3	24.3	83
S2	Soil	PFBA	µg/kg	9.42	10.8	115
S2	Soil	PFPeA	µg/kg	4.01	3.71	93
S2	Soil	PFHxA	µg/kg	5.00	5.25	105
S2	Soil	PFHpA	µg/kg	3.00	3.01	100
S2	Soil	PFOA	µg/kg	10.1	10.5	104
S2	Soil	PFNA	µg/kg	6.02	5.98	99
S2	Soil	PFDA	µg/kg	11.2	11.1	99
S2	Soil	PFTrDA	µg/kg	15.2	13.7	90
S2	Soil	PFODA	µg/kg	20.2	17.8	88
S2	Soil	PFOSA	µg/kg	13.4	13.8	103
S2	Soil	MeFOSAA	µg/kg	10.1	8.57	85
S2	Soil	EtFOSAA	µg/kg	10.1	8.57	85
S2	Soil	8:2FTS	µg/kg	6.68	6.49	97
S2	Soil	10:2FTS	µg/kg	48.7	44.3	91
S2	Soil	8:2diPAP	µg/kg	50.3	39.6	79
S2	Soil	GenX	µg/kg	15.2	2.17	14
S2	Soil	ADONA	µg/kg	23.7	23.3	98
S2	Soil	9Cl-PF3ONS	µg/kg	23.5	23.4	100
S2	Soil	11Cl-PF3OUdS	µg/kg	23.7	20.9	88
S2*	Soil	5:3FTCA	µg/kg	35.2	29.2	83
S3*	Biosolid	PFBS	µg/kg	10.7	9.1	85
S3*	Biosolid	PFPeS	µg/kg	12.5	12.3	98
S3*	Biosolid	PFHxS	µg/kg	6.25	6.23	100
S3*	Biosolid	PFHxS_L	µg/kg	6.25	5.88	94
S3*	Biosolid	PFHpS	µg/kg	2.44	2.40	98
S3*	Biosolid	PFOS	µg/kg	10.1	9.9	98
S3*	Biosolid	PFOS_L	µg/kg	10.1	9.9	98
S3*	Biosolid	PFNS	µg/kg	1.92	1.27	66
S3*	Biosolid	PFDS	µg/kg	44.4	33.8	76
S3*	Biosolid	PFDoS	µg/kg	38.4	15.1	39
S3*	Biosolid	PFBA	µg/kg	12.4	11.5	93
S3*	Biosolid	PFPeA	µg/kg	5.30	5.31	100

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S3*	Biosolid	PFHxA	µg/kg	6.62	7.90	119
S3*	Biosolid	PFHpA	µg/kg	3.97	4.42	111
S3*	Biosolid	PFOA	µg/kg	13.3	14.9	112
S3*	Biosolid	PFNA	µg/kg	7.97	7.60	95
S3*	Biosolid	PFDA	µg/kg	14.9	15.0	101
S3*	Biosolid	PFTrDA	µg/kg	15.1	11.1	74
S3*	Biosolid	PFODA	µg/kg	25.6	11.6	45
S3*	Biosolid	PFOSA	µg/kg	17.8	13.7	77
S3*	Biosolid	MeFOSAA	µg/kg	14.2	11.9	84
S3*	Biosolid	EtFOSAA	µg/kg	13.4	11.3	84
S3*	Biosolid	8:2FTS	µg/kg	8.93	8.30	93
S3*	Biosolid	10:2FTS	µg/kg	64.2	44.9	70
S3*	Biosolid	8:2diPAP	µg/kg	66.6	60.0	90
S3*	Biosolid	GenX	µg/kg	19.9	19.6	98
S3*	Biosolid	ADONA	µg/kg	31.4	28.6	91
S3*	Biosolid	9Cl-PF3ONS	µg/kg	31.0	26.4	85
S3*	Biosolid	11Cl-PF3OUdS	µg/kg	31.4	19.5	62
S3*	Biosolid	5:3FTCA	µg/kg	29.2	31.5	108
S5	Water	PFBS	µg/L	0.0397	0.0342	86
S5	Water	PFPeS	µg/L	0.0233	0.0222	95
S5	Water	PFHxS	µg/L	0.0376	0.0344	91
S5	Water	PFHxS_L	µg/L	0.0376	0.0346	92
S5	Water	PFHpS	µg/L	0.00378	0.00332	88
S5	Water	PFOS	µg/L	0.00950	0.00545	57
S5	Water	PFOS_L	µg/L	0.00950	0.00561	59
S5*	Water	PFNS	µg/L	0.0381	0.00996	26
S5*	Water	PFDS	µg/L	0.0958	0.0150	16
S5	Water	PFDoS	µg/L	0.0816	0.050	61
S5	Water	PFBA	µg/L	0.232	0.229	99
S5	Water	PFPeA	µg/L	0.0399	0.0379	95
S5	Water	PFHxA	µg/L	0.0297	0.0318	107
S5	Water	PFHpA	µg/L	0.0249	0.0237	95
S5	Water	PFOA	µg/L	0.0347	0.0342	99
S5	Water	PFNA	µg/L	0.00498	0.00434	87
S5	Water	PFDA	µg/L	0.0281	0.0194	69
S5	Water	PFUdA	µg/L	0.0488	0.0416	85

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S5	Water	PFDoA	µg/L	0.0595	0.0466	78
S5	Water	PFTrDA	µg/L	0.124	0.095	77
S5	Water	PFTeDA	µg/L	0.148	0.117	79
S5	Water	PFOSA	µg/L	0.0476	0.0397	83
S5	Water	6:2FTS	µg/L	0.0376	0.0360	96
S5*	Water	10:2FTS	µg/L	0.0383	0.0108	28
S5	Water	GenX	µg/L	0.0696	0.0671	96
S5	Water	ADONA	µg/L	0.0561	0.0533	95
S5*	Water	9Cl-PF3ONS	µg/L	0.0926	0.0380	41
S5*	Water	11Cl-PF3OUdS	µg/L	0.139	0.0168	12
S5*	Water	5:3FTCA	µg/L	0.119	0.113	95

*Robust Average outliers excluded (Assigned value not set)

6.2 Measurement Uncertainty Reported by Participants

Participants were asked to report an estimate of the expanded measurement uncertainty associated with their results. It is a requirement of ISO/IEC 17025 that laboratories have procedures to estimate the uncertainty of chemical measurements and to report this in specific circumstances, including when the client's instruction so requires.[7]

Of 2913 numerical results, 2600 (89%) were reported with an expanded measurement uncertainty, indicating that not all laboratories have addressed this requirement of ISO 17025.[7] The magnitude of the reported expanded uncertainties was within the range 0% to 200% of the reported value. The participants used a wide variety of procedures to estimate expanded measurement uncertainty. These are presented in Tables 3 and 4.

Participation in proficiency testing programs allows participants to check how reasonable their estimates of uncertainty are. Results and the expanded MU are presented in the bar charts for each analyte in this study (Figures 2 to 120).

Laboratories 6, 8, 14, 21, 28, 33, 34 and 38 should review their procedure for estimating measurement uncertainty as some of the relative uncertainties reported by them were lower than 10%, which the study coordinator believes is unrealistically small for a routine PFAS measurement.

Laboratories 3, 4, 5, 7, 8, 23, 26, 27, 30 and 34 who reported estimates of uncertainty greater than 50% should also review their procedure as it might not be fit-for-purpose.

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

Laboratories 10, 21, 27 and 32 attached an estimate of the expanded measurement uncertainty to a result reported as being 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 result of "12.808 ± 2.818 µg/L", should instead be expressed as "12.8 ± 2.8 µg/L").[8]

6.3 z-Score

The z-score compares the participant's deviation from the assigned value with the target standard deviation set for proficiency assessment.

A target standard deviation equivalent to 20% coefficient of variation (CV) was used to calculate z-scores. Unlike the standard deviation based on between-laboratory CV, setting the target standard deviation as a realistic set value enables z-scores to be used as fixed reference value points for assessment of laboratory performance, independent of group performance.

The between-laboratory coefficient of variation predicted by the modified Horwitz equation[6] and the between-laboratory CV are presented for comparison in Table 126.

To account for possible bias in the consensus values due to laboratories using inefficient analytical/extraction techniques, z-scores were adjusted for PFOS, PFOS_L, PFDoS, PFDA, PFTrDA, PFTeDA in Sample S5.

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. E_n-scores could not be calculated. When the results are higher than the maximum acceptable concentration, z-scores were 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 121 and 123 and by analyte in Figures 122 and 124.

Of the 2258 results for which z-scores were calculated, 2097 (93%) returned a satisfactory z-score of $|z| \leq 2.0$ and 75 (3%) 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 method or laboratory bias.

6.4 E_n-Score

E_n-score can be interpreted 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 125. 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.

For results whose *z*-scores were adjusted no E_n-score has been calculated.

Of 2247 results for which E_n-scores were calculated, 1751 (78%) 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.

Table 126 Performance Target standard deviation, modified Horwitz values and between-laboratory CV

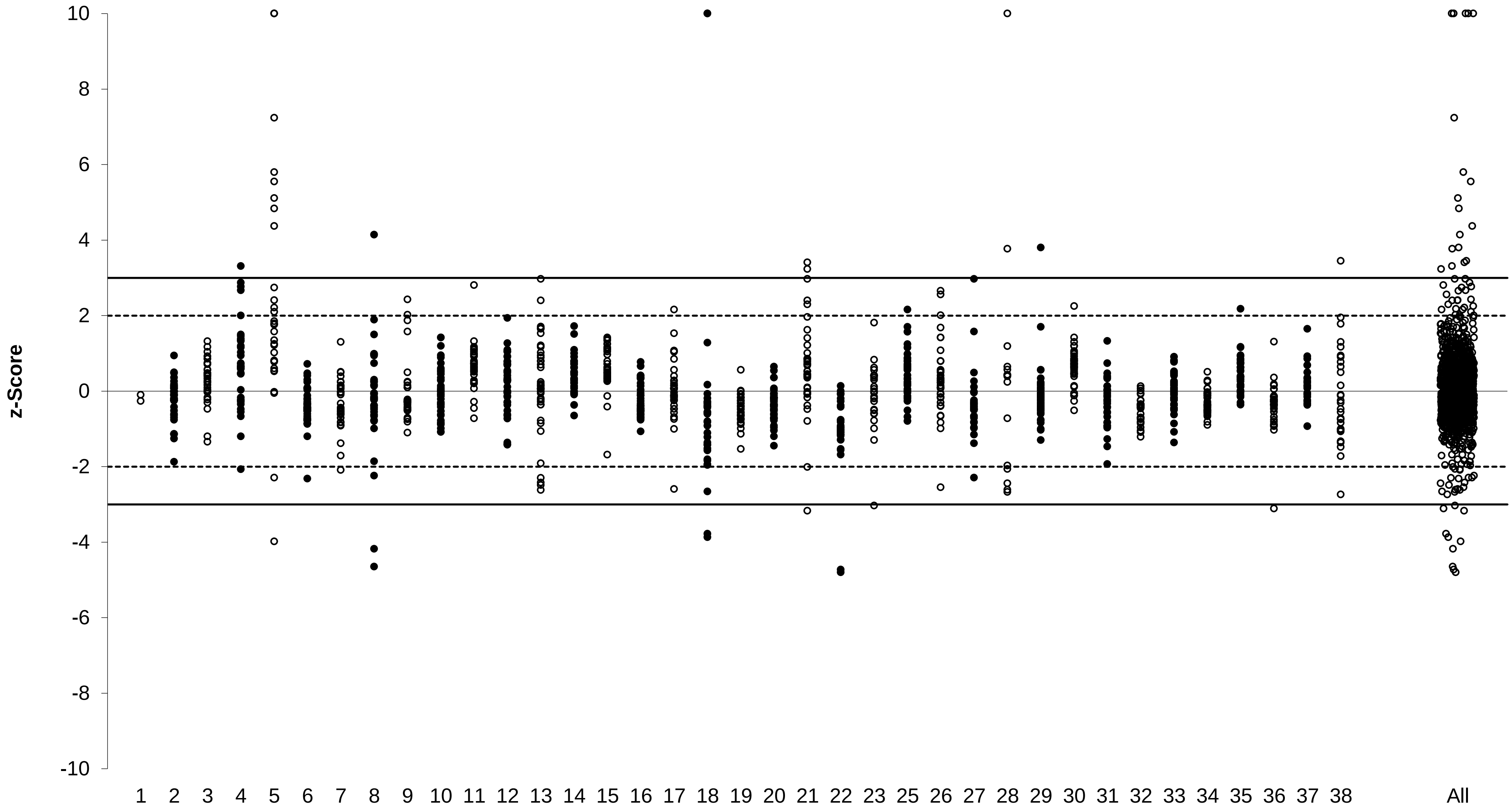
Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S1	PFBS	47.7	µg/kg	20	22	9.4
S1	PFPeS	46.0	µg/kg	20	22	17
S1	PFHxS	300	µg/kg	20	19	13
S1	PFHxS_L	254	µg/kg	20	20	12
S1	PFHpS	50.4	µg/kg	20	22	24
S1	PFOS	3950	µg/kg	20	13	18
S1	PFOS_L	2320	µg/kg	20	14	17
S1**	PFNS	11.6	µg/kg	Not Set	22	94
S1**	PFDS	2.50	µg/kg	Not Set	22	80
S1	PFBA	17.2	µg/kg	20	22	16
S1	PFPeA	26.5	µg/kg	20	22	13
S1	PFHxA	117	µg/kg	20	22	14
S1	PFHpA	15.2	µg/kg	20	22	15
S1	PFOA	41.3	µg/kg	20	22	16
S1	PFNA	0.432	µg/kg	20	22	30
S1**	PFDA	0.177	µg/kg	Not Set	22	59
S1	PFOSA	3.24	µg/kg	20	22	25
S1**	6:2FTS	9.25	µg/kg	Not Set	22	180
S2	PFBS	6.91	µg/kg	20	22	11
S2	PFPeS	8.73	µg/kg	20	22	12
S2	PFHxS	4.44	µg/kg	20	22	14
S2	PFHxS_L	4.44	µg/kg	20	22	12
S2	PFHpS	1.82	µg/kg	20	22	13
S2	PFOS	5.53	µg/kg	20	22	16
S2	PFOS_L	5.52	µg/kg	20	22	13
S2	PFNS	0.907	µg/kg	20	22	14
S2	PFDS	31.1	µg/kg	20	22	16
S2	PFDoS	24.3	µg/kg	20	22	11
S2	PFBA	10.8	µg/kg	20	22	14
S2	PFPeA	3.71	µg/kg	20	22	13
S2	PFHxA	5.25	µg/kg	20	22	10
S2	PFHpA	3.01	µg/kg	20	22	11
S2	PFOA	10.5	µg/kg	20	22	11

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S2	PFNA	5.98	µg/kg	20	22	12
S2	PFDA	11.1	µg/kg	20	22	15
S2	PFTrDA	13.7	µg/kg	20	22	16
S2	PFODA	17.8	µg/kg	20	22	16
S2	PFOSA	13.8	µg/kg	20	22	11
S2	MeFOSAA	8.57	µg/kg	20	22	17
S2	EtFOSAA	8.57	µg/kg	20	22	13
S2	8:2FTS	6.49	µg/kg	20	22	16
S2	10:2FTS	44.3	µg/kg	20	22	24
S2	8:2diPAP	39.6	µg/kg	20	22	13
S2	GenX	2.17	µg/kg	20	22	15
S2	ADONA	23.3	µg/kg	20	22	20
S2	9Cl-PF3ONS	23.4	µg/kg	20	22	21
S2	11Cl-PF3OUdS	20.9	µg/kg	20	22	27
S2**	5:3FTCA	29.2	µg/kg	Not Set	22	27
S3**	PFBS	9.1	µg/kg	Not Set	22	21
S3**	PFPeS	12.3	µg/kg	Not Set	22	31
S3**	PFHxS	6.23	µg/kg	Not Set	22	18
S3**	PFHxS_L	5.88	µg/kg	Not Set	22	16
S3**	PFHpS	2.40	µg/kg	Not Set	22	30
S3**	PFOS	9.9	µg/kg	Not Set	22	17
S3**	PFOS_L	9.9	µg/kg	Not Set	22	17
S3**	PFNS	1.27	µg/kg	Not Set	22	26
S3**	PFDS	33.8	µg/kg	Not Set	22	16
S3**	PFDoS	15.1	µg/kg	Not Set	22	65
S3**	PFBA	11.5	µg/kg	Not Set	22	27
S3**	PFPeA	5.31	µg/kg	Not Set	22	27
S3**	PFHxA	7.90	µg/kg	Not Set	22	25
S3**	PFHpA	4.42	µg/kg	Not Set	22	28
S3**	PFOA	14.9	µg/kg	Not Set	22	27
S3**	PFNA	7.60	µg/kg	Not Set	22	24
S3**	PFDA	15.0	µg/kg	Not Set	22	25
S3**	PFTrDA	11.1	µg/kg	Not Set	22	33
S3**	PFODA	11.6	µg/kg	Not Set	22	72
S3**	PFOSA	13.7	µg/kg	Not Set	22	18

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S3**	MeFOSAA	11.9	µg/kg	Not Set	22	41
S3**	EtFOSAA	10.8	µg/kg	Not Set	22	45
S3**	8:2FTS	8.30	µg/kg	Not Set	22	26
S3**	10:2FTS	44.9	µg/kg	Not Set	22	30
S3***	8:2diPAP	60.0	µg/kg	Not Set	22	29
S3**	GenX	19.6	µg/kg	Not Set	22	30
S3**	ADONA	28.6	µg/kg	Not Set	22	22
S3**	9Cl-PF3ONS	26.4	µg/kg	Not Set	22	24
S3**	11Cl-PF3OUdS	19.5	µg/kg	Not Set	22	13
S3**	5:3FTCA	31.5	µg/kg	Not Set	22	85
S4	PFBS	0.0213	µg/L	20	22	7.9
S4	PFPeS	0.0228	µg/L	20	22	12
S4	PFHxS	0.184	µg/L	20	22	15
S4	PFHxS_L	0.160	µg/L	20	22	13
S4	PFHpS	0.0074	µg/L	20	22	27
S4	PFOS	0.109	µg/L	20	22	19
S4	PFOS_L	0.0573	µg/L	20	22	10
S4	PFBA	0.0117	µg/L	20	22	17
S4	PFPeA	0.0125	µg/L	20	22	16
S4	PFHxA	0.0320	µg/L	20	22	11
S4	PFHpA	0.00570	µg/L	20	22	18
S4	PFOA	0.00914	µg/L	20	22	15
S5	PFBS	0.0342	µg/L	20	22	12
S5	PFPeS	0.0222	µg/L	20	22	14
S5	PFHxS	0.0344	µg/L	20	22	13
S5	PFHxS_L	0.0346	µg/L	20	22	15
S5	PFHpS	0.00332	µg/L	20	22	17
S5	PFOS	0.00545	µg/L	20	22	20
S5	PFOS_L	0.00561	µg/L	20	22	20
S5**	PFNS	0.00996	µg/L	Not Set	22	30
S5**	PFDS	0.0150	µg/L	Not Set	22	34
S5	PFDoS	0.050	µg/L	20	22	21
S5	PFBA	0.229	µg/L	20	22	12
S5	PFPeA	0.0379	µg/L	20	22	12
S5	PFHxA	0.0318	µg/L	20	22	10

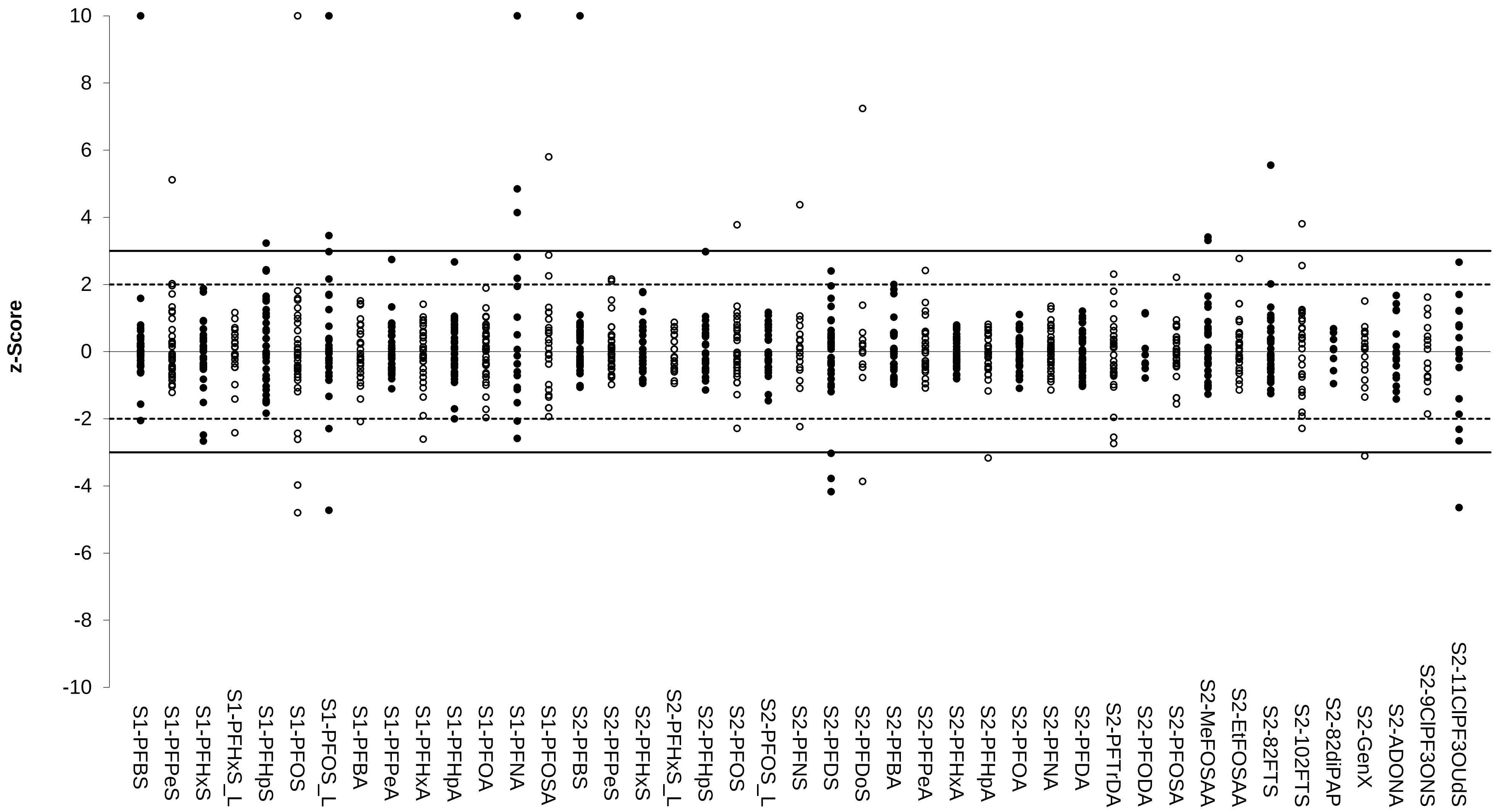
Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S5	PFHpA	0.0237	µg/L	20	22	12
S5	PFOA	0.0342	µg/L	20	22	11
S5	PFNA	0.00434	µg/L	20	22	14
S5	PFDA	0.0194	µg/L	20	22	23
S5	PFUdA	0.0416	µg/L	20	22	28
S5	PFDoA	0.0466	µg/L	20	22	26
S5	PFTrDA	0.095	µg/L	20	22	28
S5	PFTeDA	0.117	µg/L	20	22	24
S5	PFOSA	0.0397	µg/L	20	22	25
S5	6:2FTS	0.0360	µg/L	20	22	13
S5**	10:2FTS	0.0108	µg/L	Not Set	22	45
S5	GenX	0.0671	µg/L	20	22	15
S5	ADONA	0.0533	µg/L	20	22	15
S5**	9Cl-PF3ONS	0.0380	µg/L	Not Set	22	40
S5**	11Cl-PF3OUdS	0.0168	µg/L	Not Set	22	57
S5**	5:3FTCA	0.113	µg/L	Not Set	22	35

*Robust between-laboratory CV with outliers removed; **Robust Average outliers excluded (Assigned Value not set). 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).***Median value.



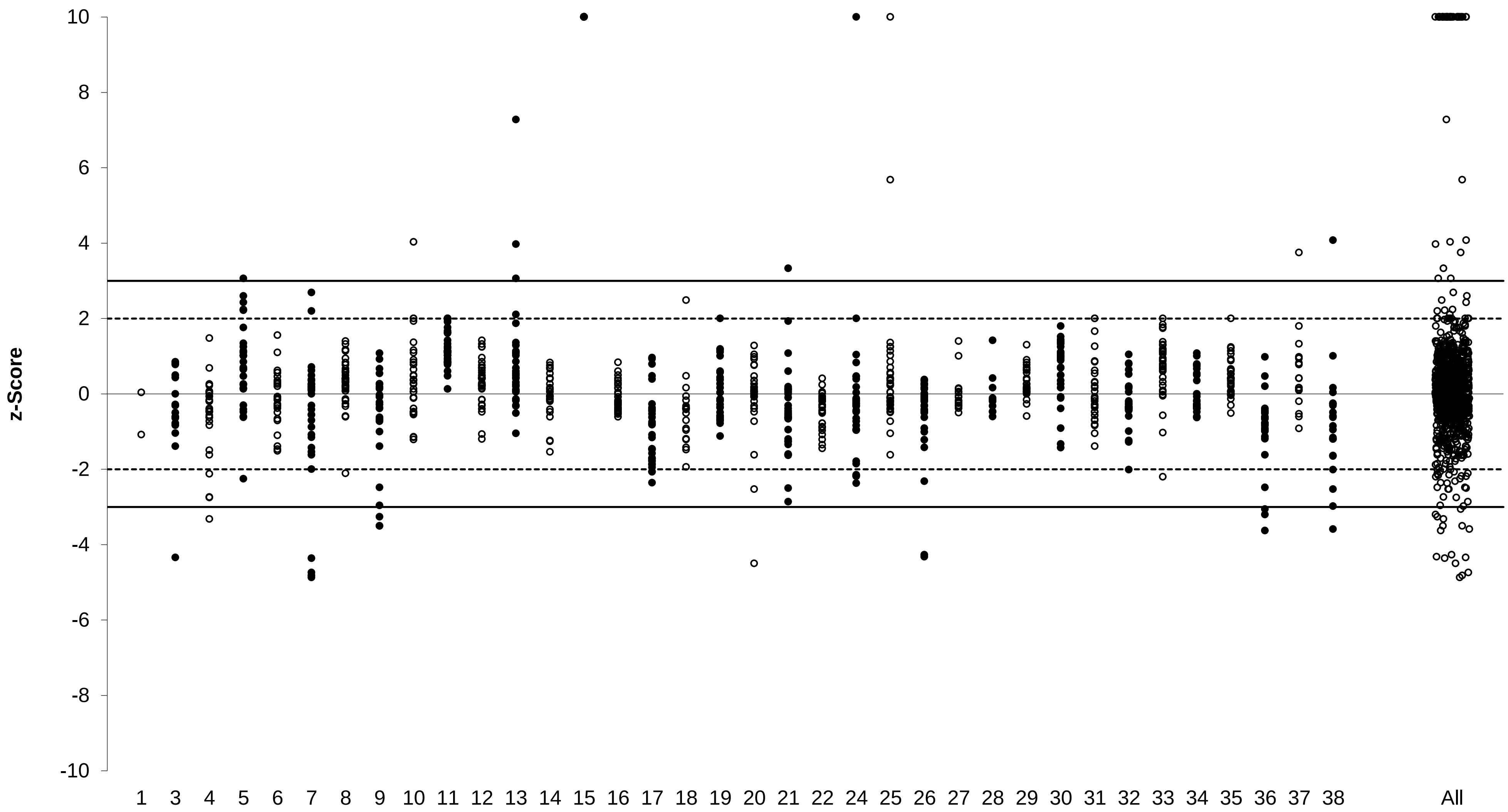
Scores greater than 10 have been plotted as 10.

Figure 121 z-Score Dispersal by Laboratory for Soil Samples S1 and S2



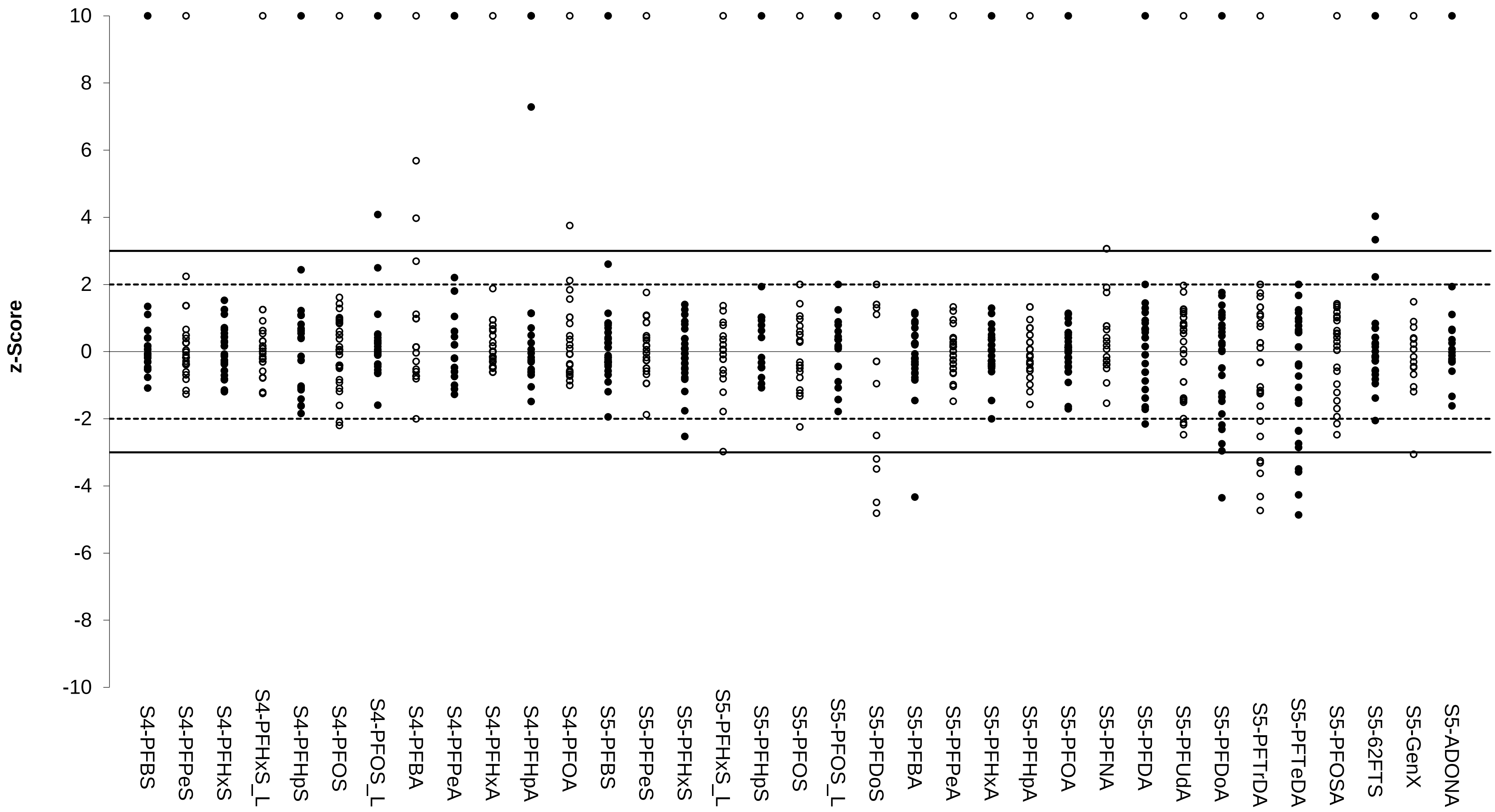
Scores greater than 10 have been plotted as 10.

Figure 122 z-Score Dispersal by Analyte for Soil Samples S1 and S2



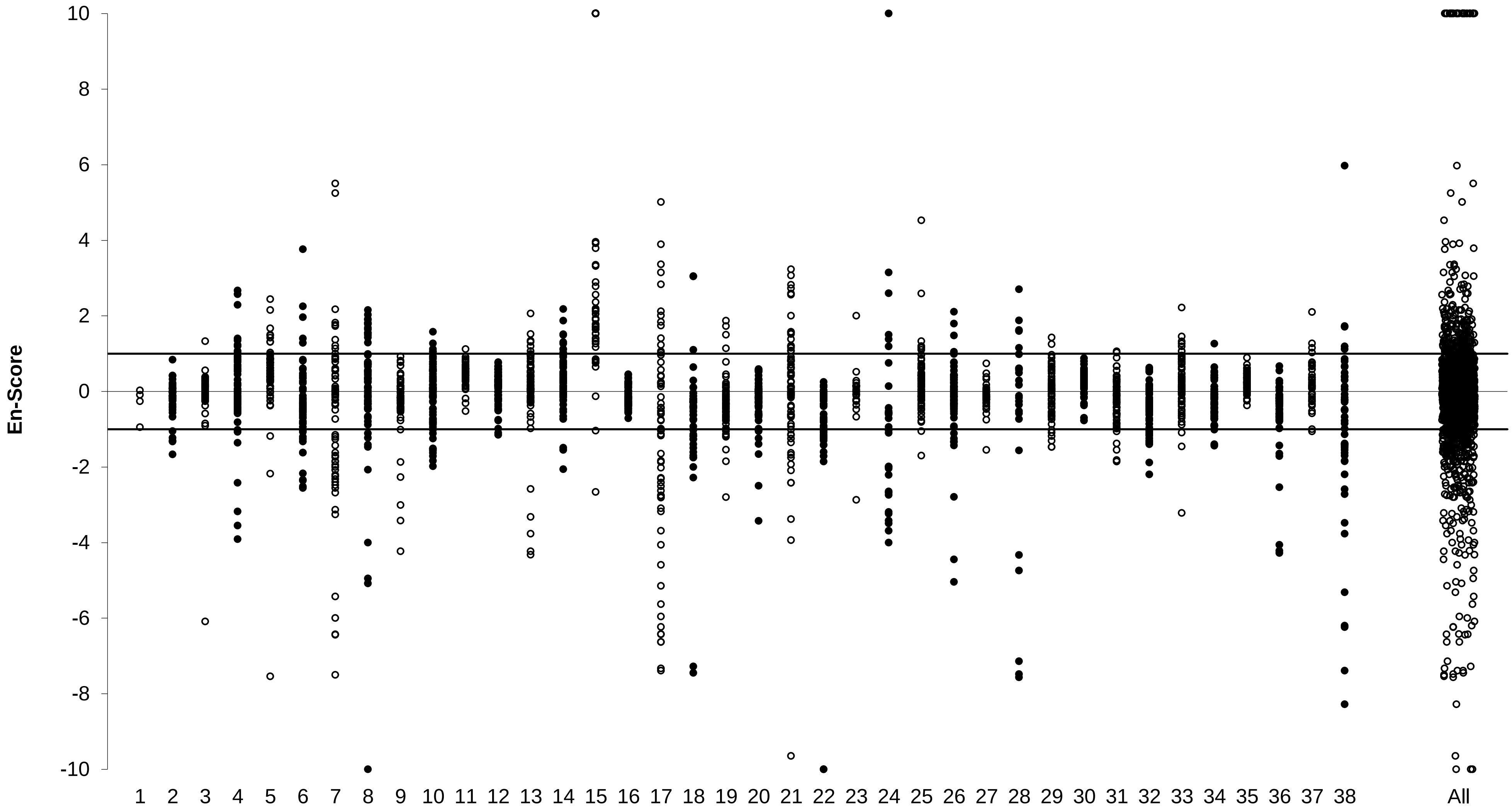
Scores greater than 10 have been plotted as 10.

Figure 123 z-Score Dispersal by Laboratory for Water Samples S4 and S5



Scores greater than 10 have been plotted as 10.

Figure 124 z-Score Dispersal by Analyte for Water Samples S4 and S5



Scores greater than 10 have been plotted as 10.

Figure 125 E_n-Score Dispersal by Laboratory

6.5 z-Score Scatter Plots

Scatter plots of z-scores for all analytes are presented in Figure 126. Scores are predominantly plotted in quadrants I and III, indicating that laboratory bias is the major contributor to the variability of results

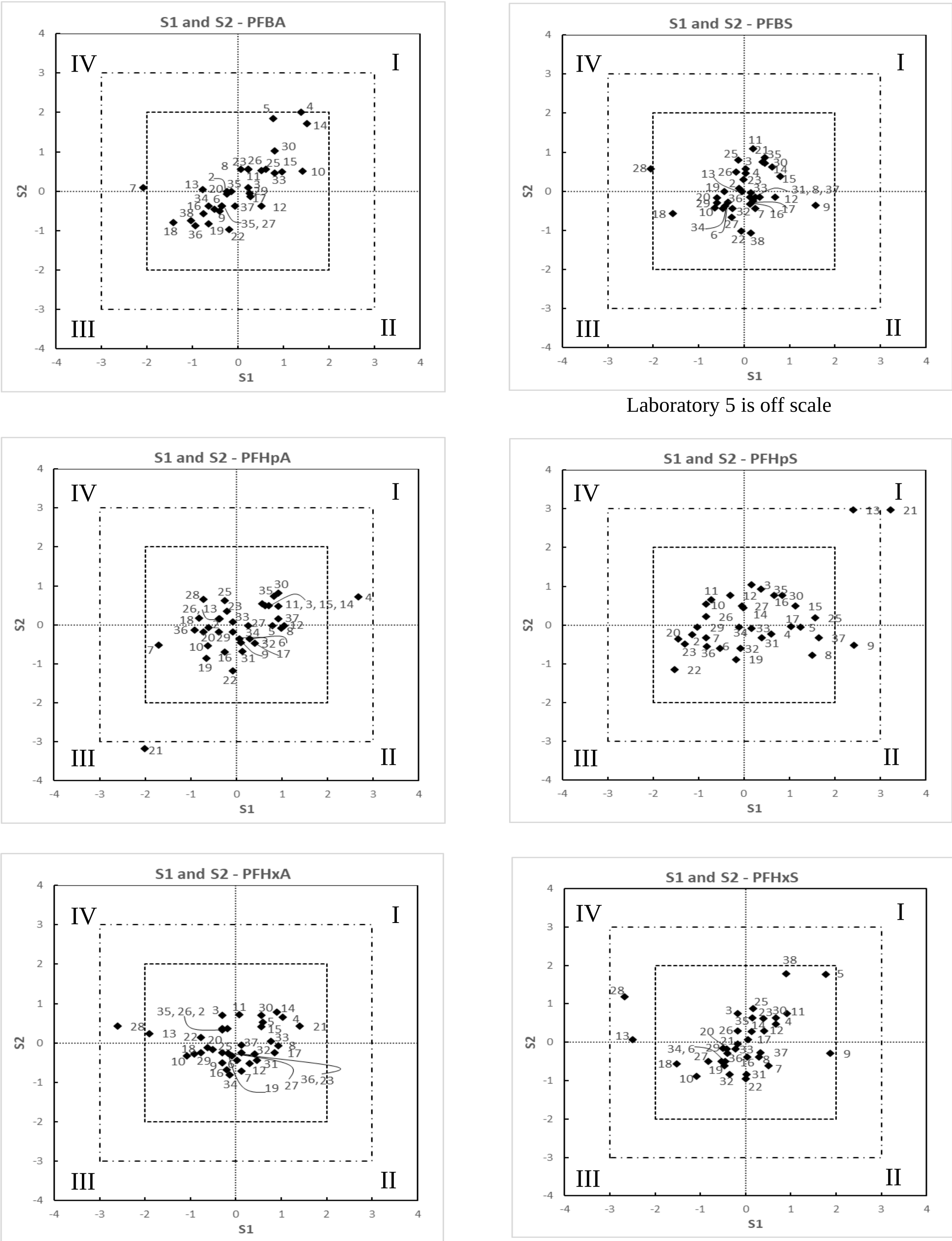
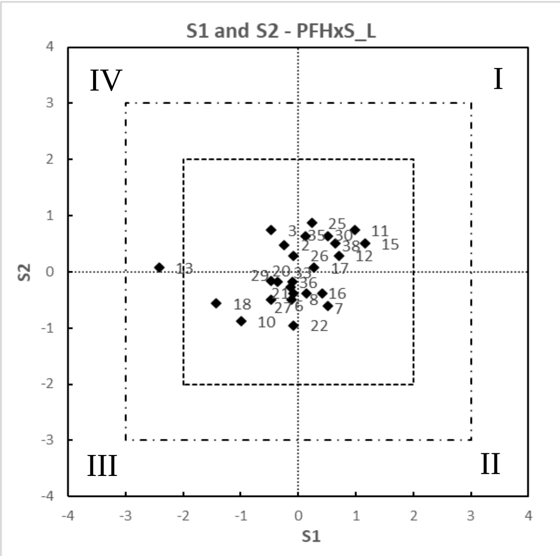
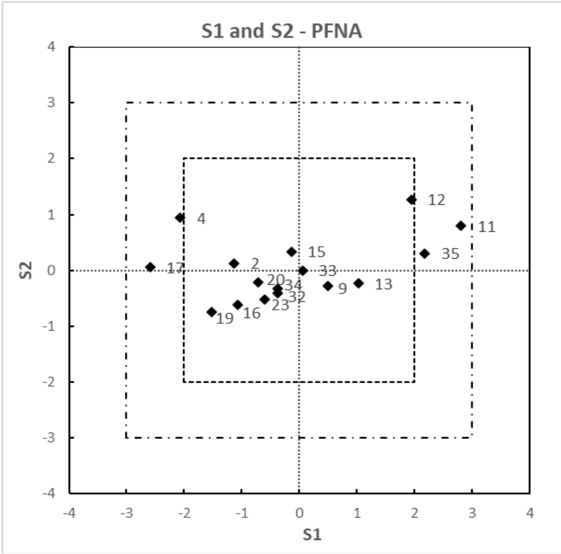
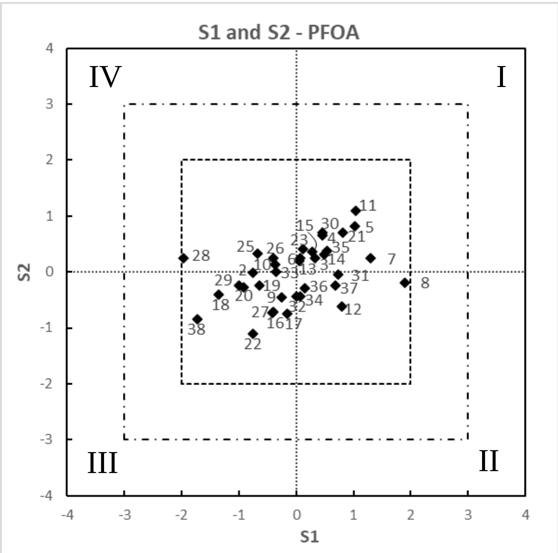


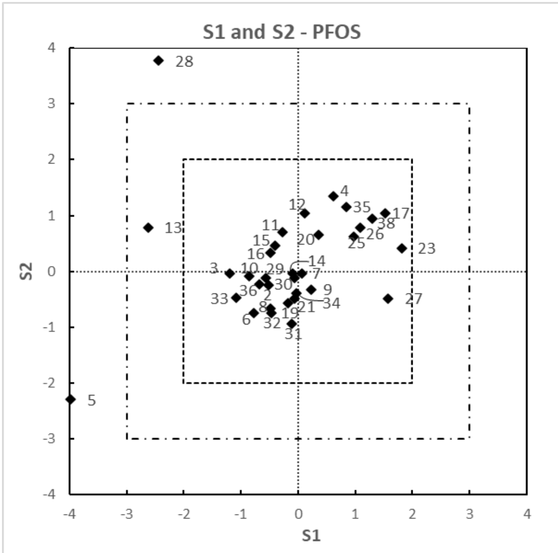
Figure 126 z-Score Scatter Plots



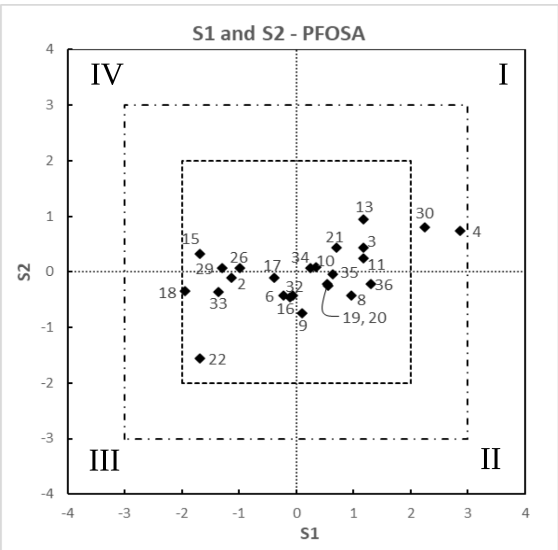


Laboratories 5, 8 and 28 are off scale.

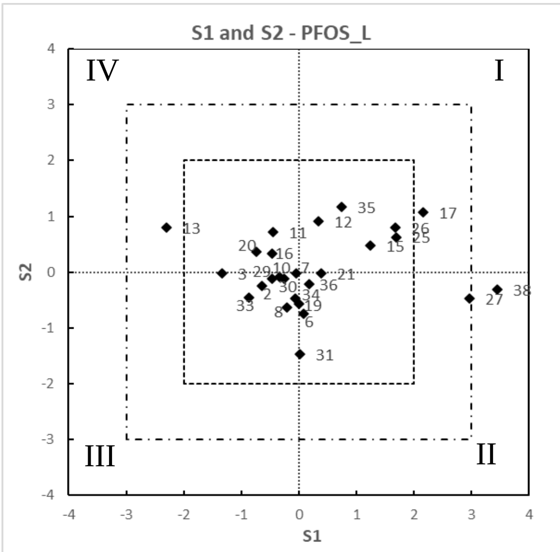




Laboratories 18 and 22 are off scale.

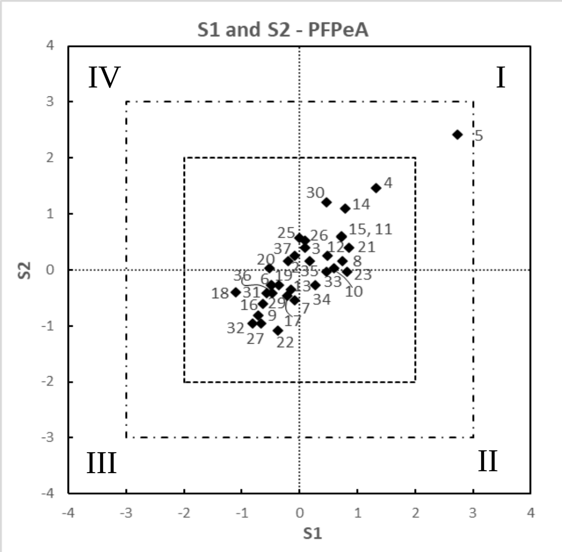


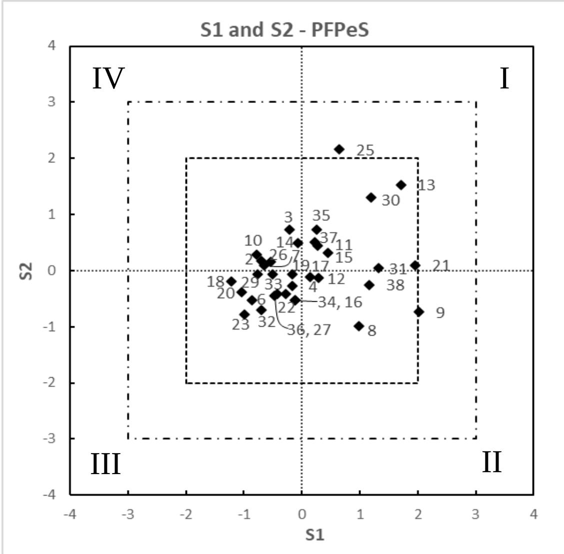
Laboratory 5 is off scale.



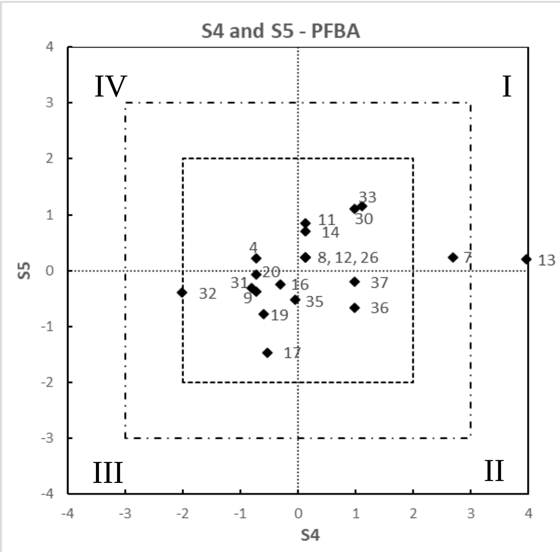
Laboratories 18 and 22 are off scale.

Figure 126 z-Score Scatter Plots (continued)

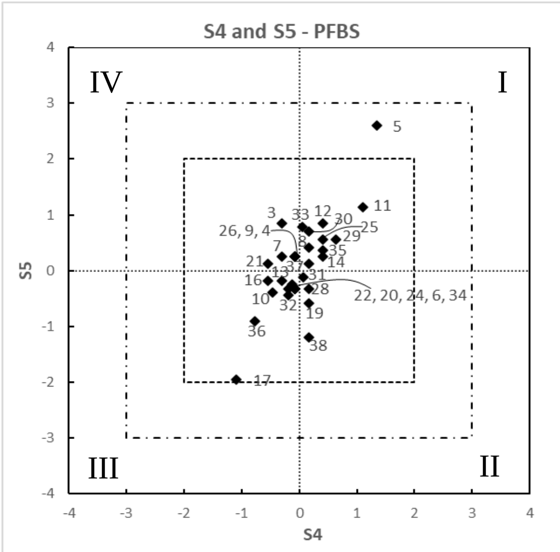




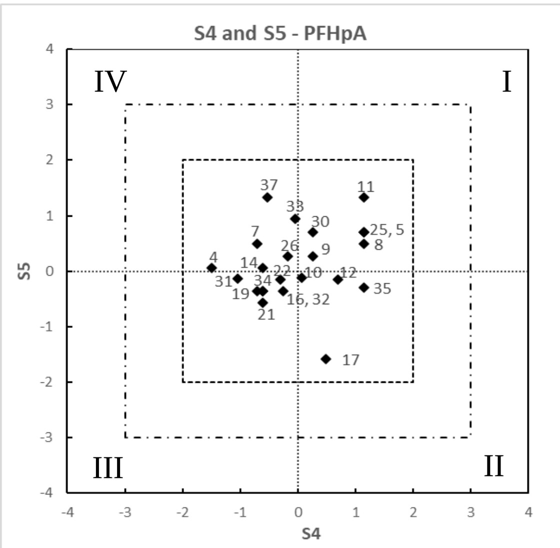
Laboratory 5 is off scale.



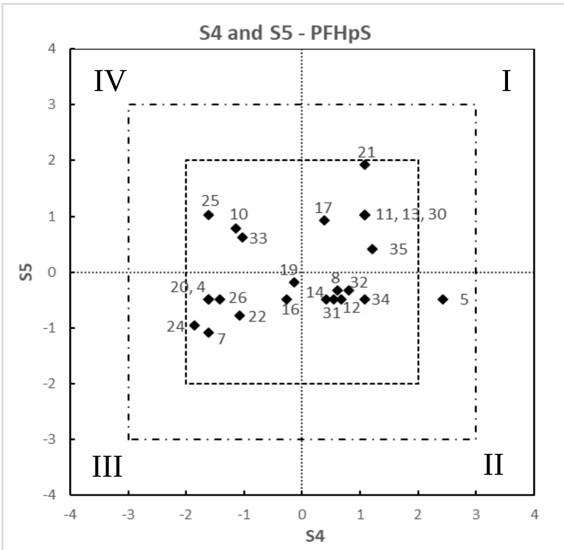
Laboratories 15 and 25 are off scale.



Laboratory 15 is off scale.

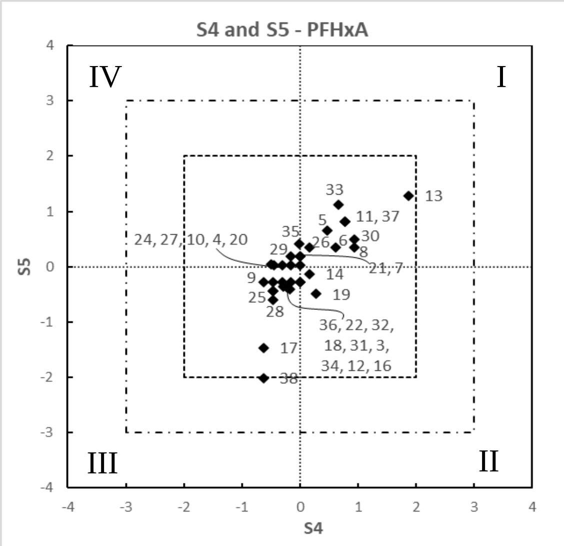


Laboratories 13, 15 and 24 are off scale.

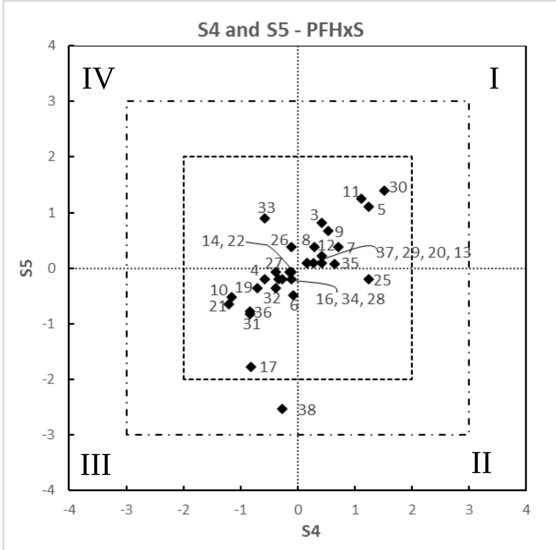


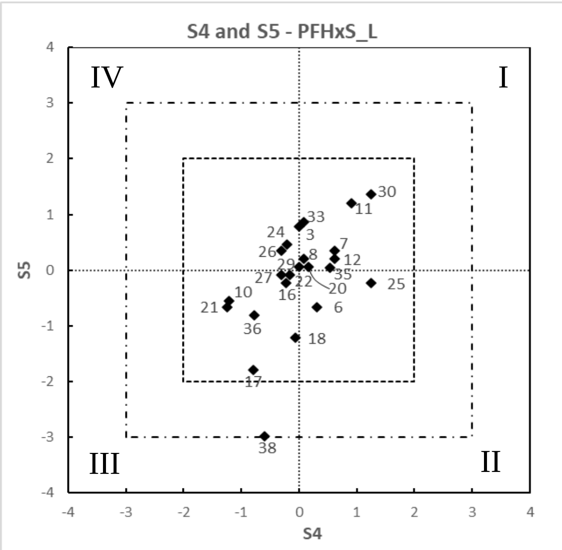
Laboratory 15 is off scale.

Figure 126 z-Score Scatter Plots (continued)

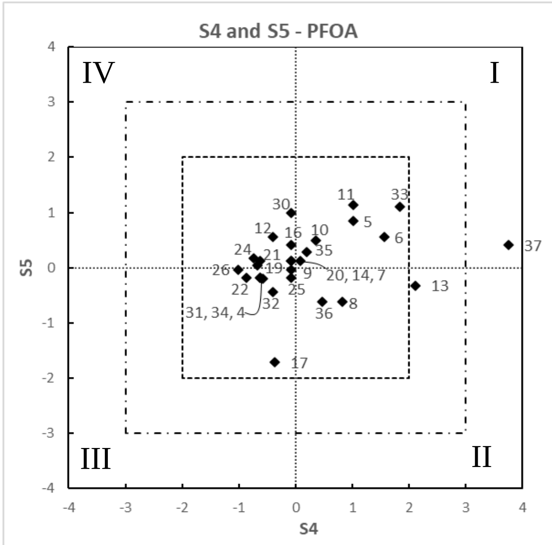


Laboratory 15 is off scale.

