Australian Government
Department of Industry, Innovation and Science
National Measurement Institute

Proficiency Test Report
AQA 19-11
PFAS in Soil and Water

January 2020

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

AQA 19-11 was conducted in July 2019. Thirty-three laboratories participated and thirty-two submitted results by the due date.

This study focused on the measurement of twenty-nine per- and polyfluorinated alkyl substances (PFAS): PFOS, PFOA, PFHxS, PFOSA, PFBS, PFBA, PFPeA, PFHxA, PFHpA, PFNA, PFDA, PFTeDA, MeFOSA, EtFOSE, 6:2 FTS, 8:2 FTS, ADONA, EtFOSA, EtFOSAA, GenX, MeFOSAA, MeFOSE, PFDoA, PFDS, PFHpS, PFNS, PFPeS, PFTrA, and PFUnA in soil and water. Four test samples were prepared at the NMI North Ryde laboratory and consisted of:

- two soil samples: Sample S1 with incurred PFAS contaminants, and Sample S2 spiked with 19 individual PFAS components; and
- two water samples: Sample S3 with incurred PFAS contaminants, and Sample S4 spiked with 19 individual PFAS components.

The samples were sufficiently homogeneous for evaluation of participants' performance. Stability issues were encountered for some new analytes spiked in the water Sample S4, EtFOSAA, EtFOSA and MeFOSE, and for these analytes no performance assessment of participants' results was conducted.

Of a possible 2192 expected numeric results a total of 1620 (74%) were submitted.

For PFOA in Sample S4, the assigned value was the reference value obtained from exact matching isotope dilution with liquid chromatography tandem mass spectrometry. The uncertainty of the reference value was estimated from an uncertainty budget of the measurement process.

Traceability: The reference value of PFOA in Sample S4 relies on gravimetric sample preparation, quantification by LC-MSMS, and density measurement. Gravimetric measurements are traceable to the SI unit for mass, the kilogram, through the Australian standard for mass. LC-MSMS measurements are traceable to the SI unit for mass via calibration with pure standard reference material certified by the National Metrology Institute, Japan (NMIJ 4056-a). Density measurement was calibrated using ultra high purity water and is traceable to the NMI Australia determination of the density of water.[1]

For all other analytes, the assigned values were the robust average of participants' results. The associated uncertainties were estimated from the robust standard deviation of the participants' results. **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.

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

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

  Laboratory performance was assessed using both z-scores and E_n-scores.
  Of 1382 z-scores, 1228 (89%) were satisfactory with $|z| \leq 2$.
  Of 1382 E_n-scores, 1019 (74%) were satisfactory with $|E_n| \leq 1$.

  Twenty-six laboratories analysed both matrices, two laboratories analysed soil only, and four laboratories analysed water only. No laboratories returned both satisfactory z and E_n-scores for all analytes for which scores were calculated.

  Laboratories **14** and **15** returned satisfactory z-scores for all analytes for which z-scores were calculated (59).

  Laboratory **14** had the highest number of satisfactory E_n-scores (57 out of 59).

- *to evaluate the laboratories' methods;*

  Participants used a variety of methods for extraction. No correlation between results and method was evident. The analytical detection method of choice was LC-MSMS.

  Sample S1 and Sample S4 had the lowest number of results reported. Sample S1, an incurred soil from a contaminated site, presented difficulties to participant laboratories due to the high level of PFOS in the sample, while the level of spiked analytes in Sample S4 was below the LOR of some participants.

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

  Of 1620 results, 1616 were reported with an associated estimate of expanded measurement uncertainty. The magnitude of the reported expanded uncertainties was within the range 0.1% to 100% of the reported value. Laboratories **4**, **16**, and **33** did not report expanded measurement uncertainties for all their tested analytes.

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: 'evaluation of participant performance against pre-established criteria by means of interlaboratory comparison.'[2] 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;
- per- and polyfluorinated alkyl substances (PFAS);
- petroleum hydrocarbons in soil and water;
- inorganic analytes in soil, water, food and pharmaceuticals;
- controlled drug assay;
- folic acid in flour; and
- allergens in food.

1.2 Study Background

Per- and polyfluorinated alkyl substances (PFAS) are chemicals found in industrial products such as fire-fighting foams and non-stick coatings. Their resistance to degradation makes them a growing global environmental concern. These complex contaminants are challenging to measure. PFOS, the most commonly reported PFAS, was added in 2010 to the list of chemicals regulated under the international Stockholm Convention for Persistent Organic Pollutants, to which Australia is a signatory.

1.3 Study Aims

The aims of the study were to:

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

1.4 Study Conduct

The conduct of NMI proficiency tests is described in the NMI Chemical Proficiency Testing Study Protocol.[3] The statistical methods used are described in the NMI Chemical Proficiency Statistical Manual.[4] These documents have been prepared with reference to ISO 17043[2] and The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories.[5]

The study falls within the scope of NMI's accreditation as a proficiency testing provider.

2 STUDY INFORMATION

2.1 Study Timetable

The timetable of the study was:

Invitation issued	30 June 2019
Samples dispatched	23 July 2019
Results due	20 September 2019
Interim report issued	15 October 2019

2.2 Participation

One hundred and twenty-four Australian and international laboratories were invited to participate. Thirty-three laboratories participated and thirty-two submitted results by the due date.

2.3 Test Material Preparation

Four test samples were prepared in June 2019. Care was taken to avoid any Teflon contamination during sample preparation.

- Two soil samples S1 and S2 each 20 g
  - Sample S1 with incurred PFAS contaminants; and
  - Sample S2 spiked with 19 individual PFAS components.
- Two water samples S3 and S4 each 2 x 50 mL
  - Sample S3 with incurred PFAS contaminants; and
  - Sample S4 spiked with 19 individual PFAS components.

    Fifteen analytes were added into the bulk water sample that was dispensed in 65 mL HDPE bottles. Each bottle was then further spiked with a composite solution containing PFTeDA, PFOSA, EtFOSA, and MeFOSE to minimise the loss of these analytes during preparation (see details in Appendix 1).

Five PFAS analytes, ADONA, GenX, EtFOSA, EtFOSAA, and MeFOSE were introduced for the first time in this PT study.

The analytical standards used for spiking samples in AQA 19-11 were purchased from HPC Standards GmbH, Toronto Research Chemicals, Sigma-Aldrich and Wellington Laboratories Canada.

Details of the spiked analytes and levels are presented in Table 1.

Table 1 Formulated concentrations of test samples

PFAS	S2 Soil µg/kg Spiked	S4 Water µg/L Spiked
PFBA	30.1	0.11
PFPeA	7.32	0.0478
PFHxA	10.1	0.0235
PFHpA	5.03	0.0095
PFOA	1.99	0.0805
PFNA	6.87	0.112
PFDA	60.3	0.0498

PFAS	S2 Soil µg/kg Spiked	S4 Water µg/L Spiked
PFTeDA	19.6	0.084
PFBS	20.3	0.0598
PFHxS	9.12	0.0907
PFOS	4.64	0.0556
PFOSA	14.9	0.063
EtFOSA	9.36	0.125
EtFOSAA	5.35	0.0698
MeFOSE	30	0.208
6:2 FTS	9.51	0.0189
8:2 FTS	9.61	0.0812
GenX	75.0	0.15
ADONA	78.2	0.141

2.4 Test Material Homogeneity and Stability Testing

The preparation of the study samples is described in Appendix 1. No homogeneity or stability testing was conducted on soil and water samples. These samples were prepared and packaged using a process that has been demonstrated to produce homogeneous and stable samples for previous NMI PFAS PT and participants' results gave no reason to question the homogeneity and stability of the previously used analytes. However there were stability issues with some of the new analytes introduced in this study including EtFOSAA, EtFOSA and MeFOSE, and no assessment of participants' performance for these analytes was conducted. Possible reasons for instability of these compounds are presented in section 6.7.

2.5 Laboratory Code

All laboratories that agreed to participate were assigned a confidential code number.

2.6 Sample Storage, Dispatch and Receipt

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

Participants were sent 20 g soil in Greiner tubes for each of Samples S1 and S2, and two 50 mL water in HDPE bottles for each of Samples S3 and S4. The samples were packed in a foam box with a cooler brick and sent by courier on 23 July 2019.

The following items were packaged with the samples:

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

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

2.7 Instructions to Participants

Participants were instructed as follows:

- Quantitatively analyse the samples using **your normal test method**. For water samples **use** the entire content of the bottle for analysis.
- Report results in units of **µg/kg** on an **as received basis** for soil samples.

- Report results in units of **µg/L** for water samples.
- For each analyte in each sample 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 in each sample report the **associated expanded measurement uncertainty** (e.g. 0.50 ± 0.02 µg/kg).
- Report any analyte not tested as **NT**.
- 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 the basis of your uncertainty estimates (e.g. uncertainty budget, repeatability precision, long term result variability).
- If determined, report your internal standard percentage recovery. This will be presented in the report for information only.
- Please **complete the method details** as required in the Methodology sheet.
- Return the completed results sheet by e-mail to proficiency@measurement.gov.au
- **Please return completed result sheet by 20 September 2019. Late results may not be included in the study report.**

2.8 Interim Report

An interim report was emailed to participants on 15 October 2019.

3 PARTICIPANT LABORATORY INFORMATION

3.1 Test Methods Reported by Participants

Table 2 Test methods – Samples S1 and S2 Soil

Lab Code	Sample Weight (g)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
1	S1: 5.05 S2: 5.02	homogenisation	Alkaline digestion	KOH/ methanol	Shaker/ Sonication	Room (3 hour shake, 12 hour sonication bath)	SPE (WAX 150mg/6cc)	LC-MSMS or LCQQQ	C18	10cm x 3.0mm x 3um	No
2		homogenisation	Liquid Liquid (LLE)	Methanol	Sonication	2x20min / 40 C°	active carbon	LC-MSMS or LCQQQ	Nucleodur Shinx RP 3µm		Yes
4	S1: 1.02 S2: 1.01	homogenisation	Alkaline digestion	0.2 % sodium hydroxide solution	Sonication	40-60°C for 20 min	SPE Envicarb	LC-MSMS or LCQQQ	C18	50 x 2.1mm, 1.9 µm	Yes
5			Solid Liquid (SLE)	Methanol/ ammonium hydroxide	Sonication	Room (30min)	Envi-carb SPE	LC-MSMS or LCQQQ Sciex Triple Quad 6500+	EVO C18	10cm x 2mm x 2.6µm	Yes
6	6	homogenisation	Alkaline digestion	ammonia-methanol	Sonication	room temp	GCB SPE	LC-MSMS or LCQQQ	Waters HSS T3	2.1 *100mm	Yes
7	0.5	no	Solid Liquid (SLE)	MeOH with 1% ammonium Hydroxide	Sonication	Room T	Bond Elut Carbon	LC-TOF or QTOF	C18	100 × 2.1 mm × 2.6µm, 100mg	Yes
8	1	homogenisation	Solid Liquid (SLE)	25uL NH3, 10mL Methanol, x2	2x Sonication in NH3-MeOH, dilute with water, pH adjust to 6.5 then SPE	ambient	Dilute 20mL extract with 180mL water, adjust to pH 6.5, SPE clean up as per water method	LC-MSMS or LCQQQ	C18	50mm x 2.0mm x 1.8µm	Yes

Lab Code	Sample Weight (g)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
9	S1: 0.1012 S2: 0.102	pH adjustment	Solid Phase (SPE)	Methanol	Sonication	30C	SPE Wax	LC-MSMS or LCQQQ	C18	75 mm	Yes
10			Direct Injection Isotope dilution	MeOH	Tumbling Vortex	Room temp	active carbon	LC-MSMS or LCQQQ	HPH - C18	2.1x 50mmx 2.7micron	Yes
11	0.5	None	Solid Phase (SPE) and Direct Injection	Methanol	SPE (WAX)	N/A	SPE (WAX), direct injection: filtration (RC)	LC-MSMS or LCQQQ	C18	1.6 µm, 50 mm x 2.0 mm	Yes
14	2		Solid Liquid (SLE)	Acetonitrile	Shaking	Ambient 15mins	SPE	Orbitrap	C18	50 cm x 2.1 cm x 2.7 um	Yes
15	2		Solid Liquid (SLE)	Acetonitrile	Shaking	Ambient 15mins	SPE	Orbitrap	C18	50 cm x 2.1 cm x 2.7 um	Yes
17		pH adjustment	Alkaline digestion	KOH-methanol	Tumbling	Room (20 min)/2 hours		LC-MSMS or LCQQQ	C18	50x2.1mm	No
18	2	NA	Solid Liquid (SLE)	200mM NaOH, MeOH	Vortex, shaking	Room temperature (30min)	dSPE (graphitised carbon)	LC-MSMS or LCQQQ	Zorbax XDB-C18	100 mm x 2.1 mm, 1.8µm	Yes
19	S1: 5 S2: 5.02	pH adjustment	Solid Liquid (SLE)	KOH-Methanol	Shaking	Room (20 min)	Ultracentrifugation, Active Carbon, SPE (Oasis, Wax)	LC-MSMS or LCQQQ	C18	5 cm x 2.1 mm x 1.7µm	Yes
20	1	homogenisation	Liquid Liquid (LLE)	MeOH/ Ammonium hydroxide 99:1	sonicate, vortex, centrifuge	Sonicate 30 min at 30-35 degrees	Strata X-AW 33um polymeric Weak Anion	Orbitrap	Kinetex C18	100x3mm 2.6 um	No

Lab Code	Sample Weight (g)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
21	2	pH adjustment Ammonium hydroxide	Solid Phase (SPE) DVB cartridge	Methanol, Water	Shaking, vortex	Room (1 h)	centrifugation	LC-MSMS or LCQQQ	C18	15 cm x 2.1 mm x 2.7 µm	Yes
22	S2: 1	homogenisation	Sonication	Methanol	Sonication	Room	SPE	LC-MSMS or LCQQQ	C8	3.0 x 100 mm, 3.5 micron	No
23	2	homogenisation	Ion Pair (IPE) Solvent extraction with ion-pairing	MTBE	Shaking	Room	None	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	Yes
24	1	homogenisation	Solid Liquid (SLE)	NH4OH 1% in MeOH	Sonication	room	none	LC-MSMS or LCQQQ	C18	2.0mmx50mm (1.6um)	Yes
25	2	homogenisation	Ion Pair (IPE) Solvent extraction with ion-pairing	MTBE	Shaking	Room	None	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	No
26	2	homogenisation	Ion Pair (IPE)	MTBE	Shaking	Room Temp	None	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	Yes
28	S1: 1 S2: 1.03	homogenisation	Solid Phase (SPE)		Shaking	room	SPE cartridge	LC-MSMS or LCQQQ	BEH C18	100mm x 2.1 mm	No
29	5		Alkaline digestion	Basified MeOH	sonication/ shaking	Room	Envicarb if needed	LC-MSMS or LCQQQ	C18	50 mm x 2.1mm x 1.8um	Yes
30	2 and 0.5		Solid Liquid (SLE)	1% nh3 in meoh	vortex, sonication	room 30 mins	dilute water, filter	LC-MSMS or LCQQQ	C18	50x 3.0 x 1.8	Yes

Lab Code	Sample Weight (g)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
31	2	homogenisation	Solid Phase (SPE)	Methanol	Tumbling	Room	Envicarb	LC-MSMS or LCQQQ	C18	2.1mm x 50mm x 2.7um	No
32	2	homogenisation	Solid Liquid (SLE)	4:1 Methanol: Water	Tumbling	Room 30min	None	LC-MSMS or LCQQQ	C18	2.1 mm × 50 mm, 2.7 µm	No
33	S1: 1.015 S2: 1.357	homogenisation	Solid Liquid (SLE)	1% acetic acid in methanol	Sonication	Room temperature (3 hours)	nylon filtration	LC-MSMS or LCQQQ	C18	100 mm x 4.6 mm x 2.6 µm	Yes

Table 3 Test methods – Samples S1 and S2 Soil (continued)

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
1	PFBA: 13C4 PFBA; PFPeA: 13C5 PFPeA; PFHxA: 13C2 PFHxA; PFHpA: 13C4 PFHpA; PFOA: 13C4 PFOA; PFNA: 13C5 PFNA; PFDA: 13C2 PFDA; PFUnA: 13C2 PFUnA; PFDoA: 13C2 PFDoA; PFTrA: 13C2 PFDoA; PFTeDA: 13C2 PFTeDA; PFBS: 18O2 PFHxS; PFPeS: 18O2 PFHxS; PFHxS: 18O2 PFHxS; PFHpS: 13C4 PFOS; PFOS: 13C4 PFOS; PFNS: 13C4 PFOS; PFDS: 13C4 PFOS; PFOSA: 13C8 PFOSA; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-NMeFOSAA; EtFOSAA: d7-NEtFOSAA; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d9-N-EtFOSA-M; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS; 10:2 FTS: M2-8:2 FTS; GenX: 13C3 HFPO-DA; ADONA: 13C4 PFOS	Wellington	Yes		No	No
2	PFBA: 13C4 PFBA; PFPeA: 13C5 PFPeA; PFHxA: 13C2 PFHxA; PFHpA: 13C4 PFHpA; PFOA: 13C8 PFOA; PFNA: 13C5 PFNA; PFDA: 13C2 PFDA; PFUnA: 13C2 PFUnA; PFDoA: 13C2 PFDoA; PFTrA: 13C2 PFTeDA; PFTeDA: 13C2 PFTeDA; PFBS: 13C3	Wellington		For all PFAS tested, as well as PFPeS, PFNS, MeFOSA, EtFOSA, MeFOSAA, EtFOSAA, MeFOSE, EtFOSE, and 10:2 FTS: 13C4 PFOA		No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFBS; PFHxS: 18O2 PFHxS; PFHpS: 18O2 PFHxS; PFOS: 13C4 PFOS; PFDS: 13C2 PFUnA; PFOSA: 13C8 PFOSA; 6:2 FTS: 13C2 6:2 FTS; 8:2 FTS: 13C2 6:2 FTS					
4	All: C8-PFOS	Wellington	No	PFBA: 13C4-PFBA; PFPeA: 13-C4 PFOS; PFHxA: 13-C4 PFOS; PFHpA: 13-C4 PFOS; PFOA: 13-C4 PFOS; PFNA: 13-C4 PFOS; PFDA: 13-C4 PFOS; PFUnA: 13C2-PFDOA; PFDoA: 13C2-PFDOA; PFTrA: 13C2-PFDOA; PFTeDA: 13C2-PFDOA; PFBS: 13-C4 PFOS; PFPeS: 13-C4 PFOS; PFHxS: 13-C4 PFOS; PFHpS: 13-C4 PFOS; PFOS: 13-C4 PFOS; PFNS: 13C2-PFDOA; PFDS: 13-C4 PFOS; PFOSA: 13-C4 PFOS; MeFOSA: d5-EtFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d5-EtFOSA; EtFOSAA: d5-EtFOSA; MeFOSE: d5-EtFOSA; EtFOSE: d5-EtFOSA; 6:2 FTS: 13C2 4:2-FTS; 8:2 FTS: 13C2 4:2-FTS; 10:2 FTS: 13C2 4:2-FTS; GenX: M3-HFPO-DA; ADONA: 13C2-PFDOA	Yes MOECC E3506	No
5	PFBA: 13C4-PFBA; PFPeA: 13C3 PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2PFUdA; PFDoA: 13C2PFDoA; PFTrA: 13C2PFDoA; PFTeDA: 13C2PFTeDA; PFBS: 13C3 PFBS; PFPeS: 13C3 PFBS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS; PFOS: 13C4-PFOS; PFNS: 13C4-PFOS; PFDS: 13C4-PFOS; PFOSA: 13C8-FOSA; MeFOSA: D3-N-Me FOSA; EtFOSA: D5-N-Et FOSA; MeFOSAA: D3-N-Me FOSAA; EtFOSAA: D5-N-Et FOSAA; MeFOSE: D7-N-Me FOSE; EtFOSE: D9-N-Et FOSE; 6:2 FTS: 13C26:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS	Wellington	Yes	PFBA: 13C3-PFBA; PFPeA: 13C5 -PFPeA; PFHxA: 13C5 -PFPeA; PFHpA: 13C8-PFOA; PFOA: 13C8-PFOA; PFNA: 13C8-PFOA; PFDA: 13C8-PFOA; PFUnA: 13C8-PFOA; PFDoA: 13C8-PFOA; PFBS: 18O3-PFHxS; PFPeS: 18O3-PFHxS; PFHxS: 18O3-PFHxS; PFHpS: 18O3-PFHxS; PFOS: 13C8-PFOS	No	No
6		Wellington	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-	No	Yes

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
				PFHpA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUdA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS-Na; PFPeS: 13C3-PFHxS-Na; PFHxS: 13C3-PFHxS-Na; PFHpS: 13C3-PFHxS-Na; PFOS: 13C8-PFOS-Na; PFNS: 13C8-PFOS-Na; PFDS: 13C8-PFOS-Na; PFOSA: 13C8-FOSA; MeFOSA: D3-N-MeFOSA; EtFOSA: D5-N-EtFOSA; MeFOSAA: D3-N-MeFOSAA; EtFOSAA: D5-N-EtFOSAA; MeFOSE: D7-N-MeFOSE; EtFOSE: D9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS-Na; 8:2 FTS: 13C2-8:2 FTS-Na; GenX: 13C3-HFPO-DA		
7	PFOA: PFOA-13C4; PFBS: PFBS13C3; PFHxS: PFHxS18O2; PFOS: PFOS-13C8	Wellington	No		No	No
8	PFBA: PFBA M4; PFPeA: PFPeA M5; PFHxA: PFHxA M6; PFHpA: PFHpA M4; PFOA: PFOA M8; PFNA: PFNA M9; PFDA: PFDA M6; PFUnA: PFUnA M7; PFDoA: PFDoA M2; PFTrA: PFDoA M2; PFTeDA: PFTeDA M2; PFBS: PFBS M3; PFPeS: PFHxA M6; PFHxS: PFHxS M6; PFHpS: PFOA M8; PFOS: PFOS M8; PFOSA: PFUnA M7; MeFOSA: PFTeDA M2; EtFOSA: PFTeDA M2; MeFOSAA: PFUnA M7; EtFOSAA: PFUnA M7; MeFOSE: PFTeDA M2; EtFOSE: PFTeDA M2; 6:2 FTS: PFOA M8; 8:2 FTS: PFDA M6; 10:2 FTS: PFDoA M2	Wellington	Yes		No	No
9	PFBA: MPFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: M4PFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUda; PFDoA: MPFDoA; PFBS: M3PFBS; PFHxS: M3PFHxS; PFOS: MPFOS; PFOSA: M8FOSA-I; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-Et-FOSA-M; MeFOSAA: d3-N-MeFOSAA;	Wellington	Yes	PFBA: M2PFOA; PFPeA: M2PFOA; PFHxA: M2PFOA; PFHpA: M2PFOA; PFOA: M2PFOA; PFNA: M2PFOA; PFDA: MPFDA; PFUnA: MPFDA; PFDoA: MPFDA; PFTrA: MPFDA; PFTeDA: MPFDA; PFBS: MPFHxS; PFPeS: MPFHxS; PFHxS: MPFHxS; PFHpS: M8PFOS; PFOS: M8PFOS; PFNS:	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	EtFOSAA: d5-N-EtFOSAA; EtFOSE: d9-N-EtFOSE-M; 6:2 FTS: M2-6,2FTS; GenX: M3HFPO-DA			M8PFOS; PFDS: M8PFOS; PFOSA: d7-N-MeFOSE-M; MeFOSA: d7-N-MeFOSE-M; EtFOSA: d7-N-MeFOSE-M; MeFOSAA: d7-N-MeFOSE-M; EtFOSAA: d7-N-MeFOSE-M; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d7-N-MeFOSE-M; 6:2 FTS: M2-4,2FTS; 8:2 FTS: M2-4,2FTS; 10:2 FTS: M2-4,2FTS; GenX: M2PFOA; ADONA: M2PFOA		
10	PFBA: PFBA-13C4; PFPeA: PFPeA-13C5; PFHxA: PFHxA-13C5; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C9; PFDA: PFDA-13C6; PFUnA: PFUdA-13C7; PFDoA: PFDoA-13C2; PFTrA: PFTeDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-13C3; PFHxS: PFHxS-13C3; PFHpS: PFHxS-13C3; PFOS: PFOS-13C8; PFNS: PFOS-13C8; PFDS: PFOS-13C8; PFOSA: FOSA-13C8; MeFOSA: N-MeFOSA-2H3; EtFOSA: N-EtFOSA-D5; MeFOSAA: N-MeFOSAA-2H3; EtFOSAA: N-EtFOSAA-D5; MeFOSE: N-MeFOSE-d7; EtFOSE: N-EtFOSE-2H9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2	Wellington Lab	Yes		No	No
11	PFHxA: M2PFHxA; PFHpA: M4PFHpA; PFOA: M4PFOA; PFNA: M5PFNA; PFDA: M2PFDA; PFBS: M3PFBS; PFHxS: MPFHxS; PFOS: M4PFOS; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS	Wellington	Yes	PFHxA: M8PFOA; PFHpA: M8PFOA; PFOA: M8PFOA; PFNA: M8PFOA; PFDA: M8PFOA; PFBS: M8PFOS; PFHxS: M8PFOS; PFOS: M8PFOS; 6:2 FTS: M8PFOS; 8:2 FTS: M8PFOS	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
14	PFBA: PFBA-13C4; PFPeA: PFPeA-13C3; PFHxA: PFHxA-13C2; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C5; PFDA: PFDA-13C2; PFUnA: PFUnDA-13C2; PFDoA: PFDoDA-13C2; PFTrA: PFDoDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-18O2; PFHxS: PFHxS-18O2; PFHpS: PFOS-13C4; PFOS: PFOS-13C4; PFNS: PFOS-13C4; PFDS: 8:2 FTS-13C2; PFOSA: FOSA-13C8; MeFOSA: MeFOSA-D3; EtFOSA: EtFOSA-D5; MeFOSAA: MeFOSAA-D3; EtFOSAA: EtFOSAA-D5; MeFOSE: MeFOSE-D7; EtFOSE: EtFOSE-D9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2; 10:2 FTS: 8:2 FTS-13C2; GenX: HFPO-DA-13C3; ADONA: PFHxS-18O2	Wellington Laboratories	Yes	All: PFOA-13C8	No	No
15	PFBA: PFBA-13C4; PFPeA: PFPeA-13C3; PFHxA: PFHxA-13C2; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C5; PFDA: PFDA-13C2; PFUnA: PFUnDA-13C2; PFDoA: PFDoDA-13C2; PFTrA: PFDoDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-18O2; PFHxS: PFHxS-18O2; PFHpS: PFOS-13C4; PFOS: PFOS-13C4; PFNS: PFOS-13C4; PFDS: 8:2 FTS-13C2; PFOSA: FOSA-13C8; MeFOSA: MeFOSA-D3; EtFOSA: EtFOSA-D5; MeFOSAA: MeFOSAA-D3; EtFOSAA: EtFOSAA-D5; MeFOSE: MeFOSE-D7; EtFOSE: EtFOSE-D9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2; 10:2 FTS: 8:2 FTS-13C2; GenX: HFPO-DA-13C3; ADONA: PFHxS-18O2	Wellington Laboratories	Yes	All: PFOA-13C8	No	No
17	PFBA: MPFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: M4PFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUdA; PFDoA: MPFDoA; PFTrA: MPFDoA; PFTeDA: M2PFTeDA; PFBS: M3PFBS; PFPeS: M3PFBS; PFHxS: M3PFHxS; PFHpS: M3PFHxS; PFOS: M8PFOS; PFNS: M8PFOS; PFDS: M8PFOS;	Wellington	Yes	PFBA: M3PFBA; PFOA: M2PFOA; PFDA: MPFDA; PFOS: MPFOS	Yes EPA DRAFT SLUDGES METHOD	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFOSA: M8FOSA-I; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d9-N-EtFOSE-M; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS; 10:2 FTS: M2-8:2 FTS					
18	PFBA: M4PFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: MPFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUnDA; PFDoA: MPFDoDA; PFTrA: MPFDoDA; PFTeDA: MPFTeDA; PFBS: M3PFBS; PFPeS: M5PFHxA; PFHxS: M3PFHxS; PFHpS: M3PFHxS; PFOS: M8PFOS; PFNS: M8PFOS; PFDS: M8PFOS; PFOSA: MPFOSA; MeFOSA: d-NMeFOSA-M; EtFOSA: d-NEtFOSA-M; MeFOSAA: d3-NMeFOSAA; EtFOSAA: d5-NEtFOSAA; MeFOSE: d7-NMeFOSE-M; EtFOSE: d9-NEtFOSE-M; 6:2 FTS: M6:2 FTS; 8:2 FTS: M8:2 FTS	Wellington Laboratory	Yes		No	No
19	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFHxS; PFHxS: 13C3-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: D3-N-MeFOSA; EtFOSA: D5-N-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D7-N-MeFOSE; EtFOSE: D9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; GenX: 13C3-HFPO-DA; ADONA: 13C3-HFPO-DA		Yes	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFHxS; PFHxS: 13C3-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: D3-N-MeFOSA; EtFOSA: D5-N-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D7-N-MeFOSE; EtFOSE: D9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; GenX: 13C3-HFPO-DA; ADONA: 13C3-HFPO-DA	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
20	PFBA: Perfluoro-n-[13C4]butanoic acid MPFBA; PFPeA: Perfluoro-n-[13C5]pentanoic acid M5PFPeA; PFHxA: Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA; PFHpA: Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA; PFOA: Perfluoro-n-[13C8]octanoic acid M8PFOA; PFNA: Perfluoro-n-[13C9]nonanoic acid M9PFNA; PFDA: Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA; PFUnA: Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA; PFDoA: Perfluoro-n-[1,2 13C2]dodecanoic acid MPFDoA; PFTeDA: Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA; PFBS: Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS; PFHxS: Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS; PFOS: Sodium perfluoro-1-[13C8] ocatanesulfonate M8PFOS; PFOSA: Perfluoro-1-[13C8]otanesulfonamide; MeFOSA: N-methyl-d3-perfluoro-1-octancesulfonamide; EtFOSA: N-ethyl-d5-perfluoro-1-octanesulfonamide; EtFOSAA: N-ethyl-d5-perfluoro-1-octanesulfonamide	Wellington lab	Yes		No Inhouse method	Yes
21	PFHxA: MPFHxA; PFHpA: MPFHxA; PFOA: MPFHxA; PFNA: MPFHxA; PFDA: MPFDA; PFUnA: MPFDA; PFDoA: MPFDA; PFTrA: MPFDA; PFTeDA: MPFDA; MeFOSAA: d5-NEtFOSAA; EtFOSAA: d5-NEtFOSAA; GenX: M3HFPO-DA; ADONA: M3HFPO-DA	Wellington	No	PFHxA: M2PFOA; PFHpA: M2PFOA; PFOA: M2PFOA; PFNA: M2PFOA; PFDA: M2PFOA; PFUnA: M2PFOA; PFDoA: M2PFOA; PFTrA: M2PFOA; PFTeDA: M2PFOA; PFBS: MPFOS; PFHxS: MPFOS; PFOS: MPFOS; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d3-N-MeFOSAA; GenX: M2PFOA; ADONA: M2PFOA	Yes EPA 537.1 Modified	No
22	PFOA: [13C8]-PFOA; PFOS: [13C8]-PFOS	Wellington	No	PFOA: [13C7]-PFUdA; PFOS: [13C3]-PFHxS	No	No
23	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTrA: d3-MeFOSA; PFTeDA: 13C2-PFTeDA;	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
				PFBS: 13C3-PFBS; PFPeS: 18O2-PFHxS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS when impacted by high PFOS; PFOS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d3-MeFOSAA; EtFOSAA: d5-EtFOSAA; MeFOSE: d7-MeFOSE; EtFOSE: d9-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-PFDoDA		
24	PFBA: 13C4 PFBA ISTD; PFPeA: 13C4 PFBA ISTD; PFHxA: 13C2 PFHxA ISTD; PFHpA: 13C2 PFHxA ISTD; PFOA: 13C4 PFOA ISTD; PFBS: 18O2 PFHxS ISTD; PFHxS: 18O2 PFHxS ISTD; PFOS: 13C4 PFOS ISTD; 6:2 FTS: 13C2 12C6 62FTS ISTD; 8:2 FTS: 13C2 12C6 62FTS ISTD		Yes	PFBA: 13C4 PFBA ISTD; PFPeA: 13C4 PFBA ISTD; PFHxA: 13C2 PFHxA ISTD; PFHpA: 13C2 PFHxA ISTD; PFOA: 13C4 PFOA ISTD; PFBS: 18O2 PFHxS ISTD; PFHxS: 18O2 PFHxS ISTD; PFOS: 13C4 PFOS ISTD; 6:2 FTS: 13C2 12C6 62FTS ISTD; 8:2 FTS: 13C2 12C6 62FTS ISTD	Yes	Yes
25	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 3C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFHxS: 16O2-PFHxS; PFOS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d3-MeFOSAA; EtFOSAA: d5-EtFOSAA; MeFOSE: d7-MeFOSE; EtFOSE: d3EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS	No	No
26	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTrA:	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
				13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 16O2-PFHxS; PFHxS: 16O2-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d7-MeFOSE; EtFOSAA: d3EtFOSE; MeFOSE: d3-MeFOSAA; EtFOSE: d5-EtFOSAA; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS		
28	PFBA: 13C3-PFBA; PFPeA: 13C3-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C2-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2-PFUdA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFDoA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 13C3-PFHxS; PFHpS: 13C2-PFOA; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: d3-N-MeFOSA; EtFOSA: d5-N-EtFOSA; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-PFDoA; GenX: 13C3-HFPO-DA; ADONA: 13C4-PFHpA	Wellington	Yes	PFBA: 13C8-PFBA; PFHxA: 13C5-PFHxA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUdA; PFHxS: 18O2-PFHxS; PFOS: 13C4-PFOS	No	No
29	PFBA: MPFBA; PFPeA: M3PFPeA; PFHxA: MPFHxA; PFHpA: M4PFHpA; PFOA: MPFOA; PFNA: MPFNA; PFDA: MPFDA; PFUnA: MPFUdA; PFDoA: MPFDoA; PFTrA: MPFDoA; PFTeDA: M2PFTeDA; PFBS: M3PFBS; PFPeS: MPFHxS; PFHxS: MPFHxS; PFHpS: MPFOS; PFOS: MPFOS; PFDS: MPFOS; PFOSA: M8FOSA; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE-M;	Wellington	Yes	All added before extraction	No In house	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	6:2 FTS: M2-6:2FTS; 8:2 FTS: M2-6:2FTS; 10:2 FTS: M2-8:2FTS					
30	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C89-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 13C3-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: D3-MeFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D9-EtFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2- 6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C3-GenX	wellington labs	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C89-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 13C3-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: D3-MeFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D9-EtFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2- 6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C3-GenX	No	No
31	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnA; PFDoA: 13C2-PFDoA; PFBS: 13C3-PFBS; PFHxS: 18O2-PFHxS; PFOS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-N-MeFOSA; EtFOSA: d5-N-EtFOSA; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE; 6:2 FTS: 13C2-6-2 FTS; 8:2 FTS: 13C2-8-2 FTS; GenX: 13C3-GenX		Yes		Yes USEPA	No
32	PFBA: 13C4-PFBA; PFPeA: 13C4-PFBA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFDoA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS; PFOS: 13C8-PFOS; PFNS:	Wellington Laboratories	Yes		Yes US EPA	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-N-MeFOSA; EtFOSA: d5-N-EtFOSA; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-NEtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE; 6:2 FTS: 13C2-6-2 FTS; 8:2 FTS: 13C2-8-2 FTS; 10:2 FTS: 13C2-8-2 FTS; GenX: 13C3-GenX; ADONA: 13C8-PFOA					
33	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS; PFOS: 13C4-PFOS; PFNS: 13C4-PFOS; PFDS: 13C4-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D7-MeFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C4-PFOA	Wellington	Yes	NA, added before extraction	No	No

Table 4 Test methods – Samples S3 and S4 Water

Lab Code	Sample Volume (mL)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
1	S3: 54.9 S4: 57.3	None	Solid Phase (SPE)	NH4OH/ methanol		Room	None	LC-MSMS or LCQQQ	C18	10cm x 3.0mm x 3um	No
2		pH adjustment	Solid Phase (SPE)	Methanol-Ammonia	Vortex		HR-XAW	LC-MSMS or LCQQQ	Nucleodur Shinx RP 3µm		Yes
3	S3: 2 S4: 5	homogenisation					SPE	LC-MSMS or LCQQQ	PFP	15cm×2.1mm ×1.8µm	Yes
4		homogenisation	Solid Phase (SPE)					LC-MSMS or LCQQQ	C18	50 x 2.1mm, 1.9 µm	Yes
5			Solid Phase (SPE)	Methanol/ ammonium acetate				LC-MSMS or LCQQQ Sciex Triple Quad 6500+	EVO C18	10cm x 2mm x 2.6µm	Yes
6	50	Trizma pre-set crystals added	Solid Phase (SPE)	none	none	room temp	WAX SPE	LC-MSMS or LCQQQ	Waters HSS T3	2.1 *100mm	Yes
7	0.05	no	Direct Injection			Room T		LC-TOF or QTOF	C18	100 × 2.1 mm × 2.6um	Yes
8	50		Solid Phase (SPE)	8mL 0.3% NH3-Methanol		ambient	Oasis WAX	LC-MSMS or LCQQQ	C18	50mm x 2.0mm x 1.8µm	Yes
9	S3: 56.9 S4: 58.2	pH adjustment	Solid Phase (SPE)	Methanol	Shaking	30C	SPE Wax	LC-MSMS or LCQQQ	C18	75 mm	Yes
10		pH adjustment	Solid Phase (SPE) Isotope dilution	MeOH		Room temp		LC-MSMS or LCQQQ	HPH - C18	2.1x 50mmx 2.7micron	Yes
11	50	None	Alkaline digestion	NH4OH - Methanol	Sonication	Room (20min x2)	active carbon	LC-MSMS or LCQQQ	C18	1.6 µm, 50 mm x 2.0 mm	Yes

Lab Code	Sample Volume (mL)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
13		none	Solid Phase (SPE)	NH4OH/ methanol	SPE	Room (90 min)	none	LC-MSMS or LCQQQ	C18	100 mm x 2.1 mm x 5.0 µm	Yes
14	10		Solid Phase (SPE)	Acetonitrile	Shaking	Ambient 15mins	SPE	Orbitrap	C18	50 cm x 2.1 cm x 2.7 um	Yes
15	10		Solid Phase (SPE)	Acetonitrile	Shaking	Ambient 15mins	SPE	Orbitrap	C18	50 cm x 2.1 cm x 2.7 um	Yes
16	S3: 56.72 S4: 57.31	pH adjustment	Solid Phase (SPE) styrene-divinylbenzene	Methanol	Shaking			LC-MSMS or LCQQQ	C18	50mmx3mmx 3um	Yes
17		pH adjustment	Solid Phase (SPE)	Ammonia-methanol	Solid Phase (SPE) Extraction	Room(20 min)	Strata XL-AW	LC-MSMS or LCQQQ	C18	50x2.1mm	No
18	S3: 1 S4: 100	NA	Solid Phase (SPE)	NA	NA	NA	SPE (OASIS WAX)	LC-MSMS or LCQQQ	Zorbax XDB-C18	100 mm x 2.1 mm, 1.8µm	Yes
20	50	pH adjustment	Solid Phase (SPE) Strata X-AW 33um polymeric Weak Anion		SPE			Orbitrap	Kinetex C18	100x3mm 2.6 um	No
21	50	No pretreatment	Solid Phase (SPE) DVB cartridge	Methanol	NA			LC-MSMS or LCQQQ	C18	15 cm x 2.1 mm x 2.7 µm	Yes
22	10	homogenisation	Sonication	Methanol	Sonication	Room	SPE	LC-MSMS or LCQQQ	C8	3.0 x 100 mm, 3.5 micron	No
23	1 and 10		Solid Phase (SPE)	Methanol		Room	SPE (polymeric reverse phase)	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	Yes
24	50	homogenisation	Solid Liquid (SLE)	NH4OH 1% in MeOH	Sonication	room	none	LC-MSMS or LCQQQ	C18	2.0mmx50mm (1.6um)	Yes

Lab Code	Sample Volume (mL)	Sample pretreatment	Extraction Technique	Extraction Solvent(s):	Extraction Process	Extraction Temperature	Extraction Clean Up	Instrument	Column Type	Column Specifications	Delay Column
25	1		Direct Injection	Methanol		Room	SPE (polymeric reverse phase)	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	No
26	10	pH adjustment	Solid Phase (SPE)	MeOH		Room Temp	None	LC-MSMS or LCQQQ	C18	1.6µm, 2.0mm x 50mm	Yes
27	S3: 56.58 S4: 57.35		Solid Phase (SPE)	Methanol				LC-MSMS or LCQQQ	BEH Shield RP18	1.7 µm, 2.1 x 100 mm	No
28	50	homogenisation	Solid Phase (SPE)		Shaking	room	SPE cartridge	LC-MSMS or LCQQQ	BEH C18	100mm x 2.1 mm	No
29	50	pH adjustment	Liquid Liquid (LLE) and Direct Injection	Basified MeOH elution	SPE	Room		LC-MSMS or LCQQQ	C18	50 mm x 2.1mm x 1.8um	Yes
30	5	Dilute meoh	Direct Injection			N/A	Filtration	LC-MSMS or LCQQQ	C18	50x 3.0x 1.8	Yes
31	10	pH adjustment	Solid Phase (SPE)	ACN/ Acetone	SPE	Room		LC-MSMS or LCQQQ	C18	2.1mm x 50mm x 2.7um	No
33	S3: 58 S4: 60	pH adjustment	Solid Phase (SPE)	methanol, 0.1% NH4OH in methanol	SPE elution	Room temperature	SPE WAX, nylon filtration	LC-MSMS or LCQQQ	C18	100 mm x 4.6 mm x 2.6 µm	Yes

Table 5 Test methods – Samples S3 and S4 Water (continued)

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
1	PFBA: 13C4 PFBA; PFPeA: 13C5 PFPeA; PFHxA: 13C2 PFHxA; PFHpA: 13C4 PFHpA; PFOA: 13C4 PFOA; PFNA: 13C5 PFNA; PFDA: 13C2 PFDA; PFUnA: 13C2 PFUnA; PFDoA: 13C2 PFDoA; PFTrA: 13C2 PFDoA;	Wellington	Yes		No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFTeDA: 13C2 PFTeDA; PFBS: 18O2 PFHxS; PFPeS: 18O2 PFHxS; PFHxS: 18O2 PFHxS; PFHpS: 13C4 PFOS; PFOS: 13C4 PFOS; PFNS: 13C4 PFOS; PFDS: 13C4 PFOS; PFOSA: 13C8 PFOSA; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-NMeFOSAA; EtFOSAA: d7-NEtFOSAA; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d9-N-EtFOSA-M; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS; 10:2 FTS: M2-8:2 FTS; GenX: 13C3 HFPO-DA; ADONA: 13C4 PFOS					
2	PFBA: 13C4 PFBA; PFPeA: 13C5 PFPeA; PFHxA: 13C2 PFHxA; PFHpA: 13C4 PFHpA; PFOA: 13C8 PFOA; PFNA: 13C5 PFNA; PFDA: 13C2 PFDA; PFUnA: 13C2 PFUnA; PFDoA: 13C2 PFDoA; PFTrA: 13C2 PFTeDA; PFTeDA: 13C2 PFTeDA; PFBS: 13C3 PFBS; PFHxS: 18O2 PFHxS; PFHpS: 18O2 PFHxS; PFOS: 13C4 PFOS; PFDS: 13C2 PFUnA; PFOSA: 13C8 PFOSA; 6:2 FTS: 13C2 6:2 FTS; 8:2 FTS: 13C2 6:2 FTS	Wellington		For all PFAS tested, as well as PFPeS, PFNS, MeFOSA, EtFOSA, MeFOSAA, EtFOSAA, MeFOSE, EtFOSE, and 10:2 FTS: 13C4 PFOA		No
3	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFDoA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFHxS; PFHxS: 13C3-PFHxS; PFHpS: 13C3-PFHxS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; 6:2 FTS: 13C2-6:2FTS; 8:2 FTS: 13C2-8:2FTS; 10:2 FTS: 13C2-8:2FTS; GenX: 13C3-GenX; ADONA: 13C8-PFOA	Wellington	No		No	Yes
4	All: C8-PFOS	Wellington	No	PFBA: 13C4-PFBA; PFPeA: 13-C4 PFOS; PFHxA: 13-C4 PFOS; PFHpA: 13-C4 PFOS; PFOA: 13-C4 PFOS; PFNA: 13-C4 PFOS; PFDA: 13-C4 PFOS; PFUnA: 13C2-PFDOA; PFDoA: 13C2-PFDOA; PFTrA: 13C2-PFDOA; PFTeDA: 13C2-PFDOA; PFBS: 13-C4 PFOS; PFPeS: 13-C4 PFOS; PFHxS: 13-C4 PFOS; PFHpS: 13-C4 PFOS; PFOS: 13-C4 PFOS; PFNS: 13C2-PFDOA; PFDS: 13-C4 PFOS;	Yes MOECC E3457	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
				PFOSA: 13-C4 PFOS; MeFOSA: d5-EtFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d5-EtFOSA; EtFOSAA: d5-EtFOSA; MeFOSE: d5-EtFOSA; EtFOSE: d5-EtFOSA; 6:2 FTS: 13C2 4:2-FTS; 8:2 FTS: 13C2 4:2-FTS; 10:2 FTS: 13C2 4:2-FTS; GenX: M3-HFPO-DA; ADONA: 13C2-PFDOA		
5	PFBA: 13C4-PFBA; PFPeA: 13C3 PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2PFUdA; PFDoA: 13C2PFDoA; PFTrA: 13C2PFDoA; PFTeDA: 13C2PFTeDA; PFBS: 13C3 PFBS; PFPeS: 13C3 PFBS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS; PFOS: 13C4-PFOS; PFNS: 13C4-PFOS; PFDS: 13C4-PFOS; PFOSA: 13C8-FOSA; MeFOSA: D3-N-Me FOSA; EtFOSA: D5-N-Et FOSA; MeFOSAA: D3-N-Me FOSAA; EtFOSAA: D5-N-Et FOSAA; MeFOSE: D7-N-Me FOSE; EtFOSE: D9-N-Et FOSE; 6:2 FTS: 13C26:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS	Wellington	Yes	PFBA: 13C3-PFBA; PFPeA: 13C5 -PFPeA; PFHxA: 13C5 -PFPeA; PFHpA: 13C8-PFOA; PFOA: 13C8-PFOA; PFNA: 13C8-PFOA; PFDA: 13C8-PFOA; PFUnA: 13C8-PFOA; PFDoA: 13C8-PFOA; PFBS: 18O3-PFHxS; PFPeS: 18O3-PFHxS; PFHxS: 18O3-PFHxS; PFHpS: 18O3-PFHxS; PFOS: 13C8-PFOS	No	No
6	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUdA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS-Na; PFPeS: 13C3-PFHxS-Na; PFHxS: 13C3-PFHxS-Na; PFHpS: 13C3-PFHxS-Na; PFOS: 13C8-PFOS-Na; PFNS: 13C8-PFOS-Na; PFDS: 13C8-PFOS-Na; PFOSA: 13C8-FOSA; MeFOSA: D3-N-MeFOSA; EtFOSA: D5-N-EtFOSA; MeFOSAA: D3-N-MeFOSAA; EtFOSAA: D5-N-EtFOSAA; MeFOSE: D7-N-MeFOSE; EtFOSE: D9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS-Na; 8:2 FTS: 13C2-8:2 FTS-Na; GenX: 13C3-HFPO-DA	Wellington	Yes		No	Yes
7	PFOA: PFOA-13C4; PFBS: PFBS13C3; PFHxS: PFHxS18O2; PFOS: PFOS-13C8	Wellington			No	No
8	PFBA: PFBA M4; PFPeA: PFPeA M5; PFHxA: PFHxA M6; PFHpA: PFHpA M4; PFOA: PFOA M8; PFNA:	Wellington	Yes		No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFNA M9; PFDA: PFDA M6; PFUnA: PFUnA M7; PFDoA: PFDoA M2; PFTrA: PFDoA M2; PFTeDA: PFTeDA M2; PFBS: PFBS M3; PFPeS: PFHxA M6; PFHxS: PFHxS M6; PFHpS: PFOA M8; PFOS: PFOS M8; PFOSA: PFUnA M7; MeFOSA: PFTeDA M2; EtFOSA: PFTeDA M2; MeFOSAA: PFUnA M7; EtFOSAA: PFUnA M7; MeFOSE: PFTeDA M2; EtFOSE: PFTeDA M2; 6:2 FTS: PFOA M8; 8:2 FTS: PFDA M6; 10:2 FTS: PFDoA M2					
9	PFBA: MPFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: M4PFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUda; PFDoA: MPFDoA; PFBS: M3PFBS; PFHxS: M3PFHxS; PFOS: MPFOS; PFOSA: M8FOSA-I; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-Et-FOSA-M; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; EtFOSE: d9-N-EtFOSE-M; 6:2 FTS: M2-6,2FTS; GenX: M3HFPO-DA	Wellington	Yes	PFBA: M2PFOA; PFPeA: M2PFOA; PFHxA: M2PFOA; PFHpA: M2PFOA; PFOA: M2PFOA; PFNA: M2PFOA; PFDA: MPFDA; PFUnA: MPFDA; PFDoA: MPFDA; PFTrA: MPFDA; PFTeDA: MPFDA; PFBS: MPFHxS; PFPeS: MPFHxS; PFHxS: MPFHxS; PFHpS: M8PFOS; PFOS: M8PFOS; PFNS: M8PFOS; PFDS: M8PFOS; PFOSA: d7-N-MeFOSE-M; MeFOSA: d7-N-MeFOSE-M; EtFOSA: d7-N-MeFOSE-M; MeFOSAA: d7-N-MeFOSE-M; EtFOSAA: d7-N-MeFOSE-M; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d7-N-MeFOSE-M; 6:2 FTS: M2-4,2FTS; 8:2 FTS: M2-4,2FTS; 10:2 FTS: M2-4,2FTS; GenX: M2PFOA; ADONA: M2PFOA	No	No
10	PFBA: PFBA-13C4; PFPeA: PFPeA-13C5; PFHxA: PFHxA-13C5; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C9; PFDA: PFDA-13C6; PFUnA: PFUdA-13C7; PFDoA: PFDoA-13C2; PFTrA: PFTeDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-13C3; PFHxS: PFHxS-13C3; PFHpS: PFHxS-13C3; PFOS: PFOS-13C8; PFNS: PFOS-13C8; PFDS: PFOS-13C8; PFOSA: FOSA-13C8; MeFOSA: N-MeFOSA-2H3; EtFOSA: N-EtFOSA-D5; MeFOSAA: N-MeFOSAA-2H3; EtFOSAA: N-EtFOSAA-D5; MeFOSE: N-MeFOSE-d7; EtFOSE: N-EtFOSE-2H9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2	Wellington Lab	Yes		No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
11	PFHxA: M2PFHxA; PFHpA: M4PFHpA; PFOA: M4PFOA; PFNA: M5PFNA; PFDA: M2PFDA; PFBS: M3PFBS; PFHxS: MPFHxS; PFOS: M4PFOS; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS	Wellington	Yes	PFHxA: M8PFOA; PFHpA: M8PFOA; PFOA: M8PFOA; PFNA: M8PFOA; PFDA: M8PFOA; PFBS: M8PFOS; PFHxS: M8PFOS; PFOS: M8PFOS; 6:2 FTS: M8PFOS; 8:2 FTS: M8PFOS	No	No
13	PFBA: 13C4 PFBA; PFPeA: 13C5 PFPeA; PFHxA: 13C2 PFHxA; PFHpA: 13C4 PFHpA; PFOA: 13C4 PFOA; PFNA: 13C5 PFNA; PFDA: 13C2 PFDA; PFUnA: 13C2 PFUnA; PFDoA: 13C2 PFDoA; PFTrA: 13C2 PFDoA; PFTeDA: 13C2 PFTeDA; PFBS: 13C3 PFBS; PFPeS: 13C3 PFBS; PFHxS: 18O2 PFHxS; PFHpS: 13C4 PFOS; PFOS: 13C4 PFOS; PFNS: 13C4 PFOS; PFDS: 13C4 PFOS; PFOSA: 13C8 FOSA; MeFOSAA: d3-NMeFOSAA; EtFOSAA: d5-NEtFOSAA; 6:2 FTS: M2-6:2FTS; 8:2 FTS: M2-8:2FTS; 10:2 FTS: M2-8:2FTS; GenX: 13C3 HPO-DA; ADONA: 13C4 PFOS	Wellington Laboratories	Yes	PFOA: 13C2 PFOA	No	No
14	PFBA: PFBA-13C4; PFPeA: PFPeA-13C3; PFHxA: PFHxA-13C2; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C5; PFDA: PFDA-13C2; PFUnA: PFUnDA-13C2; PFDoA: PFDoDA-13C2; PFTrA: PFDoDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-18O2; PFHxS: PFHxS-18O2; PFHpS: PFOS-13C4; PFOS: PFOS-13C4; PFNS: PFOS-13C4; PFDS: 8:2 FTS-13C2; PFOSA: FOSA-13C8; MeFOSA: MeFOSA-D3; EtFOSA: EtFOSA-D5; MeFOSAA: MeFOSAA-D3; EtFOSAA: EtFOSAA-D5; MeFOSE: MeFOSE-D7; EtFOSE: EtFOSE-D9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2; 10:2 FTS: 8:2 FTS-13C2; GenX: HFPO-DA-13C3; ADONA: PFHxS-18O2	Wellington Laboratories	Yes	All: PFOA-13C8	No	No
15	PFBA: PFBA-13C4; PFPeA: PFPeA-13C3; PFHxA: PFHxA-13C2; PFHpA: PFHpA-13C4; PFOA: PFOA-13C4; PFNA: PFNA-13C5; PFDA: PFDA-13C2; PFUnA: PFUnDA-13C2; PFDoA: PFDoDA-13C2; PFTrA: PFDoDA-13C2; PFTeDA: PFTeDA-13C2; PFBS: PFBS-13C3; PFPeS: PFHxS-18O2; PFHxS: PFHxS-18O2;	Wellington Laboratories	Yes	All: PFOA-13C8	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFHpS: PFOS-13C4; PFOS: PFOS-13C4; PFNS: PFOS-13C4; PFDS: 8:2 FTS-13C2; PFOSA: FOSA-13C8; MeFOSA: MeFOSA-D3; EtFOSA: EtFOSA-D5; MeFOSAA: MeFOSAA-D3; EtFOSAA: EtFOSAA-D5; MeFOSE: MeFOSE-D7; EtFOSE: EtFOSE-D9; 6:2 FTS: 6:2 FTS-13C2; 8:2 FTS: 8:2 FTS-13C2; 10:2 FTS: 8:2 FTS-13C2; GenX: HFPO-DA-13C3; ADONA: PFHxS-18O2					
16	PFHxA: 13C2-PFHxA; PFDA: 13C2-PFDA; EtFOSAA: d5-EtFOSAA; GenX: 13C3-HFPO-DA		No	PFOA: 13C2-PFOA; PFOS: 13C4-PFOS; MeFOSA: d3-MeFOSAA	Yes EPA 537.1	No
17	PFBA: MPFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: M4PFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUdA; PFDoA: MPFDoA; PFTrA: MPFDoA; PFTeDA: M2PFTeDA; PFBS: M3PFBS; PFPeS: M3PFBS; PFHxS: M3PFHxS; PFHpS: M3PFHxS; PFOS: M8PFOS; PFNS: M8PFOS; PFDS: M8PFOS; PFOSA: M8FOSA-I; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE-M; EtFOSE: d9-N-EtFOSE-M; 6:2 FTS: M2-6:2 FTS; 8:2 FTS: M2-8:2 FTS; 10:2 FTS: M2-8:2 FTS	Wellington	Yes	PFBA: M3PFBA; PFOA: M2PFOA; PFDA: MPFDA; PFOS: MPFOS	Yes EPA 537	No
18	PFBA: M4PFBA; PFPeA: M5PFPeA; PFHxA: M5PFHxA; PFHpA: MPFHpA; PFOA: M8PFOA; PFNA: M9PFNA; PFDA: M6PFDA; PFUnA: M7PFUnDA; PFDoA: MPFDoDA; PFTrA: MPFDoDA; PFTeDA: MPFTeDA; PFBS: M3PFBS; PFPeS: M5PFHxA; PFHxS: M3PFHxS; PFHpS: M3PFHxS; PFOS: M8PFOS; PFNS: M8PFOS; PFDS: M8PFOS; PFOSA: MPFOSA; MeFOSA: d-NMeFOSA-M; EtFOSA: d-NEtFOSA-M; MeFOSAA: d3-NMeFOSAA; EtFOSAA: d5-NEtFOSAA; MeFOSE: d7-NMeFOSE-M; EtFOSE: d9-NEtFOSE-M; 6:2 FTS: M6:2 FTS; 8:2 FTS: M8:2 FTS	Wellington Laboratory	Yes		No	No
20	PFBA: Perfluoro-n-[13C4]butanoic acid MPFBA; PFPeA: Perfluoro-n-[13C5]pentanoic acid M5PFPeA; PFHxA: Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid M5PFHxA;	wellington lab	Yes		No Method 537 modified	Yes

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFHpA: Perfluoro-n-[1,2,3,4-13C4]heptanoic acid M4PFHpA; PFOA: Perfluoro-n-[13C8]octanoic acid M8PFOA; PFNA: Perfluoro-n-[13C9]nonanoic acid M9PFNA; PFDA: Perfluoro-n-[1,2,3,4,6-13C6]decanoic acid M6PFDA; PFUnA: Perfluoro-n-[1,2,3,4,6,7-13C7]undecanoic acid M7PFUdA; PFDoA: Perfluoro-n-[1,2 13C2]dodecanoic acid MPFDoA; PFTeDA: Perfluoro-n-[1,2 13C2]tetradecanoic acid M2PFTeDA; PFBS: Sodium perfluoro-1-[2,3,4 13C3] butanesulfonate M3PFBS; PFHxS: Sodium perfluoro-1-[1,2,3 13C3] hexanesulfonate M3PFHxS; PFOS: Sodium perfluoro-1-[13C8] ocatanesulfonate M8PFOS; PFOSA: Perfluoro-1-[13C8]otanesulfonamide; MeFOSA: N-methyl-d3-perfluoro-1-octancesulfonamide; EtFOSA: N-ethyl-d5-perfluoro-1-octanesulfonamide; EtFOSAA: N-ethyl-d5-perfluoro-1-octanesulfonamide					
21	PFHxA: MPFHxA; PFHpA: MPFHxA; PFOA: MPFHxA; PFNA: MPFHxA; PFDA: MPFDA; PFUnA: MPFDA; PFDoA: MPFDA; PFTrA: MPFDA; PFTeDA: MPFDA; MeFOSAA: d5-NEtFOSAA; EtFOSAA: d5-NEtFOSAA; GenX: M3HFPO-DA; ADONA: M3HFPO-DA	Wellington	No	PFHxA: M2PFOA; PFHpA: M2PFOA; PFOA: M2PFOA; PFNA: M2PFOA; PFDA: M2PFOA; PFUnA: M2PFOA; PFDoA: M2PFOA; PFTrA: M2PFOA; PFTeDA: M2PFOA; PFBS: MPFOS; PFHxS: MPFOS; PFOS: MPFOS; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d3-N-MeFOSAA; GenX: M2PFOA; ADONA: M2PFOA	Yes EPA 537.1 Modified	No
22	PFOA: [13C8]-PFOA; PFOS: [13C8]-PFOS	Wellington	No	PFOA: [13C7]-PFUdA; PFOS: [13C3]-PFHxS	No	No
23	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTrA: d3-MeFOSA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 18O2-PFHxS; PFHxS: 18O2-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d3-MeFOSAA; EtFOSAA: d5-EtFOSAA; MeFOSE: d7-MeFOSE;	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
				EtFOSE: d9-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-PFDoDA		
24	PFBA: 13C4 PFBA ISTD; PFPeA: 13C4 PFBA ISTD; PFHxA: 13C2 PFHxA ISTD; PFHpA: 13C2 PFHxA ISTD; PFOA: 13C4 PFOA ISTD; PFBS: 18O2 PFHxS ISTD; PFHxS: 18O2 PFHxS ISTD; PFOS: 13C4 PFOS ISTD; 6:2 FTS: 13C2 12C6 62FTS ISTD; 8:2 FTS: 13C2 12C6 62FTS ISTD		Yes	PFBA: 13C4 PFBA ISTD; PFPeA: 13C4 PFBA ISTD; PFHxA: 13C2 PFHxA ISTD; PFHpA: 13C2 PFHxA ISTD; PFOA: 13C4 PFOA ISTD; PFBS: 18O2 PFHxS ISTD; PFHxS: 18O2 PFHxS ISTD; PFOS: 13C4 PFOS ISTD; 6:2 FTS: 13C2 12C6 62FTS ISTD; 8:2 FTS: 13C2 12C6 62FTS ISTD	Yes	Yes
25	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 3C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFHxS: 16O2-PFHxS; PFOS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d3-MeFOSAA; EtFOSAA: d5-EtFOSAA; MeFOSE: d7-MeFOSE; EtFOSE: d3EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS	No	No
26	PFOA: 13C8-PFOA; PFOS: 13C4-PFOS	Wellington Laboratories	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnDA; PFDoA: 13C2-PFDoDA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 16O2-PFHxS; PFHxS: 16O2-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-MeFOSA; EtFOSA: d5-EtFOSA; MeFOSAA: d7-MeFOSE; EtFOSAA: d3EtFOSE; MeFOSE: d3-MeFOSAA; EtFOSE: d5-EtFOSAA; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS	No	No
27	PFBA: C13-PFBA; PFPeA: C13-PFPeA; PFHxA: C13-PFHxA; PFHpA: C13-PFHxA; PFOA: C13-PFOA; PFNA: C13-PFNA; PFDA: C13-PFDA; PFUnA: C13-PFUnDA; PFDoA: C13-PFDoA; PFTrA: C13-PFDoA;	Wellington	Yes		Yes ISO25101:2009	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFTeDA: C13-PFTeDA; PFBS: 18O-PFHxS; PFPeS: 18O-PFHxS; PFHxS: 18O-PFHxS; PFHpS: 18O-PFHxS; PFOS: 13C-PFOS; PFNS: 13C-PFOS; PFDS: 13C-PFOS; PFOSA: 13C-PFOSA; 6:2 FTS: 18O-PFHxS; 8:2 FTS: 18O-PFHxS					
28	PFBA: 13C3-PFBA; PFPeA: 13C3-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C2-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2-PFUdA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFDoA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 13C3-PFHxS; PFHpS: 13C2-PFOA; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: d3-N-MeFOSA; EtFOSA: d5-N-EtFOSA; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-PFDoA; GenX: 13C3-HFPO-DA; ADONA: 13C4-PFHpA	Wellington	Yes	PFBA: 13C8-PFBA; PFHxA: 13C5-PFHxA; PFOA: 13C8-PFOA; PFNA: 13C9-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUdA; PFHxS: 18O2-PFHxS; PFOS: 13C4-PFOS	No	No
29	PFBA: MPFBA; PFPeA: M3PFPeA; PFHxA: MPFHxA; PFHpA: M4PFHpA; PFOA: MPFOA; PFNA: MPFNA; PFDA: MPFDA; PFUnA: MPFUdA; PFDoA: MPFDoA; PFTrA: MPFDoA; PFTeDA: M2PFTeDA; PFBS: M3PFBS; PFPeS: MPFHxS; PFHxS: MPFHxS; PFHpS: MPFOS; PFOS: MPFOS; PFDS: MPFOS; PFOSA: M8FOSA; MeFOSA: d-N-MeFOSA-M; EtFOSA: d-N-EtFOSA-M; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE-M; 6:2 FTS: M2-6:2FTS; 8:2 FTS: M2-6:2FTS; 10:2 FTS: M2-8:2FTS	Wellington	Yes	All added before extraction	In house	
30	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C89-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 13C3-PFHxS;	wellington labs	No	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C5-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C89-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C7-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS;	No	No

Lab code	Labelled standard added before extraction	Labelled standard source	Recovery correction	Labelled standard added before instrument analysis	Standard Method used	Blank corrected
	PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: D3-MeFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D9-EtFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2- 6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C3-GenX			PFHxS: 13C3-PFHxS; PFHpS: 13C8-PFOS; PFOS: 13C8-PFOS; PFNS: 13C8-PFOS; PFDS: 13C8-PFOS; PFOSA: D3-MeFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D9-EtFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C3-GenX		
31	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C8-PFOA; PFNA: 13C5-PFNA; PFDA: 13C6-PFDA; PFUnA: 13C2-PFUnA; PFDoA: 13C2-PFDoA; PFBS: 13C3-PFBS; PFHxS: 18O2-PFHxS; PFOS: 13C8-PFOS; PFOSA: 13C8-FOSA; MeFOSA: d3-N-MeFOSA; EtFOSA: d5-N-EtFOSA; MeFOSAA: d3-N-MeFOSAA; EtFOSAA: d5-N-EtFOSAA; MeFOSE: d7-N-MeFOSE; EtFOSE: d9-N-EtFOSE; 6:2 FTS: 13C2-6-2 FTS; 8:2 FTS: 13C2-8-2 FTS; GenX: 13C3-GenX		Yes		Yes USEPA	No
33	PFBA: 13C4-PFBA; PFPeA: 13C5-PFPeA; PFHxA: 13C2-PFHxA; PFHpA: 13C4-PFHpA; PFOA: 13C4-PFOA; PFNA: 13C5-PFNA; PFDA: 13C2-PFDA; PFUnA: 13C2-PFUnA; PFDoA: 13C2-PFDoA; PFTrA: 13C2-PFTeDA; PFTeDA: 13C2-PFTeDA; PFBS: 13C3-PFBS; PFPeS: 13C3-PFBS; PFHxS: 18O2-PFHxS; PFHpS: 18O2-PFHxS; PFOS: 13C4-PFOS; PFNS: 13C4-PFOS; PFDS: 13C4-PFOS; PFOSA: 13C8-PFOSA; MeFOSA: D3-MeFOSA; EtFOSA: D5-EtFOSA; MeFOSAA: D3-MeFOSAA; EtFOSAA: D5-EtFOSAA; MeFOSE: D7-MeFOSE; EtFOSE: D9-EtFOSE; 6:2 FTS: 13C2-6:2 FTS; 8:2 FTS: 13C2-8:2 FTS; 10:2 FTS: 13C2-8:2 FTS; GenX: 13C3-GenX; ADONA: 13C4-PFOA	Wellington	Yes	NA, added before extraction	No	No

3.2 Basis of Participants' Measurement Uncertainty Estimates

Table 6 Basis of Participants' Uncertainty Estimate

Lab Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
1	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS	USEPA SW-846
2	Bottom Up (ISO/GUM, fish bone/ cause and effect diagram)	Control samples – RM	Laboratory bias from PT studies	ISO/GUM
3	Bottom Up (ISO/GUM, fish bone/ cause and effect diagram)	Duplicate analysis Instrument calibration	Instrument calibration	ISO/GUM
4	Top Down - precision and estimates of the method and laboratory bias	Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
5	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS Duplicate analysis	Recoveries of SS Instrument calibration	Eurachem/CITAC Guide
6	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS	Eurachem/CITAC Guide
7	Standard deviation of replicate analyses multiplied by 2 or 3	Standard deviation from PT studies		NATA - Estimating and reporting MU of chemical test results
		Control samples – SS Duplicate analysis Instrument calibration	Recoveries of SS Instrument calibration	
8	Bottom Up (ISO/GUM, fish bone/ cause and effect diagram)	Control samples – CRM Duplicate analysis	CRM Recoveries of SS	ISO/GUM
9	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results
10	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results
11	Top Down - precision and estimates of the method and laboratory bias	Control samples Duplicate analysis Instrument calibration	Recoveries of SS Instrument calibration Standard purity	NATA - Estimating and reporting MU of chemical test results
13	Method Defined and Long Term Result Variability	Control samples – SS	Recoveries of SS	USEPA SW-846
14	Standard deviation of replicate analyses multiplied by 2 or 3	Standard deviation from PT studies		Nata Technical Note 33
		Control samples – SS	CRM Recoveries of SS Standard purity	
15	Standard deviation of replicate analyses multiplied by 2 or 3	Standard deviation from PT studies		Nata Technical Note 33
		Control samples – SS	CRM Recoveries of SS Standard purity	
16	Standard deviation of replicate analyses multiplied by 2 or 3	Standard deviation from PT studies		ISO/GUM
			CRM	
17	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS Duplicate analysis	CRM	NATA - Estimating and reporting MU of chemical test results

Lab Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
18	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS	Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition.
19	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS		ISO/GUM
20	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS Duplicate analysis Instrument calibration	Laboratory bias from PT studies Recoveries of SS	NATA GAG Estimating and reporting measurement uncertainty of chemical test results January 2018
21	Top Down - precision and estimates of the method and laboratory bias	Duplicate analysis	Instrument calibration	Internal SOP
22	Top Down - precision and estimates of the method and laboratory bias	Control samples – Spare samples of AQA 18-09 Duplicate analysis	Standard Purity	Eurachem/CITAC Guide
23	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
24	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS Instrument calibration	NATA - Estimating and reporting MU of chemical test results
25	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
26	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
27	2 times within laboratory reproducibility and bias of the method	Control samples – SS	Recoveries of SS	WAC/VI/A/001 and WAC/VI/A/002
28	Professional judgement	Instrument calibration	CRM Laboratory bias from PT studies Recoveries of SS Instrument calibration Standard purity	
29	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results
30	Top Down - precision and estimates of the method and laboratory bias	Control samples – SS	Recoveries of SS Instrument calibration Standard purity	Eurachem/CITAC Guide
31	Top Down - precision and estimates of the method and laboratory bias	Control samples – RM	Recoveries of SS Instrument calibration Standard purity	ISO/GUM
32	Top Down - precision and estimates of the method and laboratory bias	Control samples – RM	Recoveries of SS Instrument calibration Standard purity	ISO/GUM

Lab Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
33	Standard deviation of replicate analyses multiplied by 2 or 3	Control samples – SS	Recoveries of SS	Eurachem/CITAC Guide

*SS = Spiked Samples, RM = Reference Material, CRM = Certified Reference Material

3.3 Participants' Comments

The study co-ordinator welcomes comments or suggestions from participants about this study or possible future studies. Participants' comments are reproduced in Table 7.

Table 7 Participants' Comments

Lab Code	Sample	Participants' Comments	Study manager response
1	S1	PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFBS, PFPeS, PFHxS, PFHpS, PFNS< PFDS, PFOSA, 8:2 FTS, 10:2 FTS and ADONA were reported from a simple (no refortification of extracted internal standard) dilution. PFOS was reported from a complex (extracted internal standard was refortified following dilution) dilution.	
	S2	PFBA, PFDA, MeFOAS, GenX and ADONA were reported from a simple (no refortification of extracted internal standard) dilution.	
	S3	PFHxS and PFOS were reported from a simple (no refortification of extracted internal standard) dilution.	
	All	Uncertainty: Standard practice for laboratories utilizing US EPA's SW-846 document.	
11	S1	High concentration of PFOS in the sample caused significant suppression of the internal standard. Results could not be reported using our normal test method.	
	S3	A mixture of direct injection and SPE results have been reported above.	
13	S3 and S4	Uncertainty: Standard practice for laboratories utilizing US EPA's SW-846 document.	
14	All	The results of PFDA, PFOA, PFOS, PFHxS, EtFOSAA and MeFOSAA are reported as sum of linear and branched isomers. All other PFASs are reported as linear structure only.	
15	All	Quantitative result of PFDA, PFOA, PFOS, PFHxS, EtFOSAA and MeFOSAA are reported as sum of linear and branched isomers. All other PFAS are reported as linear only.	
17	S1	PFNA LOR raised since peak elutes close to very high PFOS and PFNA ISTD (labelled std) recovery was low. PFNS and PFDS - we used M3PFHxS ISTD since the PFOS ISTD was compromised with large concentration of PFOS present.	
18	S1	PFOS family, PFNS, PFDS and PFNA have not been reported due to a very high incurred level of L-PFOS (more than twice our highest calibrator). This results in severe internal standard response suppression which appears as low internal standard recovery.	
	All	Uncertainty: Measurement Uncertainty (U) estimated from the standard deviation (u) of replicate recovery samples using the	

Lab Code	Sample	Participants' Comments	Study manager response
		expression U = 2 x u. Procedure as set out in Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition.	
19	S1, S2	Samples were received at ambient temperature (above laboratory method recommended maximum sample storage temperature; less than or equal to 4ºC). Surrogate compounds were spiked into sample AFTER extraction but prior to cleanup. Uncertainty: The expanded measurement uncertainty value estimates were calculated using a coverage factor (K) of 2.58.	A stability study has been conducted for all analytes scored in this PT. Samples have been confirmed stable at room temperature for at least three months.
20	S1	The following compounds were detected below the limit of reporting: N-EtFOSE 0.84 ug/kg, N-MeFOSA 2.9 ug/kg, N-MeFOSAA 4.1 ug/kg, N-MeFOSE 1.0 ug/kg, PFDoS 71 ug/kg (above LOR). There was ion suppression on the labelled compound for PFNA and PFOS in undiluted samples. Diluted samples were okay.	
	S2	The following compounds were detected below the limit of reporting: N-EtFOSAA 2.7 ug/kg, 6:2 FTS 16 ug/kg, EtFOSA 8.4 ug/kg. PFPeA does not meet the confirmation criteria.	
	S3	The following compounds were detected below the limit of reporting: PFOSA 0.07ug/L	
	S4	The following compounds were detected below the limit of reporting: PFHpA 0.014ug/L, PFDA 0.041 ug/L. PFPeA and PFTeDA does not meet the confirmation criteria.	
	All	Uncertainty: Recovery and uncerainty data given for analytes at method limit of reporting.	
21	S1	Perfluoroalkyl acid MS channels contained high levels of possible branched analytes. Only MeFOSAA, EtFOSAA, PFHxS and PFOS branched isomers were quantified as those only isomers for which we have standards.	
	S3	Perfluorinated acids contained high levels of branched isomers. Only MeFOSAA, EtFOSAA, PFHxS and PFOS branched isomers were quantified.	
23	S1	Soil sample S1 highly impacted with PFOS (ppm levels) compared to low ppb levels for other PFAS compounds. Makes reliable measurement across the range of concentrations difficult.	
25	S1	Soil sample S1 highly impacted with PFOS (ppm levels) compared to low ppb levels for other PFAS compounds. Makes reliable measurement across the range of concentrations difficult. Surrogate recovery not determined due to high concentration of target analytes (PFOS) and associated dilution required.	Sample S1 is a contaminated environmental sample that laboratories receive for analysis. The study was design to test participant laboratories ability to analyse this type of sample.
26	S1	The recovery of the labelled standards could not be determined as it has been diluted out of its analytical range.	
	All	Uncertainty: MU is calculated based historic QC data.	

Lab Code	Sample	Participants' Comments	Study manager response
29	S1	Reporting limits elevated due to presence of numerous elevated PFAS analytes. Note, all branched and linear present have been reported even though some branched peaks aren't confirmed by a traceable standard. The Extracted Internal Standards (EIS) are N/A as the labelled internal standards added initially are diluted out given the large dilution applied to this sample extract.	
	S2, S3, S4	Note, all branched and linear present have been reported even though some branched peaks aren't confirmed by a traceable standard.	
33	S1	The result reported for PFOS was quantitated using the injection internal standard (13C7-PFUnDA) instead of the extracted internal standard (13C4-PFOS). The analysis of this sample required a dilution that resulted in an extracted internal standard response for 13C4-PFOS below the quantitation range.	
	All	Uncertainty: Random error associated with the calibration and measurement process is determined to be the most significant contributor to the uncertainty of most measurements, so quality control data was used to estimate uncertainty. The expanded uncertainty was determined by calculating the relative standard deviation for a set of historical QC data (from analyses of spiked blank matrix) and multiplying that value by two (coverage factor for the 95% confidence level).	

4 PRESENTATION OF RESULTS AND STATISTICAL ANALYSIS

4.1 Results Summary

Participant results are listed in Tables 8 to 83 with the summary statistics: robust average, mean, median, maximum, minimum, robust standard deviation (SD_{rob}) and robust coefficient of variation (CV_{rob}). Bar charts of results and performance scores are presented in Figures 2 to 77.

An example chart with interpretation guide is shown in Figure 1.

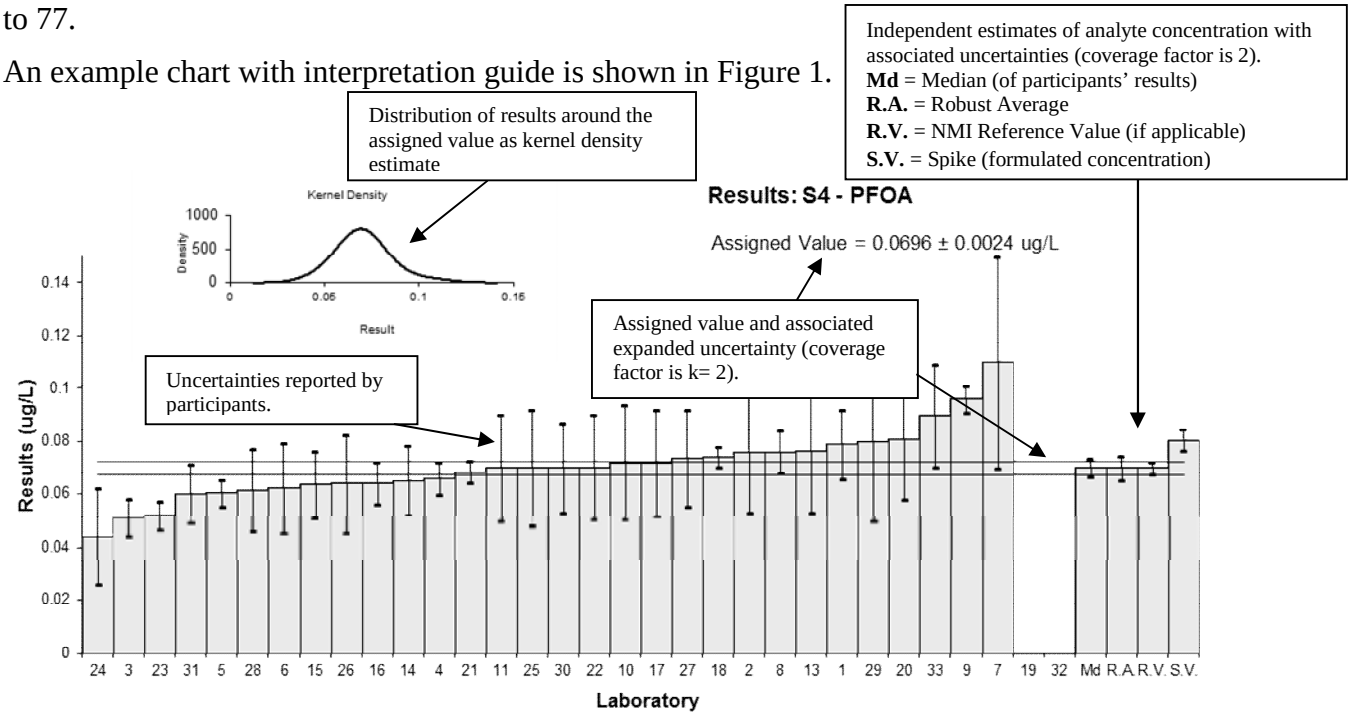


Figure 1 Guide to Presentation of Results

4.2 Assigned Value

The assigned value is defined as: 'value attributed to a particular property of a proficiency test item.'[2] In this study the property is the mass fraction (for soil samples) or concentration (for water samples) of the analyte.

The assigned value for PFOA in Sample S4 was the NMI reference value determined by exact matching isotope dilution with liquid chromatography tandem mass spectrometry (ID-LC-MSMS); the uncertainty was estimated from an uncertainty budget of the measurement process. For all other analytes, the assigned values were the robust average of participants' results; the expanded uncertainties were estimated from the associated robust standard deviations.

4.3 Performance Coefficient of Variation (PCV)

The performance coefficient of variation (PCV) is a measure of the between laboratory variation that in the judgement of the study coordinator would be expected from participants given the analyte concentration. It is important to note that this is a performance measure set by the study coordinator; it is not the coefficient of variation of participant results.

4.4 Target Standard Deviation

The target standard deviation (σ) is the product of the assigned value (X) and the performance coefficient of variation (PCV) as presented in Equation 1. This value is used for calculation of each participant z-score.

$$\sigma = X * PCV \qquad \textit{Equation 1}$$

4.5 z-Score

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

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

where:

z is z-score
χ is a participant's result
X is the assigned value
σ is the target standard deviation from equation 1

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

- $|z| \leq 2$ is satisfactory;
- $2 < |z| < 3$ is questionable;
- $|z| \geq 3$ is unsatisfactory.

4.6 E_n-Score

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:

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

where:

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

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

- $|E_n| \leq 1$ is satisfactory;
- $|E_n| > 1$ is unsatisfactory.

4.7 Traceability and Measurement Uncertainty

Laboratories accredited to ISO/IEC Standard 17025:2017[6] 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.[7]

4.8 Robust Average

The robust averages and associated expanded measurement uncertainties were calculated using the procedure described in 'ISO 13528:2015(E), Statistical methods for use in proficiency testing by interlaboratory comparisons'.[8]

5 TABLES AND FIGURES

Table 8

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.447	0.080	84
2	NT	NT	NT
3	NT	NT	NT
4	<5.0	NR	68
5	<0.2	NR	14
6	<1.0	NR	NR
7	0.50	0.23	NR
8	<0.4	NR	72
9	<0.2	0.2	30
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	0.404	0.0808	80
15	0.393	0.0786	86
16	NT	NT	NT
17	<2	NR	150
18	<1	NR	98
19	NT	NT	NT
20	< 5.0	1.9	36
21	NT	NT	NT
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<50.0	18.8	NR
26	<12.5	NR	NR
27	NT	NT	NT
28	NR	NR	25.7
29	<100	NR	NR
30	0.30	0.1	32
31	<5	1	79
32	< 5	1	80
33	1.33	0.298	105

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	0.45	0.14
Median	0.426	0.083
Mean	0.562	
N	6	
Max.	1.33	
Min.	0.3	
Robust SD	0.13	
Robust CV	29%	

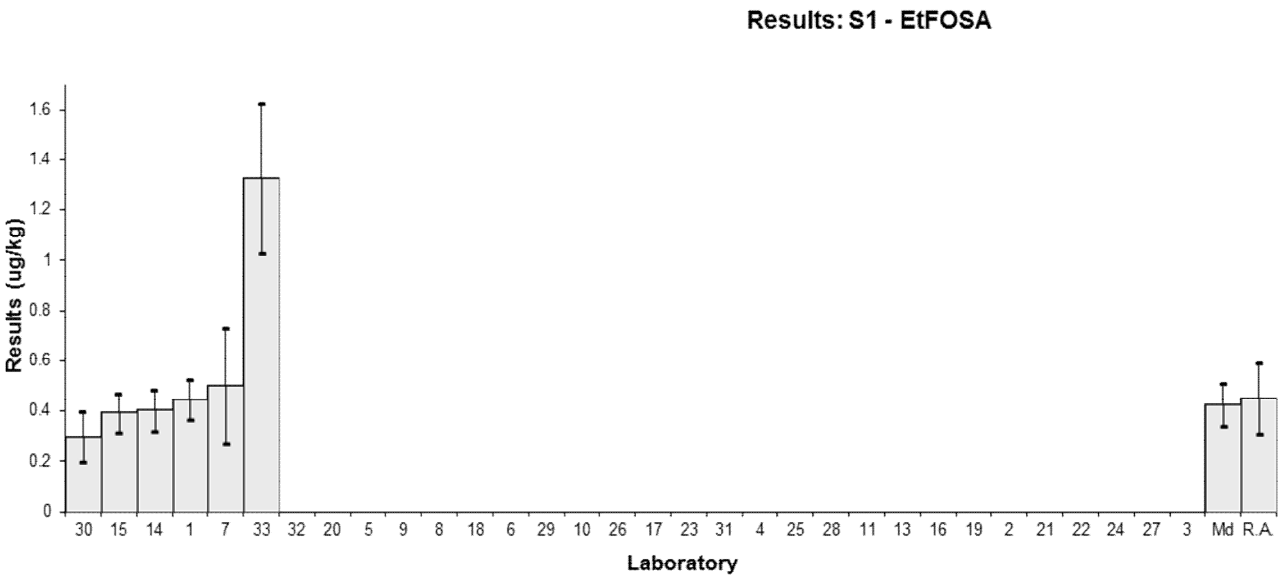

Results: S1 - EtFOSA
Results (ug/kg)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
30 15 14 1 7 33 32 20 5 9 8 18 6 29 10 26 17 23 31 4 25 28 11 13 16 19 2 21 22 24 27 3 Md R.A.
Laboratory

Figure 2

Table 9

Sample Details

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

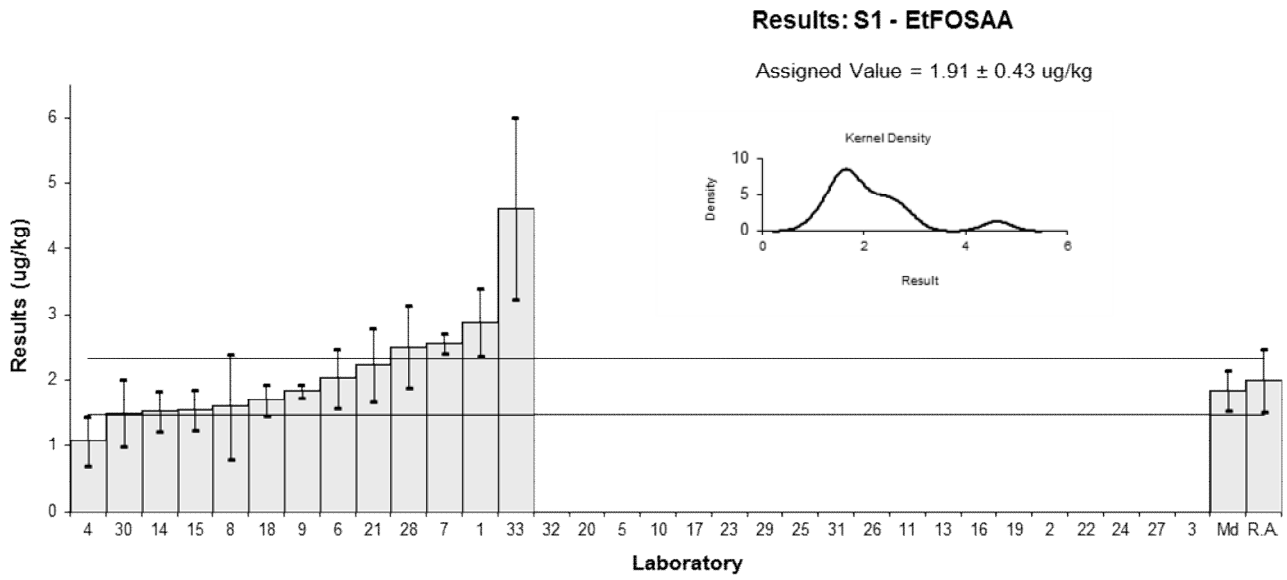
Participant Results

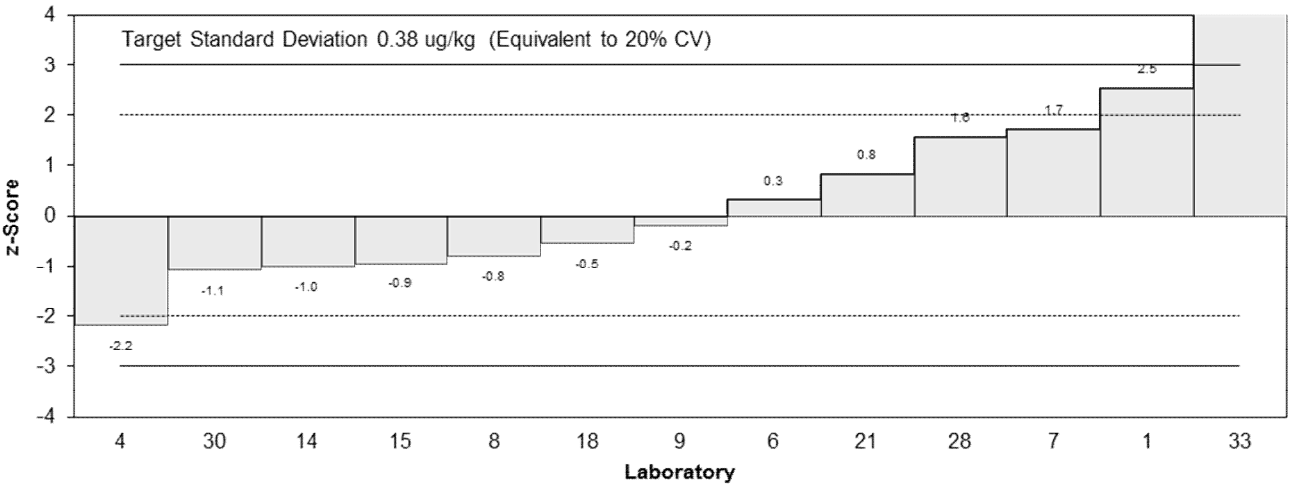
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	2.88	0.51	101	2.54	1.45
2	NT	NT	NT		
3	NT	NT	NT		
4	1.08	0.37	68	-2.17	-1.46
5	<0.06	NR	11		
6	2.034	0.447	NR	0.32	0.20
7	2.57	0.15	NR	1.73	1.45
8	1.6	0.8	86	-0.81	-0.34
9	1.84	0.1	108.2	-0.18	-0.16
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	1.53	0.306	85	-0.99	-0.72
15	1.55	0.310	61	-0.94	-0.68
16	NT	NT	NT		
17	<2	NR	109		
18	1.7	0.24	91	-0.55	-0.43
19	NT	NT	NT		
20	< 5.0	1.3	NR		
21	2.23	0.55	96	0.84	0.46
22	NT	NT	NT		
23	<2	NR	NR		
24	NT	NT	NT		
25	<20.0	5.5	NR		
26	<5.0	NR	NR		
27	NT	NT	NT		
28	2.51	0.6275	62.1	1.57	0.79
29	<20	NR	NR		
30	1.5	0.5	26	-1.07	-0.62
31	<5	1	131		
32	< 10	2	143		
33	4.62	1.39	104	7.09	1.86

Statistics

Assigned Value*	1.91	0.43
Spike	Not Spiked	
Robust Average	2.00	0.47
Median	1.84	0.30
Mean	2.13	
N	13	
Max.	4.62	
Min.	1.08	
Robust SD	0.59	
Robust CV	31%	

*Assigned value is the robust average excluding laboratory 33.


Results: S1 - EtFOSAA
Assigned Value = 1.91 ± 0.43 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
4 30 14 15 8 18 9 6 21 28 7 1 33 32 20 5 10 17 23 29 25 31 26 11 13 16 19 2 22 24 27 3 Md R.A.
Laboratory


z-Scores: S1 - EtFOSAA
Target Standard Deviation 0.38 ug/kg (Equivalent to 20% CV)
z-Score
-2.2 -1.1 -1.0 -0.9 -0.8 -0.5 -0.2 0.3 0.8 1.6 1.7 2.5
4 30 14 15 8 18 9 6 21 28 7 1 33
Laboratory

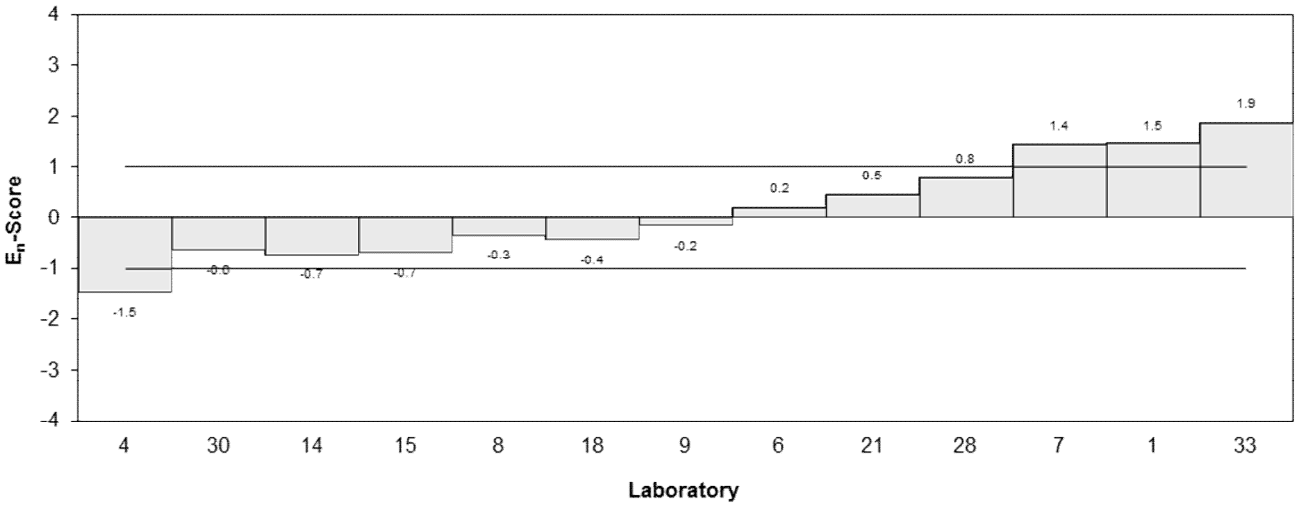

En-Scores: S1 - EtFOSAA
En-Score
-1.5 -0.6 -0.7 -0.7 -0.3 -0.4 -0.2 0.2 0.5 0.8 1.4 1.5 1.9
4 30 14 15 8 18 9 6 21 28 7 1 33
Laboratory

Figure 3

Table 10

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	3.63	0.80	51
2	NT	NT	NT
3	NT	NT	NT
4	0.78	0.3	68
5	<0.17	NR	32
6	<1.0	NR	NR
7	NT	NT	NT
8	<0.4	NR	72
9	<0.2	0.2	20
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	0.665	0.133	75
15	0.685	0.137	77
16	NT	NT	NT
17	<5	NR	112
18	<1	NR	93
19	NT	NT	NT
20	< 5.0	1.3	NR
21	NT	NT	NT
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<50.0	8.0	NR
26	<12.5	NR	NR
27	NT	NT	NT
28	1.6	0.4	68.8
29	<500	NR	NR
30	0.60	0.20	32
31	<5	1	90
32	< 5	1	74.2
33	1.27	0.283	109

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	1.09	0.60
Median	0.78	0.25
Mean	1.32	
N	7	
Max.	3.63	
Min.	0.6	
Robust SD	0.64	
Robust CV	59%	

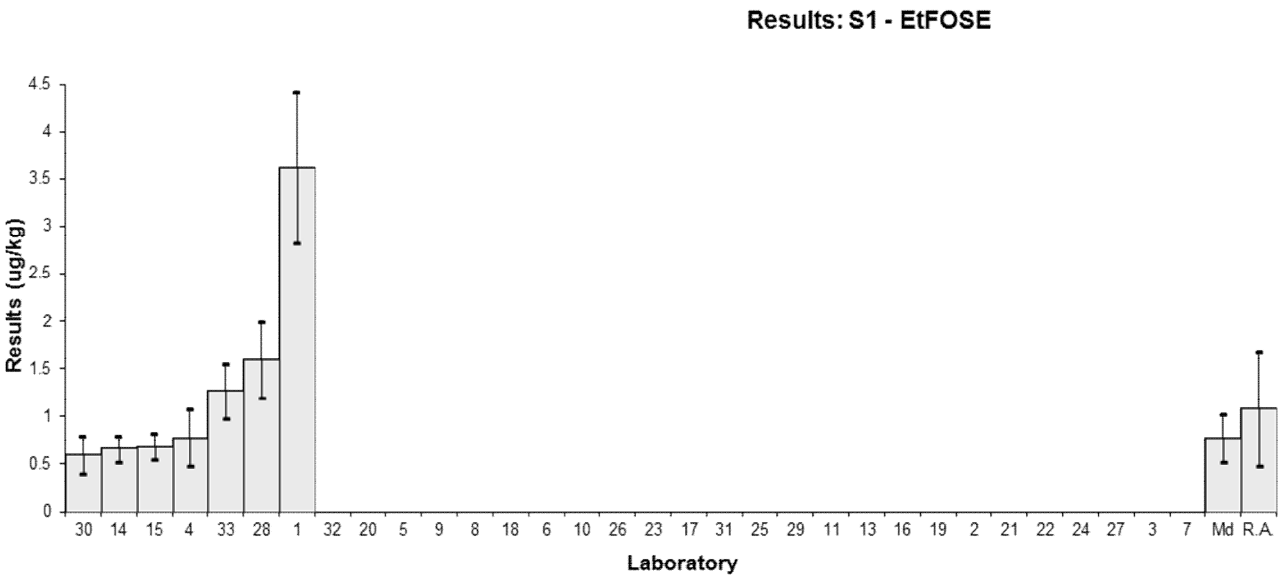

Results: S1 - EtFOSE
Results (ug/kg)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
30 14 15 4 33 28 1 32 20 5 9 8 18 6 10 26 23 17 31 25 29 11 13 16 19 2 21 22 24 27 3 7 Md R.A.
Laboratory

Figure 4

Table 11

Sample Details

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

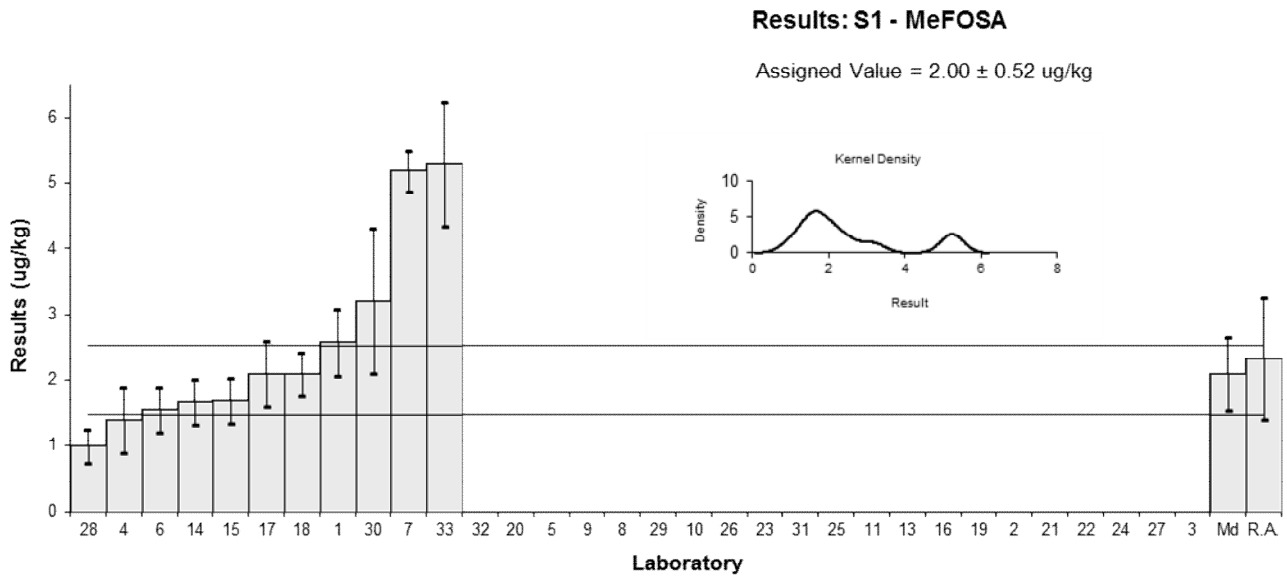
Participant Results

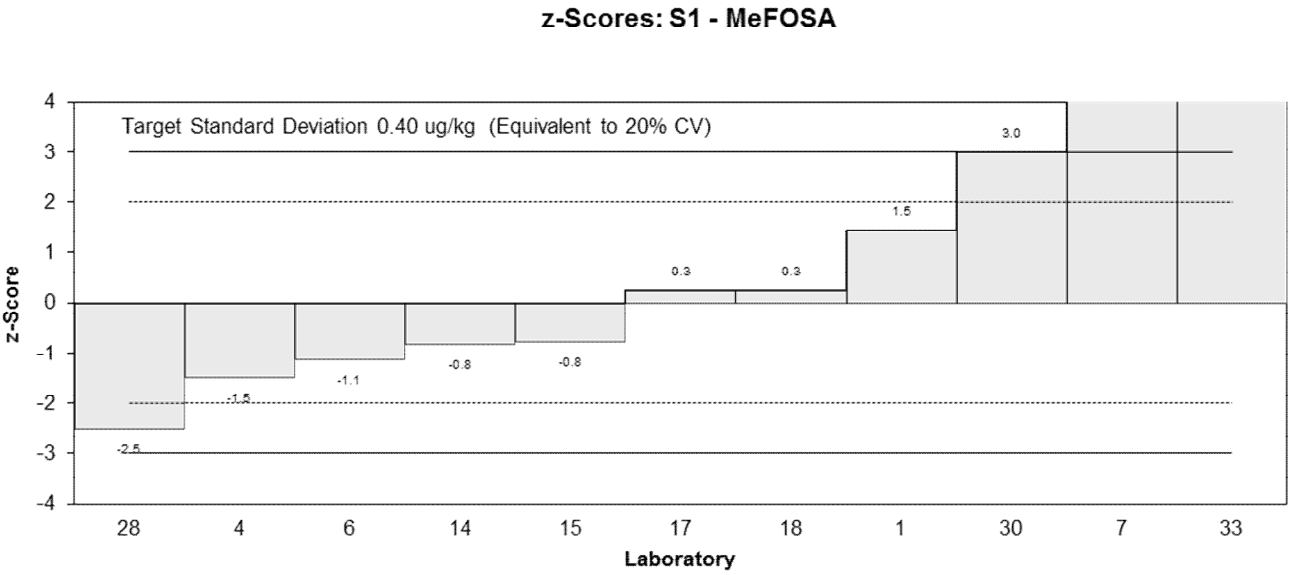
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	2.58	0.51	90	1.45	0.80
2	NT	NT	NT		
3	NT	NT	NT		
4	1.4	0.5	68	-1.50	-0.83
5	<0.2	NR	21		
6	1.545	0.340	NR	-1.14	-0.73
7	5.19	0.31	NR	7.98	5.27
8	<0.4	NR	72		
9	<0.2	0.2	68		
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	1.67	0.334	75	-0.83	-0.53
15	1.69	0.338	75	-0.78	-0.50
16	NT	NT	NT		
17	2.1	0.5	138	0.25	0.14
18	2.1	0.32	105	0.25	0.16
19	NT	NT	NT		
20	< 5.0	1.9	40		
21	NT	NT	NT		
22	NT	NT	NT		
23	<2	NR	NR		
24	NT	NT	NT		
25	<50.0	18.5	NR		
26	<12.5	NR	NR		
27	NT	NT	NT		
28	0.996	0.249	26.6	-2.51	-1.74
29	<100	NR	NR		
30	3.2	1.1	25	3.00	0.99
31	<5	1	85		
32	< 5	1	68		
33	5.30	0.946	106	8.25	3.06

Statistics

Assigned Value*	2.00	0.52
Spike	Not Spiked	
Robust Average	2.33	0.93
Median	2.10	0.55
Mean	2.52	
N	11	
Max.	5.3	
Min.	0.996	
Robust SD	0.59	
Robust CV	30%	

*Assigned value is the robust average excluding laboratories 7, 28, and 33.


Results: S1 - MeFOSA
Assigned Value = 2.00 ± 0.52 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
28 4 6 14 15 17 18 1 30 7 33 32 20 5 9 8 29 10 26 23 31 25 11 13 16 19 2 21 22 24 27 3 Md R.A
Laboratory


z-Scores: S1 - MeFOSA
Target Standard Deviation 0.40 ug/kg (Equivalent to 20% CV)
z-Score
3.0
1.5
0.3
0.3
-0.8
-0.8
-1.1
-1.5
-2.5
28 4 6 14 15 17 18 1 30 7 33
Laboratory

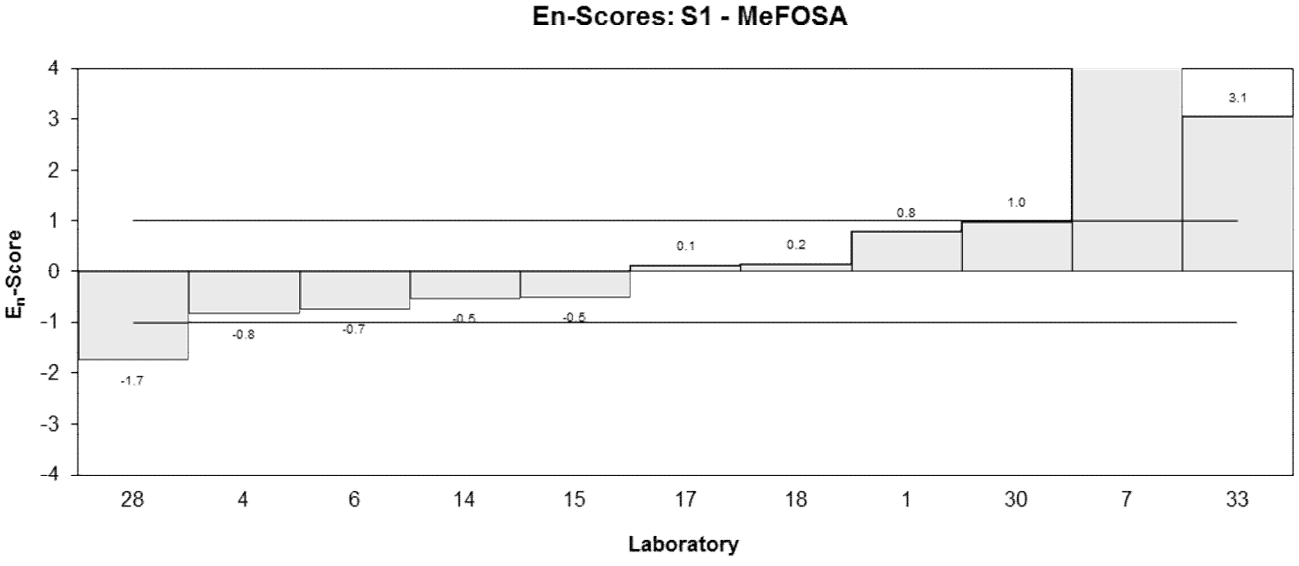

En-Scores: S1 - MeFOSA
En-Score
3.1
1.0
0.8
0.2
0.1
-0.5
-0.5
-0.7
-0.8
-1.7
28 4 6 14 15 17 18 1 30 7 33
Laboratory

Figure 5

Table 12

Sample Details

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

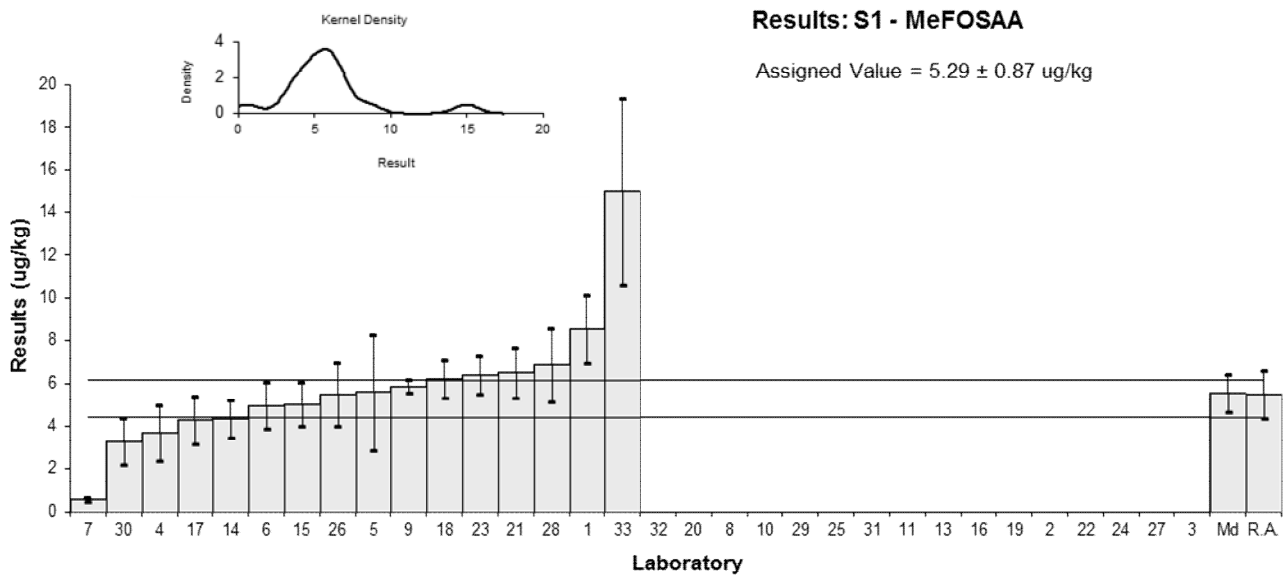
Participant Results

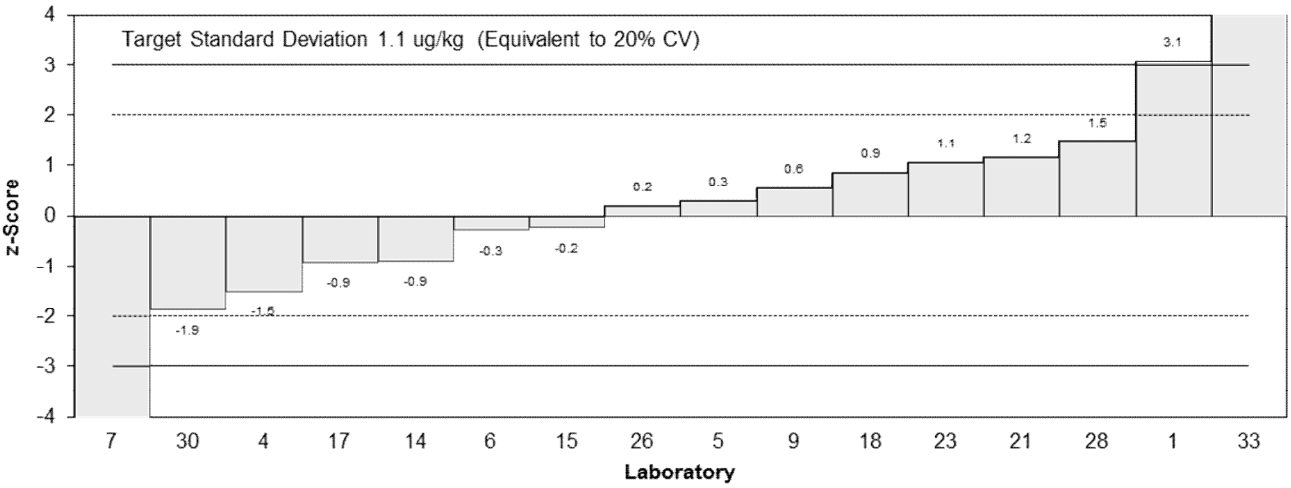
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	8.55	1.56	101	3.08	1.83
2	NT	NT	NT		
3	NT	NT	NT		
4	3.7	1.3	68	-1.50	-1.02
5	5.6	2.7	7	0.29	0.11
6	4.970	1.093	NR	-0.30	-0.23
7	0.59	0.09	NR	-4.44	-5.37
8	<0.4	NR	86		
9	5.88	0.3	132.6	0.56	0.64
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	4.34	0.868	75	-0.90	-0.77
15	5.03	1.01	65	-0.25	-0.20
16	NT	NT	NT		
17	4.3	1.1	116	-0.94	-0.71
18	6.2	0.86	84	0.86	0.74
19	NT	NT	NT		
20	< 5.0	1.3	NR		
21	6.52	1.17	NR	1.16	0.84
22	NT	NT	NT		
23	6.42	0.9	NR	1.07	0.90
24	NT	NT	NT		
25	<20.0	5.3	NR		
26	5.50	1.46	NR	0.20	0.12
27	NT	NT	NT		
28	6.86	1.715	72.2	1.48	0.82
29	<20	NR	NR		
30	3.3	1.1	16	-1.88	-1.42
31	<5	1	118		
32	< 10	2	139		
33	15.0	4.37	85	9.18	2.18

Statistics

Assigned Value*	5.29	0.87
Spike	Not Spiked	
Robust Average	5.5	1.1
Median	5.55	0.86
Mean	5.80	
N	16	
Max.	15	
Min.	0.59	
Robust SD	1.3	
Robust CV	25%	

*Assigned value is the robust average excluding laboratories 1, 7, and 33.


Kernel Density
Density
Result
Results: S1 - MeFOSAA
Assigned Value = 5.29 ± 0.87 ug/kg
Results (ug/kg)
Laboratory
7 30 4 17 14 6 15 26 5 9 18 23 21 28 1 33 32 20 8 10 29 25 31 11 13 16 19 2 22 24 27 3 Md R.A.


z-Scores: S1 - MeFOSAA
Target Standard Deviation 1.1 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
7 30 4 17 14 6 15 26 5 9 18 23 21 28 1 33
-1.9
-1.5
-0.9
-0.9
-0.3
-0.2
0.2
0.3
0.6
0.9
1.1
1.2
1.5
3.1

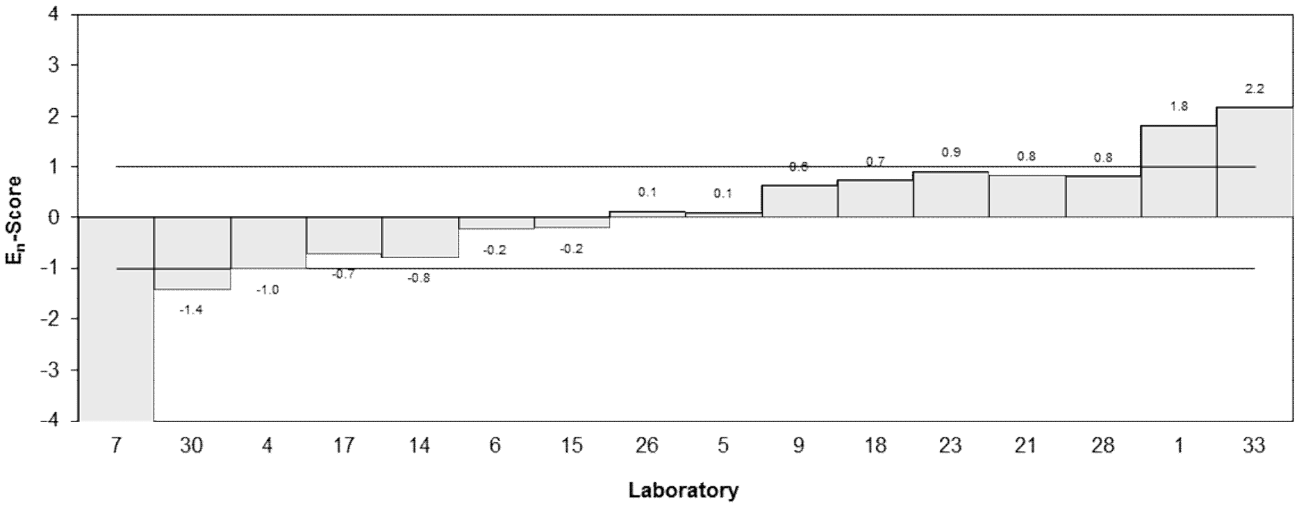

En-Scores: S1 - MeFOSAA
En-Score
Laboratory
7 30 4 17 14 6 15 26 5 9 18 23 21 28 1 33
-1.4
-1.0
-0.7
-0.8
-0.2
-0.2
0.1
0.1
0.6
0.7
0.9
0.8
0.8
1.8
2.2

Figure 6

Table 13

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	3.47	0.66	56
2	NT	NT	NT
3	NT	NT	NT
4	1.8	0.9	68
5	<0.4	NR	28
6	1.192	0.262	NR
7	NT	NT	NT
8	<0.4	NR	72
9	<0.2	0.2	NR
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	1.02	0.204	65
15	1.05	0.210	74
16	NT	NT	NT
17	<5	NR	132
18	1.1	0.16	94
19	NT	NT	NT
20	< 5.0	1.3	NR
21	NT	NT	NT
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<50.0	21.8	NR
26	<12.5	NR	NR
27	NT	NT	NT
28	4.28	1.07	69.8
29	<100	NR	NR
30	0.85	0.28	32
31	<5	1	73
32	< 5	1	113
33	2.00	0.431	96

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	1.8	1.0
Median	1.19	0.39
Mean	1.86	
N	9	
Max.	4.28	
Min.	0.85	
Robust SD	1.2	
Robust CV	67%	

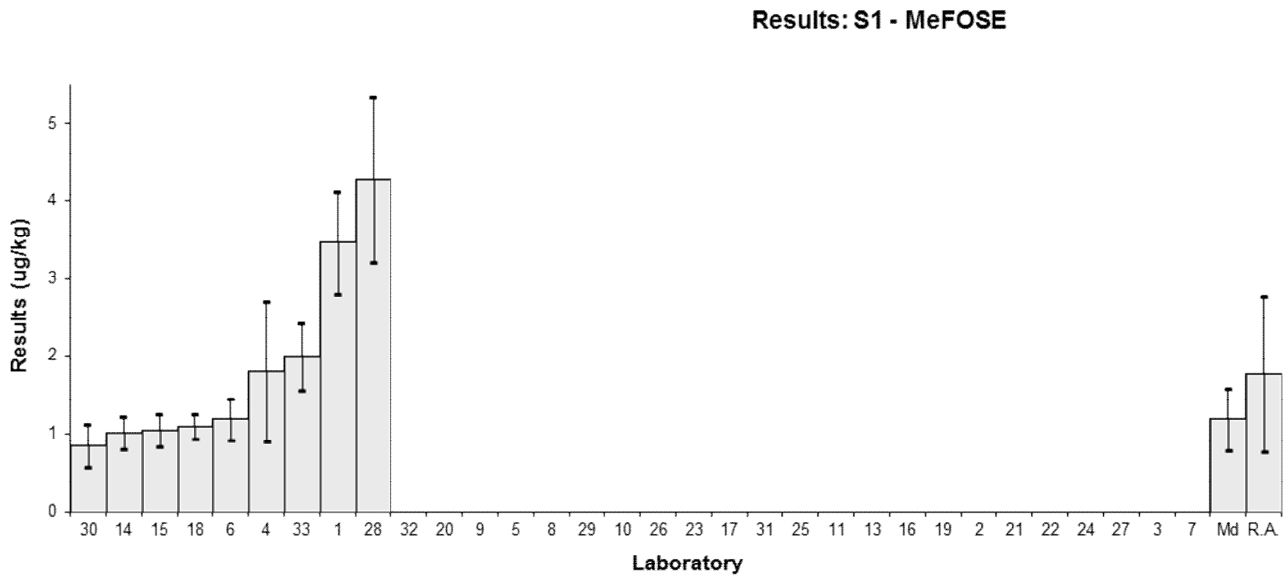

Results: S1 - MeFOSE
Results (ug/kg)
0
1
2
3
4
5
30 14 15 18 6 4 33 1 28 32 20 9 5 8 29 10 26 23 17 31 25 11 13 16 19 2 21 22 24 27 3 7 Md R.A.
Laboratory

Figure 7

Table 14

Sample Details

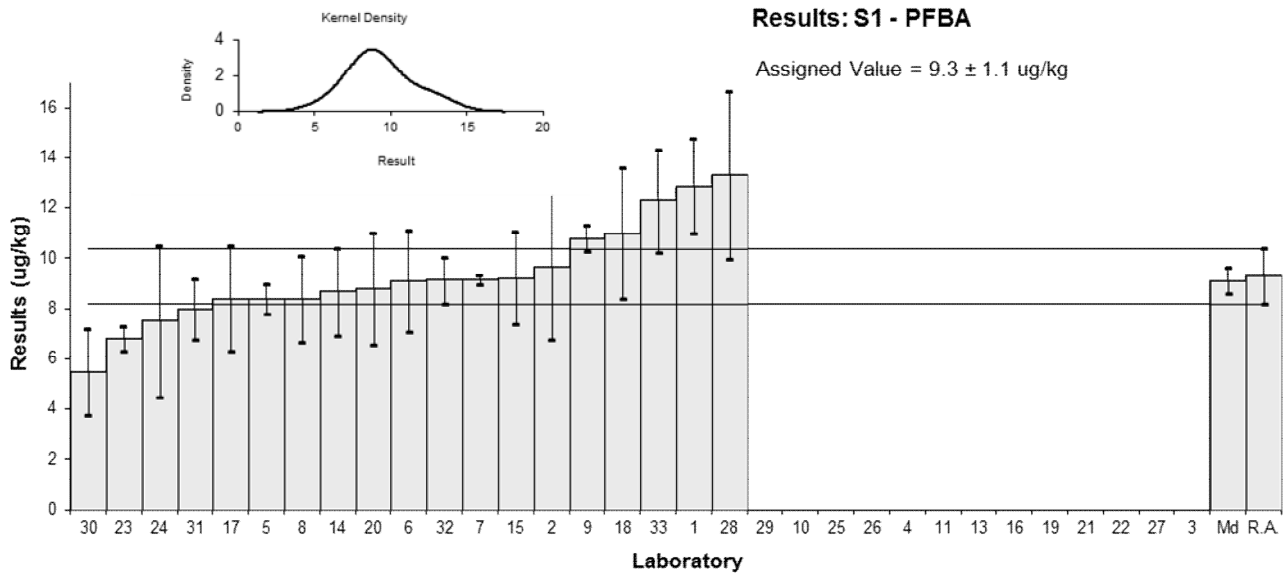
Sample No.	S1
Matrix.	Soil
Analyte.	PFBA
Units	µg/kg

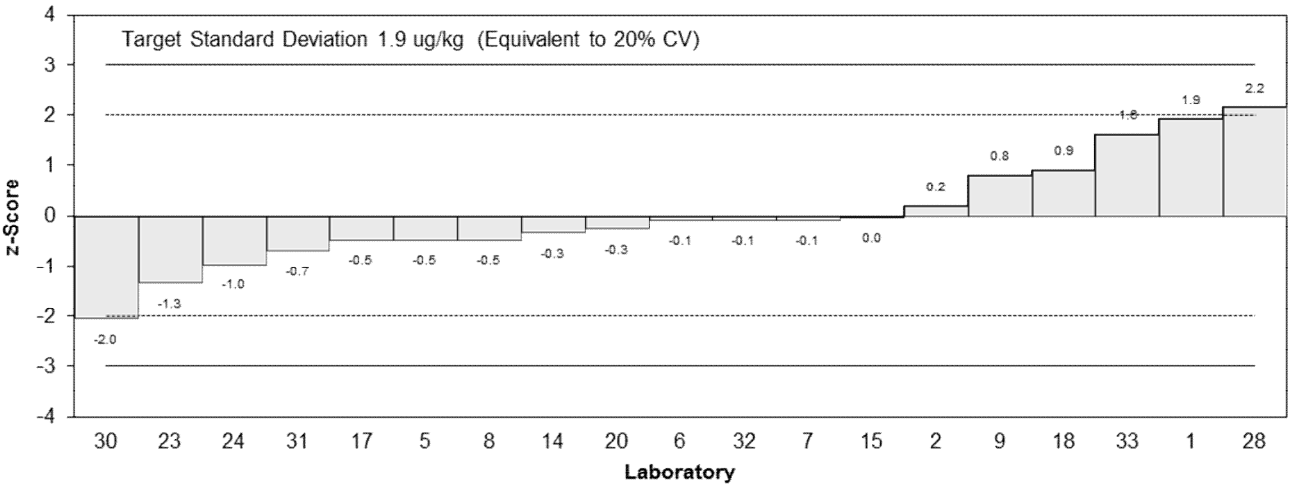
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	12.9	1.9	145	1.94	1.64
2	9.67	2.90	59	0.20	0.12
3	NT	NT	NT		
4	<30	NR	68		
5	8.40	0.60	89	-0.48	-0.72
6	9.115	2.005	NR	-0.10	-0.08
7	9.14	0.18	NR	-0.09	-0.14
8	8.4	1.7	106	-0.48	-0.44
9	10.8	0.5	88	0.81	1.24
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	8.67	1.73	78	-0.34	-0.31
15	9.23	1.85	74	-0.04	-0.03
16	NT	NT	NT		
17	8.4	2.1	114	-0.48	-0.38
18	11	2.6	102	0.91	0.60
19	NT	NT	NT		
20	8.8	2.2	101	-0.27	-0.20
21	NT	NT	NT		
22	NT	NT	NT		
23	6.8	0.5	NR	-1.34	-2.07
24	7.5	3	NR	-0.97	-0.56
25	<20	7.5	NR		
26	<20	NR	NR		
27	NT	NT	NT		
28	13.33	3.3325	95	2.17	1.15
29	< 20	NR	NR		
30	5.5	1.7	94	-2.04	-1.88
31	8.0	1.2	74	-0.70	-0.80
32	9.14	0.91	90	-0.09	-0.11
33	12.3	2.05	84	1.61	1.29

Statistics

Assigned Value	9.3	1.1
Spike	Not Spiked	
Robust Average	9.3	1.1
Median	9.12	0.51
Mean	9.32	
N	19	
Max.	13.33	
Min.	5.5	
Robust SD	1.9	
Robust CV	20%	


Kernel Density
Density
Result
Results: S1 - PFBA
Assigned Value = 9.3 ± 1.1 ug/kg
Results (ug/kg)
Laboratory
30 23 24 31 17 5 8 14 20 6 32 7 15 2 9 18 33 1 28 29 10 25 26 4 11 13 16 19 21 22 27 3 Md R.A.


z-Scores: S1 - PFBA
Target Standard Deviation 1.9 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 23 24 31 17 5 8 14 20 6 32 7 15 2 9 18 33 1 28
-2.0 -1.3 -1.0 -0.7 -0.5 -0.5 -0.5 -0.3 -0.3 -0.1 -0.1 -0.1 0.0 0.2 0.8 0.9 1.6 1.9 2.2

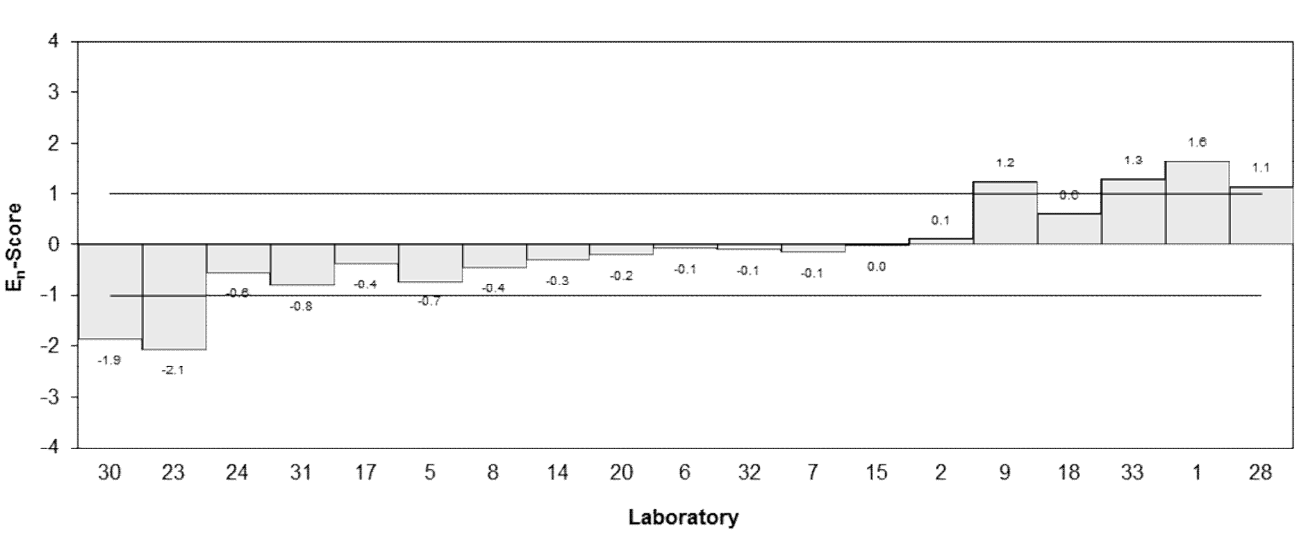

En-Scores: S1 - PFBA
En-Score
Laboratory
30 23 24 31 17 5 8 14 20 6 32 7 15 2 9 18 33 1 28
-1.9 -2.1 -0.6 -0.8 -0.4 -0.7 -0.4 -0.3 -0.2 -0.1 -0.1 -0.1 0.0 0.1 1.2 0.6 1.3 1.6 1.1

Figure 8

Table 15

Sample Details

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

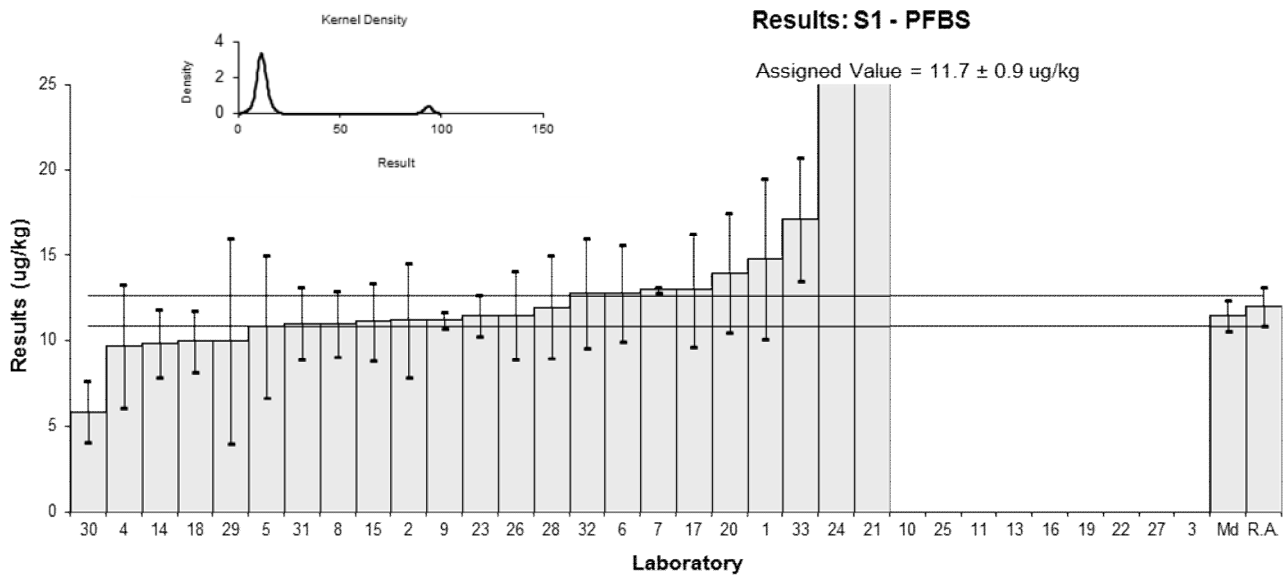
Participant Results

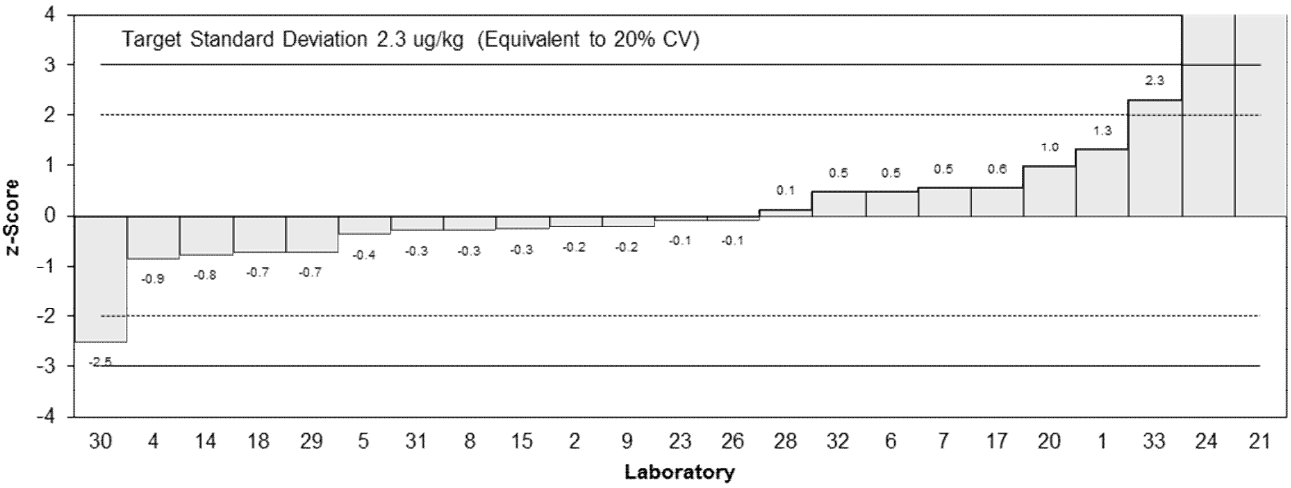
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	14.8	4.7	110	1.32	0.65
2	11.2	3.36	82	-0.21	-0.14
3	NT	NT	NT		
4	9.7	3.6	68	-0.85	-0.54
5	10.85	4.18	116	-0.36	-0.20
6	12.808	2.818	NR	0.47	0.37
7	12.98	0.18	96	0.55	1.39
8	11	1.9	95	-0.30	-0.33
9	11.2	0.5	106.4	-0.21	-0.49
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	9.88	1.98	87	-0.78	-0.84
15	11.1	2.22	57	-0.26	-0.25
16	NT	NT	NT		
17	13	3.3	123	0.56	0.38
18	10	1.8	101	-0.73	-0.84
19	NT	NT	NT		
20	14	3.5	119	0.98	0.64
21	94.3	23.9	NR	35.30	3.45
22	NT	NT	NT		
23	11.5	1.2	NR	-0.09	-0.13
24	93	37	NR	34.74	2.20
25	<20.0	5.3	NR		
26	11.5	2.59	NR	-0.09	-0.07
27	NT	NT	NT		
28	11.98	2.995	176.5	0.12	0.09
29	10	6	NR	-0.73	-0.28
30	5.85	1.81	69	-2.50	-2.89
31	11	2.1	82	-0.30	-0.31
32	12.8	3.2	96.7	0.47	0.33
33	17.1	3.61	75	2.31	1.45

Statistics

Assigned Value*	11.7	0.9
Spike	Not Spiked	
Robust Average	12.0	1.1
Median	11.5	0.9
Mean	18.8	
N	23	
Max.	94.3	
Min.	5.85	
Robust SD	1.6	
Robust CV	14%	

*Assigned value is the robust average excluding laboratories 21, 24, and 30.