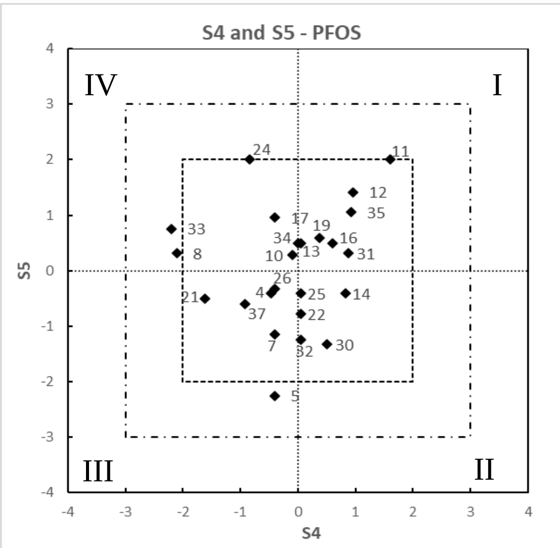




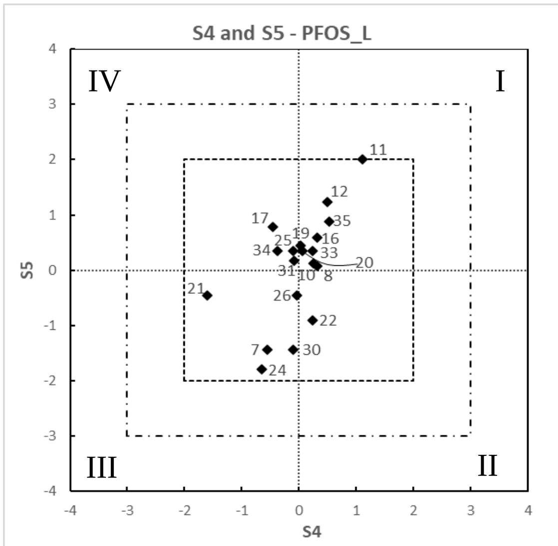
Laboratory 15 is off scale.



Laboratory 15 is off scale.

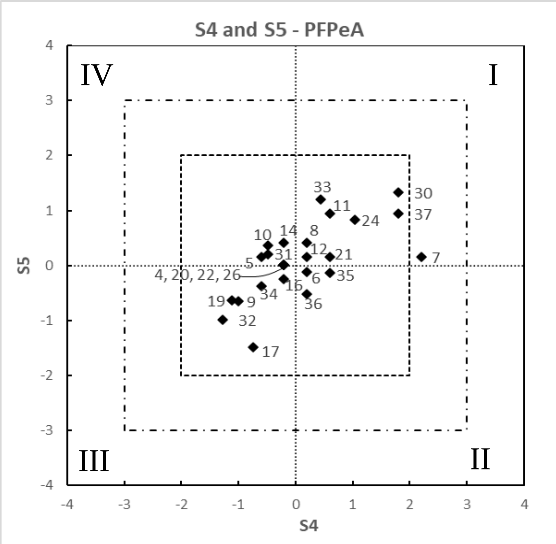


Laboratory 15 is off scale.

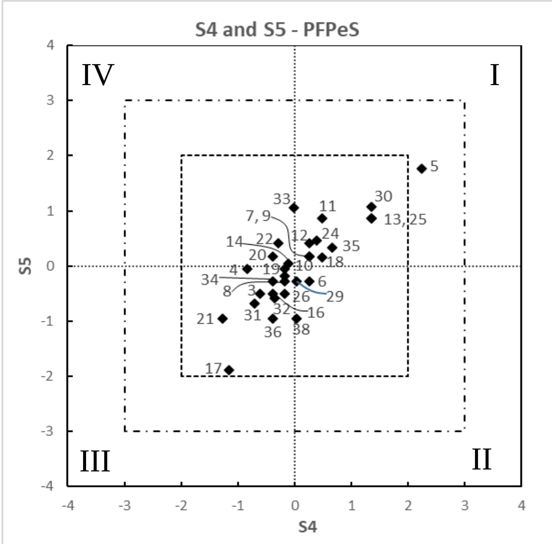


Laboratory 15 is off scale.

Figure 126 z-Score Scatter Plots (continued)



Laboratories 15 and 25 are off scale.



Laboratory 15 is off scale.

Figure 126 z-Score Scatter Plots (continued)

Table 127 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	PFNA	PFDA	PFOSA	6:2FTS
AV	47.7	46.0	300	254	50.4	3950	2320	Not Set	Not Set	17.2	26.5	117	15.2	41.3	0.432	Not Set	3.24	Not Set
1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2	46.62	39.52	NT	241.7	38.92	3542	2024	NT	0.5425	16.39	25.46	112.6	13.34	35.06	0.3346	0.1019	2.502	0.1100
3	48	44	290	230	52	3000	1700	NT	4.9	18	27	110	18	44	< 0.5	< 0.5	4	< 0.1
4	48.0	44.4	340.3	NR	56.4	4441	NR	3.15	0.391	21.983	33.542	141.06	23.33	45.12	0.253	0.097	5.099	2.748
5	316	93	406	NT	63	802	NT	24.2	6.00	19.9	41	131	17.6	49.7	0.85	0.31	7.0	<1
6	43.3	38.1	273	247.7	45.2	3338.4	2360.1	<10	<1	15.4	23.9	117.7	16.1	41.9	<1	<0.2	3.1	<0.2
7	50	41	330	280	42	4000	2300	<0.5	<0.5	10	26	120	10	52	<0.5	<0.5	<1	<1
8	50	55	318	261	65.5	3573	2228	4.86	1.38	18.1	30.4	139	18.2	56.9	0.79	0.108	3.86	< 1
9	62.8	64.58	412.05	NR	74.91	4128	NR	2.144	0.967	15.8	22.75	110.2	15.51	39.27	0.475	0.314	3.307	NR
10	41.6	38.8	234.9	203.8	41.9	3273	2162	<1.80	<1.80	22.1	29.7	91.8	13.3	38.3	<1.80	<1.80	3.47	41.5
11	49.580	48.580	355.108	303.686	43.166	3724.904	2111.369	17.667	1.281	18.938	30.346	118.675	16.908	49.864	0.675	0.310	3.999	< 0.5
12	54.3	48.7	324.3	290	47.4	4038	2480	15.7	0.8	19	29.1	124	18.4	47.8	0.6	0.3	<0.1	<0.5
13	47.2	61.7	150.6	131.2	74.6	1884	1255	30.2	0.61	14.5	24.6	72.2	14.1	41.8	0.52	0.18	4	0.11
14	53.63	45.42	307.75	NT	50.25	3878.13	NT	33.38	5.77	22.38	30.69	138.31	17.36	45.38	<1	<0.2	<0.5	<0.5
15	55.2158	50.1028	NT	312.7705	61.8012	3627.9906	2897.8269	3.1372	1.1142	20.5386	30.3388	130.274	17.1143	43.597	0.4209	0.1159	2.1508	0.099
16	49.0	45.0	302	275	57.1	3567	2106	18.22	3.43	14.6	23.1	112.3	14.4	37.9	0.33937	0.08315	3.17	< 0.5
17	49.64	47.37	303.5	268.4	60.84	5157	3323	NT	4.908	18.12	25.35	136.8	16.43	40.09	0.2082	0.1497	2.9959	<0.1
18	32.7	34.8	209	182	31.9	46700	26100	< 2.5	< 2.5	12.3	20.6	95.4	12.7	30.1	< 2.5	< 2.5	1.98	< 2.5
19	43.6	44.5	272	NT	48.6	3810	2324	NT	3.7	15	23.9	115	13.2	36	0.3	<0.5	3.6	<0.5
20	41.94	36.42	274.56	235.83	35.75	4235.99	1979.24	1.80	<1	16.33	23.73	102.20	13.01	33.73	0.37	0.10	3.59	<0.2
21	52	64	290	250	83	3900	2500	9.0	1.6	NT	31	150	9.1	48	<1	<1	3.7	<1
22	47	43.5	300	250	35	160	125	1.5	<1	16.5	24.5	99	15	35	<1	<1	2.15	<5
23	47.6	36.9	324.1	NT	37.3	5377	NT	1.69	< 0.1	17.4	30.9	126.6	14.6	42.3	0.38	0.11	NT	0.28
24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25	46.5	52	310	266	66.2	4728	3111	<1	<1	19.3	26.5	105	14.4	35.7	<1	<1	<1	<1
26	46	40	290	250	42	4800	3100	1.2	< 1.0	18	27	110	14	38	< 1.0	< 1.0	2.6	< 1.0
27	45	42	250	230	50	5200	3700	18	3	16	23	110	16	38	< 1	< 1	< 10	< 20
28	28	NT	140	NT	NT	2020	NT	NT	NT	NT	NT	56	13	25	5.3	5.8	NT	27
29	42	39	270	230	40	3500	2100	3.2	1.3	18	24	99	14	33	NR	NR	2.4	NR
30	52	57	340	280	59	3900	2200	25	4.3	20	29	130	18	45	< 0.5	< 0.5	4.7	< 0.1
31	48.9	58.2	301	NT	54.3	3860	2330	NT	<4.9	<24	23.5	128	15.6	47.4	<4.9	<4.9	<4.9	<4.9
32	45.3	39.6	279	NT	49.6	3590	NT	NT	2.9	16	22.2	120	15.4	41.4	0.4	<0.2	3.2	<0.5
33	49.1	41.4	286	249	52.0	3100	1920	2.01	0.709	20.0	29.0	135	15.0	38.4	0.437	<0.971	2.36	<0.971
34	43.7	45	268	NT	49.3	3930	2290	18.6	4	15	28	114	15	41.9	0.4	<0.4	3.4	<0.5
35	51.5	48.4	309	260	54.2	4620	2670	18.0	2.30	16.7	27.4	110	17.7	45.8	0.62	0.20	3.65	<0.5
36	44.3	41.6	276	247	42.2	3410	2404	10.9	<0.5	14	25.7	113	12.4	42.5	<0.5	<0.5	4.09	<0.5
37	51	48	320	NT	67	NR	NT	NT	NT	17	26	120	18	47	< 0.5	< 1	NT	< 0.5
38	49.1778	56.7746	354.0074	287.1000	35.4403	4975.0744	3920.3586	<5	<5	13.6618	23.5375	85.1553	13.7751	27.0822	<5	<5	<5	<5

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 128 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	PFNS	PFDS	PFDoS	PFBA	PFPeA	PFHxA	PFHpA	PFOA
AV	6.91	8.73	4.44	4.44	1.82	5.53	5.52	0.907	31.1	24.3	10.8	3.71	5.25	3.01	10.5
1	NT	NT	NT	NT	NT	NT	5.23	NT	NT	NT	NT	NT	NT	NT	10.3
2	7.015	9.042	NT	4.864	1.729	5.249	5.249	NT	36.96	NT	10.80	3.818	5.628	2.966	10.45
3	7.7	10	5.1	5.1	2.2	5.5	5.5	NT	34	NT	12	4.0	6.0	3.3	11
4	7.545	8.247	4.862	NR	1.737	7.020	NR	0.807	23.633	NR	15.123	4.797	5.930	3.445	11.873
5	28	12.4	6.0	NT	1.8	3.0	NT	1.7	40.9	59.5	14.8	5.5	5.8	3.0	12.2
6	6.3	7.8	4	4	1.6	4.7	4.7	0.75	27	20.5	9.8	3.5	4.8	2.8	11
7	6.3	9	3.9	3.9	1.7	5.5	5.5	0.9	26	22	11	3.3	4.5	2.7	11
8	6.7	7	4.1	4.1	1.54	4.8	4.82	0.5	5.1	NT	10.7	3.83	5.19	2.96	10.1
9	6.408	7.437	4.179	NR	1.63	5.173	NR	0.707	29.29	NR	9.728	3.11	4.73	2.742	9.546
10	6.33	9.23	3.66	3.66	2.02	5.43	5.43	0.852	32.9	24.4	11.9	3.73	4.9	2.69	10.8
11	8.419	9.493	5.097	5.097	2.061	6.318	6.318	1.046	35.044	NT	11.922	4.158	6.009	3.336	12.804
12	6.7	8.5	4.7	4.7	2.1	6.69	6.52	0.9	36.8	NT	10	3.9	4.7	3	9.2
13	6.9	11.4	4.5	4.5	2.9	6.4	6.4	0.93	29.9	NT	10.9	3.5	5.5	3.1	10.9
14	7.78	9.59	4.69	NT	1.98	5.49	NT	1.00	32.43	NT	14.52	4.52	6.08	3.31	11.15
15	7.4528	9.2848	NT	4.8837	1.998	6.0531	6.0531	0.9646	39.4394	31.007	11.863	4.1415	5.6936	3.3115	11.2641
16	6.46	7.82	4.10	4.10	2.10	5.89	5.89	0.97	33.48	NT	9.58	3.26	4.54	2.59	8.96
17	6.578	8.538	4.501	4.501	1.805	6.696	6.696	NT	31.52	NT	10.49	3.364	4.989	2.727	8.954
18	6.12	8.39	3.94	3.94	< 2.5	5.2	5.2	< 2.5	7.56	5.47	9.08	3.41	4.96	3.11	9.65
19	6.9	8.6	3.9	NT	1.5	4.9	4.9	NT	28.6	NT	9	3.5	4.9	2.5	10
20	6.68	8.05	4.28	4.28	1.69	6.25	5.92	0.82	28.93	22.43	10.64	3.73	5.12	2.90	9.91
21	8.1	8.9	4.4	4.1	2.9	5.0	5.5	<1	46	26	NT	4.0	5.7	1.1	12
22	5.5	8	3.6	3.6	1.4	4.1	4.1	<1	26	NT	8.7	2.9	5.4	2.3	8.2
23	7.32	7.36	4.99	NT	1.64	5.99	NT	0.88	12.23	NT	12	3.68	4.97	3.22	11.36
24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25	8.02	12.5	5.21	5.21	1.89	6.22	6.22	<1	33.7	24.1	12	4.13	5.07	3.39	11.2
26	7.6	8.9	4.7	4.7	1.9	6.4	6.4	< 1.0	27	NT	12	4.1	5.6	3.1	11
27	6	8	4	4	2	5	5	< 1	25	22	10	3	5	3	9
28	7.7	NT	5.5	NT	NT	9.7	NT	NT	NT	NT	NT	NT	5.7	3.4	11
29	6.5	8.6	4.3	4.3	1.8	5.4	5.4	NR	29	27	11	3.4	5.0	2.9	10
30	7.9	11	5.0	5.0	2.1	5.4	5.4	1.1	32	NT	13	4.6	6.0	3.5	12
31	6.7	8.8	3.7	NT	1.7	4.5	3.9	NT	27.6	NT	9	3.4	4.8	2.6	10.4
32	6.3	7.5	3.7	NT	1.6	4.7	NT	NT	24.6	NT	10	3	5	2.8	9.6
33	6.87	8.63	4.28	4.28	1.79	5.01	5.01	0.921	32.7	25.4	11.8	3.68	5.30	3.06	10.5
34	6.4	7.8	4	NT	1.8	5.1	5.0	1	30	NT	10	3.5	4.4	2.9	9.6
35	7.94	10.0	5.00	5.00	2.16	6.81	6.81	1.08	34.4	NT	10.8	3.83	5.64	3.45	11.3
36	6.53	7.95	4.19	4.19	1.62	5.28	5.28	0.88	28.8	25.1	8.9	3.45	4.98	2.93	9.9
37	6.7	9.6	4.2	NT	1.7	4.5	NT	NT	NT	NT	10	3.9	5.2	3.1	10
38	5.4380	8.2888	6.0169	4.8797	<5	6.5671	5.1749	<5	43.2479	NT	9.1714	<5	<5	<5	8.7364

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 128 Summary of Participants' Results and Performance for Sample S2 (all values are in µg/kg)* (continued)

Lab. Code	PFNA	PFDA	PFTrDA	PFODA	PFOSA	MeFOSAA	EtFOSAA	8:2FTS	10:2FTS	8:2diPAP	GenX	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS	5:3FTCA
AV	5.98	11.1	13.7	17.8	13.8	8.57	8.57	6.49	44.3	39.6	2.17	23.3	23.4	20.9	Not Set
1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2	6.139	11.67	12.55	17.46	13.50	8.565	8.203	4.852	48.69	40.23	2.223	23.25	23.75	13.07	NT
3	6.3	13	15	<0.5	15	8.6	9.3	8.2	48	NT	NT	NT	NT	NT	NT
4	7.100	13.764	11.852	NR	15.843	14.243	13.312	7.258	54.556	NR	2.820	22.143	21.779	18.891	NR
5	7.6	12.3	18.6	NT	19.9	NT	NT	13.7	NT	NT	NT	29	NT	NT	NT
6	5.6	12	15	16.6	12.6	9.8	8.7	5.8	42.5	NT	2	20	17.8	11.2	NT
7	4.9	9.8	12	NT	10	7	9	7	NT	NT	NT	NT	NT	NT	NT
8	5.7	10.6	NT	NT	12.6	NT	NT	6.26	NT	NT	1.93	19.6	14.7	1.47	25.2
9	5.64	10.51	14.39	NR	11.73	NR	NR	6.177	NR	NR	2.237	NR	NR	19.98	NR
10	5.96	11.1	17.6	NT	14.01	10.1	10.2	6.32	NT	NT	2.49	22.3	25.5	25.9	36.4
11	6.937	13.286	16.353	NT	14.479	10.832	8.943	7.695	54.305	NT	NT	NT	NT	NT	NT
12	7.5	11.1	12.9	NT	13.7	9.5	7.45	7.9	50.6	NT	1.58	16.7	20	15	0.9
13	5.7	12.5	10.8	NT	16.4	11.4	10.1	7.4	55	NT	1.8	31.1	NT	NT	NT
14	6.08	11.82	15.73	NT	14.7	7.93	7.46	7.79	46.36	NT	NT	NT	NT	NT	NT
15	6.3844	13.4264	15.4004	21.7818	14.7246	9.5173	9.0361	6.8268	55.3367	42.453	2.3402	29.9189	28.4946	NT	NT
16	5.25	9.92	14.27	NT	12.53	8.48	7.71	5.81	47.91	NT	NT	NT	NT	NT	NT
17	6.049	10.70	14.12	18.11	13.50	6.857	9.529	6.347	38.20	35.07	NT	NT	NT	NT	NT
18	5.26	10.2	8.32	< 2.5	12.86	< 2.5	< 2.5	6.4	28.3	NT	< 2.5	21.3	29.4	9.79	NT
19	5.1	8.9	11.7	NT	13.1	7.9	8	5.5	34.3	NT	NT	NT	NT	NT	NT
20	5.72	10.03	11.77	<0.5	13.21	8.26	8.26	5.83	40.77	31.99	2.20	17.72	19.81	20.63	NT
21	6.9	13	20	15	15	14.41	9.46	7.8	45	45	2.4	23	31	26	NT
22	4.6	8.8	11	NT	9.5	6.8	6.6	5.3	NT	NT	1.7	NT	NT	NT	NT
23	5.37	9.78	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25	6.21	9.34	14.1	21.9	13.8	9.54	8.22	6.9	50.3	40	2.43	29.1	26.7	24.2	31.9
26	6.1	12	6.7	NT	14	11	11	9.1	67	NT	2.1	23	25	32	NT
27	5	10	14	NT	10	8	8	5	24	NT	NT	NT	NT	NT	NT
28	6.5	12	NT	NT	NT	NT	NT	7	NT	NT	NT	NT	NT	NT	NT
29	6.0	11	NR	16	14	8.2	8.9	5.4	78	44	2.2	24	25	28	19
30	6.7	13	14	NT	16	9.7	11	7.0	53	NT	< 5	23	21	24	NT
31	5.7	10.5	14.6	NT	14.8	6.4	6.9	5.3	27.2	NT	NT	NT	NT	NT	NT
32	5.5	9.5	12.6	NT	12.6	6.7	7.1	6	33.6	NT	NT	NT	NT	NT	NT
33	5.98	10.6	12.0	16.5	12.8	9.42	9.45	5.89	52.4	37.9	2.28	25.7	24.3	22.6	33.6
34	5.6	9.1	12.3	NT	14	7.6	7.6	5.7	38.4	NT	NT	NT	NT	NT	NT
35	6.35	10.3	13.4	NT	13.7	8.77	8.59	6.90	47.6	NT	NT	NT	NT	NT	NT
36	5.82	11.2	14.7	16.5	13.2	7.99	8.18	6.15	37.6	NT	0.82	18.5	19.2	21.1	NT
37	6.8	13	NT	NT	NT	NT	NT	6.6	NT	NT	NT	NT	NT	NT	NT
38	5.8639	8.8751	6.1979	NT	15.9216	7.3291	8.3573	<5	32.5539	NT	NT	NT	NT	NT	NT

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 129 Summary of Participants' Results for Sample S3 (all values are in µg/kg)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFNS	PFDS	PFDoS	PFBA	PFPeA	PFHxA	PFHpA	PFOA
RA	9.1	12.3	6.23	5.88	2.40	9.9	9.9	1.27	33.8	15.1	11.5	5.31	7.9	4.42	14.9
1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	15	17	7.7	7.7	3.5	13	13	2.5	58	16	28	32	11	6	21
8	9.8	9.8	6.8	6.8	1.6	10.3	9.63	0.9	11.1	28.4	NT	6.33	9.12	4.97	17.6
9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10	7.35	12.3	6.03	6.03	2.93	11.7	11.3	1.14	22.4	6.9	14.4	15.4	8.28	4.55	16.4
11	7.013	8.100	5.010	4.763	1.538	7.668	7.214	1.160	21.550	NT	8.265	3.702	5.577	2.788	9.701
12	7.4	9.9	6.3	6.3	2.2	10	10	1.1	20.3	NT	12	4.6	6.6	3.5	12.4
13	32	50.4	18.8	18.8	11.6	34	34	4.4	97.4	NT	70.8	47.2	23.6	12.5	39.4
14	12.29	13.97	6.65	NT	3.42	23.64	NT	NT	72.83	NT	15.21	7.12	11.01	5.47	19.9
15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
16	6.33	9.16	4.84	4.84	2.61	9.66	9.66	1.25	21.90	NT	9.98	3.69	6.38	3.23	11.44
17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
18	3.56	5.27	2.06	2.06	< 0.72	3.33	3.33	< 1.0	9.09	5.04	7.74	1.97	2.79	1.62	5.1
19	13.5	17.2	9.2	NT	5.1	19.3	19.3	NT	88.5	NT	16	6.9	10.9	5.8	21.8
20	8.07	9.30	5.36	5.36	1.79	8.02	7.89	1.24	18.80	6.78	5.03	4.38	5.94	3.39	12.14
21	11	7.0	5.6	5.2	4.4	7.6	8.3	<1	56	<1	NT	11	8.3	1.1	15
22	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25	9.96	17.3	11.6	11.6	<5	11.9	11.9	<5	29.1	14.5	15.3	5.7	8.02	6.32	16.9
26	8.2	10	5.0	5.0	1.9	8.5	8.5	< 1.0	25	NT	11	4.4	6.7	3.4	11
27	9	13	6	6	2	10	10	1	22	10	12	5	7	4	13
28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
29	10	22	6.9	6.9	2.8	10	10	1.8	18	20	10	7.8	7.4	4.4	16
30	9.5	16	9.7	9.7	2.9	11	11	2.6	60	NT	< 1	5.7	9.5	5.4	16
31	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
32	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
33	10.3	15.7	6.45	6.45	2.30	10.3	10.3	1.81	32.9	29.7	10.1	6.00	8.19	4.30	15.8
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	9.10	12.7	6.26	6.26	<5	11.1	11.1	<5	22.9	NT	11.5	4.70	6.26	4.30	12.6
36	8.3	10.3	5.18	5.18	2.15	8.57	8.57	1.38	19.4	13.5	8.05	4.03	6.32	3.39	10.71
37	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
38	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

* RA = Robust Average outliers removed, NS = Not Sent, NT = Not Tested, NR = Not Reported.

Table 129 Summary of Participants' Results for Sample S3 (all values are in µg/kg)* (continued)

Lab. Code	PFNA	PFDA	PFTrDA	PFODA	PFOSA	MeFOSAA	EtFOSAA	8:2FTS	10:2FTS	8:2diPAP	GenX	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS	5:3FTCA
RA	7.6	15.0	11.1	11.6	13.7	11.9	11.3	8.3	45	60.0	19.6	28.6	26.4	19.5	31.5
1	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
5	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	9.4	21	13	NT	14	8	9	12	NT	NT	NT	NT	NT	NT	NT
8	7.46	15.4	15.8	NT	NT	NT	NT	8.9	NT	NT	< 0.5	28.9	20.1	6.57	15.1
9	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
10	8.75	16.6	22.4	NT	21.3	15.98	14.25	9.17	NT	NT	23.9	52.9	62.4	51.4	92.03
11	5.238	9.805	6.823	NT	11.141	9.650	9.951	5.895	60.765	NT	NT	NT	NT	NT	NT
12	6.3	14	5	NT	11.5	<0.5	<0.5	5.4	35.9	NT	14.2	29.7	<0.5	<0.5	2.5
13	22.8	56.3	16.9	NT	56	46.8	37.8	29.3	107	NT	49.8	112	NT	NT	NT
14	<25	20.13	<25	NT	<50	<50	<50	11.62	34.77	NT	NT	NT	NT	NT	NT
15	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
16	6.75	12.53	7.36	NT	10.70	11.26	9.36	6.74	45.44	NT	NT	NT	NT	NT	NT
17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
18	3.04	4.93	3.95	7.33	6.83	5.12	4.23	2.88	18.9	NT	10.4	9.99	10	8.81	NT
19	11.3	20.1	12.7	NT	26.2	15.9	15.6	10.4	35.3	NT	NT	NT	NT	NT	NT
20	6.52	12.41	4.57	7.32	13.60	8.65	7.99	6.27	40.92	37.69	18.01	23.17	22.54	<0.1	NT
21	7.5	12	<1	3.7	13	8.2	3.9	7.7	8.0	NT	15	32	94	20	NT
22	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
25	9.37	14.1	15.5	21.7	23.8	16.9	14.4	10.6	68.8	62.2	25.3	36.3	29.7	20	39.9
26	6.6	12	8.8	NT	13	8.7	7.8	8.1	50	NT	19	23	24	19	NT
27	7	14	10	NT	15	8	9	7	14	NT	NT	NT	NT	NT	NT
28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
29	8.5	17	8.6	17	4.6	15	14	8.2	310	70	22	36	47	39	30
30	9.4	19	13	NT	< 50	16	16	9.8	150	NT	27	31	30	33	NT
31	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
32	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
33	8.92	16.0	14.4	18.8	17.7	17.1	14.4	8.41	47.8	70.0	21.0	26.9	29.0	17.5	29.9
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	5.79	13.1	11.1	NT	14.8	11.1	10.3	7.41	52.3	NT	NT	NT	NT	NT	NT
36	5.2	11.71	6.78	5.08	12.4	7.99	5.68	6.33	25.4	NT	6.4	19.5	20.1	16.9	NT
37	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
38	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

* RA = Robust Average outliers removed, NS = Not Sent, NT = Not Tested, NR = Not Reported.

Table 130 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	PFBA	PFPeA	PFHxA	PFHpA	PFOA
AV	0.0213	0.0228	0.184	0.160	0.0074	0.109	0.0573	0.0117	0.0125	0.0320	0.00570	0.00914
1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	0.02	0.02	0.20	0.16	<0.01	0.12	0.05	<0.02	<0.02	0.03	<0.01	<0.01
4	0.021	0.019	0.163	NR	0.005	0.099	NR	0.010	0.012	0.031	0.004	0.008
5	0.027	0.033	0.23	NT	0.011	0.10	NT	<0.05	0.011	0.035	0.007	0.011
6	0.021	0.024	0.181	0.17	<0.01	0.085	0.053	<0.05	0.013	0.036	<0.01	0.012
7	0.02	0.024	0.21	0.18	0.005	0.1	0.051	0.018	0.018	0.032	0.0049	0.0093
8	0.022	0.022	0.195	0.1627	0.0083	0.063	0.061	0.012	0.013	0.038	0.007	0.01065
9	0.021	0.024	0.204	NR	0.009	0.112	NR	0.01	0.01	0.028	0.006	0.009
10	0.0193	0.0223	0.1415	0.1213	0.00572	0.107	0.0603	<0.01566	0.0113	0.0288	0.00577	0.0098
11	0.026	0.025	0.225	0.189	0.009	0.144	0.070	0.012	0.014	0.037	0.007	0.011
12	0.023	0.024	0.2	0.18	0.0084	0.13	0.063	0.012	0.013	0.031	0.0065	0.0084
13	0.02	0.029	0.2	0.17	0.009	0.11	0.06	0.021	<0.002	0.044	0.014	0.013
14	0.023	0.022	0.179	NT	0.008	0.127	NT	0.012	0.012	0.033	0.005	0.009
15	24.3156	25.2526	NT	189.1754	6.5969	78.7819	65.2573	11.6948	15.1316	35.5054	6.0707	8.519
16	0.019	0.021	0.174	0.153	0.007	0.122	0.060	0.011	0.012	0.032	0.005	0.009
17	0.01666	0.01752	0.1539	0.1346	0.007971	0.1001	0.05216	0.01045	0.01063	0.02806	0.006250	0.008468
18	< 0.025	0.025	NR	0.158	< 0.025	NR	0.0858	< 0.017	< 0.017	0.0309	< 0.017	< 0.017
19	0.022	0.022	0.158	NT	0.0072	0.117	0.0576	0.0103	0.0097	0.0337	0.0049	0.0079
20	0.021	0.021	0.194	0.165	0.005	0.137	0.058	0.010	0.012	0.032	<0.006	0.009
21	0.019	0.017	0.14	0.12	0.009	0.074	0.039	NT	0.014	0.032	0.005	0.008
22	0.0205	0.0215	0.18	0.155	0.0058	0.11	0.06	<0.001	0.012	0.029	0.00535	0.00755
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	0.0208	0.0246	NT	0.1533	0.00466	0.0906	0.0498	<0.05	0.0151	0.0292	0.0573	0.00781
25	0.023	0.029	0.23	0.2	0.005	0.11	0.056	0.025	0.058	0.029	0.007	0.009
26	0.021	0.022	0.18	0.15	0.0053	0.10	0.057	0.012	0.012	0.033	0.0055	0.0073
27	< 0.02	< 0.02	0.17	0.15	< 0.02	0.098	0.059	< 0.05	< 0.03	0.03	< 0.02	< 0.03
28	0.022	NT	0.18	NT	NT	0.14	NT	NT	NT	0.029	<0.01	<0.01
29	0.024	0.023	0.19	0.16	NR	0.11	0.062	NR	NR	0.031	NR	NR
30	0.022	0.029	0.24	0.20	0.009	0.12	0.056	0.014	0.017	0.038	0.006	0.009
31	0.0216	0.0196	0.153	NT	0.0082	0.128	0.0564	0.0098	0.0113	0.0302	0.0045	0.0081
32	0.0205	0.0212	0.17	NT	0.0086	0.11	NT	0.007	0.0093	0.0306	0.0054	0.0084
33	0.0215	0.0227	0.163	0.163	0.00587	0.0610	0.0610	0.0143	0.0136	0.0363	0.00564	0.0125
34	0.021	0.021	0.172	NT	0.009	0.109	0.053	<0.01	0.011	0.032	0.005	0.008
35	0.0230	0.0258	0.208	0.177	0.0092	0.129	0.0633	0.0116	0.0140	0.0319	0.0070	0.0095
36	0.018	0.021	0.153	0.135	<0.01	0.083	0.05	0.014	0.013	0.029	<0.01	0.01
37	0.022	NT	0.19	NT	NT	0.089	NT	0.014	0.017	0.037	0.0051	0.016
38	0.022	0.023	0.174	0.141	<0.01	0.131	0.104	<0.05	<0.01	0.028	<0.01	<0.01

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 131 Summary of Participants' Results and Performance for Sample S5 (all values are in µg/L)*

Lab. Code	PFBS	PFPeS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFNS	PFDS	PFDoS	PFBA	PFPeA	PFHxA	PFHpA	PFOA
AV	0.0342	0.0222	0.0344	0.0346	0.00332	0.00545	0.00561	Not Set	Not Set	0.050	0.229	0.0379	0.0318	0.0237	0.0342
1	NT	NT	NT	NT	NT	NT	0.0044	NT	NT	NT	NT	NT	NT	NT	0.0345
2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	0.04	0.02	0.04	0.04	<0.01	<0.01	<0.01	NT	<0.02	NT	0.03	0.03	0.03	0.02	0.03
4	0.036	0.022	0.033	NR	0.003	0.005	NR	0.006	0.005	NR	0.239	0.038	0.032	0.024	0.033
5	0.052	0.030	0.042	NT	0.003	0.003	NT	0.011	0.013	0.047	0.24	0.039	0.036	0.027	0.040
6	0.032	0.021	0.031	0.03	<0.01	<0.01	<0.01	<0.02	<0.02	0.061	0.25	0.037	0.034	0.023	0.038
7	0.036	0.023	0.037	0.037	0.0026	0.0042	0.004	0.0046	0.0028	0.0018	0.24	0.039	0.033	0.026	0.035
8	0.037	0.021	0.037	0.036	0.0031	0.0058	0.0057	0.011	0.015	0.064	0.24	0.041	0.034	0.026	0.03
9	0.036	0.023	0.039	NR	<0.01	<0.01	NR	<0.01	0.008	0.015	0.212	0.033	0.03	0.025	0.034
10	0.0315	0.0224	0.0308	0.0308	0.00384	0.00576	0.00576	0.0113	0.0192	0.0701	0.251	0.0407	0.0321	0.0232	0.0376
11	0.042	0.026	0.043	0.043	0.004	0.008	0.008	0.014	0.021	NT	0.268	0.045	0.037	0.030	0.042
12	0.04	0.024	0.036	0.036	0.003	0.007	0.007	0.01	0.015	NT	0.24	0.039	0.03	0.023	0.038
13	0.033	0.026	0.035	NR	0.004	0.006	NR	0.011	0.015	NT	0.238	0.034	0.04	0.024	0.032
14	0.036	0.022	0.034	NT	0.003	0.005	NT	NT	0.011	NT	0.261	0.041	0.031	0.024	0.035
15	38.4993	25.4253	NT	43.755	3.5165	6.2925	6.2925	7.4114	5.5171	10.4535	263.3792	44.403	37.0735	27.7204	39.0902
16	0.033	0.020	0.033	0.033	0.003	0.006	0.006	0.011	0.014	NT	0.218	0.036	0.030	0.022	0.037
17	0.02089	0.01385	0.02221	0.02221	0.003936	0.006501	0.006501	NT	0.01233	NT	0.1620	0.02665	0.02252	0.01622	0.022478
18	0.0294	0.0229	0.0262	0.0262	< 0.025	< 0.017	< 0.017	< 17.0	< 0.025	< 17.0	0.211	0.0351	0.0292	0.0213	0.0279
19	0.0302	0.0214	0.0319	NT	0.0032	0.0061	0.0061	NT	0.0203	NT	0.1932	0.0331	0.0287	0.022	0.0345
20	0.032	0.023	0.035	0.035	0.003	<0.007	0.006	0.011	0.1	0.005	0.226	0.038	0.032	0.024	0.035
21	0.035	0.018	0.03	0.03	0.0046	0.0049	0.0051	0.008	0.018	0.025	NT	0.039	0.033	0.021	0.035
22	0.032	0.024	0.034	0.034	0.0028	0.0046	0.0046	0.008	0.012	NT	0.22	0.038	0.029	0.023	0.033
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	0.0325	0.0243	NT	0.0378	0.00268	0.00901	0.0036	0.00426	0.00749	0.0404	0.2147	0.0442	0.032	0.023	0.0354
25	0.038	0.026	0.033	0.033	0.004	0.005	0.006	0.01	0.016	0.047	0.24	0.04	0.03	0.027	0.033
26	0.036	0.020	0.037	0.037	0.0030	0.0051	0.0051	0.0050	< 0.0050	NT	0.24	0.038	0.034	0.025	0.034
27	0.032	< 0.02	0.034	0.034	< 0.02	< 0.02	< 0.02	< 0.02	< 0.09	0.064	0.22	0.036	0.032	0.024	0.033
28	0.032	NT	0.033	NT	NT	<0.01	NT	NT	NT	NT	NT	NT	0.028	0.023	0.031
29	0.038	0.021	0.035	0.035	NR	NR	NR	0.012	0.017	0.063	0.27	0.039	0.033	0.027	0.035
30	0.039	0.027	0.044	0.044	0.004	0.004	0.004	< 0.04	< 0.02	NT	0.28	0.048	0.035	0.027	0.041
31	0.0334	0.0192	0.0287	NT	0.0030	0.0058	0.0058	NT	0.0202	NT	0.215	0.0395	0.0295	0.0231	0.0329
32	0.0312	0.0196	0.032	NT	0.0031	0.0041	NT	0.0095	0.0156	NT	0.211	0.0304	0.0294	0.022	0.0312
33	0.0396	0.0269	0.0406	0.0406	0.00373	0.00628	0.00628	0.0127	0.0205	0.0912	0.282	0.0470	0.0390	0.0282	0.0418
34	0.032	0.021	0.033	NT	0.003	0.006	0.006	0.013	0.019	NT	0.2	0.035	0.03	0.022	0.033
35	0.0367	0.0237	0.0349	0.0349	0.0036	0.0066	0.0066	0.0101	0.0130	NT	0.2055	0.0369	0.0345	0.0223	0.0362
36	0.028	0.018	0.029	0.029	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	0.199	0.034	0.029	0.019	0.03
37	0.035	NT	0.035	NT	NT	0.0048	NT	NT	NT	NT	0.22	0.045	0.037	0.03	0.037
38	0.026	0.018	0.017	0.014	<0.01	<0.01	<0.01	0.013	0.016	NT	0.190	0.036	0.019	0.018	0.023

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

Table 131 Summary of Participants' Results and Performance for Sample S5 (all values are in µg/L) (continued) *

Lab. Code	PFNA	PFDA	PFUdA	PFDoA	PFTrDA	PFTeDA	PFOSA	6:2FTS	10:2FTS	GenX	ADONA	9Cl-PF3ONS	11Cl-PF3OUdS	5:3FTCA
AV	0.00434	0.0194	0.0416	0.0466	0.095	0.117	0.0397	0.0360	Not Set	0.0671	0.0533	Not Set	Not Set	Not Set
1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
3	<0.01	<0.02	0.03	<0.05	<0.1	<0.5	<0.1	0.03	<0.02	NT	NT	NT	NT	NT
4	0.004	0.017	0.024	0.021	0.032	0.053	0.036	0.041	0.004	0.087	0.054	0.024	0.007	NR
5	0.007	0.017	0.047	0.056	0.10	0.12	< 0.005	0.052	NT	NT	NT	NT	NT	NT
6	<0.01	0.014	0.029	0.04	0.1	0.13	0.028	0.035	<0.02	0.065	0.05	0.029	0.016	NT
7	0.003	0.016	0.025	0.006	0.005	0.003	<0.002	0.032	NT	NT	NT	NT	NT	NT
8	0.0047	0.022	0.048	0.052	0.12	0.13	0.049	0.035	NT	0.0725	0.047	0.043	0.021	0.1
9	0.004	0.014	0.021	0.019	0.033	0.035	0.047	0.031	NR	0.058	0.051	0.025	0.009	NR
10	0.0049	0.0239	0.0486	0.0568	0.142	0.138	0.0506	0.065	NT	0.072	0.0739	0.0547	0.0267	0.123
11	0.006	0.029	0.058	0.063	0.126	0.156	0.051	0.042	0.015	NT	NT	NT	NT	NT
12	0.005	0.021	0.052	0.051	0.12	0.092	0.042	0.039	0.013	0.051	0.05	0.04	0.015	0.17
13	0.007	0.021	0.051	0.053	0.097	0.131	0.044	0.035	0.011	0.053	0.065	NT	NT	NT
14	0.005	0.022	0.042	0.035	0.071	0.081	0.044	0.039	0.007	NT	NT	NT	NT	NT
15	<10	20.4123	27.7378	11.5051	11.4096	<20	20.3941	38.907	<10	76.065	72.1384	44.812	NT	NT
16	0.004	0.020	0.044	0.047	0.111	0.107	0.041	0.036	0.010	NT	NT	NT	NT	NT
17	0.004109	0.01273	0.02947	0.02924	0.05574	0.06166	0.02621	0.02120	0.005470	NT	NT	NT	NT	NT
18	< 0.017	< 0.017	0.0298	0.0328	0.0889	0.108	0.0243	0.0291	< 0.017	< 17.0	< 17.0	< 17.0	< 17.0	NT
19	0.0041	0.0216	0.0515	0.0575	0.116	0.176	0.0477	0.0318	0.0131	NT	NT	NT	NT	NT
20	0.005	0.023	0.048	0.051	0.047	0.14	0.048	<0.2	0.012	0.068	0.053	0.043	0.009	NT
21	0.004	0.019	0.039	NT	0.064	0.050	0.040	0.060	0.005	0.068	0.039	0.053	0.020	NT
22	0.0039	0.018	0.041	0.034	0.072	0.083	0.032	0.035	NT	0.063	NT	NT	NT	NT
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	0.00352	0.011	0.0235	0.0262	0.0888	0.0616	0.0226	0.0347	0.00494	0.0607	0.0504	0.0205	0.0105	0.113
25	0.004	0.019	0.046	0.042	0.075	0.1	0.04	0.039	0.011	0.07	0.052	0.052	0.022	0.1
26	0.0042	0.017	0.034	0.025	0.013	0.017	0.030	0.037	NR	0.061	0.056	0.024	0.0048	NT
27	< 0.03	< 0.05	0.05	< 0.09	< 0.23	0.12	< 0.18	< 0.04	< 0.02	NT	NT	NT	NT	NT
28	<0.02	NT	NT	NT	NT	NT	NT	0.039	NT	NT	NT	NT	NT	NT
29	NR	0.022	0.048	0.049	0.10	0.12	0.035	0.042	0.020	0.072	0.060	0.053	0.028	0.054
30	0.004	0.025	0.034	< 0.05	< 0.1	< 0.5	< 0.1	0.041	< 0.02	0.079	0.057	< 0.1	< 0.1	NT
31	0.0046	0.0227	0.0521	0.0621	0.141	0.174	0.0446	0.026	0.016	NT	NT	NT	NT	NT
32	0.0045	0.02	0.0482	0.0485	0.115	0.132	0.0438	0.034	0.01	NT	NT	NT	NT	NT
33	0.00587	0.0244	0.0563	0.0595	0.128	0.144	0.0501	0.0376	0.0170	0.0768	0.0603	0.0497	0.0299	0.128
34	0.004	0.022	0.05	0.054	0.109	0.135	0.044	0.034	0.012	NT	NT	NT	NT	NT
35	0.0044	0.0219	0.0468	0.0466	0.145	0.146	0.0430	0.0378	0.0099	NT	NT	NT	NT	NT
36	<0.01	0.015	<0.01	<0.01	0.026	<0.01	0.02	<0.01	<0.01	0.026	0.036	0.021	<0.01	NT
37	NT	NT	NT	NT	NT	NT	NT	0.039	NT	NT	NT	NT	NT	NT
38	<0.01	0.013	0.039	0.042	0.073	0.033	<0.05	<0.05	<0.01	NT	NT	NT	NT	NT

* AV = Assigned Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unsatisfactory z-score.

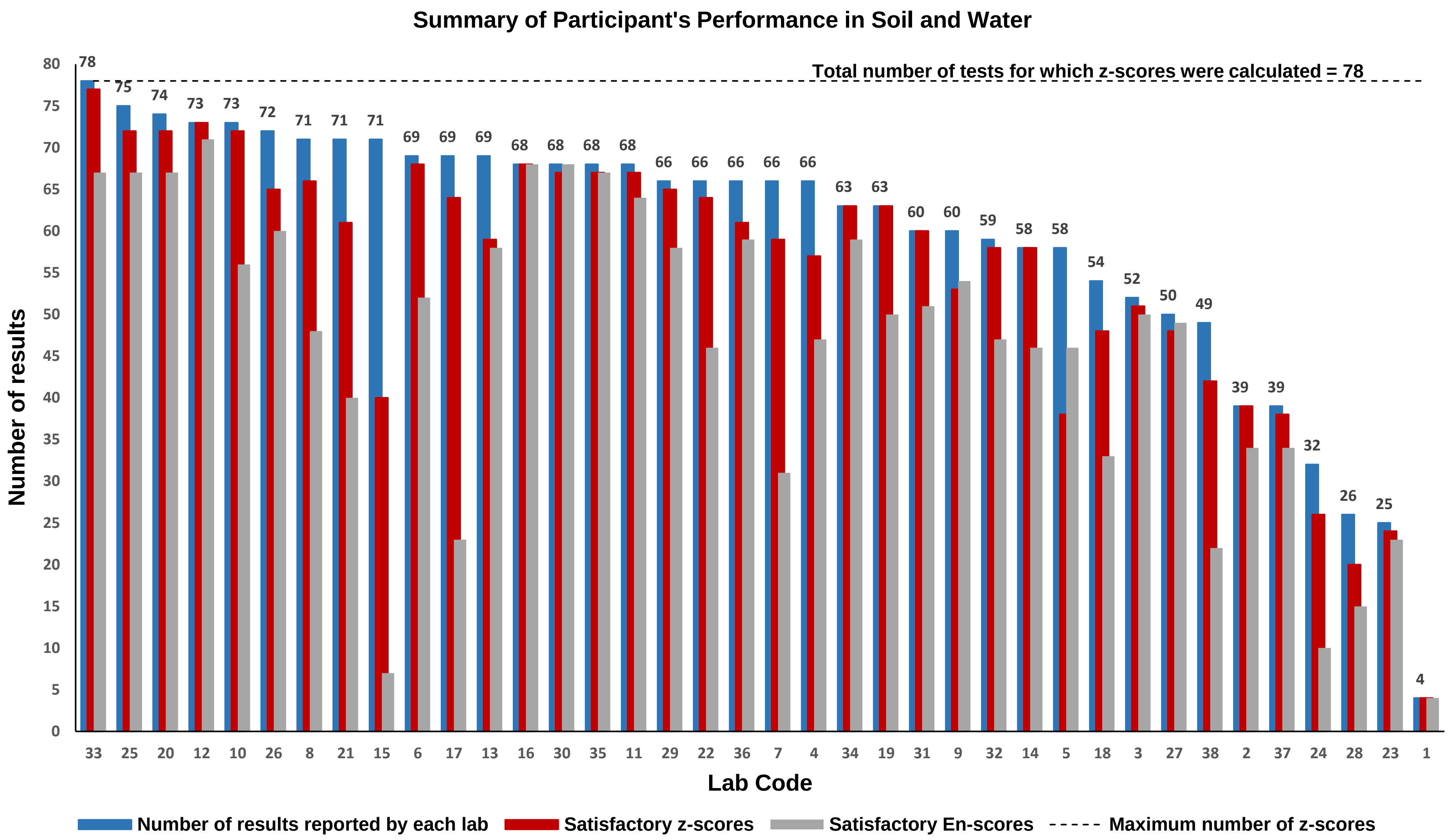


Figure 127 Summary of Participants’ Performance in Soil and Water

6.6 Summary of Participants' Results and Performances

Summaries of participants' results and performance for scored analytes in this PT study are presented in Tables 127 to 131 and Figures 121 to 125.

Thirteen laboratories reported at least one PFAS analyte that was not spiked into test samples S2 and S5 by the study coordinator. These results are presented in Appendix 5.

Thirty-five laboratories analysed soil and water matrices. Laboratory **33** reported results for all of the analytes for which z-scores were calculated (78). Laboratory 33 also returned the highest number of satisfactory z-scores (77 out of 78).

All results reported by Laboratories **12** (73), **16** (68), **19** (63), **34** (63), **31** (60), **14** (58), **2** (39) and **1** (4) returned satisfactory z-scores (Figure 127).

Laboratory **12** had the highest number of satisfactory E_n-scores (71 out of 78). Laboratories **1**, **16**, **30**, and **35** returned satisfactory E_n-scores for all analytes scored.

Two participants (Laboratories 2 and 23) analysed the soil matrix only. Of the total number of results for which z-scores were calculated (43), Laboratory **23** reported 25. Twenty-four of these returned satisfactory z-scores, with 23 returning satisfactory E_n scores.

One participant (Laboratory **24**) analysed the water matrix only. Of the total number of results for which z-scores were calculated in S4 and S5 (35), Laboratory 24 reported 32, and 26 of these returned satisfactory z-scores.

All results reported by Laboratory **15** in soil samples S1 and S2 (39) returned satisfactory z-scores. With the exception of PFDoS, PFDoA and PFTrDA in S5, Laboratory 15 also correctly measured all the analytes in the water Samples S4 and S5 but reported them in the wrong units: all the results were higher than the assigned value by a factor of approximately 1000. These results were not included in the analyses of extraction methods and of instrumental techniques employed by participants for water.

Most of the results reported by Laboratory **4** were higher than the assigned value while most of the reported results reported by Laboratory **18** were lower than the assigned value. These laboratories should check for method bias.

Most of the unsatisfactory results by Laboratory **5** in the water and soil samples were higher than the assigned value by a factor of approximately 1.5. Systematic bias was also observed in the results of laboratories **4, 17, 21, 24** and **26**. All the unsatisfactory results reported by Laboratories 21 and 26 in S2 were higher than the assigned value by the same factor of approximately 1.5. Similarly all the unsatisfactory results reported by Laboratories 4, 17 and 24 in S5 were lower than the assigned value by approximately half. These laboratories should check their calculation and/or sample preparation procedures. Using a matrix matched reference materials which is to be taken through every single step of the analytical process together with the routine sample will also help to check the calculation/reporting procedure.

6.7 Participants' Results and Analytical Methods for PFAS in Soil

Of 37 laboratories who analysed the soil samples, all reported results. 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 8.

Laboratory **33** reported results for all of the analytes scored in the two soil samples (43) and all returned satisfactory z-scores.

Laboratory **20** reported results for 42 analytes and all returned satisfactory z-scores.

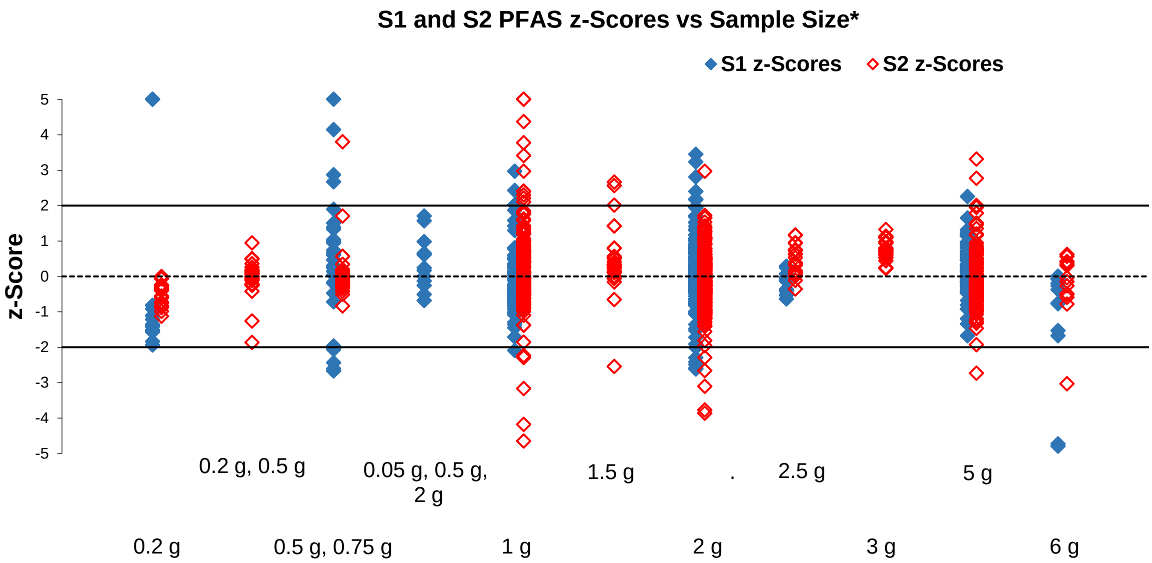
Overall the between-laboratory coefficients of variation for PFAS analytes in S1 were larger than those of S2, an indication that PFAS measurements in the incurred soil sample S1 presented more difficulty to participants than in the fortified soil sample S2.

Extraction

Sample S1 was contaminated soil, whereas Sample S2 was soil, fortified for 30 individual PFAS components. Analyte's concentration in the two soil samples was between 0.432 µg/kg and 300 µg/kg (with PFOS in S1 at 3950 µg/kg).

Several laboratories homogenised the soil sample before subsampling and one adjusted the pH whereas none reported wetting the soil prior to analysis. Small amounts of water can be added to dry soil samples to facilitate extraction.[9]

Of 36 participants who reported results for both soil samples, 32 used the same sample size for extraction in S1 as they did in S2. Laboratories used a wide variety of sample sizes from 0.05 g to 6 g. Plots of participants' performance in S1 and S2 versus the amount of sample taken for analysis are presented in Figure 128. Results from the small sample size of 0.2 g were biased low. Caution should be exercised when a small sample size is taken for analysis as this might not be representative of the whole sample.



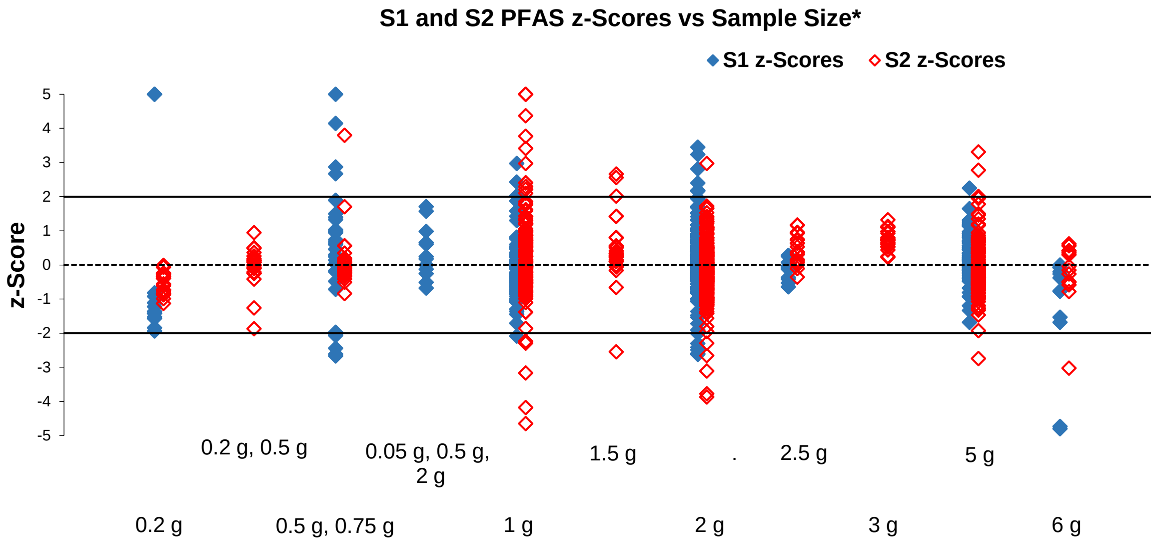
* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 128 S1 and S2 PFAS z-Scores vs Sample Size

Twenty nine participants reported adding isotopically labelled internal standards before extraction and 15 of them left the sample to equilibrate. Plots of participants' z-scores versus equilibration time are presented in Figure 129. No significant differences were evident between the performance of those participants who left the sample to equilibrate and those who didn't.