Results: S1 - PFBS
Assigned Value = 11.7 ± 0.9 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
Laboratory
30 4 14 18 29 5 31 8 15 2 9 23 26 28 32 6 7 17 20 1 33 24 21 10 25 11 13 16 19 22 27 3 Md R.A.


z-Scores: S1 - PFBS
Target Standard Deviation 2.3 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 4 14 18 29 5 31 8 15 2 9 23 26 28 32 6 7 17 20 1 33 24 21

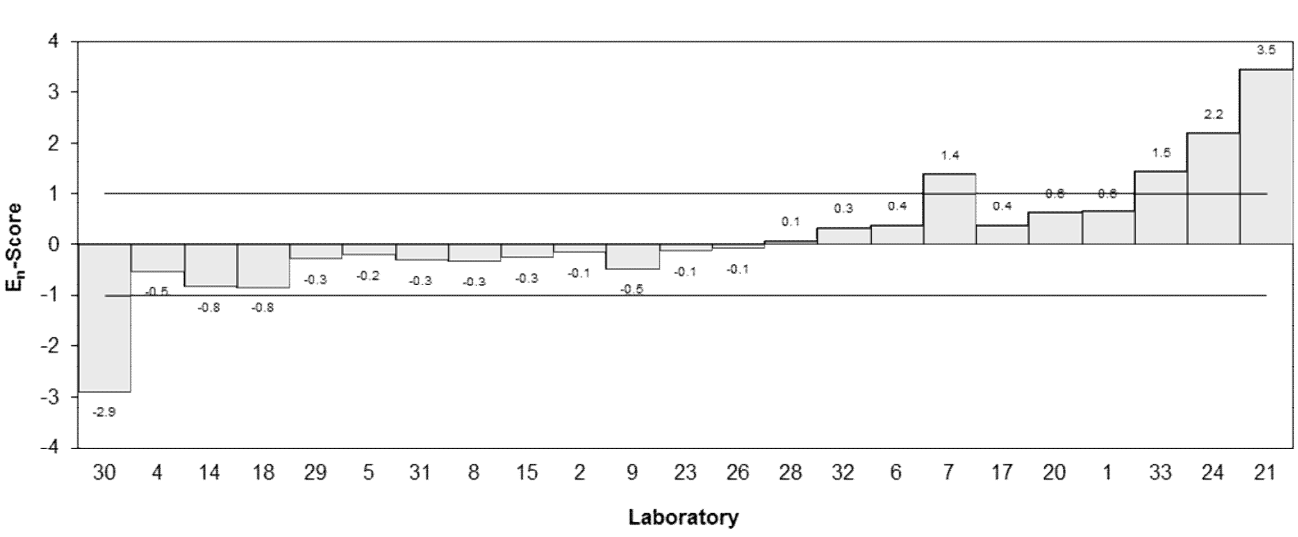

En-Scores: S1 - PFBS
En-Score
Laboratory
30 4 14 18 29 5 31 8 15 2 9 23 26 28 32 6 7 17 20 1 33 24 21

Figure 9

Table 16

Sample Details

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

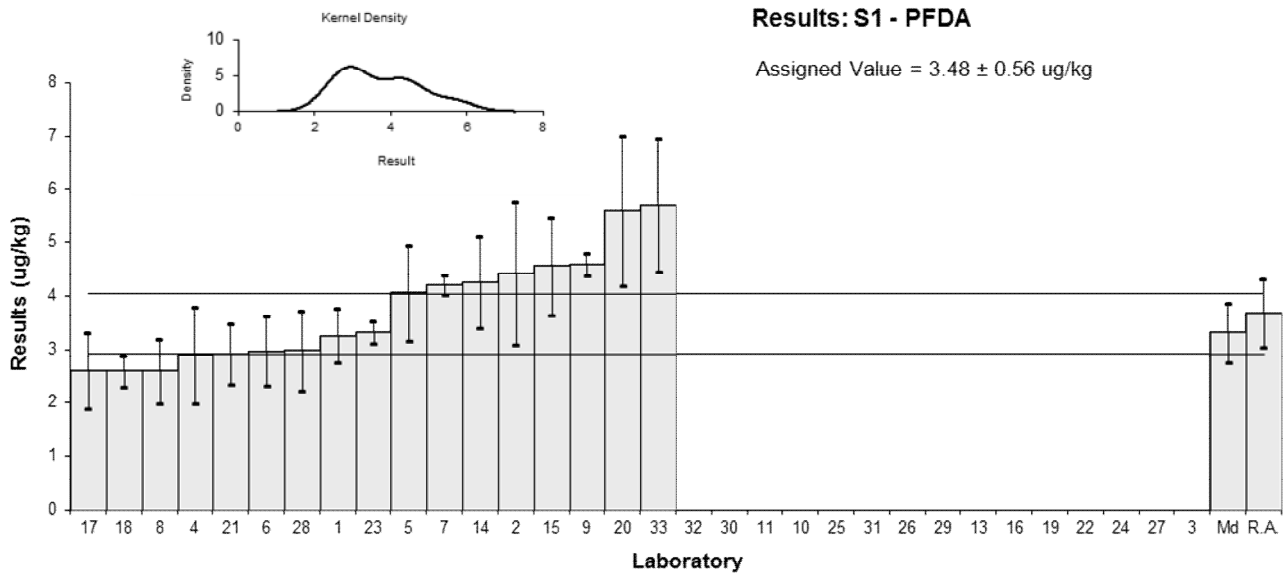
Participant Results

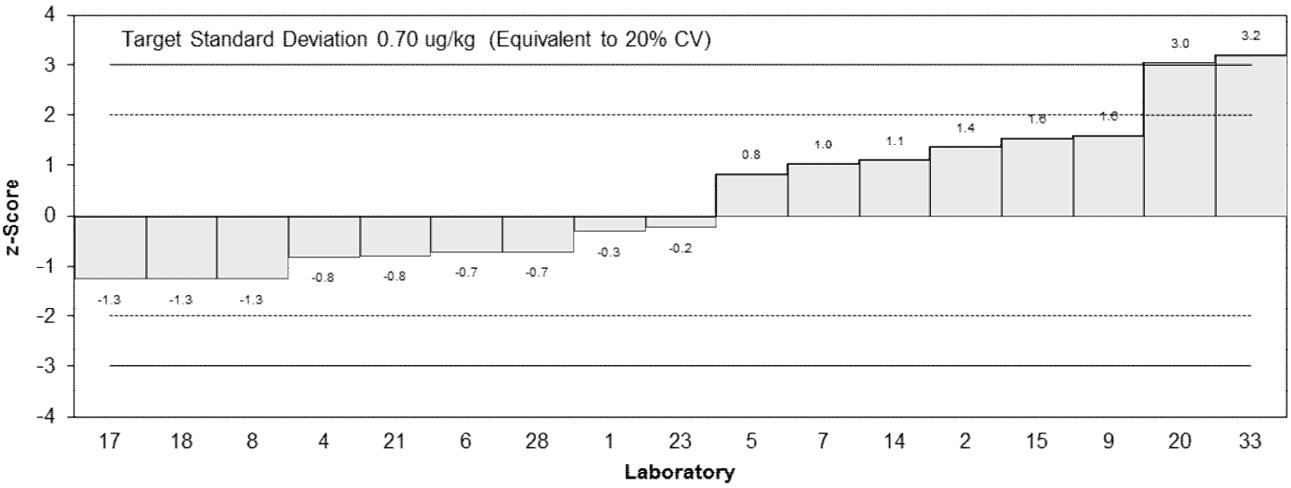
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	3.26	0.51	131	-0.32	-0.29
2	4.43	1.33	104	1.36	0.66
3	NT	NT	NT		
4	2.9	0.9	68	-0.83	-0.55
5	4.06	0.88	49	0.83	0.56
6	2.974	0.654	NR	-0.73	-0.59
7	4.20	0.18	NR	1.03	1.22
8	2.6	0.6	94	-1.26	-1.07
9	4.59	0.2	86.8	1.59	1.87
10	<1000	NR	NR		
11	<10	NR	71		
13	NT	NT	NT		
14	4.26	0.852	98	1.12	0.77
15	4.56	0.912	77	1.55	1.01
16	NT	NT	NT		
17	2.6	0.7	119	-1.26	-0.98
18	2.6	0.29	90	-1.26	-1.40
19	NT	NT	NT		
20	5.6	1.4	125	3.05	1.41
21	2.92	0.56	105	-0.80	-0.71
22	NT	NT	NT		
23	3.32	0.21	NR	-0.23	-0.27
24	NT	NT	NT		
25	<20.0	7.1	NR		
26	<5.0	NR	NR		
27	NT	NT	NT		
28	2.98	0.745	74.3	-0.72	-0.54
29	<50	NR	NR		
30	<0.1	NR	112		
31	<5	1	56		
32	< 5	1	142		
33	5.71	1.25	91	3.20	1.63

Statistics

Assigned Value*	3.48	0.56
Spike	Not Spiked	
Robust Average	3.69	0.64
Median	3.32	0.55
Mean	3.74	
N	17	
Max.	5.71	
Min.	2.6	
Robust SD	0.87	
Robust CV	25%	

*Assigned value is the robust average excluding laboratories 20 and 33.


Kernel Density
Density
Result
Results: S1 - PFDA
Assigned Value = 3.48 ± 0.56 ug/kg
Results (ug/kg)
17 18 8 4 21 6 28 1 23 5 7 14 2 15 9 20 33 32 30 11 10 25 31 26 29 13 16 19 22 24 27 3 Md R.A.
Laboratory


z-Scores: S1 - PFDA
Target Standard Deviation 0.70 ug/kg (Equivalent to 20% CV)
z-Score
-1.3 -1.3 -1.3 -0.8 -0.8 -0.7 -0.7 -0.3 -0.2 0.8 1.0 1.1 1.4 1.6 1.6 3.0 3.2
17 18 8 4 21 6 28 1 23 5 7 14 2 15 9 20 33
Laboratory

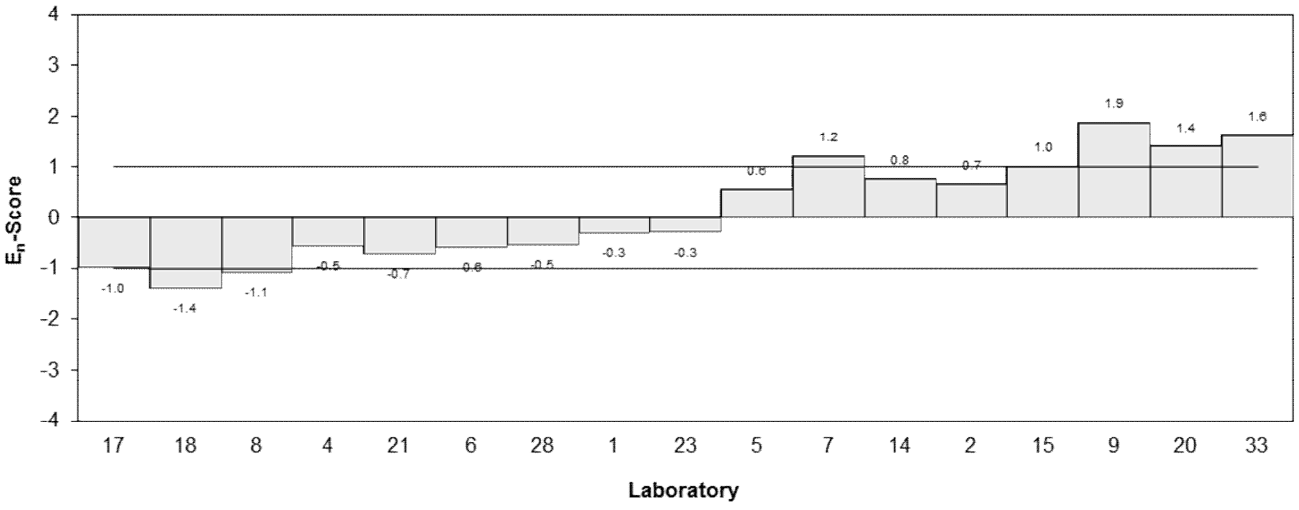

En-Scores: S1 - PFDA
En-Score
-1.0 -1.4 -1.1 -0.5 -0.7 -0.6 -0.5 -0.3 -0.3 0.6 1.2 0.8 0.7 1.0 1.9 1.4 1.6
17 18 8 4 21 6 28 1 23 5 7 14 2 15 9 20 33
Laboratory

Figure 10

Table 17

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	1.87	0.31	135
2	< 1.69	0.51	108
3	NT	NT	NT
4	2.0	1.7	68
5	2.90	1.38	26
6	1.494	0.329	NR
7	5.15	0.34	NR
8	1.0	0.3	72
9	3.49	0.2	86
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	1.15	0.230	117
15	1.27	0.254	105
16	NT	NT	NT
17	<2	NR	125
18	1.4	0.14	93
19	NT	NT	NT
20	5.5	2.5	86
21	1.49	0.25	NR
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<20.0	5.7	NR
26	<5.0	NR	NR
27	NT	NT	NT
28	1.32	0.33	76.1
29	<50	NR	NR
30	1.1	0.34	112
31	<5	1	61
32	< 5	1	117
33	4.41	0.958	90

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	2.26	0.98
Median	1.49	0.32
Mean	2.37	
N	15	
Max.	5.5	
Min.	1	
Robust SD	1.5	
Robust CV	66%	

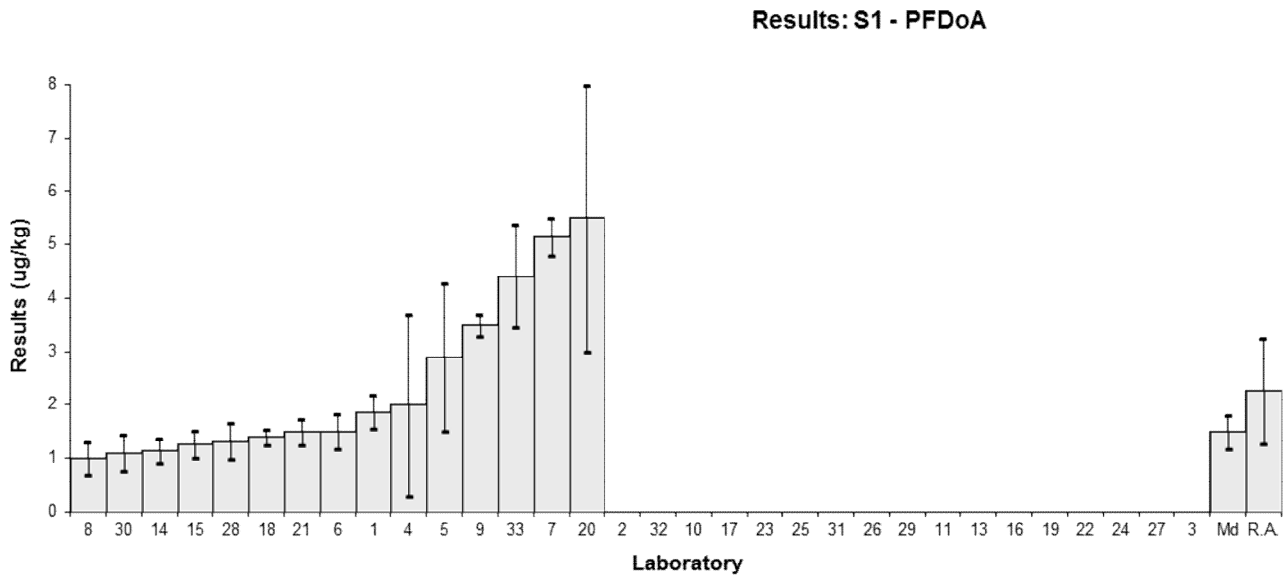

Results: S1 - PFDoA
Results (ug/kg)
0
1
2
3
4
5
6
7
8
8 30 14 15 28 18 21 6 1 4 5 9 33 7 20 2 32 10 17 23 25 31 26 29 11 13 16 19 22 24 27 3 Md R.A.
Laboratory

Figure 11

Table 18

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	56.8	11.1	44
2	12.6	3.78	95
3	NT	NT	NT
4	<0.5	NR	68
5	NT	NT	NT
6	35.793	7.874	NR
7	46.8	1.6	NR
8	NT	NT	NT
9	141	5	NR
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	24.3	4.86	75
15	26.7	5.35	61
16	NT	NT	NT
17	27	6.8	108
18	<1	NR	12
19	NT	NT	NT
20	110	37	NR
21	NT	NT	NT
22	NT	NT	NT
23	121	19	NR
24	NT	NT	NT
25	134	38.6	NR
26	117	33.67	NR
27	NT	NT	NT
28	284.9	71.225	89.2
29	140	40	NR
30	110	34	6
31	63	17	NR
32	54.8	23.6	NR
33	182	50.4	NR

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	88	37
Median	87	36
Mean	94	
N	18	
Max.	284.9	
Min.	12.6	
Robust SD	63	
Robust CV	72%	

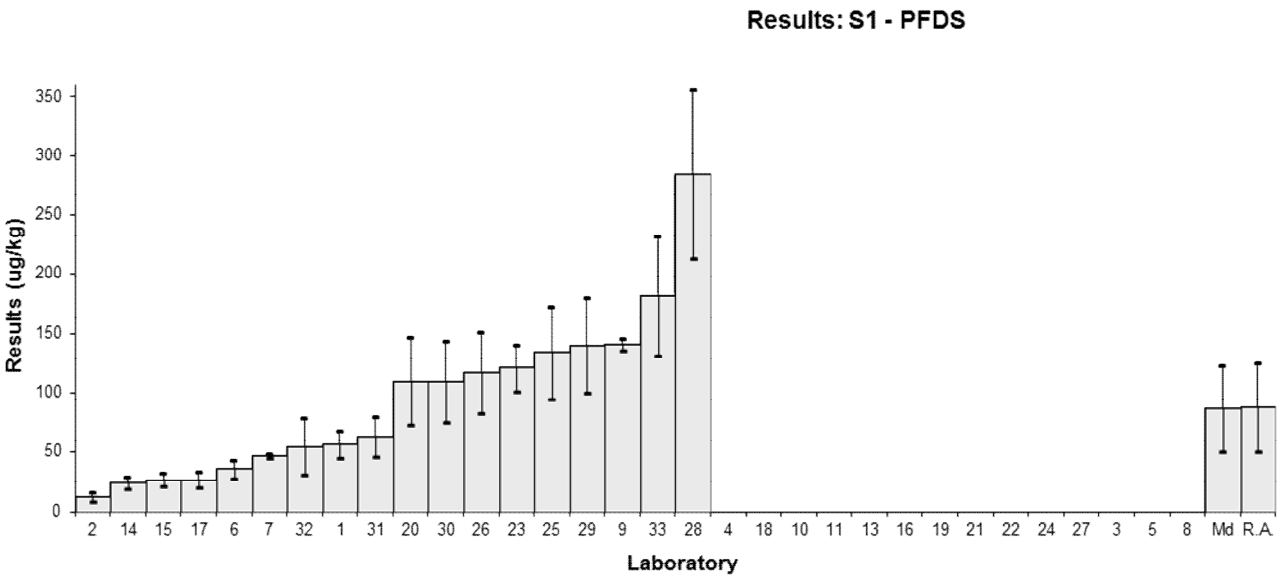

Results: S1 - PFDS
Results (ug/kg)
350
300
250
200
150
100
50
0
2 14 15 17 6 7 32 1 31 20 30 26 23 25 29 9 33 28 4 18 10 11 13 16 19 21 22 24 27 3 5 8 Md R.A.
Laboratory

Figure 12

Table 19

Sample Details

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

Participant Results

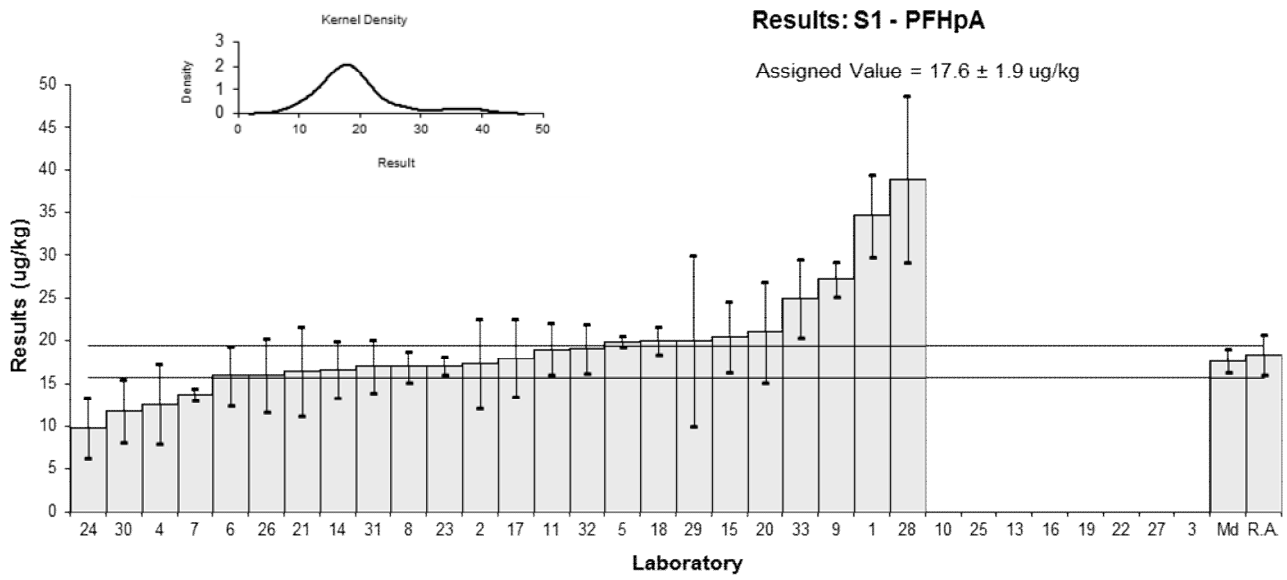
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	34.7	4.8	91	4.86	3.31
2	17.3	5.19	103	-0.09	-0.05
3	NT	NT	NT		
4**	12.6	4.6	68	-1.42	-1.00
5	19.92	0.56	81	0.66	1.17
6	15.903	3.499	NR	-0.48	-0.43
7	13.72	0.74	NR	-1.10	-1.90
8	17	1.8	83	-0.17	-0.23
9	27.2	2	59.2	2.73	3.48
10	<1000	NR	NR		
11	19	3	101	0.40	0.39
13	NT	NT	NT		
14	16.6	3.32	101	-0.28	-0.26
15	20.5	4.09	60	0.82	0.64
16	NT	NT	NT		
17	18	4.5	123	0.11	0.08
18	20	1.6	100	0.68	0.97
19	NT	NT	NT		
20	21	5.9	87	0.97	0.55
21	16.4	5.2	NR	-0.34	-0.22
22	NT	NT	NT		
23	17.1	1.1	NR	-0.14	-0.23
24	9.8	3.5	NR	-2.22	-1.96
25	<20.0	5.5	NR		
26	16.0	4.32	NR	-0.45	-0.34
27	NT	NT	NT		
28	38.96	9.74	102.3	6.07	2.15
29	20	10	NR	0.68	0.24
30	11.8	3.7	69	-1.65	-1.39
31	17	3.1	82	-0.17	-0.17
32	19.1	2.87	99	0.43	0.44
33	25.0	4.62	85	2.10	1.48

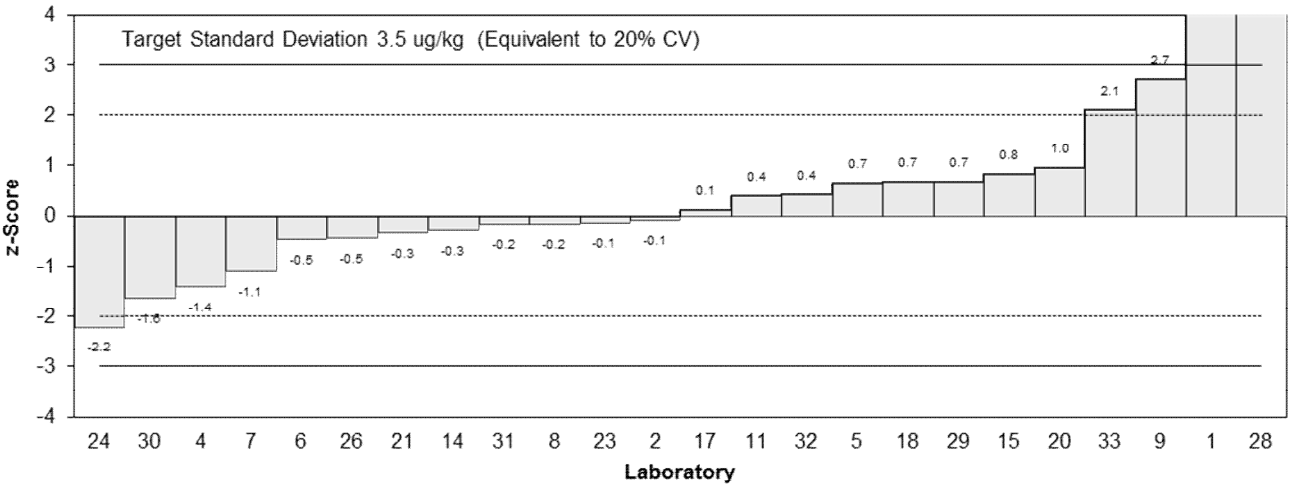
Statistics

Assigned Value*	17.6	1.9
Spike	Not Spiked	
Robust Average	18.4	2.3
Median	17.7	1.4
Mean	19.4	
N	24	
Max.	38.96	
Min.	9.8	
Robust SD	3.5	
Robust CV	20%	

*Assigned value is the robust average excluding laboratories 1 and 28.

**Laboratory 4 has $|E_n| > 1$ when E_n is not rounded; this is an unsatisfactory E_n-score.


Kernel Density
Density
Result
Results: S1 - PFHpA
Assigned Value = 17.6 ± 1.9 ug/kg
Results (ug/kg)
Laboratory
24 30 4 7 6 26 21 14 31 8 23 2 17 11 32 5 18 29 15 20 33 9 1 28 10 25 13 16 19 22 27 3 Md R.A.


z-Scores: S1 - PFHpA
Target Standard Deviation 3.5 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
24 30 4 7 6 26 21 14 31 8 23 2 17 11 32 5 18 29 15 20 33 9 1 28

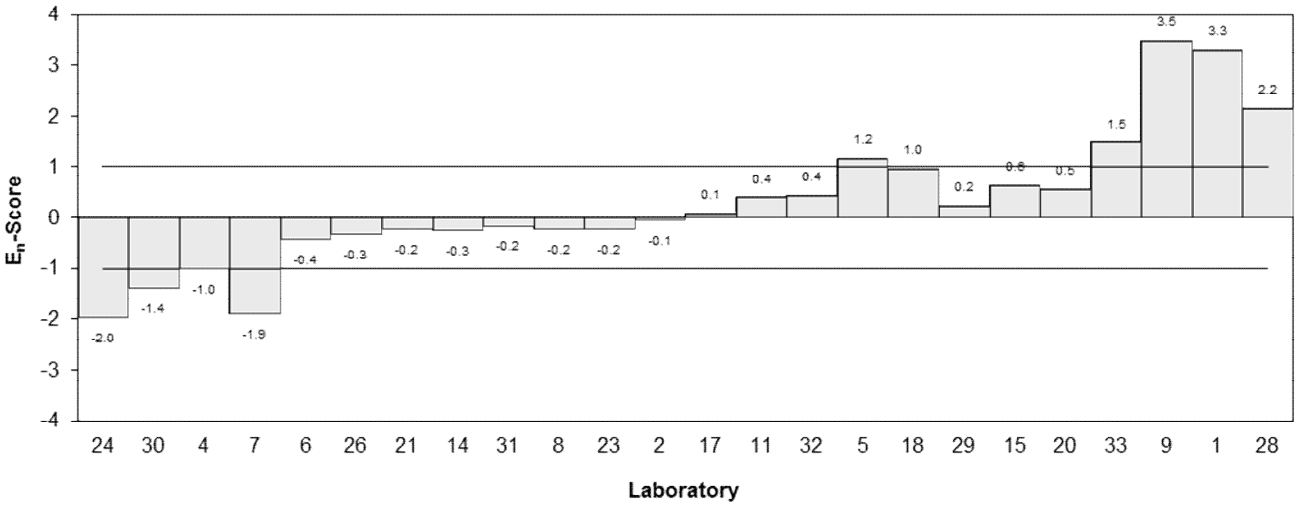

En-Scores: S1 - PFHpA
En-Score
Laboratory
24 30 4 7 6 26 21 14 31 8 23 2 17 11 32 5 18 29 15 20 33 9 1 28

Figure 13

Table 20

Sample Details

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

Participant Results

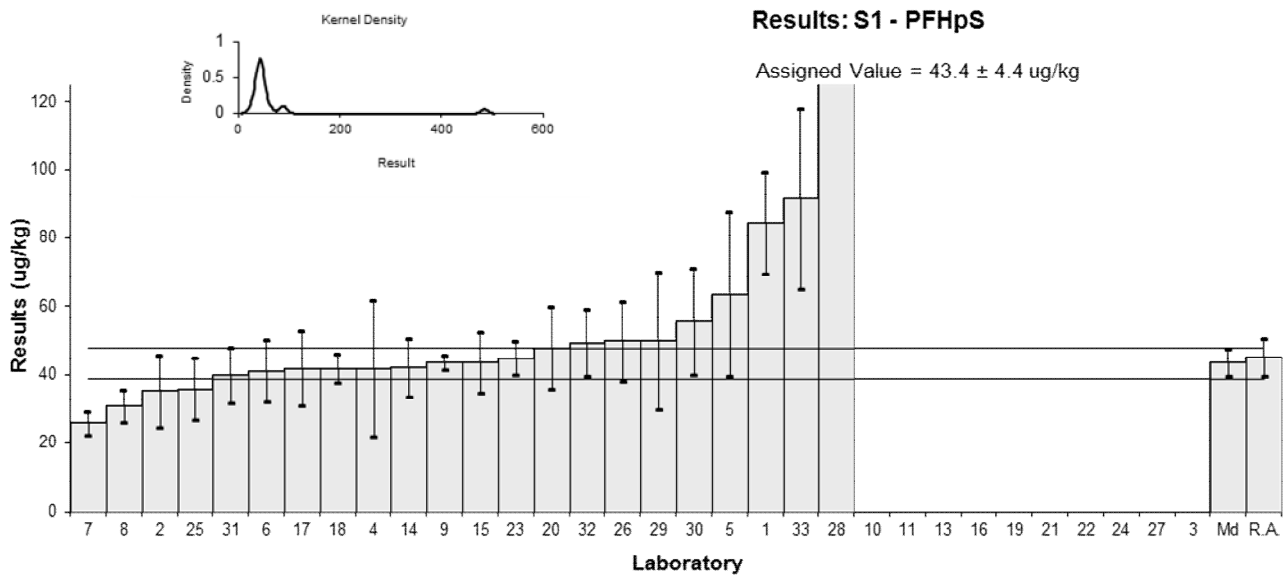
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	84.6	14.9	44	4.75	2.65
2	35.3	10.6	91	-0.93	-0.71
3	NT	NT	NT		
4	42	20	68	-0.16	-0.07
5	63.69	24.01	92	2.34	0.83
6	41.152	9.053	NR	-0.26	-0.22
7	25.9	3.4	NR	-2.02	-3.15
8	31	4.7	88	-1.43	-1.93
9	43.7	2	NR	0.03	0.06
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	42.1	8.42	70	-0.15	-0.14
15	43.8	8.76	62	0.05	0.04
16	NT	NT	NT		
17	42	11	108	-0.16	-0.12
18	42	4.2	89	-0.16	-0.23
19	NT	NT	NT		
20	48	12	NR	0.53	0.36
21	NT	NT	NT		
22	NT	NT	NT		
23	45	4.7	NR	0.18	0.25
24	NT	NT	NT		
25	36.0	9.1	NR	-0.85	-0.73
26	50.0	11.6	NR	0.76	0.53
27	NT	NT	NT		
28	485.2	121.3	109.5	50.90	3.64
29	50	20	NR	0.76	0.32
30	55.6	15.6	76	1.41	0.75
31	40	8	NR	-0.39	-0.37
32	49.5	9.9	NR	0.70	0.56
33	91.8	26.4	NR	5.58	1.81

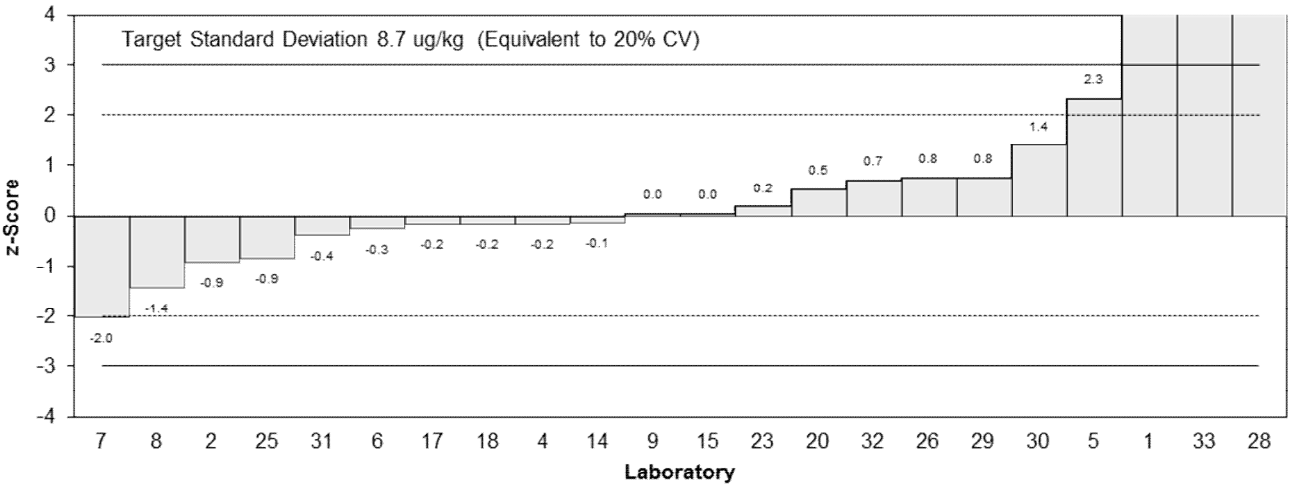
Statistics*

Assigned Value**	43.4	4.4
Spike	Not Spiked	
Robust Average	45.1	5.4
Median	43.7	3.9
Mean	47.8	
N	21	
Max.	91.8	
Min.	25.9	
Robust SD	7.7	
Robust CV	18%	

*Results from laboratory 28 were omitted from the statistical calculations.

**Assigned value is the robust average excluding laboratories 1 and 33.


Kernel Density
Density
Result
Results: S1 - PFHpS
Assigned Value = 43.4 ± 4.4 ug/kg
Results (ug/kg)
Laboratory
7 8 2 25 31 6 17 18 4 14 9 15 23 20 32 26 29 30 5 1 33 28 10 11 13 16 19 21 22 24 27 3 Md R.A.


z-Scores: S1 - PFHpS
Target Standard Deviation 8.7 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
7 8 2 25 31 6 17 18 4 14 9 15 23 20 32 26 29 30 5 1 33 28

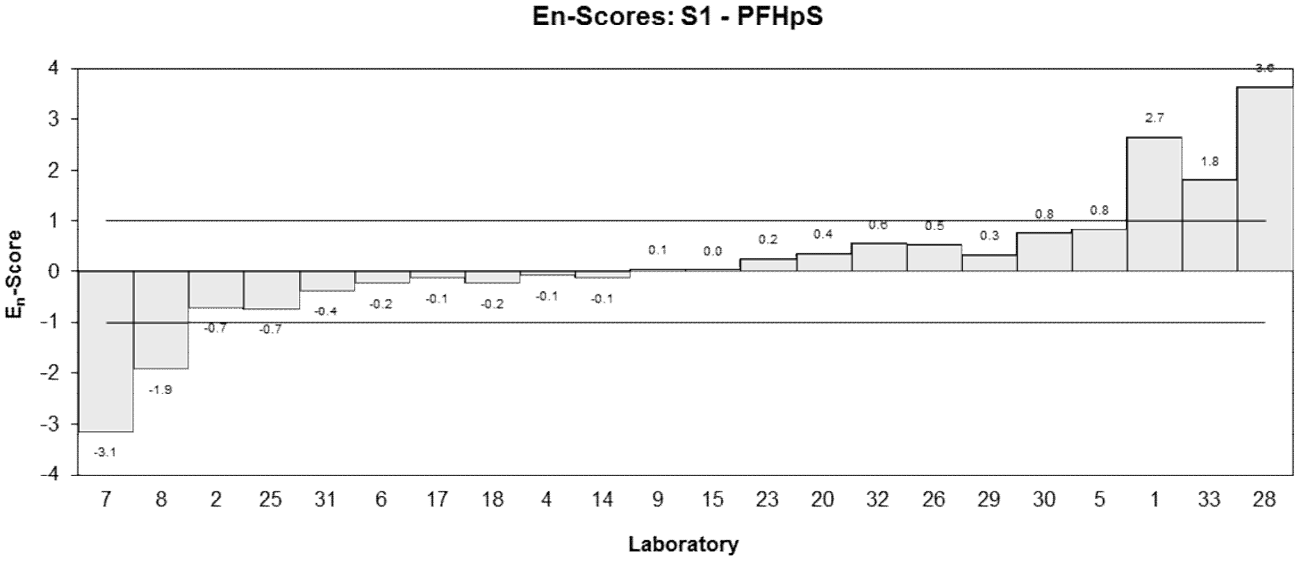

En-Scores: S1 - PFHpS
En-Score
Laboratory
7 8 2 25 31 6 17 18 4 14 9 15 23 20 32 26 29 30 5 1 33 28

Figure 14

Table 21

Sample Details

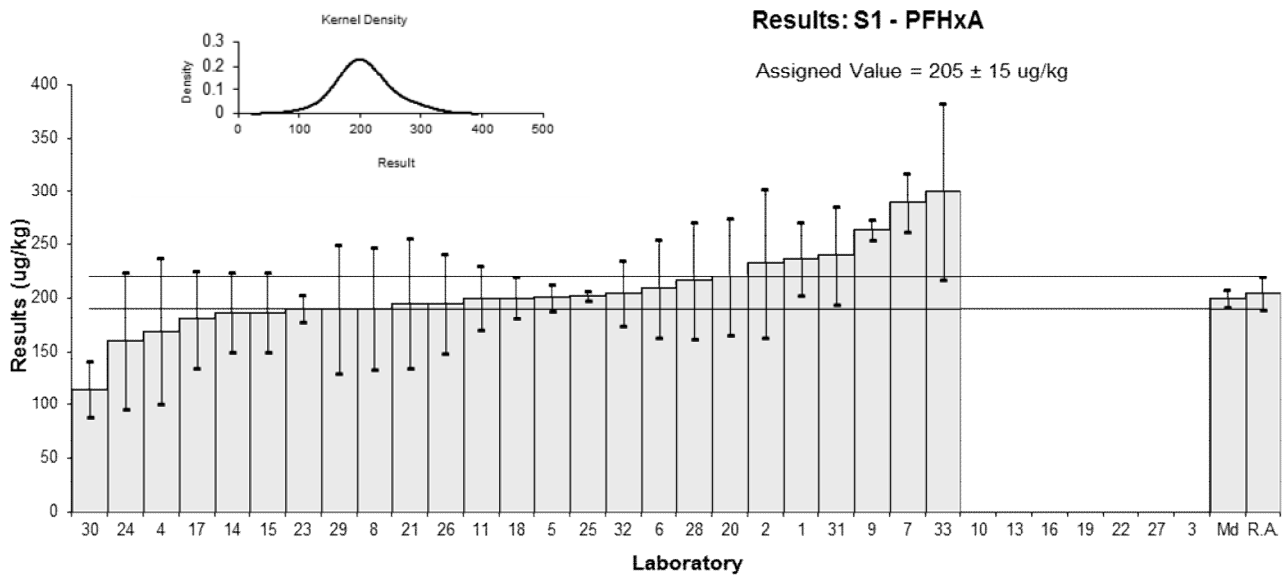
Sample No.	S1
Matrix.	Soil
Analyte.	PFHxA
Units	µg/kg

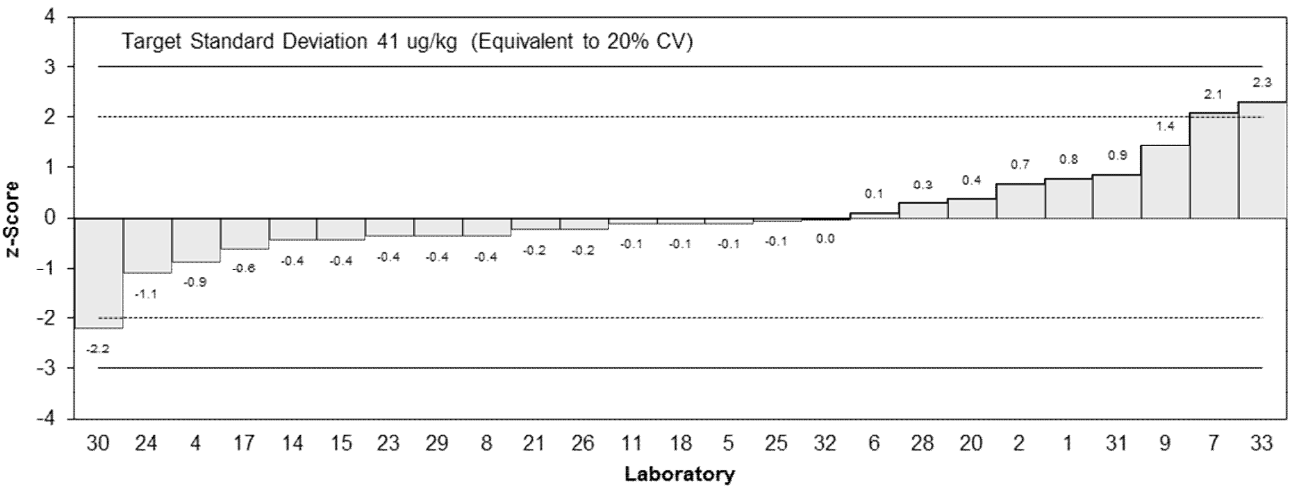
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	237	34	92	0.78	0.86
2	233	69.9	89	0.68	0.39
3	NT	NT	NT		
4	169	68	68	-0.88	-0.52
5	200.43	12.0255227	78	-0.11	-0.24
6	208.864	45.950	NR	0.09	0.08
7	290	27	NR	2.07	2.75
8	190	57	90	-0.37	-0.25
9	264	10	87.4	1.44	3.27
10	<1000	NR	NR		
11	200	30	105	-0.12	-0.15
13	NT	NT	NT		
14	187	37.4	102	-0.44	-0.45
15	187	37.5	81	-0.44	-0.45
16	NT	NT	NT		
17	180	45	98	-0.61	-0.53
18	200	19	91	-0.12	-0.21
19	NT	NT	NT		
20	220	55	101	0.37	0.26
21	195	61	75	-0.24	-0.16
22	NT	NT	NT		
23	190	13	NR	-0.37	-0.76
24	160	64	NR	-1.10	-0.68
25	202	4.6	NR	-0.07	-0.19
26	195	45.86	NR	-0.24	-0.21
27	NT	NT	NT		
28	216.6	54.15	98.9	0.28	0.21
29	190	60	NR	-0.37	-0.24
30	115	26	89	-2.20	-3.00
31	240	46	82	0.85	0.72
32	204	30.6	82	-0.02	-0.03
33	300	82.7	82	2.32	1.13

Statistics

Assigned Value	205	15
Spike	Not Spiked	
Robust Average	205	15
Median	200	8
Mean	207	
N	25	
Max.	300	
Min.	115	
Robust SD	30	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - PFHxA
Assigned Value = 205 ± 15 ug/kg
Results (ug/kg)
Laboratory
30 24 4 17 14 15 23 29 8 21 26 11 18 5 25 32 6 28 20 2 1 31 9 7 33 10 13 16 19 22 27 3 Md R.A


z-Scores: S1 - PFHxA
Target Standard Deviation 41 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 24 4 17 14 15 23 29 8 21 26 11 18 5 25 32 6 28 20 2 1 31 9 7 33

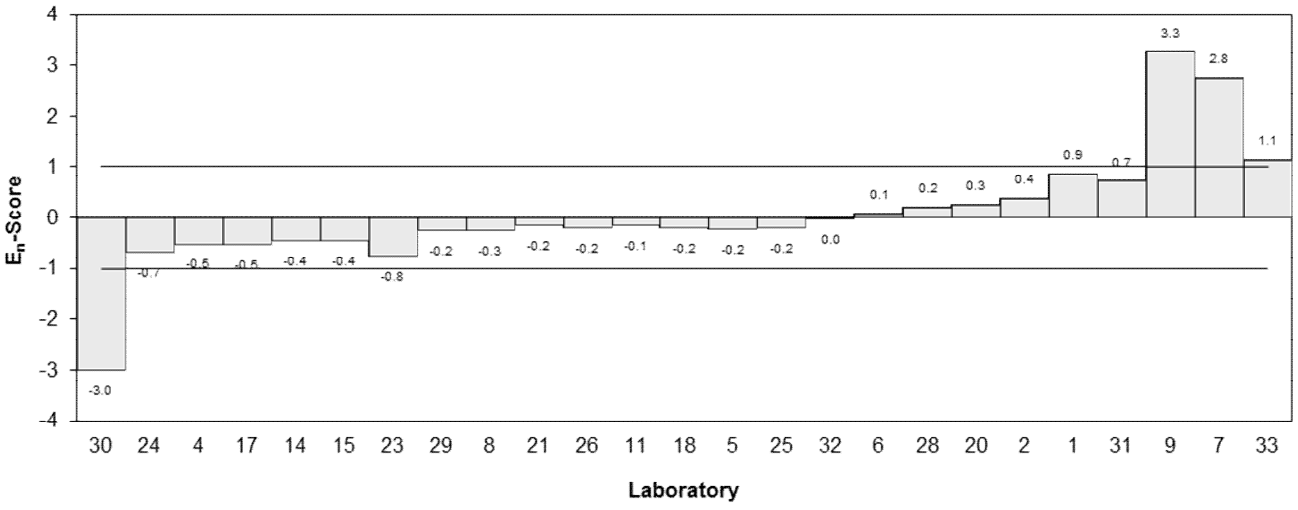

En-Scores: S1 - PFHxA
En-Score
Laboratory
30 24 4 17 14 15 23 29 8 21 26 11 18 5 25 32 6 28 20 2 1 31 9 7 33

Figure 15

Table 22

Sample Details

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

Participant Results

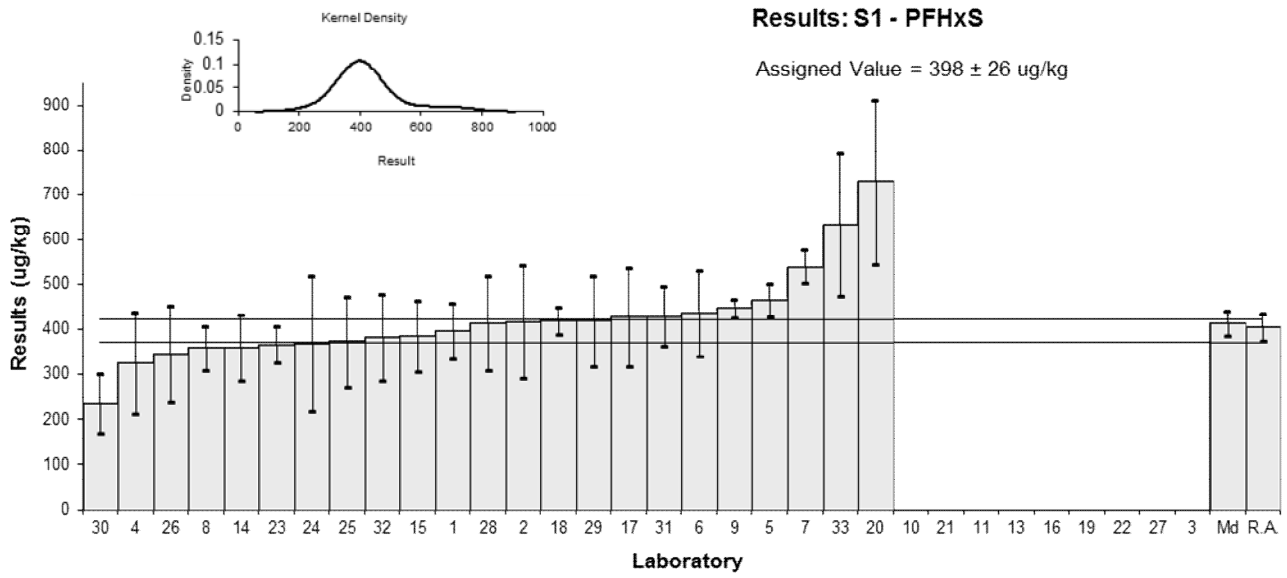
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	398	62	110	0.00	0.00
2	418	125	91	0.25	0.16
3	NT	NT	NT		
4	326	112	68	-0.90	-0.63
5	465.51	35.12	92	0.85	1.54
6	436.915	96.121	NR	0.49	0.39
7	541	37	79	1.80	3.16
8	360	48	102	-0.48	-0.70
9	448	20	87	0.63	1.52
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	361	72.2	75	-0.46	-0.48
15	386	77.2	100	-0.15	-0.15
16	NT	NT	NT		
17	430	110	106	0.40	0.28
18	420	30	89	0.28	0.55
19	NT	NT	NT		
20	730	183	88	4.17	1.80
21	3510	936	NR	39.10	3.32
22	NT	NT	NT		
23	367	40	NR	-0.39	-0.65
24	370	150	NR	-0.35	-0.18
25	374	99.5	NR	-0.30	-0.23
26	347	106.18	NR	-0.64	-0.47
27	NT	NT	NT		
28	415.1	103.775	92.4	0.21	0.16
29	420	100	NR	0.28	0.21
30	236	66	76	-2.04	-2.28
31	430	65	92	0.40	0.46
32	384	96	114	-0.18	-0.14
33	633	158	87	2.95	1.47

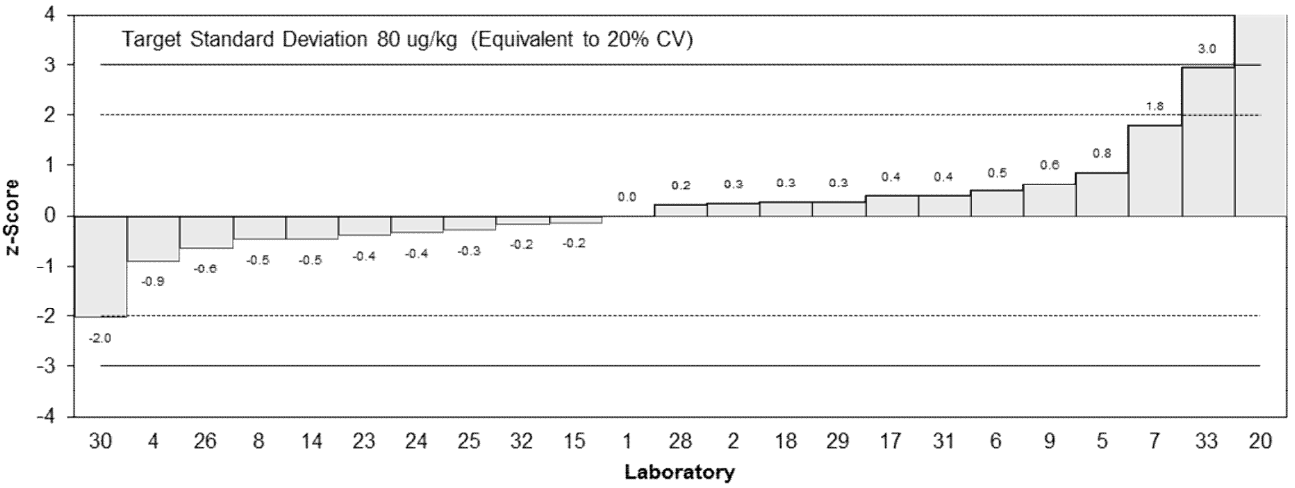
Statistics*

Assigned Value**	398	26
Spike	Not Spiked	
Robust Average	407	30
Median	415	26
Mean	422	
N	23	
Max.	730	
Min.	236	
Robust SD	48	
Robust CV	12%	

*Results from laboratory 21 were omitted from the statistical calculations.

**Assigned value is the robust average excluding laboratories 20 and 33.


Kernel Density
Density
Result
Results: S1 - PFHxS
Assigned Value = 398 ± 26 ug/kg
Results (ug/kg)
Laboratory
30 4 26 8 14 23 24 25 32 15 1 28 2 18 29 17 31 6 9 5 7 33 20 10 21 11 13 16 19 22 27 3 Md R.A.


z-Scores: S1 - PFHxS
Target Standard Deviation 80 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 4 26 8 14 23 24 25 32 15 1 28 2 18 29 17 31 6 9 5 7 33 20

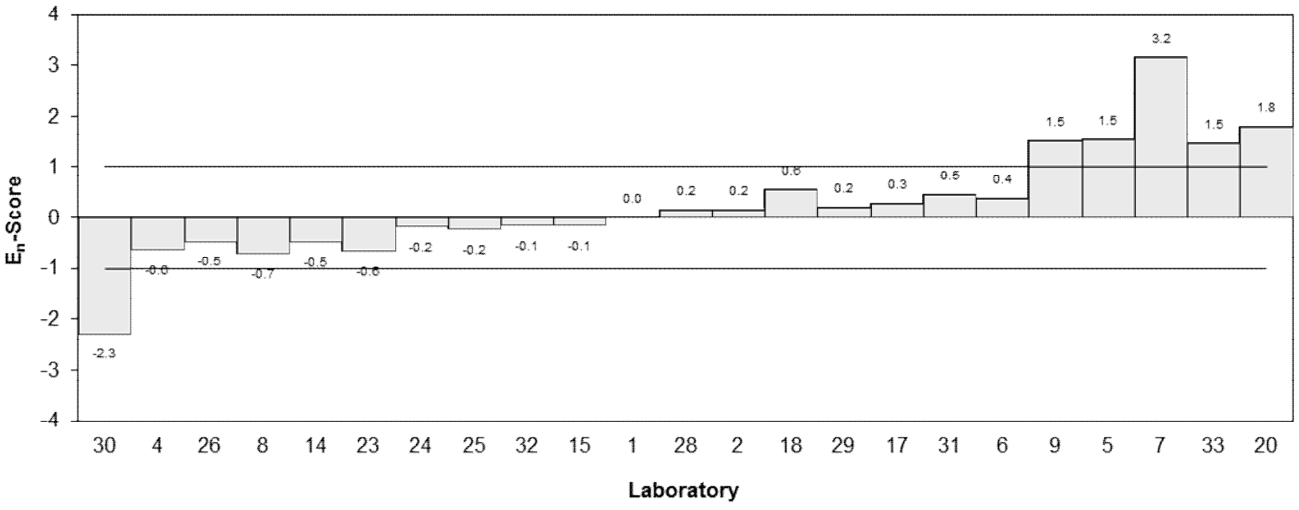

En-Scores: S1 - PFHxS
En-Score
Laboratory
30 4 26 8 14 23 24 25 32 15 1 28 2 18 29 17 31 6 9 5 7 33 20

Figure 16

Table 23

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	<19.8	NR	48
2	12.8	3.84	39
3	NT	NT	NT
4	<0.1	NR	68
5	<0.08	NR	13
6	2.986	0.657	NR
7	1.69	0.3	NR
8	<0.2	NR	85
9	2.22	0.1	23.8
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	1.83	0.366	100
15	1.85	0.370	78
16	NT	NT	NT
17	<10	NR	12
18	<1	NR	13
19	NT	NT	NT
20	< 10	2.5	77
21	3.38	0.65	NR
22	NT	NT	NT
23	3.73	0.25	NR
24	NT	NT	NT
25	<20.0	5.8	NR
26	<5.0	NR	NR
27	NT	NT	NT
28	2.84	0.71	93
29	<10	NR	NR
30	1.80	0.59	98
31	<5	1	77
32	< 5	1	117
33	9.32	1.86	17

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	3.0	1.1
Median	2.84	0.99
Mean	4.04	
N	11	
Max.	12.8	
Min.	1.69	
Robust SD	1.4	
Robust CV	47%	

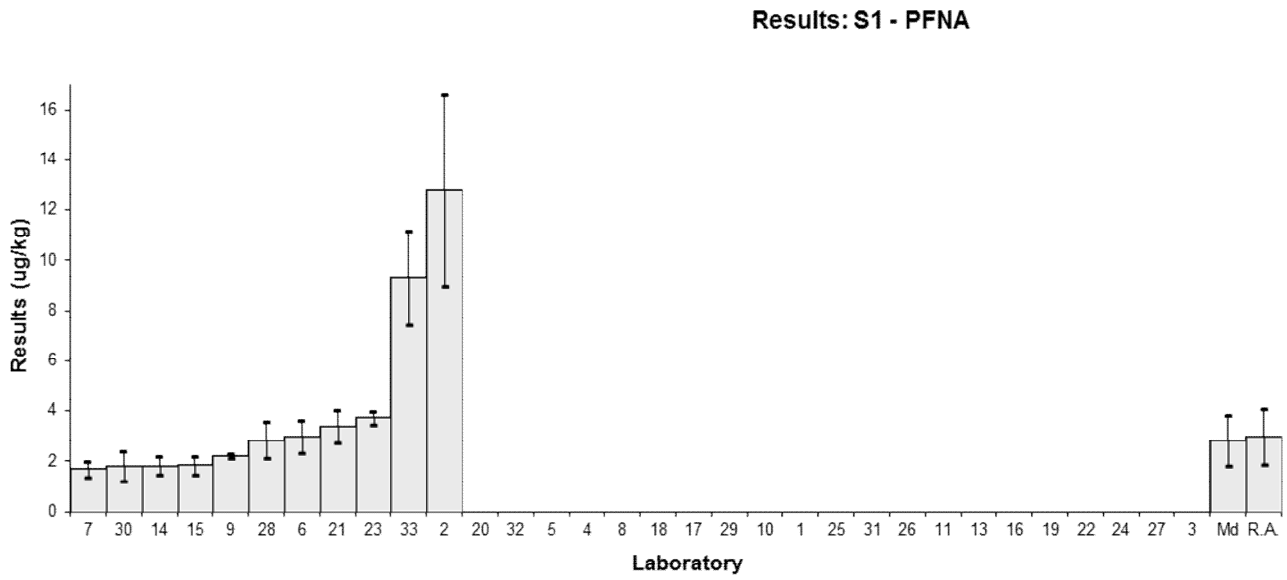

Results: S1 - PFNA
Results (ug/kg)
0
2
4
6
8
10
12
14
16
7 30 14 15 9 28 6 21 23 33 2 20 32 5 4 8 18 17 29 10 1 25 31 26 11 13 16 19 22 24 27 3 Md R.A.
Laboratory

Figure 17

Table 24

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	99.5	16.8	44
2	NT	NT	NT
3	NT	NT	NT
4	<0.5	NR	68
5	NR	NR	91
6	84.804	18.657	NR
7	79.9	2.9	NR
8	NT	NT	NT
9	473	20	NR
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	42.7	8.54	95
15	46.3	9.26	62
16	NT	NT	NT
17	47	12	108
18	<1	NR	12
19	NT	NT	NT
20	730	183	NR
21	NT	NT	NT
22	NT	NT	NT
23	NT	NT	NT
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	1794.56	448.64	89.2
29	NT	NT	NT
30	<0.1	NR	6
31	390	105	NR
32	387	58.1	NR
33	843	259	NR

Statistics*

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	290	240
Median	100	57
Mean	293	
N	11	
Max.	843	
Min.	42.7	
Robust SD	310	
Robust CV	110%	

*Results from laboratory 28 were omitted from the statistical calculations.

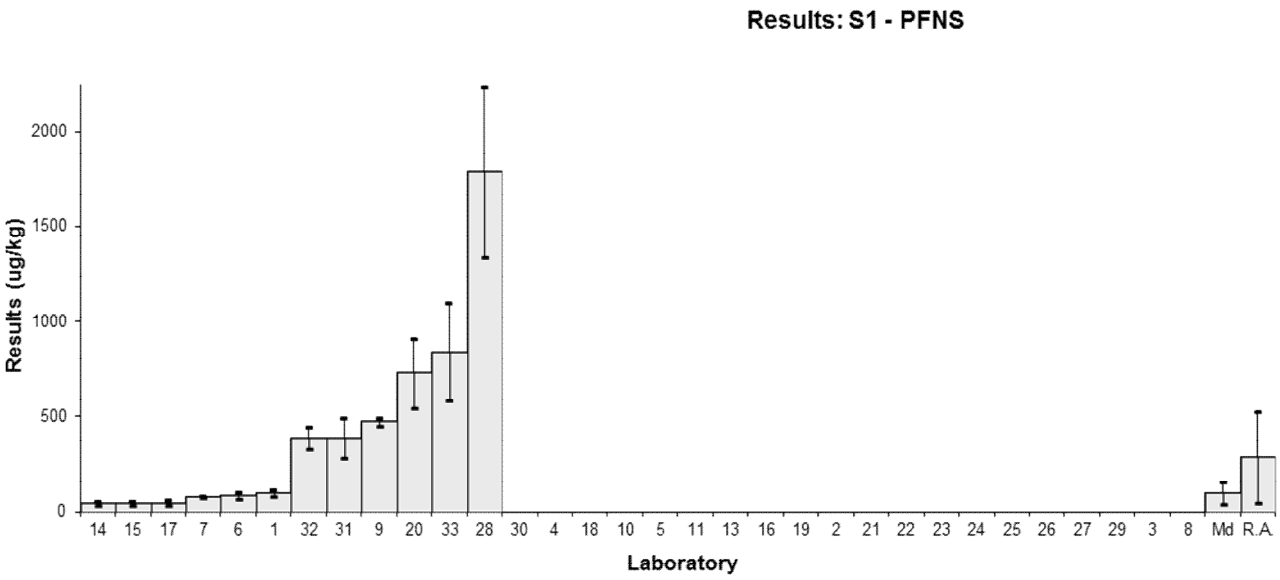

Results: S1 - PFNS
Results (ug/kg)
2000
1500
1000
500
0
14 15 17 7 6 1 32 31 9 20 33 28 30 4 18 10 5 11 13 16 19 2 21 22 23 24 25 26 27 29 3 8 Md R.A.
Laboratory

Figure 18

Table 25

Sample Details

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

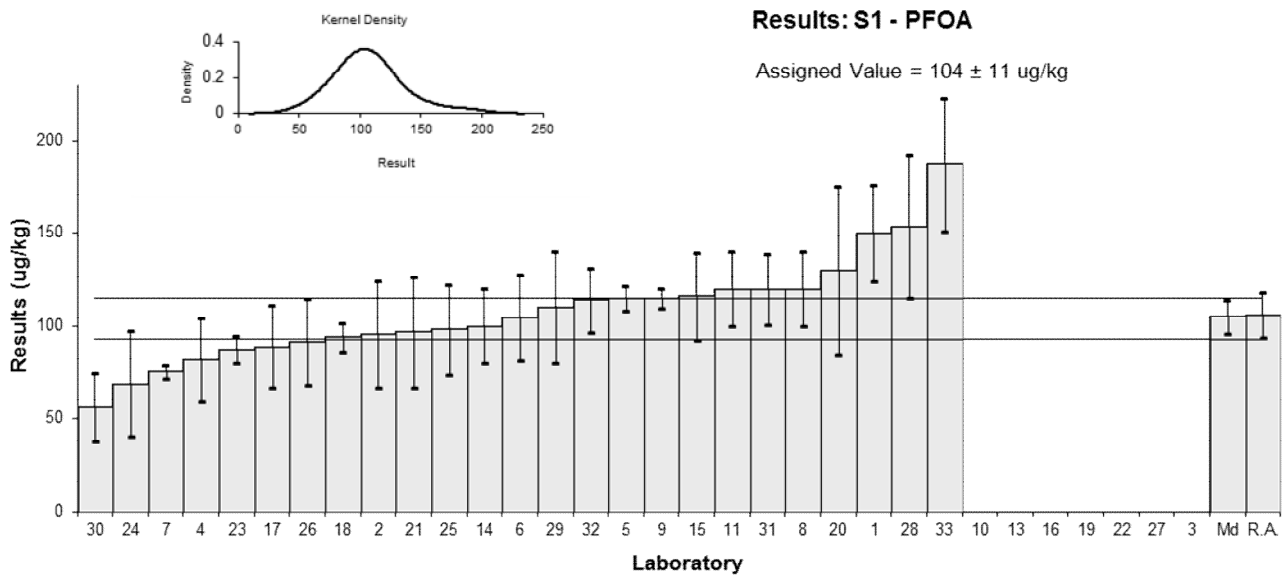
Participant Results

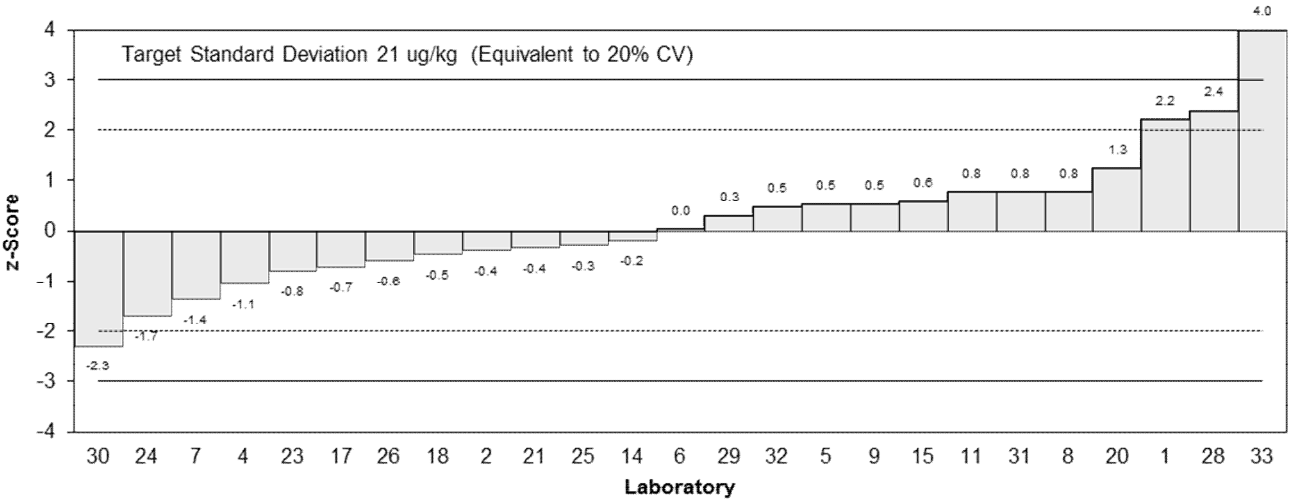
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	150	26	87	2.21	1.63
2	95.8	28.7	106	-0.39	-0.27
3	NT	NT	NT		
4	82	22.5	68	-1.06	-0.88
5	114.86	6.82	86	0.52	0.84
6	104.597	23.011	NR	0.03	0.02
7	75.5	3.4	76	-1.37	-2.48
8	120	20	88	0.77	0.70
9	115	5	90	0.53	0.91
10	<1000	NR	NR		
11	120	20	81	0.77	0.70
13	NT	NT	NT		
14	100	20.0	104	-0.19	-0.18
15	116	23.2	63	0.58	0.47
16	NT	NT	NT		
17	89	22	121	-0.72	-0.61
18	94	7.6	92	-0.48	-0.75
19	NT	NT	NT		
20	130	45	98	1.25	0.56
21	96.7	29.7	NR	-0.35	-0.23
22	NT	NT	NT		
23	87.3	7.0	98.4	-0.80	-1.28
24	69	28	NR	-1.68	-1.16
25	98.0	24.3	NR	-0.29	-0.22
26	91.5	23.24	NR	-0.60	-0.49
27	NT	NT	NT		
28	153.5	38.375	97.3	2.38	1.24
29	110	30	NR	0.29	0.19
30	56.3	18	127	-2.29	-2.26
31	120	19	78	0.77	0.73
32	114	17.1	86	0.48	0.49
33	187	36.0	81	3.99	2.20

Statistics

Assigned Value*	104	11
Spike	Not Spiked	
Robust Average	106	12
Median	105	9
Mean	108	
N	25	
Max.	187	
Min.	56.3	
Robust SD	22	
Robust CV	21%	

*Assigned value is the robust average excluding laboratory 33.


Kernel Density
Density
Result
Results: S1 - PFOA
Assigned Value = 104 ± 11 ug/kg
Results (ug/kg)
Laboratory
30 24 7 4 23 17 26 18 2 21 25 14 6 29 32 5 9 15 11 31 8 20 1 28 33 10 13 16 19 22 27 3 Md R.A.


z-Scores: S1 - PFOA
Target Standard Deviation 21 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 24 7 4 23 17 26 18 2 21 25 14 6 29 32 5 9 15 11 31 8 20 1 28 33

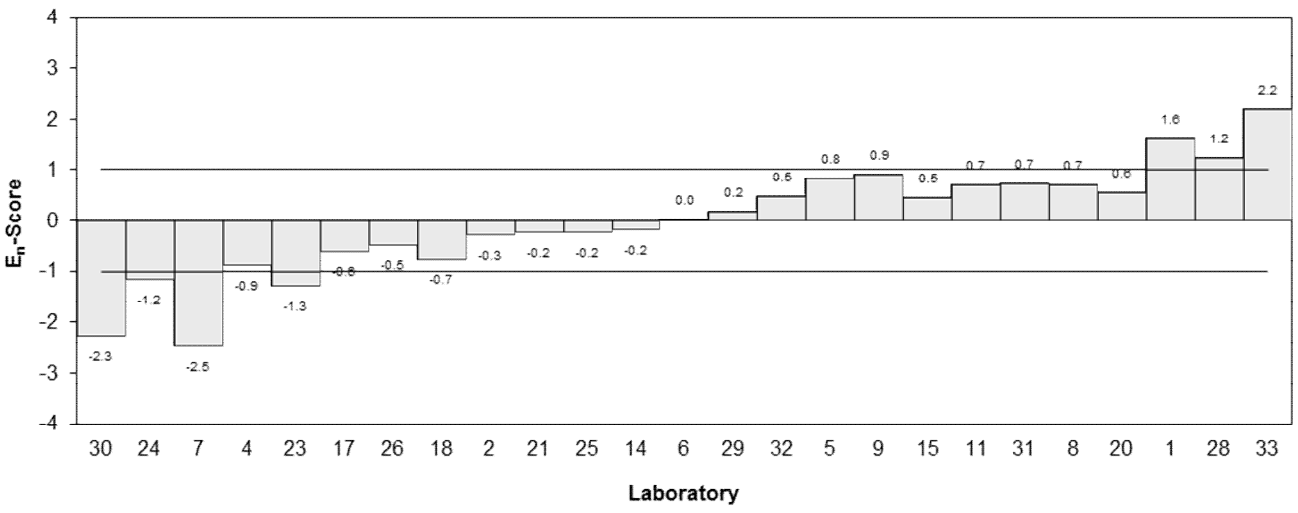

En-Scores: S1 - PFOA
En-Score
Laboratory
30 24 7 4 23 17 26 18 2 21 25 14 6 29 32 5 9 15 11 31 8 20 1 28 33

Figure 19

Table 26

Sample Details

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

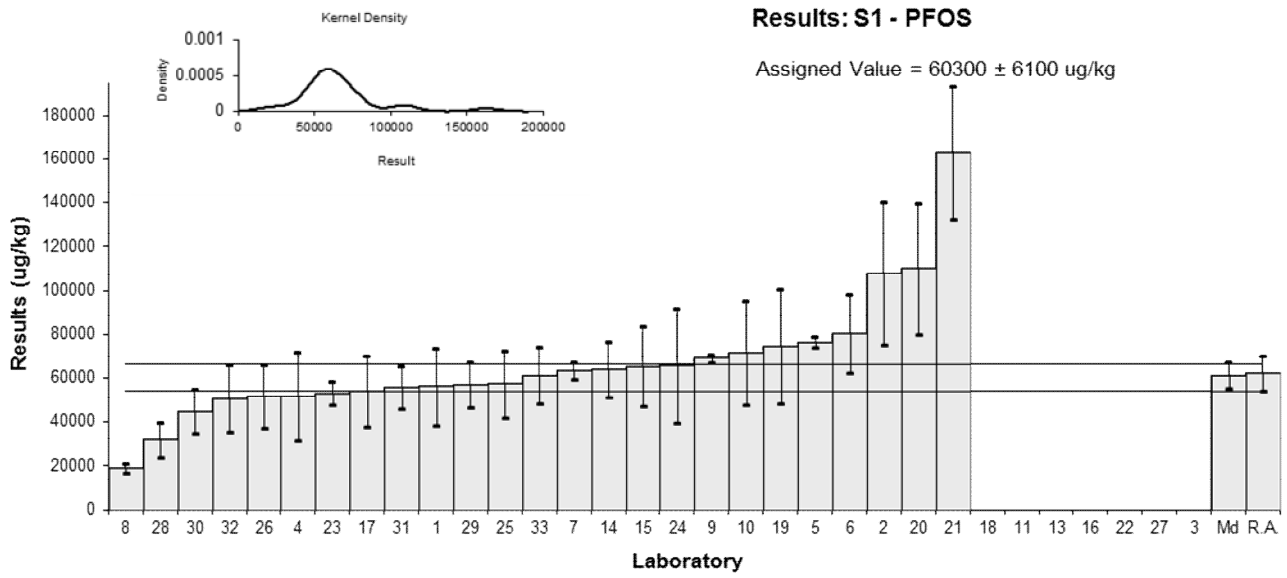
Participant Results

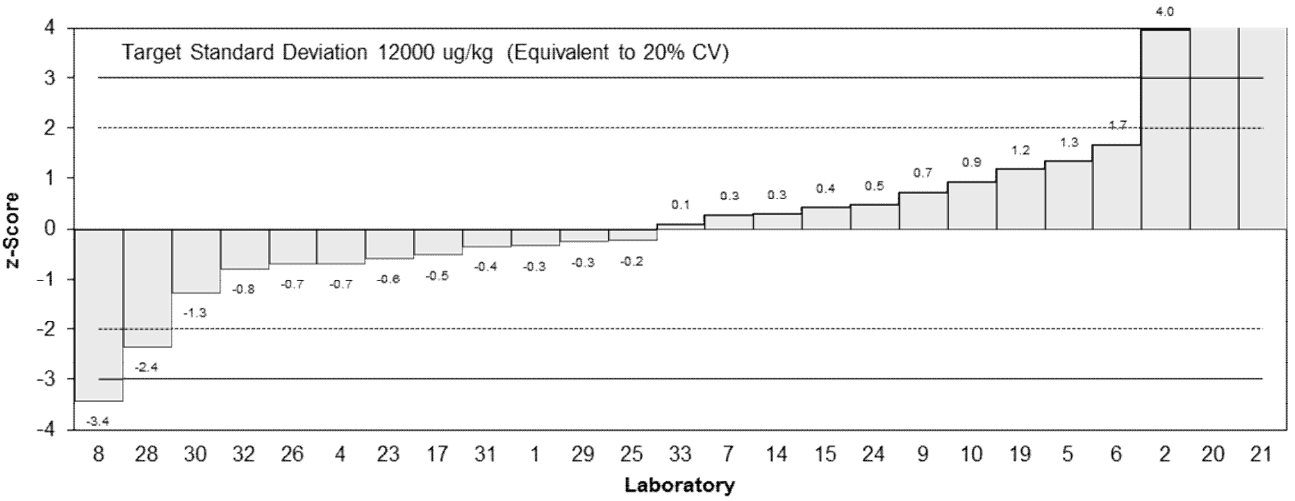
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	56200	17500	104	-0.34	-0.22
2	108000	32400	85	3.96	1.45
3	NT	NT	NT		
4	51800	20219	68	-0.70	-0.40
5	76394	2377	91	1.33	2.46
6	80393.904	17686.659	NR	1.67	1.07
7	63496	4073	65	0.27	0.44
8	19000	2100	92	-3.42	-6.40
9	69063	2000	66	0.73	1.37
10	71500	23600	99	0.93	0.46
11	NT	NT	NT		
13	NT	NT	NT		
14	64000	12800	80	0.31	0.26
15	65500	17900	62	0.43	0.27
16	NT	NT	NT		
17	54000	16000	117	-0.52	-0.37
18	<1	NR	12		
19	74600	26200	95.8	1.19	0.53
20	110000	30000	110	4.12	1.62
21	163000	30500	NR	8.52	3.30
22	NT	NT	NT		
23	53129	5400	NR	-0.59	-0.88
24	66000	26000	NR	0.47	0.21
25	57400	15400	NR	-0.24	-0.18
26	51800	14193	NR	-0.70	-0.55
27	NT	NT	NT		
28	31900	7975	100	-2.35	-2.83
29	57000	10000	NR	-0.27	-0.28
30	44950	9900	6	-1.27	-1.32
31	56000	9700	100	-0.36	-0.38
32	50710	15200	96.9	-0.80	-0.59
33	61400	12900	35	0.09	0.08

Statistics

Assigned Value*	60300	6100
Spike	Not Spiked	
Robust Average	62400	7700
Median	61400	5900
Mean	66300	
N	25	
Max.	163000	
Min.	19000	
Robust SD	11000	
Robust CV	18%	

*Assigned value is the robust average excluding laboratories 2, 8, 20 and 21.


Kernel Density
Density
Result
Results: S1 - PFOS
Assigned Value = 60300 ± 6100 ug/kg
Results (ug/kg)
Laboratory
8 28 30 32 26 4 23 17 31 1 29 25 33 7 14 15 24 9 10 19 5 6 2 20 21 18 11 13 16 22 27 3 Md R.A


z-Scores: S1 - PFOS
Target Standard Deviation 12000 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
8 28 30 32 26 4 23 17 31 1 29 25 33 7 14 15 24 9 10 19 5 6 2 20 21

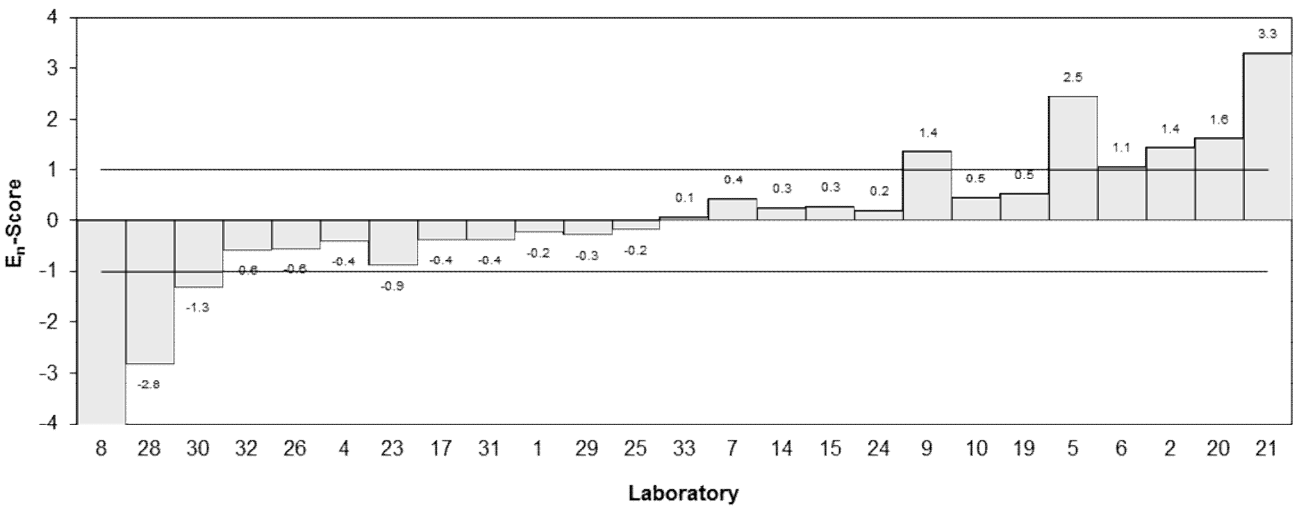

En-Scores: S1 - PFOS
En-Score
Laboratory
8 28 30 32 26 4 23 17 31 1 29 25 33 7 14 15 24 9 10 19 5 6 2 20 21

Figure 20

Table 27

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	273	49	91
2	466	140	74
3	NT	NT	NT
4	128	35	68
5	493.21	160	29
6	187.214	41.187	NR
7	225	6	NR
8	130	28	86
9	488	20	45.8
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	196	39.2	65
15	216	43.2	64
16	NT	NT	NT
17	210	53	113
18	220	24	82
19	NT	NT	NT
20	370	111	63
21	NT	NT	NT
22	NT	NT	NT
23	359	46	NR
24	NT	NT	NT
25	322	90.2	NR
26	326	100.40	NR
27	NT	NT	NT
28	219.7	54.925	24.8
29	450	100	NR
30	606	180	25
31	410	90	81
32	428	107	65.9
33	560	117	88

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	329	83
Median	324	73
Mean	331	
N	22	
Max.	606	
Min.	128	
Robust SD	160	
Robust CV	49%	

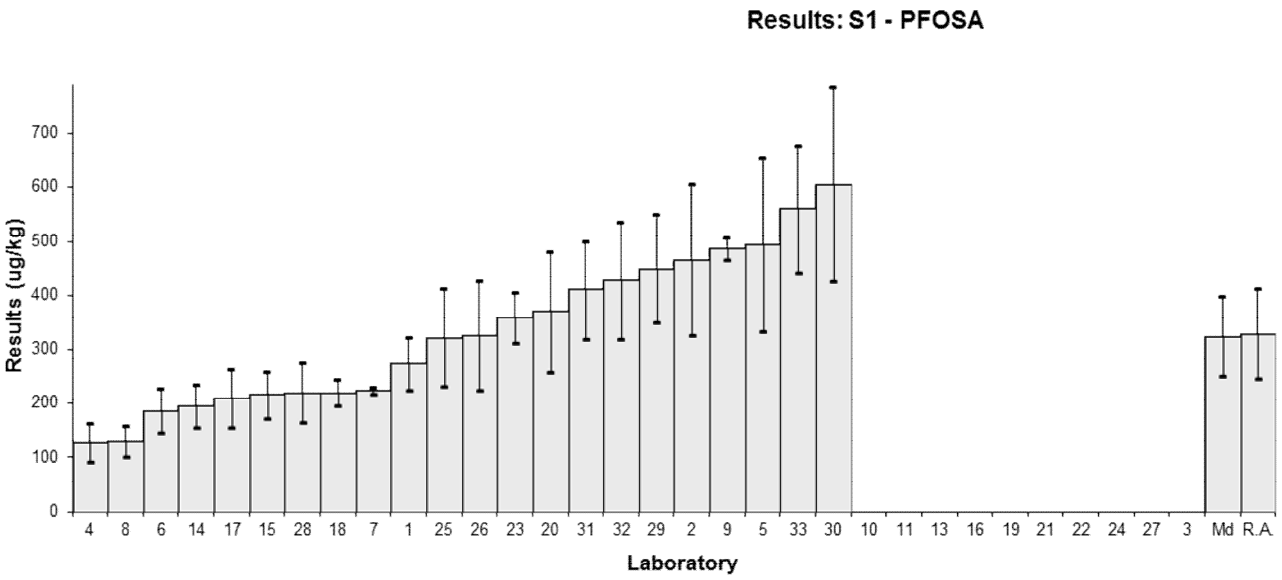

Results: S1 - PFOSA
Results (ug/kg)
0
100
200
300
400
500
600
700
4 8 6 14 17 15 28 18 7 1 25 26 23 20 31 32 29 2 9 5 33 30 10 11 13 16 19 21 22 24 27 3 Md R.A.
Laboratory

Figure 21

Table 28

Sample Details

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

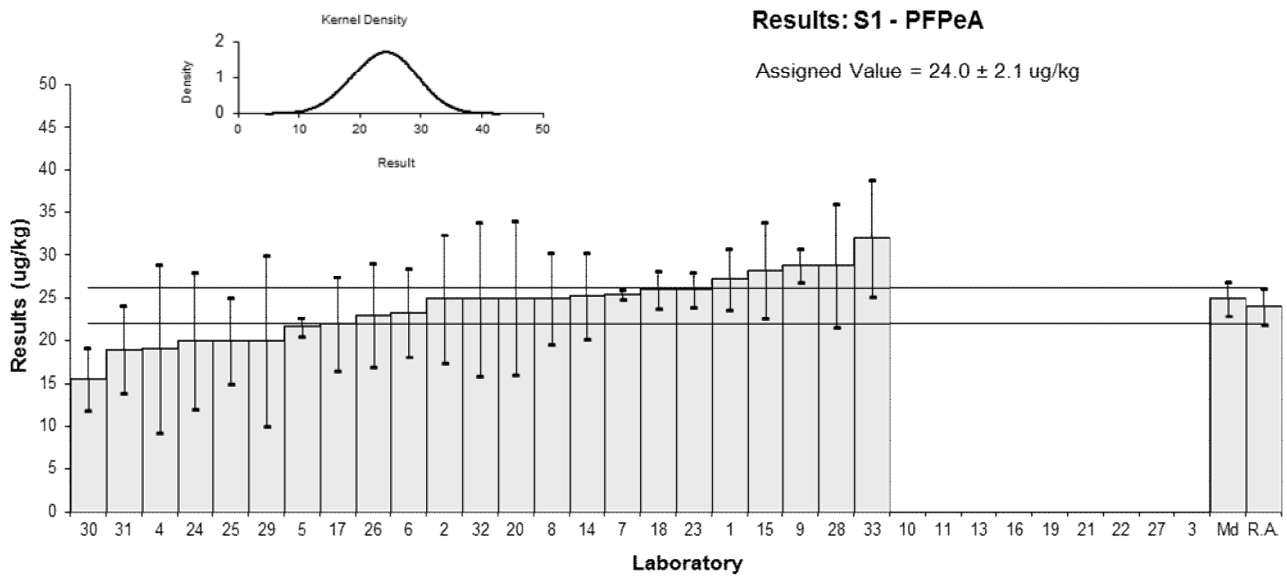
Participant Results

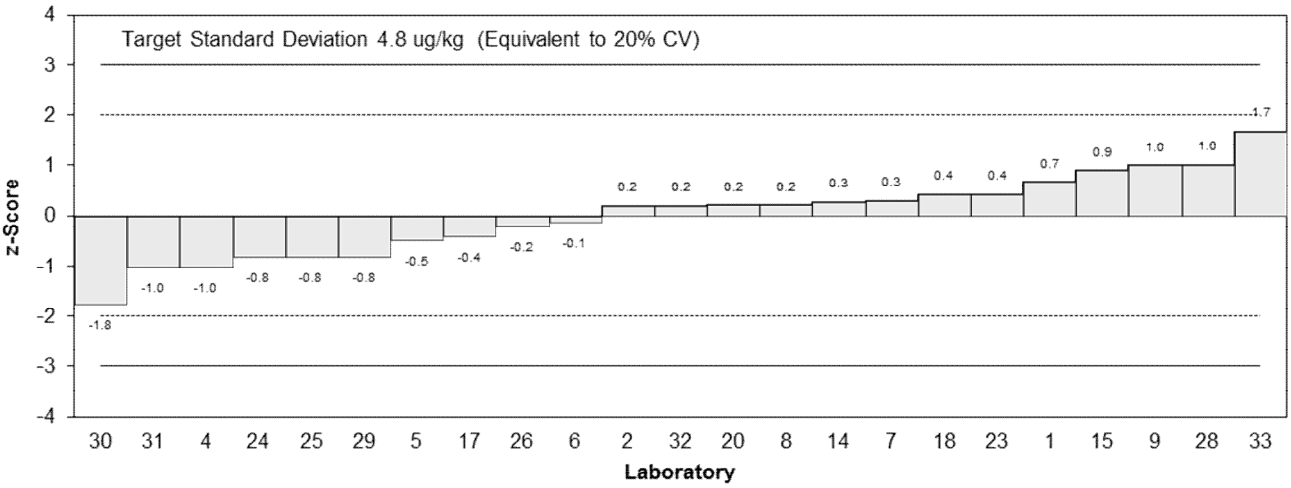
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	27.2	3.5	95	0.67	0.78
2	24.9	7.47	75	0.19	0.12
3	NT	NT	NT		
4	19.1	9.8	68	-1.02	-0.49
5*	21.65	1.04	89	-0.49	-1.00
6	23.300	5.126	NR	-0.15	-0.13
7	25.41	0.53	NR	0.29	0.65
8	25	5.3	97	0.21	0.18
9	28.8	2	91.8	1.00	1.66
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	25.3	5.06	89	0.27	0.24
15	28.3	5.66	93	0.90	0.71
16	NT	NT	NT		
17	22	5.5	114	-0.42	-0.34
18	26	2.2	99	0.42	0.66
19	NT	NT	NT		
20	25	9.0	102	0.21	0.11
21	NT	NT	NT		
22	NT	NT	NT		
23	26	2	NR	0.42	0.69
24	20	8	NR	-0.83	-0.48
25	20.0	5.0	NR	-0.83	-0.74
26	23.0	6.07	NR	-0.21	-0.16
27	NT	NT	NT		
28	28.85	7.2125	114	1.01	0.65
29	20	10	NR	-0.83	-0.39
30	15.5	3.7	87	-1.77	-2.00
31	19	5.1	89	-1.04	-0.91
32	24.9	9	105	0.19	0.10
33	32.0	6.77	85	1.67	1.13

Statistics

Assigned Value	24.0	2.1
Spike	Not Spiked	
Robust Average	24.0	2.1
Median	24.9	1.9
Mean	24.0	
N	23	
Max.	32	
Min.	15.5	
Robust SD	4.0	
Robust CV	17%	

*Laboratory 5 has $|E_n| > 1$ when E_n is not rounded; this is an unsatisfactory E_n-score.


Kernel Density
Density
Result
Results: S1 - PFPeA
Assigned Value = 24.0 ± 2.1 ug/kg
Results (ug/kg)
Laboratory
30 31 4 24 25 29 5 17 26 6 2 32 20 8 14 7 18 23 1 15 9 28 33 10 11 13 16 19 21 22 27 3 Md R.A.


z-Scores: S1 - PFPeA
Target Standard Deviation 4.8 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 31 4 24 25 29 5 17 26 6 2 32 20 8 14 7 18 23 1 15 9 28 33

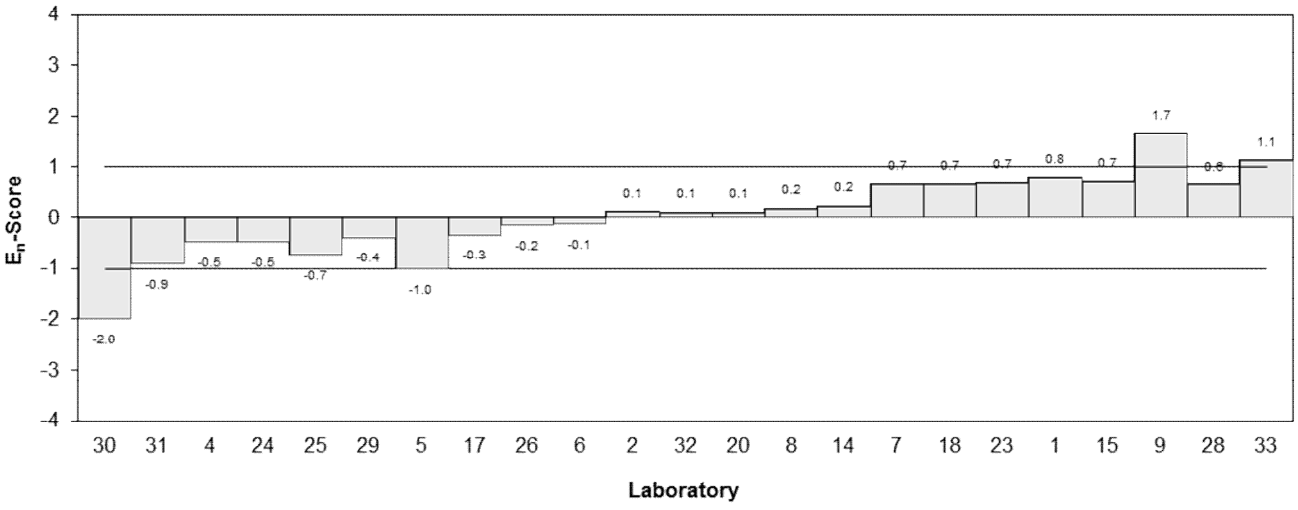

En-Scores: S1 - PFPeA
En-Score
Laboratory
30 31 4 24 25 29 5 17 26 6 2 32 20 8 14 7 18 23 1 15 9 28 33

Figure 22

Table 29

Sample Details

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

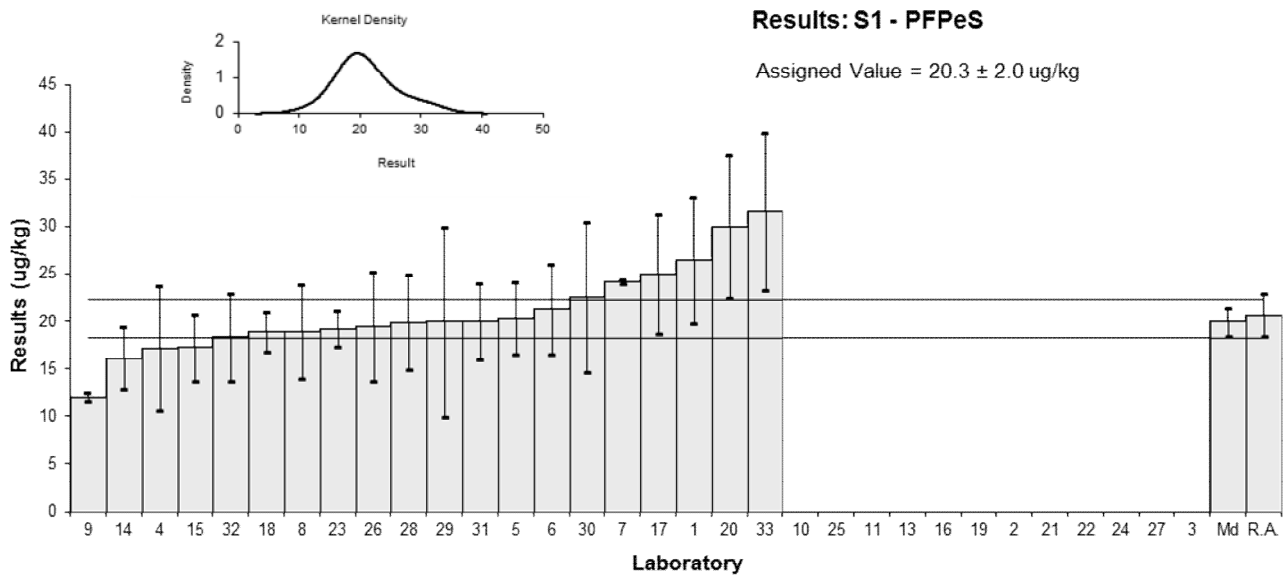
Participant Results

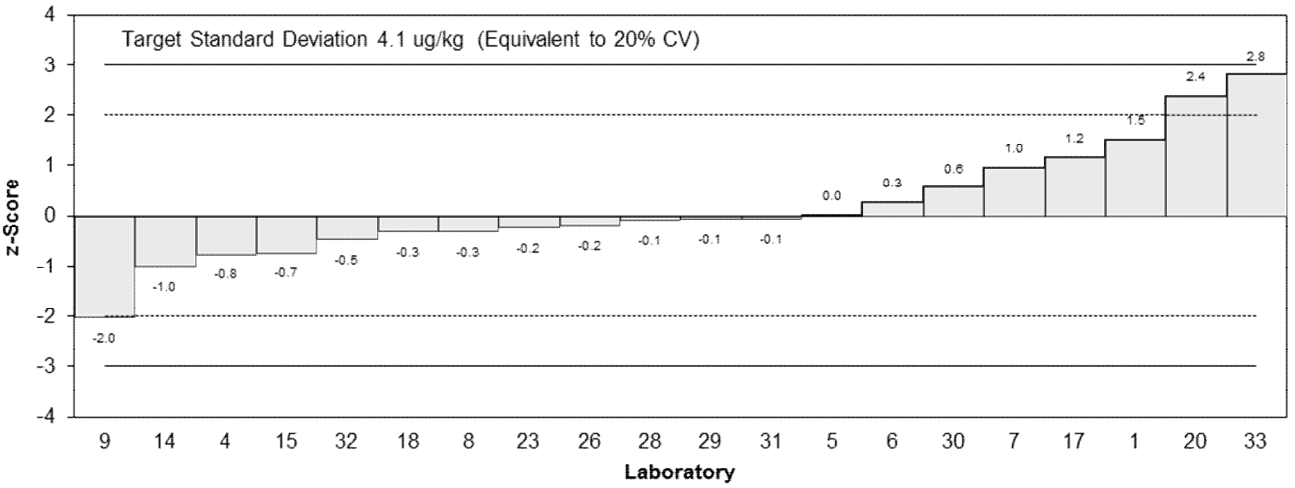
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	26.5	6.6	110	1.53	0.90
2	NT	NT	NT		
3	NT	NT	NT		
4	17.2	6.5	68	-0.76	-0.46
5	20.35	3.76	116	0.01	0.01
6	21.367	4.701	NR	0.26	0.21
7	24.23	0.16	NR	0.97	1.96
8	19	4.9	90	-0.32	-0.25
9	12.1	0.5	NR	-2.02	-3.98
10	<1000	NR	NR		
11	NT	NT	NT		
13	NT	NT	NT		
14	16.2	3.23	70	-1.01	-1.08
15	17.3	3.47	100	-0.74	-0.75
16	NT	NT	NT		
17	25	6.3	123	1.16	0.71
18	19	2.1	91	-0.32	-0.45
19	NT	NT	NT		
20	30	7.5	NR	2.39	1.25
21	NT	NT	NT		
22	NT	NT	NT		
23	19.3	1.9	NR	-0.25	-0.36
24	NT	NT	NT		
25	<20.0	5.2	NR		
26	19.5	5.77	NR	-0.20	-0.13
27	NT	NT	NT		
28	19.93	4.9825	92.4	-0.09	-0.07
29	20	10	NR	-0.07	-0.03
30	22.6	7.9	69	0.57	0.28
31	20	4	NR	-0.07	-0.07
32	18.4	4.6	NR	-0.47	-0.38
33	31.7	8.32	NR	2.81	1.33

Statistics

Assigned Value*	20.3	2.0
Spike	Not Spiked	
Robust Average	20.7	2.2
Median	20.0	1.5
Mean	21.0	
N	20	
Max.	31.7	
Min.	12.1	
Robust SD	3.5	
Robust CV	17%	

*Assigned value is the robust average excluding laboratory 33.


Kernel Density
Density
Result
Results: S1 - PFPeS
Assigned Value = 20.3 ± 2.0 ug/kg
Results (ug/kg)
Laboratory
9 14 4 15 32 18 8 23 26 28 29 31 5 6 30 7 17 1 20 33 10 25 11 13 16 19 2 21 22 24 27 3 Md R.A.


z-Scores: S1 - PFPeS
Target Standard Deviation 4.1 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
9 14 4 15 32 18 8 23 26 28 29 31 5 6 30 7 17 1 20 33
-2.0 -1.0 -0.8 -0.7 -0.5 -0.3 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 0.0 0.3 0.6 1.0 1.2 1.5 2.4 2.8

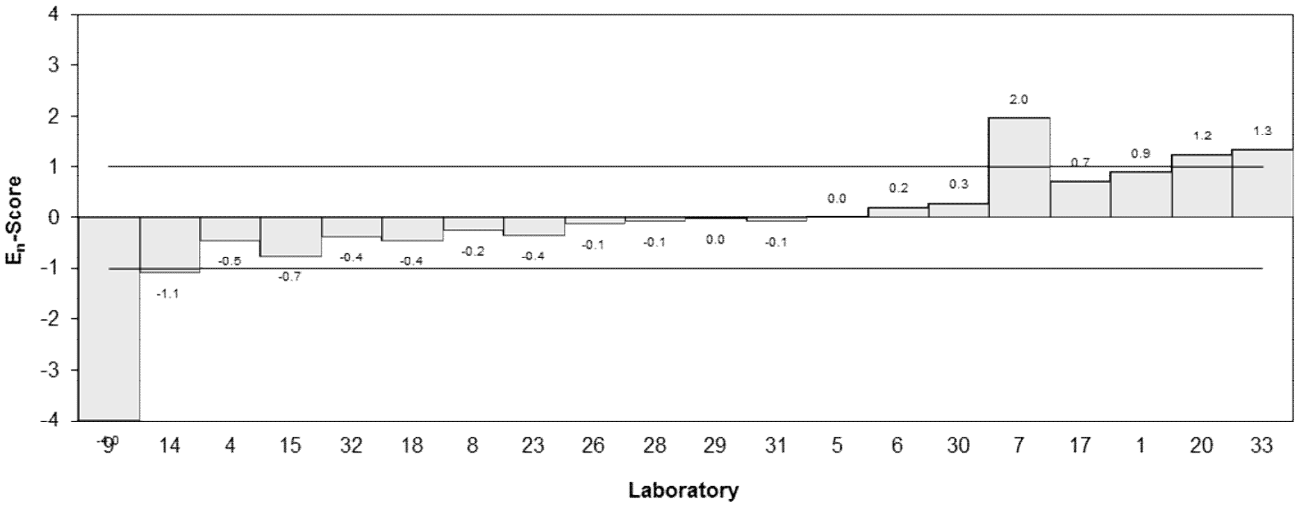

En-Scores: S1 - PFPeS
En-Score
Laboratory
9 14 4 15 32 18 8 23 26 28 29 31 5 6 30 7 17 1 20 33
-1.1 -0.5 -0.7 -0.4 -0.4 -0.2 -0.4 -0.1 -0.1 0.0 -0.1 0.0 0.2 0.3 2.0 0.7 0.9 1.2 1.3

Figure 23

Table 30

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.271	0.047	131
2	< 1.69	0.51	139
3	NT	NT	NT
4	<5.0	NR	68
5	<0.27	NR	8
6	<1.0	NR	NR
7	2.57	0.11	NR
8	<0.2	NR	72
9	0.426	0.05	NR
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	<0.5	NR	65
15	<0.5	NR	64
16	NT	NT	NT
17	<2	NR	149
18	<1	NR	94
19	NT	NT	NT
20	< 10	6.3	88
21	<0.5	0.5	NR
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<50.0	14.7	NR
26	<12.5	NR	NR
27	NT	NT	NT
28	0.174	0.0435	64
29	<500	NR	NR
30	0.2	0.07	74
31	<5	1	119
32	< 5	1	70
33	1.21	0.258	106

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	0.69	0.81
Median	0.35	0.25
Mean	0.81	
N	6	
Max.	2.57	
Min.	0.174	
Robust SD	0.79	
Robust CV	110%	

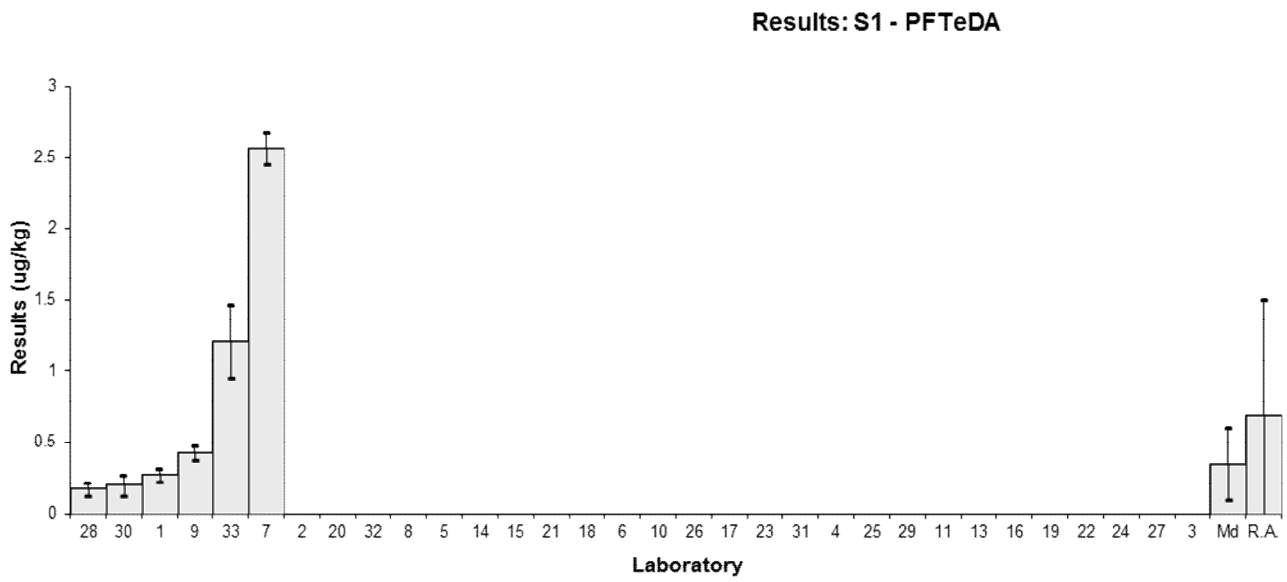

Results: S1 - PFTeDA
Results (ug/kg)
3
2.5
2
1.5
1
0.5
0
28 30 1 9 33 7 2 20 32 8 5 14 15 21 18 6 10 26 17 23 31 4 25 29 11 13 16 19 22 24 27 3 Md R.A.
Laboratory

Figure 24

Table 31

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	1.33	0.26	135
2	< 1.69	0.51	139
3	NT	NT	NT
4	<5.0	NR	68
5	<0.25	NR	26
6	<1.0	NR	NR
7	15.48	0.26	NR
8	<0.2	NR	72
9	1.03	0.1	NR
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	<0.5	NR	85
15	<0.5	NR	105
16	NT	NT	NT
17	<2	NR	125
18	<1	NR	93
19	NT	NT	NT
20	< 7.0	2.9	NR
21	<0.5	0.5	NR
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	<20.0	7.0	NR
26	<5.0	NR	NR
27	NT	NT	NT
28	0.149	0.03725	76.1
29	<50	NR	NR
30	0.5	0.15	74
31	<5	1	NR
32	< 5	1	NR
33	<0.985	NR	NR

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	1.4	1.8
Median	1.03	0.98
Mean	3.70	
N	5	
Max.	15.48	
Min.	0.149	
Robust SD	1.6	
Robust CV	110%	

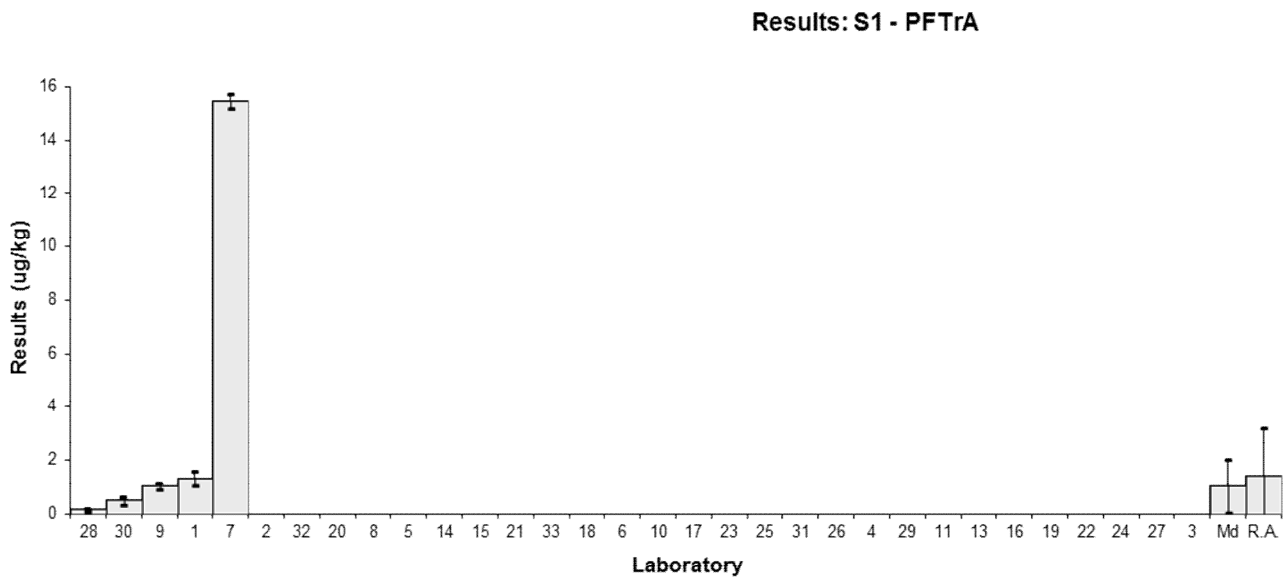

Results: S1 - PFTrA
Results (ug/kg)
16
14
12
10
8
6
4
2
0
28 30 9 1 7 2 32 20 8 5 14 15 21 33 18 6 10 17 23 25 31 26 4 29 11 13 16 19 22 24 27 3 Md R.A.
Laboratory

Figure 25

Table 32

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	1.00	0.15	132
2	< 1.69	0.51	95
3	NT	NT	NT
4	<1.0	NR	68
5	2.61	0.93	28
6	<1.0	NR	NR
7	6.25	0.04	NR
8	<0.2	NR	86
9	2.85	0.1	85.2
10	<1000	NR	NR
11	NT	NT	NT
13	NT	NT	NT
14	0.75	0.150	94
15	0.698	0.140	80
16	NT	NT	NT
17	<2	NR	122
18	<1	NR	92
19	NT	NT	NT
20	5.3	2.3	108
21	0.745	0.159	NR
22	NT	NT	NT
23	2.08	0.14	NR
24	NT	NT	NT
25	<20.0	5.7	NR
26	<5.0	NR	NR
27	NT	NT	NT
28	0.768	0.192	71.9
29	<50	NR	NR
30	0.52	0.19	30
31	<5	1	65
32	< 5	1	117
33	<0.985	NR	80

Statistics

Assigned Value	Not Set	
Spike	Not Spiked	
Robust Average	1.9	1.3
Median	1.00	0.48
Mean	2.14	
N	11	
Max.	6.25	
Min.	0.52	
Robust SD	1.7	
Robust CV	89%	

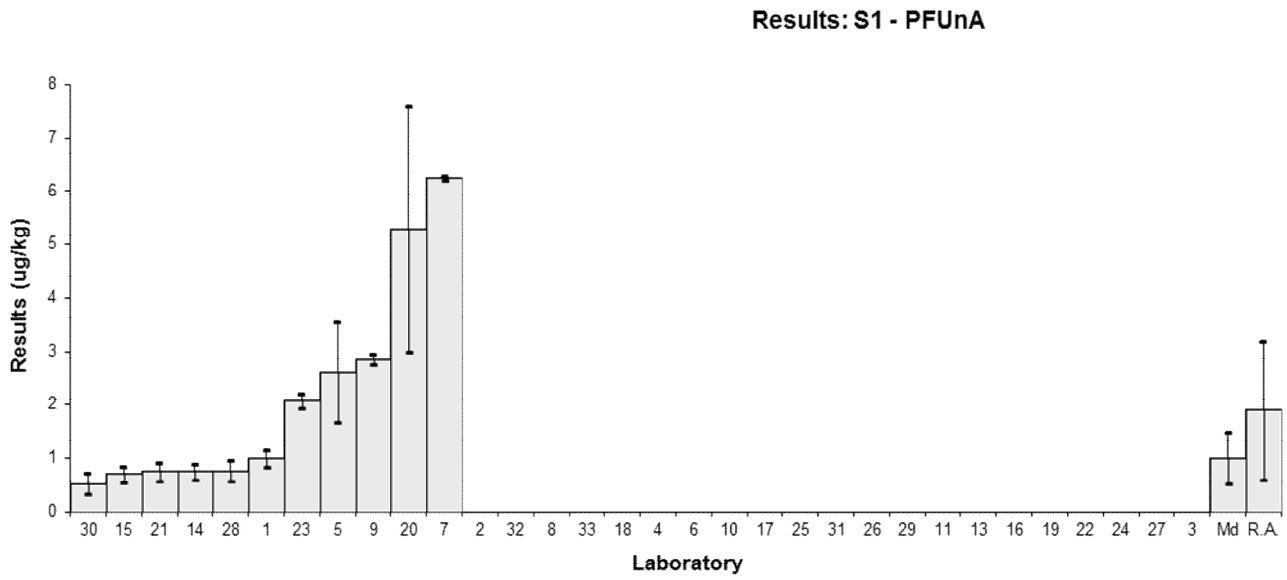

Results: S1 - PFUnA
Results (ug/kg)
0
1
2
3
4
5
6
7
8
30 15 21 14 28 1 23 5 9 20 7 2 32 8 33 18 4 6 10 17 25 31 26 29 11 13 16 19 22 24 27 3 Md R.A.
Laboratory

Figure 26

Table 33

Sample Details

Sample No.	S2
Matrix.	Soil
Analyte.	6:2 FTS
Units	µg/kg

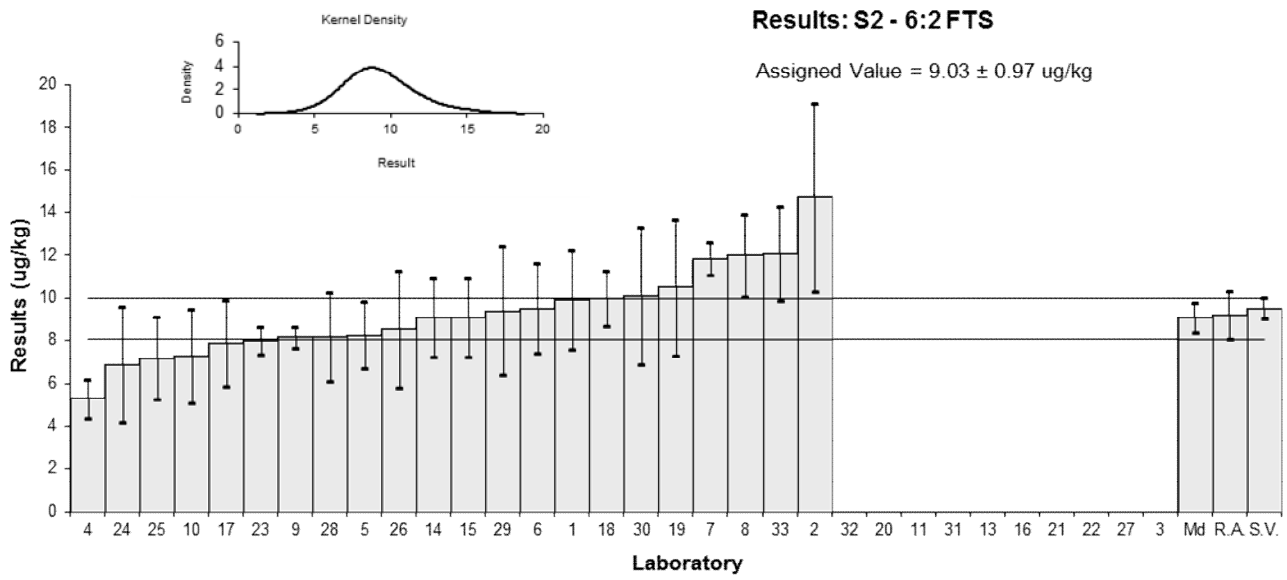
Participant Results

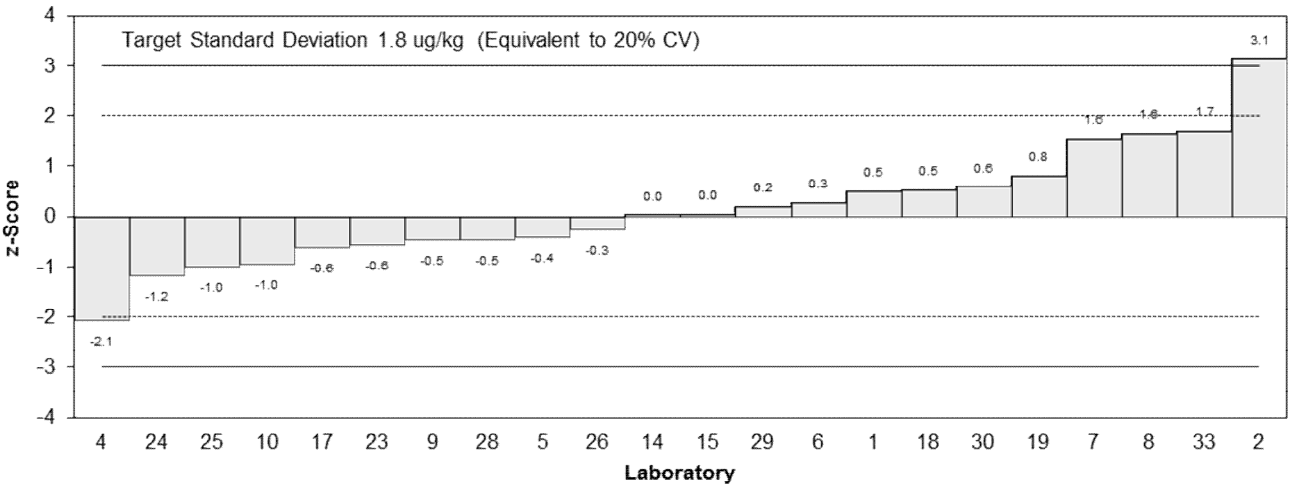
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	9.92	2.30	96	0.49	0.36
2	14.7	4.41	119	3.14	1.26
3	NT	NT	NT		
4	5.3	0.9	105	-2.07	-2.82
5	8.27	1.54	73	-0.42	-0.42
6	9.516	2.094	NR	0.27	0.21
7	11.83	0.75	NR	1.55	2.28
8	12	1.9	102	1.64	1.39
9	8.16	0.5	113.6	-0.48	-0.80
10	7.31	2.19	NR	-0.95	-0.72
11	<10	NR	156		
13	NT	NT	NT		
14	9.08	1.81	96	0.03	0.02
15	9.09	1.82	86	0.03	0.03
16	NT	NT	NT		
17	7.9	2.0	88	-0.63	-0.51
18	10	1.3	95	0.54	0.60
19	10.5	3.2	110	0.81	0.44
20	< 20	5.0	NR		
21	NT	NT	NT		
22	NT	NT	NT		
23	8.01	0.61	NR	-0.56	-0.89
24	6.9	2.7	NR	-1.18	-0.74
25	7.2	1.93	NR	-1.01	-0.85
26	8.56	2.72	NR	-0.26	-0.16
27	NT	NT	NT		
28	8.20	2.05	93	-0.46	-0.37
29	9.4	3	127	0.20	0.12
30	10.1	3.2	100	0.59	0.32
31	<5	1	131		
32	< 10	5	91		
33	12.1	2.18	95	1.70	1.29

Statistics

Assigned Value*	9.03	0.97
Spike	9.51	0.48
Robust Average	9.2	1.1
Median	9.09	0.69
Mean	9.27	
N	22	
Max.	14.7	
Min.	5.3	
Robust SD	1.8	
Robust CV	20%	

*Assigned value is the robust average excluding laboratory 2.


Kernel Density
Density
Result
Results: S2 - 6:2 FTS
Assigned Value = 9.03 ± 0.97 ug/kg
Results (ug/kg)
Laboratory
4 24 25 10 17 23 9 28 5 26 14 15 29 6 1 18 30 19 7 8 33 2 32 20 11 31 13 16 21 22 27 3 Md R.A S.V.


z-Scores: S2 - 6:2 FTS
Target Standard Deviation 1.8 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
4 24 25 10 17 23 9 28 5 26 14 15 29 6 1 18 30 19 7 8 33 2
-2.1 -1.2 -1.0 -1.0 -0.6 -0.6 -0.5 -0.5 -0.4 -0.3 0.0 0.0 0.2 0.3 0.5 0.5 0.6 0.8 1.6 1.6 1.7 3.1

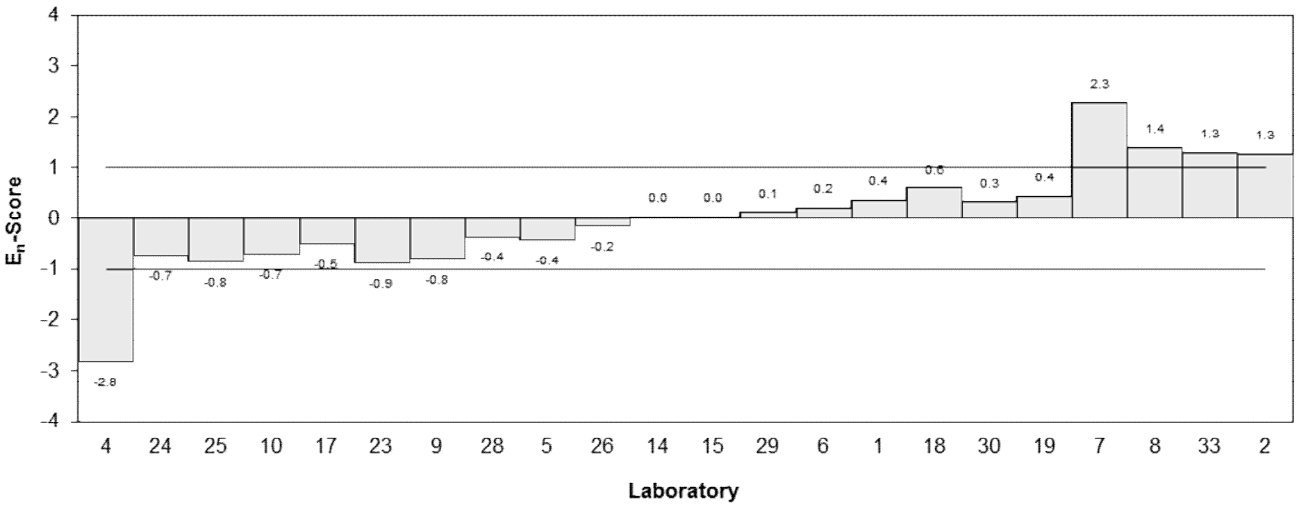

En-Scores: S2 - 6:2 FTS
En-Score
Laboratory
4 24 25 10 17 23 9 28 5 26 14 15 29 6 1 18 30 19 7 8 33 2
-2.8 -0.7 -0.8 -0.7 -0.5 -0.9 -0.8 -0.4 -0.4 -0.2 0.0 0.0 0.1 0.2 0.4 0.6 0.3 0.4 2.3 1.4 1.3 1.3

Figure 27

Table 34

Sample Details

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

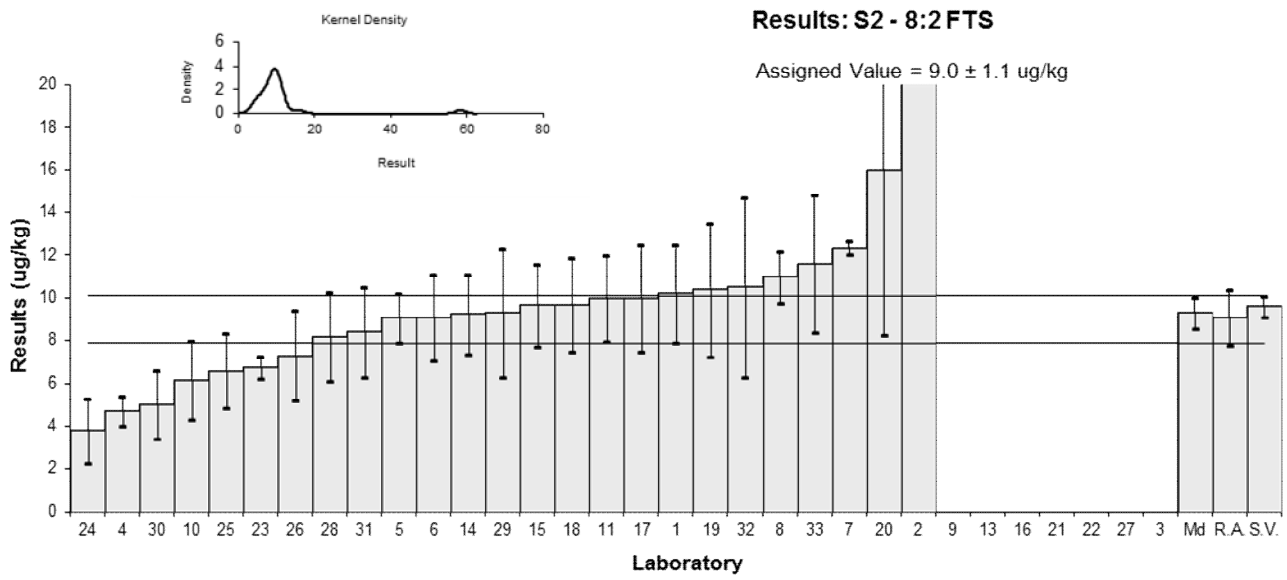
Participant Results

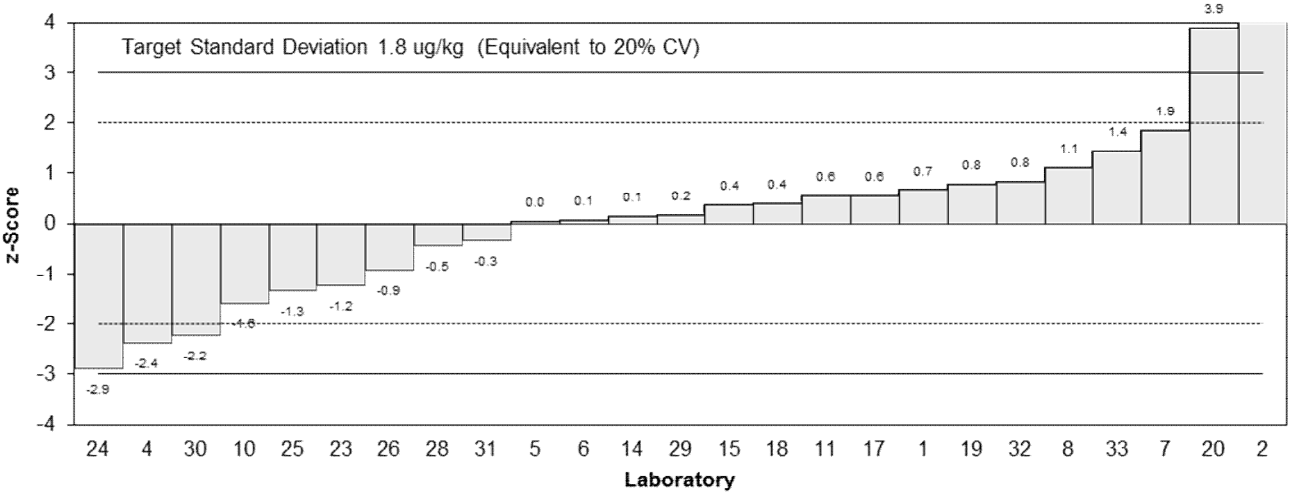
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	10.2	2.3	99	0.67	0.47
2	58.3	17.5	119	27.39	2.81
3	NT	NT	NT		
4	4.7	0.7	105	-2.39	-3.30
5	9.06	1.15	64	0.03	0.04
6	9.109	2.004	NR	0.06	0.05
7	12.34	0.30	NR	1.86	2.93
8	11	1.2	109	1.11	1.23
9	<0.2	0.2	NR		
10	6.14	1.84	NR	-1.59	-1.33
11	10	2	119	0.56	0.44
13	NT	NT	NT		
14	9.26	1.85	81	0.14	0.12
15	9.66	1.93	84	0.37	0.30
16	NT	NT	NT		
17	10	2.5	73	0.56	0.37
18	9.7	2.2	99	0.39	0.28
19	10.4	3.11	109	0.78	0.42
20	16	7.7	NR	3.89	0.90
21	NT	NT	NT		
22	NT	NT	NT		
23	6.77	0.52	NR	-1.24	-1.83
24	3.8	1.5	NR	-2.89	-2.80
25	6.6	1.72	NR	-1.33	-1.18
26	7.32	2.11	NR	-0.93	-0.71
27	NT	NT	NT		
28	8.19	2.0475	87.3	-0.45	-0.35
29	9.3	3	149	0.17	0.09
30	5.0	1.6	100	-2.22	-2.06
31	8.4	2.1	105	-0.33	-0.25
32	10.5	4.2	131	0.83	0.35
33	11.6	3.20	99	1.44	0.77

Statistics

Assigned Value*	9.0	1.1
Spike	9.61	0.48
Robust Average	9.1	1.3
Median	9.30	0.73
Mean	10.93	
N	25	
Max.	58.3	
Min.	3.8	
Robust SD	2.1	
Robust CV	23%	

*Assigned value is the robust average excluding laboratories 2, 20, and 24.