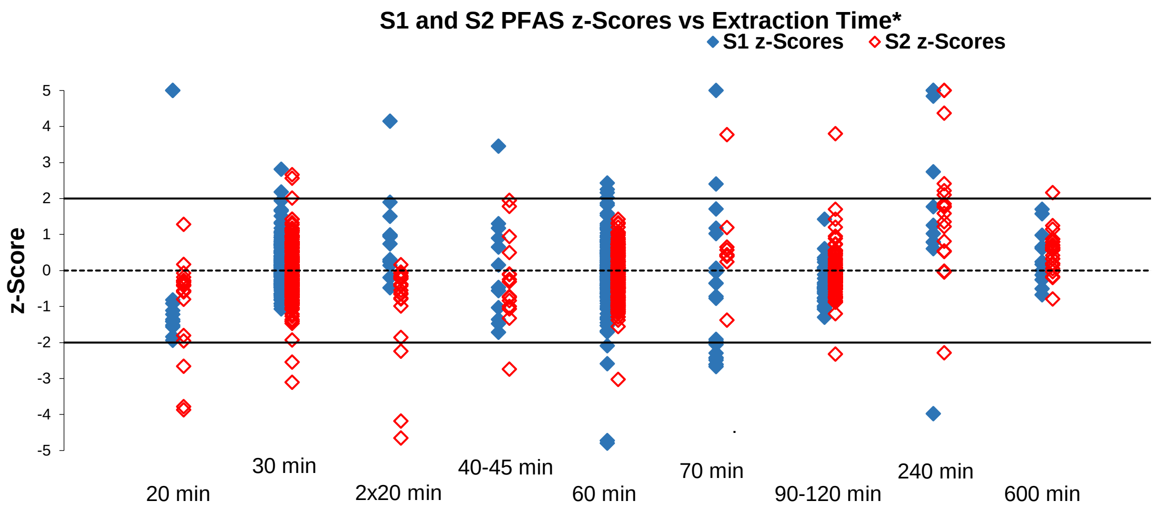
Most laboratories extracted their samples for either 30 or 60 minutes (Figure 130). One laboratory reported extracting their sample over 10 hours (including SPE).

Methanol and base modified methanol were the preferred extraction reagents. In general, PFAS results were compatible with each other regardless of the extraction reagent used (Figure 131).



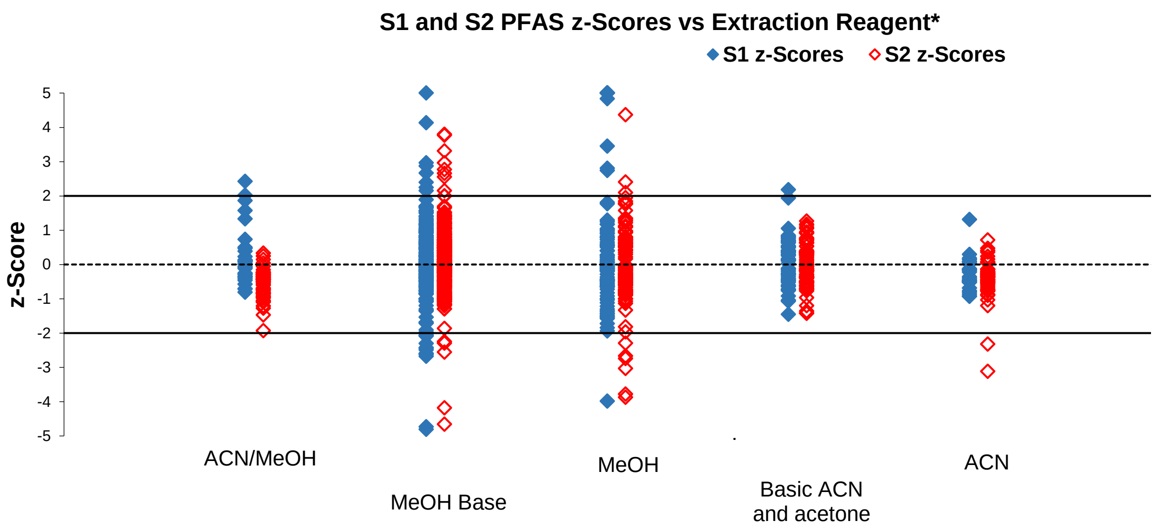
* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 129 S1 and S2 PFAS z-Scores vs Equilibration Time



* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

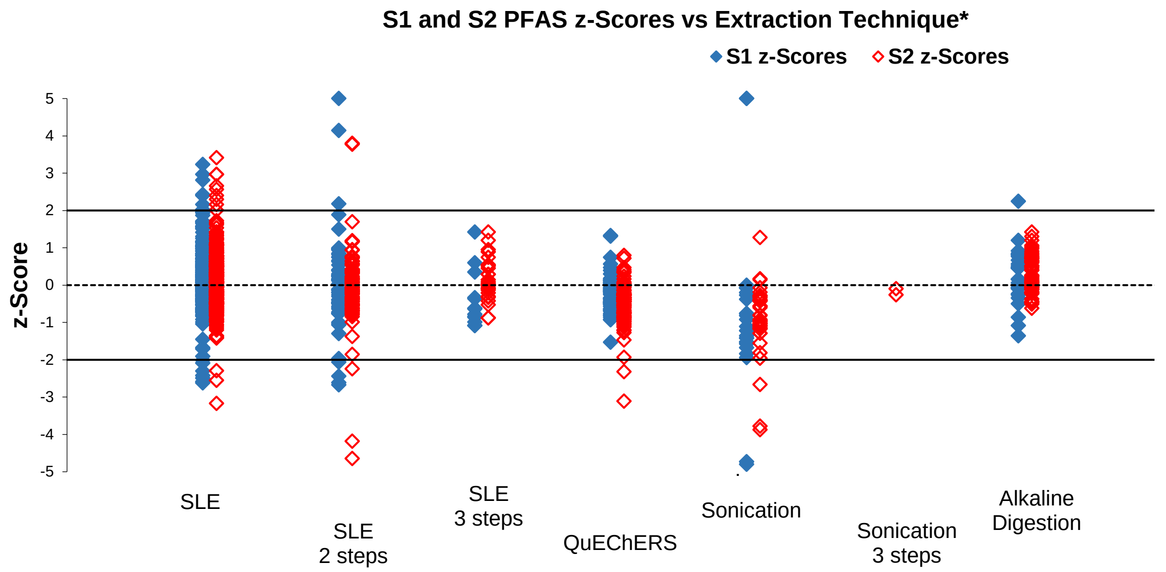
Figure 130 S1 and S2 PFAS z-Scores vs Extraction Time



* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

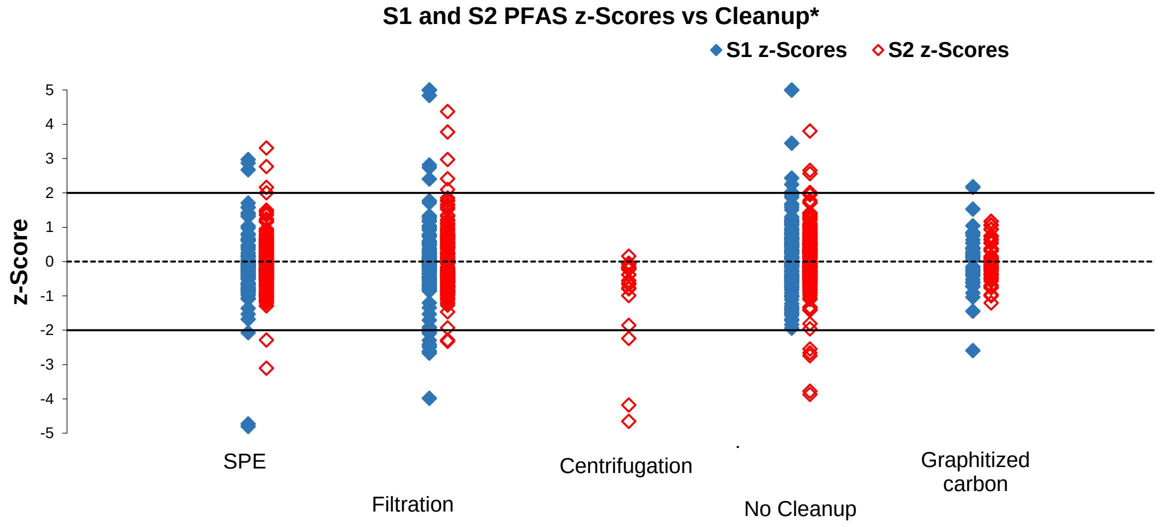
Figure 131 S1 and S2 PFAS z-Scores vs Extraction Reagent

Participants used a wide variety of extraction procedures based on SLE, alkaline digestion, QuEChERS, or accelerated solvent extraction (sonication). The use of mass labelled standards played a significant role in correcting the difference between these in-house analytical methods. Seven participants reported using a staggered extraction: 5 conducted SLE extraction over 2 steps, one laboratory used a staggered SLE extraction over 3 steps, and one sonicated their sample across 3 rounds. Most results produced were compatible with each other (Figure 132). The results from one round of sonication were biased low.



* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 132 S1 and S2 PFAS z-Scores vs Extraction Technique



* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 133 S1 and S2 PFAS z-Scores vs Extraction Cleanup Procedure

Seventeen laboratories added loose carbon to the sample extract to facilitate better adsorption of interferent organics.[9]

Eleven participants concentrated their sample extract at a temperature of between 39°C to 60°C for 30 to 60 min. One laboratory concentrated their sample extract at 55°C for 255 min. According to the USEPA Method 1633, if all methanol is evaporated then the extract can be too concentrated and/or losses of neutral compounds can occur (FOSEs and FOSAs).

Alternatively if excess methanol is present during SPE cleanup then long chain carboxylic acids and sulfonates are likely to have poor recovery. [9]

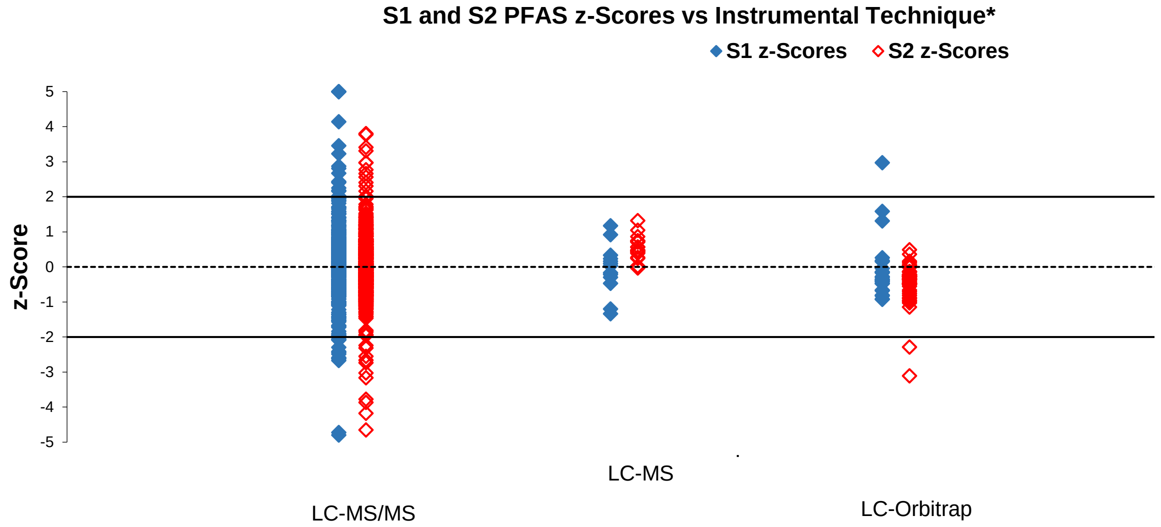
Cleanup of the crude extracts is an important step in the removal of matrix constituents that may interfere in instrumental determination. Matrix effects have been known to be one of the main causes of variability in results. Nine participants used SPE for cleanup of crude extracts, 10 used filtration to remove solids from the extract, and 11 did not cleanup after extraction. Laboratory 8 centrifuged the sample before transferring it to LCMS vials (Figure 133).

The most popular method was a SLE extraction based on the method that involved a sample size of 2 g, methanol base as extraction solvent, two to three rounds of 30 min shaking at room temperature, and a cleanup step using active carbon.

Instrumental Technique

The analytical detection method of choice was LC-MS (Figure 134). With the exception of three, all participants reported using LC-MS/MS (QQQ) for PFAS measurements. Laboratories 27 and 36 used Orbitrap and Laboratory 3 used LC-MS.

Of 37 participants, 6 reported diluting the samples before analysis; the dilution factors employed by them varied from 5 to 2000 times. Laboratory 28 diluted Sample S1 by a factor of only 10 for PFHxA, PFHxS, PFNA determination and by a factor of 50 for PFOS measurement.



* Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 134 Participants' Performance for PFAS in S1 and S2 vs Instrumental Technique

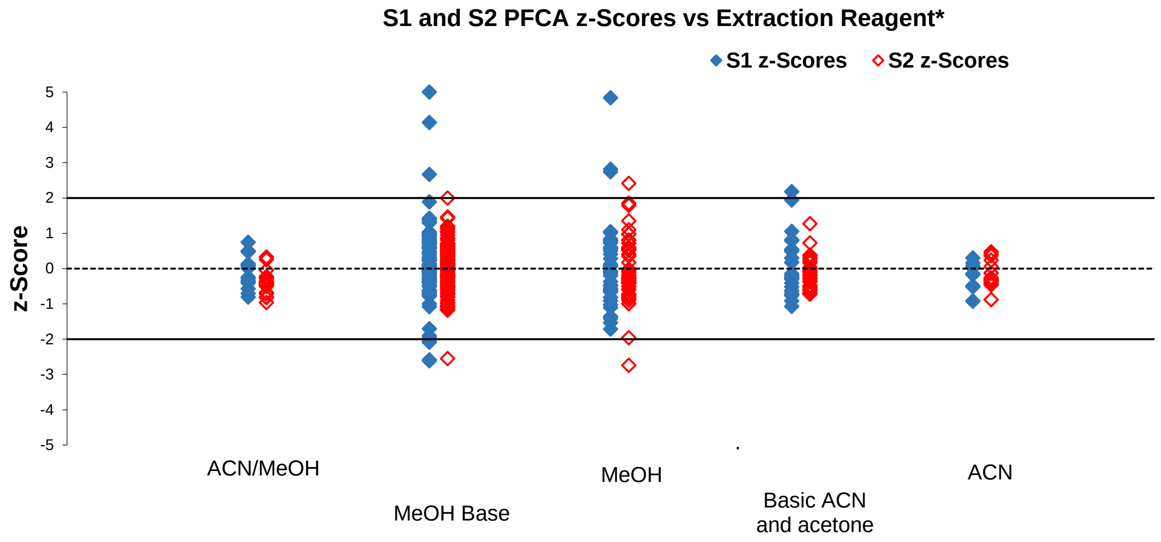
6.7.1 Individual PFCA Analytes in Soil

Sample S1 was contaminated soil, while Sample S2 was soil fortified for 11 PFCAs analytes. PFCAs measurements in S1 presented more difficulty to participants than in S2. The between-laboratory coefficient of variation was between 13% and 59% for PFCAs results reported in S1, and between 10% and 16% for PFCAs results reported in the spiked soil sample S2.

PFDA and PFNA in S1 were the analytes which challenged most participants' analytical techniques. The between-laboratory coeficient of variation for PFDA in S1 was high, 59% and hence no assigned value was set for this test. PFDA was also the analyte in S1 with the least number of reported results (15). A large variation between the results reported by participants was also noticed for PFNA, 30%. Of 19 results reported for PFNA in S1 only 12 returned satisfactory z-scores. The level of these two analytes in S1 was low, below the level of reporting of many participants and this may have challenged laboratories' analytical techniques.

PFBA and PFPeA Figure 135 presents plots of participants' z-scores for PFCAs in S1 and S2 versus the extraction reagent used. While no trends were evident between the overall PFCAs results and regents used, some discrepancies have been noticed between the PFBA and PFPeA results produced by extraction solvents containing methanol and those from extraction with ACN or basic ACN and acetone (Figures 136 and 137).

When ACN is used in LC-MS the chromatographic peak for the short chain carboxylic acids might appear wide and partially split, and a decrease in sensitivity for these analytes' responses is sometimes noted.[10]



* Scores greater than 5 have been plotted as 5.

Figure 135 S1 and S2 PFCAs z-Scores vs Extraction Reagent

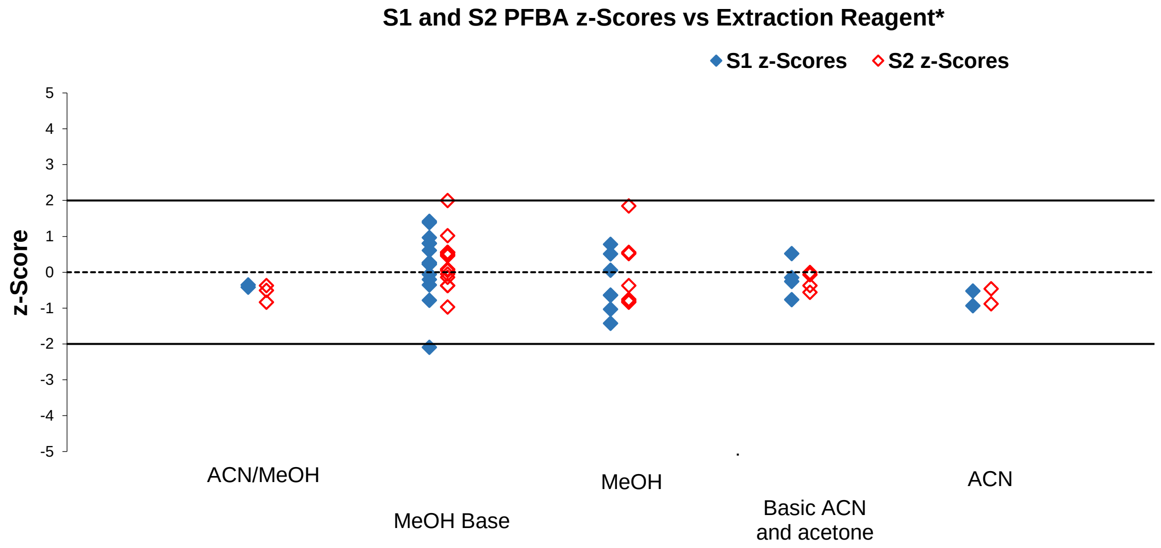


Figure 136 S1 and S2 PFBA z-Scores vs Extraction Reagent

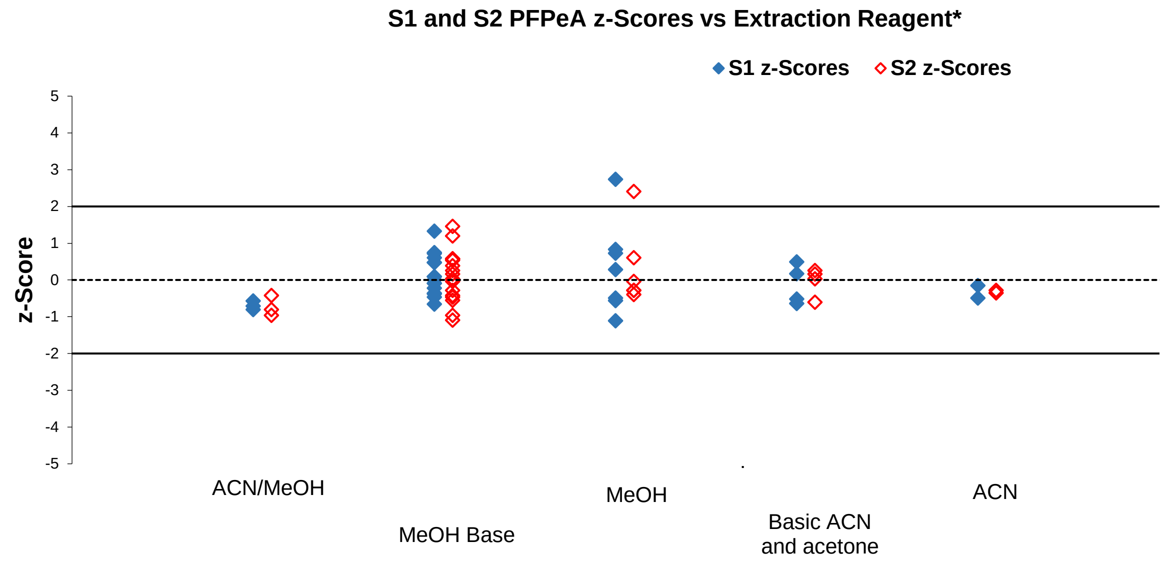


Figure 137 S1 and S2 PFPeA z-Scores vs Extraction Reagent

PFODA was introduced for the first time in a PT study based on participants' feedback. Of 37 laboratories who analysed the soil samples, 9 reported results for PFODA in S2 and all perform satisfactorily. The labelled standards used by participants as reported by them are presented in Figure 138.

The assigned value for PFODA was 17.8 ±2.3 µg/kg. Some laboratories reported a result as less than their level of reporting (0.5 µg/L or 2.5 µg/L). These laboratories should review their methodology as PFODA can be lost from extracts depending on extract solvent composition.

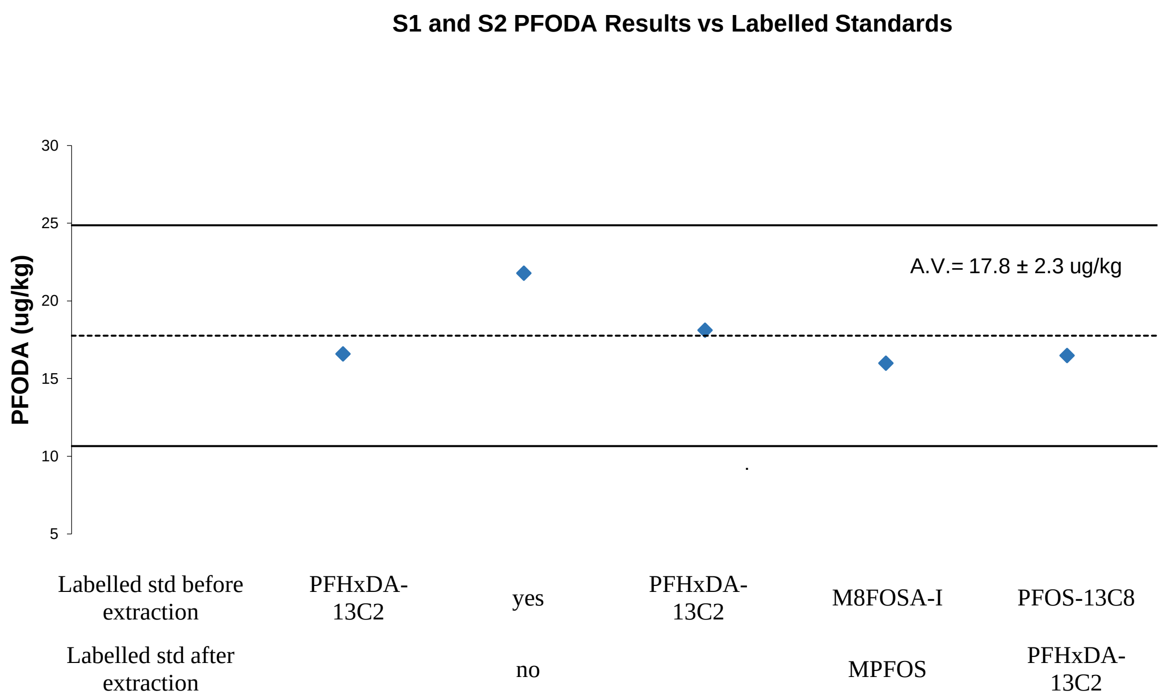


Figure 138 S1 and S2 PFODA Results vs Labelled Standards

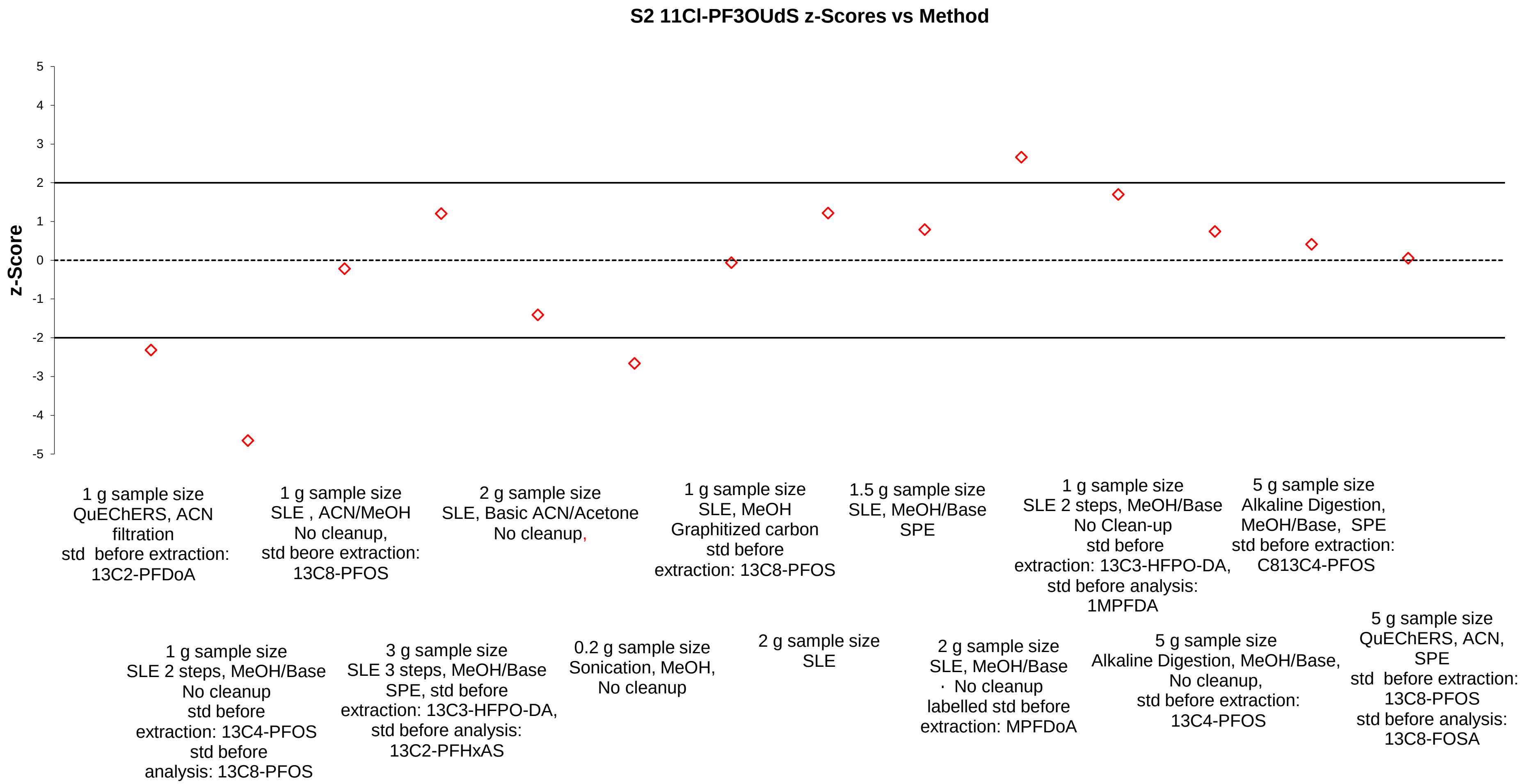


Figure 139 S2 11Cl-PF3OUdS z-Scores vs Methods

6.7.2 Individual PFECA and PFESA Analytes in Soil

GenX and ADONA were introduced in a PT study for the first time in 2019. As in the previous studies, approximately only one third of participants reported results for ADONA and GenX in S2 and all performed satisfactorily. The reported results were in excellent agreement with each other. The between-laboratory CV was 15% for GenX and 20% for ADONA.

The results reported for GenX in S2 were low compared to the spiked value however the excellent agreement between them (between-laboratory CV was 15%) indicates that some losses might have occurred during PT material preparation and not during transport and sample analysis. No relationship was evident between the reported results and the date when the sample was received or analysed. The same low spike recovery was also observed in the previous studies. Strong bonding of the spiked analyte to the soil matrix high in organic content might also explain the low recovery.

9Cl-PF3ONS and 11Cl-PF3OUdS Of 37 participants who reported results in the soil samples, 16 reported results for 9Cl-PF3ONS and for 11Cl-PF3OUdS. All 9Cl-PF3ONS results were statisfactory while only 12 results returned satisfactory z-scores for 11Cl-PF3OUdS in S2.

Plots of participants' performance for 11Cl-PF3OUdS in S2 versus method used are presented in Figure 139.

5:3FTCA was introduced for the first time in a PT study based on participants' feedback. Of 37 laboratories who reported results for PFAS in soil, 6 measured and reported results for 5:3FTCA in S2. Most of the reported results were relative good agreement with each other with the spike value and with the robust average of participants results of (Figure 140). No assigned value was set for this tests because the results were too few.

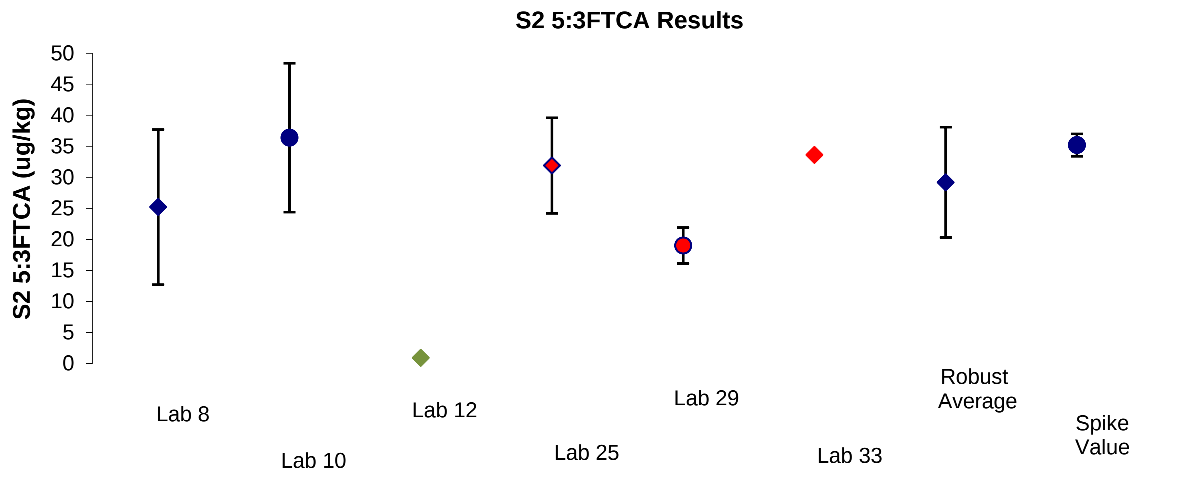
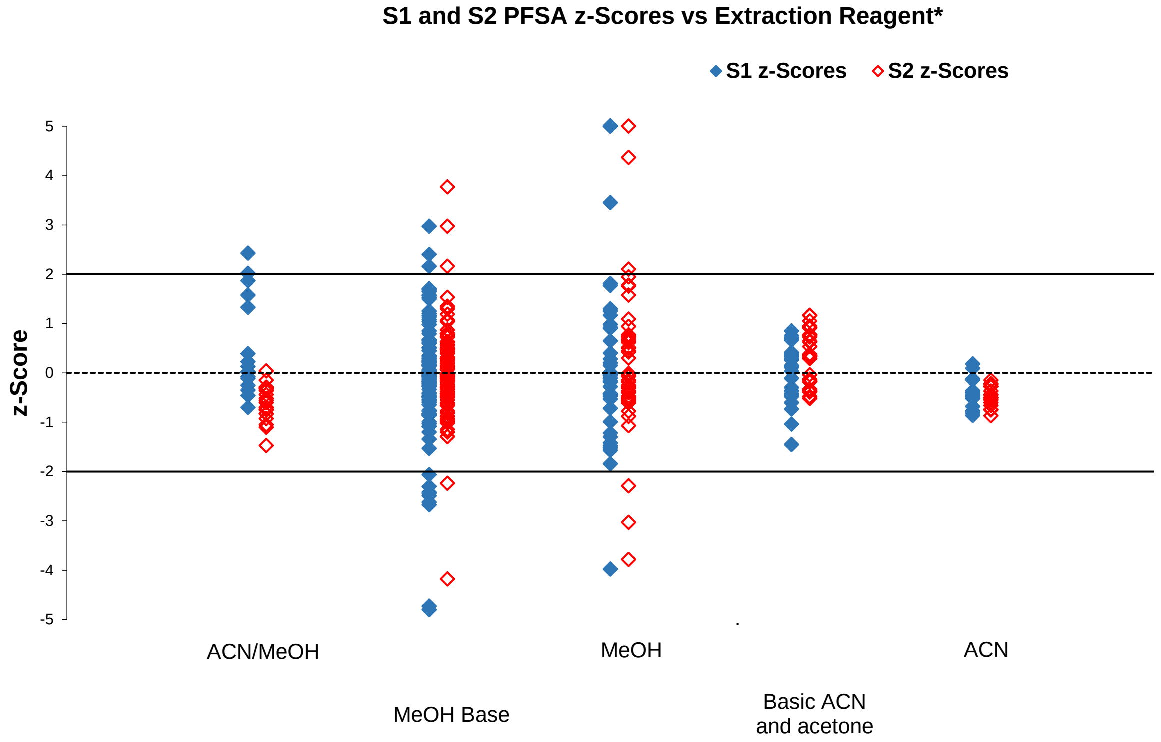


Figure 140 S2 5:3FTCA Results

6.7.3 Individual PFSA Analytes in Soil

Plots of participants' z-scores for PFSAs in S1 and S2 versus the extraction solvent used are presented in Figure 141. No relationship was evident between results produced using extraction solvents containing methanol and those produced by the other extraction solvents.



Scores greater than 5 or smaller than -5 have been plotted as 5 or -5 respectively.

Figure 141 Participants’ Performance for PFSA in S1 and S2 vs Extraction Reagent

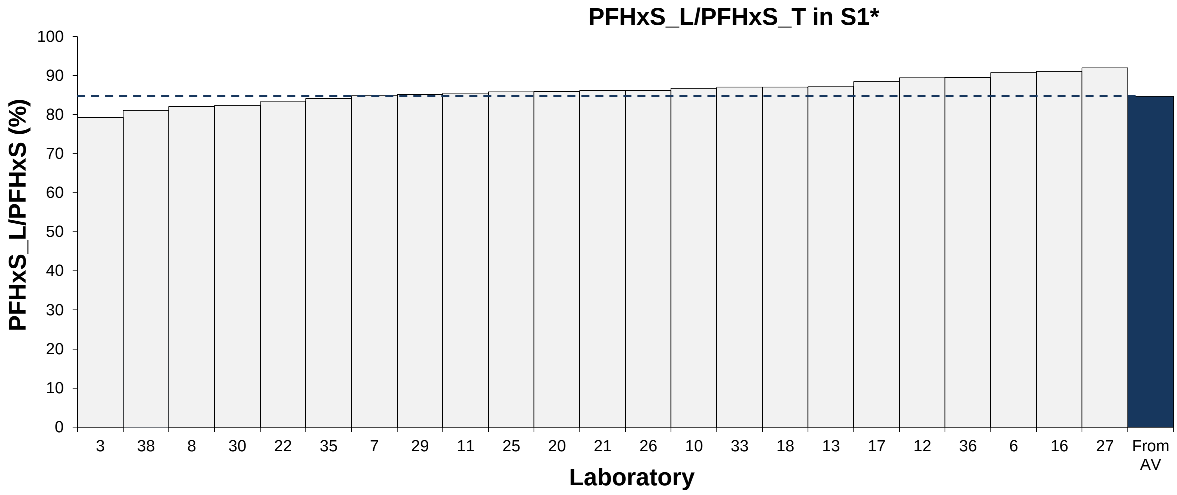
PFNS and PFDS As in the previous study, no assigned value could be set for PFNS and PFDS in the contaminated soil sample S1 because the results reported for these analytes were not compatible.

PFOS level in S1 was high, at 3950 µg/kg which may have resulted in suppression of the PFOS labelled internal standards used for these analytes. This might introduce a bias for analytes for which these labelled internal stdandards were used. The spread of results might be influenced by the amount of internal standards used and the instrumental technique involved.

Laboratories should consider using matrix matched reference materials with high PFAS content to monitor the accuracy of their measurement results for analytes for which labelled PFOS internal standards were used and reassess their estimates of uncertainty for these tests.

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

Twenty-three participants reported results for both total and linear PFHxS in S1. The ratios of linear PFHxS versus total PFHxS in S1 were between 79% and 92% while the assigned value ratio between the two isomers was 85% (Figure 142).

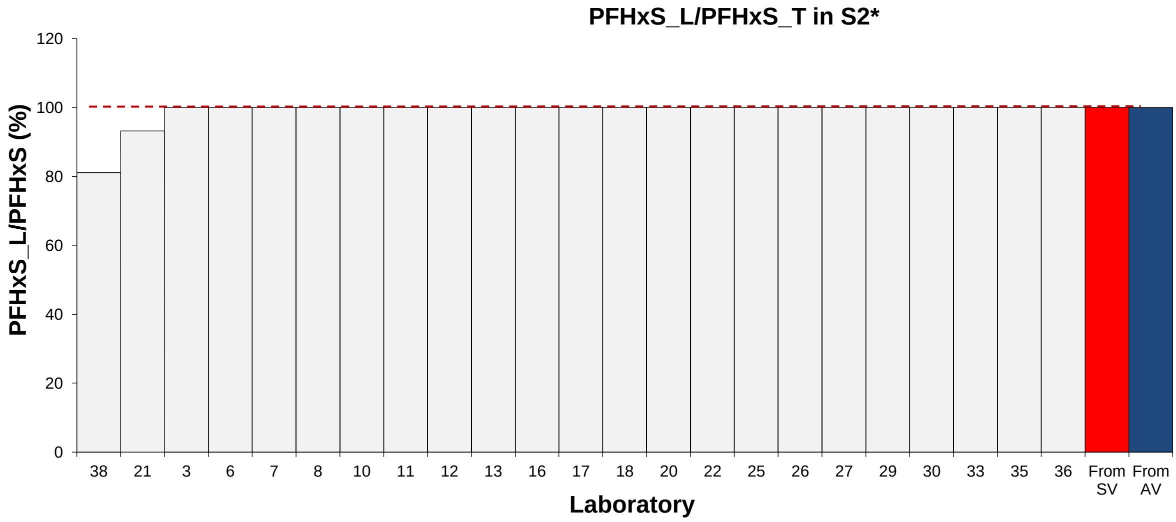


*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 142 Bar Charts of PFHxS_L/PFHxS_T in S1

The soil sample S2 was spiked with linear PFHxS; the ratio of linear PFHxS to total was expected to be 100% for this sample.

Twenty-three participants reported results for both PFHxS total and linear in S2. The linear to total ratio of the results reported for PFHxS isomers was between 81% to 100% (Figure 143). How laboratories used branched isomers for quantitation may explain some of the ratios lower than 100%. When a laboratory is using combined branched/linear standard and integrate branched/linear together for totals, the result could be different to a linear only result due to response factor differences between the isomers.[9]

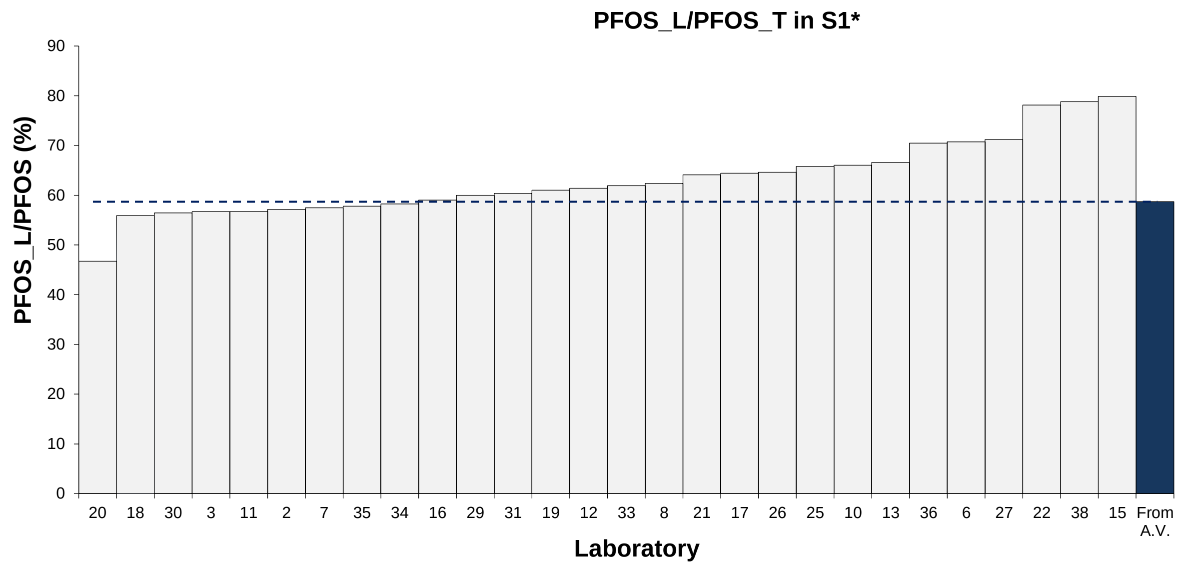


*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 143 Bar Charts of PFHxS_L/PFHxS_T in S2

Figures 144 and 145 present bar charts with ratios of linear PFOS results versus total PFOS results in in S1 and S2 respectively. Twenty-eight participants reported results for both PFOS isotopes (total and linear) in the two soil samples.

The ratios of linear PFOS versus total PFOS in S1 were between 47% and 80% while the assigned value ratio between the two isomers was 59% (Figure 144).

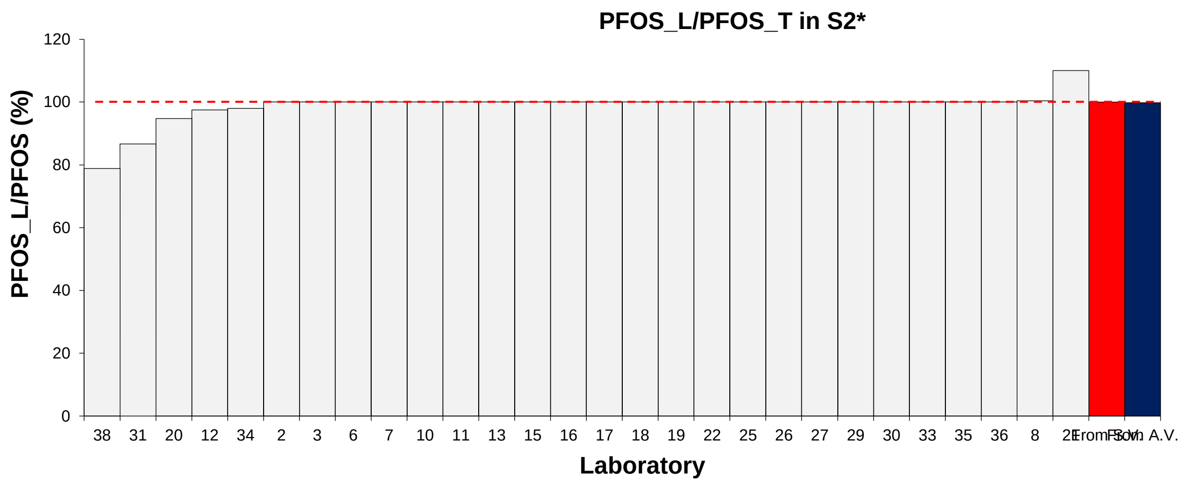


*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 144 Bar Charts o f PFOS_L/PFOS_T in S1

As for PFHxS the soil sample S2 was spiked with linear PFOS; the ratio of linear PFOS to total was also expected to be 100% for this sample. Figure 145 presents bar charts of linear PFOS results vs total PFOS results as reported by participants.

Laboratory 27 reported: “In this method the linear standards are used to quantify both the linear as well as the branched isomers”.



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 145 Bar of Charts PFOS_L/PFOS_T in S2

6.7.4 Individual PFAA Precursors Analytes in Soil

PFOSA level in S1 was 3.24 µg/kg and might have challenged participants’ analytical techniques; the between-laboratory CV was 25%. The PFOSA level in S2 was approximately 4 times higher and the between-laboratory CV was only 11%.

EtFOSAA, MeFOSAA, 8:2FTS measurements in S2 did not present analytical difficulty to participating laboratories. The between-laboratory CVs for these analytes were between 13% and 17%.

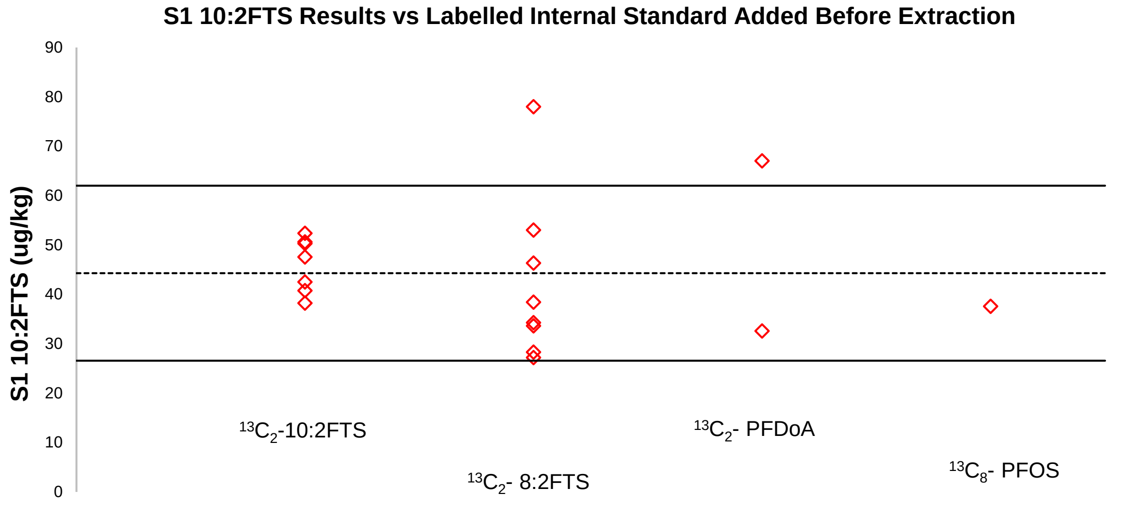


Figure 146 10:2FTS Results vs Internal Standard Added Before Extraction

6:2FTS Only 7 laboratories reported results for 6:2FTS in S1. The results reported were between 0.099 µg/kg and 41.5 µg/kg. No assigned value was set for this test.

10:2FTS Of 37 participants who analysed the soil samples, 27 reported results for 10:2FTS in S2, and 24 of them performed satisfactorily. The between-laboratory CV was 24%, larger than the CV predicted by Thompson and Harwitz.

The telomer sulfonates are referenced to their $^{13}C_2$ isotope dilution analogue (labelled internal standard added before extraction). The product ions of the telomer sulfonate dilution analogues would contain a small contribution from the ^{34}S analogue of the native sulfonates if a correction equation is not used. [9]

Figure 146 presents plots of participants' results reported for 10:2FTS in S2 versus the labelled internal standard added before extraction.

8:2diPAP is not within the analytical suite of many laboratories. Only 8 participants reported results for the fluorotelomer-based PAA precursor in S2 and all performed satisfactorily.

6.8 Participants' Results and Analytical Methods for PFAS in Biosolid

The biosolid Sample S3 was fortified for 30 individual PFAS components. The concentration of the PFAS components in the soil Sample S2 and in the biosolid Sample S3 was similar. This study design was aimed at helping laboratories to assess/develop their method for PFAS analytes in biosolid and to investigate the effect of sample matrices on their results. This is the first time that biosolid have been introduced in a NMIA PFAS PT study, and no individual assessment was conducted for this matrix.

Twenty participants reported results for PFAS analytes in S3. The method descriptions provided by participants are presented in Appendix 9.

Of 20 participants who reported results in the soil and biosolid samples, 10 used the same analytical method. The most frequent changes seen in the methods used for biosolid when compared to the methods used for soil, are: a smaller sample size, staggered extraction, QuEChERS instead of SLE, addition of loose carbon and cleanup of crude extract.

Laboratories used a wide variety of sample sizes for biosolid sample analysis, ranging from 0.2 g to 5 g. Four laboratories took a much smaller sample size (less than half) of biosolid for analysis than for soil, while 2 laboratories reported using a biosolid sample size almost 5 times larger than that for soil.

One laboratory reported wetting the biosolid sample with ammonium acetate and ACN, and soaking the sample overnight, whereas another left the sample to dry overnight at 40°C.

As for soil, most laboratories extracted their sample for either 30 or 60 minutes.

Methanol and base modified methanol were the preferred extraction reagents. However 3 laboratories chose to change the extraction reagent used for soil, from methanol or base modified methanol, to acetonitrile or basic acetonitrile with acetone.

With the exception of four, all laboratories used the same extraction technique as for soil: SLE, alkaline digestion, QuEChERS or accelerated solvent extraction (sonication). Three participants reported using QuEChERS instead of SLE while one used QuEChERS extraction for soil and SLE for biosolid sample.

Many more participants reported using a staggered extraction for the biosolid sample than for soil samples.

Of 37 laboratories who reported soil results, 17 added loose carbon to the soil sample extract to facilitate better adsorption of interferent organics. Of 20 participants who reported results for the biosolid sample S3, 14 added loose carbon to the biosolid extract.

Most participants concentrated their sample extract at 40°C.

A larger proportion of laboratories cleaned up the biosolid crude extract than the soil extract. The majority used SPE.

The most popular method used for the biosolid sample analysis consisted of: SLE extraction, a sample size of 1 or 2 g, methanol base as extraction solvent, an extraction temperature of 40°C and SPE cleanup.

Although participants used a wide variety of methods, most produced compatible results for most analytes in the biosolid sample S3 (Appendix 7). No agreement was found between the results reported for PFDoS, PFODA, MeFOSAA, EtFOSAA and 5:3FTCA.

Only 4 laboratories reported results for 8:2diPAP in biosolid sample. All 4 results were in good agreement with each other and with the spiked value.

Overall, the between-laboratory CVs of the biosolid Sample S3 were higher than those of the soil sample S2. PFDoS, PFODA followed by EtFOSAA and 5:3FTCA in biosolid were the tests which challenged most participants' analytical techniques when compared to the soil sample. The between-laboratory CVs for these tests in S3 were 3 to 6 times larger than in S2.

Individual assessments of participants' performance measuring PFAS analytes in biosolid samples will be conducted in our next PT study for PFAS in soil and biosolid.

6.9 Participants' Results and Analytical Methods for PFAS in Water

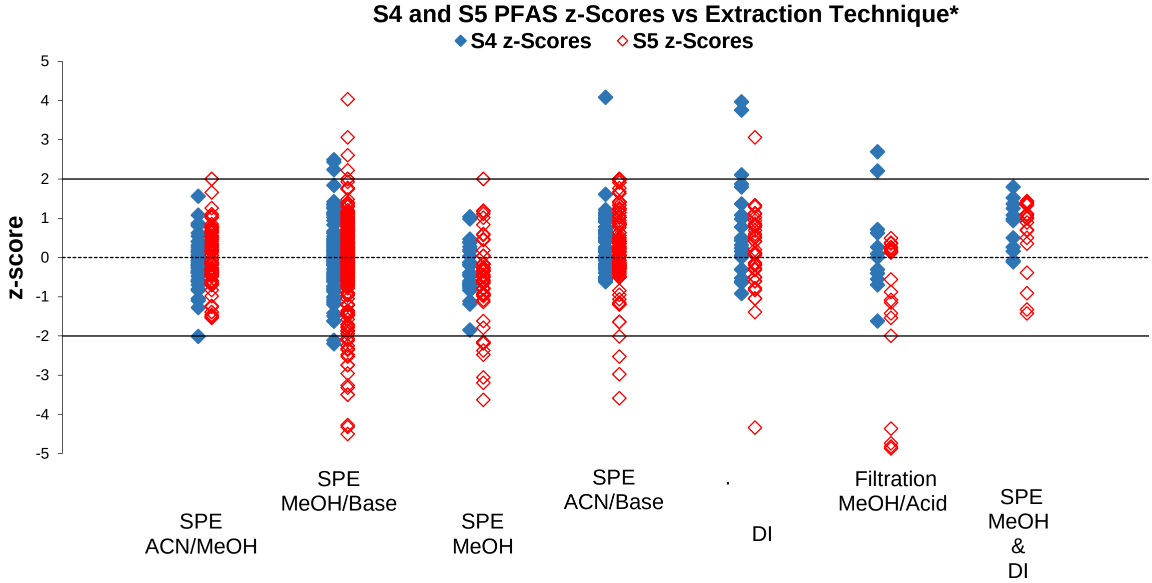
The method descriptions provided by participants for PFAS measurements in water are presented in Appendix 10.

Extraction

Sample S4 was contaminated water, whereas sample S5 was milli-Q water fortified for 27 individual PFAS components. Analyte concentration in the two water samples were between 0.00332 µg/L and 0.229 µg/L. Of 35 participants who reported results for both water samples, all but one used the same sample size for both samples.

In order to account for analyte absorption into the wall of the container, participants were instructed to use the entire contents of the bottle for analysis. Twenty-three reported using the entire container, 4 laboratories used 5 to 10 mL from each sample and 1 used only 1.5 mL. Laboratory 1 used 25 and 50 mL of Sample S5. However, they did not test for long chain carboxylic acids and for PFDoS in S5.

Most laboratories chose to enrich the test samples using SPE (Figure 147).



*Laboratory 15 excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5.

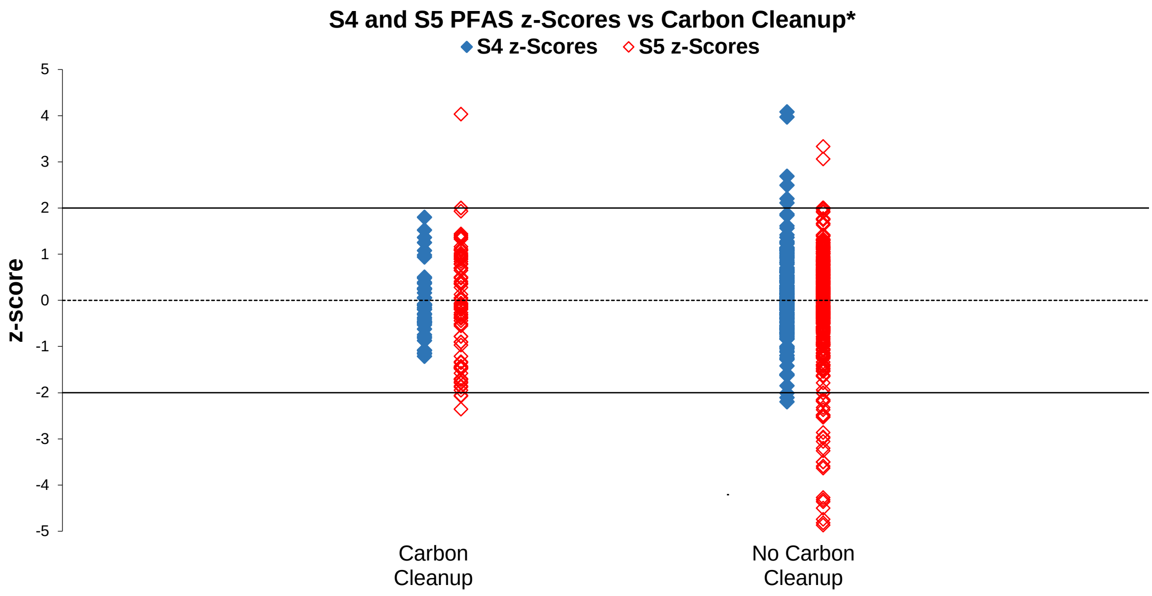
Figure 147 S4 and S5 Performance vs Extraction Technique

Laboratory 15 reported using direct injection without sample enrichment and taking for analysis 1.2 mL of sample.

Laboratory 7 reported taking for analysis 5 mL of sample, filtering it and then extracting with AcOH/MeOH at room temperature. The direct injection procedure they followed might explain the unsatisfactory result they reported for the measurement of the long chain carboxylic acids PFDoA, PFTrDA and PFTeDA and for the long chain sulphonic acid PFDoS in S5, as these PFAS components stick to the walls of the bottle. [9-15]

Two similar water bottles were provided for analysis of each sample. Laboratory 30 may have measured some PFAS components by direct injection in water from one of the two bottles and the other PFAS components using SPE extractions using the entire water sample from the other bottle. However, the level of the long chain carboxylic acids in S5 was less than their reporting limit.

Of 36 laboratories who reported results in at least one of the two water samples, only 4 conducted a carbon cleanup (Figure 148). USEPA Method 1633 employs both SPE and carbon cleanup to remove interferences in water samples, but notes that the use of of carbon cleanup may remove analytes if there is low organic carbon content.[9]



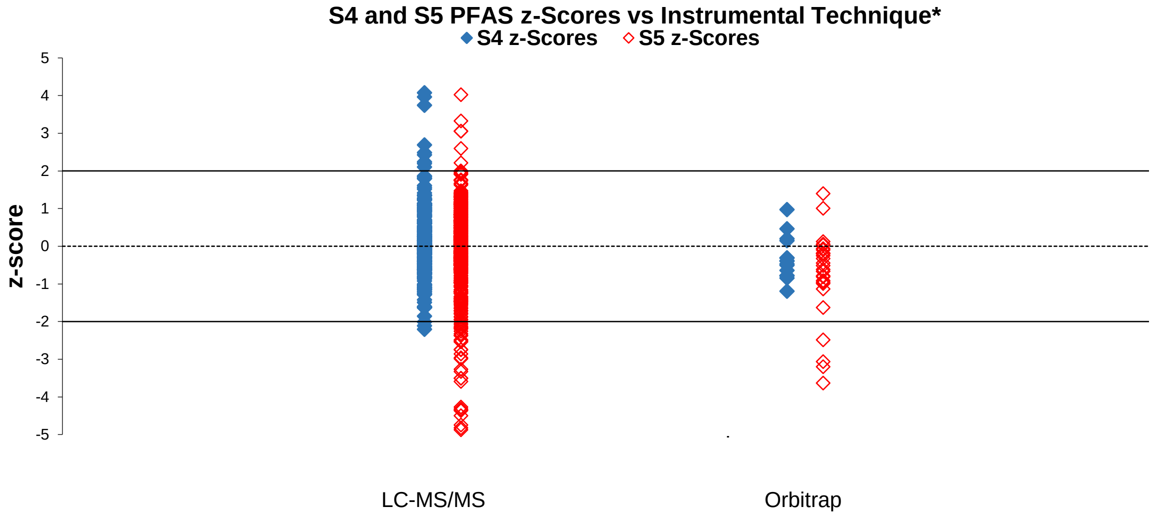
*Laboratory 15 excluded. Scores smaller than -5 have been plotted as -5.

Figure 148 S4 and S5 Performance vs Carbon Cleanup

The most popular method used for measurements of PFAS in water samples S4 and S5 was a SPE extraction procedure which involved taking for analysis the entire sample, methanol or methanol base as elution solvent, and no carbon cleanup step.

Instrumental Technique

With the exception of 2 participants, all laboratories reported using LC-MS/MS(QQQ) for PFAS measurements. Laboratories 27 and 36 used Orbitrap (Figure 149).



*Laboratory 15 excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5..

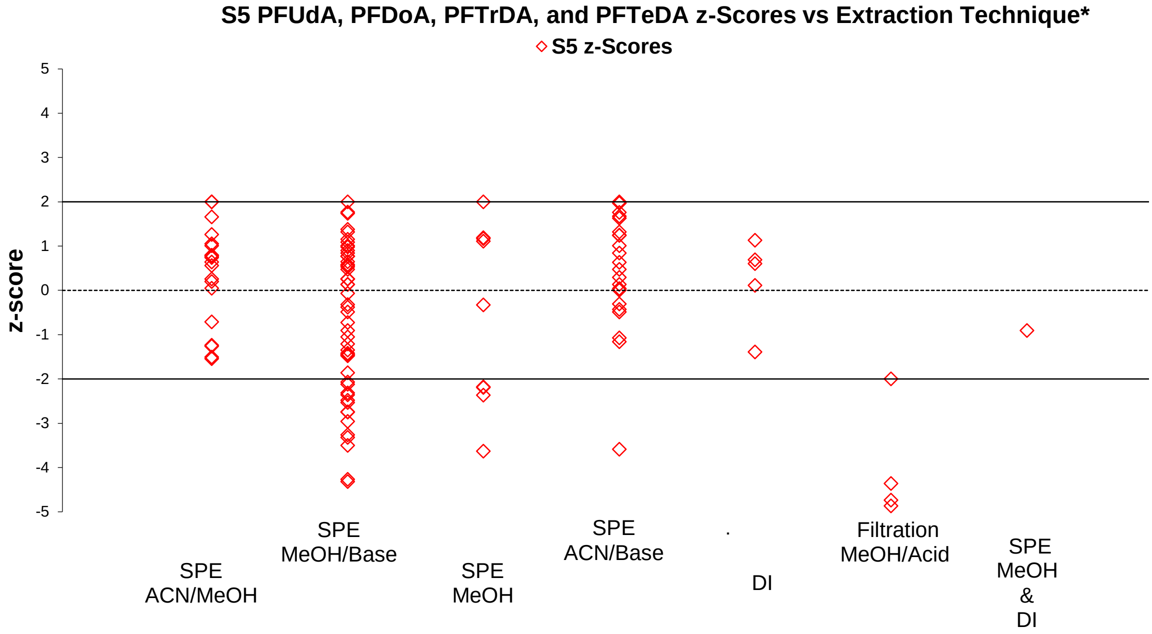
Figure 149 S4 and S5 Performance vs Instrumental Technique

6.9.1 Individual PFCAs Analytes in Water

The between-laboratory coeficient of variation for PFCAs in S4 and S5 was between 11% to 28% .

PFUdA, PFDoA, PFTrDA and PFTeDA were identified from literature as well as previous experience, as being analytes which are at risk of being absorbed into the wall of the container during sample preparation and/or during analysis. [9-15] 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 77% and 85% of the spiked value.

Figure 150 presents plots of participants’z-scores versus the extraction technique used.

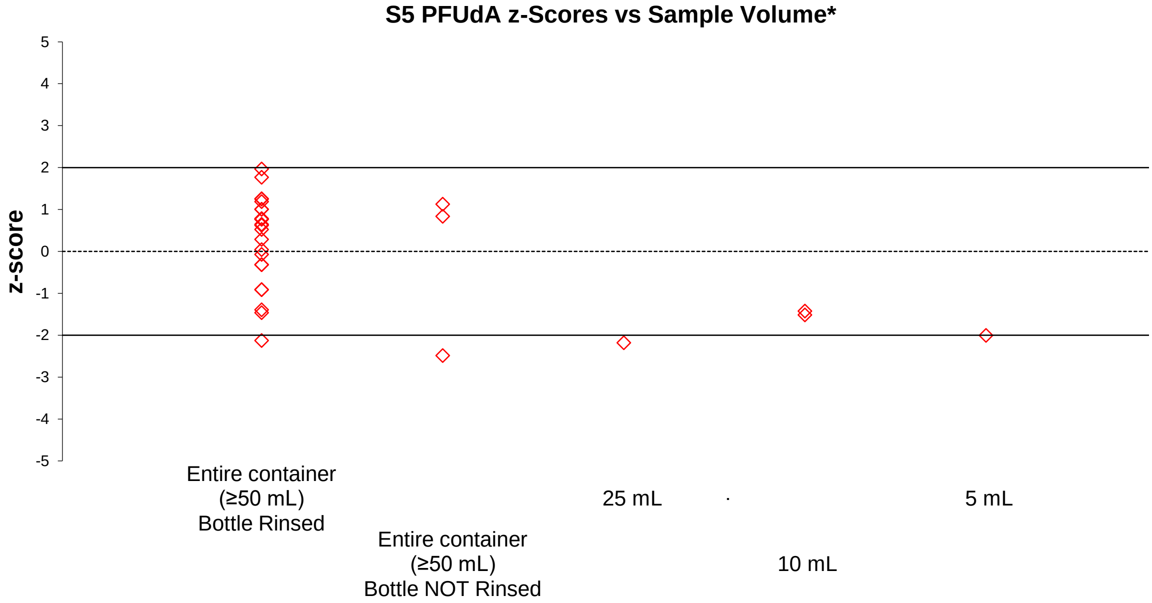


*Laboratory 15 excluded. Scores smaller than -5 have been plotted as -5.

Figure 150 S5 Long Chain Carboxylic Acids Performance vs Extraction Technique

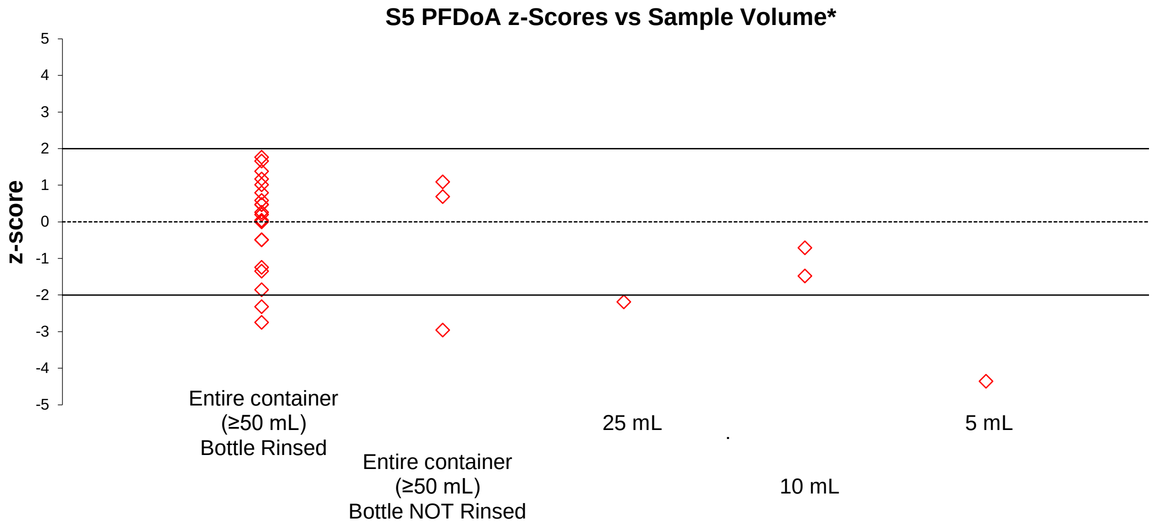
Plots of participants’ z-scores versus sample volume are presented in Figures 151 to 154, while plots of participants’ results (normalised to spike value) versus sample volume are presented in Figures 155 to 158.

Most of the low z-scores were from laboratories who did not use the entire sample.



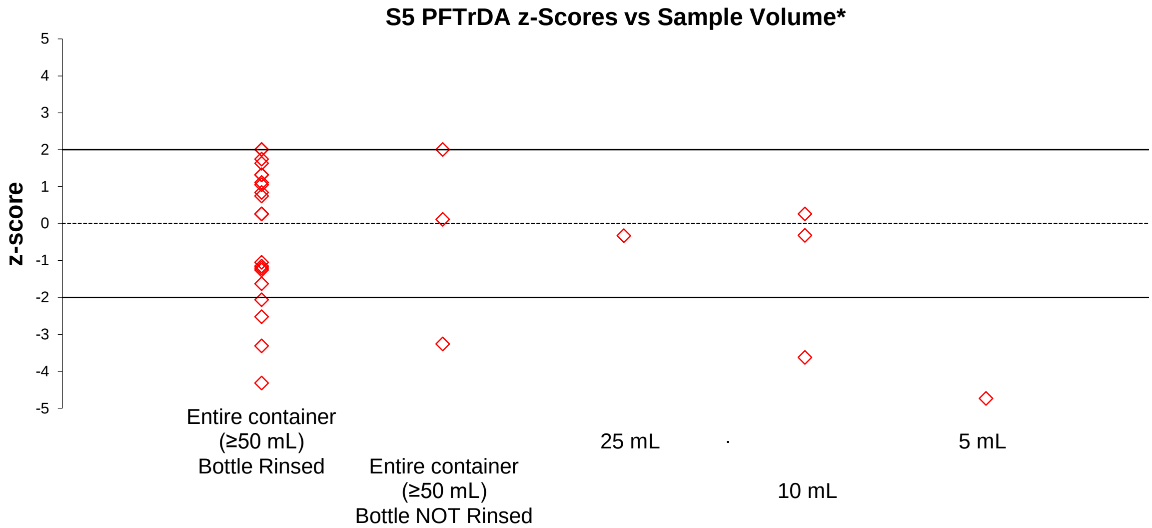
*Laboratory 15 excluded.

Figure 151 S5-PFUdA z-Scores vs Sample Volume



*Laboratory 15 excluded.

Figure 152 S5-PFDoA z-Scores vs Sample Volume



*Laboratory 15 excluded.

Figure 153 S5-PFTrDA z-Scores vs Sample Volume

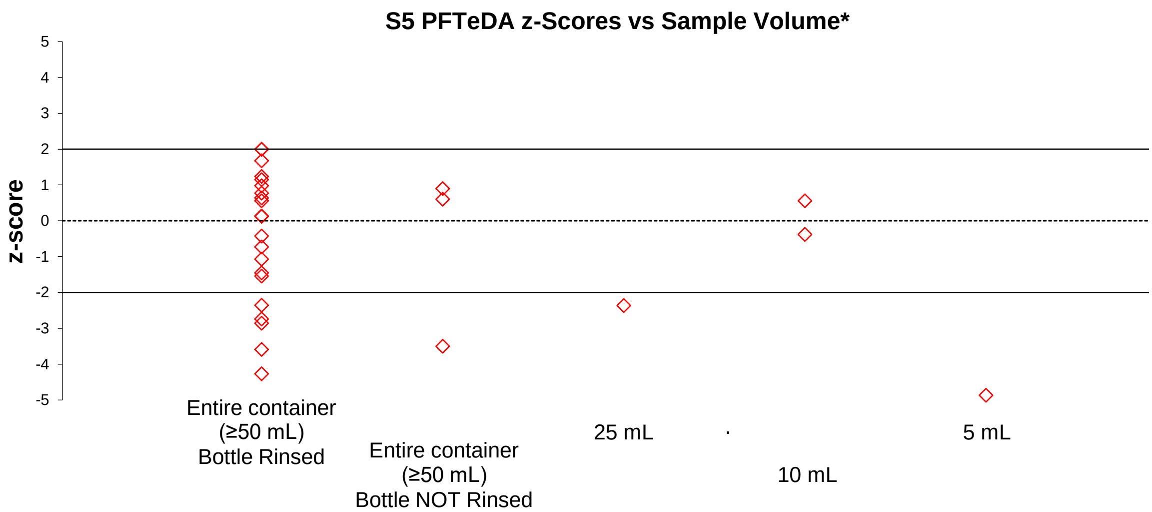
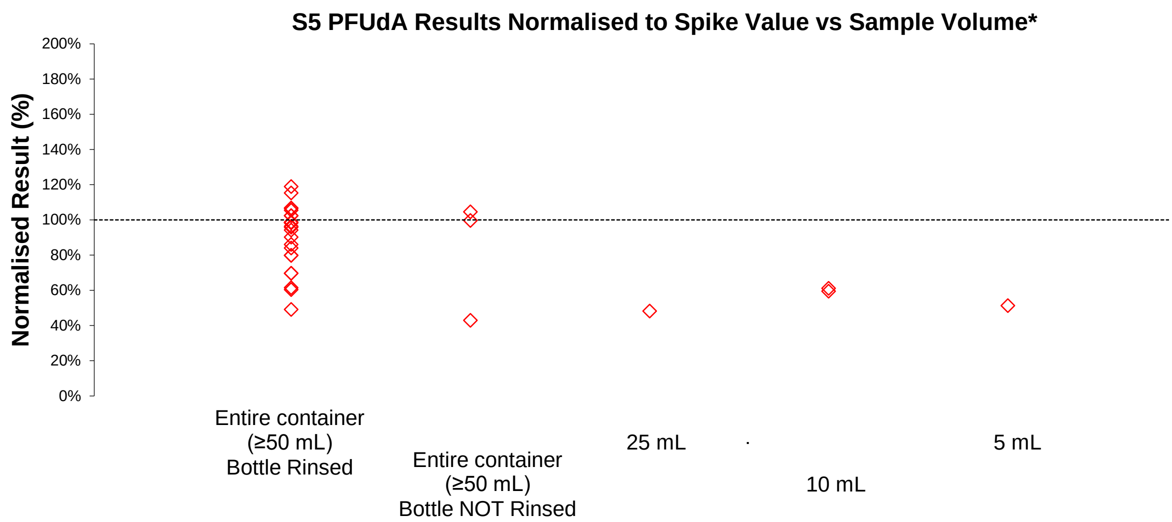
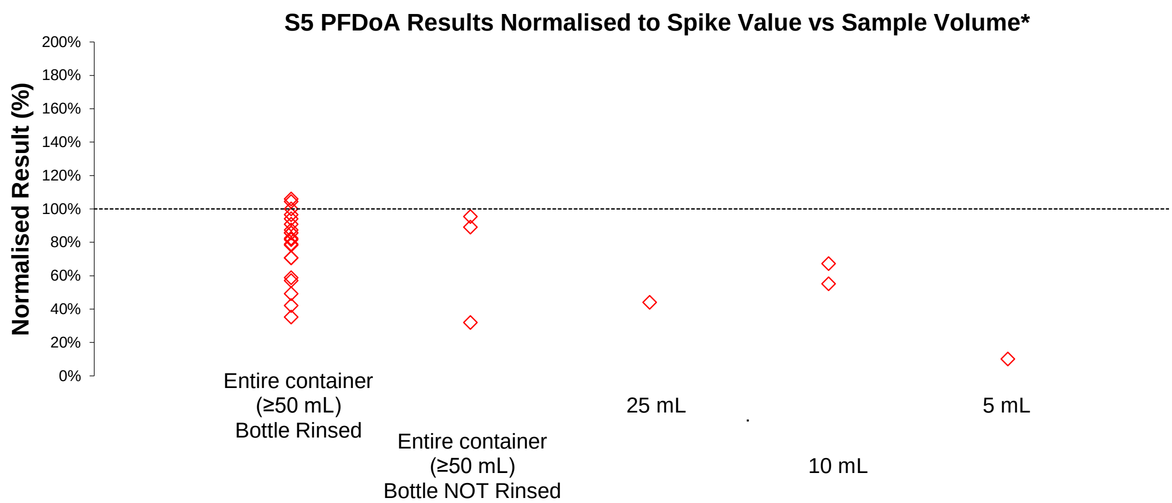


Figure 154 S5-PFTeDA z-Scores vs Sample Volume



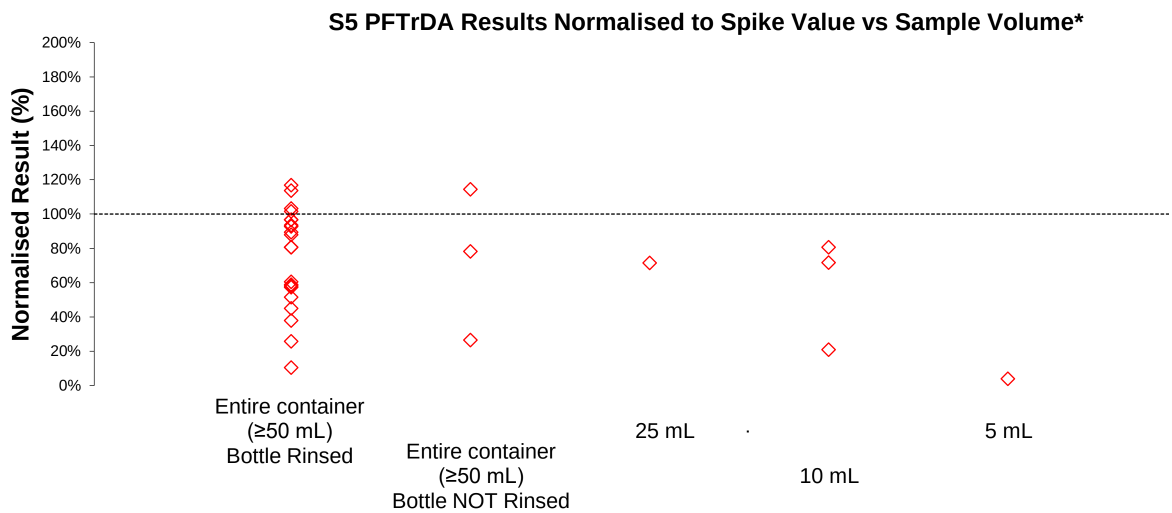
*Laboratory 15 excluded.

Figure 155 S5-PFUdA Results Normalised to Spiked Value vs Sample Volume



*Laboratory 15 excluded.

Figure 156 S5-PFDoA Results Normalised to Spiked Value vs Sample Volume



*Laboratory 15 excluded

Figure 157 S5-PFTrDA Results Normalised to Spiked Value vs Sample Volume

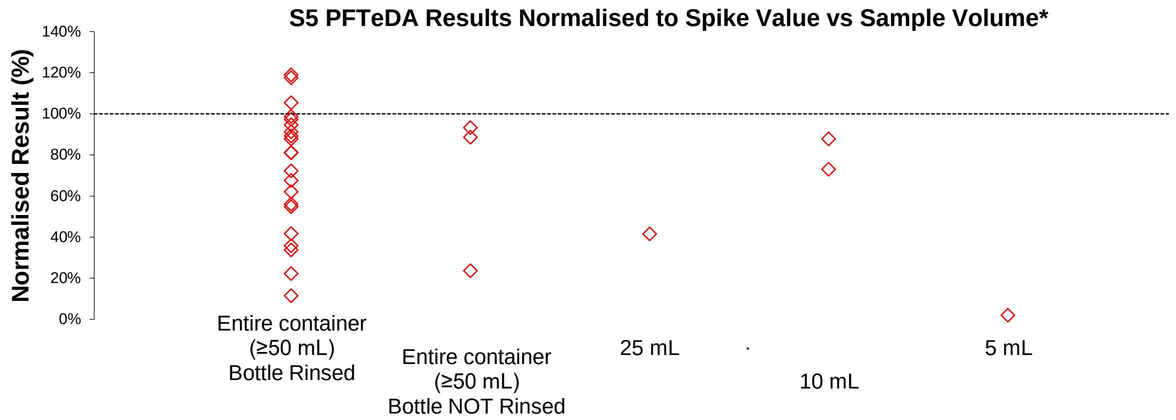
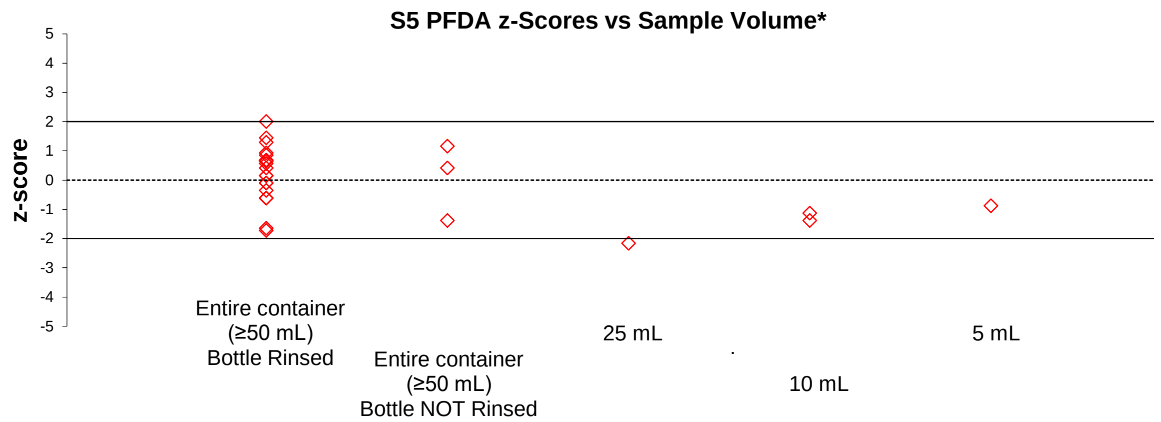


Figure 158 S5-PFTeDA Results Normalised to Spiked Value vs Sample Volume

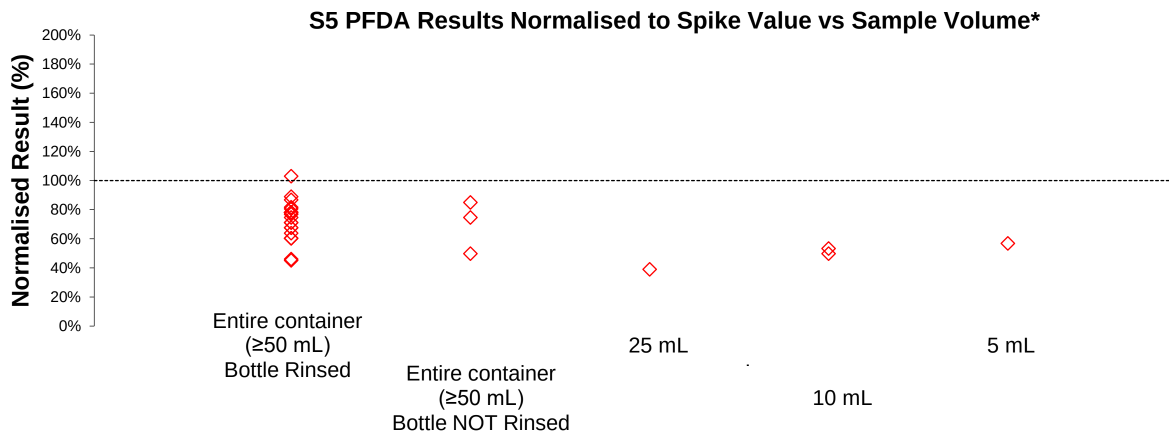
Most participants who recovered 100% of the spiked long chain carboxilic acids (PFUdA, PFDoA, PFTrDA and PFTeDA) used the entire container or almost the entire container (≥50 mL).

PFDA The between-laboratory CV for PFDA results in S5 was larger than the CV predicted by Thompson and Horwitz. Plots of participants’ z-scores versus the amount of sample taken for analyses and of participants’ results normalised to spike value indicate that this analyte might also stick to the bottle walls (Figures 159 and 160).



*Laboratory 15 excluded.

Figure 159 S5 PFDA z-scores vs Amount of Sample Taken for Analysis



*Laboratory 15 excluded.

Figure 160 S5 PFDA Results Normalised to Spike Value vs Sample Volume

6.9.2 Individual PFECA and PFESA Analytes in Water

A limited number of participants (less than half) provided results for PFECA and PFESA analytes in water.

9Cl-PF3ONS and **11Cl-PF3OUdS** No agreement was found between participants' results reported for 9Cl-PF3ONS and 11Cl-PF3OUdS in water.

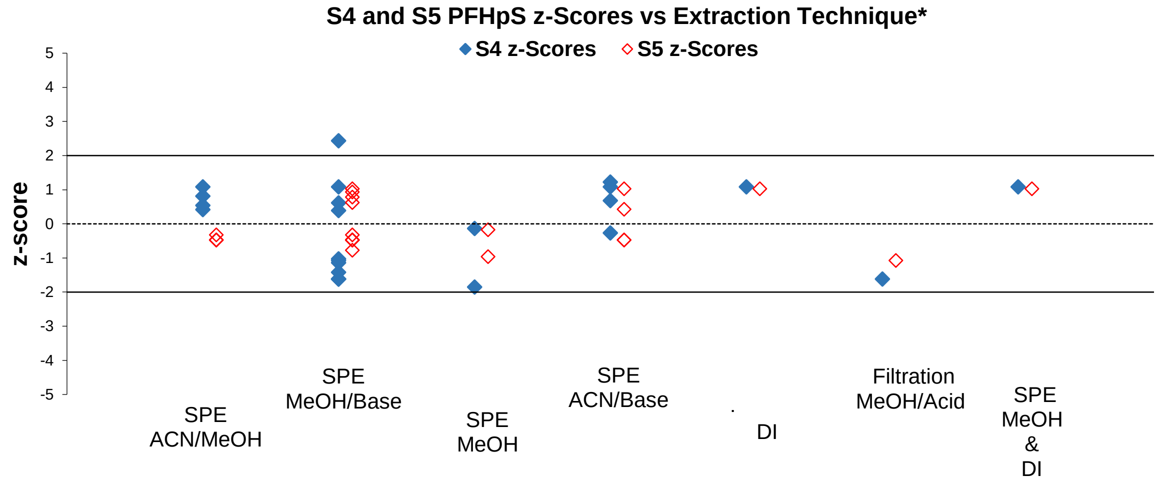
The results reported for these analytes in soil were in relative good agreement with each other.

6.9.3 Individual PFSA Analyte in Water

PFHpS in S4 and **PFNS and PFDS** in S5 were the PFSAs which presented the most analytical difficulty to participating laboratories. The between-laboratory CV for these tests was between 27% and 34%.

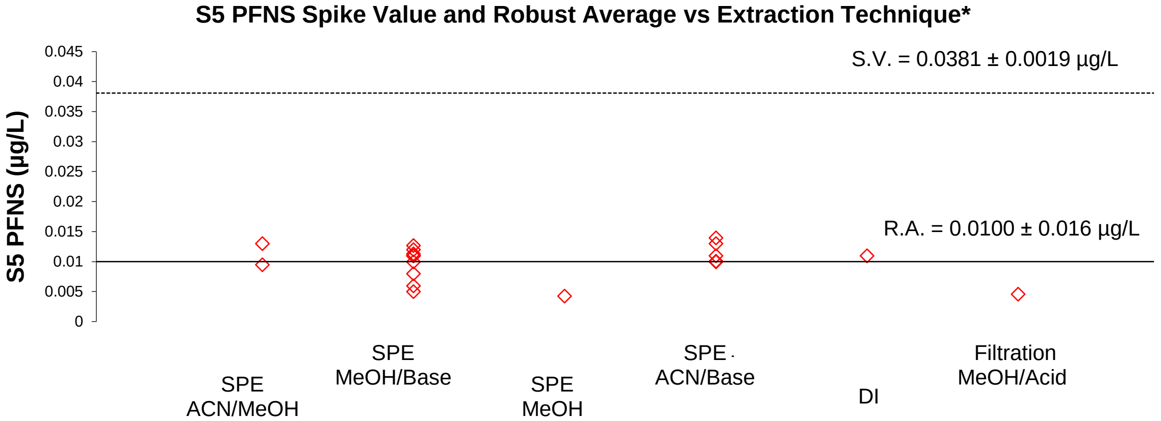
Plots of participants' performance for these tests versus analytical techniques used are presented in Figures 161 to 163. Due to limited data and the variety of extraction techniques used, no significant trends in extraction and sample preparation procedures used were identified.

A low recovery of the spiked value was noticed for PFNS (28%) and PFDS (17%) indicating a possible stability issue.



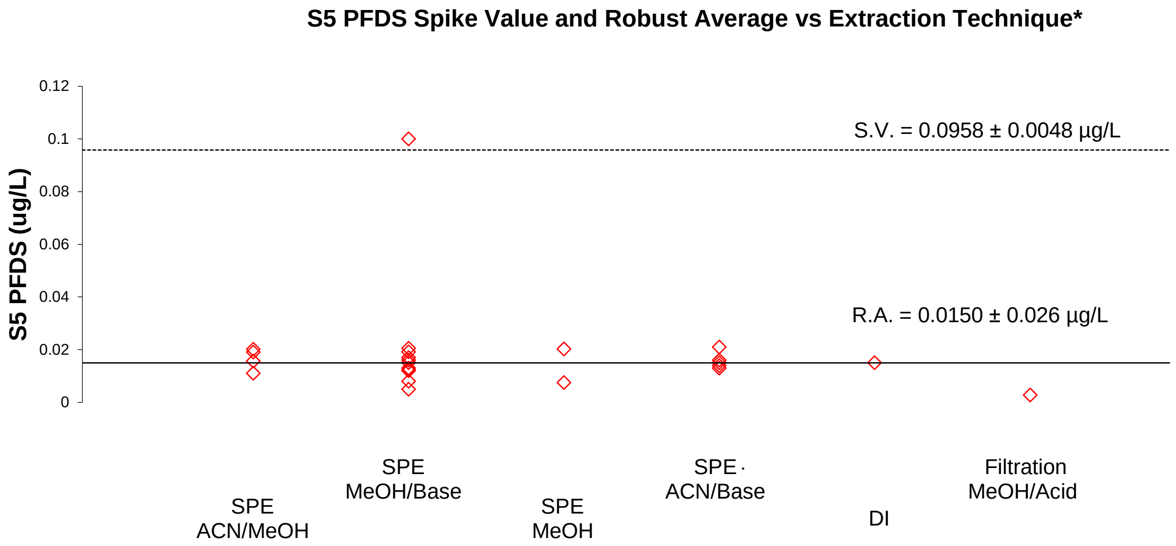
*Laboratory 15 excluded.

Figure 161 S4 and S5-PFHpS z-Scores vs Analytical Technique



*Laboratory 15 excluded.

Figure 162 S5-PFNS Results vs Analytical Technique

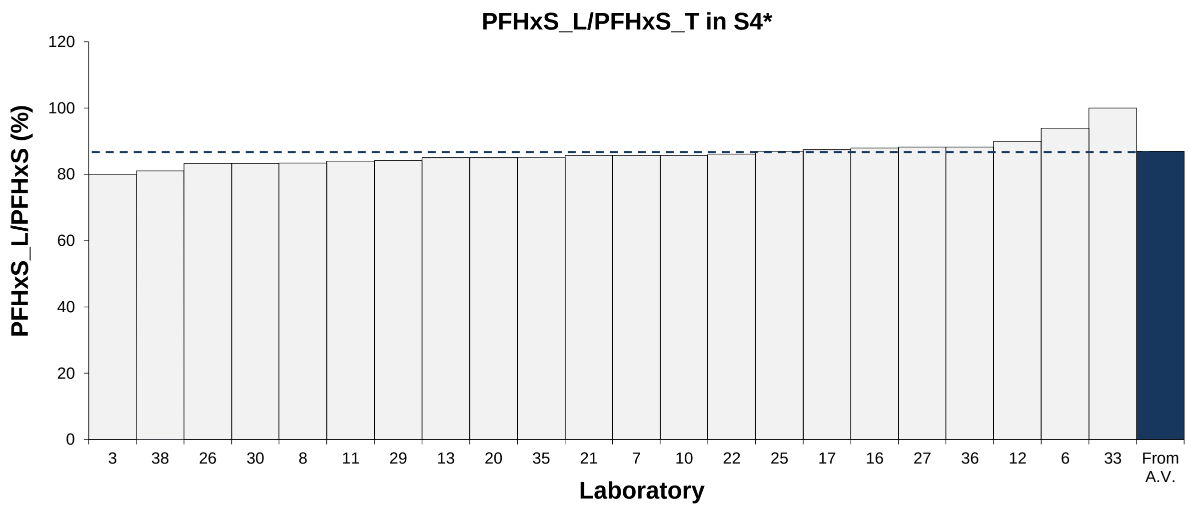


*Laboratory 15 excluded.

Figure 163 S5-PFDS Results vs Analytical 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.

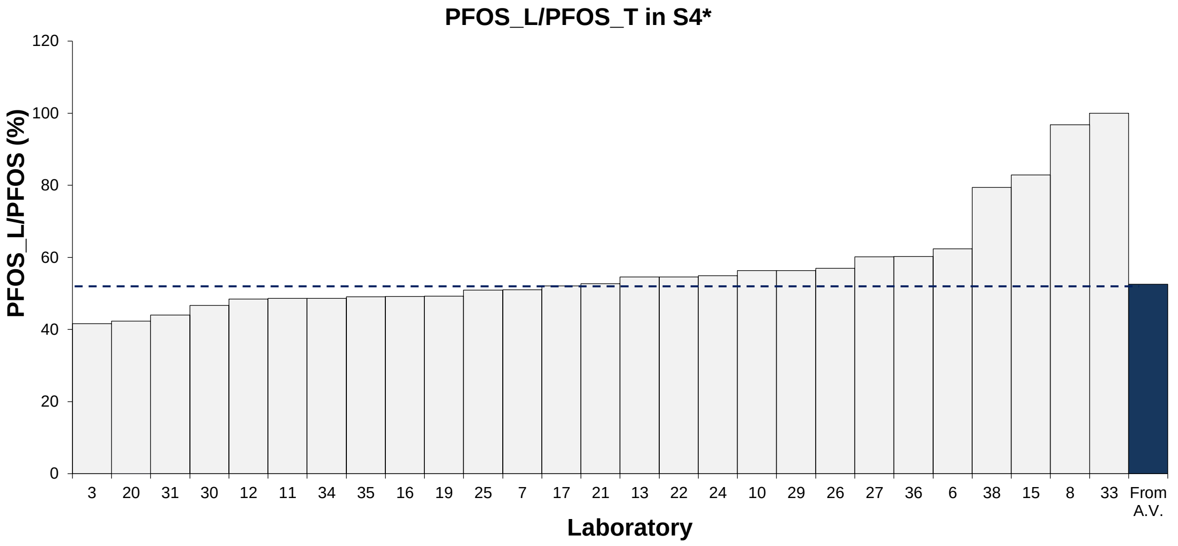
Twenty-two participants reported results for both total and linear PFHxS in S4. The ratios of PFHxS_L versus total PFHxS_T in S4 were between 80% and 100% while the assigned value ratio between the two isomers was 87% (Figure 164).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 164 Bar Charts of PFHxS_L/PFHxS_T in S4

Twenty-seven laboratories reported results for the two PFOS isomers in S4. The assigned values were 0.109 µg/L for total PFOS and 0.0573 µg/L for linear PFOS, with the ratio of linear PFOS versus total PFOS being 53%. Figure 165 presents bar charts of linear PFOS results vs total PFOS results as reported by participants.

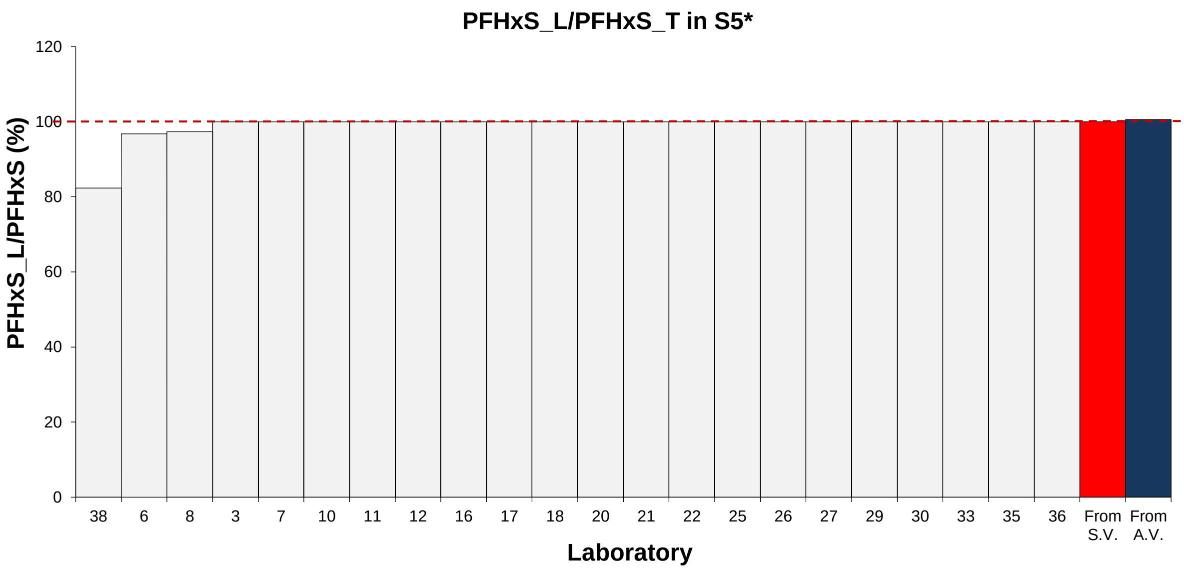


*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 165 Bar Charts of PFOS_L/PFOS_T in S4

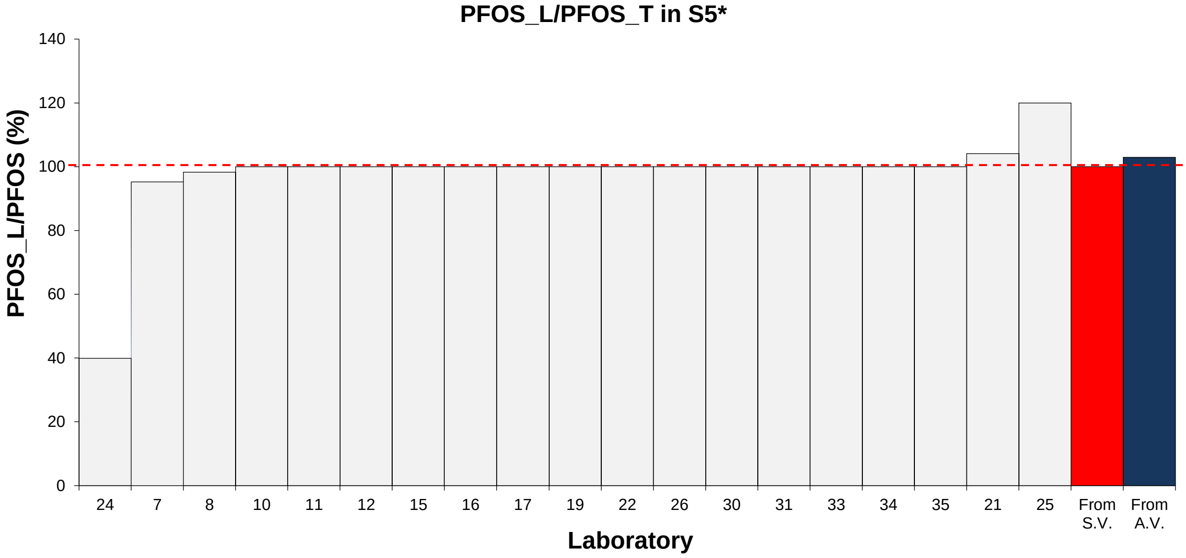
The water Sample S5 was spiked with the linear PFHxS standard and linear PFOS standard, and therefore the linear to total ratio for the two analytes was expected to be 100%. Twenty-two participants reported results for both PFHxS total and linear in S5 and 19 for both PFOS total and linear isomers. The linear to total ratio of the results was between 82% to 100% for PFHxS and between 40% to 120% for PFOS (Figure 166 and 167).

When a laboratory is using combined branched/linear standard and integrate branched/linear together for totals, the result could be different to a linear only result due to response factor differences between the isomers.



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 166 Bar Charts of PFHxS_L/PFHxS_T in S5



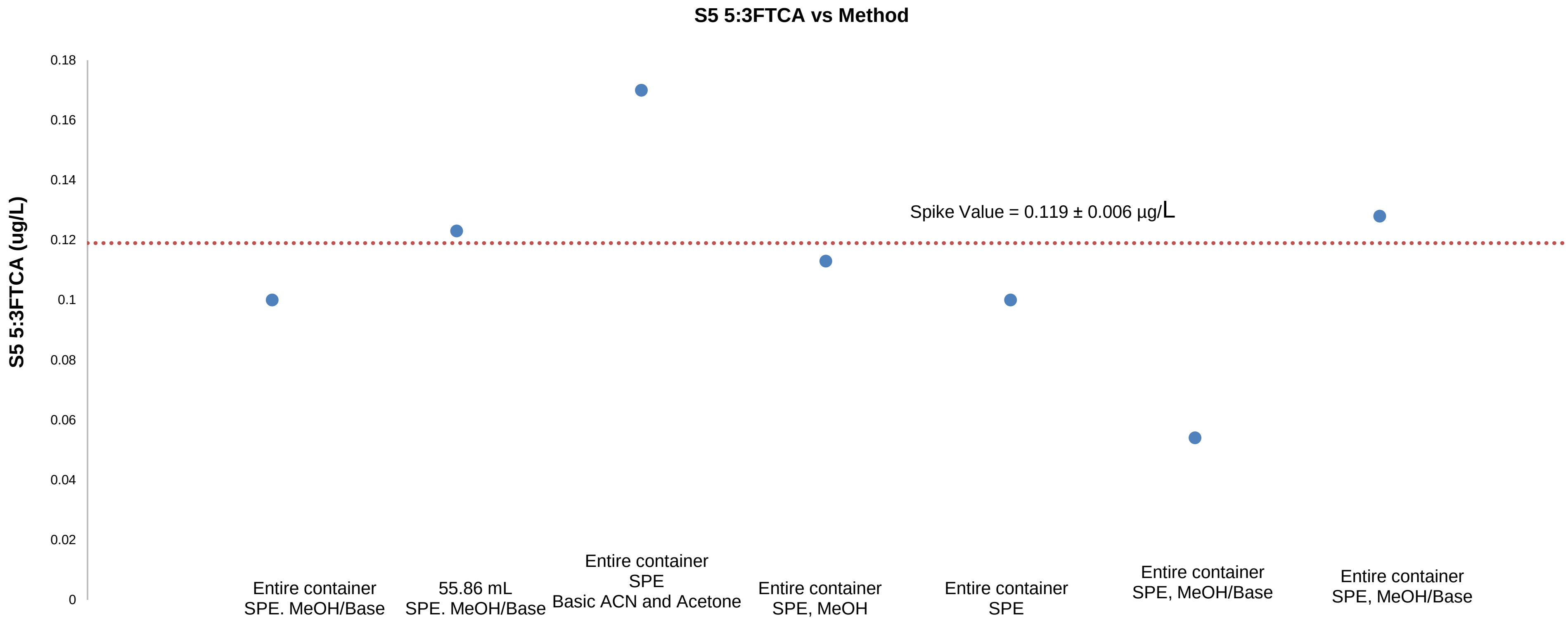
*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 167 Bar Charts of PFOS_L/PFOS_T in S5

6.9.4 Individual PFAA Precursors Analytes in Water

5:3FTCA was introduced for the first time in a water sample in a PT study. 95% of the spike value was recovered for this analyte. Seven results were reported and all were in good agreement with each other but one.

Figure 168 presents plots of participants results reported for 5:3FTCA in S5 versus the method used.



Labelled std before extraction	$^{13}C_2$-6:2FTCA	$^{13}C_5$-PFHxA	N/A			M5PFHxA	
Labelled std after extraction		$^{13}C_2$-PFHxA				M2PFOA	

Figure 168 S5 5:3FTCA vs Methods

6.10 Effects of Sample Matrix

Overall the participants' performance in the water and soil samples was comparable (Table 132).

Table 132 Satisfactory z-Scores for Each Matrix

Sample	Expected nr of z-Scores	Actual nr of z-Scores (% of expected nr. of z-Scores)	Nr. of Satisfactory z-Scores (% of satisfactory z-Scores)
S1 Soil (incurred)	518	449 (87%)	413 (92%)
S2 Soil (spiked)	1073	809 (75%)	775 (96%)
S4 Water (incurred)	432	350 (81%)	323 (92%)
S5 Water (spiked)	828	650 (79%)	586 (90%)

6.11 False Negatives

Appendix 6 presents false negative results. These are analytes present in the samples which a participant tested for, but did not report a result; for example, when participants reported a 'less-than' result ($< x$) when the assigned value was higher than their limit of reporting (LOR), or did not report anything (NR). However results reported as NR may or may not be false negatives as this is depending on the participant's actual LOR.

For analytes where no assigned value was set, results were only 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.

6.12 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 of which 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 the rates of participation and reported results over the last 9 studies (2015 to 2023) is presented in Figure 169.

AQA 23-14 is the ninth 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 still experience problems with the measurement of 11Cl-PF3OUdS in water. This analyte was introduced for the first time in PT Study AQA 21-07. The results reported by participants in this study as in the present study were not compatible with each other and hence no assigned value could be set. The lack of available labelled standards for this test might explain the wide variability in participants results.

Participants still do not have capability to measure PFNS and PFDS in soil samples with high PFOS content. As in the previous studies no assigned value was set for these analytes in the present study because the reported results were too variable.

A summary of participants' performance in the measurement of PFAS analytes in soil and water over time is presented in Figure 170.

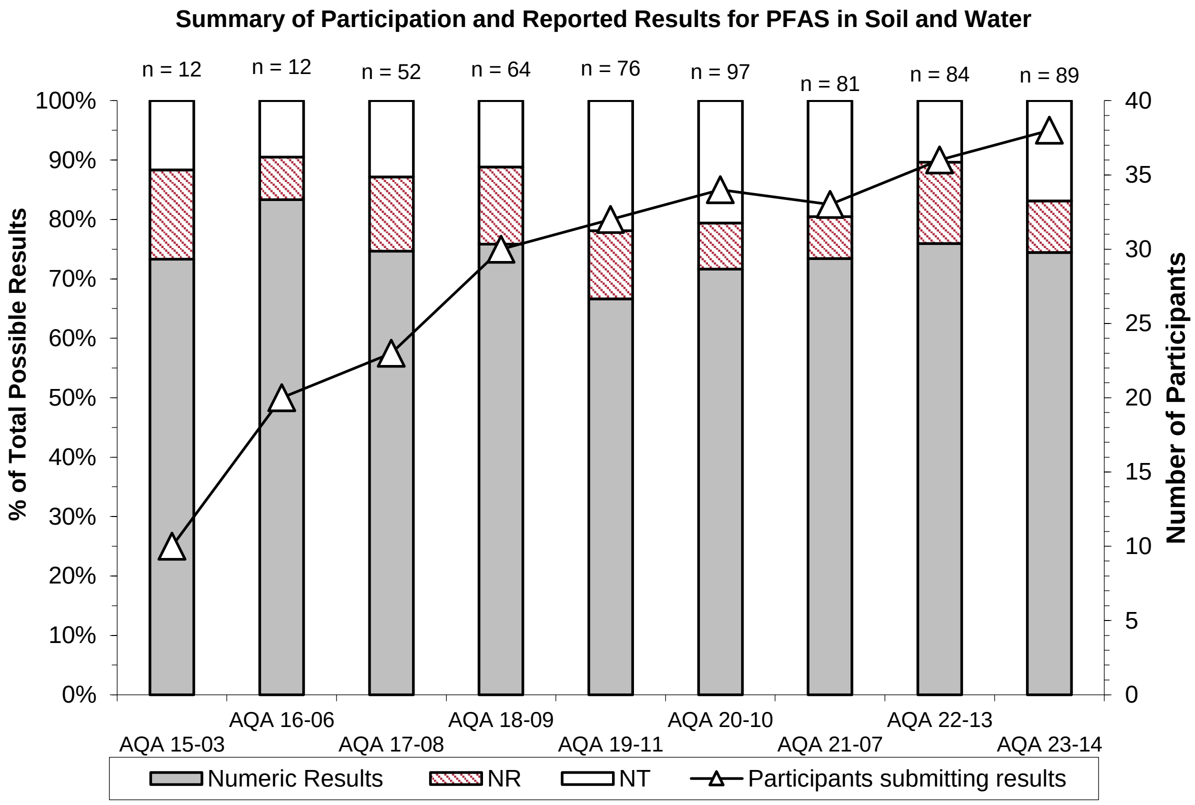


Figure 169 Summary of Participation and Reported Results for PFAS in Soil and Water PT Studies (n = number of analytes).

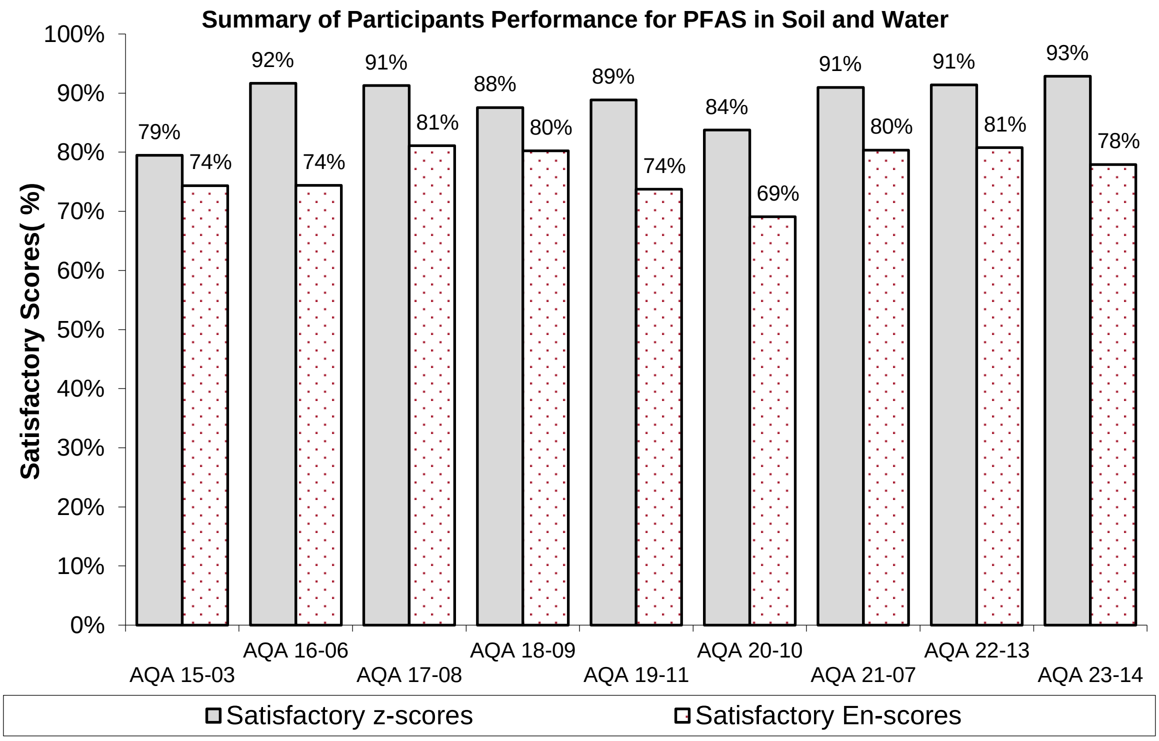


Figure 170 Summary of Participants’ Performance for PFAS in Soil and Water PT Studies

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.

7 REFERENCES

Note: For all undated references, the latest edition of the referenced document (including any amendments) applies

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APPENDIX 1 ‑ SAMPLE PREPARATION, SAMPLE ANALYSIS and HOMOGENEITY and STABILITY

A1.1 Sample Preparation

Sample S1: 1200 g of contaminated soil was ground, sieved through an 850 µm sieve and collected on a 355 µm sieve. The ground and sieved soil material was further divided into equal portions of approximately 20 g each, packed into labelled Greiner tubes, labelled in filling order 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 prepared 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 aproximately 25 g portions, packed into labelled Greiner tubes and shrink-wrapped.

Sample S3: 2500 g of moist uncontaminated biosolid was placed in a 3 L tray. As with Sample S2, a slurry was prepared by adding acetone and then spiked with a composite solution. Vials of Wellington Laboratories standard solutions were individually spiked. The slurry was mixed well and then placed under a fumehood to evaporate the acetone. The moist biosolid were divided into approximately 25 g portions, packed into labelled Greiner tubes and shrink-wrapped. The moisture content of the biosolid before and after preparation was measured, and the spike value adjusted accordingly.

Sample S4: An incurred water sample was placed in a 10 L Schott bottle and autoclaved. The water was then dispensed through a sterile 0.2 µm pore size filter into 60 mL HDPE containers using a peristaltic pump. The bottles were labelled, shrink-wrapped and stored in a refrigerator.

Sample S5: 6000 g of milli-Q water was spiked with a composite spike solution containing 21 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 PFUdA, PFDoA, PFTrA, PFTeDA, PFOSA and PFDoS to minimise the loss of these analytes during preparation. The bottles were tumbled, shrink-wrapped and refrigerated.

Soil and water samples were stored at 4°C prior to dispatch to participants. The biosolid sample was stored at -20°C.