Kernel Density
Density
Result
Results: S2 - 8:2 FTS
Assigned Value = 9.0 ± 1.1 ug/kg
Results (ug/kg)
Laboratory
24 4 30 10 25 23 26 28 31 5 6 14 29 15 18 11 17 1 19 32 8 33 7 20 2 9 13 16 21 22 27 3 Md R.A S.V.


z-Scores: S2 - 8:2 FTS
Target Standard Deviation 1.8 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
24 4 30 10 25 23 26 28 31 5 6 14 29 15 18 11 17 1 19 32 8 33 7 20 2

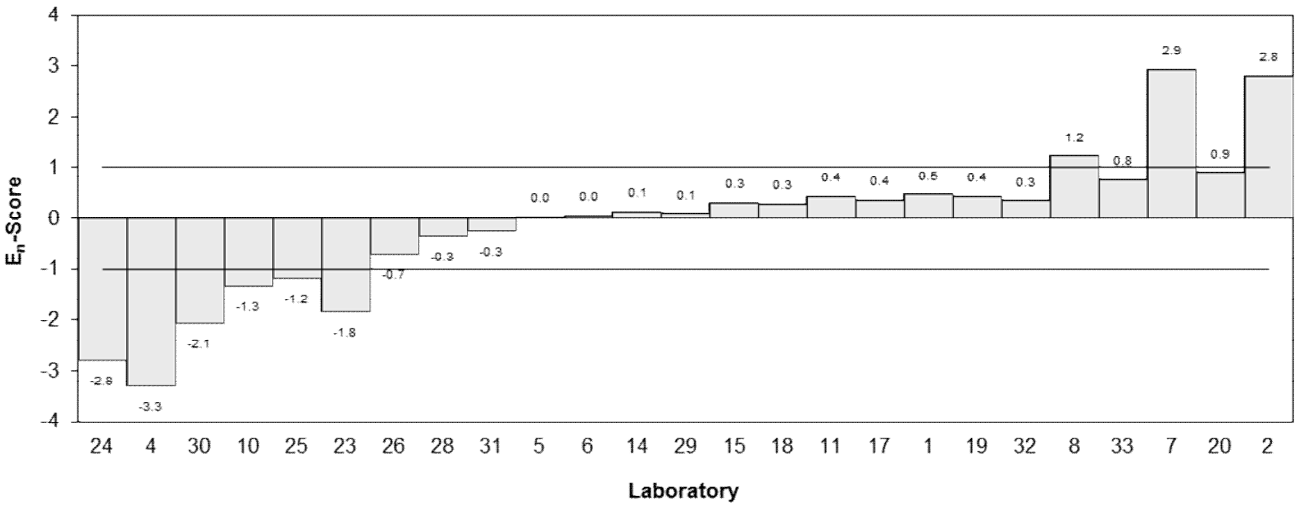

En-Scores: S2 - 8:2 FTS
En-Score
Laboratory
24 4 30 10 25 23 26 28 31 5 6 14 29 15 18 11 17 1 19 32 8 33 7 20 2

Figure 28

Table 35

Sample Details

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

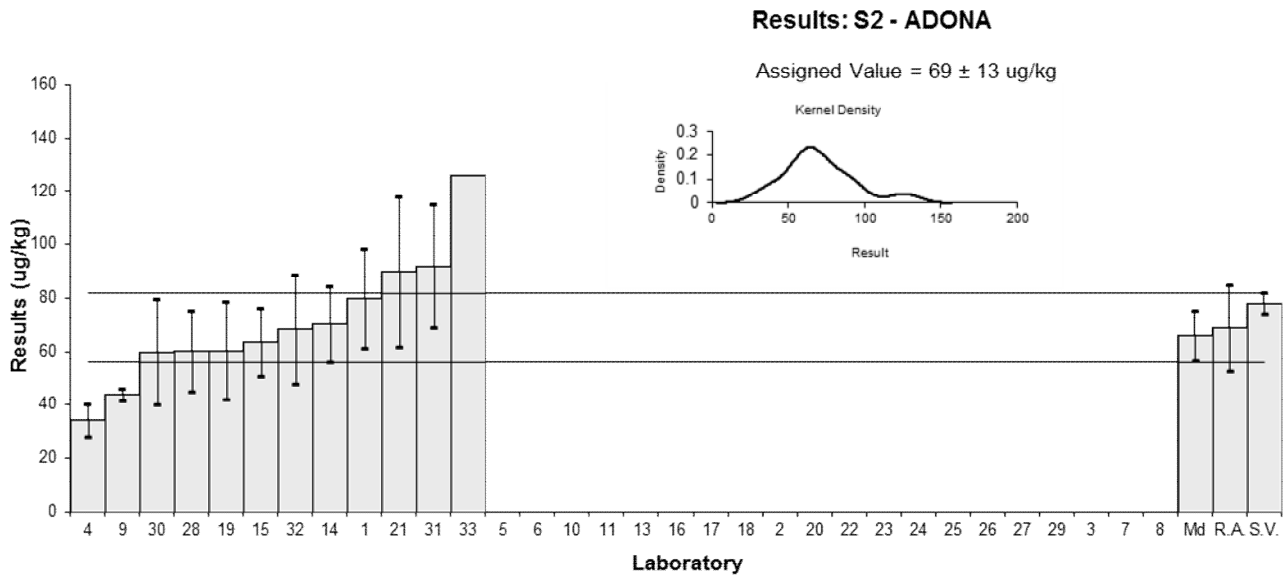
Participant Results

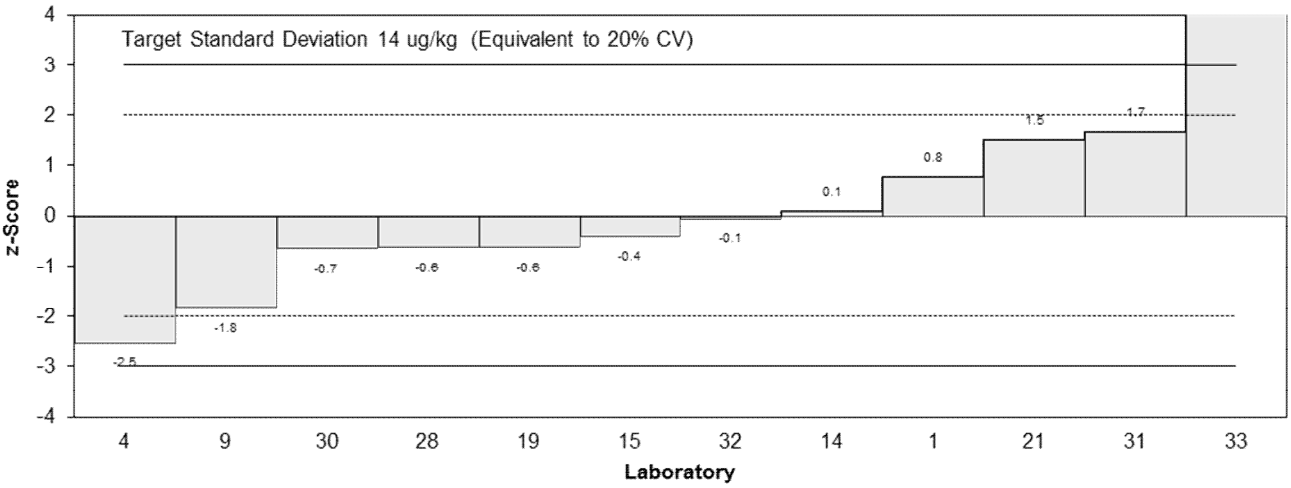
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	79.8	18.4	93	0.78	0.48
2	NT	NT	NT		
3	NT	NT	NT		
4	34.2	5.9	105	-2.52	-2.44
5	<1	NR	NT		
6	NR	NR	NR		
7	NT	NT	NT		
8	NT	NT	NT		
9	43.9	2	NR	-1.82	-1.91
10	NT	NT	NT		
11	NT	NT	NT		
13	NT	NT	NT		
14	70.3	14.1	80	0.09	0.07
15	63.4	12.7	96	-0.41	-0.31
16	NT	NT	NT		
17	NT	NT	NT		
18	NT	NT	NT		
19	60.4	18.1	126	-0.62	-0.39
20	NT	NT	NT		
21	89.9	28.2	NR	1.51	0.67
22	NT	NT	NT		
23	NT	NT	NT		
24	NT	NT	NT		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	60.29	15.0725	94.8	-0.63	-0.44
29	NT	NT	NT		
30	60.0	19.7	133	-0.65	-0.38
31	92	23	NR	1.67	0.87
32	68.3	20.5	NR	-0.05	-0.03
33	126	NR	NR	4.13	4.38

Statistics

Assigned Value*	69	13
Spike	78.2	3.9
Robust Average	69	16
Median	65.9	9.3
Mean	70.7	
N	12	
Max.	126	
Min.	34.2	
Robust SD	17	
Robust CV	25%	

*Assigned value is the robust average excluding laboratories 4 and 33.


Results: S2 - ADONA
Assigned Value = 69 ± 13 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
Laboratory
4 9 30 28 19 15 32 14 1 21 31 33 5 6 10 11 13 16 17 18 2 20 22 23 24 25 26 27 29 3 7 8 Md R.A. S.V.


z-Scores: S2 - ADONA
Target Standard Deviation 14 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
4 9 30 28 19 15 32 14 1 21 31 33
-2.5
-1.8
-0.7
-0.6
-0.6
-0.4
-0.1
0.1
0.8
1.5
1.7

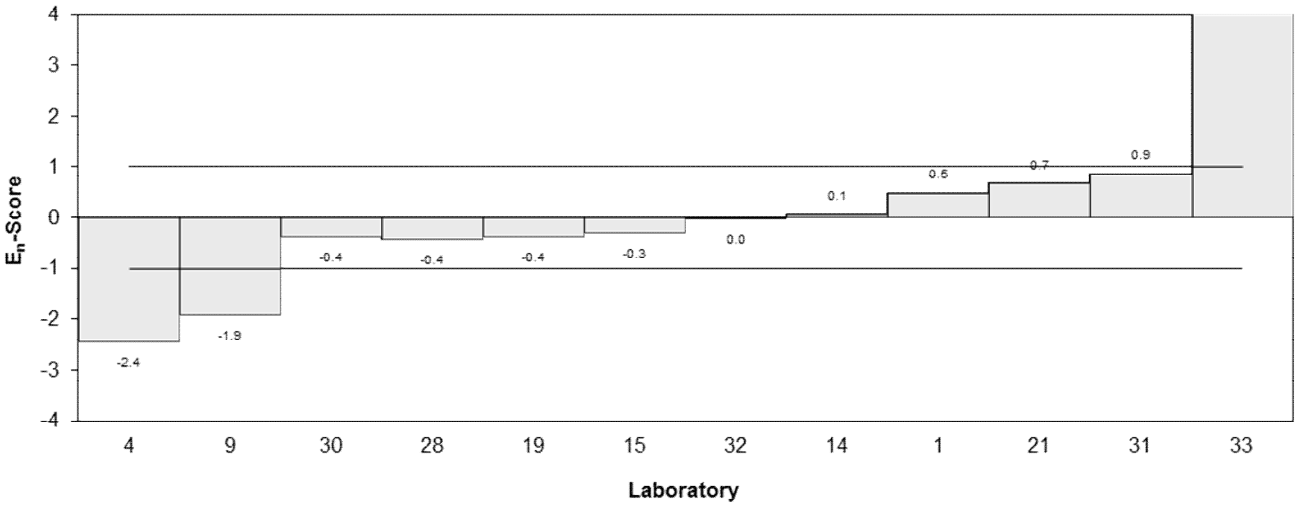

En-Scores: S2 - ADONA
En-Score
Laboratory
4 9 30 28 19 15 32 14 1 21 31 33
-2.4
-1.9
-0.4
-0.4
-0.4
-0.3
0.0
0.1
0.5
0.7
0.9

Figure 29

Table 36

Sample Details

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

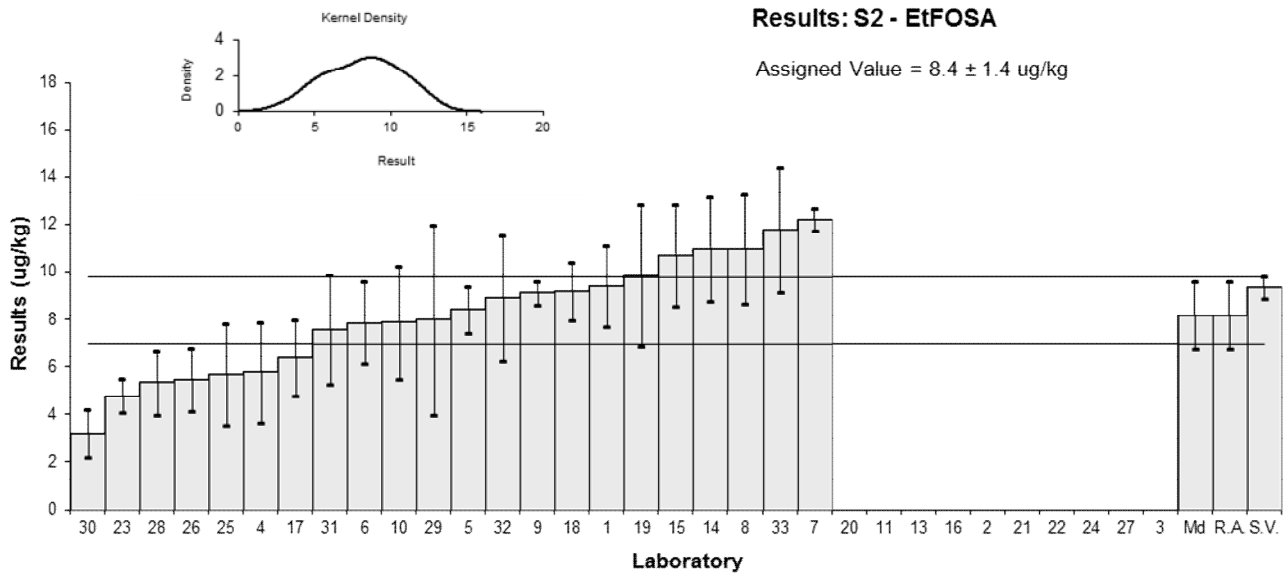
Participant Results

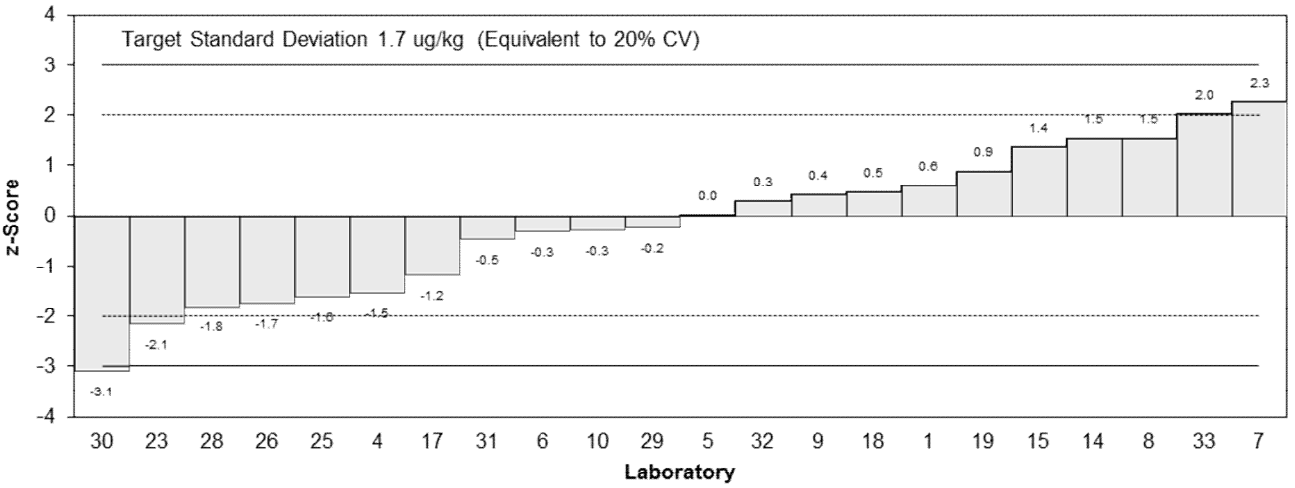
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	9.42	1.70	43	0.61	0.46
2	NT	NT	NT		
3	NT	NT	NT		
4	5.8	2.1	105	-1.55	-1.03
5	8.43	0.97	14	0.02	0.02
6	7.866	1.731	NR	-0.32	-0.24
7	12.22	0.45	NR	2.27	2.60
8	11	2.3	68	1.55	0.97
9	9.13	0.5	46.8	0.43	0.49
10	7.89	2.37	124	-0.30	-0.19
11	NT	NT	NT		
13	NT	NT	NT		
14	11	2.20	86	1.55	1.00
15	10.7	2.13	90	1.37	0.90
16	NT	NT	NT		
17	6.4	1.6	129	-1.19	-0.94
18	9.2	1.2	103	0.48	0.43
19	9.88	2.96	14.6	0.88	0.45
20	< 50	18	88		
21	NT	NT	NT		
22	NT	NT	NT		
23	4.80	0.7	NR	-2.14	-2.30
24	NT	NT	NT		
25	5.7	2.14	NR	-1.61	-1.06
26	5.48	1.33	NR	-1.74	-1.51
27	NT	NT	NT		
28	5.36	1.34	6.8	-1.81	-1.57
29	8	4	93	-0.24	-0.09
30	3.2	1.0	34	-3.10	-3.02
31	7.6	2.3	92	-0.48	-0.30
32	8.91	2.67	137	0.30	0.17
33	11.8	2.64	80	2.02	1.14

Statistics

Assigned Value*	8.4	1.4
Spike	9.36	0.47
Robust Average	8.2	1.4
Median	8.2	1.4
Mean	8.2	
N	22	
Max.	12.22	
Min.	3.2	
Robust SD	2.5	
Robust CV	30%	

*Assigned value is the robust average excluding laboratory 30.


Kernel Density
Density
Result
Results: S2 - EtFOSA
Assigned Value = 8.4 ± 1.4 ug/kg
Results (ug/kg)
Laboratory
30 23 28 26 25 4 17 31 6 10 29 5 32 9 18 1 19 15 14 8 33 7 20 11 13 16 2 21 22 24 27 3 Md R.A. S.V.


z-Scores: S2 - EtFOSA
Target Standard Deviation 1.7 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 23 28 26 25 4 17 31 6 10 29 5 32 9 18 1 19 15 14 8 33 7
-3.1 -2.1 -1.8 -1.7 -1.6 -1.5 -1.2 -0.5 -0.3 -0.3 -0.2 0.0 0.3 0.4 0.5 0.6 0.9 1.4 1.5 1.5 2.0 2.3

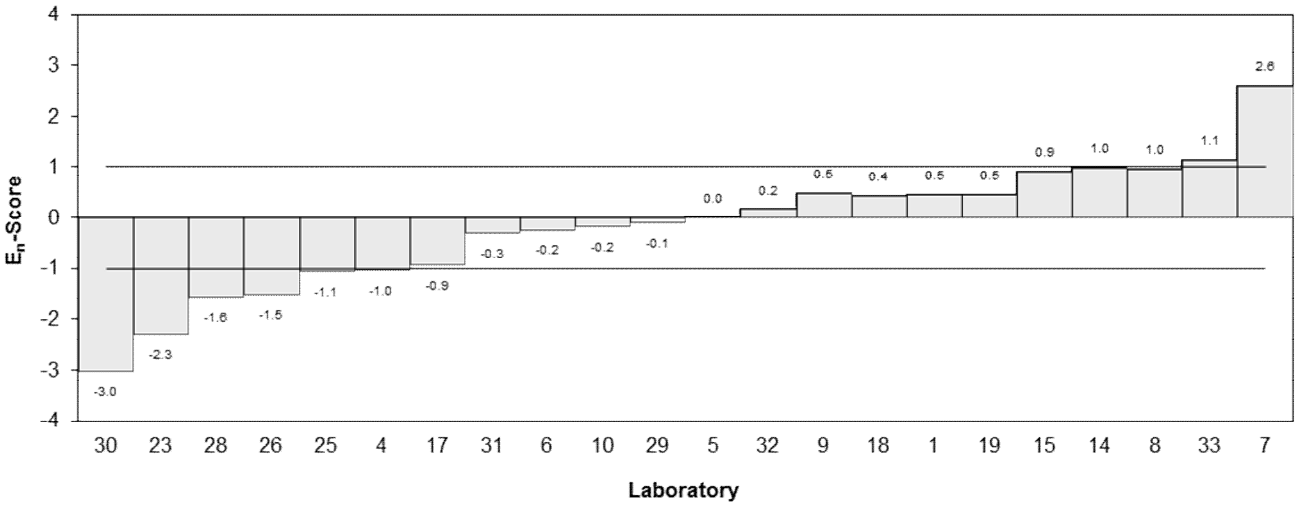

En-Scores: S2 - EtFOSA
En-Score
Laboratory
30 23 28 26 25 4 17 31 6 10 29 5 32 9 18 1 19 15 14 8 33 7
-3.0 -2.3 -1.6 -1.5 -1.1 -1.0 -0.9 -0.3 -0.2 -0.2 -0.1 0.0 0.2 0.5 0.4 0.5 0.5 0.9 1.0 1.0 1.1 2.6

Figure 30

Table 37

Sample Details

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

Participant Results

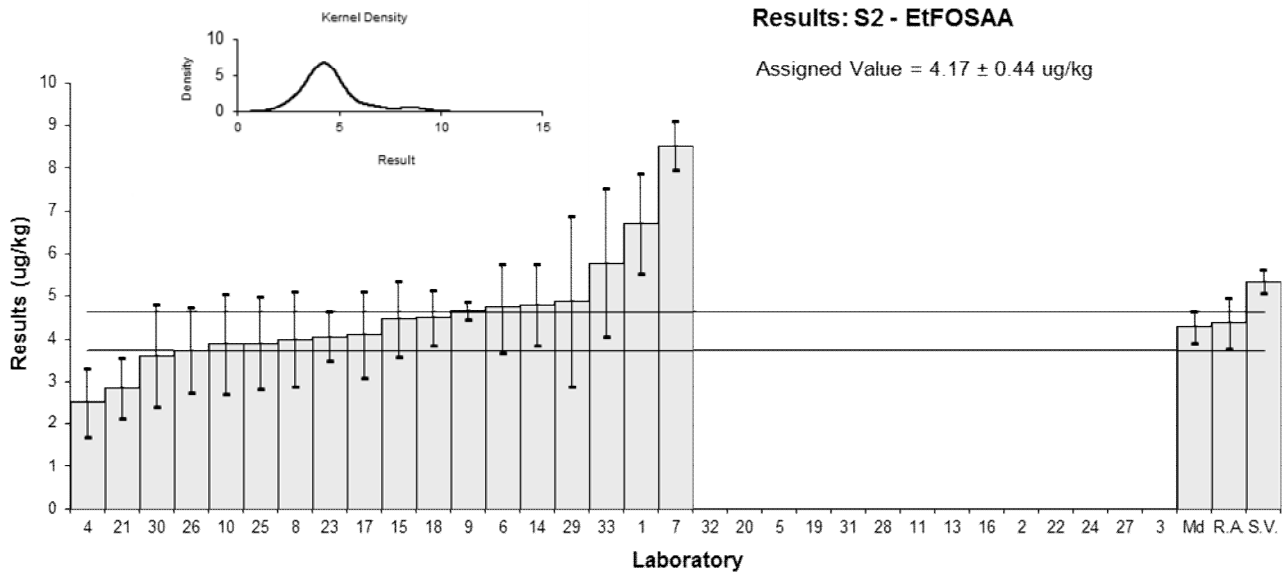
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	6.71	1.18	76	3.05	2.02
2	NT	NT	NT		
3	NT	NT	NT		
4**	2.5	0.8	105	-2.00	-1.83
5	<0.06	NR	25		
6	4.727	1.040	NR	0.67	0.49
7	8.54	0.56	NR	5.24	6.14
8	4.0	1.1	114	-0.20	-0.14
9	4.66	0.2	63.8	0.59	1.01
10	3.89	1.17	134	-0.34	-0.22
11	NT	NT	NT		
13	NT	NT	NT		
14	4.81	0.961	61	0.77	0.61
15	4.46	0.892	74	0.35	0.29
16	NT	NT	NT		
17	4.1	1.0	92	-0.08	-0.06
18	4.5	0.64	109	0.40	0.42
19	<0.159	NR	85.5		
20	< 5.0	1.3	NR		
21	2.85	0.70	69	-1.58	-1.60
22	NT	NT	NT		
23	4.05	0.57	NR	-0.14	-0.17
24	NT	NT	NT		
25	3.9	1.08	NR	-0.32	-0.23
26	3.73	1.00	NR	-0.53	-0.40
27	NT	NT	NT		
28	NR	NR	71.1		
29	4.9	2	137	0.88	0.36
30	3.6	1.2	21	-0.68	-0.45
31	<5	1	128		
32	< 10	2	77		
33	5.78	1.73	83	1.93	0.90

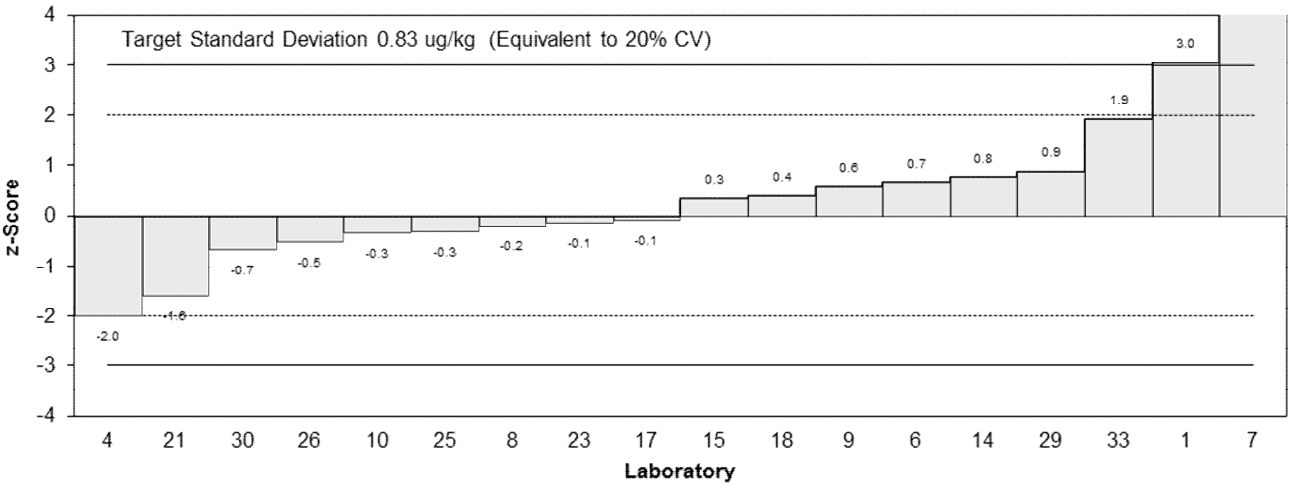
Statistics

Assigned Value*	4.17	0.44
Spike	5.35	0.27
Robust Average	4.37	0.60
Median	4.28	0.36
Mean	4.54	
N	18	
Max.	8.54	
Min.	2.5	
Robust SD	0.70	
Robust CV	17%	

*Assigned value is the robust average excluding laboratories 1 and 7.

**Laboratory 4 has |z| > 2 when z is not rounded; this is an unsatisfactory z-score.


Kernel Density
Density
Result
Results: S2 - EtFOSAA
Assigned Value = 4.17 ± 0.44 ug/kg
Results (ug/kg)
4 21 30 26 10 25 8 23 17 15 18 9 6 14 29 33 1 7 32 20 5 19 31 28 11 13 16 2 22 24 27 3 Md R.A. S.V.
Laboratory


z-Scores: S2 - EtFOSAA
Target Standard Deviation 0.83 ug/kg (Equivalent to 20% CV)
z-Score
-2.0 -1.6 -0.7 -0.5 -0.3 -0.3 -0.2 -0.1 -0.1 0.3 0.4 0.6 0.7 0.8 0.9 1.9 3.0
4 21 30 26 10 25 8 23 17 15 18 9 6 14 29 33 1 7
Laboratory

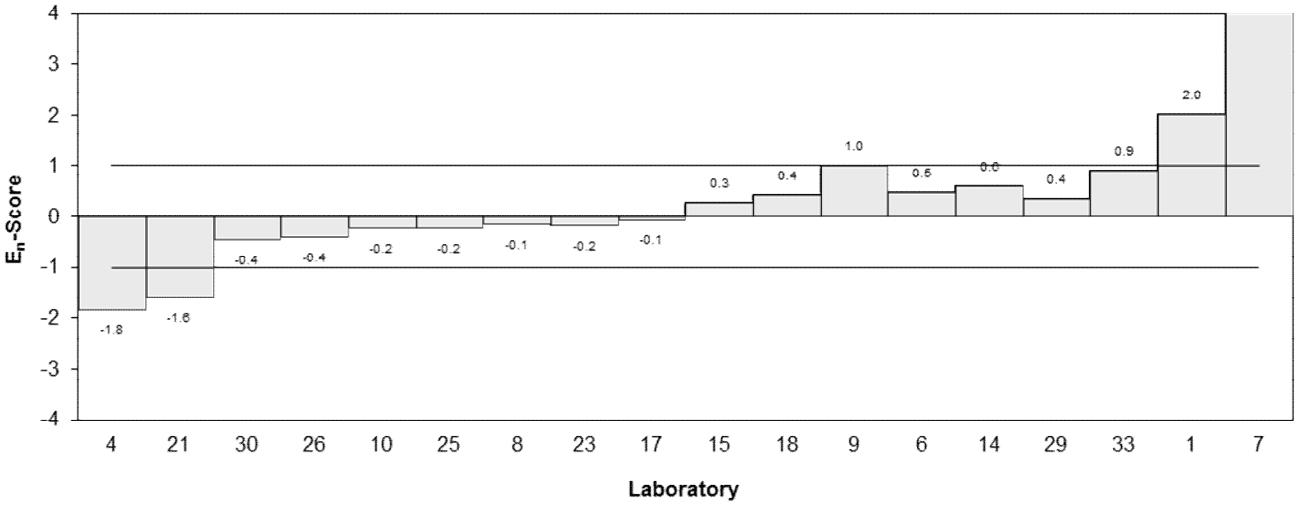

En-Scores: S2 - EtFOSAA
En-Score
-1.8 -1.6 -0.4 -0.4 -0.2 -0.2 -0.1 -0.2 -0.1 0.3 0.4 1.0 0.5 0.6 0.4 0.9 2.0
4 21 30 26 10 25 8 23 17 15 18 9 6 14 29 33 1 7
Laboratory

Figure 31

Table 38

Sample Details

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

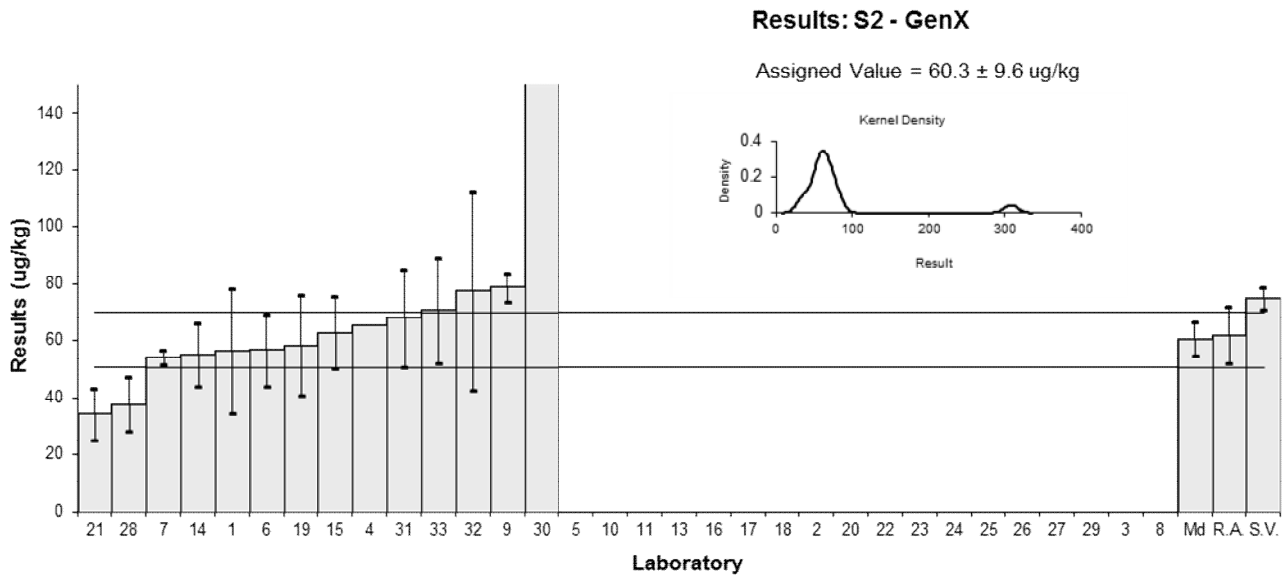
Participant Results

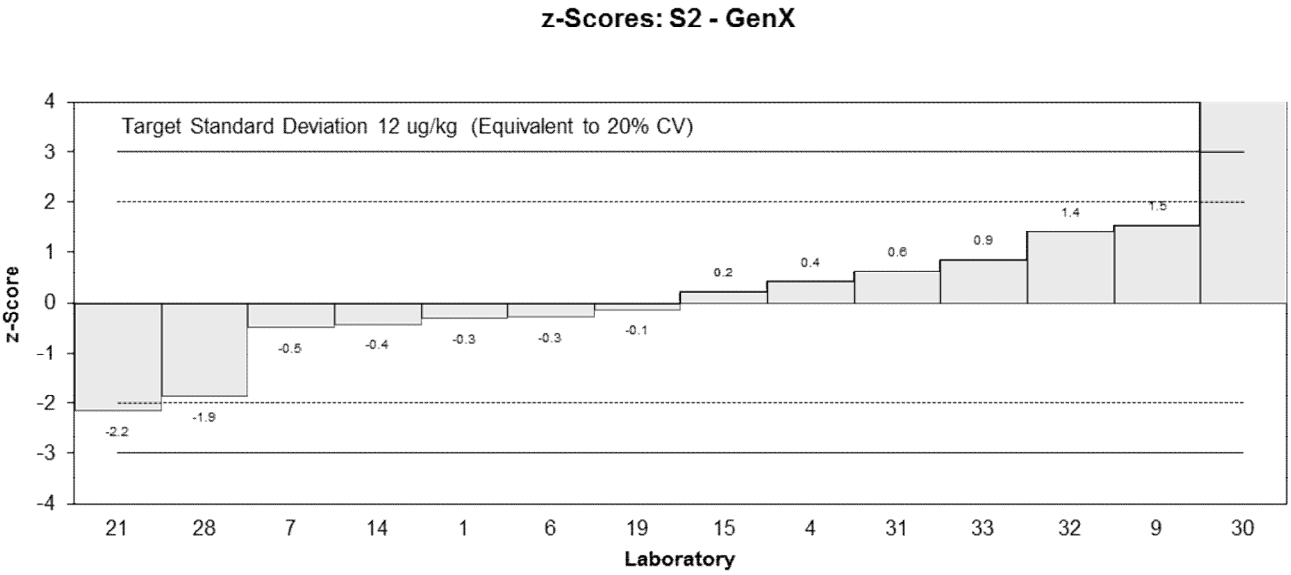
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	56.5	21.8	102	-0.32	-0.16
2	NT	NT	NT		
3	NT	NT	NT		
4	65.4	NR	105	0.42	0.53
5	<1	NR	NT		
6	56.782	12.492	NR	-0.29	-0.22
7	54.4	2.5	NR	-0.49	-0.59
8	NT	NT	NT		
9	78.9	5	89.8	1.54	1.72
10	NT	NT	NT		
11	NT	NT	NT		
13	NT	NT	NT		
14	55.1	11.0	75	-0.43	-0.36
15	62.9	12.6	100	0.22	0.16
16	NT	NT	NT		
17	NT	NT	NT		
18	NT	NT	NT		
19	58.5	17.6	126	-0.15	-0.09
20	NT	NT	NT		
21	34.3	8.9	67	-2.16	-1.99
22	NT	NT	NT		
23	NT	NT	NT		
24	NT	NT	NT		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	37.72	9.43	106.8	-1.87	-1.68
29	NT	NT	NT		
30	308	94	133	20.54	2.62
31	68	17	86	0.64	0.39
32	77.5	34.9	NR	1.43	0.48
33	70.7	18.3	78	0.86	0.50

Statistics

Assigned Value*	60.3	9.6
Spike	75.0	3.8
Robust Average	62	10
Median	60.7	5.8
Mean	77.5	
N	14	
Max.	308	
Min.	34.3	
Robust SD	14	
Robust CV	23%	

*Assigned value is the robust average excluding laboratory 30.


Results: S2 - GenX
Assigned Value = 60.3 ± 9.6 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
Laboratory
21 28 7 14 1 6 19 15 4 31 33 32 9 30 5 10 11 13 16 17 18 2 20 22 23 24 25 26 27 29 3 8 Md R.A. S.V.


z-Scores: S2 - GenX
Target Standard Deviation 12 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
21 28 7 14 1 6 19 15 4 31 33 32 9 30
-2.2 -1.9 -0.5 -0.4 -0.3 -0.3 -0.1 0.2 0.4 0.6 0.9 1.4 1.5

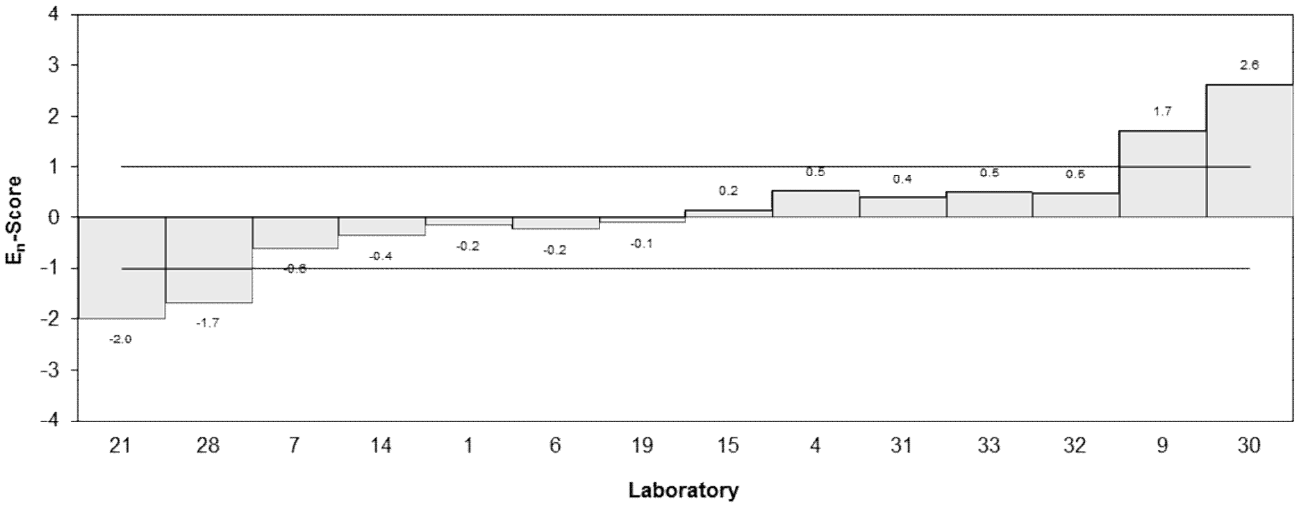

En-Scores: S2 - GenX
En-Score
Laboratory
21 28 7 14 1 6 19 15 4 31 33 32 9 30
-2.0 -1.7 -0.6 -0.4 -0.2 -0.2 -0.1 0.2 0.5 0.4 0.5 0.5 1.7 2.6

Figure 32

Table 39

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	28.5	5.4	33
2	NT	NT	NT
3	NT	NT	NT
4	18.1	8.8	105
5	<0.4	NR	88
6	27.134	5.969	NR
7	NT	NT	NT
8	35	2.7	68
9	7.28	0.5	NR
10	19.6	5.88	100
11	NT	NT	NT
13	NT	NT	NT
14	30.1	6.02	74
15	26.4	5.28	81
16	NT	NT	NT
17	25	6.3	100
18	28	3.9	93
19	27.2	8.2	9.86
20	10	2.5	NR
21	NT	NT	NT
22	NT	NT	NT
23	18.2	2.4	NR
24	NT	NT	NT
25	18.2	7.93	NR
26	16.1	3.54	NR
27	NT	NT	NT
28	4.81	1.2025	44.7
29	29	10	151
30	16.0	4.6	20
31	35	8.0	73
32	27	8.1	112
33	36.3	7.81	74

Statistics

Assigned Value	Not Set	
Spike	30.0	1.5
Robust Average	23.3	5.2
Median	26.4	5.5
Mean	23.0	
N	21	
Max.	36.3	
Min.	4.81	
Robust SD	9.5	
Robust CV	41%	

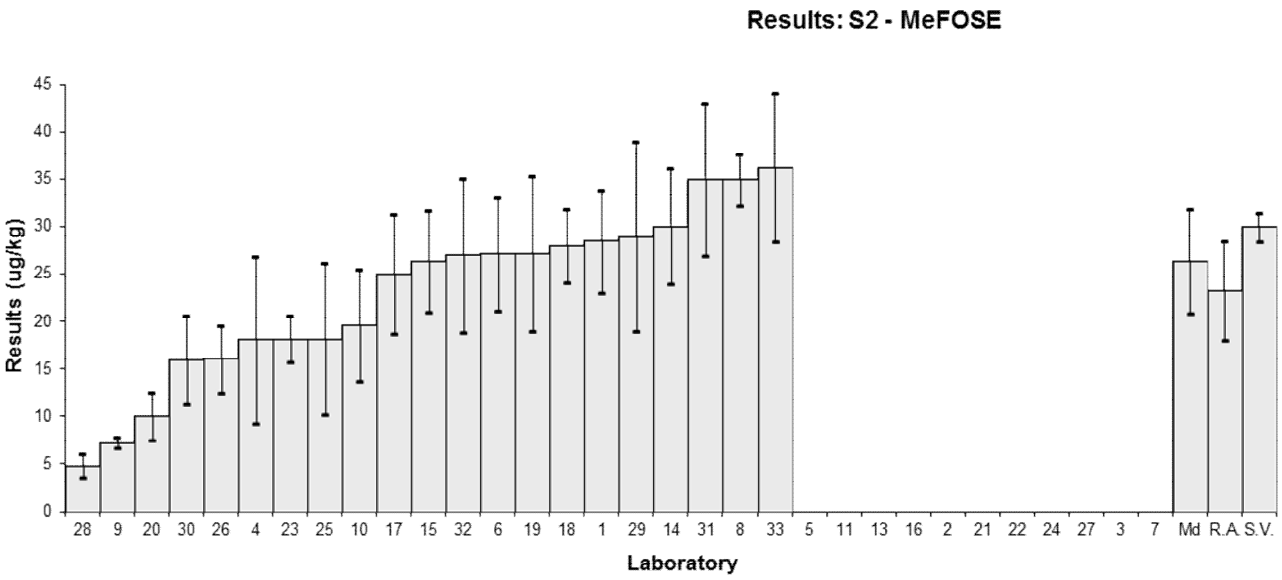

Results: S2 - MeFOSE
Results (ug/kg)
0
5
10
15
20
25
30
35
40
45
28 9 20 30 26 4 23 25 10 17 15 32 6 19 18 1 29 14 31 8 33 5 11 13 16 2 21 22 24 27 3 7 Md R.A. S.V.
Laboratory

Figure 33

Table 40

Sample Details

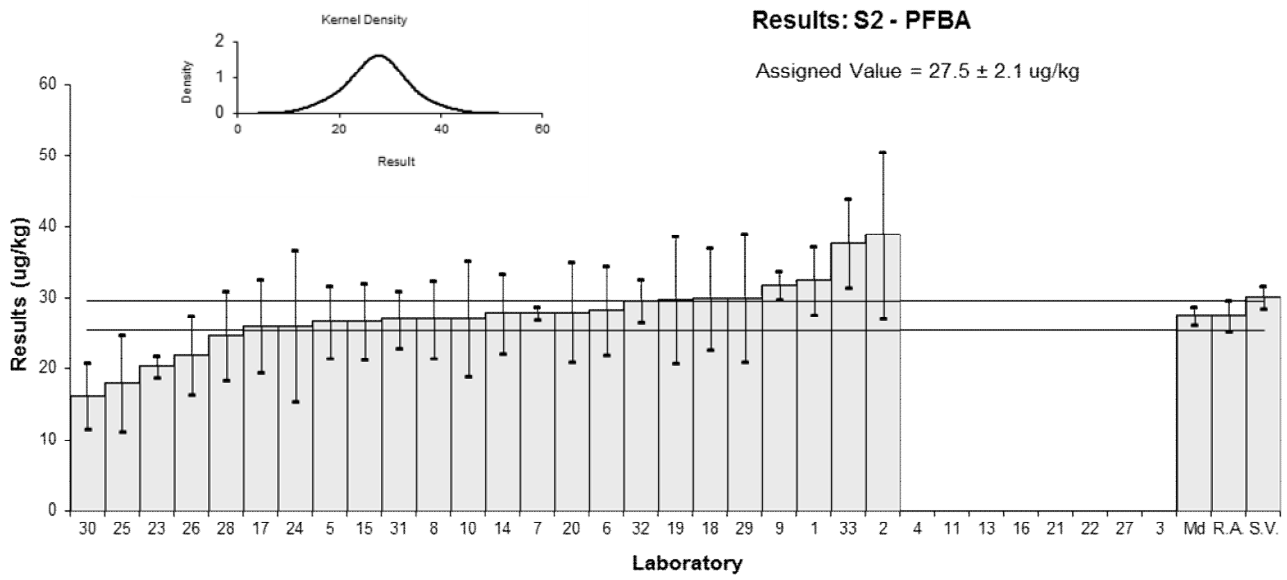
Sample No.	S2
Matrix.	Soil
Analyte.	PFBA
Units	µg/kg

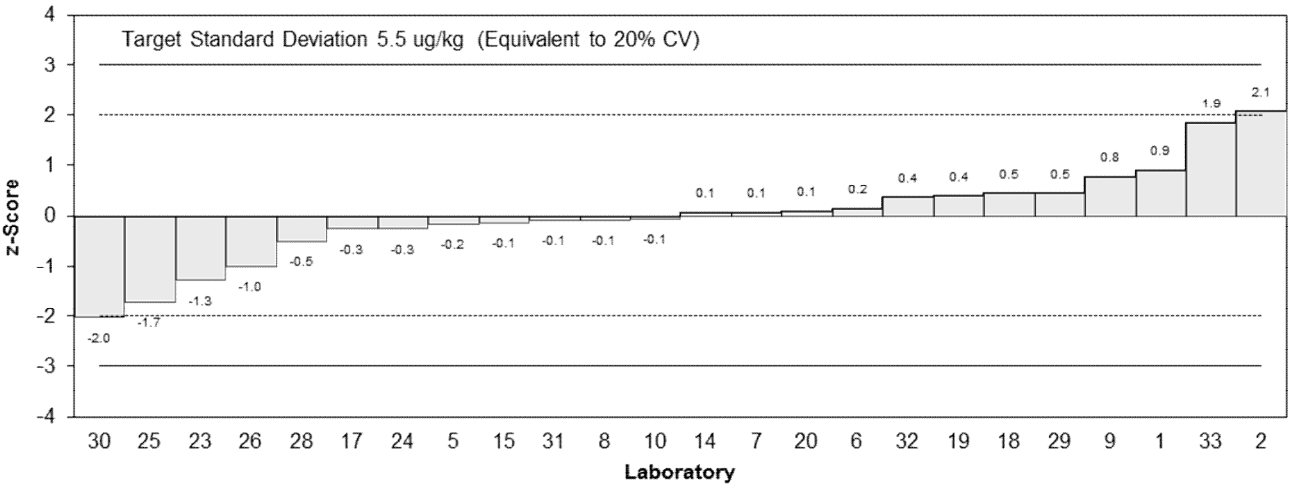
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	32.5	4.8	91	0.91	0.95
2	38.9	11.7	56	2.07	0.96
3	NT	NT	NT		
4	<30	NR	105		
5	26.63132	5.0	86	-0.16	-0.16
6	28.34	6.235	NR	0.15	0.13
7	27.9	0.9	NR	0.07	0.18
8	27	5.4	92	-0.09	-0.09
9	31.8	2	81.2	0.78	1.48
10	27.1	8.13	114	-0.07	-0.05
11	NT	NT	NT		
13	NT	NT	NT		
14	27.9	5.58	74	0.07	0.07
15	26.7	5.34	89	-0.15	-0.14
16	NT	NT	NT		
17	26	6.5	115	-0.27	-0.22
18	30	7.1	98	0.45	0.34
19	29.7	8.9	20.0	0.40	0.24
20	28	7.0	104	0.09	0.07
21	NT	NT	NT		
22	NT	NT	NT		
23	20.4	1.6	NR	-1.29	-2.69
24	26	10.6	NR	-0.27	-0.14
25	18	6.73	NR	-1.73	-1.35
26	22.0	5.54	NR	-1.00	-0.93
27	NT	NT	NT		
28	24.7	6.175	96.7	-0.51	-0.43
29	30	9	129	0.45	0.27
30	16.3	4.6	81	-2.04	-2.21
31	27	4.0	78	-0.09	-0.11
32	29.5	2.95	81	0.36	0.55
33	37.7	6.27	68	1.85	1.54

Statistics

Assigned Value	27.5	2.1
Spike	30.1	1.5
Robust Average	27.5	2.1
Median	27.5	1.3
Mean	27.5	
N	24	
Max.	38.9	
Min.	16.3	
Robust SD	4.1	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - PFBA
Assigned Value = 27.5 ± 2.1 ug/kg
Results (ug/kg)
Laboratory
30 25 23 26 28 17 24 5 15 31 8 10 14 7 20 6 32 19 18 29 9 1 33 2 4 11 13 16 21 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFBA
Target Standard Deviation 5.5 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 25 23 26 28 17 24 5 15 31 8 10 14 7 20 6 32 19 18 29 9 1 33 2
-2.0 -1.7 -1.3 -1.0 -0.5 -0.3 -0.3 -0.2 -0.1 -0.1 -0.1 -0.1 0.1 0.1 0.1 0.2 0.4 0.4 0.5 0.5 0.8 0.9 1.9 2.1

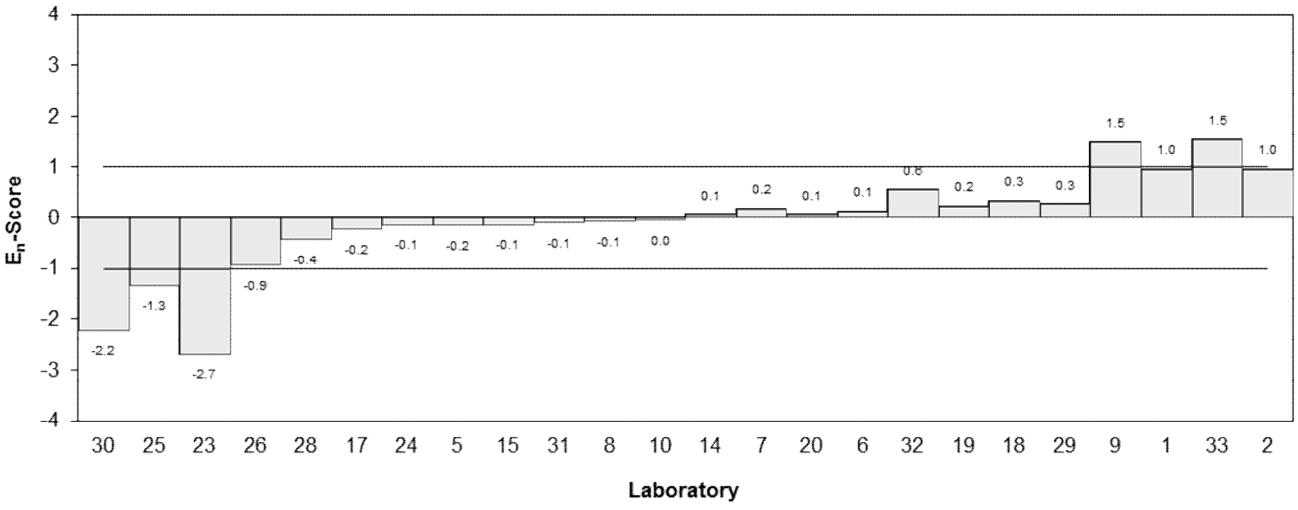

En-Scores: S2 - PFBA
En-Score
Laboratory
30 25 23 26 28 17 24 5 15 31 8 10 14 7 20 6 32 19 18 29 9 1 33 2
-2.2 -1.3 -2.7 -0.9 -0.4 -0.2 -0.1 -0.2 -0.1 -0.1 -0.1 0.0 0.1 0.2 0.1 0.1 0.6 0.2 0.3 0.3 1.5 1.0 1.5 1.0

Figure 34

Table 41

Sample Details

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

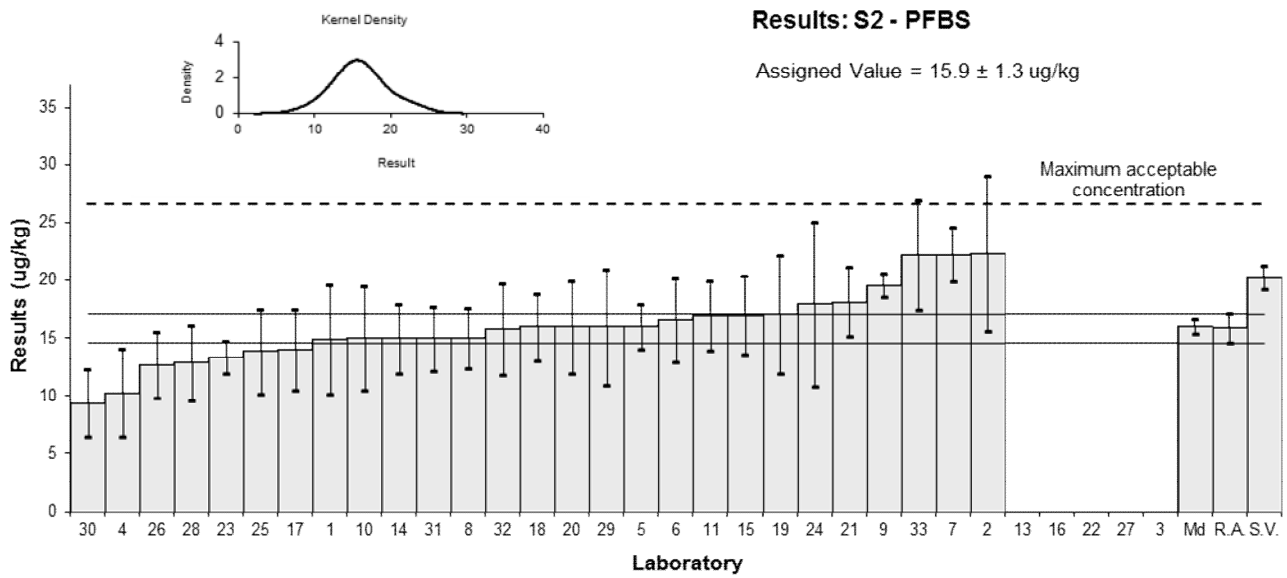
Participant Results

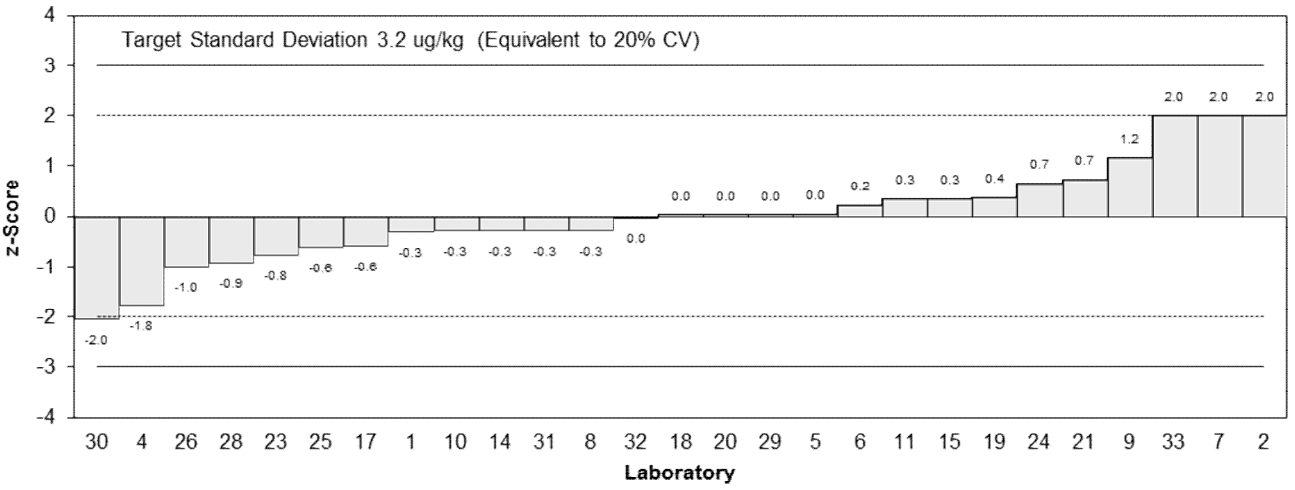
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	14.9	4.7	89	-0.31	-0.21
2*	22.4	6.72	72	2.00	0.95
3	NT	NT	NT		
4	10.3	3.8	105	-1.76	-1.39
5	16.01	1.96	87	0.03	0.05
6	16.587	3.649	NR	0.22	0.18
7*	22.3	2.3	95	2.00	1.00
8	15	2.6	97	-0.28	-0.31
9	19.6	1	105.6	1.16	2.26
10	15.0	4.5	107	-0.28	-0.19
11	17	3	71	0.35	0.34
13	NT	NT	NT		
14	15	3.00	57	-0.28	-0.28
15	17.0	3.40	119	0.35	0.30
16	NT	NT	NT		
17	14	3.5	114	-0.60	-0.51
18	16	2.9	98	0.03	0.03
19	17.1	5.1	80.9	0.38	0.23
20	16	4.0	119	0.03	0.02
21	18.2	3.0	NR	0.72	0.70
22	NT	NT	NT		
23	13.4	1.4	NR	-0.79	-1.31
24	18	7.1	NR	0.66	0.29
25	13.9	3.67	NR	-0.63	-0.51
26	12.7	2.87	NR	-1.01	-1.02
27	NT	NT	NT		
28	12.91	3.2275	92.7	-0.94	-0.86
29	16	5	98	0.03	0.02
30	9.4	2.9	74	-2.04	-2.05
31	15	2.8	101	-0.28	-0.29
32	15.8	3.95	76	-0.03	-0.02
33*	22.3	4.71	89	2.00	1.00

Statistics

Assigned Value	15.9	1.3
Spike	20.3	1.0
Maximum acceptable conc.*	26.7	
Robust Average	15.9	1.3
Median	16.0	0.6
Mean	16.0	
N	27	
Max.	22.4	
Min.	9.4	
Robust SD	2.7	
Robust CV	17%	

*z-score adjusted to 2 (see Section 6.3).


Kernel Density
Density
Result
Results: S2 - PFBS
Assigned Value = 15.9 ± 1.3 ug/kg
Maximum acceptable concentration
Results (ug/kg)
Laboratory
30 4 26 28 23 25 17 1 10 14 31 8 32 18 20 29 5 6 11 15 19 24 21 9 33 7 2 13 16 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFBS
Target Standard Deviation 3.2 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 4 26 28 23 25 17 1 10 14 31 8 32 18 20 29 5 6 11 15 19 24 21 9 33 7 2

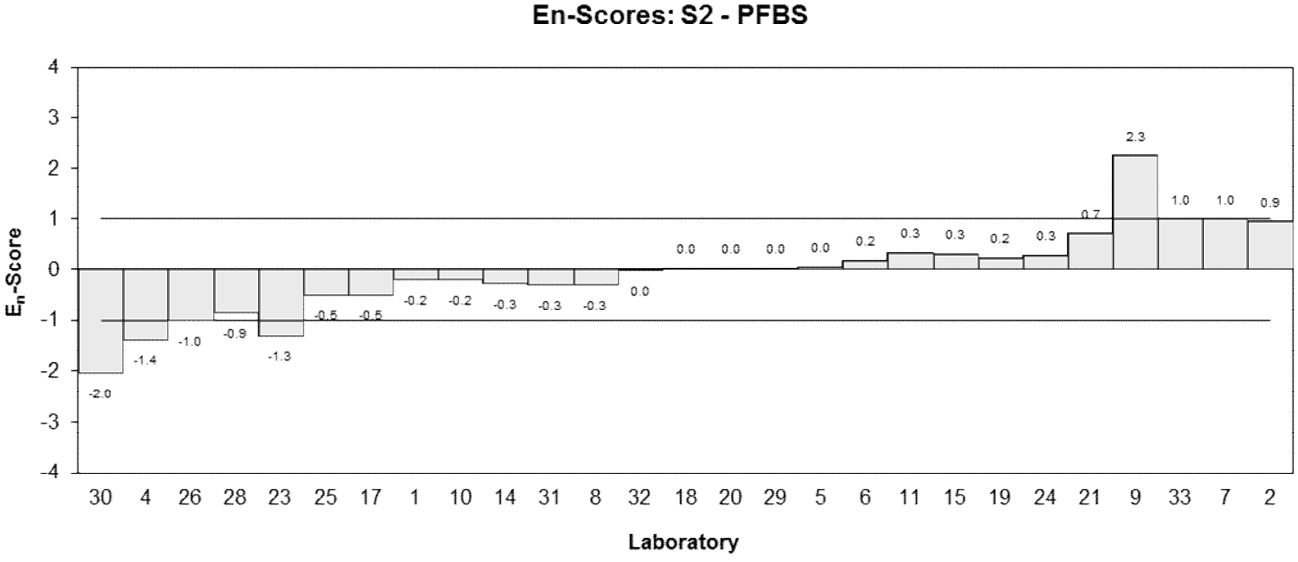

En-Scores: S2 - PFBS
En-Score
Laboratory
30 4 26 28 23 25 17 1 10 14 31 8 32 18 20 29 5 6 11 15 19 24 21 9 33 7 2

Figure 35

Table 42

Sample Details

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

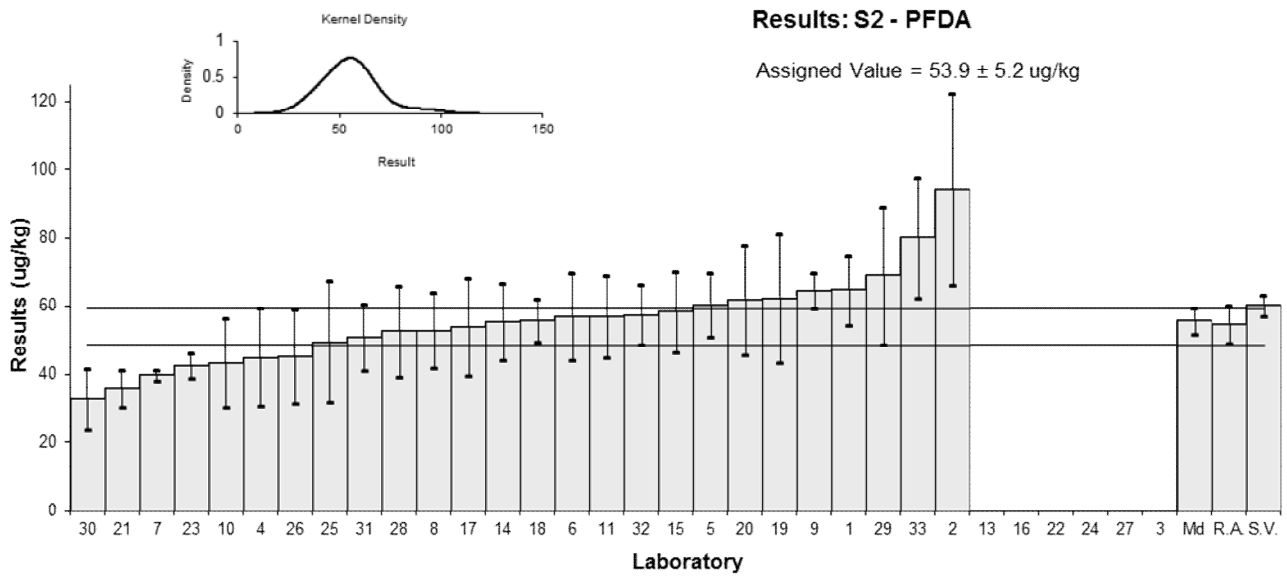
Participant Results

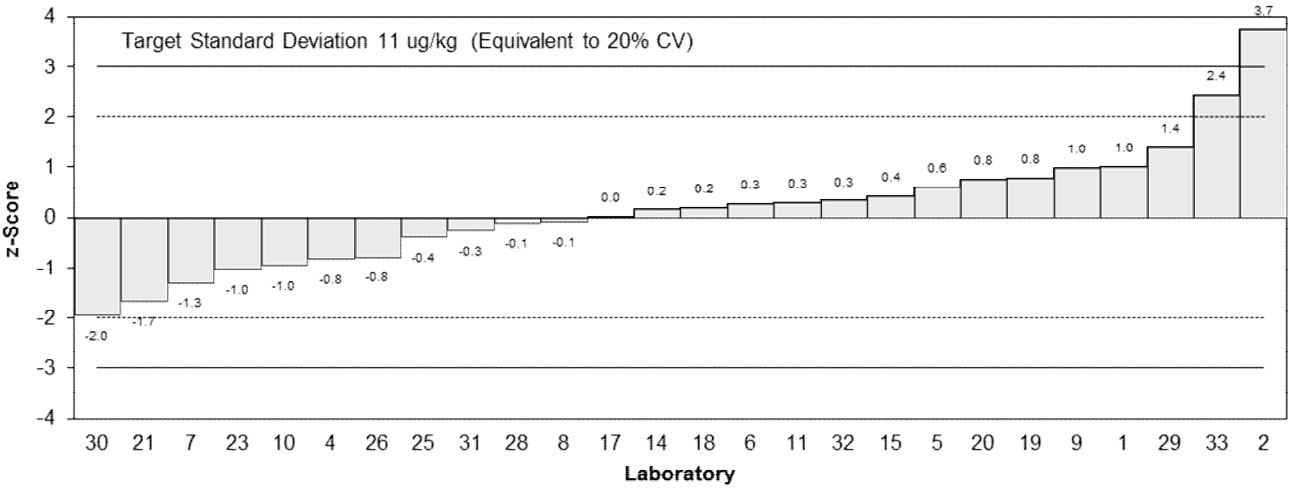
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	64.8	10.2	91	1.01	0.95
2	94.3	28.3	88	3.75	1.40
3	NT	NT	NT		
4	45.1	14.3	105	-0.82	-0.58
5	60.37908	9.32	81	0.60	0.61
6	56.943	12.527	NR	0.28	0.22
7	39.9	1.6	NR	-1.30	-2.57
8	53	11	109	-0.08	-0.07
9	64.5	5	82.2	0.98	1.47
10	43.5	13.1	101	-0.96	-0.74
11	57	12	61	0.29	0.24
13	NT	NT	NT		
14	55.6	11.1	77	0.16	0.14
15	58.4	11.7	97	0.42	0.35
16	NT	NT	NT		
17	54	14	106	0.01	0.01
18	56	6.2	91	0.19	0.26
19	62.4	18.7	85.8	0.79	0.44
20	62	16	124	0.75	0.48
21	36.0	5.5	66	-1.66	-2.36
22	NT	NT	NT		
23	42.7	3.5	NR	-1.04	-1.79
24	NT	NT	NT		
25	49.6	17.66	NR	-0.40	-0.23
26	45.4	13.75	NR	-0.79	-0.58
27	NT	NT	NT		
28	52.77	13.1925	80.4	-0.10	-0.08
29	69	20	114	1.40	0.73
30	32.8	8.9	72	-1.96	-2.05
31	51	9.5	87	-0.27	-0.27
32	57.5	8.62	92	0.33	0.36
33	80.1	17.6	81	2.43	1.43

Statistics

Assigned Value*	53.9	5.2
Spike	60.3	3.0
Robust Average	54.6	5.4
Median	55.8	3.8
Mean	55.6	
N	26	
Max.	94.3	
Min.	32.8	
Robust SD	10	
Robust CV	19%	

*Assigned value is the robust average excluding laboratory 2.