APPENDIX 2 - SAMPLE ANALYSIS HOMOGENEITY and STABILITY ASESSMENT

No homogeneity or stability testing was conducted on soil and water samples. These samples were prepared, stored and packaged using a process that has been demonstrated to produce homogeneous and stable samples in previous NMI PFAS PTs.

Except for 5:3FTCA, 8:2diPAP and PFODA, a homogeneity and stability study was conducted for the biosolid sample.

A2.1 Sample S3 Biosolid Homogeneity and Stability Assessment

Samples were analysed by the NMI Australian Ultra Trace Laboratory. For homogeneity testing, measurements were made under repeatability conditions in a random order.

Biosolid samples were prepared in duplicate by accurately weighing 1 g of sample and spiking with 100 µL of labelled internal standards in methanol. The samples were extracted overnight by tumbling in alkaline methanol (0.01 N potassium hydroxide), then centrifuged and passed through a carbon cartridge (SUPELCO ENVI-CARB, 500 mg, 120-400 Mesh) and evaporated under nitrogen. The extract (reconstituted to 600 µL) was spiked with 20 µL of labelled recovery standards in methanol and filtered.

Instrument analysis was performed using a SCIEX Exion AD UPLC coupled with a SCIEX 6500+ mass spectrometer operating in multiple reaction monitoring mode. 2 µL of extract was injected onto a C18 column (2.1 mm X 100 mm, 1.7 um, 130Å) with a mobile phase consisting of purified water: methanol (2 mM ammonium acetate). The instrument mass accuracy is calibrated annually during preventative maintenance, and an eight point calibration curve established for each analytical batch. A reagent blank is extracted and analysed with each batch, and sample results must be at least three times the level of any analyte detected in the reagent blank to be reported. Quantification is based on the use of the labelled surrogates using relative response factors from the multipoint calibration, and is corrected for internal standard recoveries. The analysis is based on USEPA Method 1633 and used calibration, internal and recovery standards supplied by Wellington Laboratories, Canada.

Homogeneity Asessment

With the exception of 5:3FTCA, 8:2diPAP and PFODA a full homogeneity and stability study was conducted for the biosolid sample (Tables 133 to 157). Homogeneity testing was based on that described in the International Harmonised Protocol from Proficiency Testing.[4] Minimum 6 bottles were selected at random. Duplicate test-portions were taken from each bottle and the concentration of all targeted analytes measured. Measurements were made under repeatability conditions in random order.

The bisolid sample was found homogeneous for all PFAS analytes of interest with the exception of 5:3FTCA, 8:2diPAP and PFODA. No homogeneity analysis was conducted for these tests.

Table 133 Sample S3 PFBS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	10.1	9.13
11	9.82	10.3
15	9.65	9.98
26	9.65	9.68
33	10.1	9.31
44	10.0	9.97
50	10.4	9.86
Mean	9.85	
CV	2.5%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.46	0.73	**Pass**
s_{an}/σ	0.060	0.50	**Pass**
s^2_{sam}	0.047	0.75	**Pass**

Table 134 Sample S3 PFPeS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	20.3	18.7
11	21.0	20.4
15	17.5	18.7
26	18.7	18.8
33	19.8	19.6
44	19.0	19.5
50	21.7	20.6
Mean	19.6	
CV	1.2%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.44	0.73	**Pass**
s_{an}/σ	0.030	0.50	**Pass**
s^2_{sam}	0.047	2.92	**Pass**

Table 135 Sample S3 PFHxS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	6.55	6.18
11	7.59	7.32
15	6.64	6.23
26	7.09	6.46
33	6.54	7.03
44	7.02	7.06
50	7.02	6.70
Mean	6.82	
CV	3.6%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.36	0.73	**Pass**
s_{an}/σ	0.090	0.50	**Pass**
s^2_{sam}	0.047	0.37	**Pass**

Table 136 Sample S3 PFHpS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	2.99	2.57
11	3.04	3.06
15	2.70	2.52
26	2.69	2.54
33	2.75	2.83
44	2.87	2.82
50	2.85	2.75
Mean	2.78	
CV	11.9%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.70	0.73	**Pass**
s_{an}/σ	0.22	0.50	**Pass**
s^2_{sam}	0.047	0.080	**Pass**

Table 137 Sample S3 PFOS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	10.9	10.1
11	13.1	10.7
15	10.6	10.7
26	9.72	10.2
33	10.3	10.7
44	11.2	11.5
50	10.4	11.5
Mean	10.8	
CV	2.2%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.72	0.73	**Pass**
s_{an}/σ	0.060	0.50	**Pass**
s^2_{sam}	0.047	0.91	**Pass**

Table 138 Sample S3 PFNS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	2.27	2.16
11	2.80	2.31
15	2.25	2.27
26	2.19	2.35
33	2.31	2.14
44	2.36	2.27
50	2.25	2.47
Mean	2.32	
CV	15.4%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.66	0.73	**Pass**
s_{an}/σ	0.26	0.50	**Pass**
s^2_{sam}	0.047	0.060	**Pass**

Table 139 Sample S3 PFDS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	37.1	36.2
11	41.7	34.9
15	35.3	39.2
26	35.3	38.1
33	36.8	33.1
44	35.9	37.6
50	32.5	37.1
Mean	36.5	
CV	0.70%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.43	0.73	**Pass**
s_{an}/σ	0.020	0.50	**Pass**
s^2_{sam}	0.047	10.1	**Pass**

Table 140 Sample S3 PFDoS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	30.0	29.7
11	33.0	31.4
15	33.8	35.2
26	29.9	30.6
33	31.8	30.3
44	32.1	33.4
Mean	31.8	
CV	5.8%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.29	0.78	**Pass**
s_{an}/σ	0.014	0.50	**Pass**
s^2_{sam}	2.71	9.29	**Pass**

Table 141 Sample S3 PFBA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	13.0	12.4
11	12.2	13.2
15	13.3	13.3
26	13.1	12.5
33	13.0	12.3
44	13.8	13.4
50	13.0	13.0
Mean	12.9	
CV	6.3%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.40	0.73	**Pass**
s_{an}/σ	0.16	0.50	**Pass**
s^2_{sam}	0.044	1.50	**Pass**

Table 142 Sample S3 PFPeA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	5.28	5.39
11	5.31	5.38
15	5.20	5.36
26	5.26	5.27
33	5.49	5.49
44	5.50	5.31
50	5.28	5.39
Mean	5.35	
CV	2.9%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.45	0.78	**Pass**
s_{an}/σ	0.070	0.50	**Pass**
s^2_{sam}	0.0039	0.24	**Pass**

Table 143 Sample S3 PFHxA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	8.24	7.96
11	8.62	8.63
15	8.18	7.98
26	8.05	8.19
33	7.96	8.11
44	8.47	8.36
50	8.57	8.37
Mean	8.26	
CV	2.9%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.38	0.73	**Pass**
s_{an}/σ	0.070	0.50	**Pass**
s^2_{sam}	0.047	0.54	**Pass**

Table 144 Sample S3 PFHpA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	4.97	4.49
11	4.80	4.68
15	4.71	4.35
26	4.83	4.71
33	4.58	4.66
44	4.51	4.89
50	4.70	4.89
Mean	4.70	
CV	5.2%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.40	0.73	**Pass**
s_{an}/σ	0.13	0.50	**Pass**
s^2_{sam}	0.047	0.19	**Pass**

Table 145 Sample S3 PFOA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	16.3	15.0
11	18.6	15.2
15	15.2	16.0
26	16.4	15.4
33	15.8	15.0
44	15.6	15.1
50	16.1	15.0
Mean	15.8	
CV	1.5%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.68	0.73	**Pass**
s_{an}/σ	0.040	0.50	**Pass**
s^2_{sam}	0.047	1.90	**Pass**

Table 146 Sample S3 PFNA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	9.75	8.68
11	10.8	9.83
15	9.59	9.16
26	9.26	9.19
33	9.20	9.34
44	9.80	9.17
50	9.33	9.97
Mean	9.50	
CV	2.6%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.38	0.73	**Pass**
s_{an}/σ	0.060	0.50	**Pass**
s^2_{sam}	0.047	0.70	**Pass**

Table 147 Sample S3 PFDA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	17.3	16.4
15	17.1	17.3
26	17.0	17.0
33	16.5	16.9
44	17.0	17.2
50	17.7	18.0
Mean	17.1	
CV	3.8%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.76	0.78	**Pass**
s_{an}/σ	0.090	0.50	**Pass**
s^2_{sam}	0.103	2.51	**Pass**

Table 148 Sample S3 PFTrDA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	16.2	15.8
11	20.4	17.1
15	18.0	16.1
26	15.9	19.1
33	16.9	15.0
44	14.1	17.9
50	15.8	16.5
Mean	16.8	
CV	1.5%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.34	0.73	**Pass**
s_{an}/σ	0.040	0.50	**Pass**
s^2_{sam}	0.047	2.14	**Pass**

Table 149 Sample S3 PFOSA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	18.3	17.3
15	17.9	18.3
26	18.5	18.4
33	18.7	18.4
44	19.1	19.2
50	18.9	18.3
Mean	18.5	
CV	3.7%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.61	0.78	**Pass**
s_{an}/σ	0.090	0.50	**Pass**
s^2_{sam}	0.157	2.91	**Pass**

Table 150 Sample S3 MeFOSAA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	14.3	14.4
11	16.7	15.2
15	14.9	15.0
26	14.9	13.8
33	13.9	14.1
44	13.7	14.5
50	15.2	15.3
Mean	14.7	
CV	1.7%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.53	0.73	**Pass**
s_{an}/σ	0.040	0.50	**Pass**
s^2_{sam}	0.047	1.66	**Pass**

Table 151 Sample S3 EtFOSAA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	13.7	13.3
11	16.6	14.7
15	13.1	14.0
26	13.4	12.4
33	13.8	13.3
44	15.0	14.4
50	15.2	13.6
Mean	14.0	
CV	1.7%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.42	0.73	**Pass**
s_{an}/σ	0.040	0.50	**Pass**
s^2_{sam}	0.047	1.51	**Pass**

Table 152 Sample S3 8:2FTS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	10.5	9.94
11	12.8	10.8
15	10.4	10.2
26	10.5	9.76
33	10.1	10.3
44	9.81	11.0
50	10.6	10.7
Mean	10.5	
CV	2.3%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.65	0.73	**Pass**
s_{an}/σ	0.060	0.50	**Pass**
s^2_{sam}	0.047	0.86	**Pass**

Table 153 Sample S3 10:2FTS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	58.0	52.0
11	50.1	64.9
15	62.4	60.8
26	60.3	50.4
33	61.3	54.7
44	52.3	66.2
50	57.3	60.5
Mean	57.9	
CV	0.40%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.37	0.73	**Pass**
s_{an}/σ	0.010	0.50	**Pass**
s^2_{sam}	0.047	25.4	**Pass**

Table 154 Sample S3 GenX Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
11	23.7	23.6
15	22.3	22.8
26	20.9	21.9
33	21.9	21.9
44	23.8	22.4
50	22.4	23.6
Mean	22.6	
CV	5.6%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.41	0.78	**Pass**
s_{an}/σ	0.14	0.50	**Pass**
s^2_{sam}	0.506	4.74	**Pass**

Table 155 Sample S3 ADONA Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	25.2	24.0
11	26.8	27.5
15	23.9	26.6
26	24.6	25.1
33	24.7	25.8
44	25.9	25.9
50	24.8	25.3
Mean	25.4	
CV	1.0%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.66	0.73	**Pass**
s_{an}/σ	0.020	0.50	**Pass**
s^2_{sam}	0.047	4.90	**Pass**

Table 156 Sample S3 9Cl-PF3ONS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	36.5	33.8
11	40.0	40.5
15	34.2	36.5
26	35.3	37.0
33	34.5	35.1
44	36.3	35.0
50	36.3	35.0
Mean	36.1	
CV	0.70%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.38	0.73	**Pass**
s_{an}/σ	0.020	0.50	**Pass**
s^2_{sam}	0.047	9.89	**Pass**

Table 157 Sample S3 11Cl-PF3OUdS Homogeneity Testing

Container Number	Result (µg/kg)	
	Replicate 1	Replicate 2
5	16.9	15.5
11	17.3	19.1
15	16.9	17.3
26	17.5	18.4
33	16.5	16.2
44	16.6	18.2
50	15.1	17.3
Mean	17.0	
CV	1.4%	

Thompson and Fearn Homogeneity Tests[12]

Test	Value	Critical	Result
Cochran	0.36	0.73	**Pass**
s_{an}/σ	0.040	0.50	**Pass**
s^2_{sam}	0.047	2.22	**Pass**

Stability Asessment

Except for 5:3FTCA, 8:2diPAP and PFODA, a stability study was conducted for PFAS analytes in S3

Two main factors were considered to affect the stability of these tests in biosolid: storage condition (e.g storage during transport) and time.

To test for storage stability, the results from a sample kept at -20°C (freezer) was compared with the results from one packaged sample left out on a laboratory table until all samples had been delivered to participants (room). The “room temperature samples” were moved back to the -20°C freezer after the samples’ delivery and analysed at the same time with “reference samples” at the end of the study.

To check sample stability during the study, a comparison was conducted of the results from samples analysed before the samples’ dispatch (T0) versus those analysed at the end of the study, after submission of results (T1) stored at room temperature and in freezer.

Results from both stability studies were in good agreement with each other and the robust average of participants’ results outliers removed (RA) within their stated uncertainties (Figures 171-197).

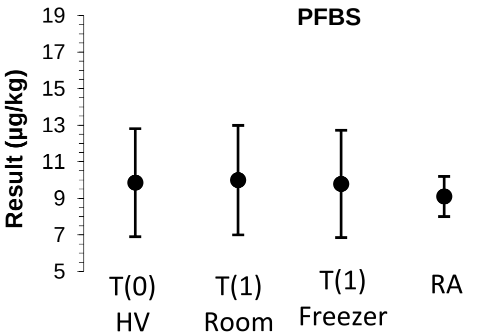


Figure 171 PFBS S3 Biosolid Stability Assessment

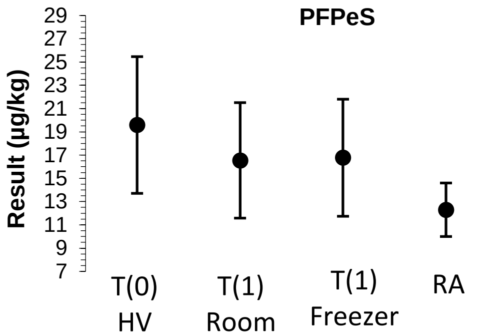


Figure 172 PFPeS S3 Biosolid Stability Assessment

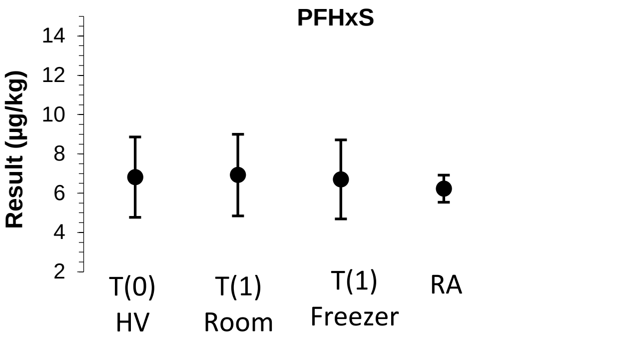


Figure 173 PFHxS S3 Biosolid Stability Assessment

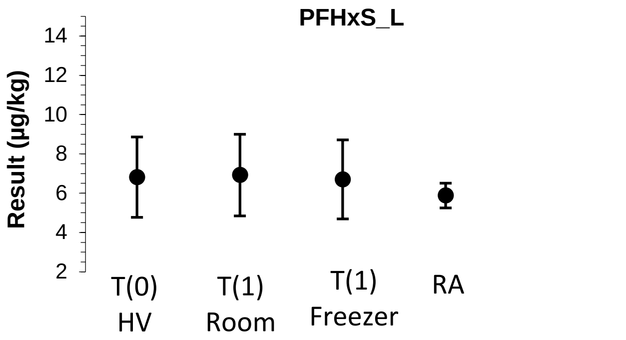


Figure 174 PFHxS_L S3 Biosolid Stability Assessment

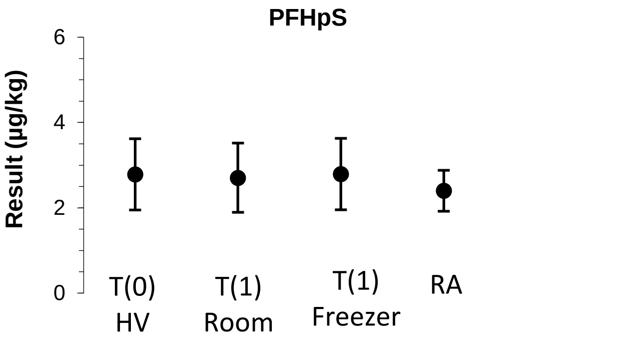


Figure 175 PFHpS S3 Biosolid Stability Assessment

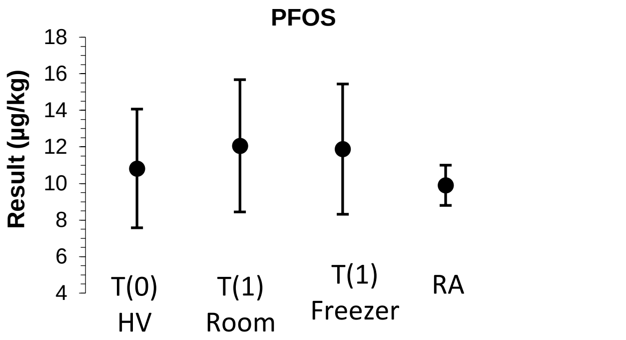


Figure 176 PFOS S3 Biosolid Stability Assessment

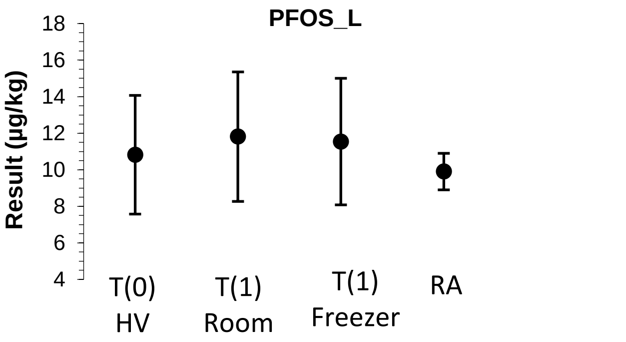


Figure 177 PFOS_L S3 Biosolid Stability Assessment

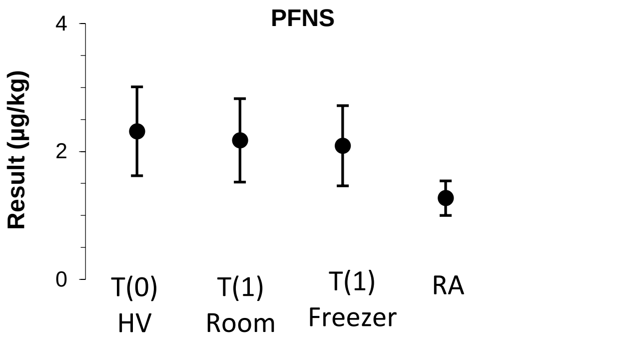


Figure 178 PFNS S3 Biosolid Stability Assessment

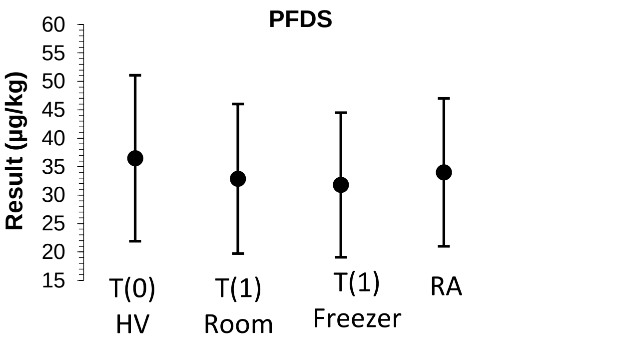


Figure 179 PFDS S3 Biosolid Stability Assessment

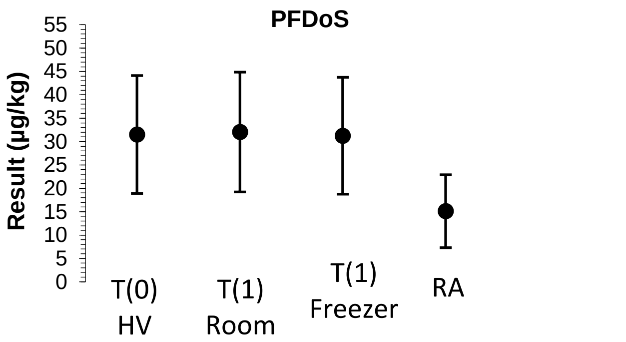


Figure 180 PFDoS S3 Biosolid Stability Assessment

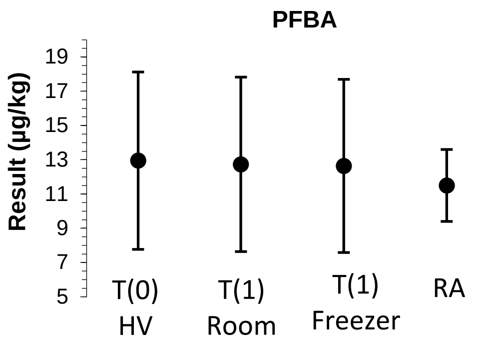


Figure 181 PFBA S3 Biosolid Stability Assessment

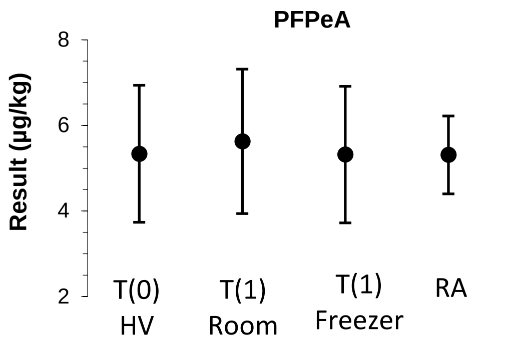


Figure 182 PFPeA S3 Biosolid Stability Assessment

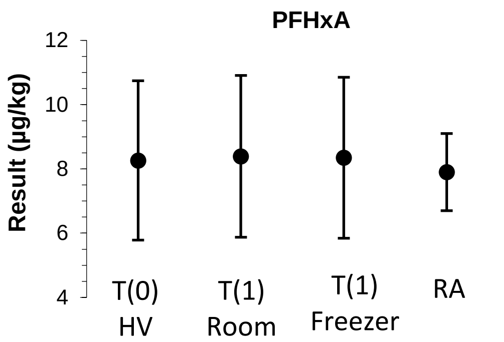


Figure 183 PFHxA S3 Biosolid Stability Assessment

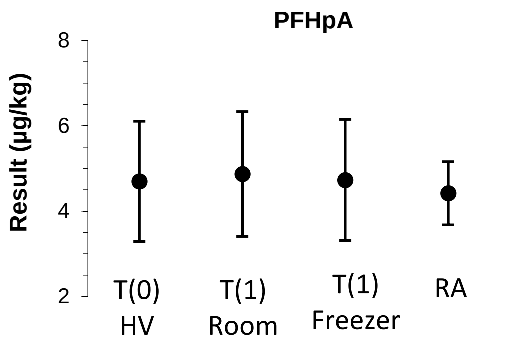


Figure 184 PFHpA S3 Biosolid Stability Assessment

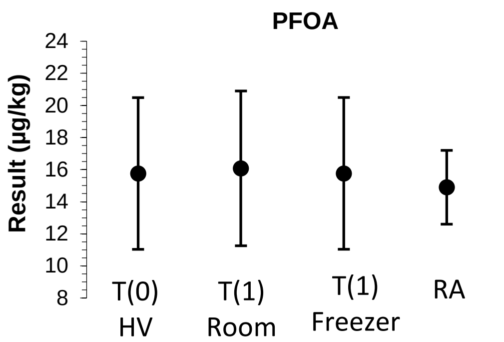


Figure 185 PFOA S3 Biosolid Stability Assessment

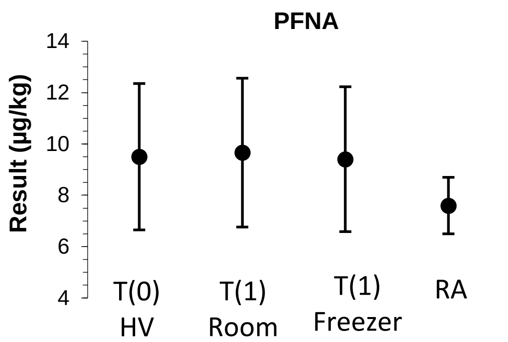


Figure 186 PFNA S3 Biosolid Stability Assessment

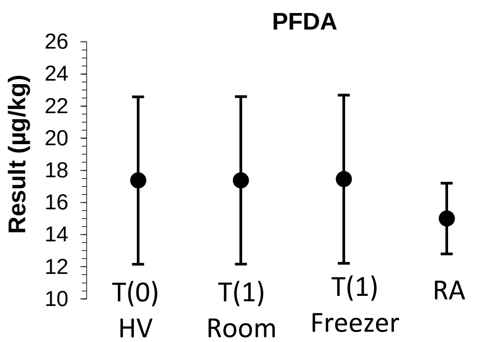


Figure 187 PFDA S3 Biosolid Stability Assessment

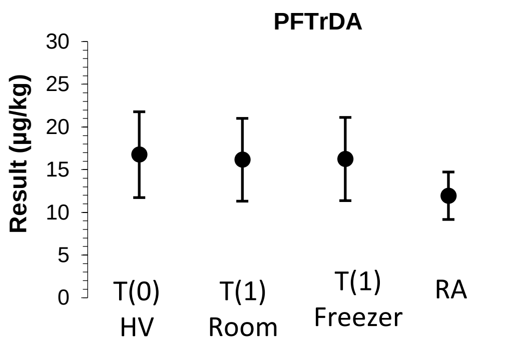


Figure 188 PFTrDA S3 Biosolid Stability Assessment

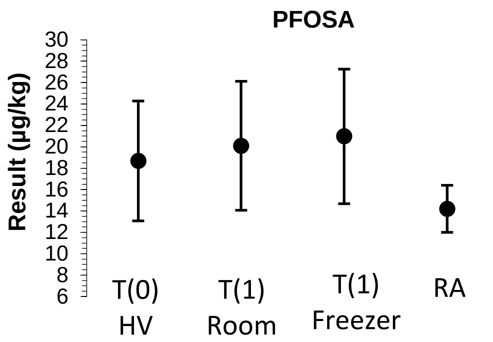


Figure 189 PFOSA S3 Biosolid Stability Assessment

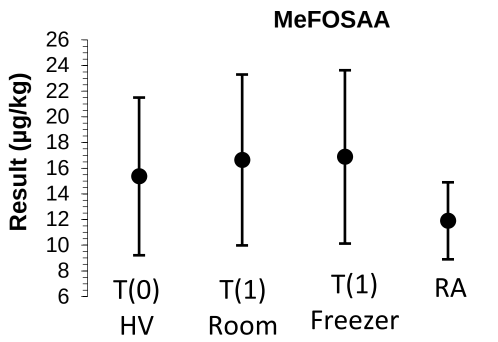


Figure 190 MeFOSAA S3 Biosolid Stability Assessment

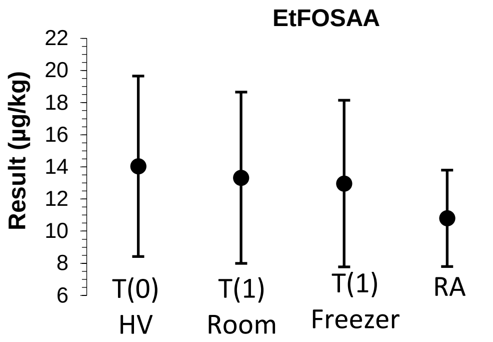


Figure 191 EtFOSAA S3 Biosolid Stability Assessment

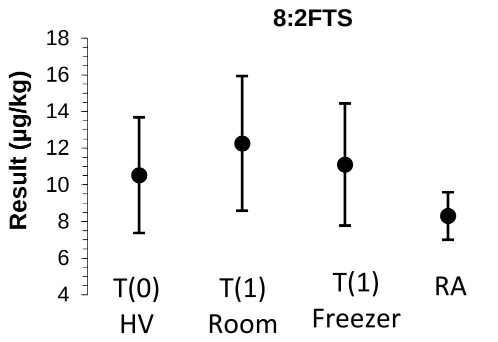


Figure 192 8:2FTS S3 Biosolid Stability Assessment

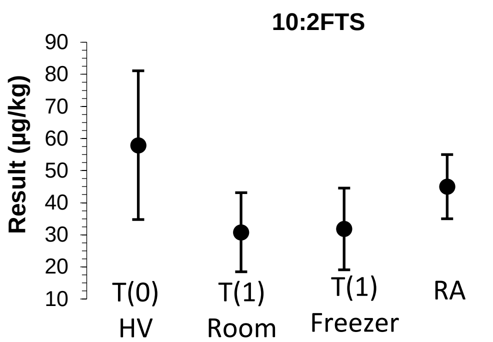


Figure 193 10:2FTS S3 Biosolid Stability Assessment

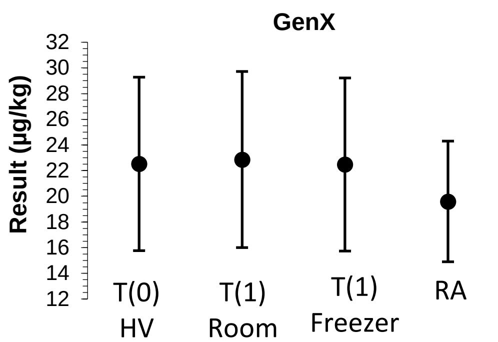


Figure 194 GenX S3 Biosolid Stability Assessment

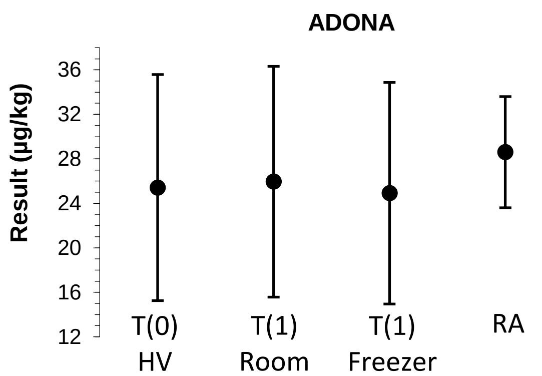


Figure 195 ADONA S3 Biosolid Stability Assessment

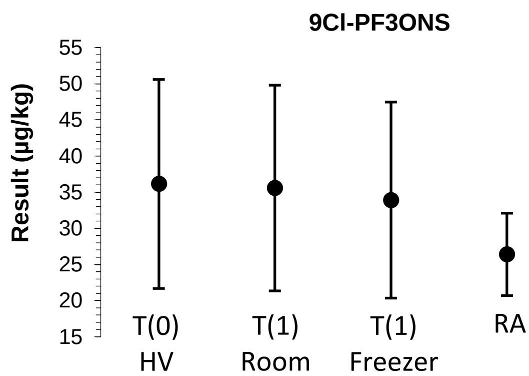


Figure 196 9Cl-PF3ONS S3 Biosolid Stability Assessment

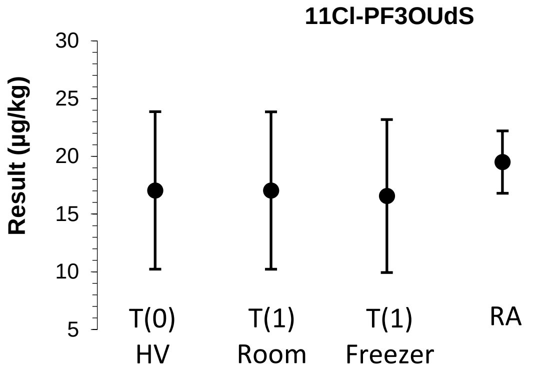


Figure 197 11Cl-PF3OUdS S3 Biosolid Stability Assessment

APPENDIX 3 - ROBUST AVERAGE AND ASSOCIATED UNCERTAINTY, Z-SCORE AND E_N-SCORE CALCULATIONS

A3.1 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:

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

where:

$u_{\text{rob average}}$	is the standard uncertainty of the robust average
$S_{rob\ average}$	is the standard deviation of the robust average
p	is the number of results

The expanded uncertainty ($U_{rob\ average}$) 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 158.

Table 158 Uncertainty Estimate for PFPeA in Sample S2

No. results (p)*	34
Robust Average	3.71 µg/kg
$S_{rob\ av}$	0.48 µg/kg
$u_{rob\ av}$	0.10 µg/kg
k	2
$U_{rob\ av}$	0.21 µg/kg

*Outliers excluded

Therefore, the robust average for PFPeA in Sample S2 is **3.71 ± 0.21 µg/kg**.

A3.2 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 13).

A worked example is set out below in Table 159.

Table 159 z-Score and E_n-Score for Sample S2 PFPeA Result Reported by Laboratory 8

Participant Result (µg/kg)	Assigned Value (µg/kg)	Target Standard Deviation	z-Score	E_n-Score
3.83 ± 1.02	3.71 ± 0.21	20% as PCV, or: 0.2 × 3.71 = 0.74 µg/kg	z-Score = $\frac{3.83-3.71}{0.74}$ = 0.16	E_n-Score = $\frac{3.83-3.71}{\sqrt{1.02^2+0.21^2}}$ = 0.12

APPENDIX 4 – USING PT DATA FOR UNCERTAINTY ESTIMATION

When a laboratory has successfully participated in at least 6 proficiency testing studies, the standard deviation from proficiency testing studies can also be used to estimate the uncertainty of their measurement results.[16] An example is given. Between 2015 and 2023 NMI carried out 9 proficiency tests of PFAS in soil. These studies involved analyses of PFAS analytes at low and high levels.

Laboratory X submitted results for PFOA in most of these PTs. All reported results below returned satisfactory z-scores (Table 160).

Taking the average of the robust CV over these PT samples gives estimates of the relative standard uncertainty of 14%. Using a coverage factor of two gives a relative expanded uncertainty of 28%, at a level of confidence of approximately 95%.

Table 160 Laboratory X Reported Results for PFOA

Study No.	Sample	Laboratory result µg/kg	Assigned value* µg/kg	Robust CV of all results (%)	Number of Results
AQA 15-03	S2 - Soil	8.34	8.9	19	9
AQA 16-06	S3 - Soil	7.45	5.83	9.7	17
AQA 18-09	S1 - Soil	6.2	6.55	9.7	23
AQA 18-09	S2 - Soil	65.4	80.5	11	22
AQA 19-11	S1 - Soil	91.5	104	21	24
AQA 19-11	S2 - Soil	1.59	1.70	19	24
AQA 20-10	S1 - Soil	520	466	16	22
AQA 20-10	S2 - Soil	7.4	7.82	16	27
AQA 21-07	S1 - Soil	4.05	3.70	15	29
AQA 21-07	S2 - Soil	12.1	12.0	9.7	29
AQA 22-13	S1 - Soil	20.8	20.4	17	32
AQA 22-13	S2 - Soil	9.71	9.67	11	32
AQA 23-14	S1 - Soil	36	41.3	16	36
AQA 23-14	S2 - Soil	10	10.5	11	37
Average				14**	

* The mean value of robust CV was used. ** The mean value of Robust CV was used.

Table 161 sets out the expanded uncertainty for results of the measurement of PFOA in soil over the range 1 – 500 µg/kg.

Table 161 Uncertainty of PFOA Results Estimated Using PT Data.

Results µg/kg	Uncertainty µg/kg
1.00	0.28
20.0	5.6
100	28
250	70
500	140

The estimate of 28% passes the test of being reasonable, and the analysis of the 14 different PT samples over nine years can be assumed to include all the relevant uncertainty components (different matrices, operators, reagents, calibrators etc.), and so complies with AS ISO/IEC 17025:2018.[7]

APPENDIX 5 – ADDITIONAL ANALYTES

Table 162 Additional Analytes

Lab. Code	Sample	Analyte	Result S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Uncertainty S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Recovery (%)
2	S1	PFUdA	0.02709	0.003522	NR
		PFDoA	0.03866	0.005799	NR
		EtFOSAA	0.03810	0.008763	NR
		8:2FTS	0.03799	0.009118	NR
	S2	PFDoA	0.1646	0.02469	NR
4	S1	PFUdA	0.024	0.005	91
		PFDoA	0.034	0.005	81
		PFTrDA	0.011	0.003	NR
		PFTeDA	0.023	0.005	58
		MeFOSA	0.030	0.01	100
		EtFOSA	0.039	0.01	242
		MeFOSAA	0.033	0.01	72
		EtFOSAA	0.015	0.01	96
		EtFOSE	0.051	0.04	67
		8:2FTS	0.019	0.005	78
		10:2FTS	0.004	0.002	NR
		ADONA	0.001	0.001	NR
	S2	PFUdA	0.024	0.005	89
		PFDoA	0.186	0.05	87
		PFTeDA	0.017	0.005	71
		MeFOSA	6.261	1.5	100
		EtFOSA	0.039	0.008	223
		MeFOSE	0.030	0.005	75
		EtFOSE	0.087	0.009	74
		6:2FTS	3.316	0.5	103
	S4	MeFOSE	0.001	0.001	94.1
		6:2FTS	0.003	0.001	117.5
	S5	MeFOSA	0.015	0.004	100.0
		MeFOSE	0.001	0.001	91.3
5	S1	PFUdS	2.9	1.5	NR
		PFDoS	5.0	2.5	NR
		PFTrDS	3.4	1.7	NR
		PFUdA	0.1	0.2	NR
		PFDoA	0.08	0.1	NR
		PFTrDA	0.16	0.1	NR
		PFTeDA	0.03	0.05	NR

Lab. Code	Sample	Analyte	Result S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Uncertainty S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Recovery (%)
5	S1	8:2FTS	0.7	0.5	NR
	S2	PFUdS	0.2	0.2	NR
		PFDoA	0.25	0.2	NR
	S4	PFUdA	0.005	0.002	NR
7	S2	PFDoA	0.1	NR	93
	S3	PFDoA	0.4	NR	133
	S4	PFUdA	0.001	NR	87
		6:2FTS	0.0005	NR	76
8	S1	PFDoS	0.332	0.06	66
	S3	PFDoA	0.63	0.092	10
9	S1	PFUdS	0.366	0.128	59
		PFUdA	0.139	0.059	107
		PFDoA	0.11	0.039	104
		8:2FTS	0.092	0.032	107
		GenX	0.169	0.059	98
	S2	PFUdS	0.138	0.0483	96
		PFDoA	0.182	0.0637	83
10	S1	MeFOSA	1.99	0.64	34.5
	S2	PFDoA	0.175	0.04	93.2
	S3	PFUdA	0.184	0.026	37.9
		PFDoA	0.782	0.18	22.3
		PFTeDA	0.108	0.014	12.3
		MeFOSE	0.91	0.22	9.91
		6:2FTS	0.245	0.087	72.5
		7:3FTCA	4.92	1.57	54.6
	S4	6:2FTS	0.0273	0.0115	91.8
11	S2	PFDoA	0.190	0.06	90
	S3	PFDoA	0.332	0.0997	99
		MeFOSE	0.865	0.2596	77
		EtFOSE	0.104	0.0311	82
12	S2	PFDoA	0.26	0.08	154
13	S1	PFUdA	0.05	0.02	99
		PFDoA	0.07	0.02	98
		8:2FTS	0.04	0.01	92
	S2	PFDoA	0.15	0.05	98
	S3	PFUdA	0.63	0.21	19
		PFDoA	1.53	0.5	19
		PFTeDA	0.41	0.15	48
	S4	PFNA	0.009	0.003	78

Lab. Code	Sample	Analyte	Result S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Uncertainty S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Recovery (%)
15	S1	PFDoS	0.5262	NR	53
	S4	ADONA	5.6805	NR	83
16	S3	MeFOSE	1.19	0.36	61
17	S1	PFDoA	0.04687	NR	NR
	S2	PFDoA	0.1700	NR	NR
	S4	PFNA	0.0007207	NR	NR
		PFDA	0.0005190	NR	NR
		PFTrDA	0.0005513	NR	NR
		PFTeDA	0.0009247	NR	NR
		6:2FTS	0.0001386	NR	NR
	S5	8:2diPAP	0.00009000	NR	NR
20	S2	PFUdS	0.10	0.00	84
		PFDoA	0.15	0.03	83
	S3	PFUdA	0.10	NR	64
		PFDoA	0.28	NR	42
21	S1	PFDoS	3.0	0.6	NR
	S4	6:2FTS	0.024	0.0080	NR
27	S1	PFDoS	2	1	NR
28	S1	8:2FTS	27	3	93
33	S1	PFDoS	0.618	0.19	101
	S2	PFDoA	0.137	0.017	86
	S3	PFUdA	0.212	0.0326	55
		PFDoA	0.558	0.0698	54
		MeFOSE	2.92	0.549	54
		7:3FTCA	1.04	0.00383	NR
	S4	8:2diPAP	0.000932	0	159
35	S2	PFDoA	0.15	0.07	98

APPENDIX 6 – FALSE NEGATIVES

Table 163 False Negatives

Lab. Code	Sample	Analyte	Assigned Value S1, S2 & S3 (μg/kg) S4 & S5 (μg/L)	Spiked Value S1, S2 & S3 (μg/kg) S4 & S5 (μg/L)	Reported Result** S1, S2 & S3 (μg/kg) S4 & S5 (μg/L)
3	S2	PFODA	17.8	20.2	<0.5
4	S1	PFHxS_L	254	Not Spiked	NR
		PFOS_L	2320	Not Spiked	NR
	S2	PFHxS_L	4.44	4.76	NR
		PFOS_L	5.52	5.77	NR
		PFDoS	24.3	29.3	NR
		PFODA	17.8	20.2	NR
		8:2diPAP	39.6	50.3	NR
		5:3FTCA	NA	35.2	NR
	S4	PFHxS_L	0.16	Not Spiked	NR
		PFOS_L	0.0573	Not Spiked	NR
	S5	PFHxS_L	0.0346	0.0376	NR
		PFOS_L	0.00561	0.0095	NR
		PFDoS	0.05	0.0816	NR
		5:3FTCA	0.113*	0.119	NR
5	S5	PFOSA	0.0397	0.0476	< 0.005
7	S1	PFOSA	3.24	Not Spiked	<1
	S5	PFOSA	0.0397	0.0476	<0.002
8	S3	GenX	19.6*	19.9	< 0.5
9	S1	PFHxS_L	254	Not Spiked	NR
		PFOS_L	2320	Not Spiked	NR
	S2	PFHxS_L	4.44	4.76	NR
		PFOS_L	5.52	5.77	NR
		PFDoS	24.3	29.3	NR
		PFODA	17.8	20.2	NR
		MeFOSAA	8.57	10.1	NR
		EtFOSAA	8.57	10.1	NR
		10:2FTS	44.3	48.7	NR
		8:2diPAP	39.6	50.3	NR
		ADONA	23.3	23.7	NR
		9Cl-PF3ONS	23.4	23.5	NR
		5:3FTCA	NA	35.2	NR
	S4	PFHxS_L	0.16	Not Spiked	NR
		PFOS_L	0.0573	Not Spiked	NR
	S5	PFHxS_L	0.0346	0.0376	NR
		PFOS_L	0.00561	0.0095	NR

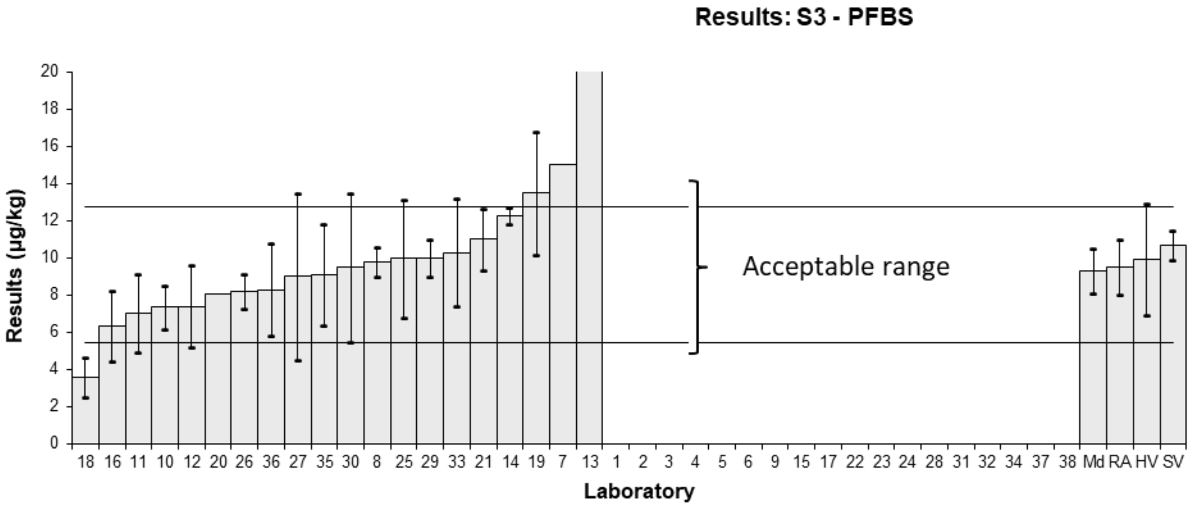
Lab. Code	Sample	Analyte	Assigned Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Spiked Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Reported Result** S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)
9	S5	10:2FTS	0.0108*	0.0383	NR
		5:3FTCA	0.113*	0.119	NR
12	S1	PFOSA	3.24	Not Spiked	<0.1
	S3	MeFOSAA	11.9*	14.2	<0.5
		EtFOSAA	10.8*	13.4	<0.5
		9Cl-PF3ONS	32*	31	<0.5
		11Cl-PF3OUdS	22*	31.4	<0.5
13	S4	PFPeA	0.0125	Not Spiked	<0.002
	S5	PFHxS_L	0.0346	0.0376	NR
		PFOS_L	0.00561	0.0095	NR
14	S1	PFOSA	3.24	Not Spiked	<0.5
18	S2	PFODA	17.8	20.2	< 2.5
		MeFOSAA	8.57	10.1	< 2.5
		EtFOSAA	8.57	10.1	< 2.5
	S3	PFHpS	2.75*	2.44	< 0.72
		PFNS	1.58*	1.92	< 1.0
	S4	PFHxS	0.184	Not Spiked	NR
		PFOS	0.109	Not Spiked	NR
	S5	PFDA	0.0194	0.0281	< 0.017
20	S2	PFODA	17.8	20.2	<0.5
	S3	11Cl-PF3OUdS	22*	31.4	<0.1
21	S3	PFNS	1.58*	1.92	<1
		PFDoS	15.1*	38.4	<1
		PFTrDA	10.7*	15.1	<1
22	S4	PFBA	0.0117	Not Spiked	<0.001
25	S1	PFOSA	3.24	Not Spiked	<1
26	S3	PFNS	1.58*	1.92	< 1.0
	S5	PFDS	0.0150*	0.0958	< 0.005
		10:2FTS	0.0108*	0.0383	NR
29	S1	PFNA	0.432	Not Spiked	NR
	S2	PFNS	0.907	0.966	NR
		PFTrDA	13.7	15.2	NR
	S4	PFHpS	0.0074	Not Spiked	NR
		PFBA	0.0117	Not Spiked	NR
		PFPeA	0.0125	Not Spiked	NR
29	S4	PFHpA	0.0057	Not Spiked	NR
		PFOA	0.00914	Not Spiked	NR
	S5	PFHpS	0.00332	0.00378	NR
		PFOS	0.00545	0.0095	NR

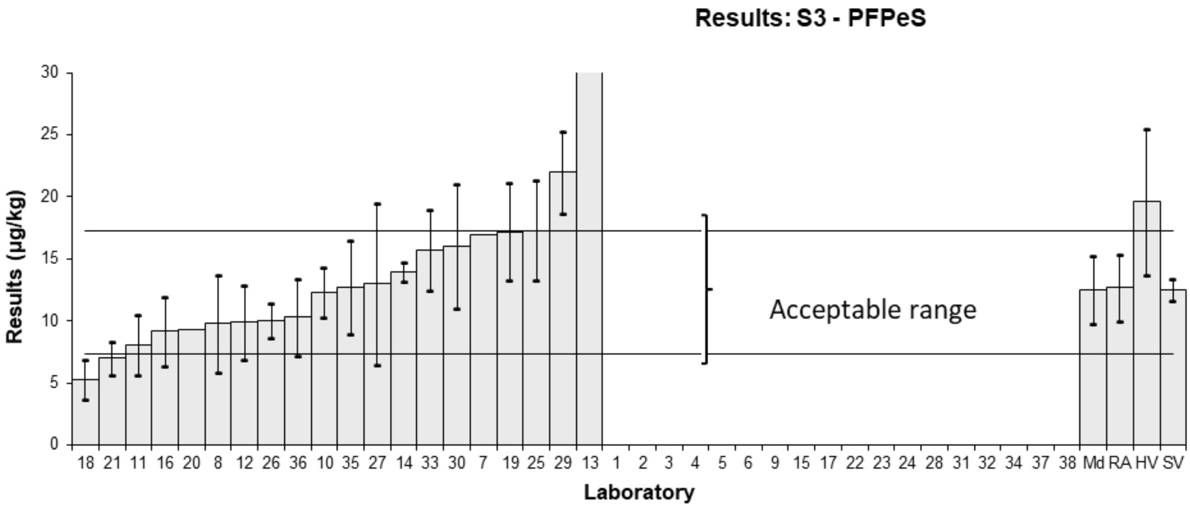
Lab. Code	Sample	Analyte	Assigned Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Spiked Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Reported Result** S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)
		PFOS_L	0.00561	0.0095	NR
		PFNA	0.00434	0.00498	NR
30	S3	PFBA	12.0*	12.4	< 1
36	S5	PFDS	0.0150*	0.0958	<0.01
		PFUdA	0.0416	0.0488	<0.01
		PFDoA	0.0466	0.0595	<0.01
		PFTeDA	0.117	0.148	<0.01
		6:2FTS	0.036	0.0376	<0.01
		11Cl-PF3OUdS	0.0168*	0.139	<0.01
37	S1	PFOS	3950	Not Spiked	NR
	S3	PFBS	9.5*	10.7	NR
		PFPeS	12.7*	12.5	NR
		PFHxS	6.6*	6.25	NR
		PFHxS_L	6.27*	6.25	NR
		PFHpS	2.75*	2.44	NR
		PFOS	10.5*	10.1	NR
		PFOS_L	10.1*	10.1	NR
		PFNS	1.58*	1.92	NR
		PFDS	34*	44.4	NR
		PFDoS	15.1*	38.4	NR
		PFBA	12.0*	12.4	NR
		PFPeA	6.3*	5.3	NR
		PFHxA	7.9*	6.62	NR
		PFHpA	4.29*	3.97	NR
		PFOA	15.0*	13.3	NR
		PFNA	7.6*	7.97	NR
		PFDA	15.0*	14.9	NR
		PFTrDA	10.7*	15.1	NR
		PFODA	11.6*	25.6	NR
		PFOSA	14.9*	9.3	NR
		MeFOSAA	11.9*	14.2	NR
38	S3	EtFOSAA	10.8*	13.4	NR
		8:2FTS	8.3*	8.93	NR
		10:2FTS	48*	64.2	NR
		8:2diPAP	NA	66.6	NR
		GenX	19.6*	19.9	NR
		ADONA	30.3*	31.4	NR
		9Cl-PF3ONS	32*	31	NR
		11Cl-PF3OUdS	22*	31.4	NR

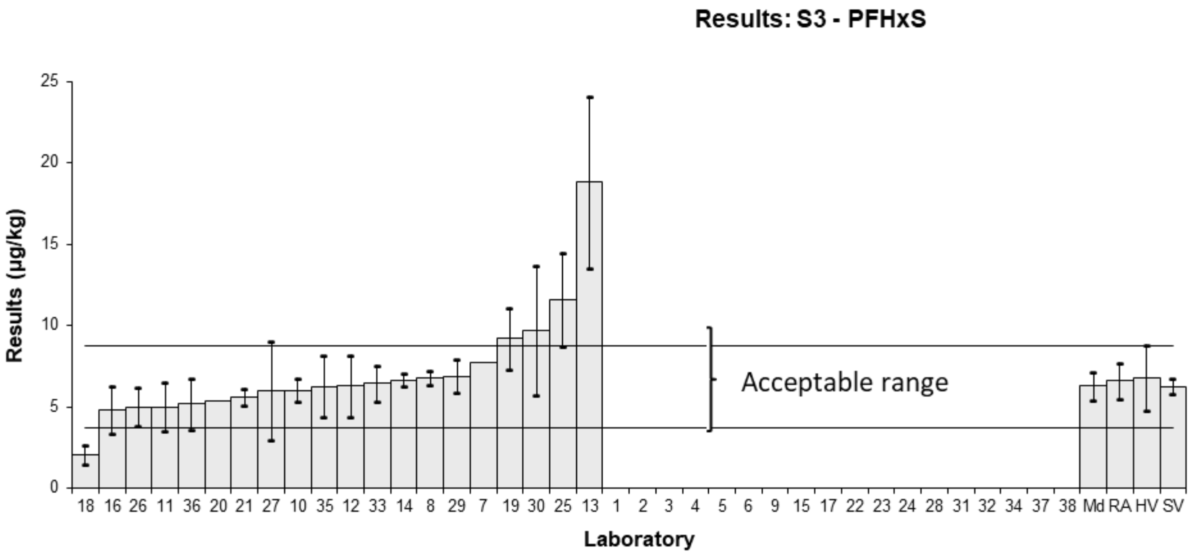
Lab. Code	Sample	Analyte	Assigned Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Spiked Value S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)	Reported Result** S1, S2 & S3 (µg/kg) S4 & S5 (µg/L)
		5:3FTCA	32*	29.2	NR

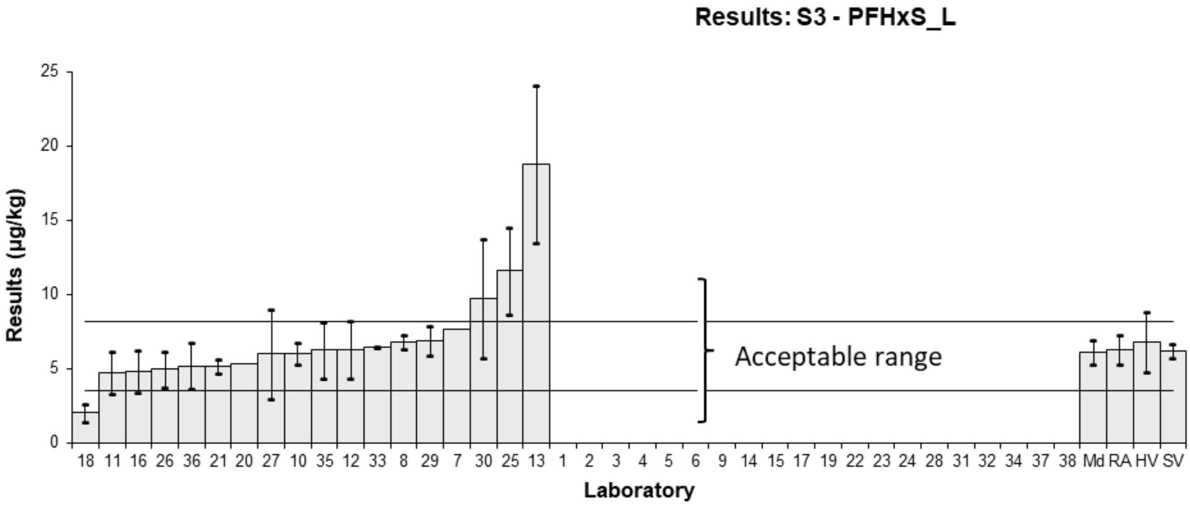
*Robust Average (assigned value not set for this analyte); ** Results reported as NR may or may not be false negatives, depending on the participant's actual LOR.

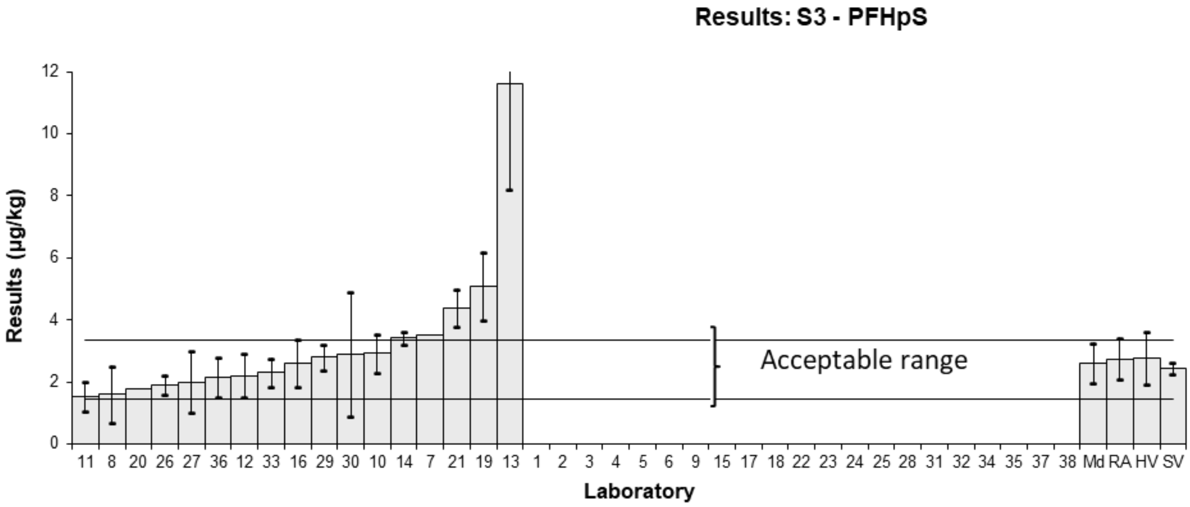
APPENDIX 7 – ASESSMENT OF RESULTS COMPATIBILITY FOR PFAS IN S3

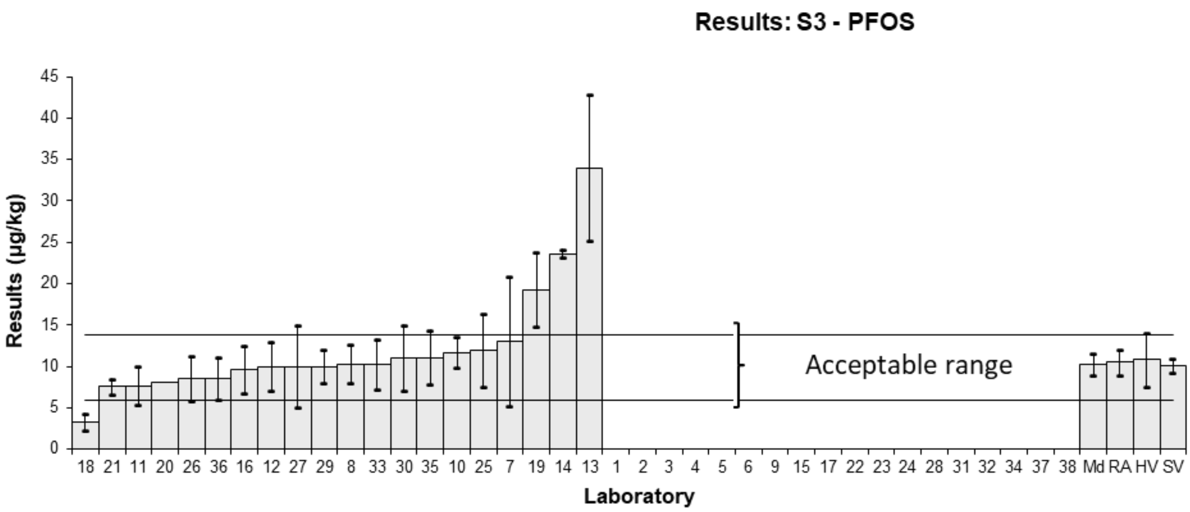


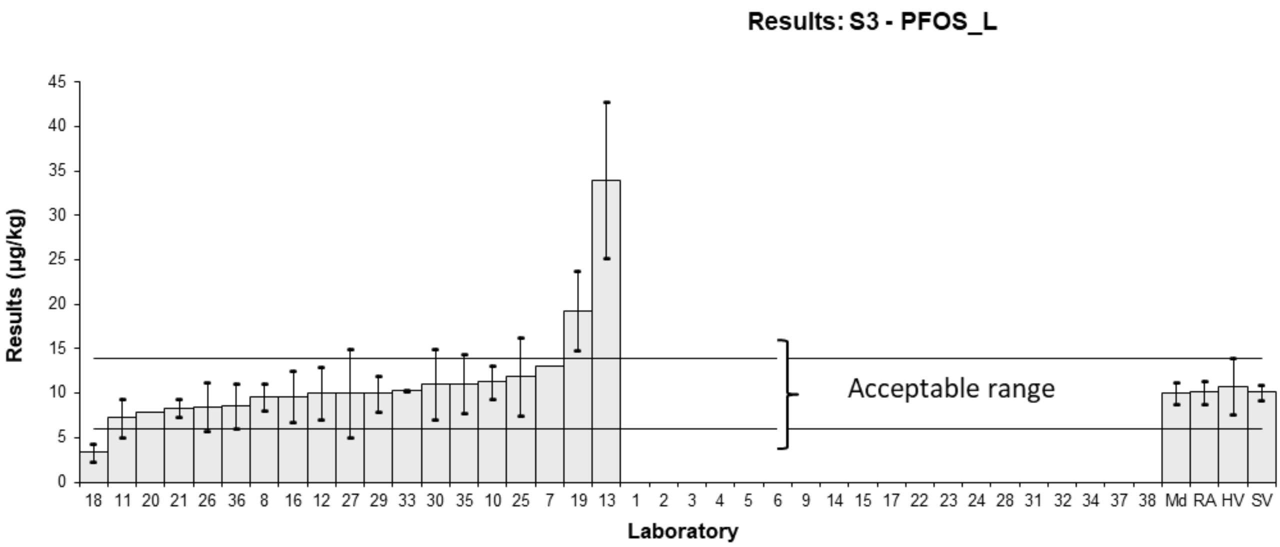


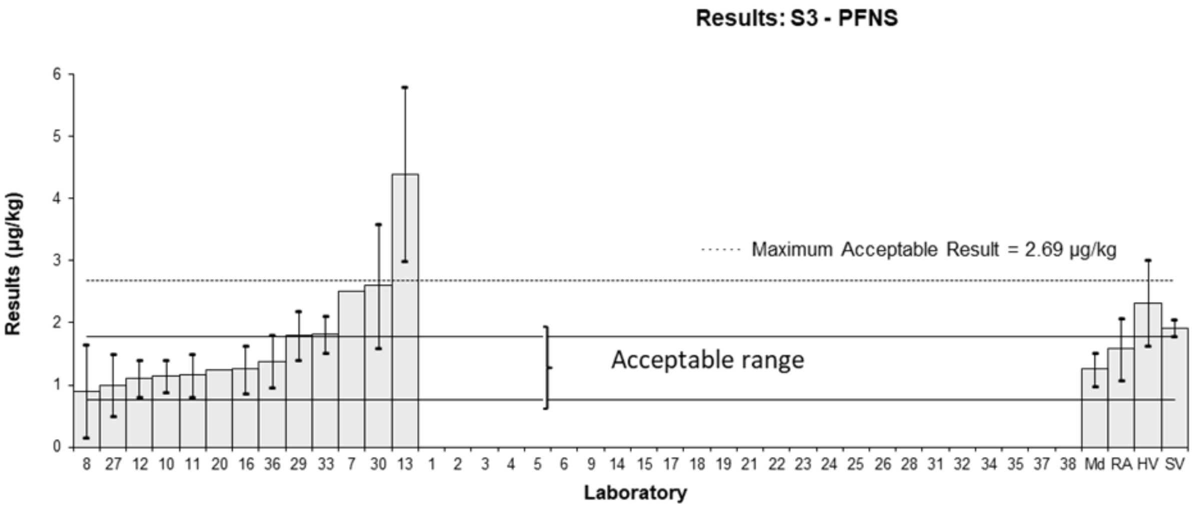


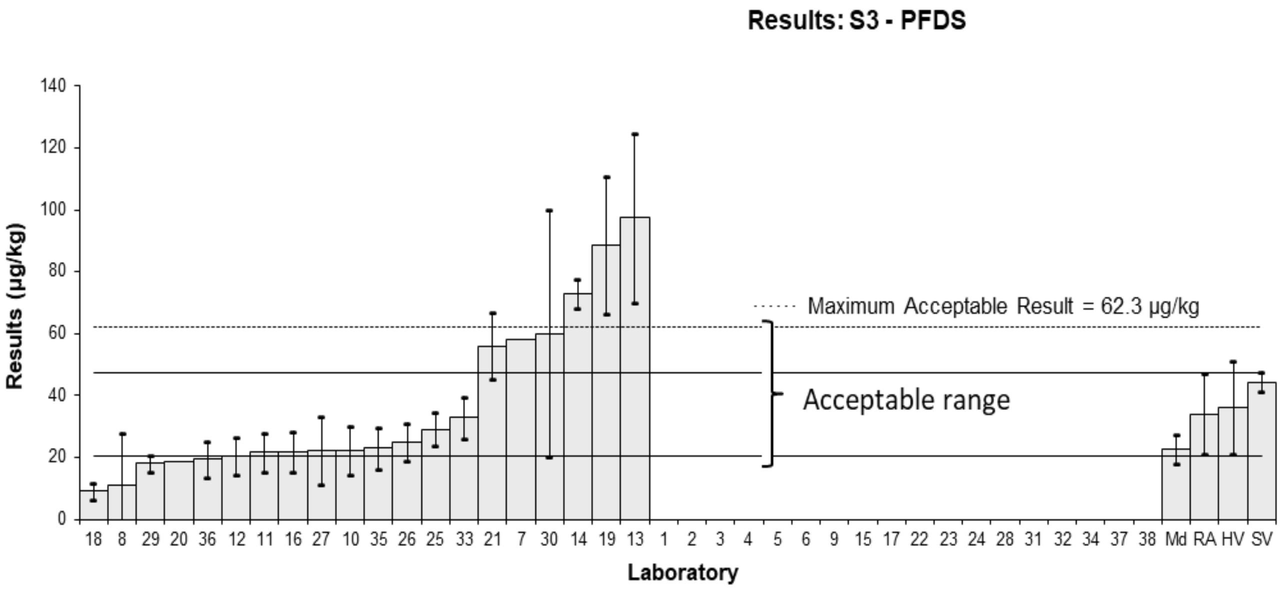

Results: S3 - PFHxS_L
Results (µg/kg)
Acceptable range
18 11 16 26 36 21 20 27 10 35 12 33 8 29 7 30 25 13 1 2 3 4 5 6 9 14 15 17 19 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory


Results: S3 - PFHpS
Results (µg/kg)
Acceptable range
11 8 20 26 27 36 12 33 16 29 30 10 14 7 21 19 13 1 2 3 4 5 6 9 15 17 18 22 23 24 25 28 31 32 34 35 37 38 Md RA HV SV
Laboratory

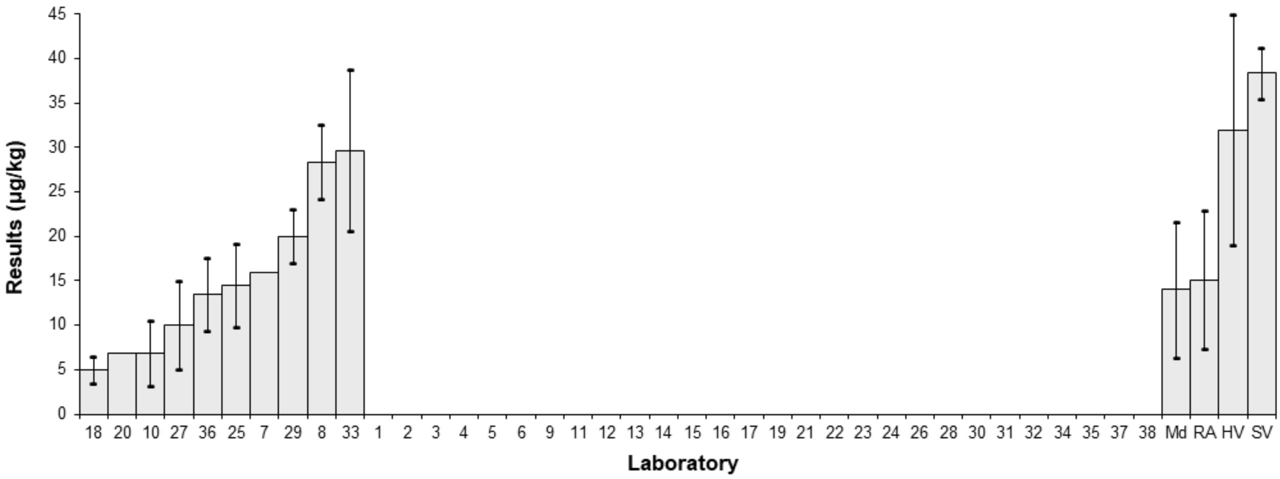

Results: S3 - PFOS
Results (µg/kg)
Acceptable range
18 21 11 20 26 36 16 12 27 29 8 33 30 35 10 25 7 19 14 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory


Results: S3 - PFOS_L
Results (µg/kg)
Acceptable range
18 11 20 21 26 36 8 16 12 27 29 33 30 35 10 25 7 19 13 1 2 3 4 5 6 9 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

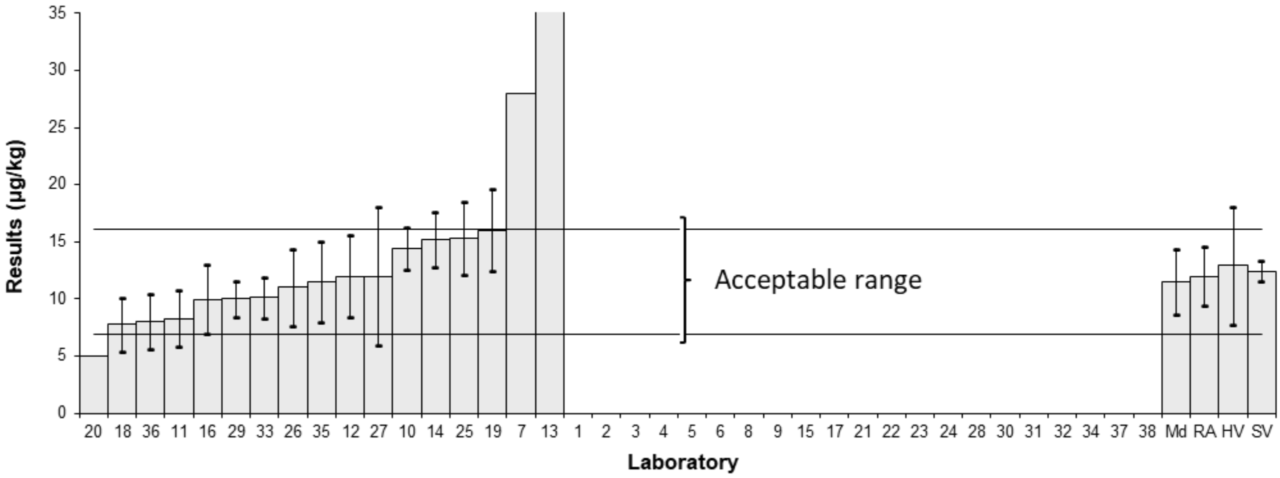

Results: S3 - PFNS
Results (µg/kg)
Maximum Acceptable Result = 2.69 µg/kg
Acceptable range
8 27 12 10 11 20 16 36 29 33 7 30 13 1 2 3 4 5 6 9 14 15 17 18 19 21 22 23 24 25 26 28 31 32 34 35 37 38 Md RA HV SV
Laboratory


Results: S3 - PFDS
Results (µg/kg)
Maximum Acceptable Result = 62.3 µg/kg
Acceptable range
18 8 29 20 36 12 11 16 27 10 35 26 25 33 21 7 30 14 19 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

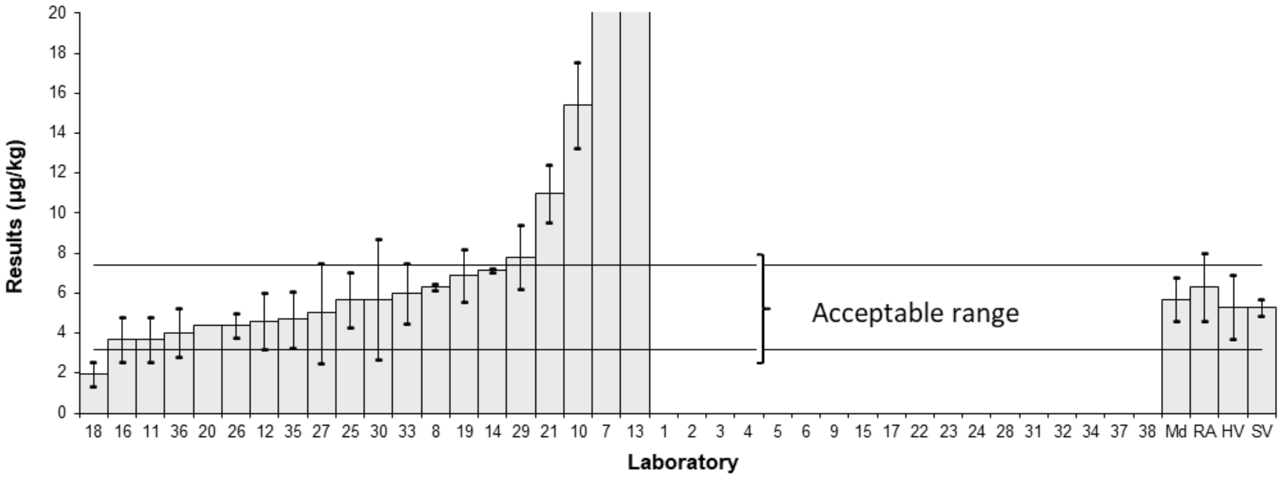
Results: S3 - PFDoS



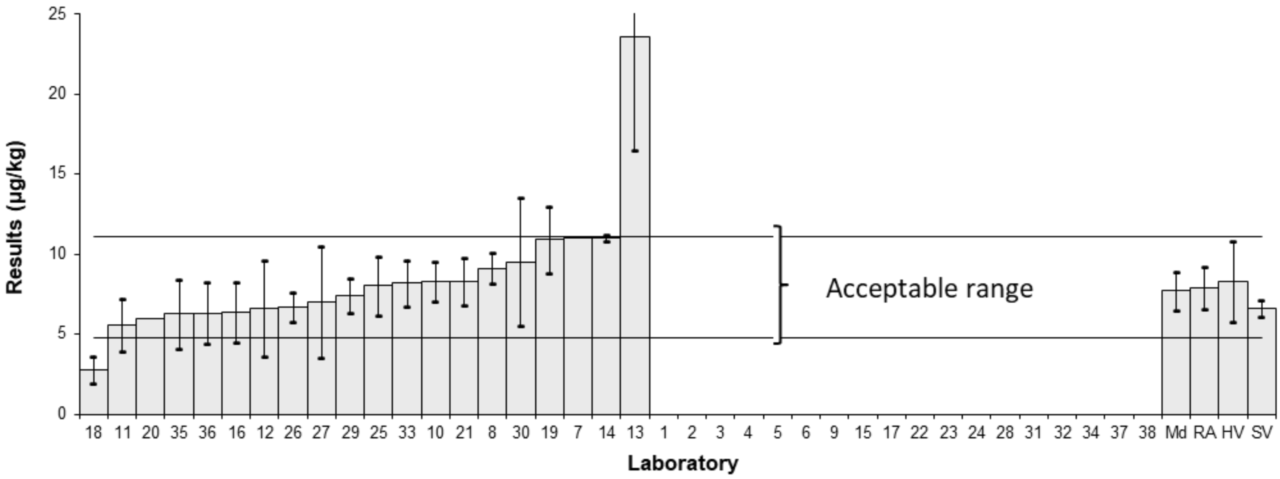
Results: S3 - PFBA



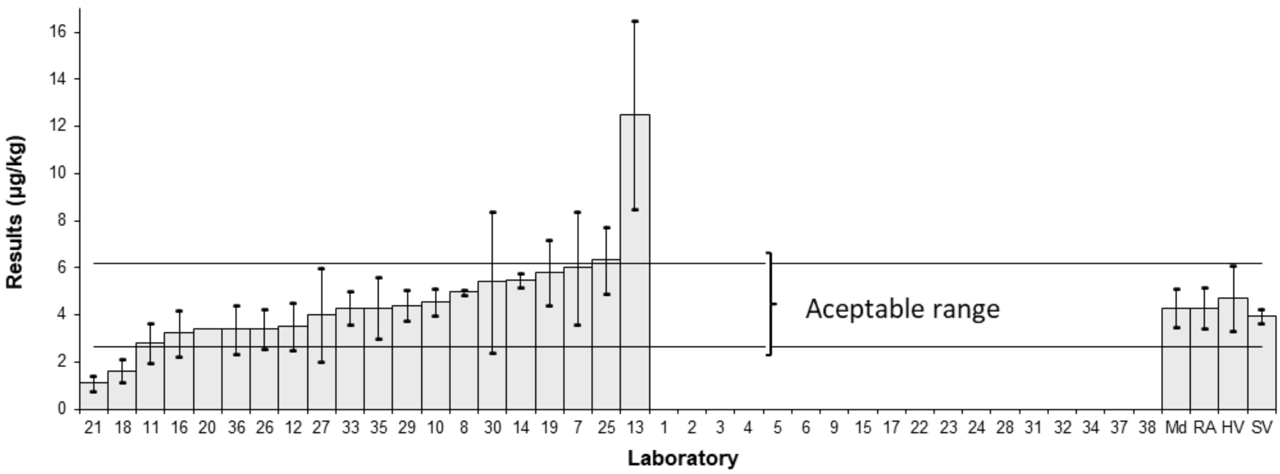
Results: S3 - PFPeA



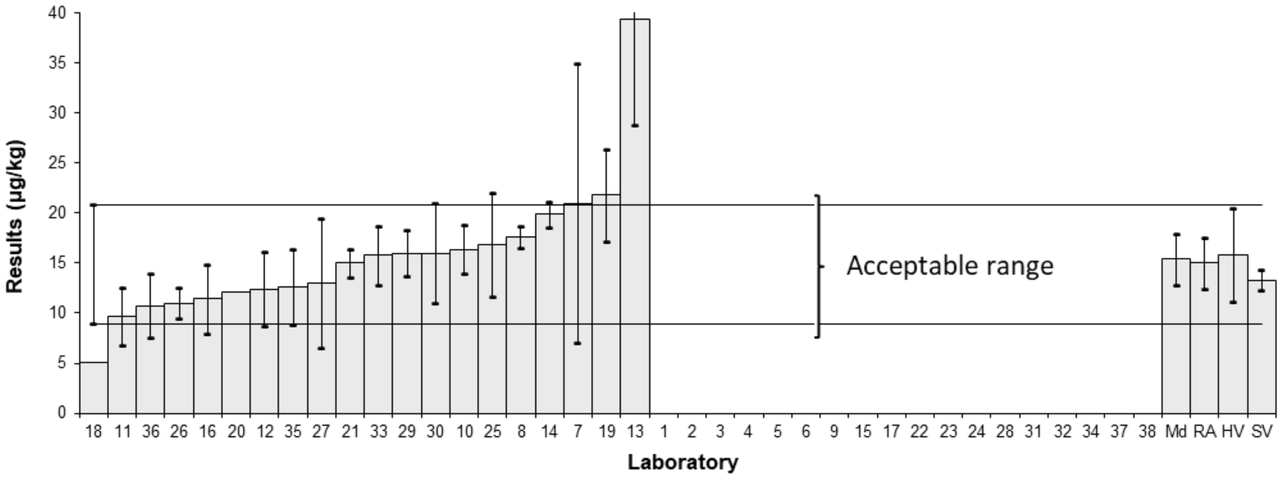
Results: S3 - PFHxA

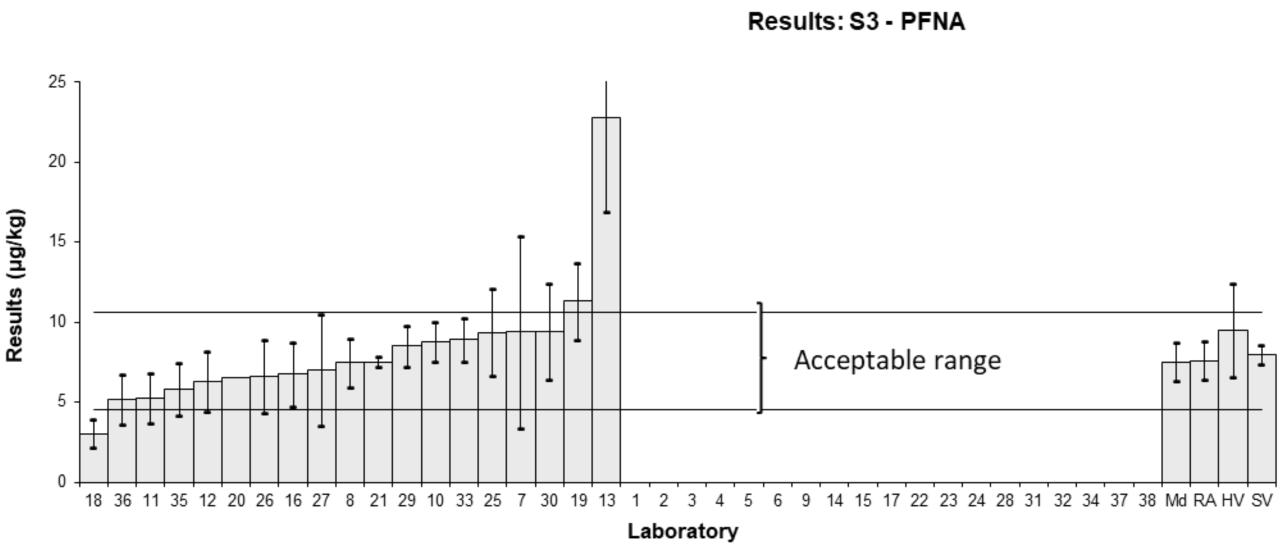


Results: S3 - PFHpA

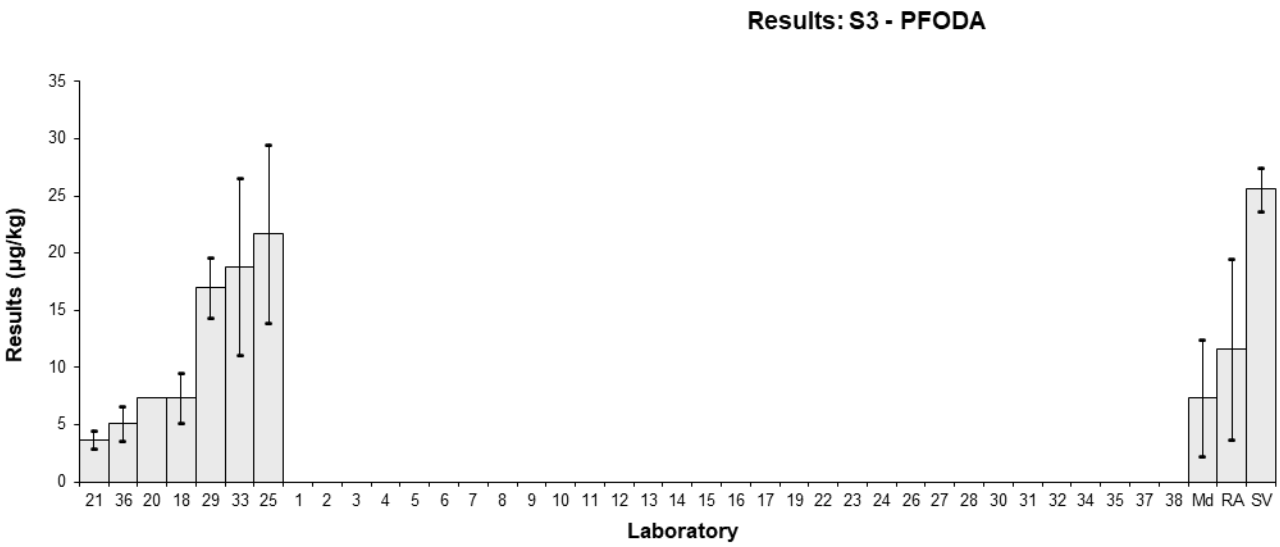


Results: S3 - PFOA

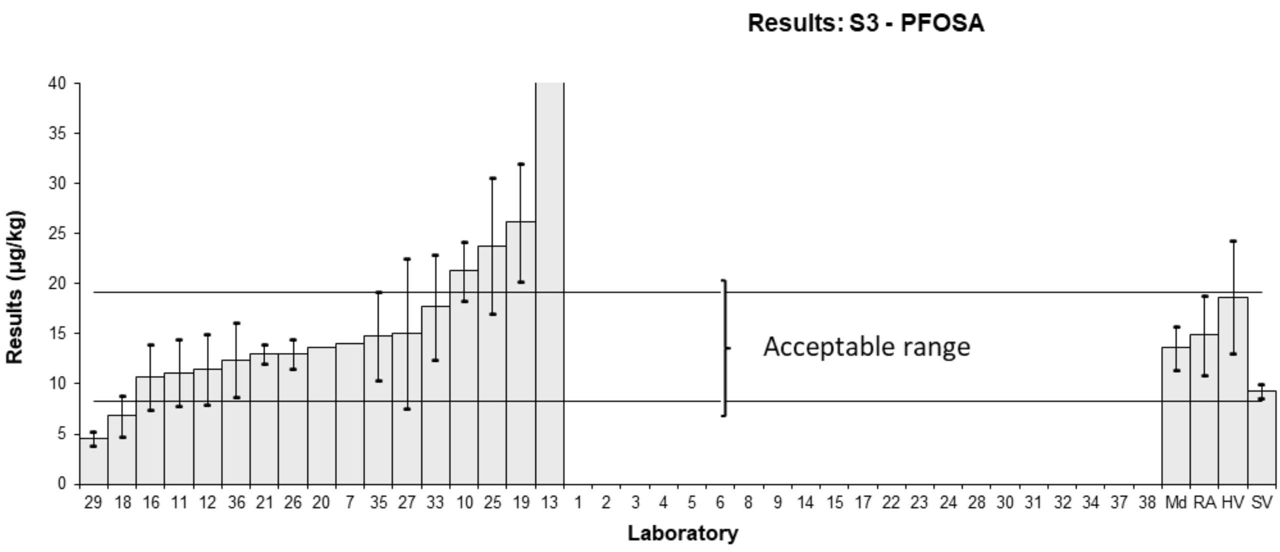




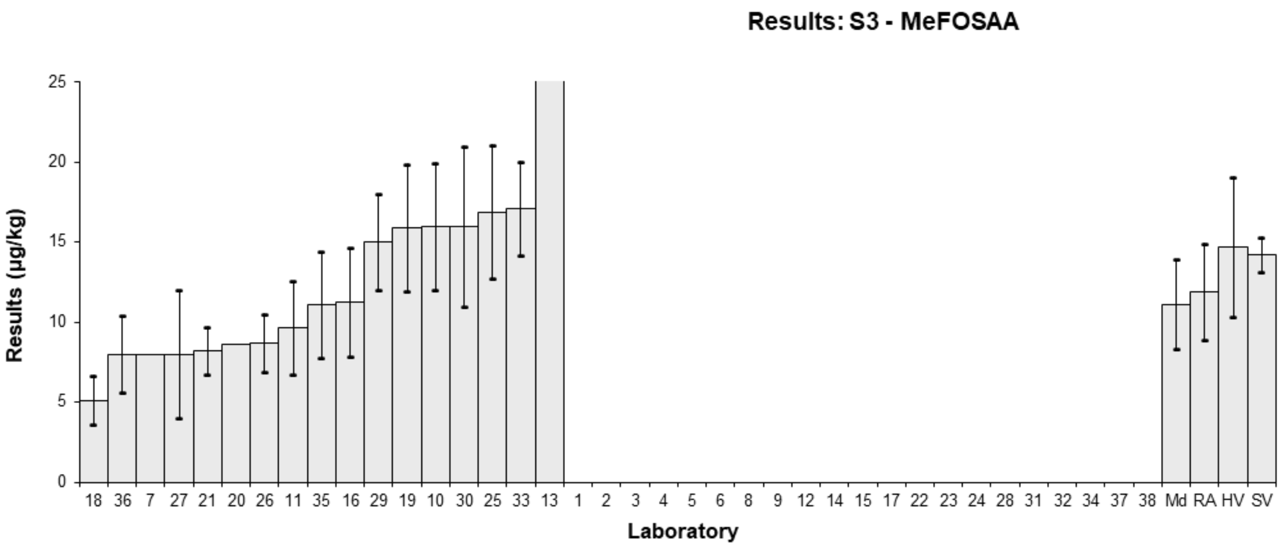
Results: S3 - PFNA
Results (µg/kg)
25
20
15
10
5
0
Acceptable range
18 36 11 35 12 20 26 16 27 8 21 29 10 33 25 7 30 19 13 1 2 3 4 5 6 9 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV
Laboratory

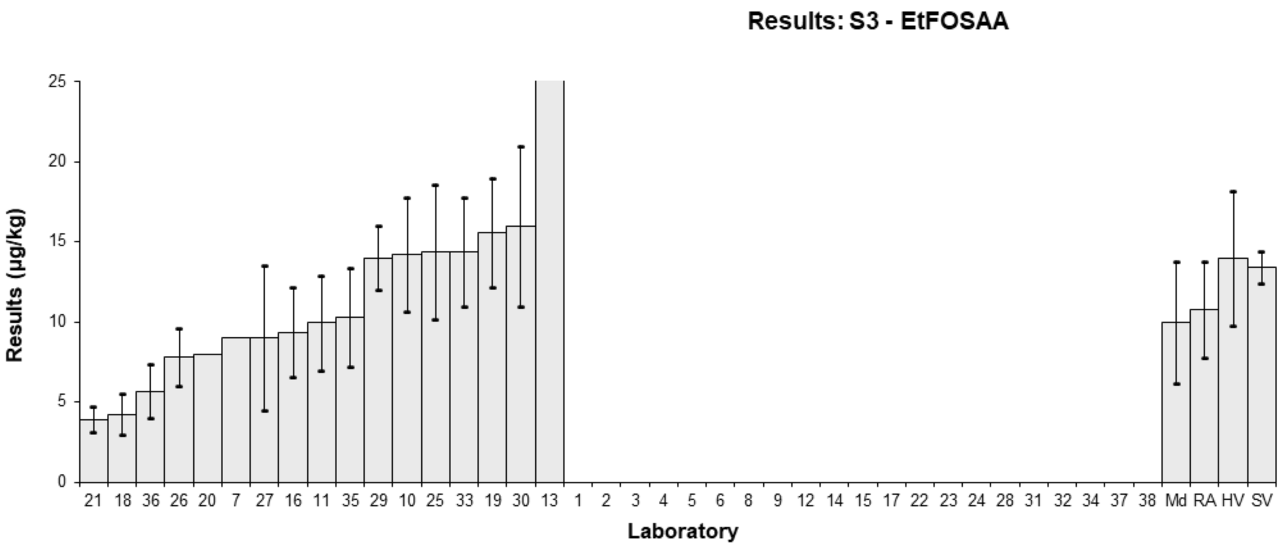


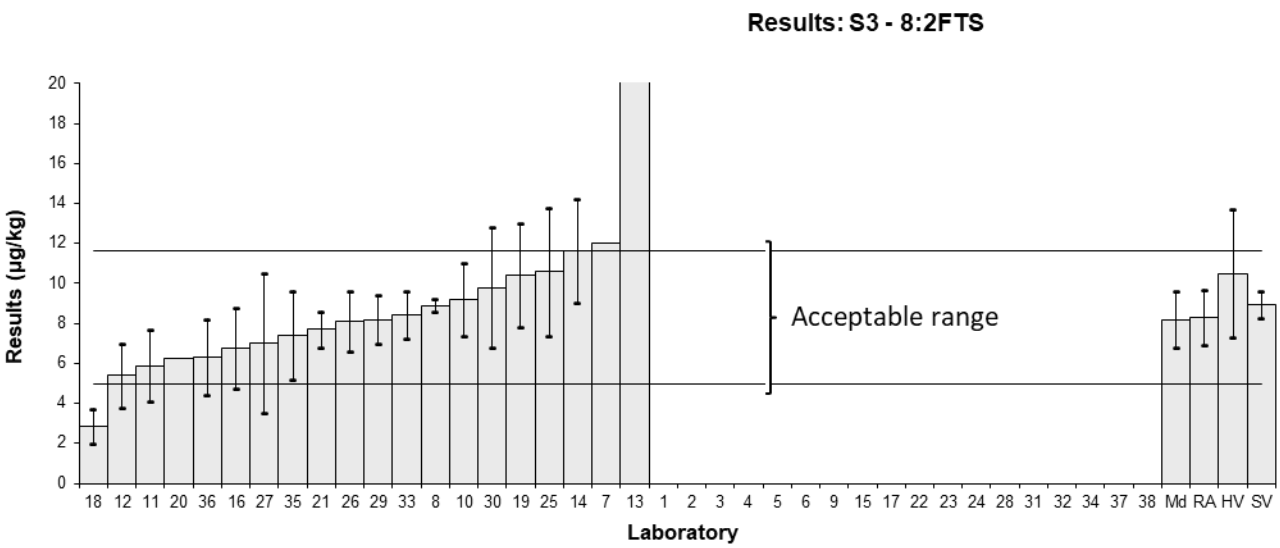
Results: S3 - PFODA
Results (µg/kg)
35
30
25
20
15
10
5
0
21 36 20 18 29 33 25 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 19 22 23 24 26 27 28 30 31 32 34 35 37 38 Md RA SV
Laboratory



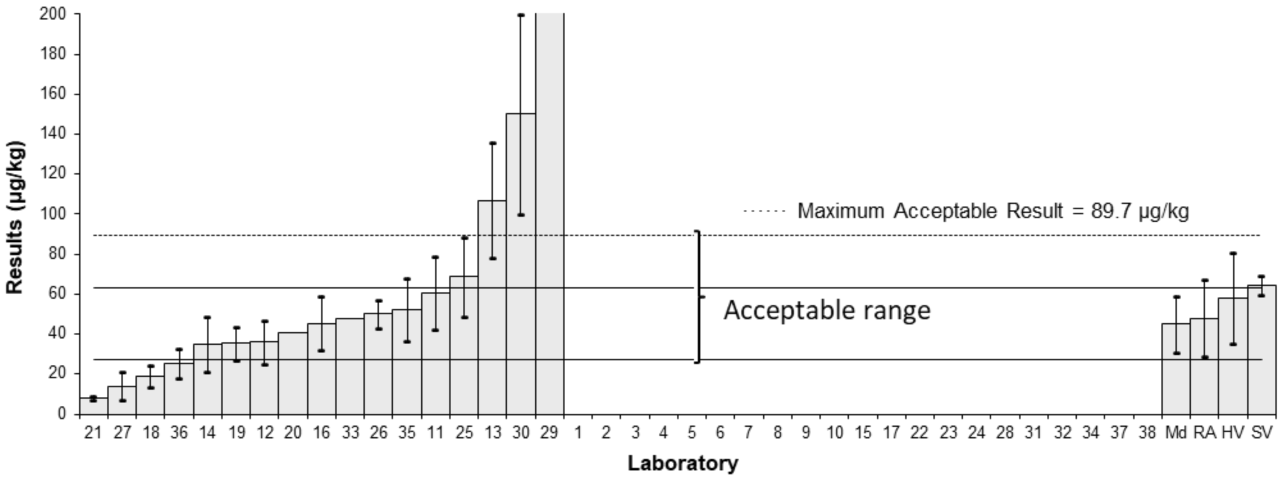
Results: S3 - PFOSA
Results (µg/kg)
40
35
30
25
20
15
10
5
0
Acceptable range
29 18 16 11 12 36 21 26 20 7 35 27 33 10 25 19 13 1 2 3 4 5 6 8 9 14 15 17 22 23 24 28 30 31 32 34 37 38 Md RA HV SV
Laboratory


Results: S3 - MeFOSAA
Results (µg/kg)
Laboratory
18 36 7 27 21 20 26 11 35 16 29 19 10 30 25 33 13 1 2 3 4 5 6 8 9 12 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

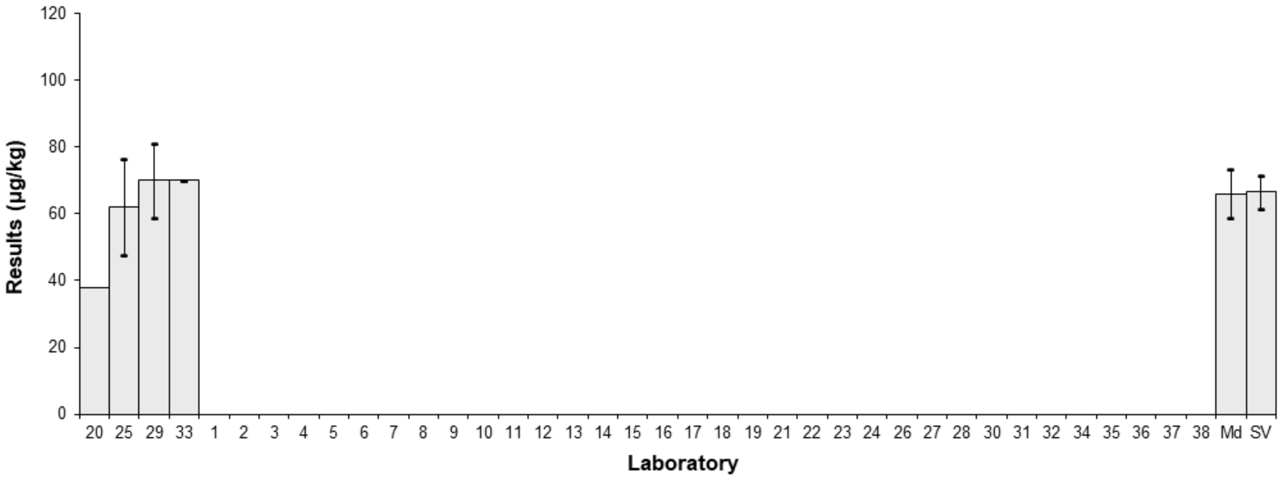

Results: S3 - EtFOSAA
Results (µg/kg)
Laboratory
21 18 36 26 20 7 27 16 11 35 29 10 25 33 19 30 13 1 2 3 4 5 6 8 9 12 14 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV


Results: S3 - 8:2FTS
Acceptable range
Results (µg/kg)
Laboratory
18 12 11 20 36 16 27 35 21 26 29 33 8 10 30 19 25 14 7 13 1 2 3 4 5 6 9 15 17 22 23 24 28 31 32 34 37 38 Md RA HV SV

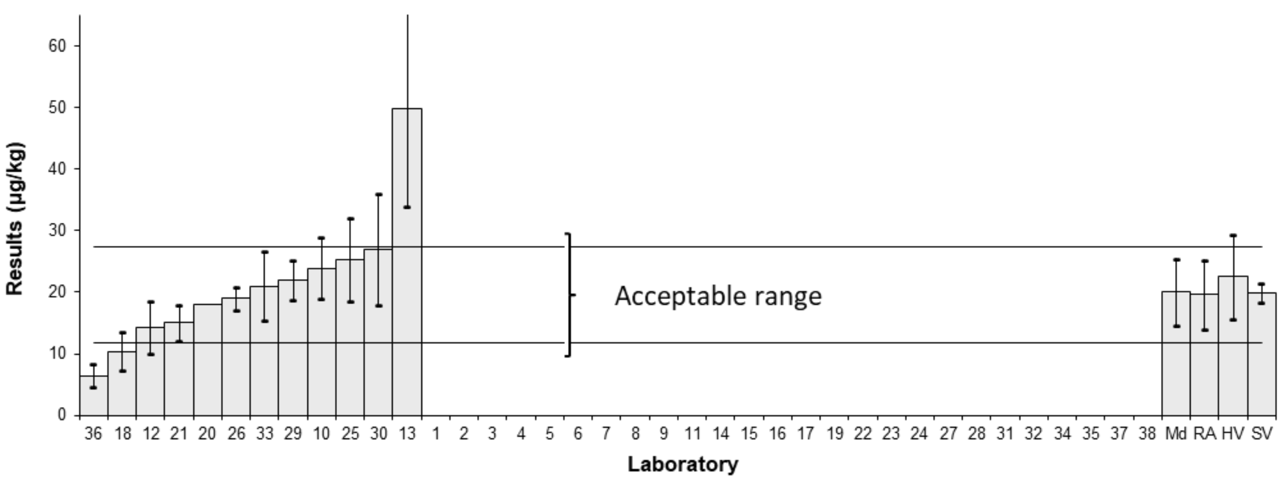
Results: S3 - 10:2FTS



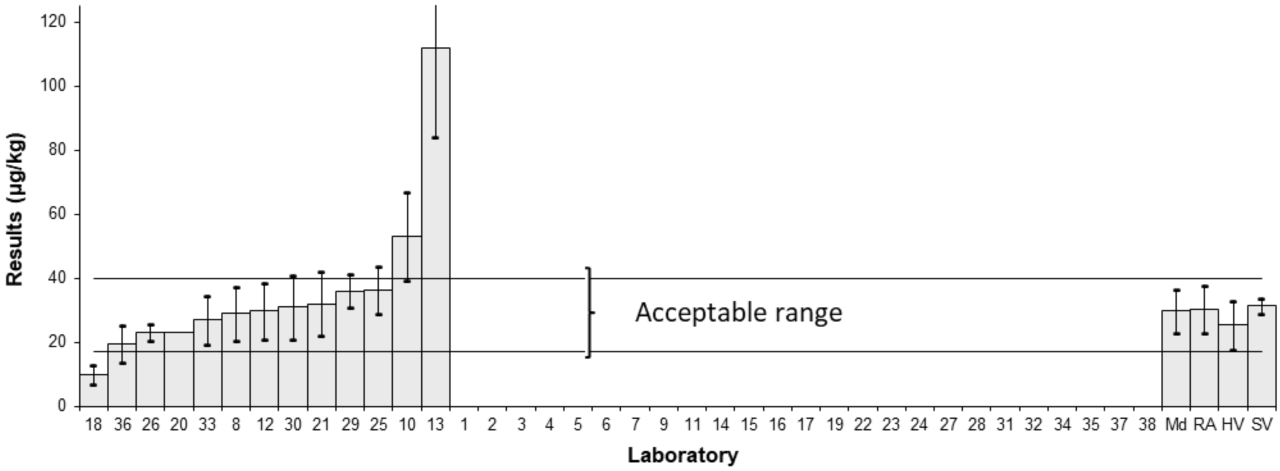
Results: S3 - 8:2diPAP



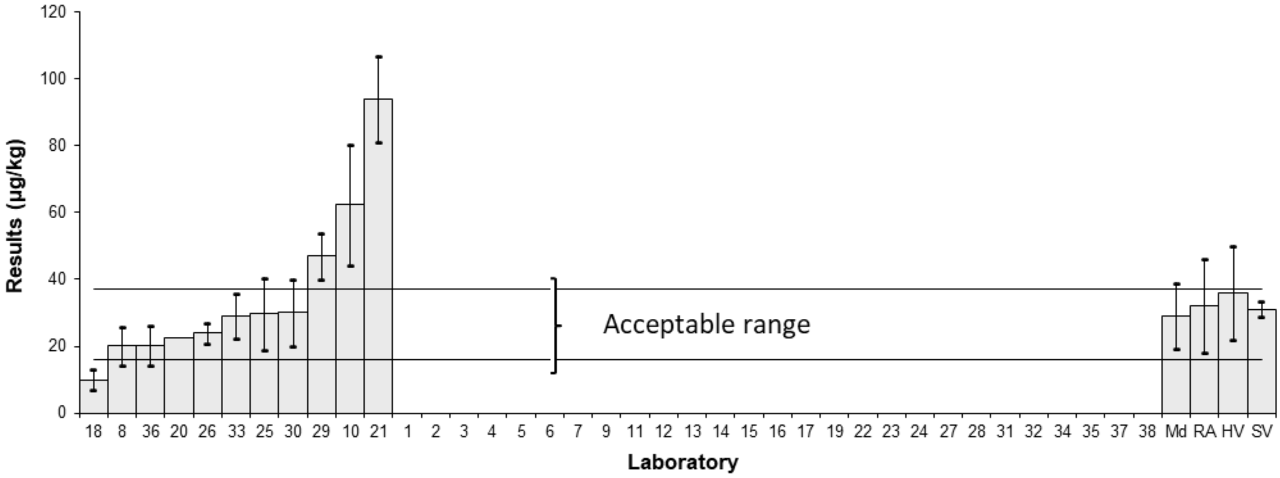
Results: S3 - GenX



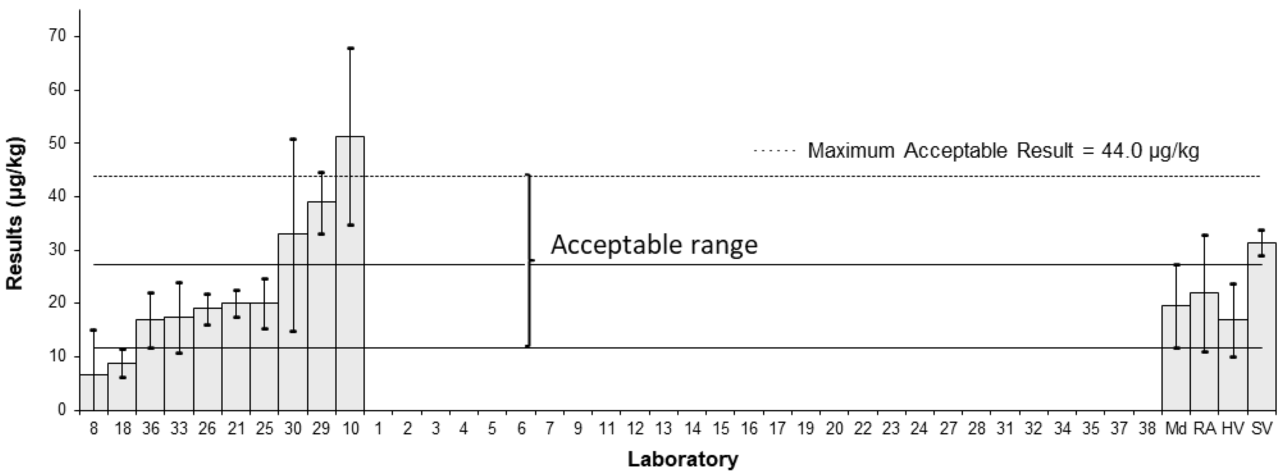
Results: S3 - ADONA

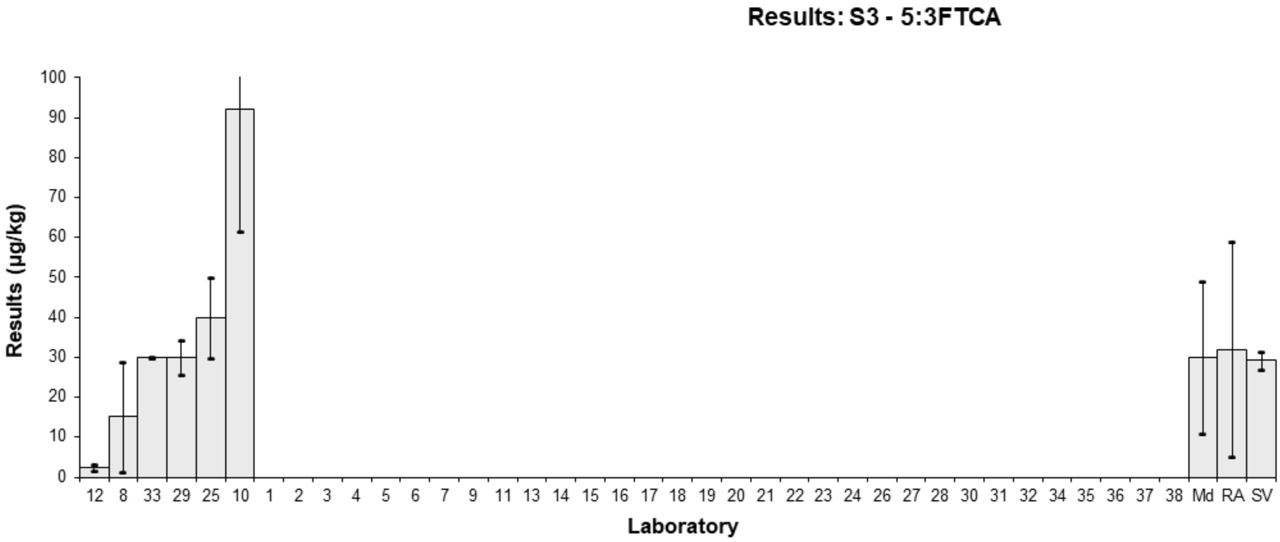


Results: S3 - 9Cl-PF3ONS



Results: S3 - 11Cl-PF3OUdS





Results: S3 - 5:3FTCA
Results (µg/kg)
0
10
20
30
40
50
60
70
80
90
100
12 8 33 29 25 10 1 2 3 4 5 6 7 9 11 13 14 15 16 17 18 19 20 21 22 23 24 26 27 28 30 31 32 34 35 36 37 38 Md RA SV
Laboratory

APPENDIX 8 – PARTICIPANTS' TEST METHODS FOR SOIL SAMPLES

Participants' methods for soil samples are presented in Tables 164 to 211

Table 164 Participant Methodology – Extraction

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
1	NA	0.2 g, 0.5 g	NA	Yes	30 mins	Homogenisation	Sonication	3 times	Methanol	30 min x 3 times	No	Room temperature	30 mins	Solid-Phase Extraction	Methanol	NA
6	1	1	No	Yes	10		QuEChERS		ACN	120	No	40	30	Filtration	Not Applicable	NA
7	1	1	No	Yes	0	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	N/A	MeOH, 0.3% NH3	60	Yes	20	N/A	Filtration	MeOH	No
8	0.5	1	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	99/1 methanol/ammonium hydroxide (v/v)	2 x 20 min	Yes	40		None		No
9	1	1	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		ACN/MeOH	60	No	40	10	None	MeOH	No
10	1.009 g (as rece	3.089 g (as	Yes	Yes	30 min		Solid-Liquid Extraction (vortexed and centrifuged)	3	MeOH, 0.3% NH3	100 min	Yes	55 C	255 min	Solid-Phase Extraction	NH4OH/ MeOH	Yes

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
	ived)	rece ived)														
11	2	2	NA	Yes	30 mins		Solid-Liquid Extraction (vortexed and centrifuged)		MeOH	30 mins	No	Room Temp 22 °C	NA	Filtration	Not Applicable	NA
12	2	2	No	Yes	30 minutes		Solid-Liquid Extraction (vortexed and centrifuged)		Basic ACN and Acetone	30 minutes	Yes	45	30 minutes	None		No
13	2	2	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		NH4OH/MeOH	70	Yes			Filtration		Yes
14	2	2	No	Yes	~1	N/A	Ion Pair Extraction with Solid-Liquid Extraction	N/A	NH4C2H3O2/MeOH/CAN	30	No	N/A	N/A	None		No
15	5	5	Yes	Yes	5		Solid-Liquid Extraction (vortexed and centrifuged)		NH4OH/MeOH	60	No	20	60	None		Yes
16	2	2	No	Yes	30	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	15mL, 2 steps	Basic ACN and Acetone	30	Yes	22	N/A	Solid-Phase Extraction	Not Applicable	NA
17	2.04	1.96	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		NH4OH/MeOH	60 min	Yes	room		Carbon S	NH4OH/MeOH	Yes

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
18	0.2 g	0.2 g		Yes			Ultra sonic		MeOH	20 min	Yes	40°		None		
19	2	2	No	Yes			QuEChERS		MeOH	60	Yes			Filtration		
20	0.987	1.016	No	Yes	15	No	Solid liquid extraction (vortex 30s/shaking 1h)		NH4C2H3O2/MeOH	60	Yes	40	30 - 120	Carbon (Envicarb 1000 mg)	ACN	No
21	2	2	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)									Yes
22	6	6	No	No	NA	No	Sonication	NA	NH4OH/MeOH	60	Yes	NA	NA	Solid-Phase Extraction	NaOH/MeOH	No
23									Methanol	approx. 60min	yes					
24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	0.05, 0.5 and 2.0 g	1.0 and 2.5 g	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3	10 hours (including SPE)	Yes		5 hours	Solid-Phase Extraction	If combination or other, please type here.	No

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
26	2.002 and 2.021 (duplicate)	2.055 and 2.064 (duplicate)	No	Yes	30 min	NA	Solid-Liquid Extraction (vortexed and centrifuged)	NA	2000mM NaOH, MeOH	30 min	Yes	50°C	Variable	None	Not Applicable	No
27	1	1.05		Yes		pH Adjustment	Solid-Liquid Extraction		Extraction with MeOH/Ammonium hydroxide 99:1					Solid-Phase Extraction	3x 5mL MeOH/Ammonium hydroxide	
28	0.5	0.5	NA	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	MeOH, 0.3% NH3	70	Yes	60	60	Filtration	MeOH, 0.3% NH3	No
29	0.99	0.98	No	Yes	0		Solid-Liquid Extraction (vortexed and centrifuged)	2	KOH/MeOH	120	No	40		None	Not Applicable	No
30	5g	5g	No	Yes	10	Homogenisation	Alkaline Digestion	N/A	Basic MeOH	60	No	N/A	N/A	None	N/A	Yes
31	2	2	NA	Yes	NA	Homogenisation	QuEChERS	NA	ACN/MeOH	30 minutes	No	NA	NA	Filtration	ACN/Ammonium	NA
32	2	2	No	Yes	NA	NA	QuEChERS		ACN/MeOH	30	Yes	NA	NA	Filtration		NA

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
33	1.03	5.02				Homogenisation	Alkaline Digestion		KOH/MeOH	60		Room Temperature		Solid-Phase Extraction		
34	2.511	2.533	No	Yes	no	None	Solid-Liquid Extraction (vortexed and centrifuged)	No	NH4C2H3O2/MeOH	30	No	Room temp	None	None	Not Applicable	No
35	2	2	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	Basic ACN and Acetone	30	Yes	39	45	Carbon	Basic ACN and Acetone	No
36	5	5	No	Yes			QuEChERS		ACN	30	No	Ambient		Solid-Phase Extraction	ACN	No
38	2	2		Yes	30min	NA	Solid-Liquid Extraction (vortexed and centrifuged)		4:1 MeOH : Ultrapure water	~45min	No	NA	NA	None	Not Applicable	No

*Additional Information in Table 211.