Results: S2 - PFDA
Assigned Value = 53.9 ± 5.2 ug/kg
Kernel Density
Density
Result
Results (ug/kg)
Laboratory
30 21 7 23 10 4 26 25 31 28 8 17 14 18 6 11 32 15 5 20 19 9 1 29 33 2 13 16 22 24 27 3 Md R.A. S.V.


z-Scores: S2 - PFDA
Target Standard Deviation 11 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 21 7 23 10 4 26 25 31 28 8 17 14 18 6 11 32 15 5 20 19 9 1 29 33 2

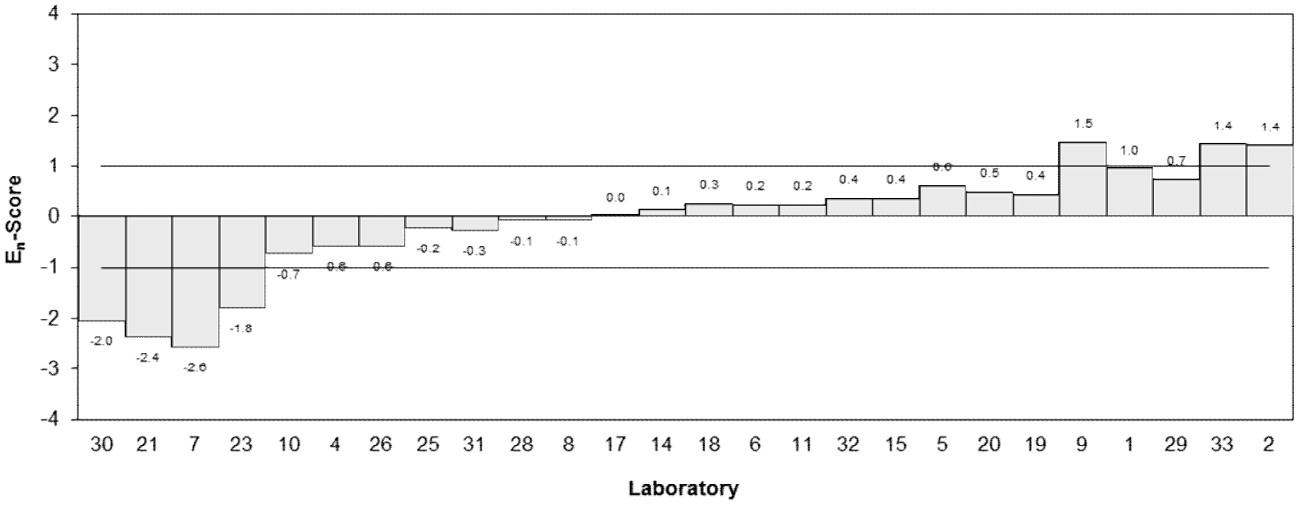

En-Scores: S2 - PFDA
En-Score
Laboratory
30 21 7 23 10 4 26 25 31 28 8 17 14 18 6 11 32 15 5 20 19 9 1 29 33 2

Figure 36

Table 43

Sample Details

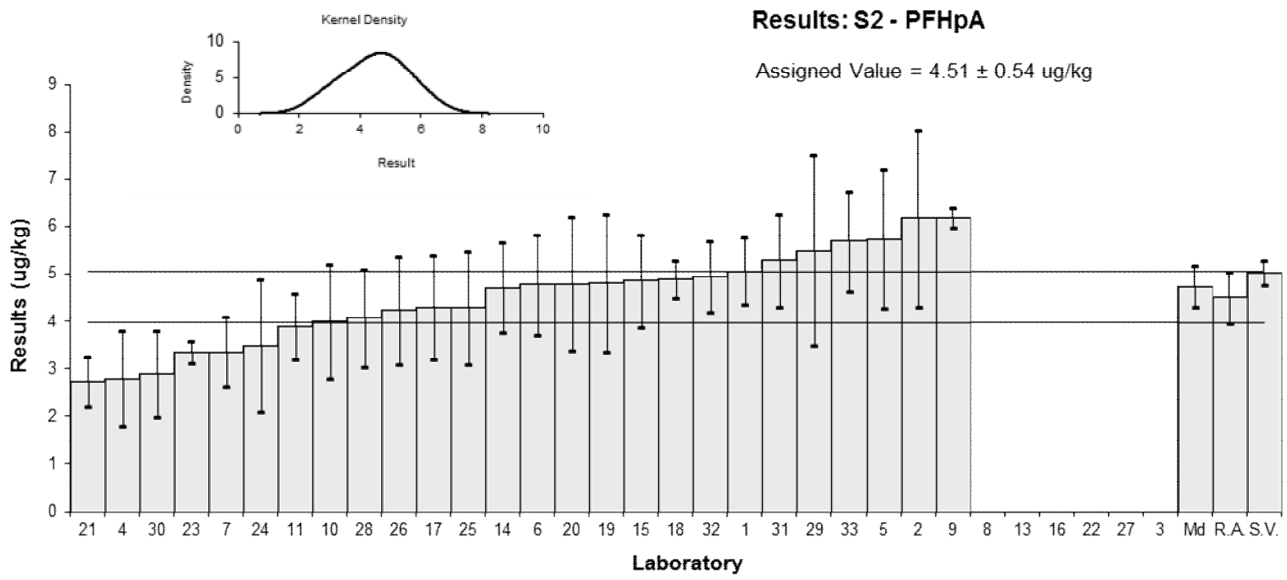
Sample No.	S2
Matrix.	Soil
Analyte.	PFHpA
Units	µg/kg

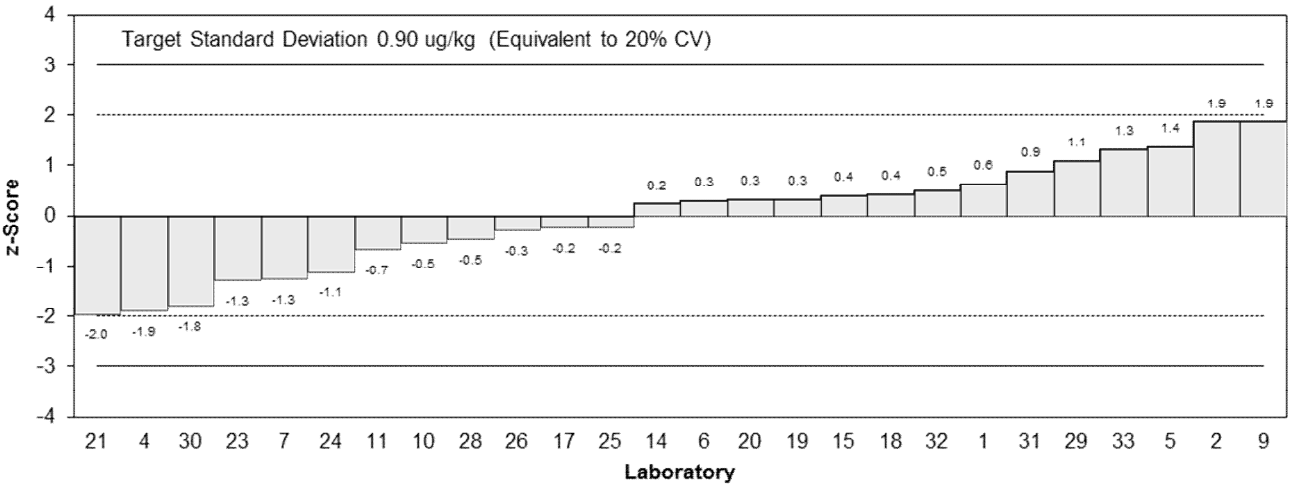
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	5.07	0.70	89	0.62	0.63
2	6.19	1.86	90	1.86	0.87
3	NT	NT	NT		
4	2.8	1.0	105	-1.90	-1.50
5	5.745277	1.45	83	1.37	0.80
6	4.779	1.051	NR	0.30	0.23
7	3.37	0.73	NR	-1.26	-1.26
8	<0.2	NR	102		
9	6.19	0.2	93	1.86	2.92
10	4.02	1.2	115	-0.54	-0.37
11	3.9	0.7	88	-0.68	-0.69
13	NT	NT	NT		
14	4.72	0.944	60	0.23	0.19
15	4.87	0.974	87	0.40	0.32
16	NT	NT	NT		
17	4.3	1.1	116	-0.23	-0.17
18	4.9	0.40	99	0.43	0.58
19	4.81	1.44	79.1	0.33	0.20
20	4.8	1.4	105	0.32	0.19
21	2.74	0.53	NR	-1.96	-2.34
22	NT	NT	NT		
23	3.36	0.24	NR	-1.27	-1.95
24	3.5	1.4	NR	-1.12	-0.67
25	4.3	1.19	NR	-0.23	-0.16
26	4.24	1.14	NR	-0.30	-0.21
27	NT	NT	NT		
28	4.085	1.02125	94.8	-0.47	-0.37
29	5.5	2	112	1.10	0.48
30	2.9	0.9	127	-1.78	-1.53
31	5.3	0.97	84	0.88	0.71
32	4.96	0.74	84	0.50	0.49
33	5.70	1.05	88	1.32	1.01

Statistics

Assigned Value	4.51	0.54
Spike	5.03	0.25
Robust Average	4.51	0.54
Median	4.75	0.42
Mean	4.50	
N	26	
Max.	6.19	
Min.	2.74	
Robust SD	1.1	
Robust CV	24%	


Kernel Density
Density
Result
Results: S2 - PFHpA
Assigned Value = 4.51 ± 0.54 ug/kg
Results (ug/kg)
Laboratory
21 4 30 23 7 24 11 10 28 26 17 25 14 6 20 19 15 18 32 1 31 29 33 5 2 9 8 13 16 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFHpA
Target Standard Deviation 0.90 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
21 4 30 23 7 24 11 10 28 26 17 25 14 6 20 19 15 18 32 1 31 29 33 5 2 9

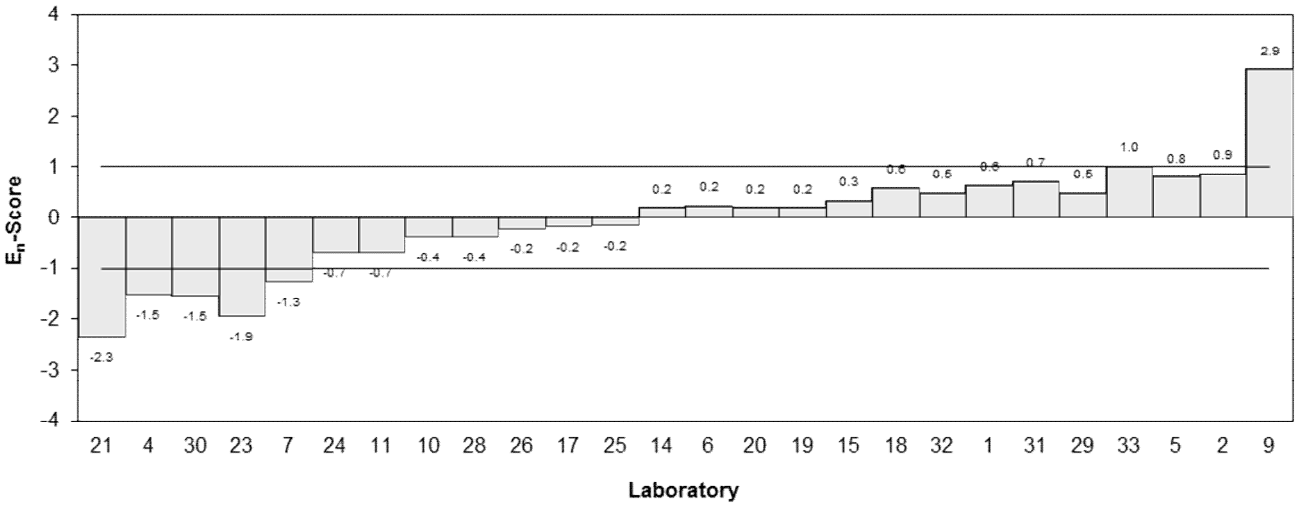

En-Scores: S2 - PFHpA
En-Score
Laboratory
21 4 30 23 7 24 11 10 28 26 17 25 14 6 20 19 15 18 32 1 31 29 33 5 2 9

Figure 37

Table 44

Sample Details

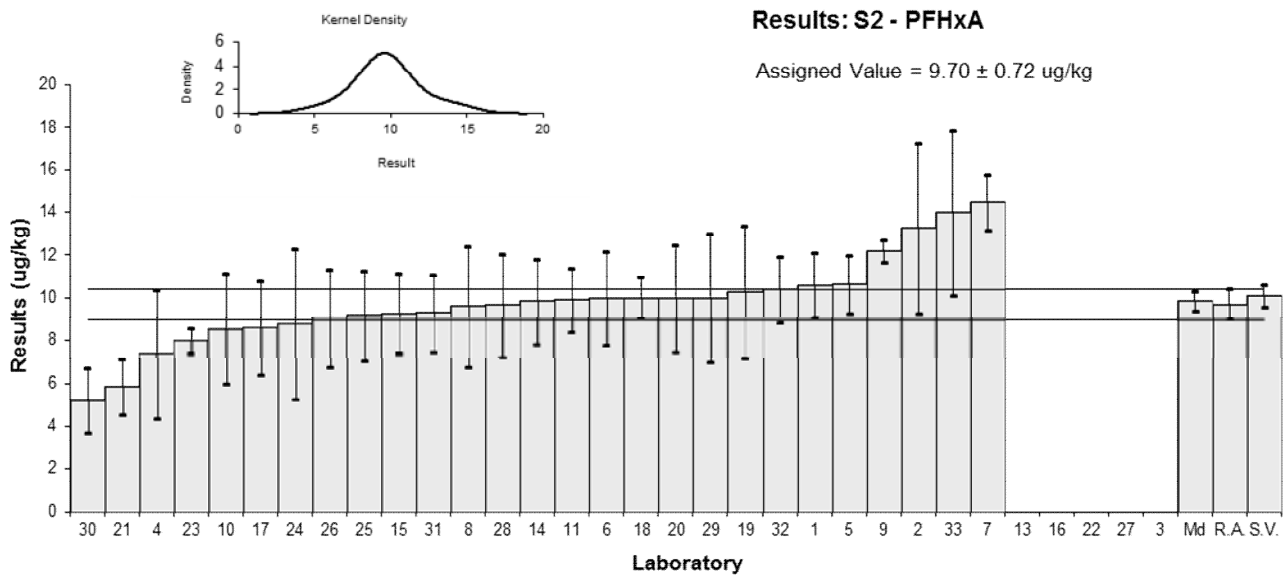
Sample No.	S2
Matrix.	Soil
Analyte.	PFHxA
Units	µg/kg

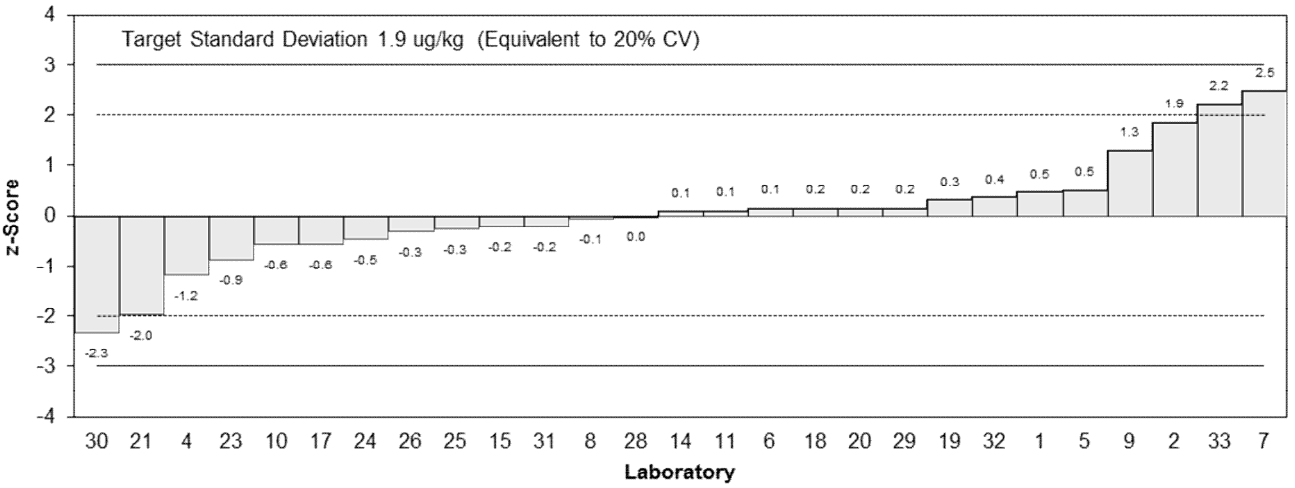
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	10.6	1.5	80	0.46	0.54
2	13.3	3.99	80	1.86	0.89
3	NT	NT	NT		
4	7.4	3.0	105	-1.19	-0.75
5	10.65637	1.34	77	0.49	0.63
6	9.983	2.196	NR	0.15	0.12
7	14.5	1.3	NR	2.47	3.23
8	9.6	2.8	98	-0.05	-0.03
9	12.2	0.5	86.4	1.29	2.85
10	8.57	2.57	115	-0.58	-0.42
11	9.9	1.5	66	0.10	0.12
13	NT	NT	NT		
14	9.86	1.97	81	0.08	0.08
15	9.28	1.86	94	-0.22	-0.21
16	NT	NT	NT		
17	8.6	2.2	115	-0.57	-0.48
18	10	0.97	99	0.15	0.25
19	10.3	3.1	90.0	0.31	0.19
20	10	2.5	111	0.15	0.12
21	5.88	1.29	65	-1.97	-2.59
22	NT	NT	NT		
23	8.00	0.56	NR	-0.88	-1.86
24	8.8	3.5	NR	-0.46	-0.25
25	9.2	2.09	NR	-0.26	-0.23
26	9.08	2.28	NR	-0.32	-0.26
27	NT	NT	NT		
28	9.663	2.41575	90.6	-0.02	-0.01
29	10	3	114	0.15	0.10
30	5.2	1.5	108	-2.32	-2.70
31	9.3	1.8	94	-0.21	-0.21
32	10.4	1.56	83	0.36	0.41
33	14.0	3.86	84	2.22	1.10

Statistics

Assigned Value	9.70	0.72
Spike	10.1	0.5
Robust Average	9.70	0.72
Median	9.86	0.43
Mean	9.79	
N	27	
Max.	14.5	
Min.	5.2	
Robust SD	1.5	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - PFHxA
Assigned Value = 9.70 ± 0.72 ug/kg
Results (ug/kg)
Laboratory
30 21 4 23 10 17 24 26 25 15 31 8 28 14 11 6 18 20 29 19 32 1 5 9 2 33 7 13 16 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFHxA
Target Standard Deviation 1.9 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 21 4 23 10 17 24 26 25 15 31 8 28 14 11 6 18 20 29 19 32 1 5 9 2 33 7

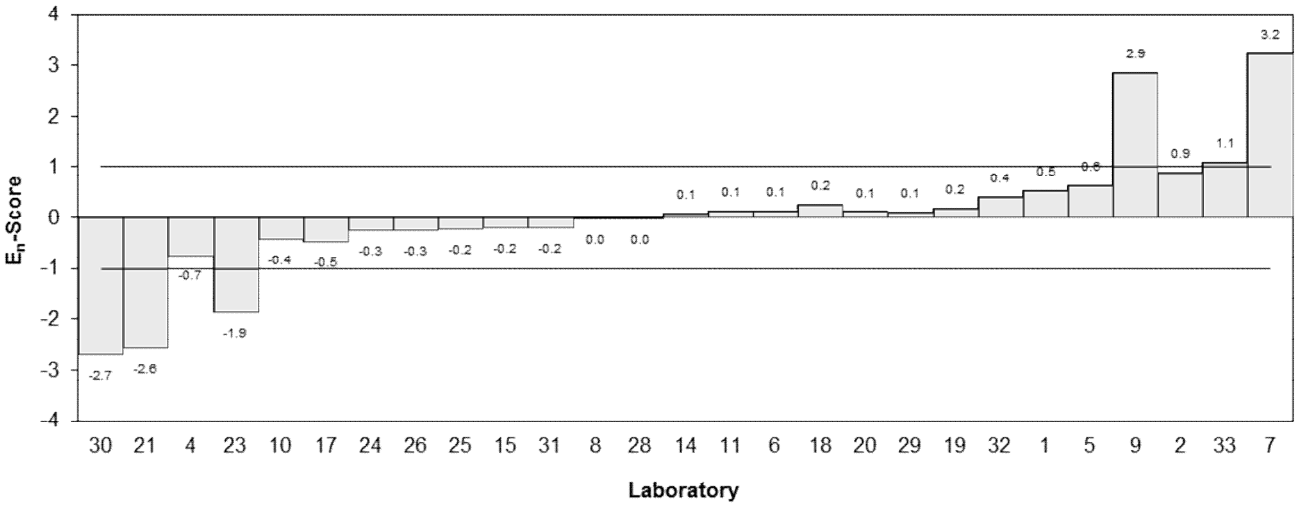

En-Scores: S2 - PFHxA
En-Score
Laboratory
30 21 4 23 10 17 24 26 25 15 31 8 28 14 11 6 18 20 29 19 32 1 5 9 2 33 7

Figure 38

Table 45

Sample Details

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

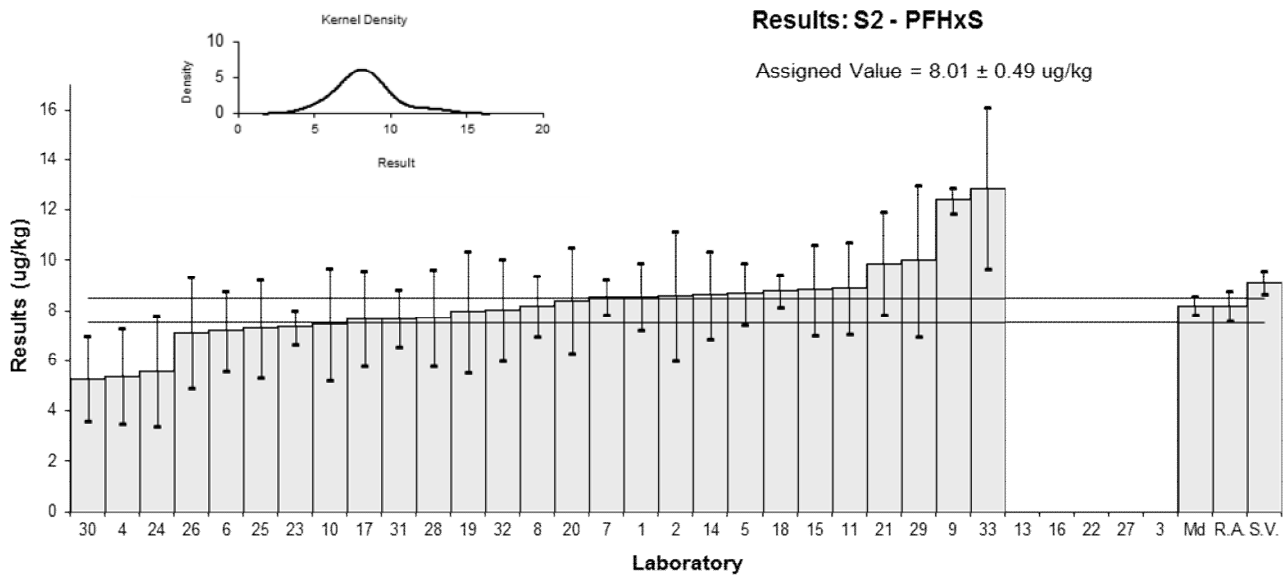
Participant Results

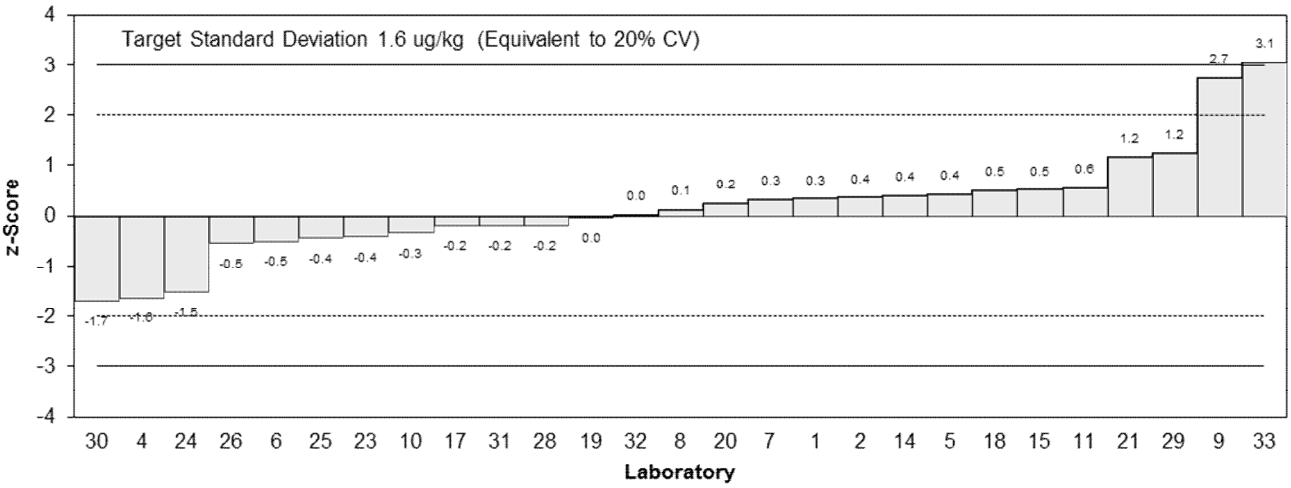
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	8.55	1.33	89	0.34	0.38
2	8.59	2.58	92	0.36	0.22
3	NT	NT	NT		
4	5.4	1.9	105	-1.63	-1.33
5	8.69	1.22	81	0.42	0.52
6	7.196	1.583	NR	-0.51	-0.49
7	8.54	0.69	80	0.33	0.63
8	8.2	1.2	96	0.12	0.15
9	12.4	0.5	92.8	2.74	6.27
10	7.47	2.24	113	-0.34	-0.24
11	8.9	1.8	90	0.56	0.48
13	NT	NT	NT		
14	8.64	1.73	100	0.39	0.35
15	8.83	1.77	96	0.51	0.45
16	NT	NT	NT		
17	7.7	1.9	115	-0.19	-0.16
18	8.8	0.62	97	0.49	1.00
19	7.96	2.39	88.5	-0.03	-0.02
20	8.4	2.1	107	0.24	0.18
21	9.89	2.04	NR	1.17	0.90
22	NT	NT	NT		
23	7.35	0.68	NR	-0.41	-0.79
24	5.6	2.2	NR	-1.50	-1.07
25	7.3	1.94	NR	-0.44	-0.35
26	7.13	2.18	NR	-0.55	-0.39
27	NT	NT	NT		
28	7.72	1.93	87.7	-0.18	-0.15
29	10	3	102	1.24	0.65
30	5.3	1.7	120	-1.69	-1.53
31	7.7	1.1	109	-0.19	-0.26
32	8.04	2.01	102	0.02	0.01
33	12.9	3.22	76	3.05	1.50

Statistics

Assigned Value*	8.01	0.49
Spike	9.12	0.46
Robust Average	8.17	0.58
Median	8.20	0.37
Mean	8.27	
N	27	
Max.	12.9	
Min.	5.3	
Robust SD	0.97	
Robust CV	12%	

*Assigned value is the robust average excluding laboratories 9 and 33.


Kernel Density
Density
Result
Results: S2 - PFHxS
Assigned Value = 8.01 ± 0.49 ug/kg
Results (ug/kg)
Laboratory
30 4 24 26 6 25 23 10 17 31 28 19 32 8 20 7 1 2 14 5 18 15 11 21 29 9 33 13 16 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFHxS
Target Standard Deviation 1.6 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 4 24 26 6 25 23 10 17 31 28 19 32 8 20 7 1 2 14 5 18 15 11 21 29 9 33

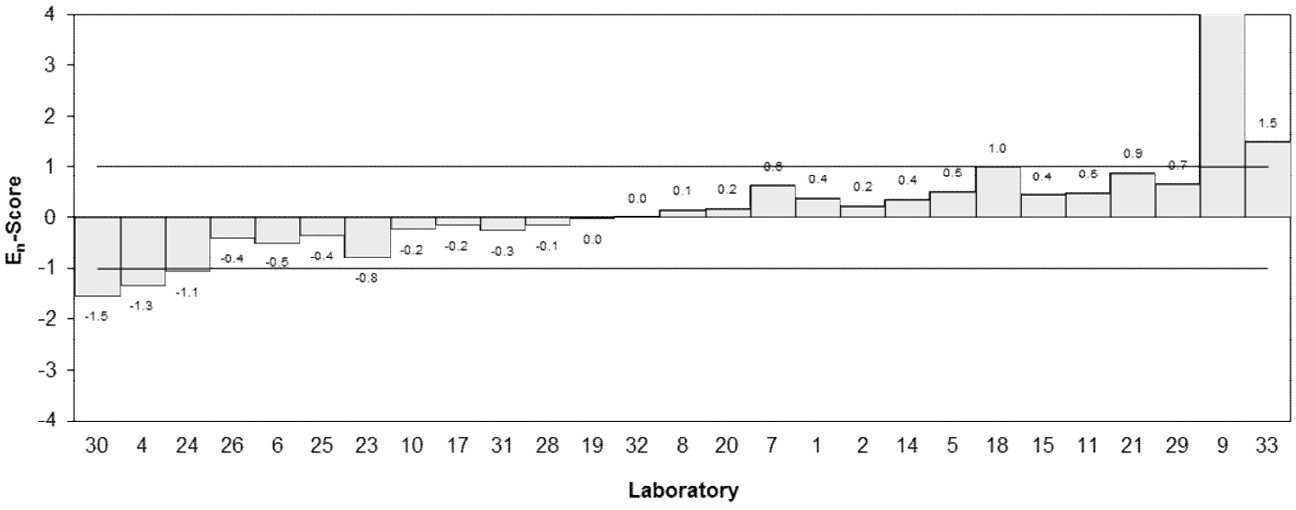

En-Scores: S2 - PFHxS
En-Score
Laboratory
30 4 24 26 6 25 23 10 17 31 28 19 32 8 20 7 1 2 14 5 18 15 11 21 29 9 33

Figure 39

Table 46

Sample Details

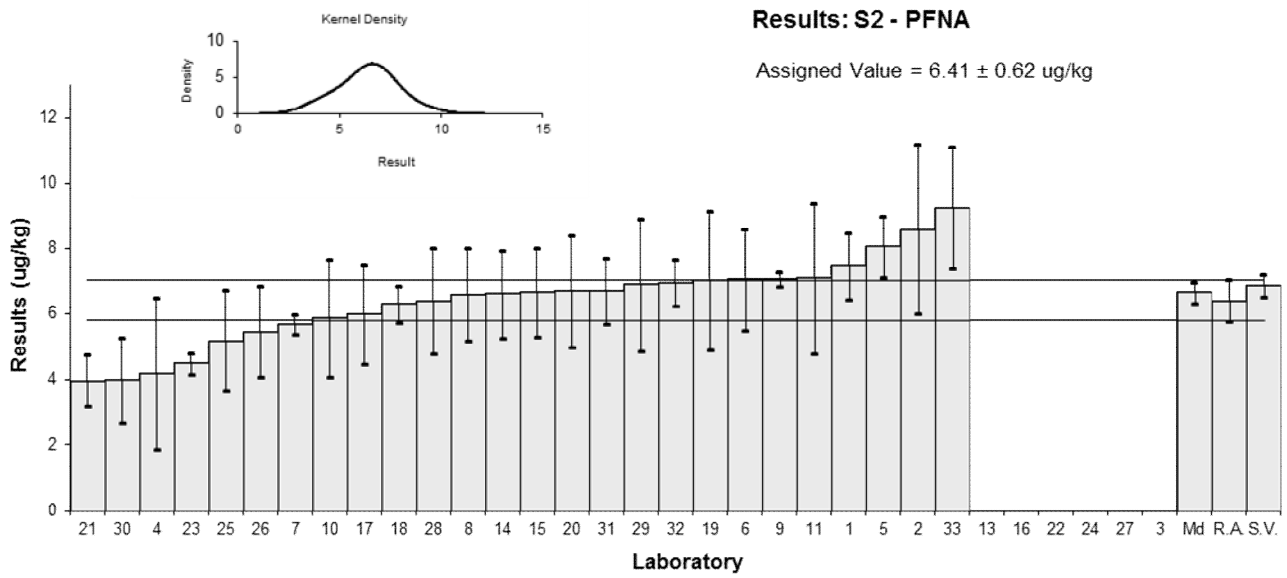
Sample No.	S2
Matrix.	Soil
Analyte.	PFNA
Units	µg/kg

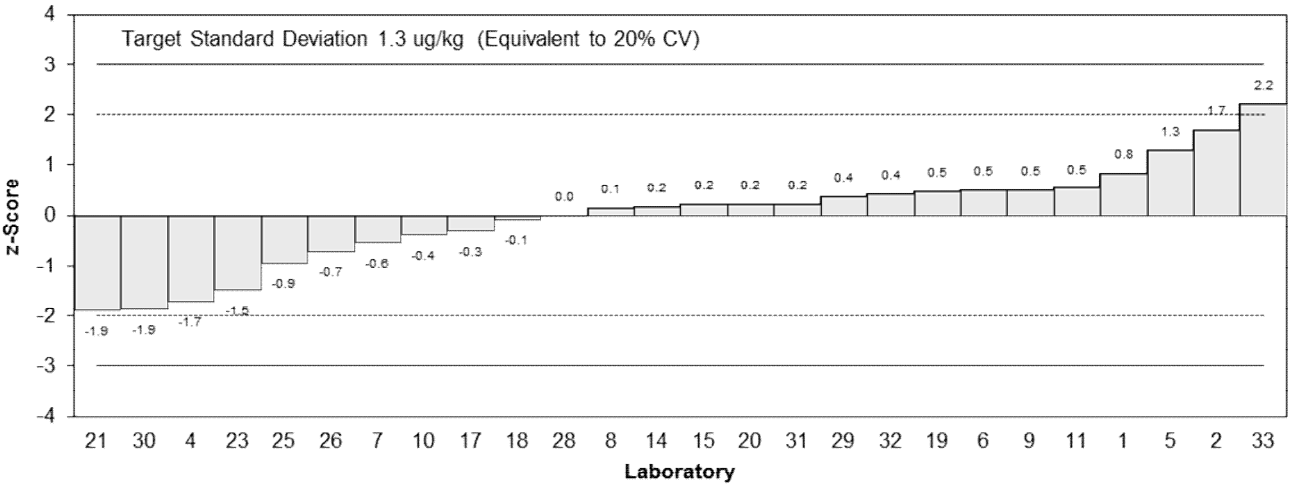
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	7.47	1.02	92	0.83	0.89
2	8.60	2.58	105	1.71	0.83
3	NT	NT	NT		
4	4.2	2.3	105	-1.72	-0.93
5	8.064692	0.94	83	1.29	1.47
6	7.059	1.553	NR	0.51	0.39
7	5.7	0.3	NR	-0.55	-1.03
8	6.6	1.4	111	0.15	0.12
9	7.06	0.2	81.4	0.51	1.00
10	5.89	1.78	116	-0.41	-0.28
11	7.1	2.3	73	0.54	0.29
13	NT	NT	NT		
14	6.62	1.32	78	0.16	0.14
15	6.68	1.34	90	0.21	0.18
16	NT	NT	NT		
17	6.0	1.5	112	-0.32	-0.25
18	6.3	0.54	97	-0.09	-0.13
19	7.03	2.11	90.6	0.48	0.28
20	6.7	1.7	118	0.23	0.16
21	3.99	0.77	NR	-1.89	-2.45
22	NT	NT	NT		
23	4.51	0.31	NR	-1.48	-2.74
24	NT	NT	NT		
25	5.2	1.52	NR	-0.94	-0.74
26	5.47	1.38	NR	-0.73	-0.62
27	NT	NT	NT		
28	6.41	1.6025	86.1	0.00	0.00
29	6.9	2	138	0.38	0.23
30	4.0	1.3	98	-1.88	-1.67
31	6.7	0.99	91	0.23	0.25
32	6.95	0.70	83	0.42	0.58
33	9.25	1.85	93	2.22	1.46

Statistics

Assigned Value	6.41	0.62
Spike	6.87	0.34
Robust Average	6.41	0.62
Median	6.65	0.33
Mean	6.40	
N	26	
Max.	9.25	
Min.	3.99	
Robust SD	1.3	
Robust CV	20%	


Kernel Density
Density
Result
Results: S2 - PFNA
Assigned Value = 6.41 ± 0.62 ug/kg
Results (ug/kg)
Laboratory
21 30 4 23 25 26 7 10 17 18 28 8 14 15 20 31 29 32 19 6 9 11 1 5 2 33 13 16 22 24 27 3 Md R.A. S.V.


z-Scores: S2 - PFNA
Target Standard Deviation 1.3 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
21 30 4 23 25 26 7 10 17 18 28 8 14 15 20 31 29 32 19 6 9 11 1 5 2 33

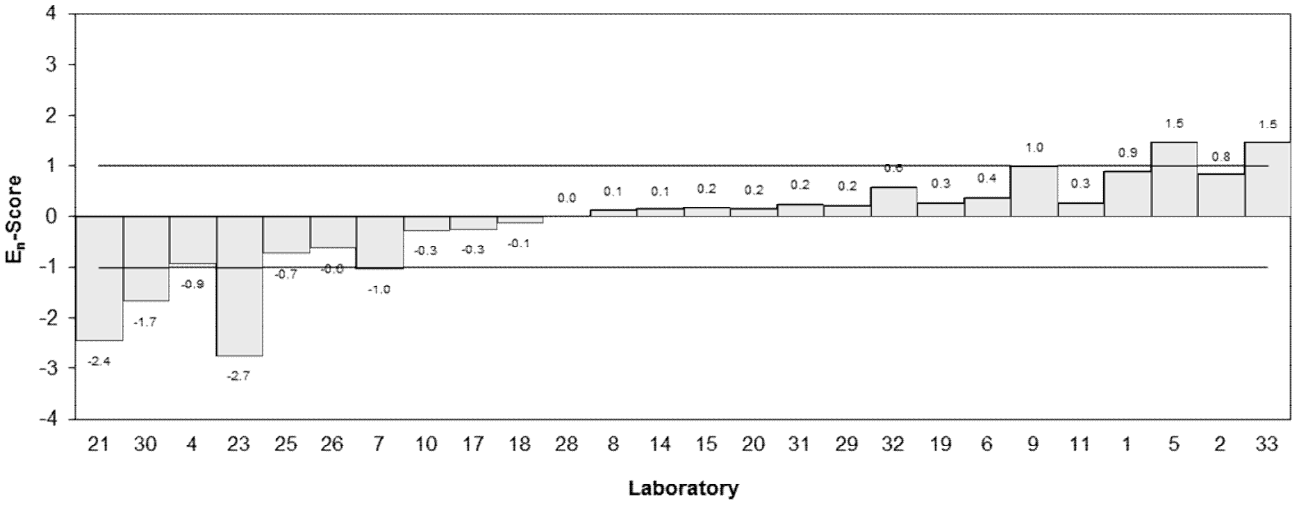

En-Scores: S2 - PFNA
En-Score
Laboratory
21 30 4 23 25 26 7 10 17 18 28 8 14 15 20 31 29 32 19 6 9 11 1 5 2 33

Figure 40

Table 47

Sample Details

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

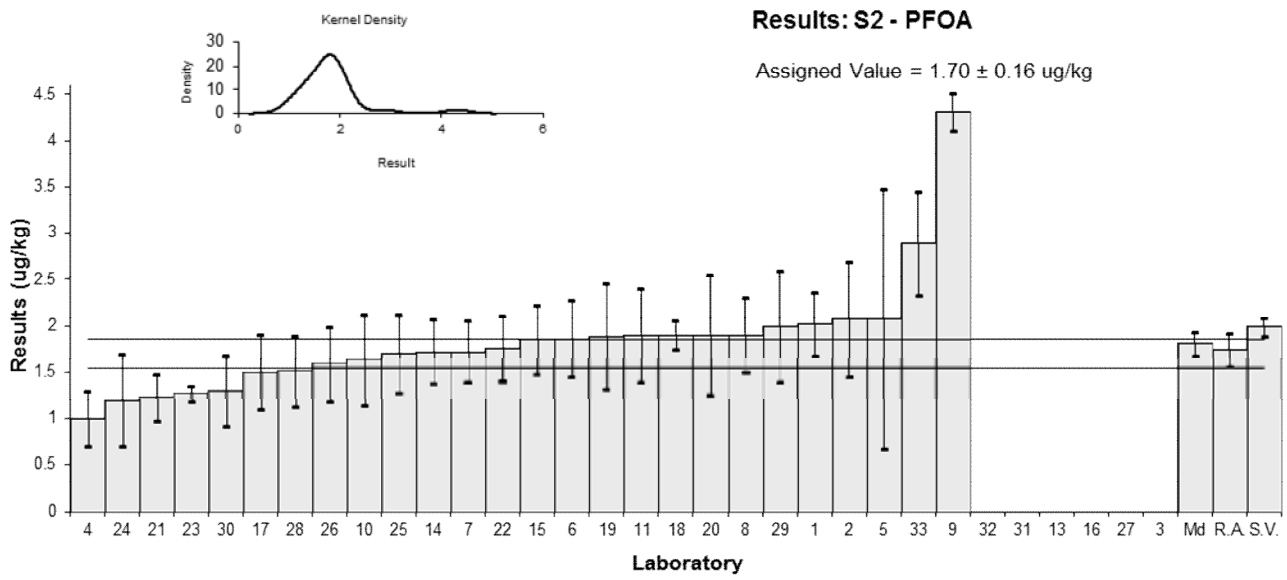
Participant Results

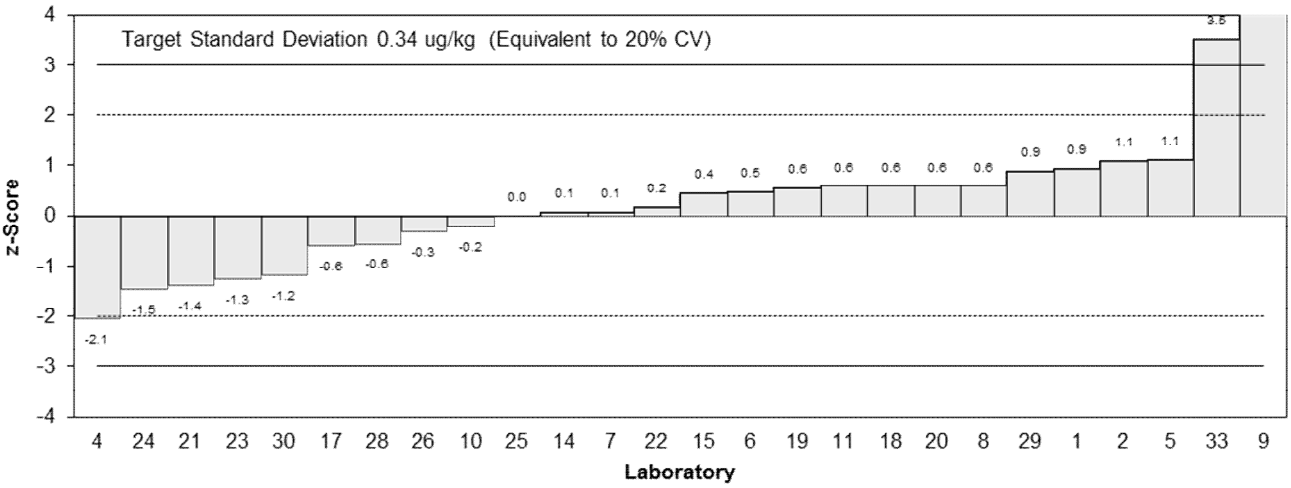
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	2.02	0.34	86	0.94	0.85
2	2.07	0.621	102	1.09	0.58
3	NT	NT	NT		
4	1.0	0.30	105	-2.06	-2.06
5	2.07832	1.4	89	1.11	0.27
6	1.861	0.409	NR	0.47	0.37
7	1.72	0.33	71	0.06	0.05
8	1.9	0.4	102	0.59	0.46
9	4.31	0.2	82.8	7.68	10.19
10	1.63	0.49	119	-0.21	-0.14
11	1.9	0.5	84	0.59	0.38
13	NT	NT	NT		
14	1.72	0.344	63	0.06	0.05
15	1.85	0.370	99	0.44	0.37
16	NT	NT	NT		
17	1.5	0.4	116	-0.59	-0.46
18	1.9	0.15	97	0.59	0.91
19	1.89	0.57	81.4	0.56	0.32
20	1.9	0.65	111	0.59	0.30
21	1.23	0.25	NR	-1.38	-1.58
22	1.76	0.35	98.6	0.18	0.16
23	1.27	0.08	87.9	-1.26	-2.40
24	1.2	0.5	NR	-1.47	-0.95
25	1.7	0.42	118	0.00	0.00
26	1.59	0.40	77	-0.32	-0.26
27	NT	NT	NT		
28	1.51	0.3775	96.4	-0.56	-0.46
29	2.0	0.6	134	0.88	0.48
30	1.3	0.38	121	-1.18	-0.97
31	<5	1	82		
32	< 5	1	86		
33	2.89	0.557	74	3.50	2.05

Statistics

Assigned Value*	1.70	0.16
Spike	1.99	0.10
Robust Average	1.74	0.18
Median	1.81	0.12
Mean	1.83	
N	26	
Max.	4.31	
Min.	1	
Robust SD	0.32	
Robust CV	19%	

*Assigned value is the robust average excluding laboratories 9 and 33.


Kernel Density
Density
Result
Results: S2 - PFOA
Assigned Value = 1.70 ± 0.16 ug/kg
Results (ug/kg)
Laboratory
4 24 21 23 30 17 28 26 10 25 14 7 22 15 6 19 11 18 20 8 29 1 2 5 33 9 32 31 13 16 27 3 Md R.A S.V.


z-Scores: S2 - PFOA
Target Standard Deviation 0.34 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
4 24 21 23 30 17 28 26 10 25 14 7 22 15 6 19 11 18 20 8 29 1 2 5 33 9

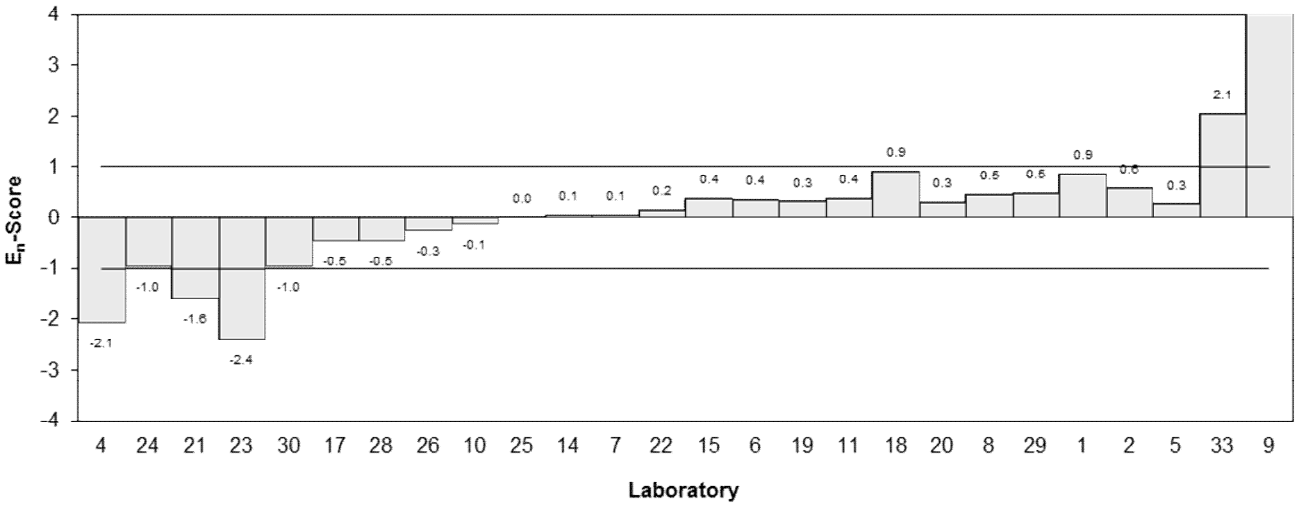

En-Scores: S2 - PFOA
En-Score
Laboratory
4 24 21 23 30 17 28 26 10 25 14 7 22 15 6 19 11 18 20 8 29 1 2 5 33 9

Figure 41

Table 48

Sample Details

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

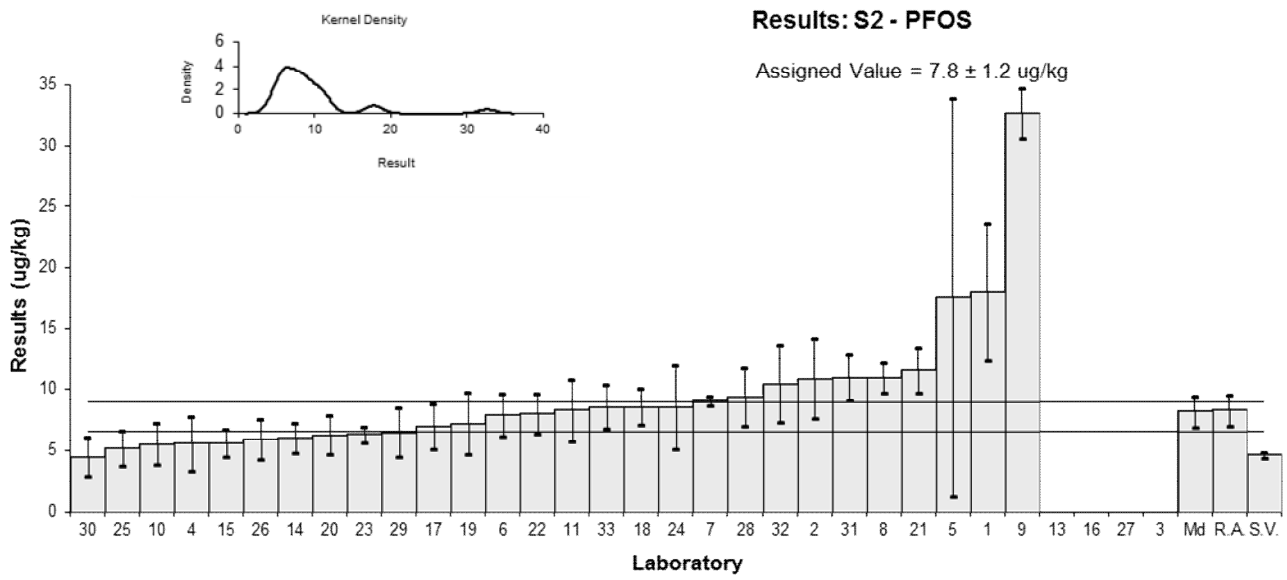
Participant Results

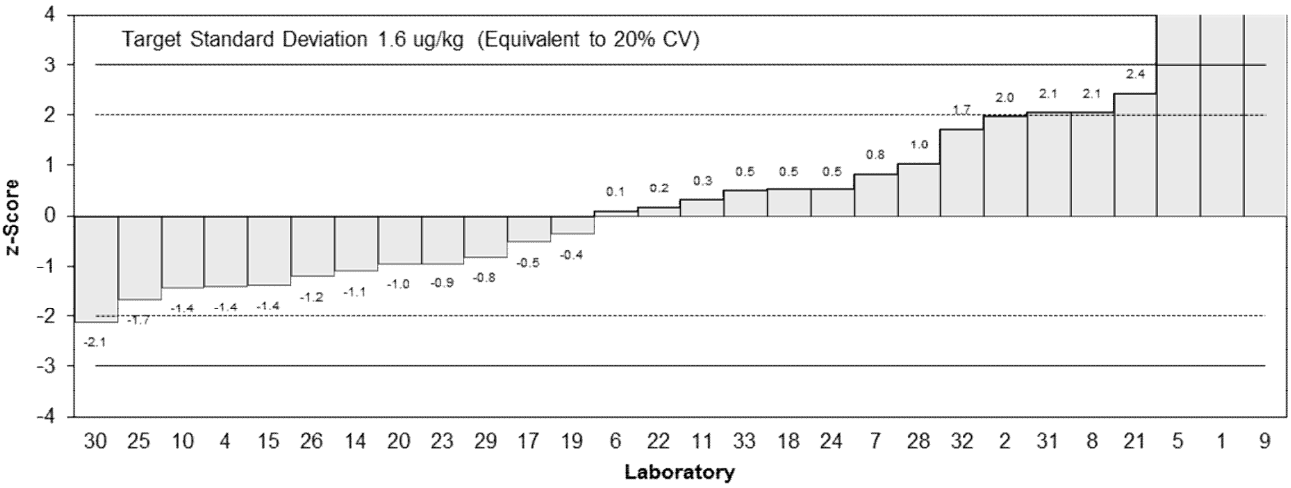
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	18.0	5.6	85	6.54	1.78
2	10.9	3.27	94	1.99	0.89
3	NT	NT	NT		
4	5.6	2.2	105	-1.41	-0.88
5	17.57	16.3	81	6.26	0.60
6	7.945	1.748	NR	0.09	0.07
7	9.10	0.40	72	0.83	1.03
8	11	1.2	90	2.05	1.89
9	32.7	2	80	15.96	10.68
10	5.56	1.67	122	-1.44	-1.09
11	8.3	2.5	82	0.32	0.18
13	NT	NT	NT		
14	6.06	1.21	80	-1.12	-1.02
15	5.64	1.13	88	-1.38	-1.31
16	NT	NT	NT		
17	7.0	1.8	79	-0.51	-0.37
18	8.6	1.5	104	0.51	0.42
19	7.23	2.54	84.3	-0.37	-0.20
20	6.3	1.6	114	-0.96	-0.75
21	11.6	1.8	NR	2.44	1.76
22	8.07	1.61	84.2	0.17	0.13
23	6.33	0.64	106	-0.94	-1.08
24	8.6	3.4	NR	0.51	0.22
25	5.2	1.39	88.5	-1.67	-1.42
26	5.91	1.62	75.5	-1.21	-0.94
27	NT	NT	NT		
28	9.43	2.3575	80.1	1.04	0.62
29	6.5	2	112	-0.83	-0.56
30	4.5	1.6	104	-2.12	-1.65
31	11	1.9	125	2.05	1.42
32	10.5	3.15	99	1.73	0.80
33	8.59	1.80	102	0.51	0.37

Statistics

Assigned Value*	7.8	1.2
Spike	4.64	0.23
Robust Average	8.3	1.3
Median	8.2	1.3
Mean	9.4	
N	28	
Max.	32.7	
Min.	4.5	
Robust SD	2.3	
Robust CV	29%	

*Assigned value is the robust average excluding laboratories 1, 5 and 9.


Kernel Density
Density
Result
Results: S2 - PFOS
Assigned Value = 7.8 ± 1.2 ug/kg
Results (ug/kg)
Laboratory
30 25 10 4 15 26 14 20 23 29 17 19 6 22 11 33 18 24 7 28 32 2 31 8 21 5 1 9 13 16 27 3 Md R.A S.V.


z-Scores: S2 - PFOS
Target Standard Deviation 1.6 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 25 10 4 15 26 14 20 23 29 17 19 6 22 11 33 18 24 7 28 32 2 31 8 21 5 1 9

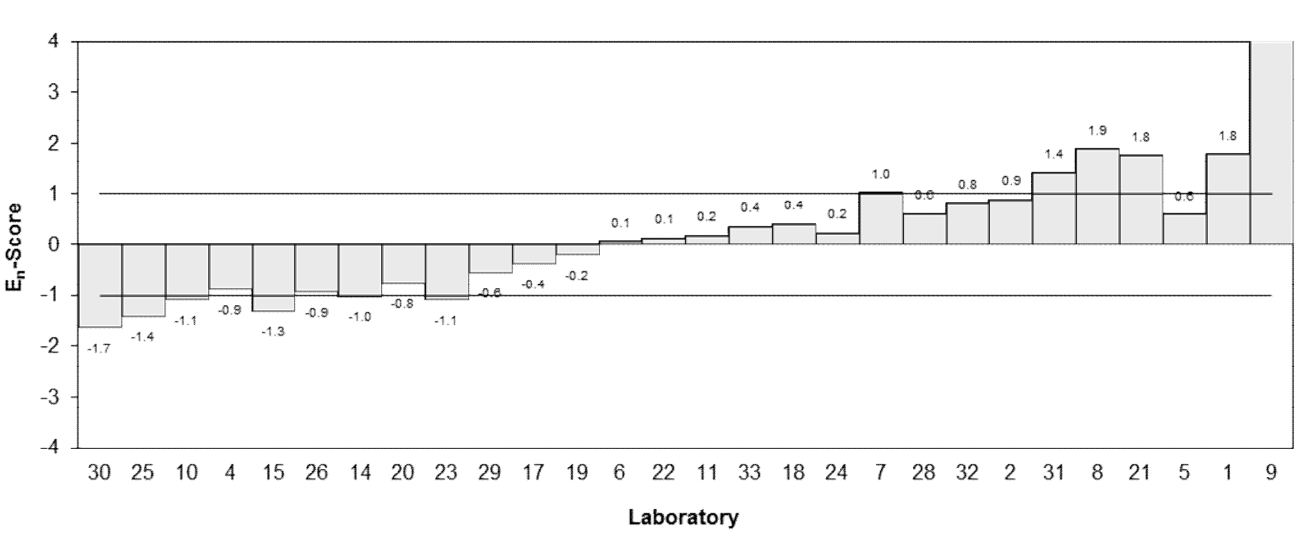

En-Scores: S2 - PFOS
En-Score
Laboratory
30 25 10 4 15 26 14 20 23 29 17 19 6 22 11 33 18 24 7 28 32 2 31 8 21 5 1 9

Figure 42

Table 49

Sample Details

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

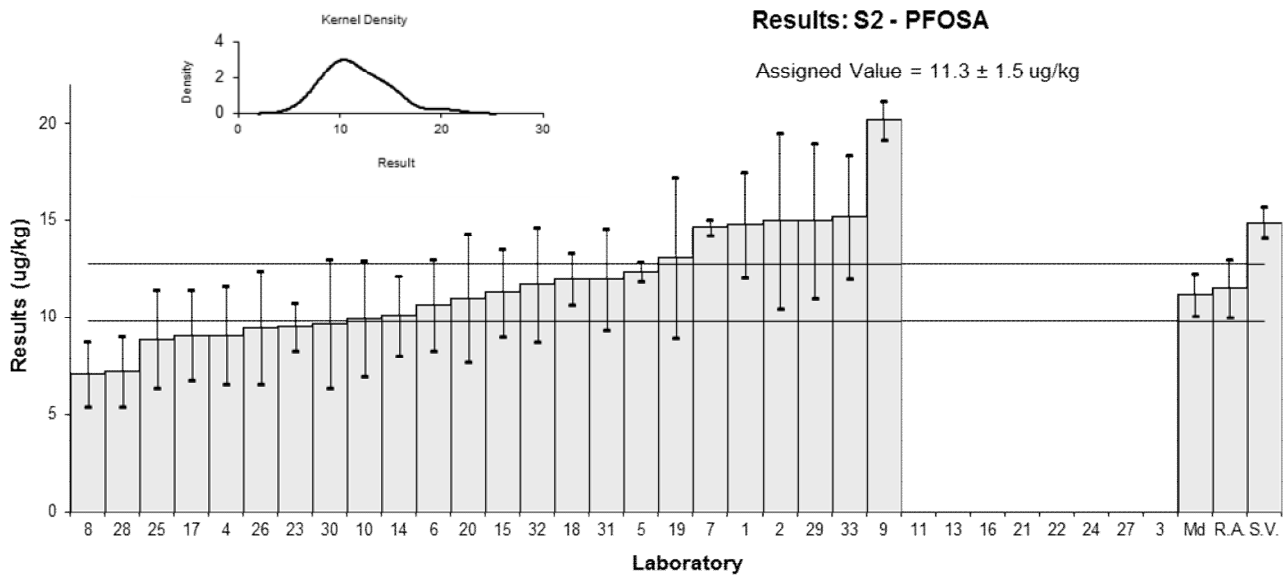
Participant Results

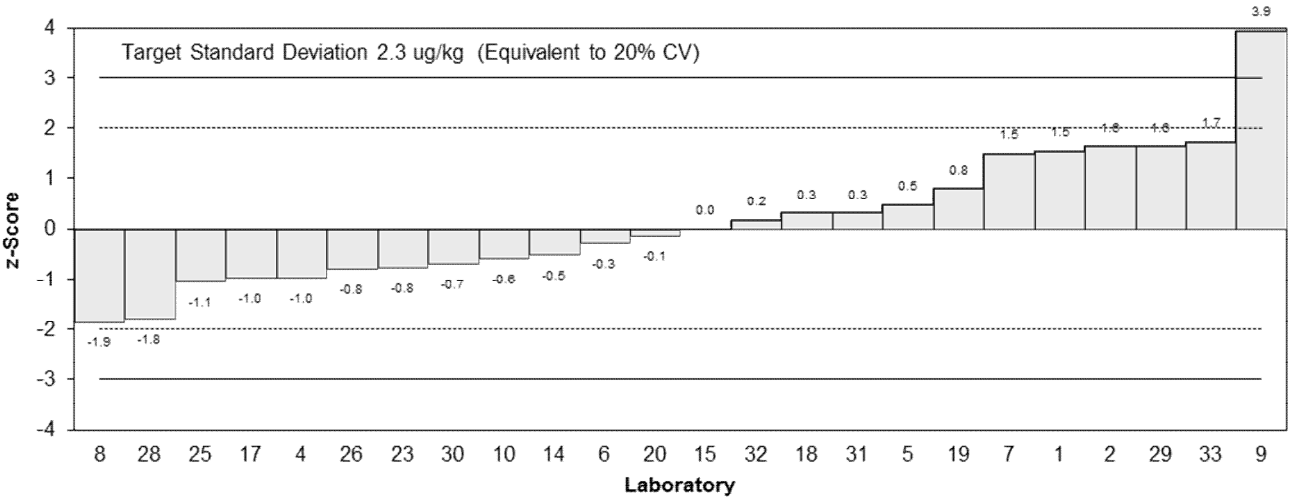
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	14.8	2.7	87	1.55	1.13
2	15.0	4.5	80	1.64	0.78
3	NT	NT	NT		
4	9.1	2.5	105	-0.97	-0.75
5	12.37	0.52	97	0.47	0.67
6	10.653	2.344	NR	-0.29	-0.23
7	14.66	0.41	NR	1.49	2.16
8	7.1	1.7	114	-1.86	-1.85
9	20.2	1	56.8	3.94	4.94
10	9.96	2.99	120	-0.59	-0.40
11	NT	NT	NT		
13	NT	NT	NT		
14	10.1	2.02	77	-0.53	-0.48
15	11.3	2.26	105	0.00	0.00
16	NT	NT	NT		
17	9.1	2.3	121	-0.97	-0.80
18	12	1.3	96	0.31	0.35
19	13.1	4.1	86.1	0.80	0.41
20	11	3.3	49	-0.13	-0.08
21	NT	NT	NT		
22	NT	NT	NT		
23	9.52	1.21	NR	-0.79	-0.92
24	NT	NT	NT		
25	8.9	2.49	NR	-1.06	-0.83
26	9.50	2.93	NR	-0.80	-0.55
27	NT	NT	NT		
28	7.22	1.805	59.2	-1.81	-1.74
29	15	4	121	1.64	0.87
30	9.7	3.3	31	-0.71	-0.44
31	12	2.6	81	0.31	0.23
32	11.7	2.93	92	0.18	0.12
33	15.2	3.17	81	1.73	1.11

Statistics

Assigned Value*	11.3	1.5
Spike	14.9	0.8
Robust Average	11.5	1.5
Median	11.2	1.1
Mean	11.6	
N	24	
Max.	20.2	
Min.	7.1	
Robust SD	2.8	
Robust CV	25%	

*Assigned value is the robust average excluding laboratory 9.