Table 165 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
8	Centrifuged S2 samples before transferring to LCMS vials to remove some particulates
20	After clean-up the solvent is changed to methanol/water 1/1
25	Elution Solvent MeOH, 1.0% NH3 and acetic acid added to extract
26	Vortex, shaking

Lab. Code	Extraction Additional Information
27	Strata X-AW 33um polymeric Weak Anion

Table 166 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Correction?
1	LC-MSMS or LC-QQQ	No	No
6	LC-MSMS or LC-QQQ		No
7	LC-MSMS or LC-QQQ	S1 done 1 to 5 dilution.	No
8	LC-MSMS or LC-QQQ	No	No
9	LC-MSMS or LC-QQQ		No
10	LC-MSMS or LC-QQQ	No	No
11	LC-MSMS or LC-QQQ	NO	No
12	LC-MSMS or LC-QQQ	No	No
13	LC-MSMS or LC-QQQ	2	No
14	LC-MSMS or LC-QQQ		No
15	LC-MSMS or LC-QQQ	no	Yes
16	LC-MSMS or LC-QQQ	0.8	No
17	LC-MSMS or LC-QQQ	Delutions Soil: 10, 20,50,200 and 2000	No
18	LC-MSMS or LC-QQQ		No
19	LC-MSMS or LC-QQQ	No	No
20	LC-MSMS or LC-QQQ	No	No
21	LC-MSMS or LC-QQQ		
22	LC-MSMS or LC-QQQ	5	No
23	LC-MS/MS		no
24	NA	NA	NA

Lab. Code	Instrument	Dilution Factor	Blank Correction?
25	LC-MSMS or LC-QQQ		No
26	LC-MSMS or LC-QQQ	NA	No
27	LC-Orbitrap	S1 PFOS results from x10 injection volume dilution of x10 physical dilution (x100 overall)	No
28	LC-MSMS or LC-QQQ	Yes - S1: DF10 for PFHxA, PFHxS, PFNA; DF50 for PFOS. Undiluted for other analytes.	No
29	LC-MSMS or LC-QQQ		No
30	LC-MSMS or LC-QQQ	5	No
31	LC-MSMS or LC-QQQ	No	No
32	LC-MSMS or LC-QQQ	S1 x10 and x 100	No
33	LC-MSMS or LC-QQQ	No	No
34	LC-MSMS or LC-QQQ	none	No
35	LC-MSMS or LC-QQQ	No	No
36	LC-Orbitrap	DF10, DF10, DF1000	No
38	LC-MSMS or LC-QQQ	0.625	Yes

*Additional Information in Table 211.

Table 167 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
27	In this method the linear standards are used to quantify both the linear as well as the branched isomers.

Table 168 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	Wellington	No	NA	NA
6	Wellington and Cambridge	No	No	
7	Wellington	No		
8	Wellington	Yes	Isotopic dilution	
9	Wellington	Yes	DIN 38414-14 (S 14) (2011-08)	
10	Wellington	Yes	No	
11	Wellington	No		
12	Wellington, Cambridge Isotope laborotories	No		
13	Wellington Labs	No		
14	Wellington	Yes	N/A	
15	Wellington	Yes	no	
16	Wellington	Yes	Isotope Dilution	
17	Wellington	Yes	No	IS-correction using the above labelled standards
18		Yes		
19	Wellington Laboratories	Yes		
20	Chiron, Wellington, Cambridge Isotope Laboratories	Yes	Flemish Standard Method CMA/3/D, see https://reflabos.vito.be/2024/CMA_3_D.pdf	
22	Wellington Labs	NA	No	
23		Yes	Yes	
24	NA	NA	NA	NA

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
25	Wellington and Cambridge Isotope Laboratories	Yes	Yes EPA Method 1633	
26	Wellington Laboratory	Yes	No	NA
27	Wellington	Yes	In house	
28	Wellington	Yes	No	
29	Wellington	Yes	USEPA 537	
30	Wellington	Yes	No. In-house	
31	Wellington Laboratories	Yes	In House	
32	Wellington	Yes	No	
33		Yes		
34	Wellington Laboratory	No	No	
35	Wellington	Yes		
36	Wellington	Yes		Results corrected by ISTD added before instrumentation
38	Wellington Laboratories			

Table 169 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFBS-13C3	
7	PFBS - 13C3	PFHxS-18O2
8	13C3-PFBS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFBS	18O2-PFHxS
11	YES	
12	13C3-PFBS	
13	yes	
14	13C3-PFBS	
15	yes	no
16	Y	N
17	PFBS-13C3	
18	13C3-PFBS	13C4-PFOA
19	13C3-PFBS	
20	13C-PFBS	
21		
22	No	13C3-PFBS-Na
23		
24	NA	NA
25	13C3-PFBS	
26	M3PFBS	NA
27	Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS	
28	M3PFBS	M8PFOS
29	M3PFBS	MPFDA
30	13C3-PFBS	N/A
31	13C3-PFBS	
32	PFBS	
33	13C3 PFBS	
34	PFBS_ISTD	
35	13C3-PFBS	
36	PFOS-13C8	PFBS-13C3
38	13C3-PFBS	

Table 170 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFBS-13C3	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	yes	no
16	N	N
17	PFHxS-13C3	
18	13C3-PFBS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	No	13C3-PFBS-Na
23		
24	NA	NA
25		
26	M5PFHxA	NA
27		
28		
29	M3PFBS	MPFDA
30	18O2-PFHxS	N/A
31	16O2-PFHxS	
32	PFBS	
33	13C3 PFBS	
34	PFHxS_ISTD	
35	N/A	
36	PFOS-13C8	PFOS-13C4
38	13C3-PFBS	

Table 171 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFHxS	18O2-PFHxS
11	NO	
12	18O2-PFHxS	
13		
14	16O2-PFHxS	
15	yes	no
16	Y	N
17	PFHxS-13C3	
18	18O2-PFHxS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	No	13C3-PFHxS-Na
23		
24	NA	NA
25	13C3-PFHxS	18O2-PFHxS
26	M3PFHxS	NA
27	Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS	
28	MPFHxS	M8PFOS
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	16O2-PFHxS	
32	PFHxS	
33	18O2 PFHxS	
34	PFHxS_ISTD	
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
38	18O2-PFHxS	

Table 172 Labelled Standards for PFHxS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9		
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	18O2-PFHxS	
13	yes	
14	NT	
15	yes	no
16	Y	N
17	PFHxS-13C3	
18	18O2-PFHxS	13C4-PFOA
19	NT	
20	13C-PFHxS	
21		
22	No	13C3-PFHxS-Na
23		
24	NA	NA
25		
26	M3PFHxS	NA
27		
28		
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	--	
32	NT	
33	18O2 PFHxS	
34	n/a	
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
38	18O2-PFHxS	

Table 173 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	yes	no
16	Y	N
17	PFOS-13C4	
18	18O2-PFHxS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFHxS	
21		
22	No	13C3-PFHxS-Na
23		
24	NA	NA
25		
26	M3PFHxS	NA
27		
28		
29	M3PFHxS	MPFDA
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFHxS	
33	13C4 PFOS	
34	PFHxS_ISTD	
35	N/A	
36	PFOS-13C8	PFOS-C4
38	18O2-PFHxS	

Table 174 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	NO	
12	13C8-PFOS	
13		
14	13C8-PFOS	
15	yes	no
16	N	N
17	PFOS-13C4	
18	13C4-PFOS	13C4-PFOA
19	13C4-PFOS	
20	13C-PFOS	
21		
22	No	13C8-PFOS-Na
23		
24	NA	NA
25	13C8-PFOS	13C4-PFOS
26	M8PFOS	NA
27	Sodium perfluoro-1-[13C8] ocatanesulfonate M8PFOS	
28	M4PFOS	M8PFOS
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFOS	
33	13C4 PFOS	
34	PFOS_ISTD	
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
38	13C8-PFOS	

Table 175 Labelled Standards for PFOS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1	[13C4]-PFOS	[13C4]-PFOS
2		
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9		
10	13C8-PFOS	13C4-PFOS
11	YES	
12	13C8-PFOS	
13	yes	
14	NT	
15	yes	no
16	Y	N
17	PFOS-13C4	
18	13C4-PFOS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	No	13C8-PFOS-Na
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	NT	
33	13C4 PFOS	
34	PFOS_ISTD	
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
37		
38	13C8-PFOS	

Table 176 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	yes	no
16	N	N
17	NT	
18	13C8-PFOA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	No	13C8-PFOS-Na
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	NT	
33	13C4 PFOS	
34	PFOS_ISTD	
35	N/A	
36	PFOS-13C8	PFBS-13C3
38	13C8-PFOS	

Table 177 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	yes	no
16	N	N
17	PFOS-13C4	
18	13C2-PFUnA	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	No	13C8-PFOS-Na
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFUdA	
33	13C4 PFOS	
34	PFOS_ISTD	
35	N/A	
36	PFOS-13C8	PFBA-13C4
37		
38	13C8-PFOS	

Table 178 Labelled Standards for PFUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8		
9	C13-PFOS	
10	NT	NT
11	NT	
12	N/A	
13		
14	NT	
15	yes	no
16	NT	NT
17	NT	
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	NT	
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 179 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFOS-13C4	
7		
8	13C2-PFTeDA	13C8-PFOS
9		
10	13C8-PFOS	13C4-PFOS
11	NT	
12	N/A	
13		
14	NT	
15	yes	no
16	NT	NT
17	NT	
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37		
38	NT	

Table 180 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8		
9		
10	NT	NT
11	YES	
12	N/A	
13		
14	NT	
15	yes	no
16	NT	NT
17	NT	
18		13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	NT	
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 181 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFBA-13C3	
7	PFBA-13C4	PFBA-13C3
8	13C4-PFBA	13C3-PFBA
9	C13-PFBA	
10	13C4-PFBA	13C3-PFBA
11	YES	
12	13C4-PFBA	
13	yes	
14	13C4-PFBA	
15	yes	no
16	Y	N
17	PFBA-13C4	
18	13C4-PFBA	13C4-PFOA
19	13C4-PFBA	
20	13C-PFBA	
21		
22	No	13C4-PFBA
23		
24	NA	NA
25	13C4-PFBA	13C3-PFBA
26	M4PFBA	NA
27	Perfluoro-n-[13C4]butanoic acid MPFBA	
28		
29	MPFBA	M3PFBA
30	13C4-PFBA	N/A
31	13C4-PFBA	
32	PFBA	
33	13C4 PFBA	
34	PFBA_ISTD	
35	13C4-PFBA	
36	PFOS-13C8	PFBA-13C4
38	13C4-PFBA	

Table 182 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFPeA-13C3	
7	PFPeA - 13C5	PFBA-13C3
8	13C4-PFPeA	13C5 -PFPeA
9	C13-PFHxA	
10	13C5-PFPeA	13C2-PFHxA
11	YES	
12	13C5-PFPeA	
13	yes	
14	13C5-PFPeA	
15	yes	no
16	N	N
17	PFHxA-13C2	
18	13C5-PFPeA	13C4-PFOA
19	13C5-PFPeA	
20	13C-PFPeA	
21		
22	No	13C5-PFPeA
23		
24	NA	NA
25	13C5-PFPeA	
26	M5PFPeA	NA
27	Perfluoro-n-[13C5]pentanoic acid M5PFPeA	
28		
29	M5PFPeA	M3PFBA
30	13C3-PFPeA	N/A
31	13C5-PFPeA	
32	PFPeA	
33	13C5 PFPeA	
34	PFPeA_ISTD	
35	13C5-PFPeA	
36	PFOS-13C8	PFPeA-13C3
38	13C5-PFPeA	

Table 183 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHxA-13C2	
7	PFHxA - 13C5	PFOA-13C2
8	13C2-PFHxA	13C5 -PFPeA
9	C13-PFHxA	
10	13C5-PFHxA	13C2-PFHxA
11	YES	
12	13C2-PFHxA	
13	yes	
14	13C5-PFHxA	
15	yes	no
16	Y	N
17	PFHxA-13C2	
18	13C2-PFHxA	13C4-PFOA
19	13C5-PFHxA	
20	13C-PFHxA	
21		
22	No	13C5-PFHxA
23		
24	NA	NA
25	13C5-PFPxA	13C2-PFHxA
26	M5PFHxA	NA
27	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA	
28	M2PFHxA	M8PFOA
29	M5PFHxA	M3PFBA
30	13C2-PFHxA	N/A
31	13C5-PFHxA	
32	PFHxA	
33	13C2 PFHxA	
34	PFHxA_ISTD	
35	13C2-PFHxA	
36	PFOS-13C8	PFHxA-13C2
38	13C2-PFHxA	

Table 184 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHpA-13C4	
7	PFHpA - 13C4	PFOA-13C2
8	13C3-PFHpA	13C8-PFOA
9	C13-PFOA	
10	13C4-PFHpA	13C4-PFOA
11	YES	
12	13C4-PFHpA	
13	yes	
14	13C4-PFHpA	
15	yes	no
16	Y	N
17	PFHpA-13C4	
18	13C4-PFHpA	13C4-PFOA
19	13C4-PFHpA	
20	13C-PFHpA	
21		
22	No	13C4-PFHpA
23		
24	NA	NA
25	13C4-PFHpA	
26	MPFHpA	NA
27	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA	
28	M4PFHpA	M8PFOA
29	M4PFHpA	M3PFBA
30	13C4-PFHpA	N/A
31	13C4-PFHpA	
32	PFHpA	
33	13C4 PFHpA	
34	PFHpA_ISTD	
35	13C4-PFHpA	
36	PFOS-13C8	PFHpA-13C4
38	13C4-PFHpA	

Table 185 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1	[13C4]-PFOA	[13C4]-PFOA
2		
3		
4		
5		
6	PFOA-13C4	
7	PFOA - 13C4	PFOA-13C2
8	13C4-PFOA	13C8-PFOA
9	C13-PFOA	
10	13C8-PFOA	13C4-PFOA
11	YES	
12	13C8-PFOA	
13	yes	
14	13C4-PFOA	
15	yes	no
16	Y	N
17	PFOA-13C8	
18	13C8-PFOA	13C4-PFOA
19	13C8-PFOA	
20	13C-PFOA	
21		
22	No	13C8-PFOA
23		
24	NA	NA
25	13C8-PFOA	13C4-PFOA
26	M8PFOA	NA
27	Perfluoro-n-[13C8]octanoic acid M8PFOA	
28	M4PFOA	M8PFOA
29	M8PFOA	M2PFOA
30	13C4-PFOA	N/A
31	13C4-PFOA	
32	PFOA	
33	13C4 PFOA	
34	PFOA_ISTD	
35	13C8-PFOA	
36	PFOS-13C8	PFOA-13C4
38	13C8-PFOA	

Table 186 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFNA-13C5	
7	PFNA - 13C9	PFNA-13C5
8	13C5-PFNA	13C8-PFOA
9	C13-PFOA	
10	13C9-PFNA	13C5-PFNA
11	YES	
12	13C5-PFNA	
13	yes	
14	13C5-PFNA	
15	yes	no
16	Y	N
17	PFDA-13C2	
18	13C5-PFNA	13C4-PFOA
19	13C5-PFNA	
20	13C-PFNA	
21		
22	No	13C9-PFNA
23		
24	NA	NA
25	13C9-PFNA	13C5-PFNA
26	M9PFNA	NA
27	Perfluoro-n-[13C9]nonanoic acid M9PFNA	
28	M5PFNA	M8PFOA
29	M9PFNA	M2PFOA
30	13C5-PFNA	N/A
31	13C5-PFNA	
32	PFNA	
33	13C5 PFNA	
34	PFNA_ISTD	
35	13C5-PFNA	
36	PFOS-13C8	PFNA-13C5
38	13C5-PFNA	

Table 187 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFDA-13C2	
7	PFDA - 13C6	PFDA-13C2
8	13C2-PFDA	13C8-PFOA
9	C13-PFOA	
10	13C6-PFDA	13C2-PFDA
11	YES	
12	13C6-PFDA	
13	yes	
14	13C6-PFDA	
15	yes	no
16	Y	N
17	PFDA-13C2	
18	13C2-PFDA	13C4-PFOA
19	13C6-PFDA	
20	13C-PFDA	
21		
22	No	13C6-PFDA
23		
24	NA	NA
25	13C6-PFDA	13C2-PFDA
26	M6PFDA	NA
27	Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA	
28	M2PFDA	M8PFOA
29	M6PFDA	MPFDA
30	13C2-PFDA	N/A
31	13C6-PFDA	
32	PFDA	
33	13C2 PFDA	
34	PFDA_ISTD	
35	13C6-PFDA	
36	PFOS-13C8	PFDA-13C2
38	13C6-PFDA	

Table 188 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFUdA-13C2	
7	PFUdA - 13C7	PFDA-13C2
8	13C2-PFUdA	13C8-PFOA
9	C13-PFOA	
10	13C7-PFUNA	13C2-PFDA
11	YES	
12	13C2-PFUnA	
13	yes	
14	13C2-PFUnDA	
15	yes	no
16	Y	N
17	PFDA-13C2	
18	13C2-PFUnA	13C4-PFOA
19	13C2-PFUnDA	
20	13C-PFUnDA	
21		
22	No	13C7-PFUdA
23		
24	NA	NA
25	13C2-PFUnA	
26	M7PFUnDA	NA
27	Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA	
28		
29	M7PFUdA	MPFDA
30	13C2-PFUdA	N/A
31	13C2-PFUnDA	
32		
33	13C2 PFUnA	
34	PFUnDA_ISTD	
35	13C2-PFUnA	
36	PFOS-13C8	PFUNDA-13C2
38	13C2-PFUnA	

Table 189 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFDoA-13C2	
7	PFDoA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	C13-PFDoA	
10	13C2-PFDoA	13C2-PFDA
11	YES	
12	13C2-PFDoA	
13	yes	
14	13C2-PFDoDA	
15	yes	no
16	Y	N
17	PFDoA-13C2	
18	13C2-PFDoA	13C4-PFOA
19	13C2-PFDoDA	
20	13C-PFDoDA	
21		
22	No	13C2-PFDoA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27	Perfluoro-n-[1,2 13C2]dodecanoic acid MPFDoA	
28		
29	MPFDoA	MPFDA
30	13C2-PFDoDA	N/A
31	13C2-PFDoDA	
32	PFDoA	
33	13C2 PFDoA	
34	PFDoA_ISTD	
35	13C2-PFDoA	
36	PFOS-13C8	PFDoDA-13C2
38	13C2-PFDoA	

Table 190 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFTeDA-13C2	
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	C13-PFDoA	
10	13C2-PFDoA/13C2-PFTeDA	13C2-PFDA
11	YES	
12	N/A	
13		
14	13C2-PFDoDA	
15	yes	no
16	N	N
17	PFTeDA-13C2	
18	13C12-PFDoA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTrDA	
21		
22	No	13C2-PFDoA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27		
28		
29	MPFDoA	MPFDA
30	13C2-PFTeDA	N/A
31	13C2-PFDoDA	
32	PFDoA	
33	13C2 PFDoA	
34	PFDoA_ISTD	
35	N/A	
36	PFOS-13C8	PFTeDA-13C2
37		
38	13C2-PFTeDA	

Table 191 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	PFTeDA-13C2	
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFTeDA	13C8-PFOA
9		
10	13C2-PFTeDA	13C2-PFDA
11	YES	
12	13C2-PFTeDA	
13	yes	
14	13C2-PFTeDA	
15	yes	no
16	Y	N
17	PFTeDA-13C2	
18	13C2-PFTeDA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTeDA	
21		
22	No	13C2-PFTeDA
23		
24	NA	NA
25	13C2-PFTeDA	
26	MPFTeDA	NA
27	Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA	
28		
29	M2PFTeDA	MPFDA
30	13C2-PFTeDA	N/A
31	13C2-PFTeDA	
32	PFTeDA	
33	13C2 PFTeDA	
34	PFTeDA_INSTD	
35	13C2-PFTeDA	
36	PFOS-13C8	PFTeDA-13C2
38	13C2-PFTeDA	

Table 192 Labelled Standards for PFODA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	PFHxDA-13C2	
7		
8		
9		
10	NT	NT
11	YES	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	PFHxDA-13C2	
18	13C2-PFTeDA	13C4-PFOA
19	NT	
20	13C-PFHxDA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27	Perfluoro-1-[13C8]otanesulfonamide	
28		
29	M8FOSA-I	MPFOS
30	NT	NT
31	13C8-FOSA	
32	NT	
33		
34	n/a	
35	N/A	
36	PFOS-13C8	PFHxDA-13C2
37		
38	NT	

Table 193 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	FOSA-13C8	
7	PFOSA - 13C8	PFOS-13C4
8	13C8-FOSA	
9	C13-PFOSA	
10	13C8-PFOSA	13C4-PFOS
11	YES	
12	13C8-FOSA	
13	yes	
14	13C8-FOSA	
15	yes	no
16	Y	N
17	PFOSA-13C8	
18	13C8-PFOSA	13C4-PFOA
19	13C8-FOSA	
20	13C-PFOSA	
21		
22	No	13C8-FOSA
23		
24	NA	NA
25	13C8-PFOSA	
26	MPFOSA	NA
27	N-methyl-d3-perfluoro-1-octancesulfonamide	
28		
29	d-N-MeFOSA-M	MPFOS
30	13C8-FOSA	N/A
31	d3-MeFOSA	
32	PFOSA	
33	13C8 FOSA	
34	FOSA_ISTD	
35	13C8-FOSA	
36	PFOS-13C8	FOSA-13C8
38	13C8-FOSA	

Table 194 Labelled Standards for N-MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	MeFOSA-D3	
7	N-MeFOSA - 2H3	PFOS-13C4
8	D3-N-Me FOSA	
9		
10	D3-N-MeFOSA	13C4-PFOS
11	YES	
12	d3-N-MeFOSA	
13	yes	
14	d3-MeFOSA	
15	yes	no
16	Y	N
17	N-MeFOSA-D3	
18	D3-MeFOSA	13C4-PFOA
19	d3-MeFOSA	
20	13C-MePFOSA	
21		
22	No	D3-N-MeFOSA-M
23		
24	NA	NA
25	d3-N-MeFOSA-M	
26	d-NMeFOSA-M	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28		
29	d-N-EtFOSA-M	MPFOS
30	D3-M PFOSA	N/A
31	d5-EtFOSA	
32	N-MeFOSA	
33	d-N-MeFOSA-M	
34	N-MeFOSA_ISTD	
35	d3-N-MeFOSA	
36	PFOS-13C8	MeFOSA-D3
38	d3-MeFOSA	

Table 195 Labelled Standards for N-EtFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	EtFOSA-D5	
7	N-EtFOSA - D5	PFOS-13C4
8	D5-N-Et FOSA	
9		
10	D5-N-EtFOSA	13C4-PFOS
11	YES	
12	d5-N-EtFOSA	
13	yes	
14	d5-EtFOSA	
15	yes	no
16	Y	N
17	NT	
18	d5-EtFOSA	13C4-PFOA
19	d5-EtFOSA	
20	13C-EtPFOSA	
21		
22	No	D5-N-EtFOSA-M
23		
24	NA	NA
25	d5-N-EtFOSA-M	
26	d-NEtFOSA-M	NA
27		
28		
29	d3-N-MeFOSAA	MPFOS
30	D5-E PFOSA	N/A
31	d3-MeFOSAA	
32	N-EtFOSA	
33	d-N-EtFOSA-M	
34	N-EtFOSA_ISTD	
35	d5-N-EtFOSA	
36	PFOS-13C8	EtFOSA-D5
37		
38	d5-EtFOSA	

Table 196 Labelled Standards for N-MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	MeFOSAA-D3	
7	N-MeFOSAA - 2H3	PFOS-13C4
8	D3-N-Me FOSAA	
9		
10	D3-N-MeFOSAA	13C2-D4-6:2FTS
11	YES	
12	d3-N-MeFOSAA	
13	yes	
14	d3-MeFOSAA	
15	yes	no
16	Y	N
17	N-MeFOSAA-D3	
18	d3-N-MeFOSAA	13C4-PFOA
19	d3-MeFOSAA	
20	13C-MePFOSAA	
21		
22	No	D3-N-MeFOSAA
23		
24	NA	NA
25	d3-N-MeFOSAA	
26	d3-NMeFOSAA	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28		
29	d5-N-EtFOSAA	MPFOS
30	D3-Me-FOSAA	N/A
31	d5-EtFOSAA	
32	N-MeFOSAA	
33	d3-NMeFOSAA	
34	N-MeFOSAA_ISTD	
35	d3-N-MeFOSAA	
36	PFOS-13C8	MeFOSAA-D3
38	d3-N-MeFOSAA	

Table 197 Labelled Standards for N-EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
3		
5		
6	EtFOSAA-D3	
7	N-EtFOSA - 2H5	PFOS-13C4
8	D5-N-Et FOSAA	
9		
10	D5-N-EtFOSAA	13C2-D4-6:2FTS
11	YES	
12	d5-NEtFOSAA	
13	yes	
14	d5-EtFOSAA	
15	yes	no
16	Y	N
17	N-EtFOSAA-D5	
18	d5-N-EtFOSAA	13C4-PFOA
19	d5-EtFOSAA	
20	13C-EtPFOSAA	
21		
22	No	D5-N-EtFOSAA
23		
24	NA	NA
25	d5-N-EtFOSAA	
26	d5-NEtFOSAA	NA
27	d7-N-MeFOSE-M 2-(N-methyl-d3-perfluoro-1-octanesulfonamido) ethand4-ol	
28		
29	d7-N-MeFOSE-M	MPFOS
30	D5-Et-FOSAA	N/A
31	d7-MeFOSE	
32	N-EtFOSAA	
33	d5-NEtFOSAA	
34	N-EtFOSAA_ISTD	
35	d5-NEtFOSAA	
36	PFOS-13C8	EtFOSAA-D5
38	d5-N-EtFOSAA	

Table 198 Labelled Standards for N-MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	MeFOSE-D7	
7	N-MeFOSE - D7	PFOS-13C4
8	D7-N-Me FOSE	
9		
10	D7-N-MeFOSE	13C4-PFOS
11	YES	
12	d7-N-MeFOSE	
13		
14	d7-MeFOSE	
15	yes	no
16	Y	N
17	NT	
18	d3-MeFOSE	13C4-PFOA
19	d7-MeFOSE	
20		
21		
22	No	D7-N-MeFOSE-M
23		
24	NA	NA
25	d7-N-MeFOSE-M	
26	d7-NMeFOSE-M	NA
27	d9-N-EtFOSE-M 2-(N-ethyl-d5-perfluoro-1-octanesulfonamido) ethan-d4-ol	
28		
29	d9-N-EtFOSE-M	MPFOS
30	D7-Me-FOSE	N/A
31	d3EtFOSE	
32	N-MeFOSE	
33	d7-N-MeFOSE-M	
34	N-MeFOSE_ISTD	
35	d7-N-MeFOSE	
36	PFOS-13C8	MeFOSE-D3
38	d7-MeFOSE	

Table 199 Labelled Standards for N-EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	EtFOSE-D9	
7	N-EtFOSE - 2H9	PFOS-13C4
8	D9-N-Et FOSE	
9		
10	D9-N-EtFOSE	13C4-PFOS
11	YES	
12	d9-N-EtFOSE	
13	yes	
14	d3-EtFOSE	
15	yes	no
16	Y	N
17	NT	
18	d9-EtFOSE	13C4-PFOA
19	d3-EtFOSE	
20		
21		
22	No	D9-N-EtFOSE-M
23		
24	NA	NA
25	d9-N-EtFOSE-M	
26	d9-NEtFOSE-M	NA
27	M2-4:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-hexane sulfonate (4:2)	
28		
29	M2-4:2FTS	MPFOS
30	D9-Et-FOSE	N/A
31	13C2-4:2FTS	
32	N-EtFOSE	
33	d9-N-EtFOSE-M	
34	N-EtFOSE_ISTD	
35	d9-N-EtFOSE	
36	PFOS-13C8	EtFOSE-D9
38	d9-EtFOSE	

Table 200 Labelled Standards for 6:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	6:2FTS-13C2	
7	6:2FTS - 13C2	PFHxS-18O2
8	13C2-6:2FTS	
9		
10	13C2-6:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-6-2FTS	
13	yes	
14	13C2-6:2FTS	
15	yes	no
16	Y	N
17	6:2FTS-13C2	
18	13C2-6:2FTS	13C4-PFOA
19	13C2-6:2FTS	
20	13C-6:2FTS	
21		
22	No	13C2-6:2FTS-Na
23		
24	NA	NA
25	13C2-6:2FTS	
26	M6:2FTS	NA
27	M2-6:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-octane sulfonate (6:2)	
28	M2-6:2FTS	M8PFOS
29	M2-6:2FTS	MPFOS
30	13C2,12C6 6:2-FTS	N/A
31	13C2-6:2FTS	
32	6:2FTS	
33	M2-6:2FTS	
34	6:2FTS_ISTD	
35	13C2-6:2FTS	
36	PFOS-13C8	6:2FTS-13C2
38	13C2-62FTS	

Table 201 Labelled Standards for 8:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
5		
6	8:2FTS-13C2	
7	8:2FTS - 13C2	PFHxS-18O3
8	13C2-8:2FTS	
9	C13-6:2-FTS	
10	13C2-8:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-8:2FTS	
13	yes	
14	13C2-8:2FTS	
15	yes	no
16	Y	N
17	8:2FTS-13C2	
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-8:2FTS	
21		
22	No	13C2-8:2FTS-Na
23		
24	NA	NA
25	13C2-8:2FTS	
26	M8:2FTS	NA
27	M2-8:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-decane sulfonate (8:2)	
28	M2-8:2FTS	M8PFOS
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	13C2-8:2FTS	
32	8:2FTS	
33	M2-8:2FTS	
34	8:2FTS_ISTD	
35	13C2-8:2FTS	
36	PFOS-13C8	8:2FTS-13C2
38	13C2-82FTS	

Table 202 Labelled Standards for 10:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	10:2FTS-13C2-D4	
7		
8		
9		
10	NT	NT
11	YES	
12	13C2-10:2FTS	
13		
14	13C2-8:2FTS	
15	yes	no
16	Y	Y
17	10:2FTS-13C2-D4	
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-10:2FTS	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-10:2FTS	
26	MPFDoDA	NA
27		
28		
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	13C2-8:2FTS	
32	8:2FTS	
33	13C2 10:2FTS	
34	8:2FTS_ISTD	
35	13C2-10:2FTS	
36	PFOS-13C8	10:2FTS-13C2
37		
38	13C2-PFDoA	

Table 203 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8		
9		
10	NT	NT
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	8:2-diPAP-13C4	
18		
19	NT	
20	13C-8:2diPAP	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-8:2diPAP	
26	NT	NA
27		
28		
29	M4-8:2diPAP	M2PFOA
30	NT	NT
31	--	
32	NT	
33	13C4-8:2 Fluorotelomer phosphate diester	
34	n/a	
35	N/A	
36		
38	NT	

Table 204 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	HFPO-DA-13C3	
7		
8	13C3-GenX	
9	C13-PFHxA	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	13C3-GenX	
13	yes	
14		
15	yes	no
16	NT	NT
17	NT	
18	13C3-HFPO-DA	13C4-PFOA
19	NT	
20	13C-HFPO-DA	
21		
22	No	13C3-HFPO-DA
23		
24	NA	NA
25	13C3-HFPO-DA	
26	M3HFPO-DA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C312C3HF11O3	N/A
31	--	
32	NT	
33	13C3 HFPO-DA	
34	n/a	
35	13C3-GenX	
36	PFOS-13C8	
37		
38	NT	

Table 205 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFHpA-13C4	
7		
8	13C4-PFOA	
9		
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18	13C4-PFHpA	13C4-PFOA
19	NT	
20	13C-PFOA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFHpA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFHpA	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	
37		
38	NT	

Table 206 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFNA-13C5	
7		
8	13C4-PFOS	13C8-PFOS
9		
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18	13C4-PFOS	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37		
38	NT	

Table 207 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	PFDoA-13C2	
7		
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18	13C2-PFDoA	
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	FOSA-13C8
37		
38	NT	

Table 208 Labelled Standards for 3:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8		
9		
10	13C5-PFPeA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	M5PFHxA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 209 Labelled Standards for 5:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8	13C2-6:2 FTCA	
9		
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	M5PFHxA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 210 Labelled Standards for 7:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3		
4		
5		
6	NT	
7		
8		
9		
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28		
29	M4PFHpA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 211 Participant Methodology for Soil Samples– Additional Information

Lab. Code	Sample	Additional Information
3	S1	All linear and branched present have been reported although some branched peaks are not confirmed by traceable standards.
8	S1	Reporting linear isomer only for PFDS and PFNS due to interference in chromatograms. Used smaller volume injection on LCMS (0.2 ul and 0.5ul, normal injection volume is 5ul) to quantify PFHxS and PFOS
10	S1 and S2	Sample was received at a temperature of 10°C which was above the method recommended sample storage temperature (less than or equal to 6ºC).
20	All	The laboratory is accredited for following PFAS in soil samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFOSA, 4:2 FTS, 8:2 diPAP, HFPO-DA, DONA, PFECHS.
23	All	4:2 FTS can be considered to be included
26	S1	PFTeDA is not reported (NR) because of a high internal standard recovery NT = not tested
	S2	NT = not tested
27	S1	PFOS and PFOS ISTD data from dilution

APPENDIX 9 – PARTICIPANTS' TEST METHODS FOR BIOSOLID SAMPLES

Participants' methods for soil samples are presented in Tables 212 to 259.

Table 212 Participant Methodology – Extraction

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3														
4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	1	Yes	0	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	N/A	MeOH, 0.3% NH3	60	Yes	20	N/A	Filtratio n	MeOH	No
8	1	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	99/1 methanol/am monium hydroxide (v/v)	2 x 20 min	Yes	40		None		No
9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	3.012 g (as	Yes	30 min		Solid-Liquid Extraction	3	MeOH, 0.3% NH3	100 min	Yes	55C	255 min	Solid-Phase	NH4OH/M eOH	Yes

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
	receiv ed)				(vortexed and centrifuged)							Extracti on		
11	2g	Yes	30 mins	NO	Solid-Liquid Extraction (vortexed and centrifuged)		**Basic ACN and Acetone**	**15 mins**	**Yes**	**40 °C**	**60 mins**		**Basic ACN and Acetone**	**No**
12	**5g**	Yes	30		**QuEChERS**	3	**ACN**	30	Yes	45	30	**Solid-Phase Extracti on**	Basic ACN and Acetone	No
13	**0.5**	Yes			Solid-Liquid Extraction (vortexed and centrifuged)	2	NH4OH/Me OH	70	Yes			Filtratio n		Yes
14	1	Yes	~1min	Wet with ammoniu m acetate+ ACN. Shake. Soak overnight	QuEChERS	N/A	NH4C2H3O 2/ACN	Overnigh t + 1.5hrs	Yes	N/A	N/A	**dSPE**		No
15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	2	Yes	30		Solid-Liquid Extraction	15mL, 2 steps	Basic ACN and Acetone	30	Yes	22	N/A	Solid-Phase	N/A	No

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
					(vortexed and centrifuged)							Extraction		
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	0,2 g	Yes			Ultra Sonic		MeOH	20 min	Yes	40°		None		
19	1	Yes		Homogenisation	**Solid-Liquid Extraction (vortexed and centrifuged)**		MeOH	60				Filtration		
20	**4.25**	Yes	15	dry overnight at 40 °C	**QuEChERS**		**ACN**	2 min 30 sec	No	40	30 - 120	**dSPE (PSA + C18EC)**		No
21	2	Yes			Solid-Liquid Extraction (vortexed and centrifuged)									Yes
22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
23														
24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	1.0g and 2.0 g	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3	10 hours (including SPE	Yes		5 hours	Solid-Phase Extraction	If combination or other, please type here.	No

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
26	2.031 and 2.038 (duplicate)	Yes	30 min	NA	Solid-Liquid Extraction (vortexed and centrifuged)	NA	2000mM NaOH, MeOH	30 min	Yes	50°C	Variable	None	Not Applicable	No
27	1	Yes		pH Adjustment	Solid-Liquid Extraction		Extraction with MeOH/Ammonium hydroxide 99:1					Solid-Phase Extraction	3x 5mL MeOH/Ammonium hydroxide	
28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
29	1	Yes	N/A	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	2	KOH/MeOH	120	Yes	40		**Carbon SPE**	KOH/MeOH	No
30	**2g**	Yes	10	Homogenisation	Alkaline Digestion	N/A	Basic MeOH	60	Yes	**40**	**20**	**Envirocarb**	N/A	Yes
31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	1.08			Homogenisation	Alkaline Digestion		KOH/MeOH	60		Room Temperature		Solid-Phase Extraction		
34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature	Extraction Time	Extraction Cleanup	Elution Solvent	Final pH adjustment?
35	2	Yes	30	No	Solid-Liquid Extraction (vortexed and centrifuged)	2	Basic ACN and Acetone	30	Yes	39	45	**Filtration**	Basic ACN and Acetone	
36	5	Yes			QuEChERS		ACN	30	No			Solid-Phase Extraction	ACN	No
37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

*Additional Information in Table 259.

Table 213 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
8	Centrifuged samples before transferring to LCMS vials to remove some particulates
20	After clean-up the solvent is changed to methanol/water 1/1
25	Elution Solvent MeOH, 1.0% NH3 and acetic acid added to extract
26	Vortex, shaking
27	Strata X-AW 33um polymeric Weak Anion

Table 214 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Correction?
1	NA	NA	NA

Lab. Code	Instrument	Dilution Factor	Blank Correction?
2	NA	NA	NA
4	NA	NA	NA
5	NA	NA	NA
6	NA	NA	NA
7	LC-MSMS or LC-QQQ	No	No
8	LC-MSMS or LC-QQQ	No	No
9	NA	NA	NA
10	LC-MSMS or LC-QQQ	No	No
11	LC-MSMS or LC-QQQ	NO	No
12	LC-MSMS or LC-QQQ	No	No
13	LC-MSMS or LC-QQQ	2	No
14	LC-MSMS or LC-QQQ		No
15	NA	NA	NA
17	NA	NA	NA
18	LC-MSMS or LC-QQQ		No
19	LC-MSMS or LC-QQQ	No	No
20	LC-MSMS or LC-QQQ	No	No
21	LC-MSMS or LC-QQQ		
22	NA	NA	NA
24	NA	NA	NA
25	LC-MSMS or LC-QQQ	No	No
26	LC-MSMS or LC-QQQ	NA	No
27	LC-Orbitrap		No
28	NA	NA	NA

Lab. Code	Instrument	Dilution Factor	Blank Correction?
29	LC-MSMS or LC-QQQ		No
30	LC-MSMS or LC-QQQ	10	No
31	NA	NA	NA
32	NA	NA	NA
33	LC-MSMS or LC-QQQ	No	No
34	NA	NA	NA
35	LC-MSMS or LC-QQQ	20	No
36	LC-Orbitrap	DF10, DF100, DF1000	No
37	NA	NA	NA

*Additional Information in Table 259.

Table 215 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
27	In this method the linear standards are used to quantify both the linear as well as the branched isomers.

Table 216 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	NA	NA	NA	NA
2	NA	NA	NA	NA
4	NA	NA	NA	NA
5	NA	NA	NA	NA
6	NA	NA	NA	NA
7	Wellington	No		
8	Wellington	Yes	Isotopic dilution	

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
9	NA	NA	NA	NA
10	Wellington	Yes	No	
11	Wellington	No		
12	Wellington, Cambridge Isotope laborotories	No		
13	Wellington	No		
14	Wellington	Yes	N/A	
15	NA	NA	NA	NA
17	NA	NA	NA	NA
18		Yes		
19	Wellington Laboratories	Yes		
20	Chiron, Wellington, Cambridge Isotope Laboratories	Yes	Flemish Standard Method CMA/3/O, see https://reflabos.vito.be/2024/CMA_3_O.pdf	
22	NA	NA	NA	NA
24	NA	NA	NA	NA
25	Wellington and Cambridge Isotope Laboratories	Yes	Yes EPA Method 1633	
26	Wellington Laboratory	Yes	No	NA
27	Wellington	Yes	In house	
28	NA	NA	NA	NA
29	Wellington	Yes	USEPA 537	
30	Wellington	Yes	No. In-house	
31	NA	NA	NA	NA

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
32	NA	NA	NA	NA
33		Yes		
34	NA	NA	NA	NA
35	Wellington	Yes		
36	Wellington	Yes		Results corrected by ISTD added before instrumentation
37	NA	NA	NA	NA

Table 217 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFBS - 13C3	PFHxS-18O2
8	13C3-PFBS	13C3-PFHxS
9	NA	NA
10	13C3-PFBS	18O2-PFHxS
11	YES	
12	13C3-PFBS	
13	yes	
14	13C3-PFBS	
15	NA	NA
16		
17	NA	NA
18	13C3-PFBS	13C4-PFOA
19	13C3-PFBS	
20	13C-PFBS	
22	NA	NA
23		
24	NA	NA
25	13C3-PFBS	
26	M3PFBS	NA
27	Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS	
28	NA	NA
29	M3PFBS	MPFDA
30	13C3-PFBS	N/A
31	NA	NA
32	NA	NA
33	13C3 PFBS	
34	NA	NA
35	13C3-PFBS	
36	PFOS-13C8	PFBS-13C3
37	NA	NA
38		

Table 218 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	NA	NA
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	NA	NA
16		
17	NA	NA
18	13C3-PFBS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M5PFHxA	NA
27		
28	NA	NA
29	M3PFBS	MPFDA
30	18O2-PFHxS	N/A
31	NA	NA
32	NA	NA
33	13C3 PFBS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFOS-13C4
37	NA	NA
38		

Table 219 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	NA	NA
10	13C3-PFHxS	18O2-PFHxS
11	NO	
12	18O2-PFHxS	
13		
14	16O2-PFHxS	
15	NA	NA
16		
17	NA	NA
18	18O2-PFHxS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	NA	NA
23		
24	NA	NA
25	13C3-PFHxS	18O2-PFHxS
26	M3PFHxS	NA
27	Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS	
28	NA	NA
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	NA	NA
32	NA	NA
33	18O2 PFHxS	
34	NA	NA
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
38		

Table 220 Labelled Standards for PFHxS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	NA	NA
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	18O2-PFHxS	
13	yes	
14	NT	
15	NA	NA
16		
17	NA	NA
18	18O2-PFHxS	13C4-PFOA
19	NT	
20	13C-PFHxS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M3PFHxS	NA
27		
28	NA	NA
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	NA	NA
32	NA	NA
33	18O2 PFHxS	
34	NA	NA
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
37	NA	NA
38		

Table 221 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	NA	NA
16		
17	NA	NA
18	18O2-PFHxS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFHxS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M3PFHxS	NA
27		
28	NA	NA
29	M3PFHxS	MPFDA
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFOS-C4
37	NA	NA
38		

Table 222 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	NO	
12	13C8-PFOS	
13		
14	13C8-PFOS	
15	NA	NA
16		
17	NA	NA
18	13C4-PFOS	13C4-PFOA
19	13C4-PFOS	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25	13C8-PFOS	13C4-PFOS
26	M8PFOS	NA
27	Sodium perfluoro-1-[13C8] ocatanesulfonate M8PFOS	
28	NA	NA
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
38		

Table 223 Labelled Standards for PFOS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	YES	
12	13C8-PFOS	
13	yes	
14	NT	
15	NA	NA
16		
17	NA	NA
18	13C4-PFOS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28	NA	NA
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
37	NA	NA
38		

Table 224 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	NA	NA
16		
17	NA	NA
18	13C8-PFOA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28	NA	NA
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFBS-13C3
37	NA	NA
38		

Table 225 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	NA	NA
16		
17	NA	NA
18	13C2-PFUnA	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28	NA	NA
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFBA-13C4
37	NA	NA
38		

Table 226 Labelled Standards for PFUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	NT	NT
11	NT	
12	N/A	
13		
14	NT	
15	NA	NA
16		
17	NA	NA
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	NT	NT
30	NT	NT
31	NA	NA
32	NA	NA
33	NT	
34	NA	NA
35	N/A	
36		
37	NA	NA
38		

Table 227 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C2-PFTeDA	13C8-PFOS
9	NA	NA
10	13C8-PFOS	13C4-PFOS
11	NT	
12	N/A	
13		
14	NT	
15	NA	NA
16		
17	NA	NA
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	NT	NT
30	NT	NT
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37	NA	NA
38		

Table 228 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	NT	NT
11	NT	
12	N/A	
13		
14	NT	
15	NA	NA
16		
17	NA	NA
18	13C2-PFTeDA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	NT	NT
30	NT	NT
31	NA	NA
32	NA	NA
33	NT	
34	NA	NA
35	N/A	
36		
37	NA	NA
38		

Table 229 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFBA-13C4	PFBA-13C3
8	13C4-PFBA	13C3-PFBA
9	NA	NA
10	13C4-PFBA	13C3-PFBA
11	YES	
12	13C4-PFBA	
13	yes	
14	13C4-PFBA	
15	NA	NA
16		
17	NA	NA
18	13C4-PFBA	13C4-PFOA
19	13C4-PFBA	
20	13C-PFBA	
21		
22	NA	NA
23		
24	NA	NA
25	13C4-PFBA	13C3-PFBA
26	M4PFBA	NA
27	Perfluoro-n-[13C4]butanoic acid MPFBA	
28	NA	NA
29	MPFBA	M3PFBA
30	13C4-PFBA	N/A
31	NA	NA
32	NA	NA
33	13C4 PFBA	
34	NA	NA
35	13C4-PFBA	
36	PFOS-13C8	PFBA-13C4
38		

Table 230 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFPeA - 13C5	PFBA-13C3
8	13C4-PFPeA	13C5 -PFPeA
9	NA	NA
10	13C5-PFPeA	13C2-PFHxA
11	YES	
12	13C5-PFPeA	
13	yes	
14	13C5-PFPeA	
15	NA	NA
16		
17	NA	NA
18	13C5-PFPeA	13C4-PFOA
19	13C5-PFPeA	
20	13C-PFPeA	
21		
22	NA	NA
23		
24	NA	NA
25	13C5-PFPeA	
26	M5PFPeA	NA
27	Perfluoro-n-[13C5]pentanoic acid M5PFPeA	
28	NA	NA
29	M5PFPeA	M3PFBA
30	13C3-PFPeA	N/A
31	NA	NA
32	NA	NA
33	13C5 PFPeA	
34	NA	NA
35	13C5-PFPeA	
36	PFOS-13C8	PFPeA-13C3
38		

Table 231 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHxA - 13C5	PFOA-13C2
8	13C2-PFHxA	13C5 -PFPeA
9	NA	NA
10	13C5-PFHxA	13C2-PFHxA
11	YES	
12	13C2-PFHxA	
13	yes	
14	13C5-PFHxA	
15	NA	NA
16		
17	NA	NA
18	13C2-PFHxA	13C4-PFOA
19	13C5-PFHxA	
20	13C-PFHxA	
21		
22	NA	NA
23		
24	NA	NA
25	13C5-PFPxA	13C2-PFHxA
26	M5PFHxA	NA
27	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA	
28	NA	NA
29	M5PFHxA	M3PFBA
30	13C2-PFHxA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFHxA	
34	NA	NA
35	13C2-PFHxA	
36	PFOS-13C8	PFHxA-13C2
38		

Table 232 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFHpA - 13C4	PFOA-13C2
8	13C3-PFHpA	13C8-PFOA
9	NA	NA
10	13C4-PFHpA	13C4-PFOA
11	YES	
12	13C4-PFHpA	
13	yes	
14	13C4-PFHpA	
15	NA	NA
16		
17	NA	NA
18	13C4-PFHpA	13C4-PFOA
19	13C4-PFHpA	
20	13C-PFHpA	
21		
22	NA	NA
23		
24	NA	NA
25	13C4-PFHpA	
26	MPFHpA	NA
27	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA	
28	NA	NA
29	M4PFHpA	M3PFBA
30	13C4-PFHpA	N/A
31	NA	NA
32	NA	NA
33	13C4 PFHpA	
34	NA	NA
35	13C4-PFHpA	
36	PFOS-13C8	PFHpA-13C4
38		

Table 233 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOA - 13C4	PFOA-13C2
8	13C4-PFOA	13C8-PFOA
9	NA	NA
10	13C8-PFOA	13C4-PFOA
11	YES	
12	13C8-PFOA	
13	yes	
14	13C4-PFOA	
15	NA	NA
16		
17	NA	NA
18	13C8-PFOA	13C4-PFOA
19	13C8-PFOA	
20	13C-PFOA	
21		
22	NA	NA
23		
24	NA	NA
25	13C8-PFOA	13C4-PFOA
26	M8PFOA	NA
27	Perfluoro-n-[13C8]octanoic acid M8PFOA	
28	NA	NA
29	M8PFOA	M2PFOA
30	13C4-PFOA	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOA	
34	NA	NA
35	13C8-PFOA	
36	PFOS-13C8	PFOA-13C4
38		

Table 234 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFNA - 13C9	PFNA-13C5
8	13C5-PFNA	13C8-PFOA
9	NA	NA
10	13C9-PFNA	13C4-PFNA
11	YES	
12	13C5-PFNA	
13	yes	
14	13C5-PFNA	
15	NA	NA
16		
17	NA	NA
18	13C5-PFNA	13C4-PFOA
19	13C5-PFNA	
20	13C-PFNA	
21		
22	NA	NA
23		
24	NA	NA
25	13C9-PFNA	13C5-PFNA
26	M9PFNA	NA
27	Perfluoro-n-[13C9]nonanoic acid M9PFNA	
28	NA	NA
29	M9PFNA	M2PFOA
30	13C5-PFNA	N/A
31	NA	NA
32	NA	NA
33	13C5 PFNA	
34	NA	NA
35	13C5-PFNA	
36	PFOS-13C8	PFNA-13C5
38		

Table 235 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFDA - 13C6	PFDA-13C2
8	13C2-PFDA	13C8-PFOA
9	NA	NA
10	13C6-PFDA	13C2-PFDA
11	YES	
12	13C6-PFDA	
13	yes	
14	13C6-PFDA	
15	NA	NA
16		
17	NA	NA
18	13C2-PFDA	13C4-PFOA
19	13C6-PFDA	
20	13C-PFDA	
21		
22	NA	NA
23		
24	NA	NA
25	13C6-PFDA	13C2-PFDA
26	M6PFDA	NA
27	Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA	
28	NA	NA
29	M6PFDA	MPFDA
30	13C2-PFDA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFDA	
34	NA	NA
35	13C6-PFDA	
36	PFOS-13C8	PFDA-13C2
38		

Table 236 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFUdA - 13C7	PFDA-13C2
8	13C2-PFUdA	13C8-PFOA
9	NA	NA
10	13C7-PFUNA	13C2-PFDA
11	YES	
12	13C2-PFUnA	
13	yes	
14	13C2-PFUnDA	
15	NA	NA
16		
17	NA	NA
18	13C2-PFUnA	13C4-PFOA
19	13C2-PFUnDA	
20	13C-PFUnDA	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-PFUnA	
26	M7PFUnDA	NA
27	Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA	
28	NA	NA
29	M7PFUdA	MPFDA
30	13C2-PFUdA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFUnA	
34	NA	NA
35	13C2-PFUnA	
36	PFOS-13C8	PFUNDA-13C2
38		

Table 237 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFDoA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	NA	NA
10	13C2-PFDoA	13C2-PFDA
11	YES	
12	13C2-PFDoA	
13	yes	
14	13C2-PFDoDA	
15	NA	NA
16		
17	NA	NA
18	13C2-PFDoA	13C4-PFOA
19	13C2-PFDoDA	
20	13C-PFDoDA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27	Perfluoro-n-[1,2 13C2]dodecanoic acid MPFDoA	
28	NA	NA
29	MPFDoA	MPFDA
30	13C2-PFDoDA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFDoA	
34	NA	NA
35	13C2-PFDoA	
36	PFOS-13C8	PFDoDA-13C2
38		

Table 238 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	NA	NA
10	13C2-PFDoA/13C2-PFTeDA	13C2-PFDA
11	YES	
12	N/A	
13		
14	13C2-PFDoDA	
15	NA	NA
16		
17	NA	NA
18	13C12-PFDoA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTrDA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27		
28	NA	NA
29	MPFDoA	MPFDA
30	13C2-PFTeDA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFDoA	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFTeDA-13C2
37	NA	NA
38		

Table 239 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFTeDA	13C8-PFOA
9	NA	NA
10	13C2-PFTeDA	13C2-PFDA
11	YES	
12	13C2-PFTeDA	
13	yes	
14	13C2-PFTeDA	
15	NA	NA
16		
17	NA	NA
18	13C2-PFTeDA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTeDA	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-PFTeDA	
26	MPFTeDA	NA
27	Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA	
28	NA	NA
29	M2PFTeDA	MPFDA
30	13C2-PFTeDA	N/A
31	NA	NA
32	NA	NA
33	13C2 PFTeDA	
34	NA	NA
35	13C2-PFTeDA	
36	PFOS-13C8	PFTeDA-13C2