Kernel Density
Density
Result
Results: S2 - PFOSA
Assigned Value = 11.3 ± 1.5 ug/kg
Results (ug/kg)
Laboratory
8 28 25 17 4 26 23 30 10 14 6 20 15 32 18 31 5 19 7 1 2 29 33 9 11 13 16 21 22 24 27 3 Md R.A. S.V.


z-Scores: S2 - PFOSA
Target Standard Deviation 2.3 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
8 28 25 17 4 26 23 30 10 14 6 20 15 32 18 31 5 19 7 1 2 29 33 9

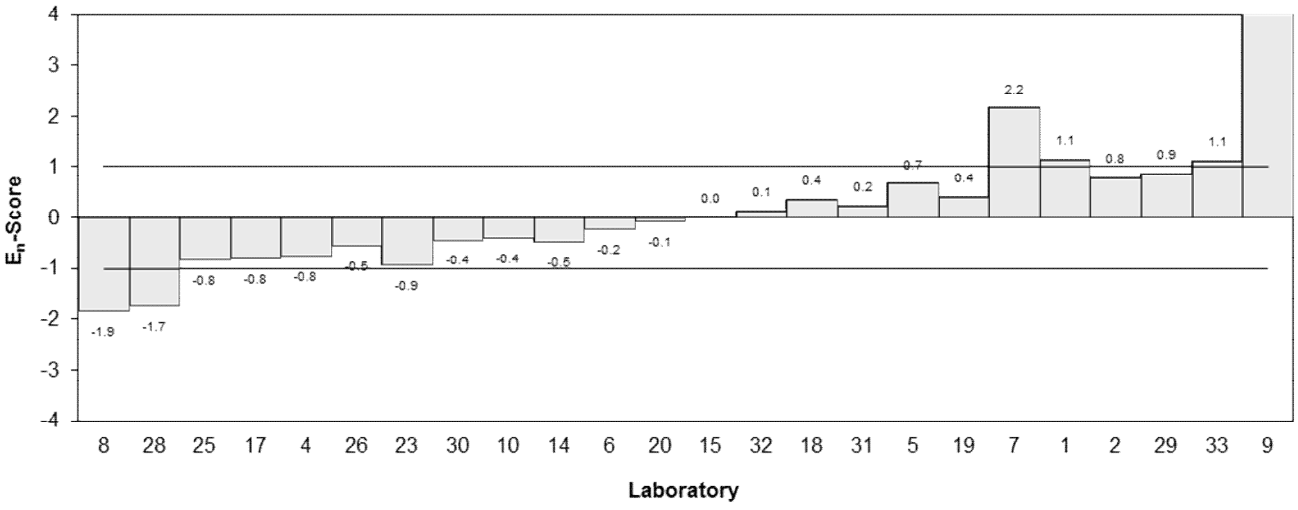

En-Scores: S2 - PFOSA
En-Score
Laboratory
8 28 25 17 4 26 23 30 10 14 6 20 15 32 18 31 5 19 7 1 2 29 33 9

Figure 43

Table 50

Sample Details

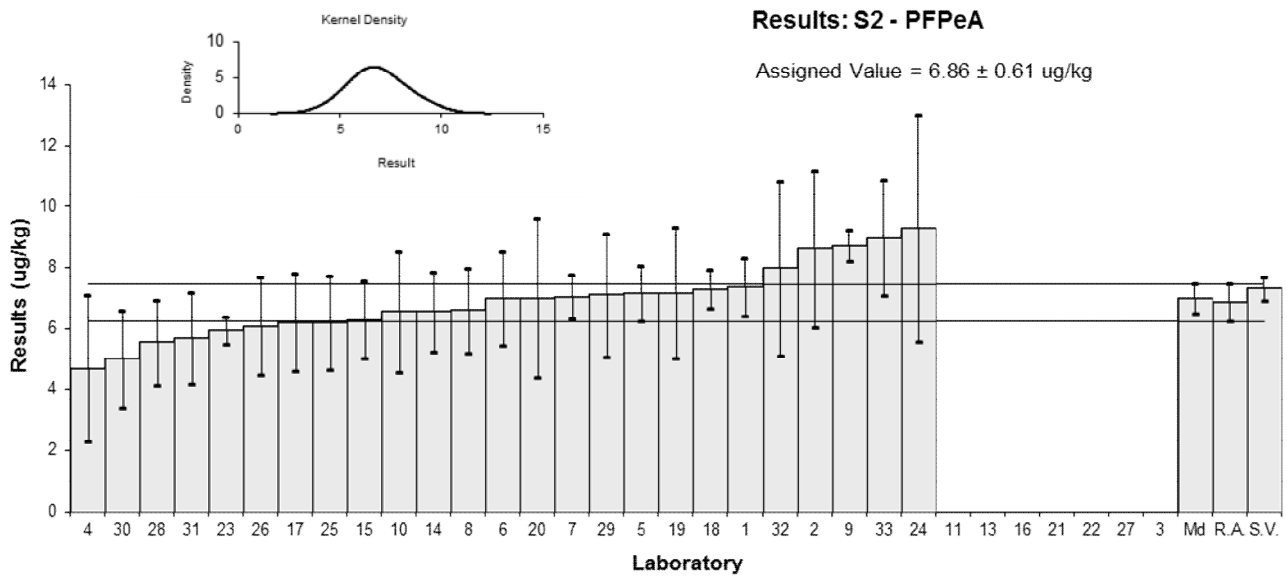
Sample No.	S2
Matrix.	Soil
Analyte.	PFPeA
Units	µg/kg

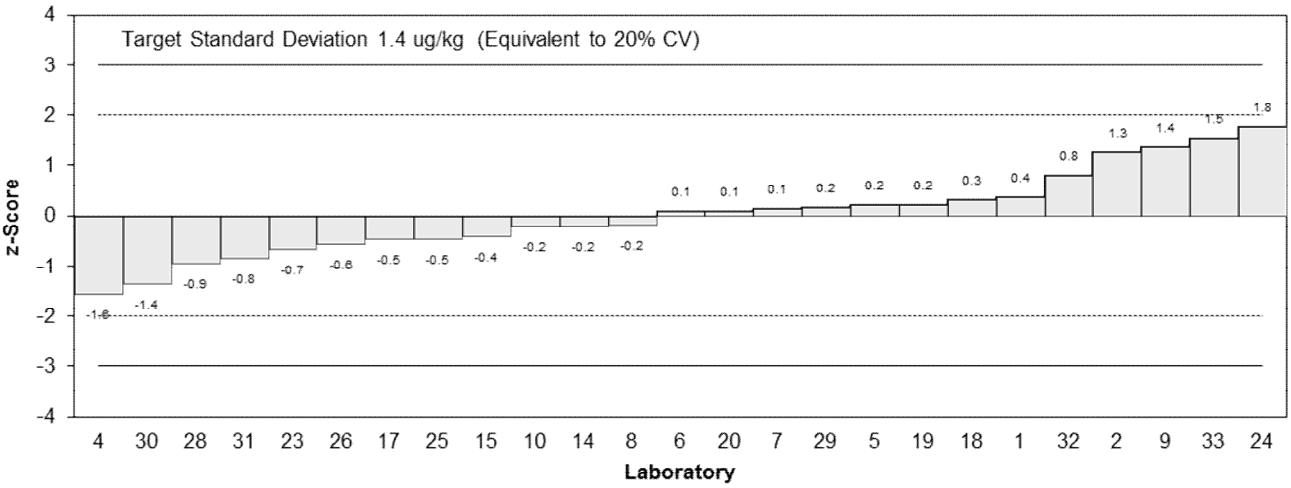
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	7.37	0.95	81	0.37	0.45
2	8.61	2.58	65	1.28	0.66
3	NT	NT	NT		
4	4.7	2.4	105	-1.57	-0.87
5	7.161578	0.9	84	0.22	0.28
6	6.979	1.535	NR	0.09	0.07
7	7.05	0.72	NR	0.14	0.20
8	6.6	1.4	99	-0.19	-0.17
9	8.73	0.5	81.2	1.36	2.37
10	6.56	1.97	104	-0.22	-0.15
11	NT	NT	NT		
13	NT	NT	NT		
14	6.56	1.31	93	-0.22	-0.21
15	6.28	1.26	96	-0.42	-0.41
16	NT	NT	NT		
17	6.2	1.6	91	-0.48	-0.39
18	7.3	0.63	99	0.32	0.50
19	7.17	2.15	94.8	0.23	0.14
20	7.0	2.6	103	0.10	0.05
21	NT	NT	NT		
22	NT	NT	NT		
23	5.95	0.45	NR	-0.66	-1.20
24	9.3	3.7	NR	1.78	0.65
25	6.2	1.54	NR	-0.48	-0.40
26	6.08	1.60	NR	-0.57	-0.46
27	NT	NT	NT		
28	5.56	1.39	110	-0.95	-0.86
29	7.1	2	109	0.17	0.11
30	5.0	1.6	91	-1.36	-1.09
31	5.7	1.5	87	-0.85	-0.72
32	7.98	2.87	81	0.82	0.38
33	8.98	1.90	66	1.55	1.06

Statistics

Assigned Value	6.86	0.61
Spike	7.32	0.37
Robust Average	6.86	0.61
Median	6.98	0.48
Mean	6.88	
N	25	
Max.	9.3	
Min.	4.7	
Robust SD	1.2	
Robust CV	17%	


Kernel Density
Density
Result
Results: S2 - PFPeA
Assigned Value = 6.86 ± 0.61 ug/kg
Results (ug/kg)
Laboratory
4 30 28 31 23 26 17 25 15 10 14 8 6 20 7 29 5 19 18 1 32 2 9 33 24 11 13 16 21 22 27 3 Md R.A. S.V.


z-Scores: S2 - PFPeA
Target Standard Deviation 1.4 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
4 30 28 31 23 26 17 25 15 10 14 8 6 20 7 29 5 19 18 1 32 2 9 33 24

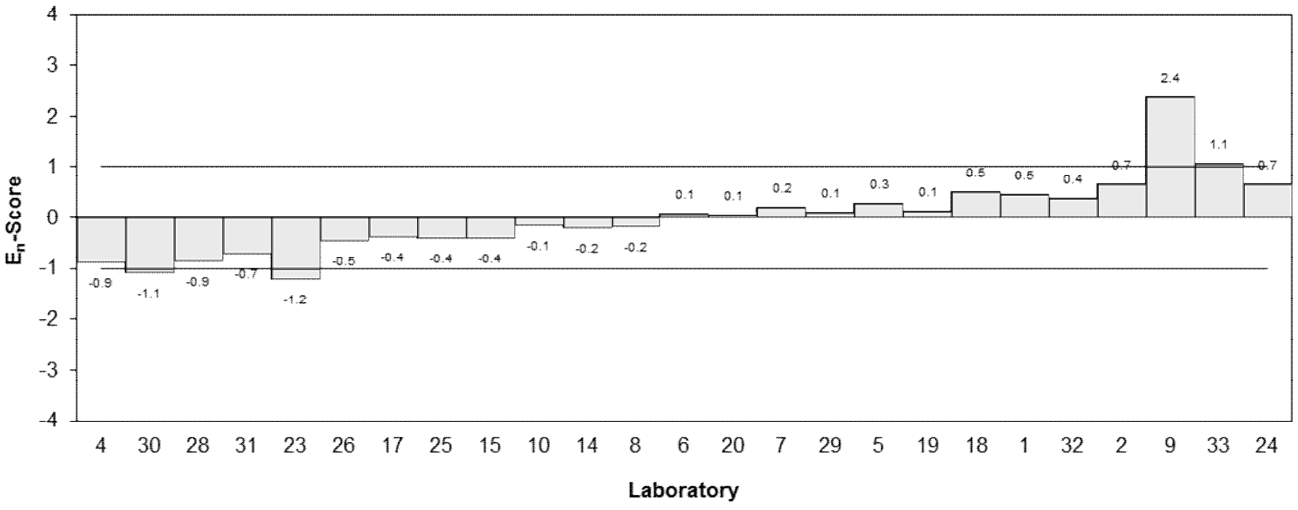

En-Scores: S2 - PFPeA
En-Score
Laboratory
4 30 28 31 23 26 17 25 15 10 14 8 6 20 7 29 5 19 18 1 32 2 9 33 24

Figure 44

Table 51

Sample Details

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

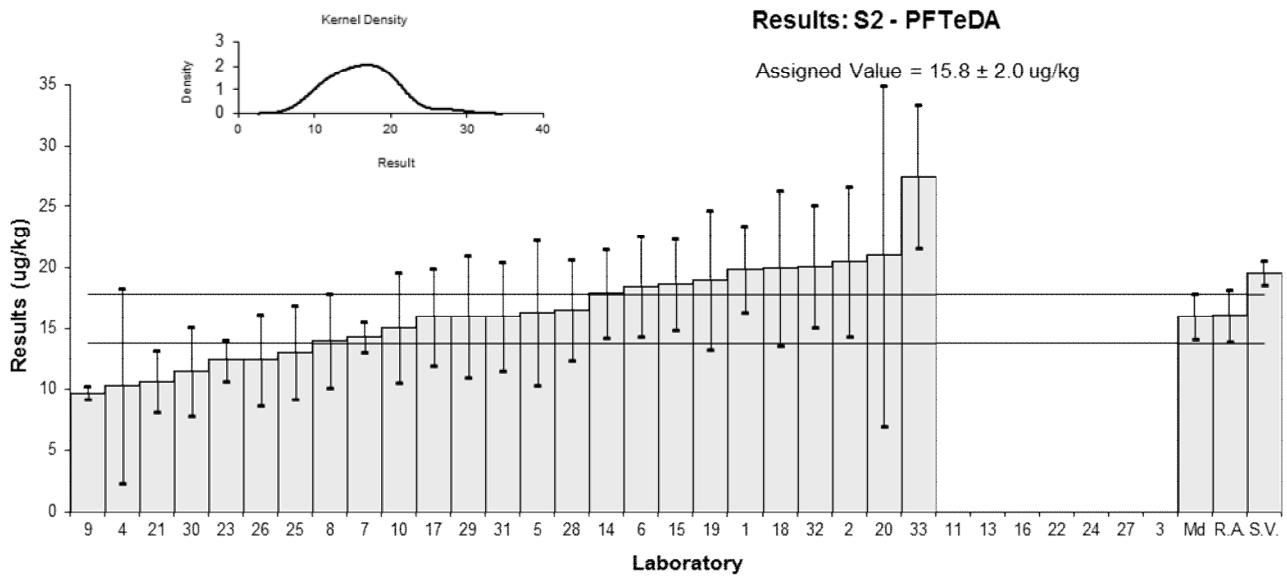
Participant Results

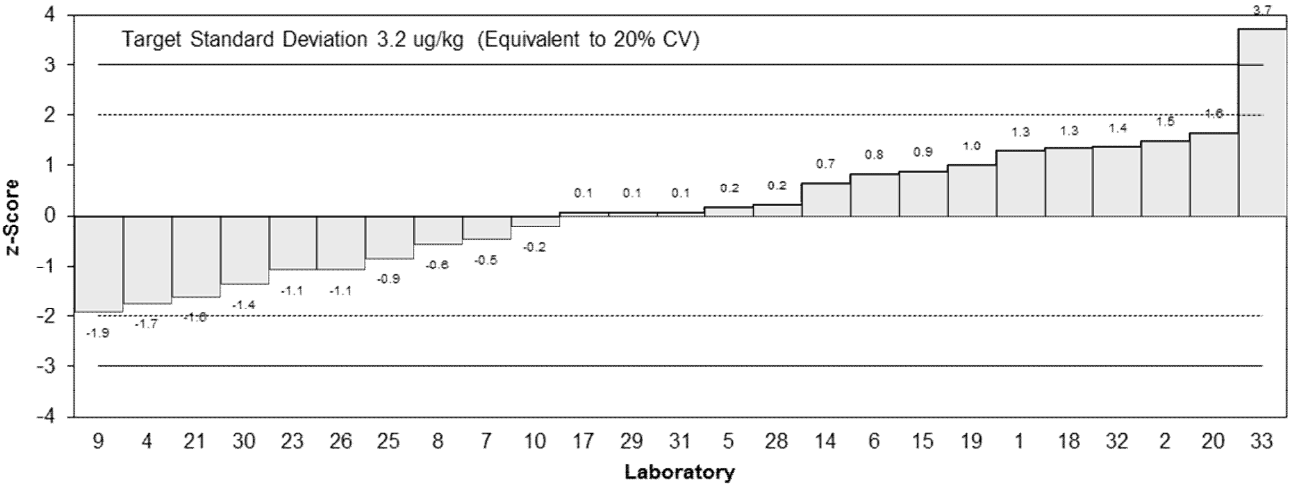
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	19.9	3.5	82	1.30	1.02
2	20.5	6.15	122	1.49	0.73
3	NT	NT	NT		
4	10.3	8.0	105	-1.74	-0.67
5	16.32	5.96	4	0.16	0.08
6	18.459	4.061	NR	0.84	0.59
7	14.3	1.2	NR	-0.47	-0.64
8	14	3.8	68	-0.57	-0.42
9	9.75	0.5	NR	-1.91	-2.93
10	15.1	4.53	76	-0.22	-0.14
11	NT	NT	NT		
13	NT	NT	NT		
14	17.9	3.58	64	0.66	0.51
15	18.6	3.72	73	0.89	0.66
16	NT	NT	NT		
17	16	4	127	0.06	0.04
18	20	6.3	95	1.33	0.64
19	19.0	5.7	79.1	1.01	0.53
20	21	14	90	1.65	0.37
21	10.7	2.5	NR	-1.61	-1.59
22	NT	NT	NT		
23	12.4	1.7	NR	-1.08	-1.30
24	NT	NT	NT		
25	13.1	3.85	NR	-0.85	-0.62
26	12.4	3.73	NR	-1.08	-0.80
27	NT	NT	NT		
28	16.52	4.13	40.8	0.23	0.16
29	16	5	133	0.06	0.04
30	11.5	3.6	70	-1.36	-1.04
31	16	4.5	138	0.06	0.04
32	20.1	5.02	86	1.36	0.80
33	27.5	5.87	88	3.70	1.89

Statistics

Assigned Value*	15.8	2.0
Spike	19.6	1.0
Robust Average	16.1	2.1
Median	16.0	1.8
Mean	16.3	
N	25	
Max.	27.5	
Min.	9.75	
Robust SD	3.9	
Robust CV	25%	

*Assigned value is the robust average excluding laboratory 33.


Kernel Density
Density
Result
Results: S2 - PFTeDA
Assigned Value = 15.8 ± 2.0 ug/kg
Results (ug/kg)
Laboratory
9 4 21 30 23 26 25 8 7 10 17 29 31 5 28 14 6 15 19 1 18 32 2 20 33 11 13 16 22 24 27 3 Md R.A S.V.


z-Scores: S2 - PFTeDA
Target Standard Deviation 3.2 ug/kg (Equivalent to 20% CV)
z-Score
Laboratory
9 4 21 30 23 26 25 8 7 10 17 29 31 5 28 14 6 15 19 1 18 32 2 20 33

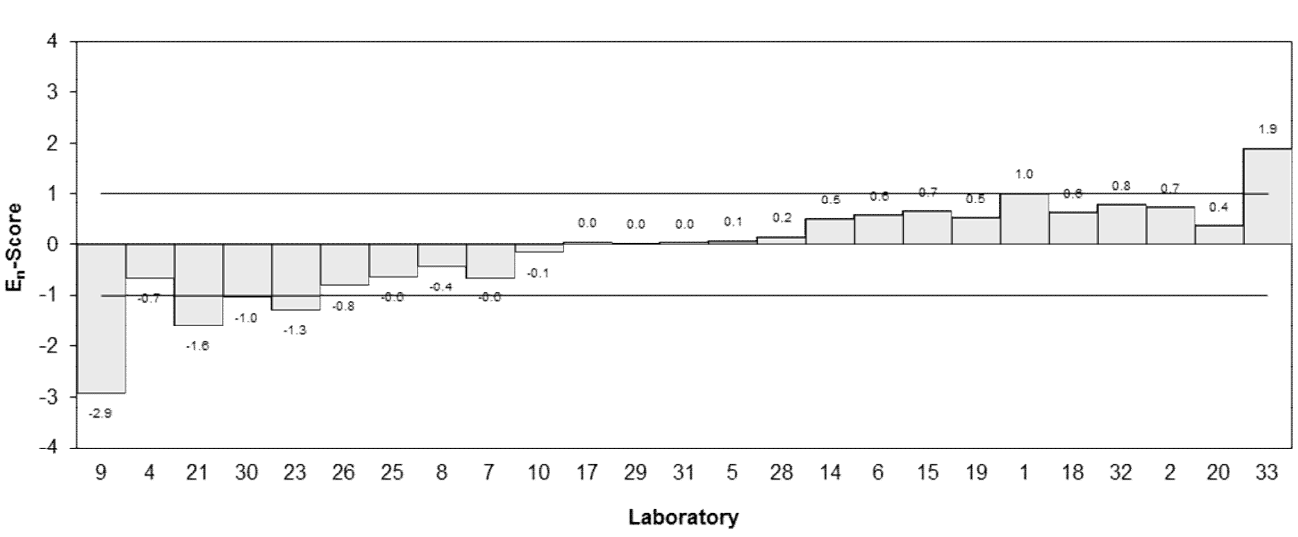

En-Scores: S2 - PFTeDA
En-Score
Laboratory
9 4 21 30 23 26 25 8 7 10 17 29 31 5 28 14 6 15 19 1 18 32 2 20 33

Figure 45

Table 52

Sample Details

Sample No.	S3
Matrix.	Water
Analyte.	6:2 FTS
Units	µg/L

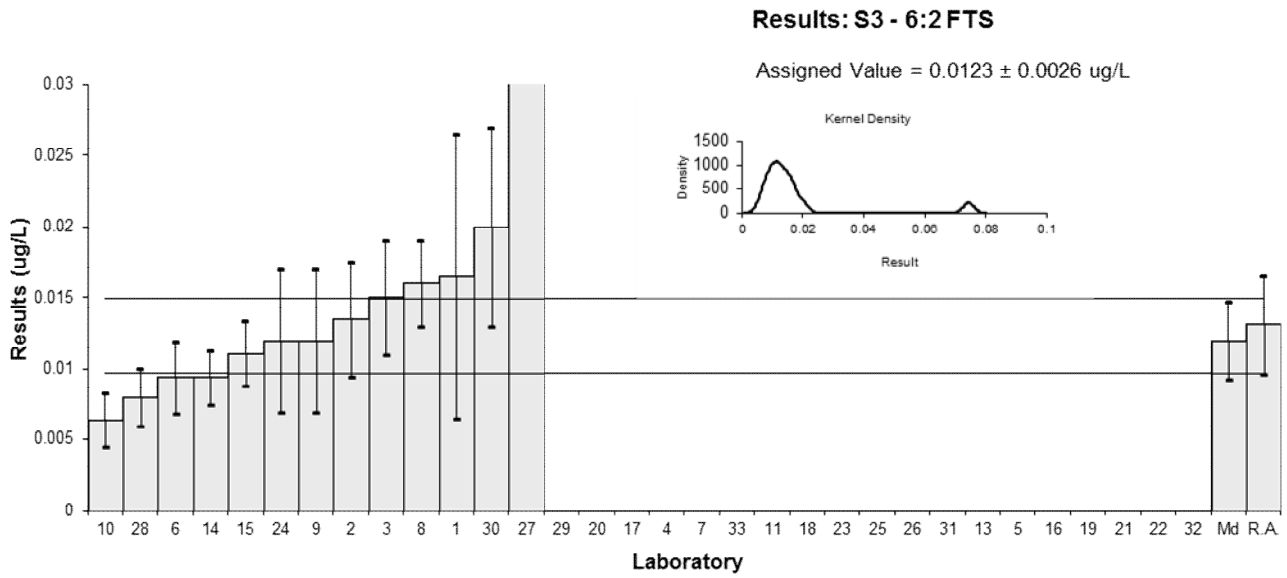
Participant Results

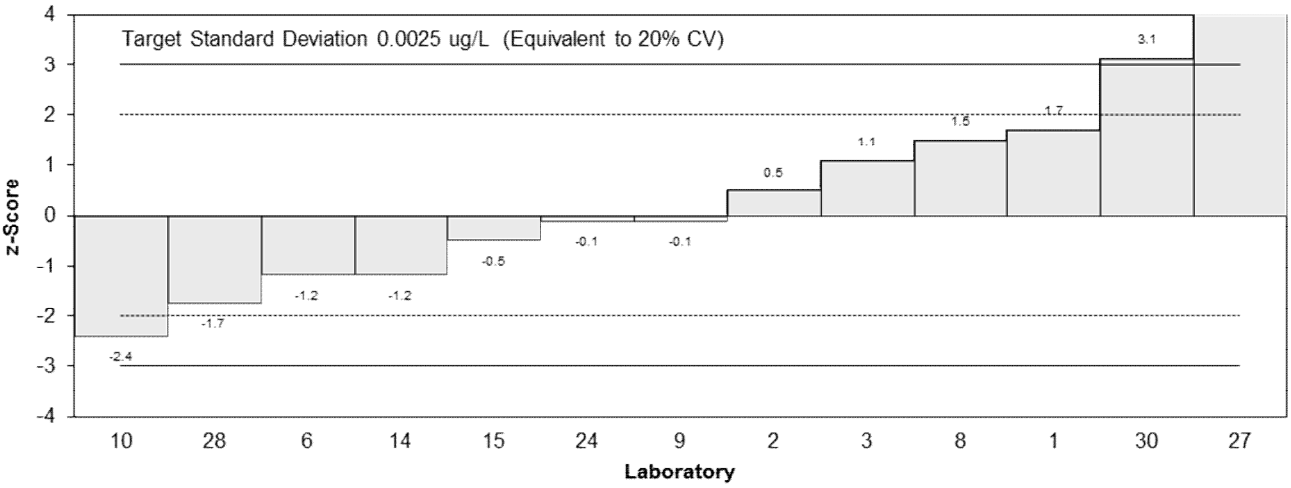
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0165	0.010	122	1.71	0.41
2	0.0135	0.004	120	0.49	0.25
3	0.015	0.004	NR	1.10	0.57
4	<0.01	NR	109		
5	<0.1	NR	96		
6	0.0094	0.0025	105	-1.18	-0.80
7	<0.02	NR	NR		
8	0.016	0.003	106	1.50	0.93
9	0.012	0.005	93.7	-0.12	-0.05
10	0.0064	0.0019	69	-2.40	-1.83
11	<0.03	NR	262		
13	<0.0887	0.04435	110		
14	0.00941	0.00188	110	-1.17	-0.90
15	0.0111	0.00222	79	-0.49	-0.35
16	NT	NT	NT		
17	<0.01	NR	96		
18	<0.05	NR	100		
19	NT	NT	NT		
20	< 0.05	0.013	NR		
21	NT	NT	NT		
22	NT	NT	NT		
23	<0.05	NR	NR		
24	0.012	0.005	NR	-0.12	-0.05
25	<0.05	0.016	NR		
26	<0.05	NR	NR		
27	0.0744	0.0186	68	25.24	3.31
28	0.008	0.002	108.3	-1.75	-1.31
29	< 0.01	NR	146		
30	0.02	0.007	95	3.13	1.03
31	<0.05	0.01	135		
32	NT	NT	NT		
33	<0.0216	NR	104		

Statistics

Assigned Value*	0.0123	0.0026
Spike	Not Spiked	
Robust Average	0.0131	0.0034
Median	0.0120	0.0027
Mean	0.0172	
N	13	
Max.	0.0744	
Min.	0.0064	
Robust SD	0.0033	
Robust CV	27%	

*Assigned value is the robust average excluding laboratories 10, 27, and 30.


Results: S3 - 6:2 FTS
Assigned Value = 0.0123 ± 0.0026 ug/L
Kernel Density
Density
Result
Results (ug/L)
Laboratory
10 28 6 14 15 24 9 2 3 8 1 30 27 29 20 17 4 7 33 11 18 23 25 26 31 13 5 16 19 21 22 32 Md R.A


z-Scores: S3 - 6:2 FTS
Target Standard Deviation 0.0025 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
10 28 6 14 15 24 9 2 3 8 1 30 27

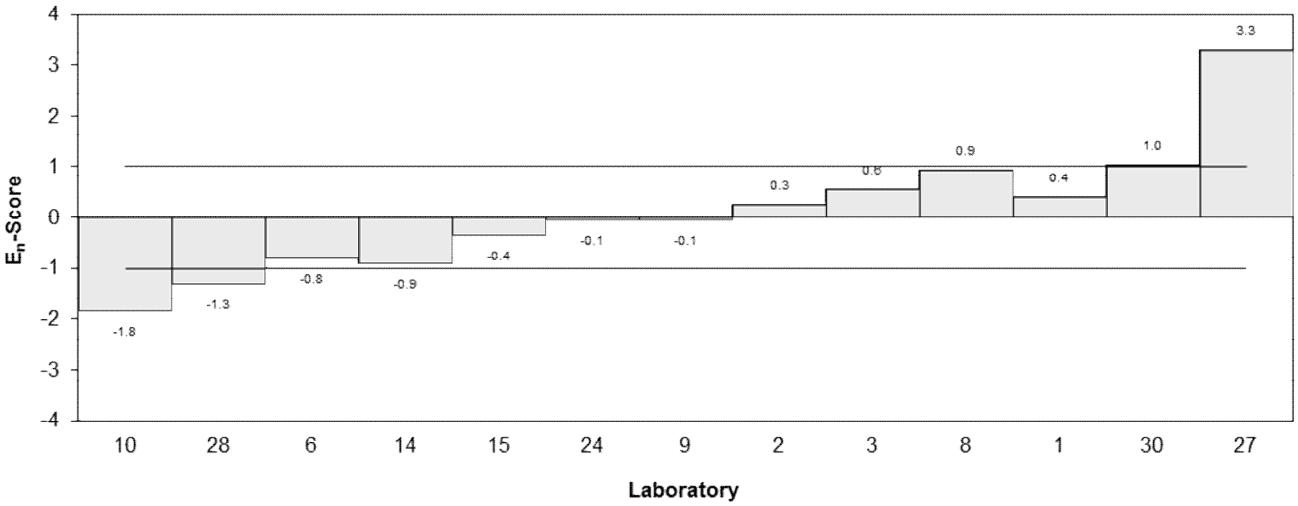

En-Scores: S3 - 6:2 FTS
En-Score
Laboratory
10 28 6 14 15 24 9 2 3 8 1 30 27

Figure 46

Table 53

Sample Details

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

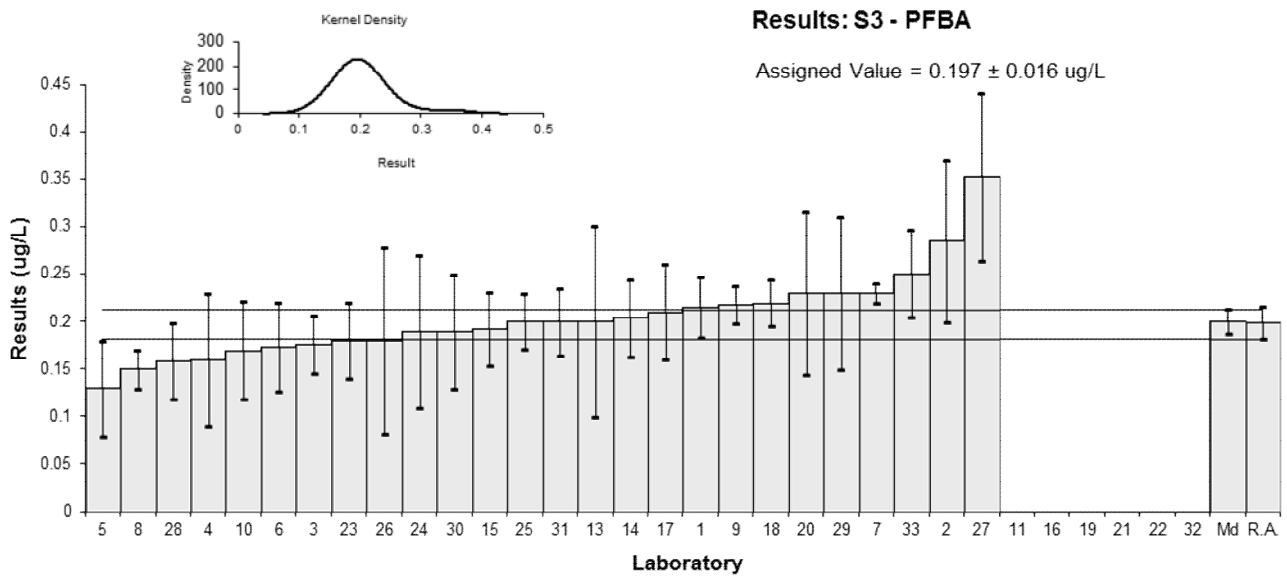
Participant Results

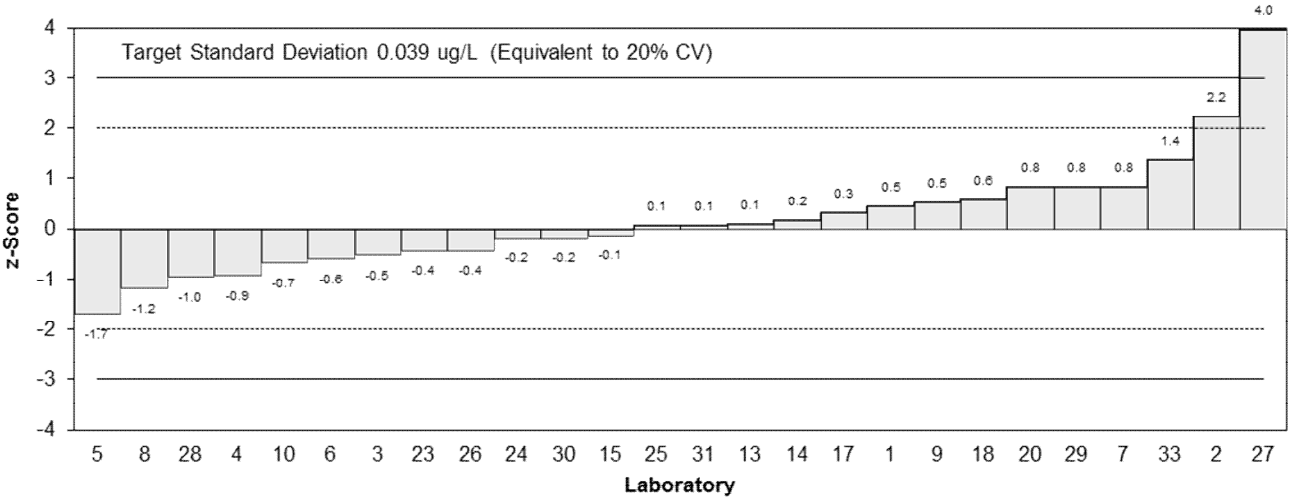
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.215	0.032	98	0.46	0.50
2	0.285	0.0855	58	2.23	1.01
3	0.176	0.030	NR	-0.53	-0.62
4	0.16	0.07	109	-0.94	-0.52
5	0.13	0.05	105	-1.70	-1.28
6	0.1737	0.0469	78	-0.59	-0.47
7	0.23	0.01	NR	0.84	1.75
8	0.15	0.02	85	-1.19	-1.84
9	0.218	0.02	85.4	0.53	0.82
10	0.17	0.051	119	-0.69	-0.51
11	NT	NT	NT		
13	0.201	0.1005	85	0.10	0.04
14	0.204	0.0408	76	0.18	0.16
15	0.192	0.0383	112	-0.13	-0.12
16	NT	NT	NT		
17	0.21	0.05	100	0.33	0.25
18	0.22	0.024	99	0.58	0.80
19	NT	NT	NT		
20	0.23	0.086	69	0.84	0.38
21	NT	NT	NT		
22	NT	NT	NT		
23	0.18	0.04	NR	-0.43	-0.39
24	0.19	0.08	NR	-0.18	-0.09
25	0.2	0.029	NR	0.08	0.09
26	0.18	0.098	NR	-0.43	-0.17
27	0.353	0.0883	72	3.96	1.74
28	0.159	0.03975	107.8	-0.96	-0.89
29	0.23	0.08	100	0.84	0.40
30	0.19	0.06	54	-0.18	-0.11
31	0.20	0.035	67	0.08	0.08
32	NT	NT	NT		
33	0.251	0.0459	77	1.37	1.11

Statistics

Assigned Value*	0.197	0.016
Spike	Not Spiked	
Robust Average	0.199	0.017
Median	0.200	0.013
Mean	0.204	
N	26	
Max.	0.353	
Min.	0.13	
Robust SD	0.032	
Robust CV	16%	

*Assigned value is the robust average excluding laboratory 27.


Kernel Density
Density
Result
Results: S3 - PFBA
Assigned Value = 0.197 ± 0.016 ug/L
Results (ug/L)
Laboratory
5 8 28 4 10 6 3 23 26 24 30 15 25 31 13 14 17 1 9 18 20 29 7 33 2 27 11 16 19 21 22 32 Md R.A


z-Scores: S3 - PFBA
Target Standard Deviation 0.039 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 8 28 4 10 6 3 23 26 24 30 15 25 31 13 14 17 1 9 18 20 29 7 33 2 27

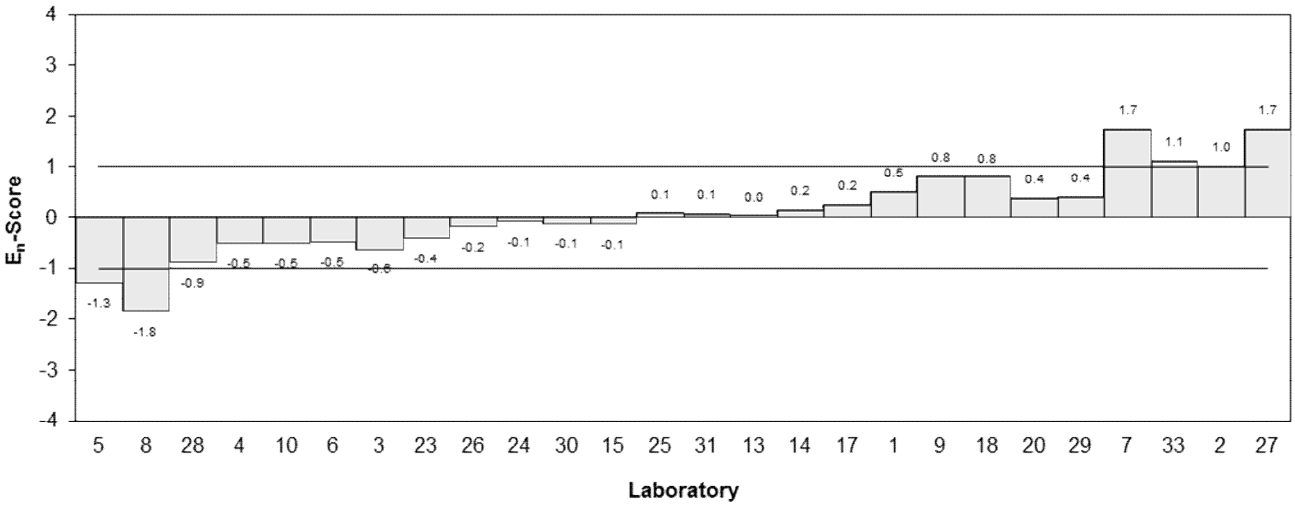

En-Scores: S3 - PFBA
En-Score
Laboratory
5 8 28 4 10 6 3 23 26 24 30 15 25 31 13 14 17 1 9 18 20 29 7 33 2 27

Figure 47

Table 54

Sample Details

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

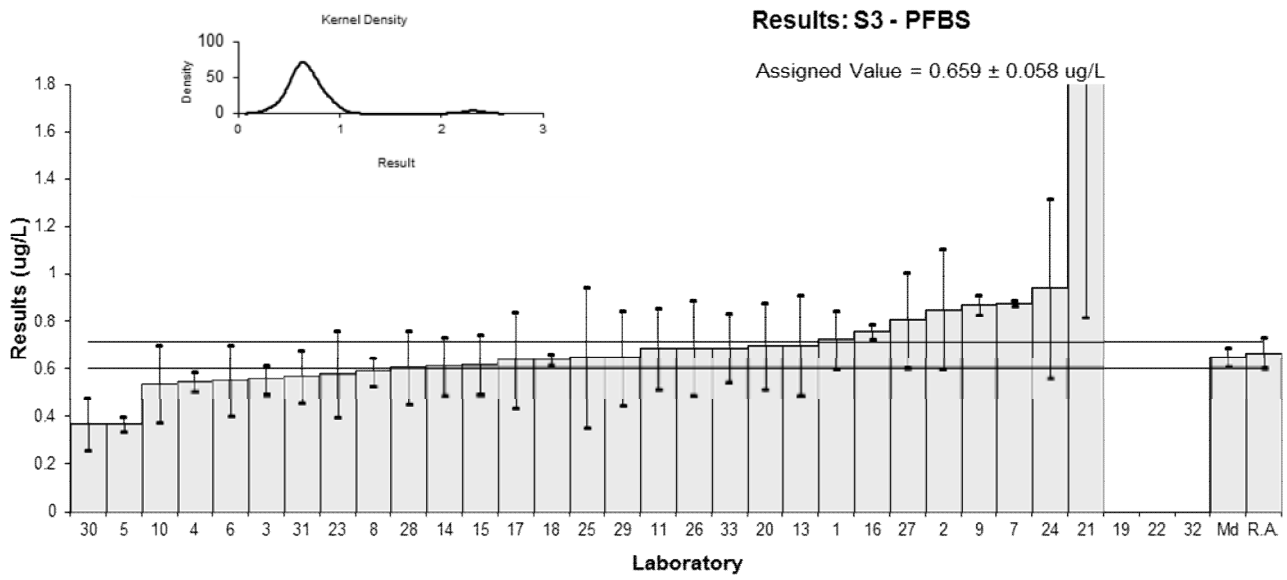
Participant Results

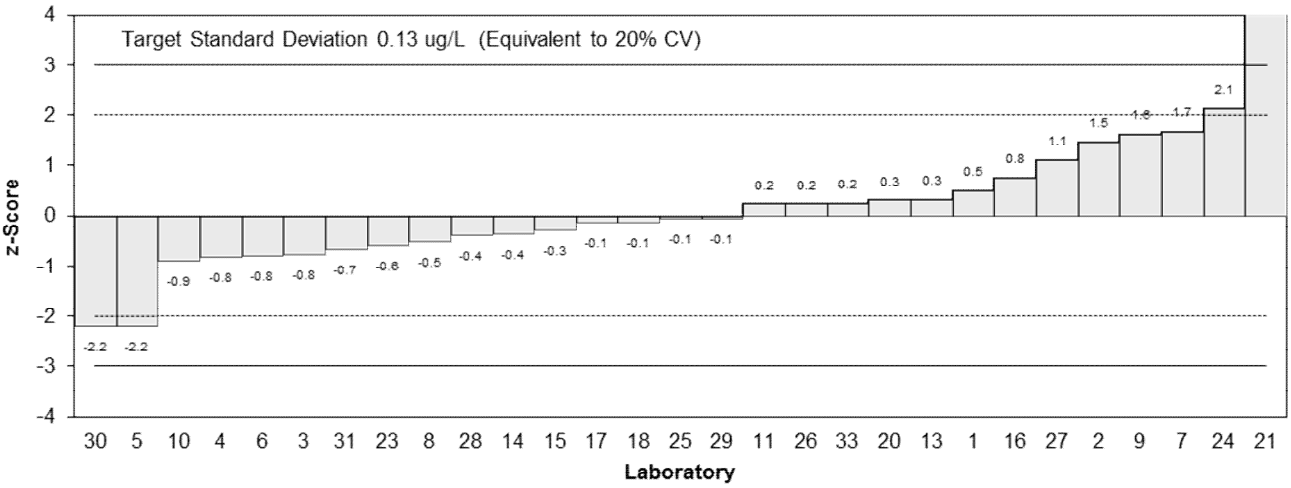
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.724	0.122	100	0.49	0.48
2	0.853	0.256	84	1.47	0.74
3	0.557	0.058	NR	-0.77	-1.24
4	0.55	0.04	109	-0.83	-1.55
5	0.37	0.03	99	-2.19	-4.43
6	0.5548	0.1498	88	-0.79	-0.65
7	0.88	0.01	84.2	1.68	3.75
8	0.59	0.06	97	-0.52	-0.83
9	0.874	0.04	102.9	1.63	3.05
10	0.54	0.162	71	-0.90	-0.69
11	0.69	0.17	67	0.24	0.17
13	0.702	0.2106	102	0.33	0.20
14	0.611	0.122	89	-0.36	-0.36
15	0.621	0.124	66	-0.29	-0.28
16	0.758	0.03	NR	0.75	1.52
17	0.64	0.2	106	-0.14	-0.09
18	0.64	0.022	105	-0.14	-0.31
19	NT	NT	NT		
20	0.70	0.18	100	0.31	0.22
21	2.31	1.49	NR	12.53	1.11
22	NT	NT	NT		
23	0.58	0.18	NR	-0.60	-0.42
24	0.94	0.38	NR	2.13	0.73
25	0.65	0.294	NR	-0.07	-0.03
26	0.69	0.200	NR	0.24	0.15
27	0.806	0.202	68	1.12	0.70
28	0.608	0.152	84.6	-0.39	-0.31
29	0.65	0.2	96	-0.07	-0.04
30	0.37	0.11	123	-2.19	-2.32
31	0.57	0.11	80	-0.68	-0.72
32	NT	NT	NT		
33	0.691	0.145	68	0.24	0.20

Statistics

Assigned Value*	0.659	0.058
Spike	Not Spiked	
Robust Average	0.669	0.064
Median	0.650	0.042
Mean	0.714	
N	29	
Max.	2.31	
Min.	0.37	
Robust SD	0.12	
Robust CV	18%	

*Assigned value is the robust average excluding laboratory 21.


Kernel Density
Density
Result
Results: S3 - PFBS
Assigned Value = 0.659 ± 0.058 ug/L
Results (ug/L)
Laboratory
30 5 10 4 6 3 31 23 8 28 14 15 17 18 25 29 11 26 33 20 13 1 16 27 2 9 7 24 21 19 22 32 Md R.A.


z-Scores: S3 - PFBS
Target Standard Deviation 0.13 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
30 5 10 4 6 3 31 23 8 28 14 15 17 18 25 29 11 26 33 20 13 1 16 27 2 9 7 24 21

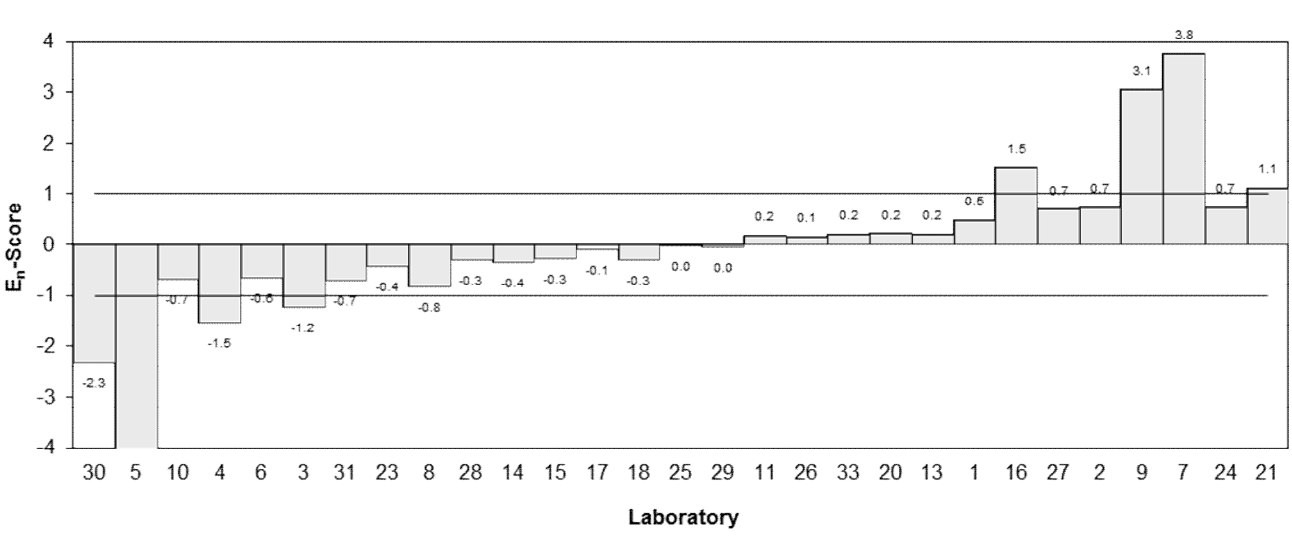

En-Scores: S3 - PFBS
En-Score
Laboratory
30 5 10 4 6 3 31 23 8 28 14 15 17 18 25 29 11 26 33 20 13 1 16 27 2 9 7 24 21

Figure 48

Table 55

Sample Details

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

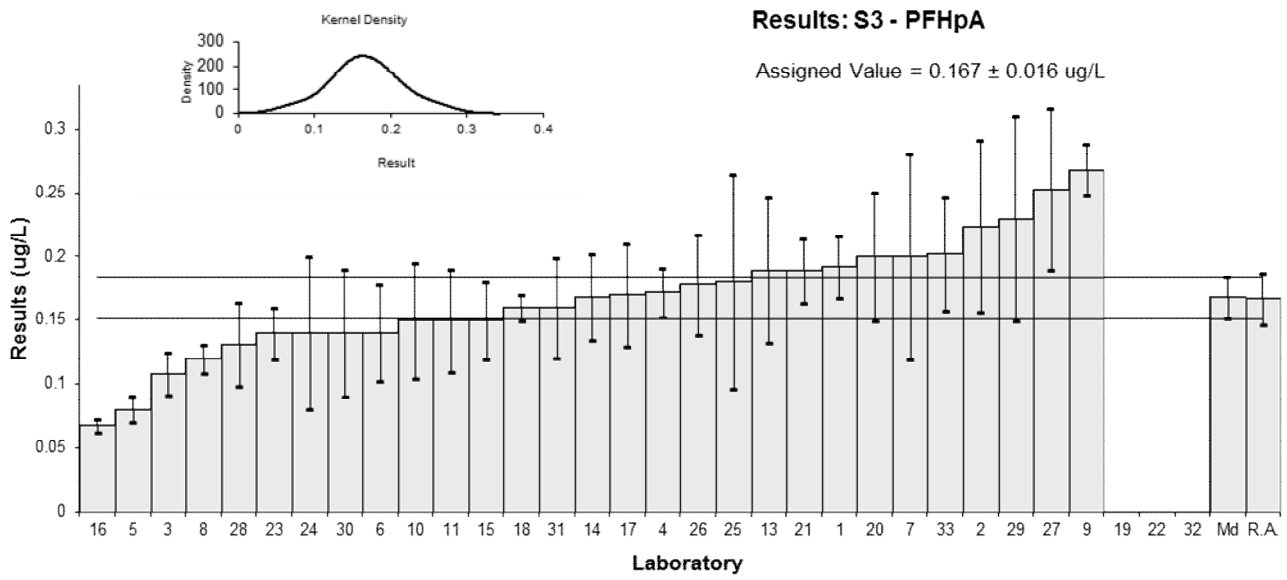
Participant Results

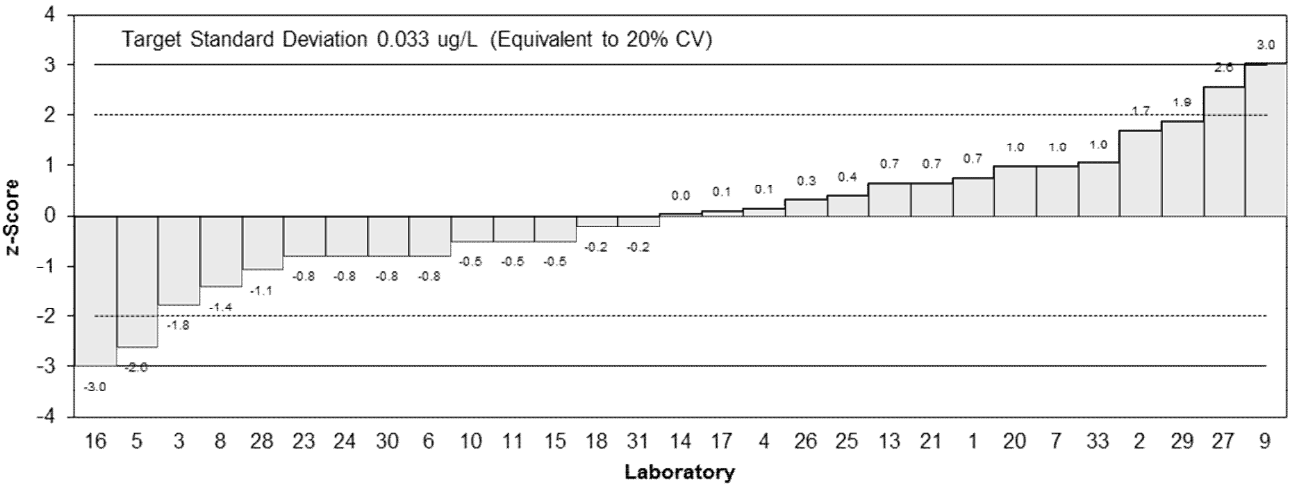
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.192	0.024	91	0.75	0.87
2	0.224	0.0672	82	1.71	0.83
3	0.108	0.017	NR	-1.77	-2.53
4	0.172	0.019	109	0.15	0.20
5	0.08	0.01	102	-2.60	-4.61
6	0.1403	0.0379	104	-0.80	-0.65
7	0.20	0.08	NR	0.99	0.40
8	0.12	0.011	98	-1.41	-2.42
9	0.268	0.02	74.2	3.02	3.94
10	0.15	0.045	103	-0.51	-0.36
11	0.15	0.04	51	-0.51	-0.39
13	0.189	0.0567	91	0.66	0.37
14	0.168	0.0336	102	0.03	0.03
15	0.150	0.0299	59	-0.51	-0.50
16	0.0674	0.005	NR	-2.98	-5.94
17	0.17	0.04	104	0.09	0.07
18	0.16	0.010	100	-0.21	-0.37
19	NT	NT	NT		
20	0.20	0.050	89	0.99	0.63
21	0.189	0.025	NR	0.66	0.74
22	NT	NT	NT		
23	0.14	0.02	NR	-0.81	-1.05
24	0.14	0.06	NR	-0.81	-0.43
25	0.18	0.084	NR	0.39	0.15
26	0.178	0.039	NR	0.33	0.26
27	0.253	0.0633	48	2.57	1.32
28	0.131	0.03275	108.6	-1.08	-0.99
29	0.23	0.08	96	1.89	0.77
30	0.14	0.05	142	-0.81	-0.51
31	0.16	0.039	104	-0.21	-0.17
32	NT	NT	NT		
33	0.202	0.0440	87	1.05	0.75

Statistics

Assigned Value*	0.167	0.016
Spike	Not Spiked	
Robust Average	0.167	0.020
Median	0.168	0.016
Mean	0.167	
N	29	
Max.	0.268	
Min.	0.0674	
Robust SD	0.033	
Robust CV	20%	

*Assigned value is the robust average excluding laboratories 5, 9, 16, and 27.


Kernel Density
Density
Result
Results: S3 - PFHpA
Assigned Value = 0.167 ± 0.016 ug/L
Results (ug/L)
Laboratory
16 5 3 8 28 23 24 30 6 10 11 15 18 31 14 17 4 26 25 13 21 1 20 7 33 2 29 27 9 19 22 32 Md R.A


z-Scores: S3 - PFHpA
Target Standard Deviation 0.033 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
16 5 3 8 28 23 24 30 6 10 11 15 18 31 14 17 4 26 25 13 21 1 20 7 33 2 29 27 9

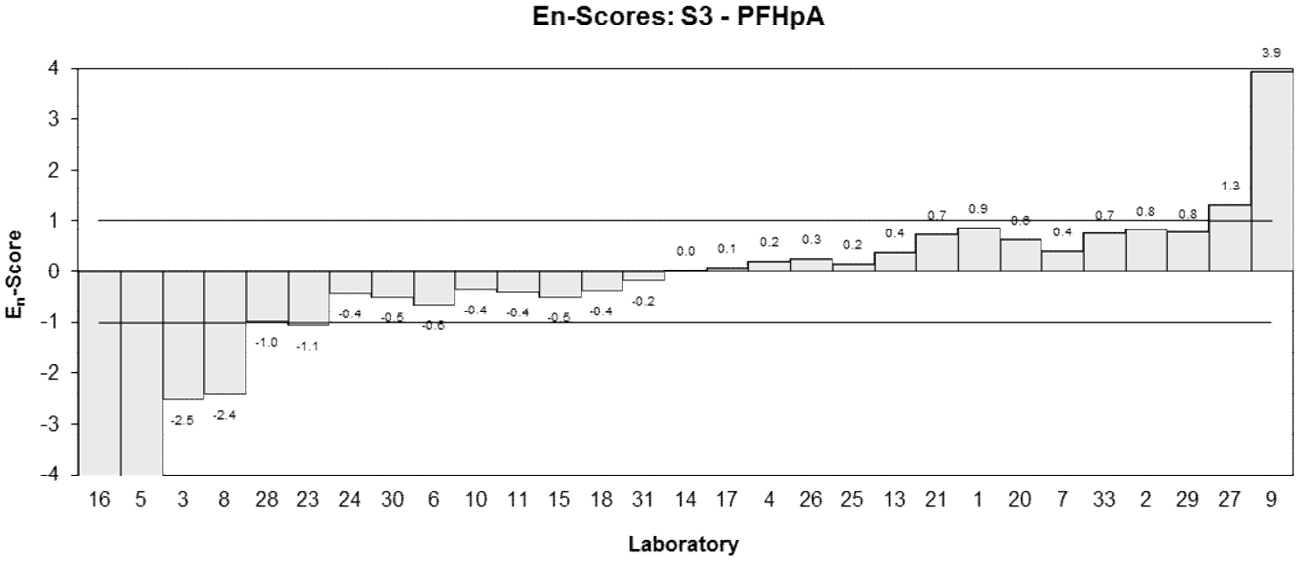

En-Scores: S3 - PFHpA
En-Score
Laboratory
16 5 3 8 28 23 24 30 6 10 11 15 18 31 14 17 4 26 25 13 21 1 20 7 33 2 29 27 9

Figure 49

Table 56

Sample Details

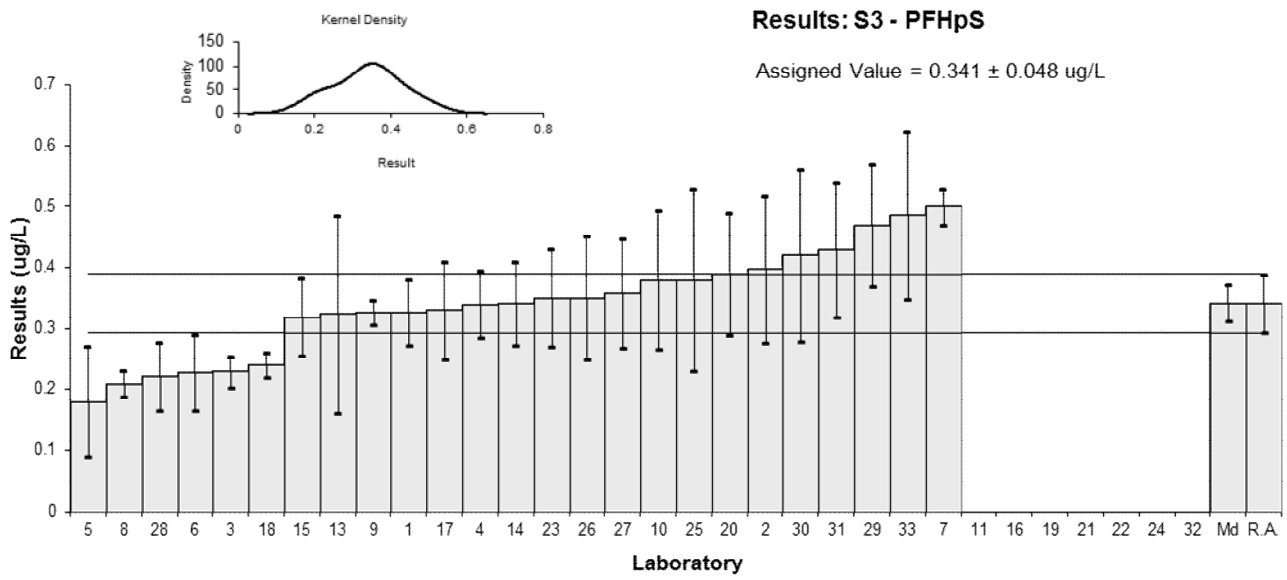
Sample No.	S3
Matrix.	Water
Analyte.	PFHpS
Units	µg/L

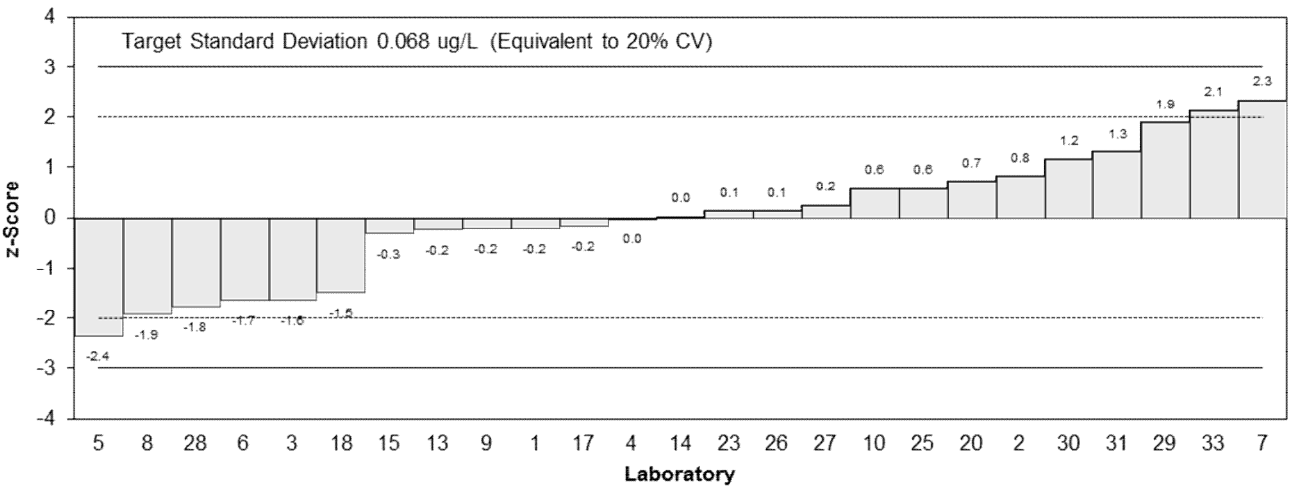
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.327	0.053	98	-0.21	-0.20
2	0.397	0.119	53	0.82	0.44
3	0.229	0.025	NR	-1.64	-2.07
4	0.340	0.055	109	-0.01	-0.01
5	0.18	0.09	NR	-2.36	-1.58
6	0.2282	0.0616	58	-1.65	-1.44
7	0.50	0.03	NR	2.33	2.81
8	0.21	0.022	106	-1.92	-2.48
9	0.326	0.02	NR	-0.22	-0.29
10	0.38	0.114	NR	0.57	0.32
11	NT	NT	NT		
13	0.324	0.162	93	-0.25	-0.10
14	0.342	0.0683	80	0.01	0.01
15	0.319	0.0638	67	-0.32	-0.28
16	NT	NT	NT		
17	0.33	0.08	88	-0.16	-0.12
18	0.24	0.020	98	-1.48	-1.94
19	NT	NT	NT		
20	0.39	0.10	NR	0.72	0.44
21	NT	NT	NT		
22	NT	NT	NT		
23	0.35	0.08	NR	0.13	0.10
24	NT	NT	NT		
25	0.38	0.149	NR	0.57	0.25
26	0.35	0.101	NR	0.13	0.08
27	0.358	0.0895	68	0.25	0.17
28	0.221	0.05525	100.6	-1.76	-1.64
29	0.47	0.1	101	1.89	1.16
30	0.42	0.14	56	1.16	0.53
31	0.43	0.11	NR	1.30	0.74
32	NT	NT	NT		
33	0.486	0.138	NR	2.13	0.99

Statistics

Assigned Value	0.341	0.048
Spike	Not Spiked	
Robust Average	0.341	0.048
Median	0.342	0.029
Mean	0.341	
N	25	
Max.	0.5	
Min.	0.18	
Robust SD	0.095	
Robust CV	28%	


Kernel Density
Density
Result
Results: S3 - PFHpS
Assigned Value = 0.341 ± 0.048 ug/L
Results (ug/L)
Laboratory
5 8 28 6 3 18 15 13 9 1 17 4 14 23 26 27 10 25 20 2 30 31 29 33 7 11 16 19 21 22 24 32 Md R.A.


z-Scores: S3 - PFHpS
Target Standard Deviation 0.068 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 8 28 6 3 18 15 13 9 1 17 4 14 23 26 27 10 25 20 2 30 31 29 33 7

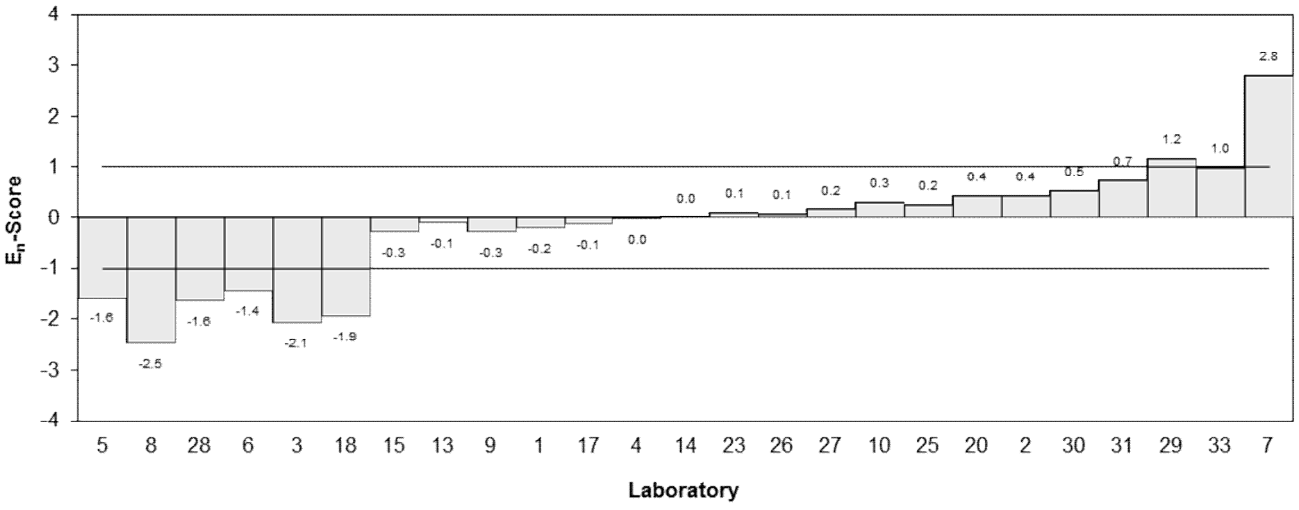

En-Scores: S3 - PFHpS
En-Score
Laboratory
5 8 28 6 3 18 15 13 9 1 17 4 14 23 26 27 10 25 20 2 30 31 29 33 7

Figure 50

Table 57

Sample Details

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

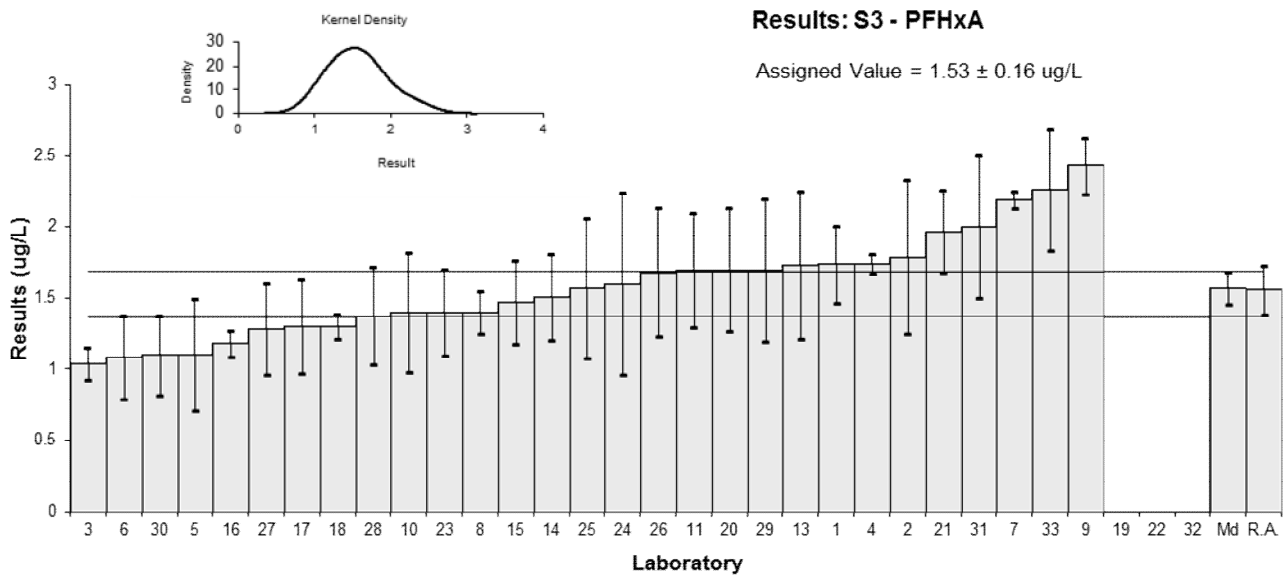
Participant Results

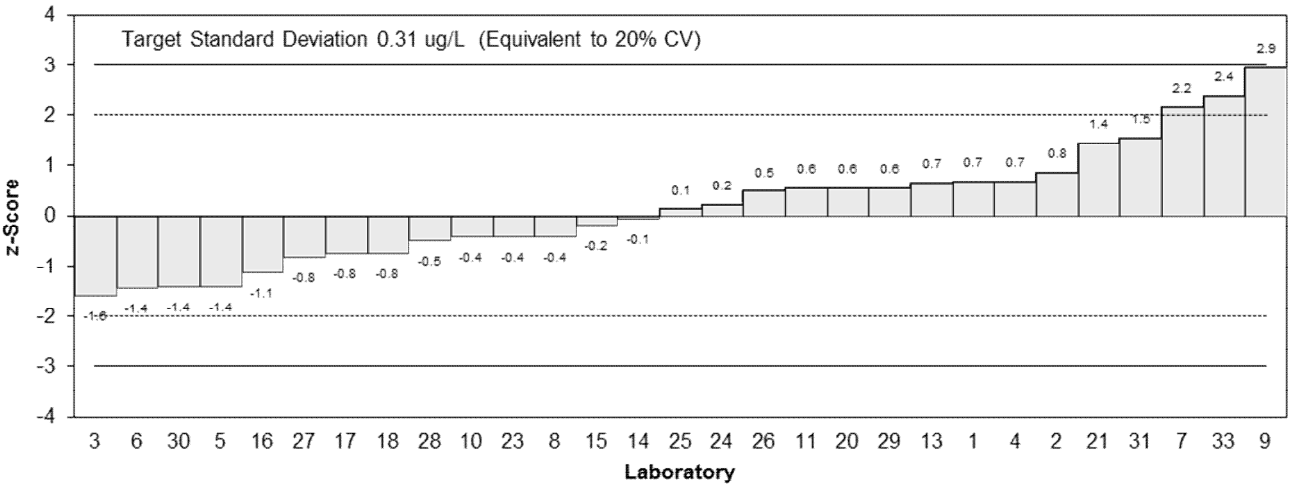
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	1.74	0.27	89	0.69	0.67
2	1.79	0.537	80	0.85	0.46
3	1.040	0.109	NR	-1.60	-2.53
4	1.74	0.07	109	0.69	1.20
5	1.1	0.39	100	-1.41	-1.02
6	1.0871	0.2935	71	-1.45	-1.32
7	2.19	0.06	NR	2.16	3.86
8	1.4	0.15	100	-0.42	-0.59
9	2.43	0.20	94.8	2.94	3.51
10	1.4	0.42	82	-0.42	-0.29
11	1.7	0.4	90	0.56	0.39
13	1.73	0.519	91	0.65	0.37
14	1.51	0.302	100	-0.07	-0.06
15	1.47	0.294	52	-0.20	-0.18
16	1.18	0.09	103.3	-1.14	-1.91
17	1.3	0.33	96	-0.75	-0.63
18	1.3	0.089	111	-0.75	-1.26
19	NT	NT	NT		
20	1.7	0.43	102	0.56	0.37
21	1.97	0.29	95	1.44	1.33
22	NT	NT	NT		
23	1.4	0.3	NR	-0.42	-0.38
24	1.6	0.64	NR	0.23	0.11
25	1.57	0.487	NR	0.13	0.08
26	1.68	0.45	NR	0.49	0.31
27	1.28	0.320	48	-0.82	-0.70
28	1.375	0.34375	91.9	-0.51	-0.41
29	1.7	0.5	99	0.56	0.32
30	1.1	0.28	120	-1.41	-1.33
31	2.0	0.50	64	1.54	0.90
32	NT	NT	NT		
33	2.26	0.427	72	2.39	1.60

Statistics

Assigned Value*	1.53	0.16
Spike	Not Spiked	
Robust Average	1.56	0.17
Median	1.57	0.11
Mean	1.58	
N	29	
Max.	2.43	
Min.	1.04	
Robust SD	0.34	
Robust CV	22%	

*Assigned value is the robust average excluding laboratory 9.