Table 240 Labelled Standards for PFODA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	NT	NT
11	YES	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18	13C2-PFTeDA	13C4-PFOA
19	NT	
20	13C-PFHxDA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27	Perfluoro-1-[13C8]otanesulfonamide	
28	NA	NA
29	M8FOSA-I	MPFOS
30	NT	NT
31	NA	NA
32	NA	NA
33		
34	NA	NA
35	N/A	
36	PFOS-13C8	PFHxDA-13C2
38		

Table 241 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	PFOSA - 13C8	PFOS-13C4
8	13C8-FOSA	
9	NA	NA
10	13C8-PFOSA	13C4-PFOS
11	YES	
12	13C8-FOSA	
13	yes	
14	13C8-FOSA	
15	NA	NA
16		
17	NA	NA
18	13C8-PFOSA	13C4-PFOA
19	13C8-FOSA	
20	13C-PFOSA	
21		
22	NA	NA
23		
24	NA	NA
25	13C8-PFOSA	
26	MPFOSA	NA
27	N-methyl-d3-perfluoro-1-octancesulfonamide	
28	NA	NA
29	d-N-MeFOSA-M	MPFOS
30	13C8-FOSA	N/A
31	NA	NA
32	NA	NA
33	13C8 FOSA	
34	NA	NA
35	13C8-FOSA	
36	PFOS-13C8	FOSA-13C8
37	NA	NA

Table 242 Labelled Standards for N-MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-MeFOSA - 2H3	PFOS-13C4
8	D3-N-Me FOSA	
9	NA	NA
10	D3-N-MeFOSA	13C4-PFOS
11	YES	
12	d3-N-MeFOSA	
13	yes	
14	d3-MeFOSA	
15	NA	NA
16		
17	NA	NA
18	D3-MeFOSA	13C4-PFOA
19	d3-MeFOSA	
20	13C-MePFOSA	
21		
22	NA	NA
23		
24	NA	NA
25	d3-N-MeFOSA-M	
26	d-NMeFOSA-M	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28	NA	NA
29	d-N-EtFOSA-M	MPFOS
30	D3-M PFOSA	N/A
31	NA	NA
32	NA	NA
33	d-N-MeFOSA-M	
34	NA	NA
35	d3-N-MeFOSA	
36	PFOS-13C8	MeFOSA-D3
37	NA	NA

Table 243 Labelled Standards for N-EtFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-EtFOSA - D5	PFOS-13C4
8	D5-N-Et FOSA	
9	NA	NA
10	D5-N-EtFOSA	13C4-PFOS
11	YES	
12	d5-N-EtFOSA	
13	yes	
14	d5-EtFOSA	
15	NA	NA
16		
17	NA	NA
18	d5-EtFOSA	13C4-PFOA
19	d5-EtFOSA	
20	13C-EtPFOSA	
21		
22	NA	NA
23		
24	NA	NA
25	d5-N-EtFOSA-M	
26	d-NEtFOSA-M	NA
27		
28	NA	NA
29	d3-N-MeFOSAA	MPFOS
30	D5-E PFOSA	N/A
31	NA	NA
32	NA	NA
33	d-N-EtFOSA-M	
34	NA	NA
35	d5-N-EtFOSA	
36	PFOS-13C8	EtFOSA-D5
37	NA	NA
38		

Table 244 Labelled Standards for N-MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-MeFOSAA - 2H3	PFOS-13C4
8	D3-N-Me FOSAA	
9	NA	NA
10	D3-N-MeFOSAA	13C2-D4-6:2FTS
11	YES	
12	d3-N-MeFOSAA	
13	yes	
14	d3-MeFOSAA	
15	NA	NA
16		
17	NA	NA
18	d3-N-MeFOSAA	13C4-PFOA
19	d3-MeFOSAA	
20	13C-MePFOSAA	
21		
22	NA	NA
23		
24	NA	NA
25	d3-N-MeFOSAA	
26	d3-NMeFOSAA	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28	NA	NA
29	d5-N-EtFOSAA	MPFOS
30	D3-Me-FOSAA	N/A
31	NA	NA
32	NA	NA
33	d3-NMeFOSAA	
34	NA	NA
35	d3-N-MeFOSAA	
36	PFOS-13C8	MeFOSAA-D3
37	NA	NA

Table 245 Labelled Standards for N-EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-EtFOSA - 2H5	PFOS-13C4
8	D5-N-Et FOSAA	
9	NA	NA
10	D5-N-EtFOSAA	13C2-D4-6:2FTS
11	YES	
12	d5-NEtFOSAA	
13	yes	
14	d5-EtFOSAA	
15	NA	NA
16		
17	NA	NA
18	d5-N-EtFOSAA	13C4-PFOA
19	d5-EtFOSAA	
20	13C-EtPFOSAA	
21		
22	NA	NA
23		
24	NA	NA
25	d5-N-EtFOSAA	
26	d5-NEtFOSAA	NA
27	d7-N-MeFOSE-M 2-(N-methyl-d3-perfluoro-1-octanesulfonamido) ethand4-ol	
28	NA	NA
29	d7-N-MeFOSE-M	MPFOS
30	D5-Et-FOSAA	N/A
31	NA	NA
32	NA	NA
33	d5-NEtFOSAA	
34	NA	NA
35	d5-NEtFOSAA	
36	PFOS-13C8	EtFOSAA-D5

Table 246 Labelled Standards for N-MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-MeFOSE - D7	PFOS-13C4
8	D7-N-Me FOSE	
9	NA	NA
10	D7-N-MeFOSE	13C4-PFOS
11	YES	
12	d7-N-MeFOSE	
13		
14	d7-MeFOSE	
15	NA	NA
16		
17	NA	NA
18	d3-MeFOSE	13C4-PFOA
19	d7-MeFOSE	
20		
21		
22	NA	NA
23		
24	NA	NA
25	d7-N-MeFOSE-M	
26	d7-NMeFOSE-M	NA
27	d9-N-EtFOSE-M 2-(N-ethyl-d5-perfluoro-1-octanesulfonamido) ethan-d4-ol	
28	NA	NA
29	d9-N-EtFOSE-M	MPFOS
30	D7-Me-FOSE	N/A
31	NA	NA
32	NA	NA
33	d7-N-MeFOSE-M	
34	NA	NA
35	d7-N-MeFOSE	
36	PFOS-13C8	MeFOSE-D3

Table 247 Labelled Standards for N-EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	N-EtFOSE - 2H9	PFOS-13C4
8	D9-N-Et FOSE	
9	NA	NA
10	D9-N-EtFOSE	13C4-PFOS
11	YES	
12	d9-N-EtFOSE	
13	yes	
14	d3-EtFOSE	
15	NA	NA
16		
17	NA	NA
18	d9-EtFOSE	13C4-PFOA
19	d3-EtFOSE	
20		
21		
22	NA	NA
23		
24	NA	NA
25	d9-N-EtFOSE-M	
26	d9-NEtFOSE-M	NA
27	M2-4:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-hexane sulfonate (4:2)	
28	NA	NA
29	M2-4:2FTS	MPFOS
30	D9-Et-FOSE	N/A
31	NA	NA
32	NA	NA
33	d9-N-EtFOSE-M	
34	NA	NA
35	d9-N-EtFOSE	
36	PFOS-13C8	EtFOSE-D9

Table 248 Labelled Standards for 6:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	6:2FTS - 13C2	PFHxS-18O2
8	13C2-6:2FTS	
9	NA	NA
10	13C2-6:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-6:2FTS	
13	yes	
14	13C2-6:2FTS	
15	NA	NA
16		
17	NA	NA
18	13C2-6:2FTS	13C4-PFOA
19	13C2-6:2FTS	
20	13C-6:2FTS	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-6:2FTS	
26	M6:2FTS	NA
27	M2-6:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-octane sulfonate (6:2)	
28	NA	NA
29	M2-6:2FTS	MPFOS
30	13C2,12C6 6:2FTS	N/A
31	NA	NA
32	NA	NA
33	M2-6:2FTS	
34	NA	NA
35	13C2-6:2FTS	
36	PFOS-13C8	6:2FTS-13C2

Table 249 Labelled Standards for 8:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7	8:2FTS - 13C2	PFHxS-18O3
8	13C2-8:2FTS	
9	NA	NA
10	13C2-8:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-8:2FTS	
13	yes	
14	13C2-8:2FTS	
15	NA	NA
16		
17	NA	NA
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-8:2FTS	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-8:2FTS	
26	M8:2FTS	NA
27	M2-8:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-decane sulfonate (8:2)	
28	NA	NA
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	NA	NA
32	NA	NA
33	M2-8:2FTS	
34	NA	NA
35	13C2-8:2FTS	
36	PFOS-13C8	8:2FTS-13C2

Table 250 Labelled Standards for 10:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	NT	NT
11	YES	
12	13C2-10-2 FTS	
13		
14	13C2-8:2FTS	
15	NA	NA
16		
17	NA	NA
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-10:2FTS	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-10:2FTS	
26	MPFDoDA	NA
27		
28	NA	NA
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	NA	NA
32	NA	NA
33	13C2 10:2FTS	
34	NA	NA
35	13C2-10-2 FTS	
36	PFOS-13C8	10:2FTS-13C2
37	NA	NA
38		

Table 251 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	NT	NT
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18		
19	NT	
20	13C-8:2diPAP	
21		
22	NA	NA
23		
24	NA	NA
25	13C2-8:2diPAP	
26	NT	NA
27		
28	NA	NA
29	M4-8:2diPAP	M2PFOA
30	NT	NT
31	NA	NA
32	NA	NA
33	13C4-8:2 Fluorotelomer phosphate diester	
34	NA	NA
35	N/A	
36		
37	NA	NA

Table 252 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C3-GenX	
9	NA	NA
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	13C3-GenX	
13	yes	
14		
15	NA	NA
16		
17	NA	NA
18	13C3-HFPO-DA	13C4-PFOA
19	NT	
20	13C-HFPO-DA	
21		
22	NA	NA
23		
24	NA	NA
25	13C3-HFPO-DA	
26	M3HFPO-DA	NA
27		
28	NA	NA
29	M3-HFPO-DA	MPFDA
30	13C312C3HF11O3	N/A
31	NA	NA
32	NA	NA
33	13C3 HFPO-DA	
34	NA	NA
35	13C3-GenX	
36	PFOS-13C8	
37	NA	NA
38		

Table 253 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C4-PFOA	
9	NA	NA
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18	13C4-PFHpA	13C4-PFOA
19	NT	
20	13C-PFOA	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFHpA	NA
27		
28	NA	NA
29	M3-HFPO-DA	MPFDA
30	13C4-PFHpA	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	
37	NA	NA
38		

Table 254 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18	13C4-PFOS	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	M8PFOS	NA
27		
28	NA	NA
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37	NA	NA
38		

Table 255 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C4-PFOS	13C8-PFOS
9	NA	NA
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18	13C2-PFDoA	
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23		
24	NA	NA
25		
26	MPFDoDA	NA
27		
28	NA	NA
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	NA	NA
32	NA	NA
33	13C4 PFOS	
34	NA	NA
35	N/A	
36	PFOS-13C8	FOSA-13C8
37	NA	NA
38		

Table 256 Labelled Standards for 3:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	13C5-PFPeA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	M5PFHxA	M2PFOA
30	NT	NT
31	NA	NA
32	NA	NA
33		
34	NA	NA
35	N/A	
36		

Table 257 Labelled Standards for 5:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8	13C2-6:2FTCA	
9	NA	NA
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	M5PFHxA	M2PFOA
30	NT	NT
31	NA	NA
32	NA	NA
33		
34	NA	NA
35	N/A	
36		
37	NA	NA
38		

Table 258 Labelled Standards for 7:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NA	NA
2	NA	NA
3		
4	NA	NA
5	NA	NA
6	NA	NA
7		
8		
9	NA	NA
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	NA	NA
16		
17	NA	NA
18		
19	NT	
20		
21		
22	NA	NA
23		
24	NA	NA
25		
26	NT	NA
27		
28	NA	NA
29	M4PFHpA	M2PFOA
30	NT	NT
31	NA	NA
32	NA	NA
33		
34	NA	NA
35	N/A	
36		
37	NA	NA
38		

Table 259 Participant Methodology for Biosolid Samples– Additional Information

Lab. Code	Sample	Additional Information
8	S3	Some homogeneity issues, with wide variation between replicates
10	S3	Sample was received at a temperature of 10°C which was above the method recommended sample storage temperature (less than or equal to 6ºC).
20	S3	Method not yet validated, measurement uncertainty is unknown. No accreditation for PFAS in biosolid.
23	All	4:2 FTS can be considered to be included
26	S3	N-EtFOSA is not reported (NR) because of a high internal standard recovery NT = not tested

APPENDIX 10 – PARTICIPANTS' TEST METHODS FOR WATER SAMPLES

Participants' methods for water samples are presented in Tables 260 to 307.

Table 260 Participant Methodology – Extraction

Lab Code	S4 Entire Container Used?	S4 Container Rinsed?	S4 Sample Amount Used (mL)	S5 Entire Container Used?	S5 Container Rinsed?	S5 Sample Amount Used (mL)	Labelled Std Added Before Extraction?	Labelled Std Added Directly into Bottle?	Other Sample Pretreatment	Extraction Technique	Extraction/Elution Solvent	Extraction Time	Extract Concentration Temperature	Extract Concentration Time	Final pH adjustment?	Carbon Cleanup?
1	NA	NA	NA	Yes	Yes	25, 50	Yes	No	No	Solid-Phase Extraction: Oasis WAX	Methanol	NA	Room temperature	30 mins	No	No
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	NA	Yes	10	NA	Yes	10	Yes	NA		Solid-Phase Extraction: HLB type (hydrophilic lipophilic balance)	ACN/MeOH	120			No	No
7	No	NA	5	No	NA	5	Yes	No	N/A	Filtration	0.2% AcOH/MeOH	N/A	20	N/A	No	No
8	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	0.2% ammonia in methanol	45	40		No	No
9	Yes	No		Yes	No		Yes	No		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	45 min	40°C	60min	No	No
10	No	No	51.07 mL	No	No	55.86 mL	Yes	No		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	60 min			No	Yes

Lab Code	S4 Entire Container Used?	S4 Container Rinsed?	S4 Sample Amount Used (mL)	S5 Entire Container Used?	S5 Container Rinsed?	S5 Sample Amount Used (mL)	Labelled Std Added Before Extraction?	Labelled Std Added Directly into Bottle?	Other Sample Pretreatment	Extraction Technique	Extraction/Elution Solvent	Extraction Time	Extract Concentration Temperature	Extract Concentration Time	Final pH adjustment?	Carbon Cleanup?
11	Yes	Yes		Yes	Yes		Yes	Yes	NO	Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	20 mins	40 °C	40 mins	No	No
12	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	30 min	45 degrees celcius	30 minutes	No	No
13	Yes			Yes			Yes			Direct Injection					Yes	No
14	Yes	Yes		Yes	Yes		Yes	Yes	Acidification	Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH in 0.1% NH4OH	~45min	40 degree blowdown	~2hrs	No	No
15	No	NA	1.2	No	NA	1.2	NA	NA	dilution Sample with MeOH en Acetonitril	Direct Injection						No
16	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	N/A	20	N/A	Not Applicable	No
17	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/MeOH	30 min	room		Yes	Yes

Lab Code	S4 Entire Container Used?	S4 Container Rinsed?	S4 Sample Amount Used (mL)	S5 Entire Container Used?	S5 Container Rinsed?	S5 Sample Amount Used (mL)	Labelled Std Added Before Extraction?	Labelled Std Added Directly into Bottle?	Other Sample Pretreatment	Extraction Technique	Extraction/Elution Solvent	Extraction Time	Extract Concentration Temperature	Extract Concentration Time	Final pH adjustment?	Carbon Cleanup?
18			10 ml			10 ml	Yes	No		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3				Yes	No
19	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH	60			Yes	No
20	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH 0.1%NH3		40 °C	30 - 120 min	No	No
21	Yes	Yes		Yes	Yes		Yes								No	
22	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	NA	Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	NA	NA	NA	Yes	Yes
23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	Yes	No	25ml per metho d	Yes	Yes	No	25ml per metho d	NA	pH Adjustme nt	Solid-Phase Extraction: C18	Methanol	Metha nol	ambien t	1 day	Yes	No
25	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	If combination or other, please type here.	4 hours	Room temper ature	3 hours	No	No
26	No	NA	100 mL	No	NA	100 mL	Yes	No	NA	Solid-Phase Extraction: WAX type (weak anion exchange)	0.1% NH4OH in MeOH	NA	50°C	Variab le	No	No

Lab Code	S4 Entire Container Used?	S4 Container Rinsed?	S4 Sample Amount Used (mL)	S5 Entire Container Used?	S5 Container Rinsed?	S5 Sample Amount Used (mL)	Labelled Std Added Before Extraction?	Labelled Std Added Directly into Bottle?	Other Sample Pretreatment	Extraction Technique	Extraction/Elution Solvent	Extraction Time	Extract Concentration Temperature	Extract Concentration Time	Final pH adjustment?	Carbon Cleanup?
27	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: Strata -X-AW	10:89:1 IPA/ACN/Am monium hydroxide					
28	No	No	50	No	No	50	Yes	No		Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/MeO H		ambien t	1hr	No	No
29	Yes	Yes		Yes	Yes		Yes	Yes	pH adjustmen t	Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/MeO H		40		No	No
30	Yes	Yes	N/A	Yes	Yes	N/A	Yes	No	Ph adjustmen t	SPE and Direct injection	MeOH	60 mins	40C	20 mins	Yes	Yes
31	Yes	Yes	--	Yes	Yes	--	Yes	Yes	pH Adjustme nt	Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH	Appro ximat ely 1 hour	30°C	variabl e	NA	NA
32	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH/N H4	NA	40	NA	Yes	No
33	Yes	Yes		Yes	Yes		Yes		None	Solid-Phase Extraction: Oasis WAX	0.3% NH4OH: Methanol	NA				
34	Yes	Yes	n/a	Yes	Yes	n/a	Yes	Yes	None	None	ACN/MeOH	45 min	Room temp	n/a	n/a	No ne

Lab Code	S4 Entire Container Used?	S4 Container Rinsed?	S4 Sample Amount Used (mL)	S5 Entire Container Used?	S5 Container Rinsed?	S5 Sample Amount Used (mL)	Labelled Std Added Before Extraction?	Labelled Std Added Directly into Bottle?	Other Sample Pretreatment	Extraction Technique	Extraction/Elution Solvent	Extraction Time	Extract Concentration Temperature	Extract Concentration Time	Final pH adjustment?	Carbon Cleanup?
35	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone		39	45	No	No
36	No		10	No		10	Yes			Solid-Phase Extraction: HLB type (hydrophilic lipophilic balance)	MeOH	1hr	40C	22min s	No	No
38	Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone		40-45 Deg C	~40mi n		

*Additional Information in Table 307.

Table 261 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
20	After SPE the solvent is changed to methanol/water 1/1
25	Elution Solvent MeOH, 1.0% NH3

Table 262 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Correction?
1	LC-MSMS or LC-QQQ	No	No
2	NA	NA	NA
6	LC-MSMS or LC-QQQ		No
7	LC-MSMS or LC-QQQ	No	No

Lab. Code	Instrument	Dilution Factor	Blank Correction?
8	LC-MSMS or LC-QQQ	no	No
9	LC-MSMS or LC-QQQ		No
10	LC-MSMS or LC-QQQ	No	No
11	LC-MSMS or LC-QQQ	NO	No
12	LC-MSMS or LC-QQQ	No	No
13	LC-MSMS or LC-QQQ		No
14	LC-MSMS or LC-QQQ		No
15	LC-MSMS or LC-QQQ	1.6667	Yes
16	LC-MSMS or LC-QQQ	No	No
17	LC-MSMS or LC-QQQ	Delutions water: 1, 2, 5, 10 and 20	No
18	LC-MSMS or LC-QQQ		No
19	LC-MSMS or LC-QQQ	No	No
20	LC-MSMS or LC-QQQ	No	No
21	LC-MSMS or LC-QQQ		
22	LC-MSMS or LC-QQQ	No	No
23	NA	NA	NA
24	LC-MSMS or LC-QQQ	5.90E-02	
25	LC-MSMS or LC-QQQ	yes (5 times)	No
26	LC-MSMS or LC-QQQ	NA	No
27	LC-Orbitrap		No
28	LC-MSMS or LC-QQQ	No	No
29	LC-MSMS or LC-QQQ		No
30	LC-MSMS or LC-QQQ	2	No
31	LC-MSMS or LC-QQQ	x10 for PFBA and PFPeA	No

Lab. Code	Instrument	Dilution Factor	Blank Correction?
32	LC-MSMS or LC-QQQ	No	No
33	LC-MSMS or LC-QQQ	None	No
34	LC-MSMS or LC-QQQ	none	No
35	LC-MSMS or LC-QQQ	No	No
36	LC-Orbitrap	DF1, DF10, DF100, DF1000	No
38	LC-MSMS or LC-QQQ	0.0125	Yes

*Additional Information in Table 307.

Table 263 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
24	Dynamic MRM
27	In this method the linear standards are used to quantify both the linear as well as the branched isomers

Table 264 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	Wellington	No	NA	NA
2	NA	NA	NA	NA
6	Wellington and Cambridge	No	No	
7	Wellington	No		
8	Wellington	Yes	Isotopic dilution	
9	Wellington	Yes	DIN 38407-42 (F 42) (2011-03)	
10	Wellington	Yes	No	
11	Wellington	No		
12	Wellington, Cambridge Isotope laborotories	No		
13	Wellington Labs	No		
14	Wellington	Yes	N/A	
15	Wellington	Yes	No	
16	Wellington	Yes	Isotope Dilution	
17	Wellington	Yes	No	IS-correction using the above labelled standards
18		yes		
19	Wellington Laboratories	Yes		
20	Chiron, Wellington, Cambridge Isotope Laboratories	Yes	Flemish Standard Method WAC/IV/A/025, see https://reflabos.vito.be/2024/WAC_IV_A_025.pdf	
22	Wellington Labs	Yes	No	
23	NA	NA	NA	NA
24	Wellignton	No	Yes, SPE	

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
25	Wellington and Cambridge Isotope Laboratories	Yes	Yes EPA Method 537.1 and 1633	
26	Wellington Laboratory	Yes	No	NA
27	Wellington	Yes	In house	
28	Wellington	Yes	No	
29	Wellington	Yes	USEPA 537	
30	Wellington	Yes	No. In-house	
31	Wellington Laboratories	Yes	In House	
32	Wellington	Yes	No	
33	Wellington	Yes		
34	Wellington Laboratory	No	No	
35	Wellington	Yes		
36	Wellington	Yes		Results corrected by ISTD added before instrumentation
38	Wellington Labratories			

Table 265 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFBS-13C3	
7	PFBS - 13C3	PFHxS-18O2
8	13C3-PFBS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFBS	18O2-PFHxS
11	YES	
12	13C3-PFBS	
13	yes	
14	13C3-PFBS	
15	Yes	no
16	Y	N
17	PFBS-13C3	
18	13C3-PFBS	13C4-PFOA
19	13C3-PFBS	
20	13C-PFBS	
21		
22	13C3-PFBS-Na	No
23	NA	NA
24		
25	13C3-PFBS	
26	M3PFBS	NA
27	Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS	
28	M3PFBS	M8PFOS
29	M3PFBS	MPFDA
30	13C3-PFBS	N/A
31	13C3-PFBS	
32	PFBS	
33	13C3 PFBS	
34	PFBS_ISTD	
35	13C3-PFBS	
36	PFOS-13C8	PFBS-13C3
37		
38	13C3-PFBS	

Table 266 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFBS-13C3	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	Yes	no
16	N	N
17	PFHxS-13C3	
18	13C3-PFBS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	13C3-PFBS-Na	No
23	NA	NA
24		
25		
26	M5PFHxA	NA
27		
28		
29	M3PFBS	MPFDA
30	18O2-PFHxS	N/A
31	16O2-PFHxS	
32	PFHxS	
33	13C3 PFBS	
34	PFHxS_ISTD	
35	N/A	
36	PFOS-13C8	PFOS-13C4
37		
38	13C3-PFBS	

Table 267 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C3-PFHxS	18O2-PFHxS
11	NO	
12	18O2-PFHxS	
13		
14	16O2-PFHxS	
15	Yes	no
16	Y	N
17	PFHxS-13C3	
18	18O2-PFHxS	13C4-PFOA
19	16O2-PFHxS	
20	13C-PFHxS	
21		
22	13C3-PFHxS-Na	No
23	NA	NA
24		
25	13C3-PFHxS	18O2-PFHxS
26	M3PFHxS	NA
27	Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS	
28	MPFHxS	M8PFOS
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	16O2-PFHxS	
32	PFHxS	
33	18O2 PFHxS	
34	PFHxS_ISTD	
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
37		
38	18O2-PFHxS	

Table 268 Labelled Standards for PFHxS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9		
10	13C3-PFHxS	18O2-PFHxS
11	YES	
12	18O2-PFHxS	
13	yes	
14	NT	
15	Yes	no
16	Y	N
17	PFHxS-13C3	
18	18O2-PFHxS	13C4-PFOA
19	NT	
20	13C-PFHxS	
21		
22	13C3-PFHxS-Na	No
23	NA	NA
24		
25		
26	M3PFHxS	NA
27		
28		
29	M3PFHxS	MPFDA
30	18O2-PFHxS	N/A
31	--	
32	NT	
33	18O2 PFHxS	
34	n/a	
35	18O2-PFHxS	
36	PFOS-13C8	PFHxS-18O2
37		
38	18O2-PFHxS	

Table 269 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHxS-18O2	
7	PFHxS - 13C3	PFHxS-18O2
8	18O2-PFHxS	13C3-PFHxS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	16O2-PFHxS	
15	Yes	no
16	Y	N
17	PFOS-13C4	
18	18O2-PFHxS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFHxS	
21		
22	13C3-PFHxS-Na	No
23	NA	NA
24		
25		
26	M3PFHxS	NA
27		
28		
29	M3PFHxS	MPFDA
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFHxS	
33	13C4 PFOS	
34	PFHxS_ISTD	
35	N/A	
36	PFOS-13C8	PFOS-C4
37		
38	18O2-PFHxS	

Table 270 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	NO	
12	13C8-PFOS	
13		
14	13C8-PFOS	
15	Yes	no
16	N	N
17	PFOS-13C4	
18	13C4-PFOS	13C4-PFOA
19	13C4-PFOS	
20	13C-PFOS	
21		
22	13C8-PFOS-Na	No
23	NA	NA
24		
25	13C8-PFOS	13C4-PFOS
26	M8PFOS	NA
27	Sodium perfluoro-1-[13C8] ocatanesulfonate M8PFOS	
28	M4PFOS	M8PFOS
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFOS	
33	13C4 PFOS	
34	PFOS_ISTD	
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
37		
38	13C8-PFOS	

Table 271 Labelled Standards for PFOS (linear)

Lab. Code	Before Extraction	Before Instrument Analysis
1	[13C4]-PFOS	[13C4]-PFOS
2	NA	NA
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9		
10	13C8-PFOS	13C4-PFOS
11	YES	
12	13C8-PFOS	
13	yes	
14	NT	
15	Yes	no
16	Y	N
17	PFOS-13C4	
18	13C4-PFOS	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	13C8-PFOS-Na	No
23	NA	NA
24		
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	NT	
33	13C4 PFOS	
34	PFOS_ISTD	
35	13C8-PFOS	
36	PFOS-13C8	PFOS-C4
37		
38	13C8-PFOS	

Table 272 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	Yes	no
16	N	N
17	NT	
18	13C8-PFOA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	13C8-PFOS-Na	No
23	NA	NA
24		
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFOS	
33	13C4 PFOS	
34	PFOS_ISTD	
35	N/A	
36	PFOS-13C8	PFBS-13C3
37		
38	13C8-PFOS	

Table 273 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFOS-13C4	
7	PFOS - 13C8	PFOS-13C4
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C8-PFOS	13C4-PFOS
11	YES	
12	N/A	
13		
14	13C8-PFOS	
15	Yes	no
16	N	N
17	PFOS-13C4	
18	13C2-PFUnA	13C4-PFOA
19	13C8-PFOS	
20	13C-PFOS	
21		
22	13C8-PFOS-Na	No
23	NA	NA
24		
25		
26	M8PFOS	NA
27		
28		
29	M8PFOS	MPFOS
30	13C4-PFOS	N/A
31	13C8-PFOS	
32	PFOS	
33	13C4 PFOS	
34	PFOS_ISTD	
35	N/A	
36	PFOS-13C8	PFBA-13C4
37		
38	13C8-PFOS	

Table 274 Labelled Standards for PFUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8		
9	C13-PFOS	
10	NT	NT
11	NT	
12	N/A	
13		
14	NT	
15	Yes	no
16	NT	NT
17	NT	
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	NT	
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 275 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFOS-13C4	
7		
8	13C2-PFTeDA	13C8-PFOS
9	C13-PFOSA	
10	13C8-PFOS	13C4-PFOS
11	NT	
12	N/A	
13		
14	NT	
15	Yes	no
16	NT	NT
17	NT	
18	13C12-PFDoA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37		
38	NT	

Table 276 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8		
9	C13-PFOSA	
10	NT	NT
11	YES	
12	N/A	
13		
14	NT	
15	Yes	no
16	NT	NT
17	NT	
18	13C2-PFTeDA	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	NT	NT
30	NT	NT
31	--	
32	NT	
33	NT	
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 277 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFBA-13C3	
7	PFBA-13C4	PFBA-13C3
8	13C4-PFBA	13C3-PFBA
9	C13-PFBA	
10	13C4-PFBA	13C3-PFBA
11	YES	
12	13C4-PFBA	
13	yes	
14	13C4-PFBA	
15	Yes	no
16	Y	N
17	PFBA-13C4	
18	13C4-PFBA	13C4-PFOA
19	13C4-PFBA	
20	13C-PFBA	
21		
22	13C4-PFBA	No
23	NA	NA
24		
25	13C4-PFBA	13C3-PFBA
26	M4PFBA	NA
27	Perfluoro-n-[13C4]butanoic acid MPFBA	
28		
29	MPFBA	M3PFBA
30	13C4-PFBA	N/A
31	13C4-PFBA	
32	PFBA	
33	13C4 PFBA	
34	PFBA_ISTD	
35	13C4-PFBA	
36	PFOS-13C8	PFBA-13C4
37		
38	13C4-PFBA	

Table 278 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFPeA-13C3	
7	PFPeA - 13C5	PFBA-13C3
8	13C4-PFPeA	13C5 -PFPeA
9	C13-PFHxA	
10	13C5-PFPeA	13C2-PFHxA
11	YES	
12	13C5-PFPeA	
13	yes	
14	13C5-PFPeA	
15	Yes	no
16	N	N
17	PFHxA-13C2	
18	13C5-PFPeA	13C4-PFOA
19	13C5-PFPeA	
20	13C-PFPeA	
21		
22	13C5-PFPeA	No
23	NA	NA
24		
25	13C5-PFPeA	
26	M5PFPeA	NA
27	Perfluoro-n-[13C5]pentanoic acid M5PFPeA	
28		
29	M5PFPeA	M3PFBA
30	13C3-PFPeA	N/A
31	13C5-PFPeA	
32	PFPeA	
33	13C5 PFPeA	
34	PFPeA_ISTD	
35	13C5-PFPeA	
36	PFOS-13C8	PFPeA-13C3
37		
38	13C5-PFPeA	

Table 279 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHxA-13C2	
7	PFHxA - 13C5	PFOA-13C2
8	13C2-PFHxA	13C5 -PFPeA
9	C13-PFHxA	
10	13C5-PFHxA	13C2-PFHxA
11	YES	
12	13C2-PFHxA	
13	yes	
14	13C5-PFHxA	
15	Yes	no
16	Y	N
17	PFHxA-13C2	
18	13C2-PFHxA	13C4-PFOA
19	13C5-PFHxA	
20	13C-PFHxA	
21		
22	13C5-PFHxA	No
23	NA	NA
24		
25	13C5-PFPxA	13C2-PFHxA
26	M5PFHxA	NA
27	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA	
28	M2PFHxA	M8PFOA
29	M5PFHxA	M3PFBA
30	13C2-PFHxA	N/A
31	13C5-PFHxA	
32	PFHxA	
33	13C2 PFHxA	
34	PFHxA_ISTD	
35	13C2-PFHxA	
36	PFOS-13C8	PFHxA-13C2
37		
38	13C2-PFHxA	

Table 280 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHpA-13C4	
7	PFHpA - 13C4	PFOA-13C2
8	13C3-PFHpA	13C8-PFOA
9	C13-PFOA	
10	13C4-PFHpA	13C4-PFOA
11	YES	
12	13C4-PFHpA	
13	yes	
14	13C4-PFHpA	
15	Yes	no
16	Y	N
17	PFHpA-13C4	
18	13C4-PFHpA	13C4-PFOA
19	13C4-PFHpA	
20	13C-PFHpA	
21		
22	13C4-PFHpA	No
23	NA	NA
24		
25	13C4-PFHpA	
26	MPFHpA	NA
27	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA	
28	M4PFHpA	M8PFOA
29	M4PFHpA	M3PFBA
30	13C4-PFHpA	N/A
31	13C4-PFHpA	
32	PFHpA	
33	13C4 PFHpA	
34	PFHpA_ISTD	
35	13C4-PFHpA	
36	PFOS-13C8	PFHpA-13C4
37		
38	13C4-PFHpA	

Table 281 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1	[13C4]-PFOA	[13C4]-PFOA
2	NA	NA
3		
4		
5		
6	PFOA-13C4	
7	PFOA - 13C4	PFOA-13C2
8	13C4-PFOA	13C8-PFOA
9	C13-PFOA	
10	13C8-PFOA	13C4-PFOA
11	YES	
12	13C8-PFOA	
13	yes	
14	13C4-PFOA	
15	Yes	no
16	Y	N
17	PFOA-13C8	
18	13C8-PFOA	13C4-PFOA
19	13C8-PFOA	
20	13C-PFOA	
21		
22	13C8-PFOA	No
23	NA	NA
24		
25	13C8-PFOA	13C4-PFOA
26	M8PFOA	NA
27	Perfluoro-n-[13C8]octanoic acid M8PFOA	
28	M4PFOA	M8PFOA
29	M8PFOA	M2PFOA
30	13C4-PFOA	N/A
31	13C4-PFOA	
32	PFOA	
33	13C4 PFOA	
34	PFOA_ISTD	
35	13C8-PFOA	
36	PFOS-13C8	PFOA-13C4
37		
38	13C8-PFOA	

Table 282 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFNA-13C5	
7	PFNA - 13C9	PFNA-13C5
8	13C5-PFNA	13C8-PFOA
9	C13-PFOA	
10	13C9-PFNA	13C4-PFNA
11	YES	
12	13C5-PFNA	
13	yes	
14	13C5-PFNA	
15	Yes	no
16	Y	N
17	PFDA-13C2	
18	13C5-PFNA	13C4-PFOA
19	13C5-PFNA	
20	13C-PFNA	
21		
22	13C9-PFNA	No
23	NA	NA
24		
25	13C9-PFNA	13C5-PFNA
26	M9PFNA	NA
27	Perfluoro-n-[13C9]nonanoic acid M9PFNA	
28	M5PFNA	M8PFOA
29	M9PFNA	M2PFOA
30	13C5-PFNA	N/A
31	13C5-PFNA	
32	PFNA	
33	13C5 PFNA	
34	PFNA_ISTD	
35	13C5-PFNA	
36	PFOS-13C8	PFNA-13C5
37		
38	13C5-PFNA	

Table 283 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFDA-13C2	
7	PFDA - 13C6	PFDA-13C2
8	13C2-PFDA	13C8-PFOA
9	C13-PFOA	
10	13C6-PFDA	13C2-PFDA
11	YES	
12	13C6-PFDA	
13	yes	
14	13C6-PFDA	
15	Yes	no
16	Y	N
17	PFDA-13C2	
18	13C2-PFDA	13C4-PFOA
19	13C6-PFDA	
20	13C-PFDA	
21		
22	13C6-PFDA	No
23	NA	NA
24		
25	13C6-PFDA	13C2-PFDA
26	M6PFDA	NA
27	Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA	
28	M2PFDA	M8PFOA
29	M6PFDA	MPFDA
30	13C2-PFDA	N/A
31	13C6-PFDA	
32	PFDA	
33	13C2 PFDA	
34	PFDA_ISTD	
35	13C6-PFDA	
36	PFOS-13C8	PFDA-13C2
37		
38	13C6-PFDA	

Table 284 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFUdA-13C2	
7	PFUdA - 13C7	PFDA-13C2
8	13C2-PFUdA	13C8-PFOA
9	C13-PFUnA	
10	13C7-PFUNA	13C2-PFDA
11	YES	
12	13C2-PFUnA	
13	yes	
14	13C2-PFUnDA	
15	Yes	no
16	Y	N
17	PFDA-13C2	
18	13C2-PFUnA	13C4-PFOA
19	13C2-PFUnDA	
20	13C-PFUnDA	
21		
22	13C7-PFUdA	No
23	NA	NA
24		
25	13C2-PFUnA	
26	M7PFUnDA	NA
27	Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA	
28		
29	M7PFUdA	MPFDA
30	13C2-PFUdA	N/A
31	13C2-PFUnDA	
32	PFUdA	
33	13C2 PFUnA	
34	PFUnDA_ISTD	
35	13C2-PFUnA	
36	PFOS-13C8	PFUNDA-13C2
37		
38	13C2-PFUnA	

Table 285 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFDoA-13C2	
7	PFDoA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	C13-PFDoA	
10	13C2-PFDoA	13C2-PFDA
11	YES	
12	13C2-PFDoA	
13	yes	
14	13C2-PFDoDA	
15	Yes	no
16	Y	N
17	PFDoA-13C2	
18	13C2-PFDoA	13C4-PFOA
19	13C2-PFDoDA	
20	13C-PFDoDA	
21		
22	13C2-PFDoA	No
23	NA	NA
24		
25		
26	MPFDoDA	NA
27	Perfluoro-n-[1,2 13C2]dodecanoic acid MPFDoA	
28		
29	MPFDoA	MPFDA
30	13C2-PFDoDA	N/A
31	13C2-PFDoDA	
32	PFDoA	
33	13C2 PFDoA	
34	PFDoA_ISTD	
35	13C2-PFDoA	
36	PFOS-13C8	PFDoDA-13C2
38	13C2-PFDoA	

Table 286 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFTeDA-13C2	
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFDoA	13C8-PFOA
9	C13-PFDoA	
10	13C2-PFDoA/13C2-PFTeDA	13C2-PFDA
11	YES	
12	N/A	
13		
14	13C2-PFDoDA	
15	Yes	no
16	N	N
17	PFTeDA-13C2	
18	13C12-PFDoA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTrDA	
21		
22	13C2-PFDoA	No
23	NA	NA
24		
25		
26	MPFDoDA	NA
27		
28		
29	MPFDoA	MPFDA
30	13C2-PFTeDA	N/A
31	13C2-PFDoDA	
32	PFDoA	
33	13C2 PFDoA	
34	PFDoA_ISTD	
35	N/A	
36	PFOS-13C8	PFTeDA-13C2
37		
38	13C2-PFTeDA	

Table 287 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFTeDA-13C2	
7	PFTeDA - 13C2	PFDA-13C2
8	13C2-PFTeDA	13C8-PFOA
9	C13-PFDoA	
10	13C2-PFTeDA	13C2-PFDA
11	YES	
12	13C2-PFTeDA	
13	yes	
14	13C2-PFTeDA	
15	Yes	no
16	Y	N
17	PFTeDA-13C2	
18	13C2-PFTeDA	13C4-PFOA
19	13C2-PFTeDA	
20	13C-PFTeDA	
21		
22	13C2-PFTeDA	No
23	NA	NA
24		
25	13C2-PFTeDA	
26	MPFTeDA	NA
27	Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA	
29	M2PFTeDA	MPFDA
30	13C2-PFTeDA	N/A
31	13C2-PFTeDA	
32	PFTeDA	
33	13C2 PFTeDA	
34	PFTeDA_INSTD	
35	13C2-PFTeDA	
36	PFOS-13C8	PFTeDA-13C2
37		
38	13C2-PFTeDA	

Table 288 Labelled Standards for PFODA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHxDA-13C2	
7		
8		
9		
10	NT	NT
11	YES	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	PFHxDA-13C2	
18	13C2-PFTeDA	13C4-PFOA
19	NT	
20	13C-PFHxDA	
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27	Perfluoro-1-[13C8]otanesulfonamide	
28		
29	M8FOSA-I	MPFOS
30	NT	NT
31	13C8-FOSA	
32	NT	
33	13C8 FOSA	
34	n/a	
35	N/A	
36	PFOS-13C8	PFHxDA-13C2
37		
38	NT	

Table 289 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	FOSA-13C8	
7	PFOSA - 13C8	PFOS-13C4
8	13C8-FOSA	
9	C13-PFOSA	
10	13C8-PFOSA	13C4-PFOS
11	YES	
12	13C8-FOSA	
13	yes	
14	13C8-FOSA	
15	Yes	no
16	Y	N
17	PFOSA-13C8	
18	13C8-PFOSA	13C4-PFOA
19	13C8-FOSA	
20	13C-PFOSA	
21		
22	13C8-FOSA	No
23	NA	NA
24		
25	13C8-PFOSA	
26	MPFOSA	NA
27	N-methyl-d3-perfluoro-1-octancesulfonamide	
28		
29	d-N-MeFOSA-M	MPFOS
30	13C8-FOSA	N/A
31	d3-MeFOSA	
32	PFOSA	
33	13C8 FOSA	
34	FOSA_ISTD	
35	13C8-FOSA	
36	PFOS-13C8	FOSA-13C8
37		
38	13C8-FOSA	

Table 290 Labelled Standards for N-MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	MeFOSA-D3	
7	N-MeFOSA - 2H3	PFOS-13C4
8	D3-N-Me FOSA	
9		
10	D3-N-MeFOSA	13C4-PFOS
11	YES	
12	d3-N-MeFOSA	
13	yes	
14	d3-MeFOSA	
15	Yes	no
16	Y	N
17	N-MeFOSA-D3	
18	D3-MeFOSA	13C4-PFOA
19	d3-MeFOSA	
20	13C-MePFOSA	
21		
22	D3-N-MeFOSA-M	No
23	NA	NA
24		
25	d3-N-MeFOSA-M	
26	d-NMeFOSA-M	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28		
29	d-N-EtFOSA-M	MPFOS
30	D3-M PFOSA	N/A
31	d5-EtFOSA	
32	N-MeFOSA	
33	d-N-MeFOSA-M	
34	N-MeFOSA_ISTD	
35	d3-N-MeFOSA	
36	PFOS-13C8	MeFOSA-D3
37		
38	d3-MeFOSA	

Table 291 Labelled Standards for N-EtFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	EtFOSA-D5	
7	N-EtFOSA - D5	PFOS-13C4
8	D5-N-Et FOSA	
9		
10	D5-N-EtFOSA	13C4-PFOS
11	YES	
12	d5-N-EtFOSA	
13	yes	
14	d5-EtFOSA	
15	Yes	no
16	Y	N
17	NT	
18	d5-EtFOSA	13C4-PFOA
19	d5-EtFOSA	
20	13C-EtPFOSA	
21		
22	D5-N-EtFOSA-M	No
23	NA	NA
24		
25	d5-N-EtFOSA-M	
26	d-NEtFOSA-M	NA
27		
28		
29	d3-N-MeFOSAA	MPFOS
30	D5-E PFOSA	N/A
31	d3-MeFOSAA	
32	N-EtFOSA	
33	d-N-EtFOSA-M	
34	N-EtFOSA_ISTD	
35	d5-N-EtFOSA	
36	PFOS-13C8	EtFOSA-D5
37		
38	d5-EtFOSA	

Table 292 Labelled Standards for N-MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	MeFOSAA-D3	
7	N-MeFOSAA - 2H3	PFOS-13C4
8	D3-N-Me FOSAA	
9	C13-PFUnA	
10	D3-N-MeFOSAA	13C2-D4-6:2FTS
11	YES	
12	d3-N-MeFOSAA	
13	yes	
14	d3-MeFOSAA	
15	Yes	no
16	Y	N
17	N-MeFOSAA-D3	
18	d3-N-MeFOSAA	13C4-PFOA
19	d3-MeFOSAA	
20	13C-MePFOSAA	
21		
22	D3-N-MeFOSAA	No
23	NA	NA
24		
25	d3-N-MeFOSAA	
26	d3-NMeFOSAA	NA
27	N-ethyl-d5-perfluoro-1-octanesulfonamide	
28		
29	d5-N-EtFOSAA	MPFOS
30	D3-Me-FOSAA	N/A
31	d5-EtFOSAA	
32	N-MeFOSAA	
33	d3-NMeFOSAA	
34	N-MeFOSAA_ISTD	
35	d3-N-MeFOSAA	
36	PFOS-13C8	MeFOSAA-D3
37		
38	d3-N-MeFOSAA	

Table 293 Labelled Standards for N-EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	EtFOSAA-D3	
7	N-EtFOSA - 2H5	PFOS-13C4
8	D5-N-Et FOSAA	
9	C13-PFUnA	
10	D5-N-EtFOSAA	13C2-D4-6:2FTS
11	YES	
12	d5-NEtFOSAA	
13	yes	
14	d5-EtFOSAA	
15	Yes	no
16	Y	N
17	N-EtFOSAA-D5	
18	d5-N-EtFOSAA	13C4-PFOA
19	d5-EtFOSAA	
20	13C-EtPFOSAA	
21		
22	D5-N-EtFOSAA	No
23	NA	NA
24		
25	d5-N-EtFOSAA	
26	d5-NEtFOSAA	NA
27	d7-N-MeFOSE-M 2-(N-methyl-d3-perfluoro-1-octanesulfonamido) ethand4-ol	
28		
29	d7-N-MeFOSE-M	MPFOS
30	D5-Et-FOSAA	N/A
31	d7-MeFOSE	
32	N-EtFOSAA	
33	d5-NEtFOSAA	
34	N-EtFOSAA_ISTD	
35	d5-NEtFOSAA	
36	PFOS-13C8	EtFOSAA-D5
38	d5-N-EtFOSAA	

Table 294 Labelled Standards for N-MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	MeFOSE-D7	
7	N-MeFOSE - D7	PFOS-13C4
8	D7-N-Me FOSE	
9		
10	D7-N-MeFOSE	13C4-PFOS
11	YES	
12	d7-N-MeFOSE	
13		
14	d7-MeFOSE	
15	Yes	no
16	Y	N
17	NT	
18	d3-MeFOSE	13C4-PFOA
19	d7-MeFOSE	
20		
21		
22	D7-N-MeFOSE-M	No
23	NA	NA
24		
25	d7-N-MeFOSE-M	
26	d7-NMeFOSE-M	NA
27	d9-N-EtFOSE-M 2-(N-ethyl-d5-perfluoro-1-octanesulfonamido) ethan-d4-ol	
28		
29	d9-N-EtFOSE-M	MPFOS
30	D7-Me-FOSE	N/A
31	d3EtFOSE	
32	N-MeFOSE	
33	d7-N-MeFOSE-M	
34	N-MeFOSE_ISTD	
35	d7-N-MeFOSE	
36	PFOS-13C8	MeFOSE-D3
38	d7-MeFOSE	

Table 295 Labelled Standards for N-EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	EtFOSE-D9	
7	N-EtFOSE - 2H9	PFOS-13C4
8	D9-N-Et FOSE	
9		
10	D9-N-EtFOSE	13C4-PFOS
11	YES	
12	d9-N-EtFOSE	
13	yes	
14	d3-EtFOSE	
15	Yes	no
16	Y	N
17	NT	
18	d9-EtFOSE	13C4-PFOA
19	d3-EtFOSE	
20		
21		
22	D9-N-EtFOSE-M	No
23	NA	NA
24		
25	d9-N-EtFOSE-M	
26	d9-NEtFOSE-M	NA
27	M2-4:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-hexane sulfonate (4:2)	
28		
29	M2-4:2FTS	MPFOS
30	D9-Et-FOSE	N/A
31	13C2-4:2FTS	
32	N-EtFOSE	
33	d9-N-EtFOSE-M	
34	N-EtFOSE_ISTD	
35	d9-N-EtFOSE	
36	PFOS-13C8	EtFOSE-D9
38	d9-EtFOSE	

Table 296 Labelled Standards for 6:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	6:2FTS-13C2	
7	6:2FTS - 13C2	PFHxS-18O2
8	13C2-6:2FTS	
9	C13-6:2FTS	
10	13C2-6:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-6:2FTS	
13	yes	
14	13C2-6:2FTS	
15	Yes	no
16	Y	N
17	6:2FTS-13C2	
18	13C2-6:2FTS	13C4-PFOA
19	13C2-6:2FTS	
20	13C-6:2FTS	
21		
22	13C2-6:2FTS-Na	No
23	NA	NA
24		
25	13C2-6:2FTS	
26	M6:2FTS	NA
27	M2-6:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-octane sulfonate (6:2)	
28	M2-6:2FTS	M8PFOS
29	M2-6:2FTS	MPFOS
30	13C2,12C6 6:2FTS	N/A
31	13C2-6:2FTS	
32	6:2FTS	
33	M2-6:2FTS	
34	6:2FTS_ISTD	
35	13C2-6:2FTS	
36	PFOS-13C8	6:2FTS-13C2
38	13C2-62FTS	

Table 297 Labelled Standards for 8:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	8:2FTS-13C2	
7	8:2FTS - 13C2	PFHxS-18O3
8	13C2-8:2FTS	
9	C13-6:2FTS	
10	13C2-8:2FTS	13C2-D4-6:2FTS
11	YES	
12	13C2-8:2FTS	
13	yes	
14	13C2-8:2FTS	
15	Yes	no
16	Y	N
17	8:2FTS-13C2	
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-8:2FTS	
21		
22	13C2-8:2FTS-Na	No
23	NA	NA
24		
25	13C2-8:2FTS	
26	M8:2FTS	NA
27	M2-8:2FTS -1H,1H,2H,2H-perfluoro1-[1,2-13C2]-decane sulfonate (8:2)	
28	M2-8:2FTS	M8PFOS
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	13C2-8:2FTS	
32	8:2FTS	
33	M2-8:2FTS	
34	8:2FTS_ISTD	
35	13C2-8:2FTS	
36	PFOS-13C8	8:2FTS-13C2
38	13C2-82FTS	

Table 298 Labelled Standards for 10:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	10:2FTS-13C2-D4	
7		
8		
9		
10	NT	NT
11	YES	
12	13C2-10-2 FTS	
13		
14	13C2-8:2FTS	
15	Yes	no
16	Y	Y
17	10:2FTS-13C2-D4	
18	13C2-8:2FTS	13C4-PFOA
19	13C2-8:2FTS	
20	13C-10:2FTS	
21		
22	NA	NA
23	NA	NA
24		
25	13C2-10:2FTS	
26	MPFDoDA	NA
27		
28		
29	M2-8:2FTS	MPFOS
30	13C2 8:2FTS	N/A
31	13C2-8:2FTS	
32	8:2FTS	
33	13C2 10:2FTS	
34	8:2FTS_ISTD	
35	13C2-10:2FTS	
36	PFOS-13C8	10:2FTS-13C2
37		
38	13C2-PFDoA	

Table 299 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8		
9	C13-8:2diPAP	
10	NT	NT
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	8:2diPAP-13C4	
18		
19	NT	
20	13C-8:2diPAP	
21		
22	NA	NA
23	NA	NA
24		
25	13C2-8:2diPAP	
26	NT	NA
27		
28		
29	M4-8:2diPAP	M2PFOA
30	NT	NT
31	--	
32	NT	
33	13C4-8:2 Fluorotelomer phosphate diester	
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 300 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	HFPO-DA-13C3	
7		
8	13C3-GenX	
9	C13-PFHxA	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	13C3-GenX	
13	yes	
14		
15	Yes	no
16	NT	NT
17	NT	
18	13C3-HFPO-DA	13C4-PFOA
19	NT	
20	13C-HFPO-DA	
21		
22	13C3-HFPO-DA	No
23	NA	NA
24		
25	13C3-HFPO-DA	
26	M3HFPO-DA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C312C3HF11O3	N/A
31	--	
32	NT	
33	13C3 HFPO-DA	
34	n/a	
35	13C3-GenX	
36	PFOS-13C8	
37		
38	NT	

Table 301 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFHpA-13C4	
7		
8	13C4-PFOA	
9	C13-PFOA	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18	13C4-PFHpA	13C4-PFOA
19	NT	
20	13C-PFOA	
21		
22	NA	NA
23	NA	NA
24		
25		
26	MPFHpA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFHpA	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	
37		
38	NT	

Table 302 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFNA-13C5	
7		
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18	13C4-PFOS	13C4-PFOA
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23	NA	NA
24		
25		
26	M8PFOS	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	PFPeA-13C3
37		
38	NT	

Table 303 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	PFDoA-13C2	
7		
8	13C4-PFOS	13C8-PFOS
9	C13-PFOS	
10	13C3-HFPO-DA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18	13C2-PFDoA	
19	NT	
20	13C-PFOS	
21		
22	NA	NA
23	NA	NA
24		
25		
26	MPFDoDA	NA
27		
28		
29	M3-HFPO-DA	MPFDA
30	13C4-PFOS	N/A
31	--	
32	NT	
33	13C4 PFOS	
34	n/a	
35	N/A	
36	PFOS-13C8	FOSA-13C8
37		
38	NT	

Table 304 Labelled Standards for 3:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8		
9		
10	13C5-PFPeA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	M5PFHxA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 305 Labelled Standards for 5:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8	13C2-6:2FTCA	
9		
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	M5PFHxA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 306 Labelled Standards for 7:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	NA	NA
3		
4		
5		
6	NT	
7		
8		
9		
10	13C5-PFHxA	13C2-PFHxA
11	NT	
12	N/A	
13		
14		
15	Yes	no
16	NT	NT
17	NT	
18		
19	NT	
20		
21		
22	NA	NA
23	NA	NA
24		
25		
26	NT	NA
27		
28		
29	M4PFHpA	M2PFOA
30	NT	NT
31	--	
32	NT	
33		
34	n/a	
35	N/A	
36		
37		
38	NT	

Table 307 Participant Methodology for Water Samples – Additional Information

Lab. Code	Sample	Additional Information
10	S4 and S5	Sample was received at a temperature of 10°C which was above the method recommended sample storage temperature (less than or equal to 6ºC).
20	S4 and S5	The laboratory is accredited for following PFAS in water samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFBS, PFHxS, PFOS, PFOSA.
23	All	4:2 FTS can be considered to be included
26	S4 and S5	N-MeFOSA, NEtFOSA, N-MeFOSE, N-EtFOSE are not reported (NR) because of poor recovery of our QC sample 10:2 FTS is not reported (NR) because of a recovery of our QC sample NT = not tested

APPENDIX 11 – ACRONYMS AND ABBREVIATIONS

10:2FTS	1H, 1H, 2H, 2H-perfluorododecane sulfonate
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
4:2FTS	1H, 1H, 2H, 2H-perfluorohexane sulfonate
5:3FTCA	2H, 2H, 3H, 3H-perfluorooctanoic acid
6:2FTS	1H, 1H, 2H, 2H-perfluorooctane sulfonate
8:2diPAP	Fluorotelomer phosphate diester
8:2FTS	1H, 1H, 2H, 2H-perfluorodecane sulfonate
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ACN	Acetonitrile
ADONA	Ammonium 4,8-dioxa-3H-perfluorononanoate
AQA	Analytical and Quality Assurance
AV	Assigned Value
CRM	Certified Reference Material
CV	Coefficient of Variation
DI	Direct Injection
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
ISO	International Standards Organisation
ISTD	Internal Standard
LC	Liquid Chromatography
LC-MSMS	Liquid Chromatography with Tandem Mass Spectrometry
LLE	Liquid-Liquid Extraction
LOR	Limit of Reporting
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

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-butanesulfonate
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
PFODA	Perfluorooctadecanoic 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
PFTrDA	Perfluorotridecanoic acid
PFTrDS	Perfluorotridecane sulfonate
PFUdA	Perfluoroundecanoic acid
PFUdS	Perfluoroundecane sulfonate
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
USEPA	United States Environmental Protection Agency

END OF REPORT