Kernel Density
Density
Result
Results: S3 - PFHxA
Assigned Value = 1.53 ± 0.16 ug/L
Results (ug/L)
Laboratory
3 6 30 5 16 27 17 18 28 10 23 8 15 14 25 24 26 11 20 29 13 1 4 2 21 31 7 33 9 19 22 32 Md R.A.


z-Scores: S3 - PFHxA
Target Standard Deviation 0.31 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
3 6 30 5 16 27 17 18 28 10 23 8 15 14 25 24 26 11 20 29 13 1 4 2 21 31 7 33 9

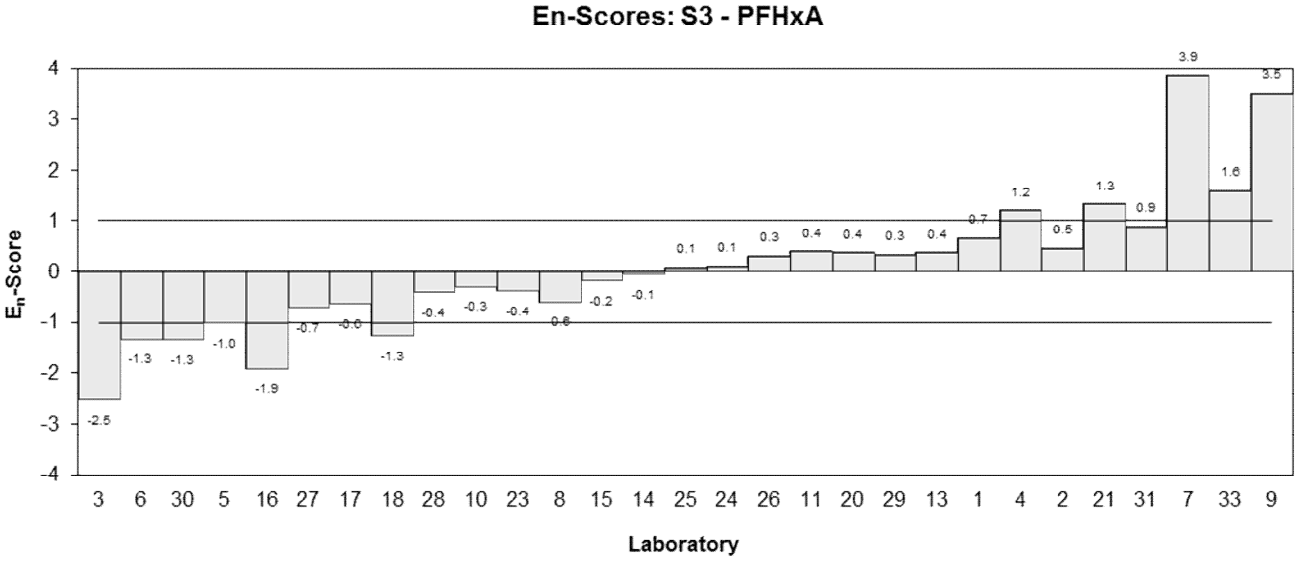

En-Scores: S3 - PFHxA
En-Score
Laboratory
3 6 30 5 16 27 17 18 28 10 23 8 15 14 25 24 26 11 20 29 13 1 4 2 21 31 7 33 9

Figure 51

Table 58

Sample Details

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

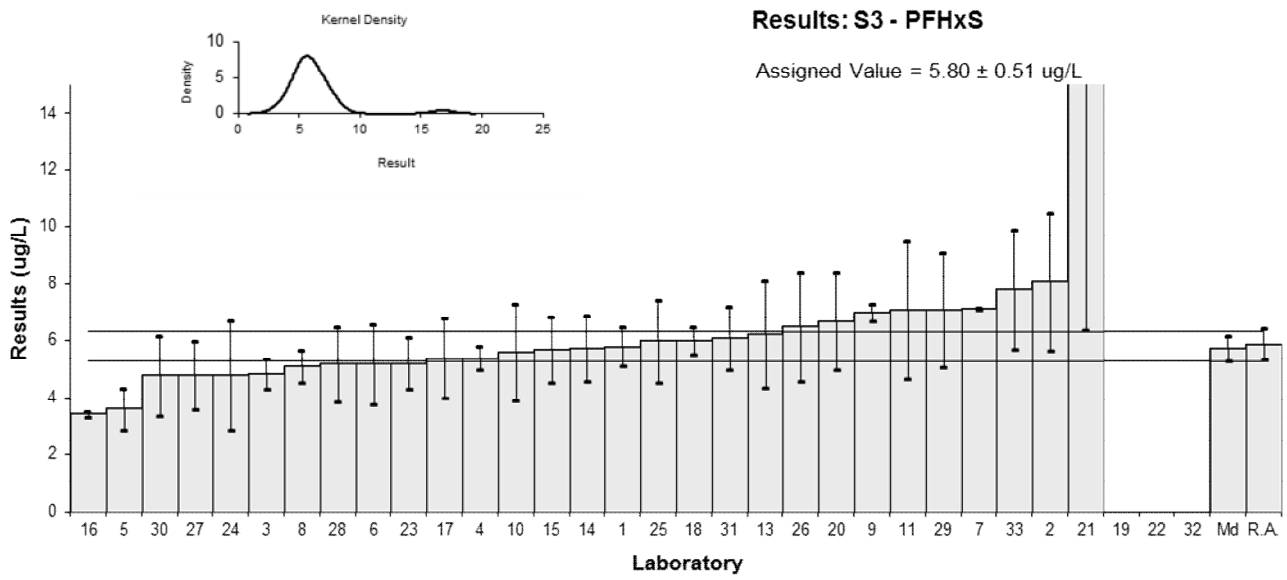
Participant Results

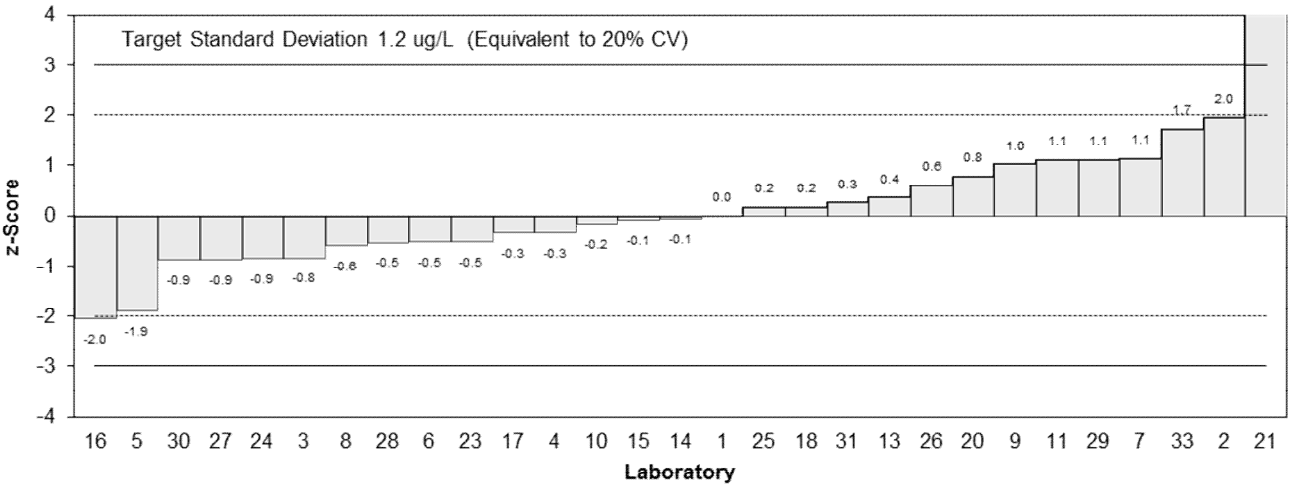
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	5.80	0.67	90	0.00	0.00
2	8.07	2.42	53	1.96	0.92
3	4.826	0.520	NR	-0.84	-1.34
4	5.4	0.4	109	-0.34	-0.62
5	3.61	0.71	105	-1.89	-2.51
6	5.1852	1.4000	58	-0.53	-0.41
7	7.12	0.02	87.5	1.14	2.59
8	5.1	0.55	88	-0.60	-0.93
9	6.99	0.30	103.0	1.03	2.01
10	5.6	1.7	116	-0.17	-0.11
11	7.1	2.4	93	1.12	0.53
13	6.22	1.866	107	0.36	0.22
14	5.74	1.15	107	-0.05	-0.05
15	5.69	1.14	82	-0.09	-0.09
16	3.43	0.1	NR	-2.04	-4.56
17	5.4	1.4	101	-0.34	-0.27
18	6.0	0.46	98	0.17	0.29
19	NT	NT	NT		
20	6.7	1.7	86	0.78	0.51
21	16.8	10.4	NR	9.48	1.06
22	NT	NT	NT		
23	5.2	0.9	NR	-0.52	-0.58
24	4.8	1.9	NR	-0.86	-0.51
25	5.99	1.439	NR	0.16	0.12
26	6.49	1.92	NR	0.59	0.35
27	4.79	1.20	68	-0.87	-0.77
28	5.18	1.295	82.9	-0.53	-0.45
29	7.1	2	96	1.12	0.63
30	4.78	1.39	56	-0.88	-0.69
31	6.1	1.1	67	0.26	0.25
32	NT	NT	NT		
33	7.81	2.11	90	1.73	0.93

Statistics

Assigned Value*	5.80	0.51
Spike	Not Spiked	
Robust Average	5.88	0.54
Median	5.74	0.42
Mean	6.17	
N	29	
Max.	16.8	
Min.	3.43	
Robust SD	1.1	
Robust CV	19%	

*Assigned value is the robust average excluding laboratory 21.


Kernel Density
Density
Result
Results: S3 - PFHxS
Assigned Value = 5.80 ± 0.51 ug/L
Results (ug/L)
Laboratory
16 5 30 27 24 3 8 28 6 23 17 4 10 15 14 1 25 18 31 13 26 20 9 11 29 7 33 2 21 19 22 32 Md R.A


z-Scores: S3 - PFHxS
Target Standard Deviation 1.2 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
16 5 30 27 24 3 8 28 6 23 17 4 10 15 14 1 25 18 31 13 26 20 9 11 29 7 33 2 21
-2.0 -1.9 -0.9 -0.9 -0.9 -0.8 -0.6 -0.5 -0.5 -0.5 -0.3 -0.3 -0.2 -0.1 -0.1 0.0 0.2 0.2 0.3 0.4 0.6 0.8 1.0 1.1 1.1 1.1 1.7 2.0

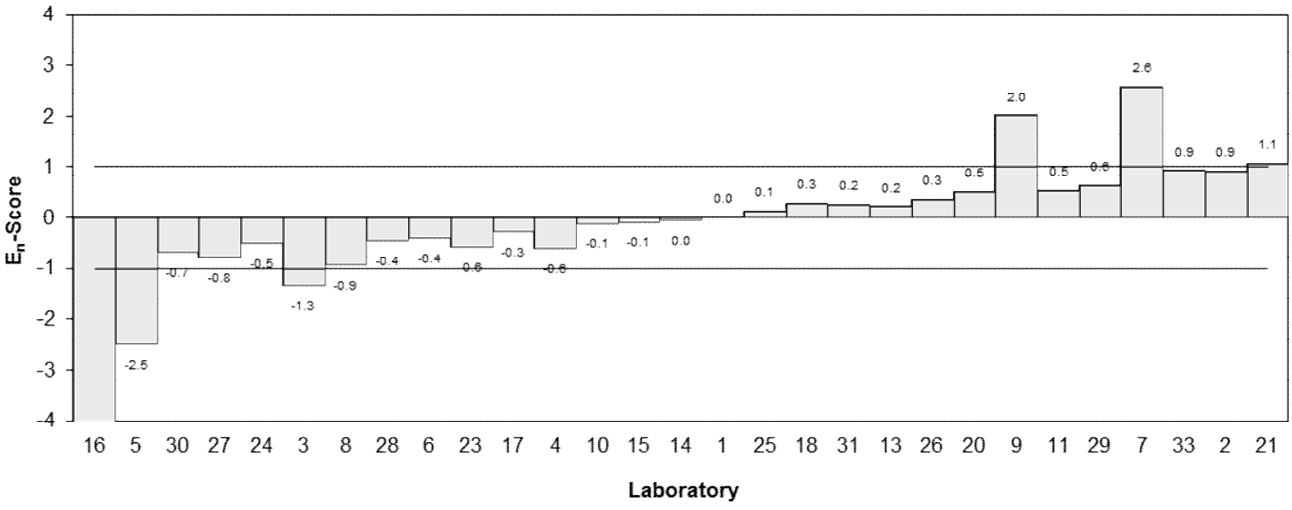

En-Scores: S3 - PFHxS
En-Score
Laboratory
16 5 30 27 24 3 8 28 6 23 17 4 10 15 14 1 25 18 31 13 26 20 9 11 29 7 33 2 21
-2.5 -0.7 -0.8 -0.5 -1.3 -0.9 -0.4 -0.4 -0.6 -0.3 -0.6 -0.1 -0.1 0.0 0.0 0.1 0.3 0.2 0.2 0.3 0.5 2.0 0.5 0.6 2.6 0.9 0.9 1.1

Figure 52

Table 59

Sample Details

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

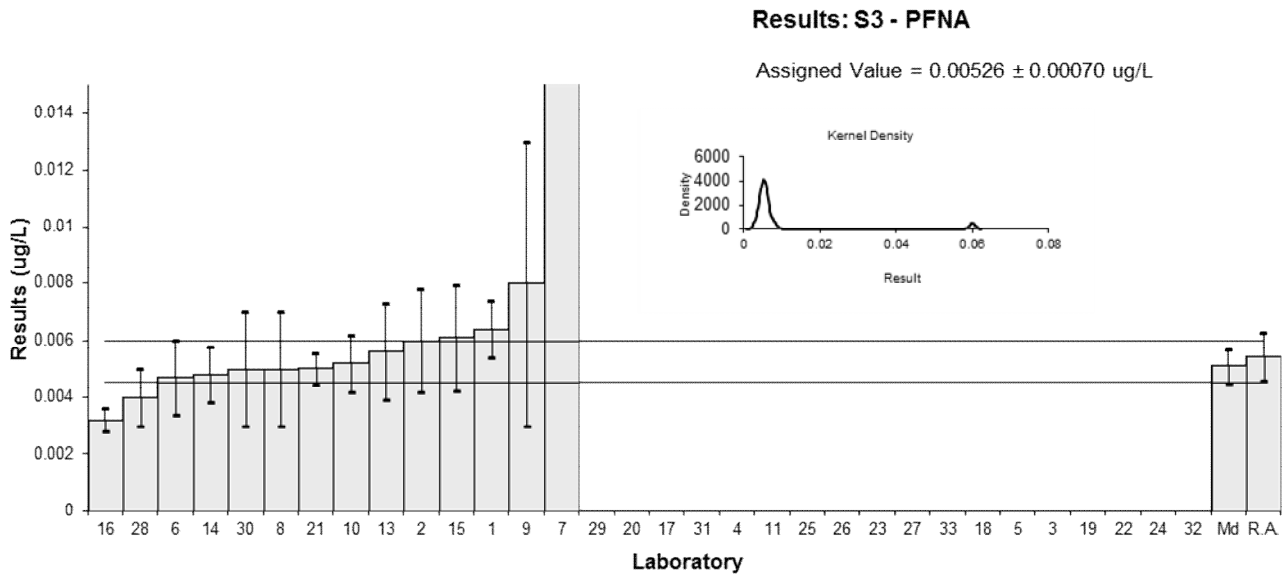
Participant Results

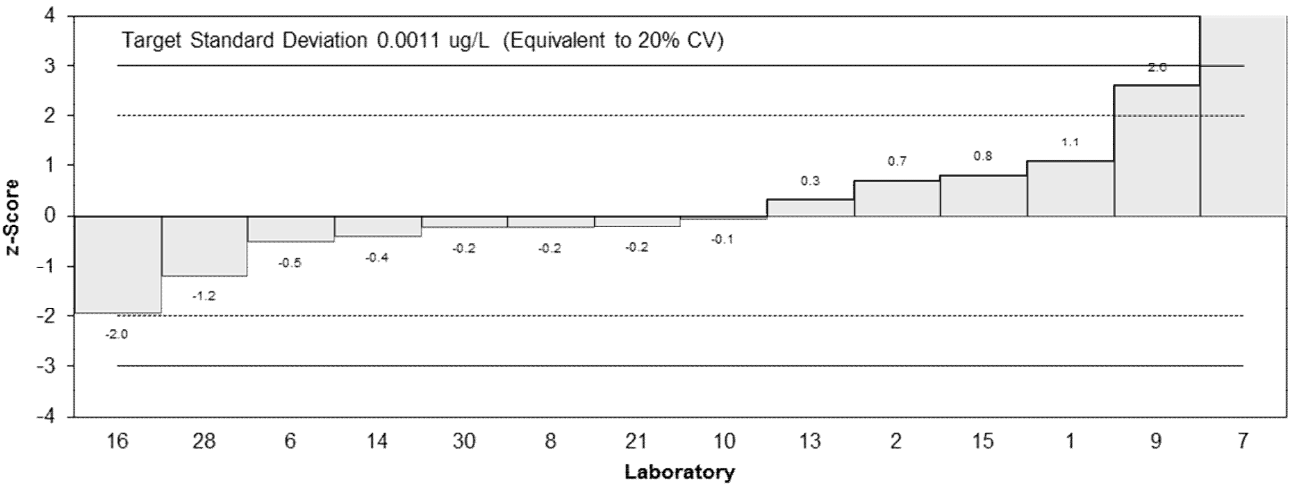
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.00640	0.001	93	1.08	0.93
2	0.006	0.0018	72	0.70	0.38
3	NR	NR	NR		
4	<0.01	NR	109		
5	<0.1	NR	101		
6	0.0047	0.0013	106	-0.53	-0.38
7	0.06	0.01	NR	52.03	5.46
8	0.005	0.002	113	-0.25	-0.12
9	0.008	0.005	129.0	2.60	0.54
10	0.0052	0.001	109	-0.06	-0.05
11	<0.02	NR	65		
13	0.00561	0.001683	95	0.33	0.19
14	0.00483	0.000967	105	-0.41	-0.36
15	0.00610	0.00185	73	0.80	0.42
16	0.00320	0.0004	NR	-1.96	-2.56
17	<0.01	NR	108		
18	<0.025	NR	105		
19	NT	NT	NT		
20	< 0.035	0.010	91		
21	0.00503	0.00054	NR	-0.22	-0.26
22	NT	NT	NT		
23	<0.020	NR	NR		
24	NT	NT	NT		
25	<0.02	0.002	NR		
26	<0.02	NR	NR		
27	<0.0200	NR	69		
28	0.004	0.001	90.9	-1.20	-1.03
29	< 0.01	NR	110		
30	0.005	0.002	127	-0.25	-0.12
31	<0.01	0.002	101		
32	NT	NT	NT		
33	<0.0216	NR	83		

Statistics

Assigned Value*	0.00526	0.00070
Spike	Not Spiked	
Robust Average	0.00543	0.00083
Median	0.00512	0.00059
Mean	0.00922	
N	14	
Max.	0.06	
Min.	0.0032	
Robust SD	0.0010	
Robust CV	19%	

*Assigned value is the robust average excluding laboratory 7.


Results: S3 - PFNA
Assigned Value = 0.00526 ± 0.00070 ug/L
Kernel Density
Density
Result
Results (ug/L)
Laboratory
16 28 6 14 30 8 21 10 13 2 15 1 9 7 29 20 17 31 4 11 25 26 23 27 33 18 5 3 19 22 24 32 Md R.A


z-Scores: S3 - PFNA
Target Standard Deviation 0.0011 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
16 28 6 14 30 8 21 10 13 2 15 1 9 7
-2.0 -1.2 -0.5 -0.4 -0.2 -0.2 -0.2 -0.1 0.3 0.7 0.8 1.1 2.6

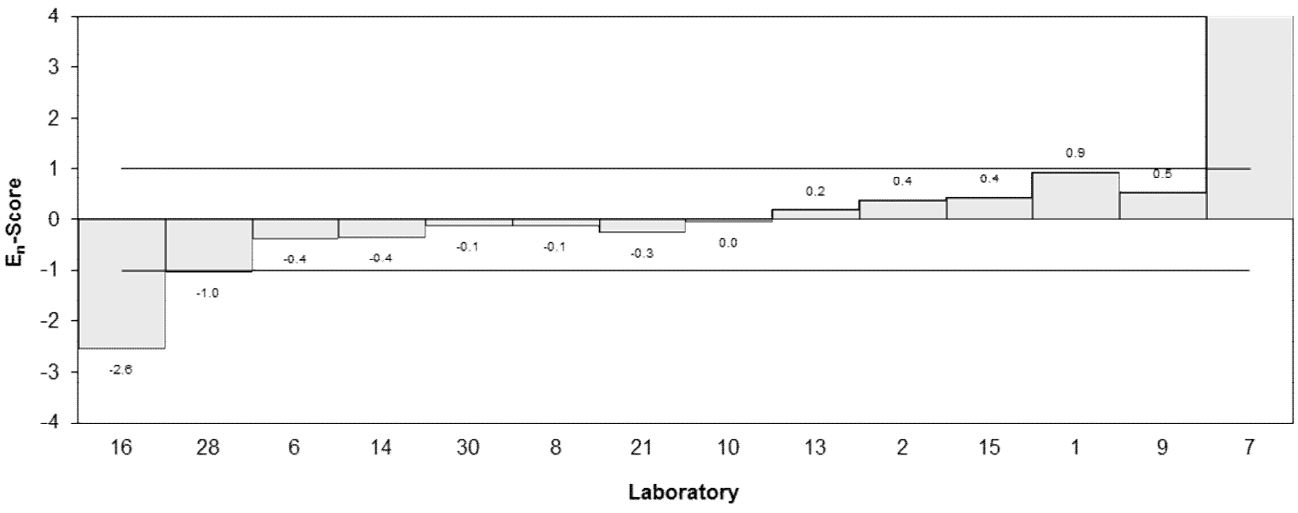

En-Scores: S3 - PFNA
En-Score
Laboratory
16 28 6 14 30 8 21 10 13 2 15 1 9 7
-2.6 -1.0 -0.4 -0.4 -0.1 -0.1 -0.3 0.0 0.2 0.4 0.4 0.9 0.5

Figure 53

Table 60

Sample Details

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

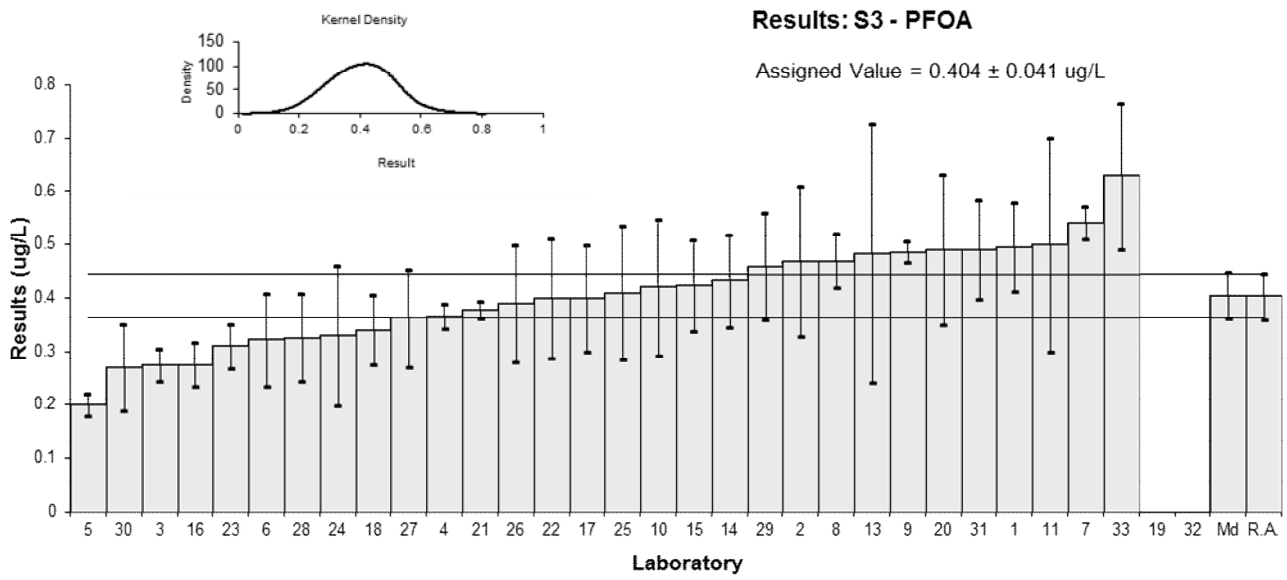
Participant Results

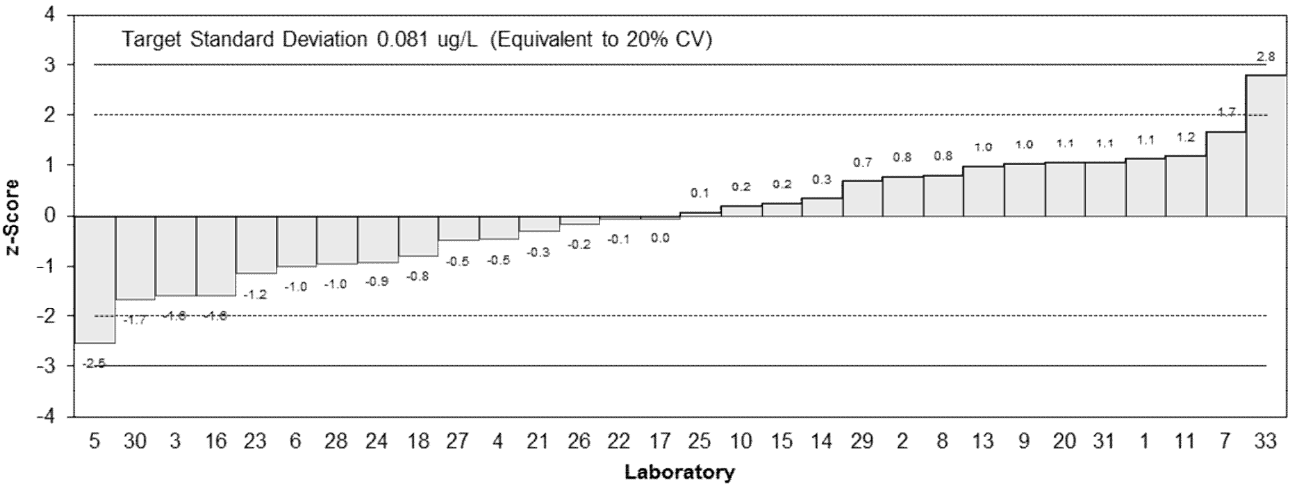
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.496	0.083	97	1.14	0.99
2	0.468	0.1404	83	0.79	0.44
3	0.275	0.029	NR	-1.60	-2.57
4	0.366	0.023	109	-0.47	-0.81
5	0.20	0.02	107	-2.52	-4.47
6	0.3221	0.0870	93	-1.01	-0.85
7	0.54	0.03	91.2	1.68	2.68
8	0.47	0.05	106	0.82	1.02
9	0.487	0.02	92.7	1.03	1.82
10	0.42	0.126	113	0.20	0.12
11	0.5	0.2	90	1.19	0.47
13	0.484	0.242	95	0.99	0.33
14	0.432	0.0864	103	0.35	0.29
15	0.424	0.0847	88	0.25	0.21
16	0.276	0.04	NR	-1.58	-2.23
17	0.40	0.1	101	-0.05	-0.04
18	0.34	0.065	111	-0.79	-0.83
19	NT	NT	NT		
20	0.49	0.14	102	1.06	0.59
21	0.378	0.015	NR	-0.32	-0.60
22	0.399	0.112	95.2	-0.06	-0.04
23	0.31	0.04	97	-1.16	-1.64
24	0.33	0.13	NR	-0.92	-0.54
25	0.41	0.125	103	0.07	0.05
26	0.39	0.109	88.3	-0.17	-0.12
27	0.363	0.0908	21	-0.51	-0.41
28	0.326	0.0815	100.6	-0.97	-0.85
29	0.46	0.1	116	0.69	0.52
30	0.27	0.08	133	-1.66	-1.49
31	0.49	0.092	80	1.06	0.85
32	NT	NT	NT		
33	0.629	0.136	79	2.78	1.58

Statistics

Assigned Value*	0.404	0.041
Spike	Not Spiked	
Robust Average	0.404	0.043
Median	0.405	0.043
Mean	0.405	
N	30	
Max.	0.629	
Min.	0.2	
Robust SD	0.088	
Robust CV	22%	

*Assigned value is the robust average excluding laboratories 5 and 33.


Kernel Density
Density
Result
Results: S3 - PFOA
Assigned Value = 0.404 ± 0.041 ug/L
Results (ug/L)
Laboratory
5 30 3 16 23 6 28 24 18 27 4 21 26 22 17 25 10 15 14 29 2 8 13 9 20 31 1 11 7 33 19 32 Md R.A


z-Scores: S3 - PFOA
Target Standard Deviation 0.081 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 30 3 16 23 6 28 24 18 27 4 21 26 22 17 25 10 15 14 29 2 8 13 9 20 31 1 11 7 33

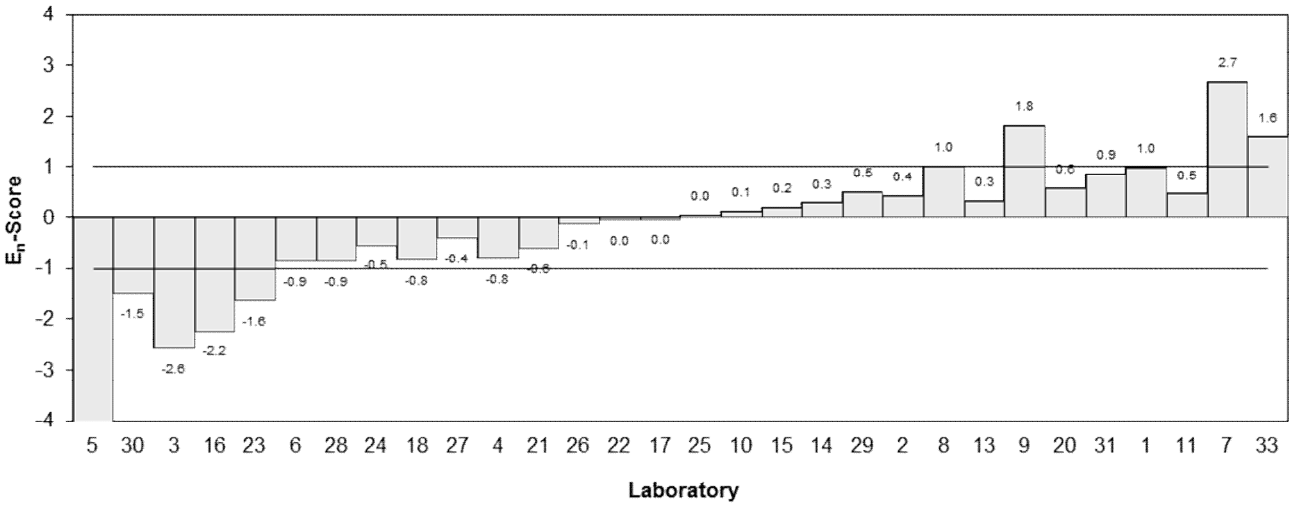

En-Scores: S3 - PFOA
En-Score
Laboratory
5 30 3 16 23 6 28 24 18 27 4 21 26 22 17 25 10 15 14 29 2 8 13 9 20 31 1 11 7 33

Figure 54

Table 61

Sample Details

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

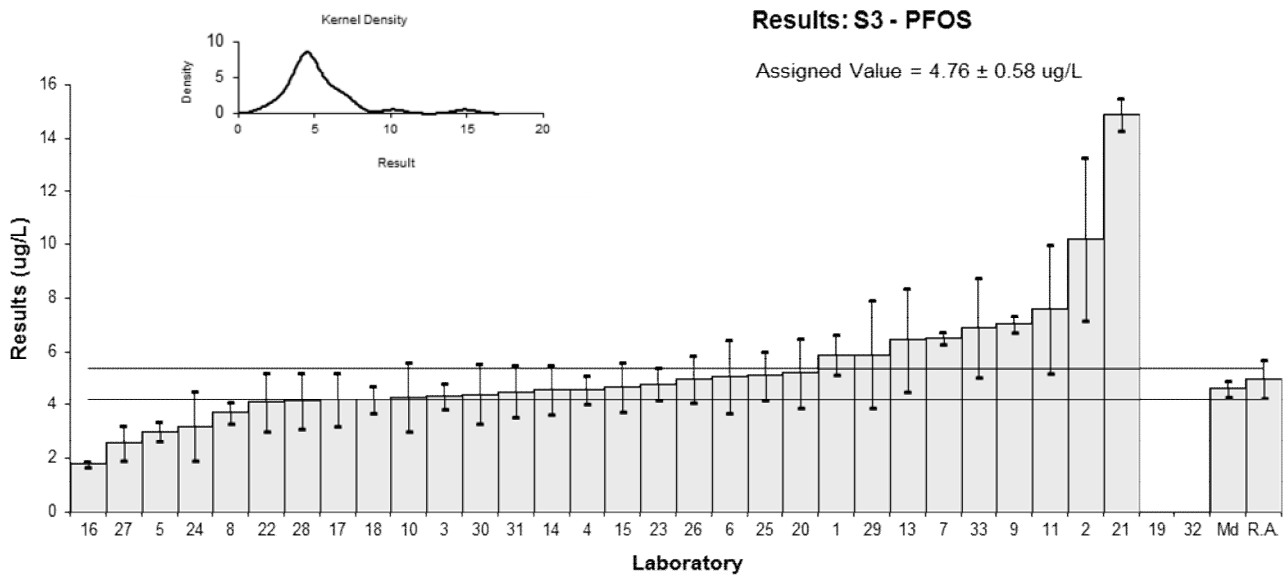
Participant Results

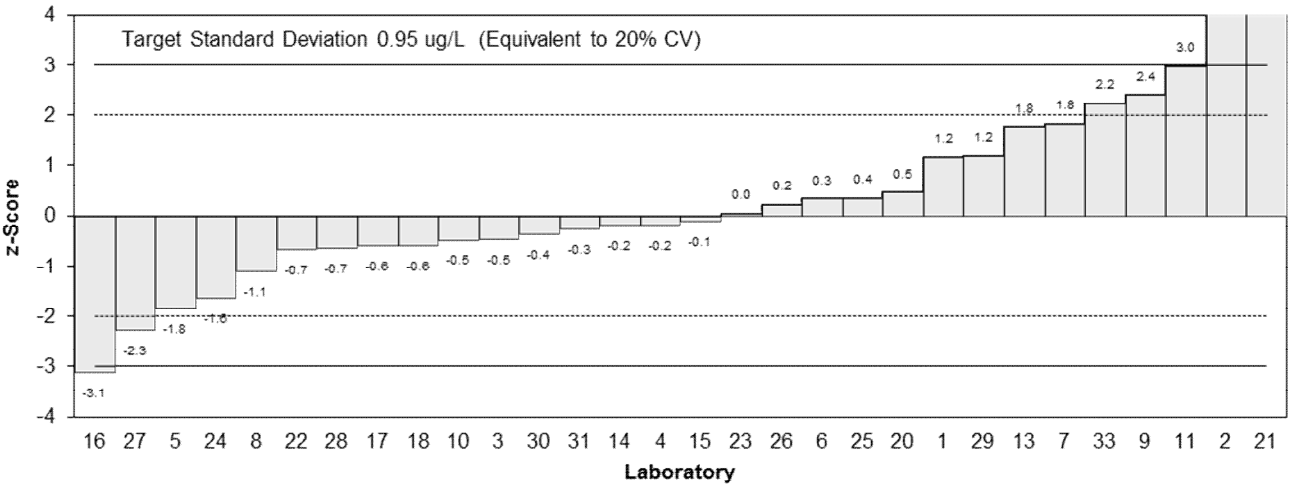
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	5.87	0.75	86	1.17	1.17
2	10.2	3.06	63	5.71	1.75
3	4.323	0.460	NR	-0.46	-0.59
4	4.58	0.53	109	-0.19	-0.23
5	3.0	0.35	105	-1.85	-2.60
6	5.0797	1.3715	74	0.34	0.21
7	6.50	0.22	103	1.83	2.80
8	3.7	0.39	96	-1.11	-1.52
9	7.043	0.30	96.0	2.40	3.50
10	4.3	1.29	117	-0.48	-0.33
11	7.6	2.4	67	2.98	1.15
13	6.44	1.932	102	1.76	0.83
14	4.57	0.914	98	-0.20	-0.18
15	4.66	0.931	67	-0.11	-0.09
16	1.78	0.1	NR	-3.13	-5.06
17	4.2	1.0	109	-0.59	-0.48
18	4.2	0.51	103	-0.59	-0.73
19	NT	NT	NT		
20	5.2	1.3	88	0.46	0.31
21	14.9	0.6	NR	10.65	12.15
22	4.11	1.07	96.0	-0.68	-0.53
23	4.8	0.6	98	0.04	0.05
24	3.2	1.3	NR	-1.64	-1.10
25	5.10	0.917	97.1	0.36	0.31
26	4.97	0.898	90.7	0.22	0.20
27	2.587	0.647	62	-2.28	-2.50
28	4.135	1.03375	99.9	-0.66	-0.53
29	5.9	2	101	1.20	0.55
30	4.4	1.1	71	-0.38	-0.29
31	4.5	0.96	79	-0.27	-0.23
32	NT	NT	NT		
33	6.88	1.84	94	2.23	1.10

Statistics

Assigned Value*	4.76	0.58
Spike	Not Spiked	
Robust Average	4.96	0.71
Median	4.62	0.30
Mean	5.29	
N	30	
Max.	14.9	
Min.	1.78	
Robust SD	1.2	
Robust CV	25%	

*Assigned value is the robust average excluding laboratories 2, 11, 16, and 21.


Kernel Density
Density
Result
Results: S3 - PFOS
Assigned Value = 4.76 ± 0.58 ug/L
Results (ug/L)
16 27 5 24 8 22 28 17 18 10 3 30 31 14 4 15 23 26 6 25 20 1 29 13 7 33 9 11 2 21 19 32 Md R.A
Laboratory


z-Scores: S3 - PFOS
Target Standard Deviation 0.95 ug/L (Equivalent to 20% CV)
z-Score
16 27 5 24 8 22 28 17 18 10 3 30 31 14 4 15 23 26 6 25 20 1 29 13 7 33 9 11 2 21
Laboratory

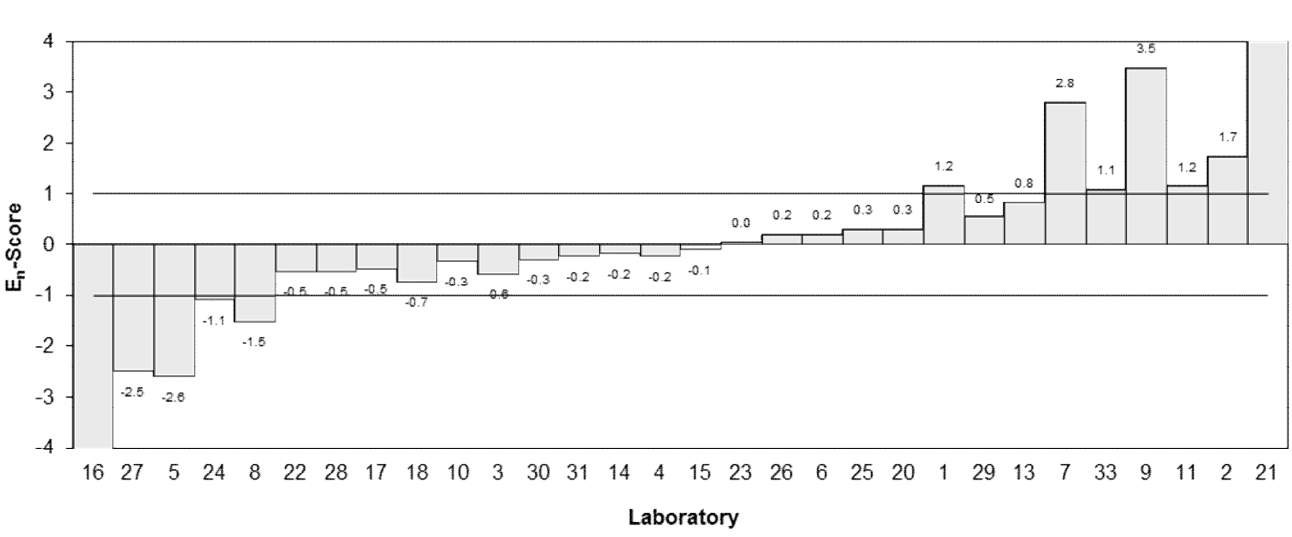

En-Scores: S3 - PFOS
En-Score
16 27 5 24 8 22 28 17 18 10 3 30 31 14 4 15 23 26 6 25 20 1 29 13 7 33 9 11 2 21
Laboratory

Figure 55

Table 62

Sample Details

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

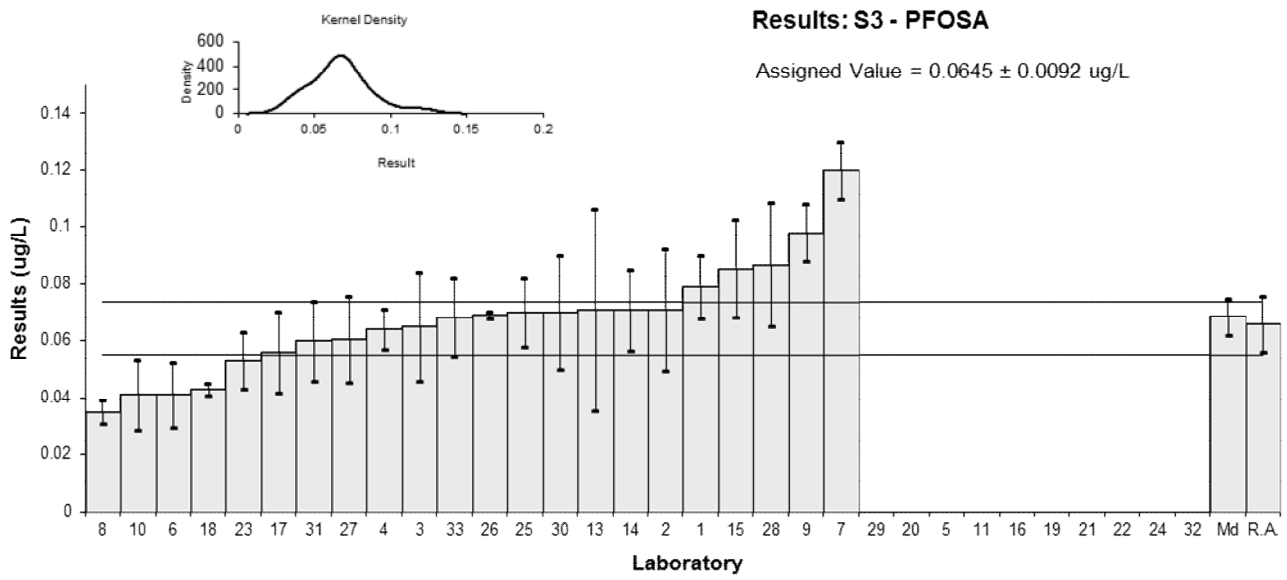
Participant Results

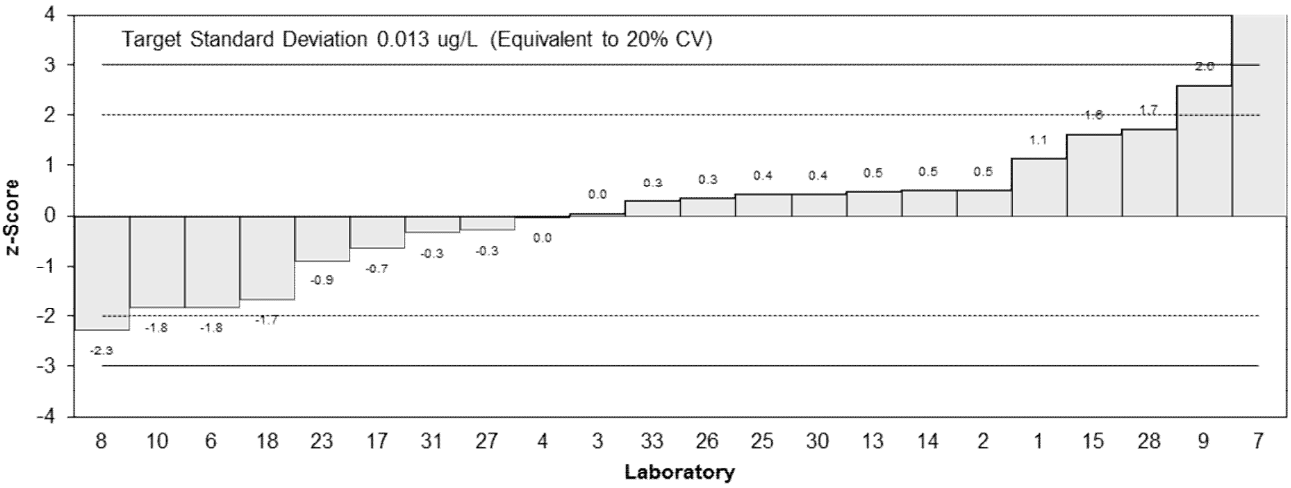
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0791	0.011	97	1.13	1.02
2	0.071	0.0213	43	0.50	0.28
3	0.065	0.019	NR	0.04	0.02
4	0.064	0.007	109	-0.04	-0.04
5	<0.1	NR	2		
6	0.0410	0.0111	114	-1.82	-1.63
7	0.12	0.01	NR	4.30	4.08
8	0.035	0.004	115	-2.29	-2.94
9	0.098	0.01	77.5	2.60	2.47
10	0.041	0.012	NR	-1.82	-1.55
11	NT	NT	NT		
13	0.0707	0.03535	94	0.48	0.17
14	0.0709	0.0141	70	0.50	0.38
15	0.0854	0.0171	100	1.62	1.08
16	NT	NT	NT		
17	0.056	0.014	92	-0.66	-0.51
18	0.043	0.0022	104	-1.67	-2.27
19	NT	NT	NT		
20	< 0.20	0.05	76		
21	NT	NT	NT		
22	NT	NT	NT		
23	0.053	0.010	NR	-0.89	-0.85
24	NT	NT	NT		
25	0.07	0.012	NR	0.43	0.36
26	0.069	0.001	NR	0.35	0.49
27	0.0606	0.0152	40	-0.30	-0.22
28	0.0867	0.021675	54	1.72	0.94
29	< 0.1	NR	109		
30	0.07	0.02	94	0.43	0.25
31	0.06	0.014	105	-0.35	-0.27
32	NT	NT	NT		
33	0.0682	0.0137	66	0.29	0.22

Statistics

Assigned Value*	0.0645	0.0092
Spike	Not Spiked	
Robust Average	0.0659	0.0097
Median	0.0686	0.0063
Mean	0.0672	
N	22	
Max.	0.12	
Min.	0.035	
Robust SD	0.017	
Robust CV	26%	

*Assigned value is the robust average excluding laboratory 7.


Kernel Density
Density
Result
Results: S3 - PFOSA
Assigned Value = 0.0645 ± 0.0092 ug/L
Results (ug/L)
Laboratory
8 10 6 18 23 17 31 27 4 3 33 26 25 30 13 14 2 1 15 28 9 7 29 20 5 11 16 19 21 22 24 32 Md R.A


z-Scores: S3 - PFOSA
Target Standard Deviation 0.013 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
8 10 6 18 23 17 31 27 4 3 33 26 25 30 13 14 2 1 15 28 9 7

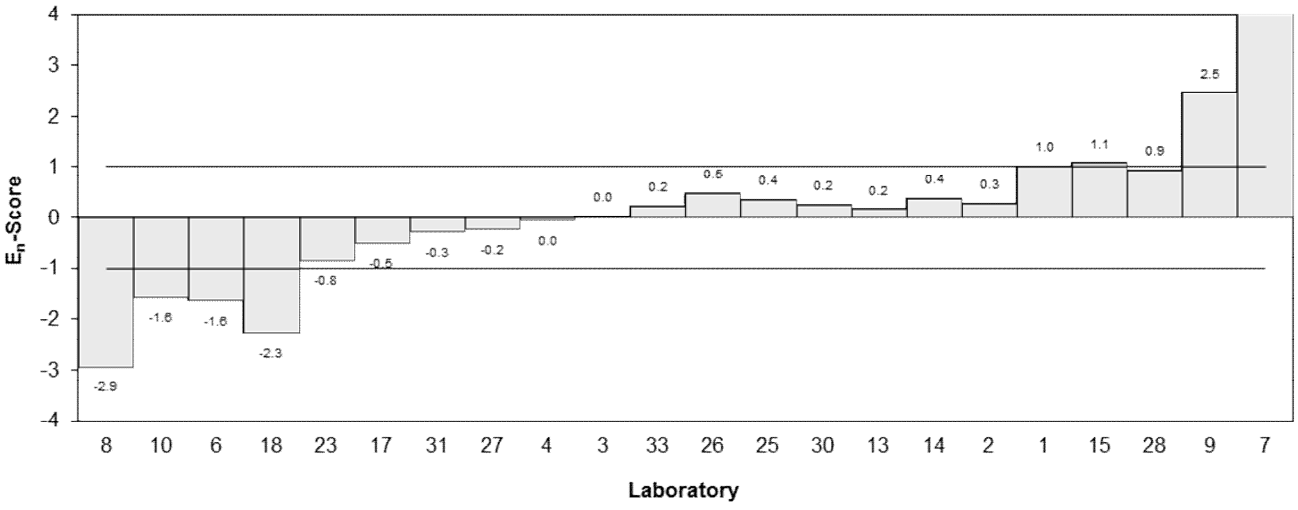

En-Scores: S3 - PFOSA
En-Score
Laboratory
8 10 6 18 23 17 31 27 4 3 33 26 25 30 13 14 2 1 15 28 9 7

Figure 56

Table 63

Sample Details

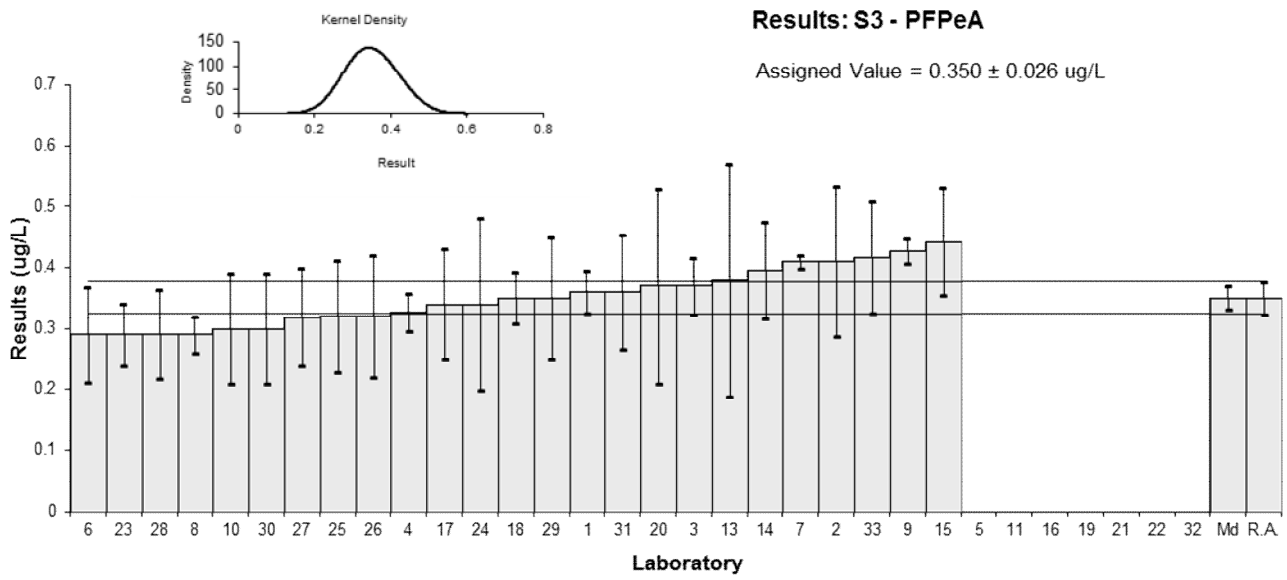
Sample No.	S3
Matrix.	Water
Analyte.	PFPeA
Units	µg/L

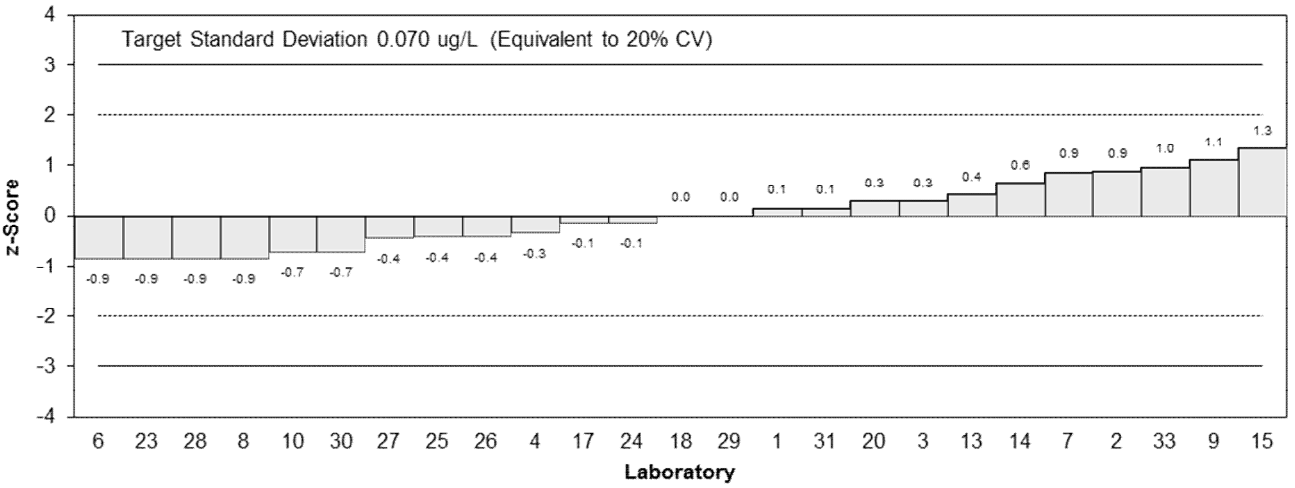
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.360	0.035	99	0.14	0.23
2	0.411	0.1233	63	0.87	0.48
3	0.370	0.046	NR	0.29	0.38
4	0.326	0.03	109	-0.34	-0.60
5	<0.1	NR	105		
6	0.2898	0.0782	77	-0.86	-0.73
7	0.41	0.01	NR	0.86	2.15
8	0.29	0.03	97	-0.86	-1.51
9	0.427	0.02	110.9	1.10	2.35
10	0.3	0.09	134	-0.71	-0.53
11	NT	NT	NT		
13	0.379	0.1895	93	0.41	0.15
14	0.395	0.0789	89	0.64	0.54
15	0.443	0.0885	74	1.33	1.01
16	NT	NT	NT		
17	0.34	0.09	88	-0.14	-0.11
18	0.35	0.042	102	0.00	0.00
19	NT	NT	NT		
20	0.37	0.16	111	0.29	0.12
21	NT	NT	NT		
22	NT	NT	NT		
23	0.29	0.05	NR	-0.86	-1.06
24	0.34	0.14	NR	-0.14	-0.07
25	0.32	0.091	NR	-0.43	-0.32
26	0.32	0.099	NR	-0.43	-0.29
27	0.319	0.0798	81	-0.44	-0.37
28	0.290	0.0725	97.1	-0.86	-0.78
29	0.35	0.1	98	0.00	0.00
30	0.30	0.09	134	-0.71	-0.53
31	0.36	0.093	74	0.14	0.10
32	NT	NT	NT		
33	0.417	0.0913	77	0.96	0.71

Statistics

Assigned Value	0.350	0.026
Spike	Not Spiked	
Robust Average	0.350	0.026
Median	0.350	0.019
Mean	0.351	
N	25	
Max.	0.443	
Min.	0.2898	
Robust SD	0.052	
Robust CV	15%	


Kernel Density
Density
Result
Results: S3 - PFPeA
Assigned Value = 0.350 ± 0.026 ug/L
Results (ug/L)
Laboratory
6 23 28 8 10 30 27 25 26 4 17 24 18 29 1 31 20 3 13 14 7 2 33 9 15 5 11 16 19 21 22 32 Md R.A


z-Scores: S3 - PFPeA
Target Standard Deviation 0.070 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
6 23 28 8 10 30 27 25 26 4 17 24 18 29 1 31 20 3 13 14 7 2 33 9 15

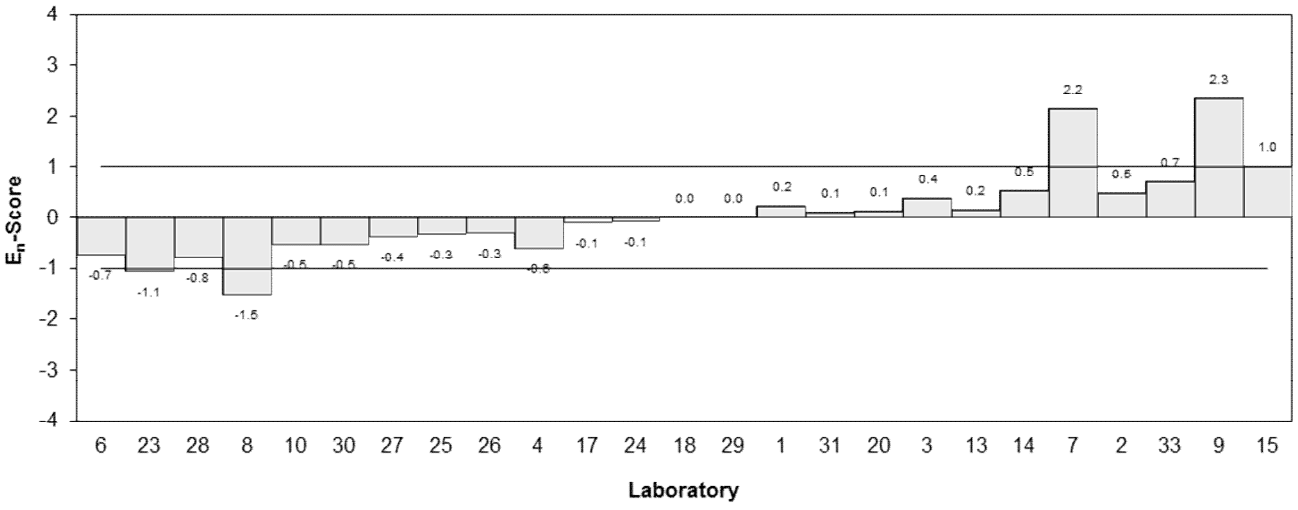

En-Scores: S3 - PFPeA
En-Score
Laboratory
6 23 28 8 10 30 27 25 26 4 17 24 18 29 1 31 20 3 13 14 7 2 33 9 15

Figure 57

Table 64

Sample Details

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

Participant Results

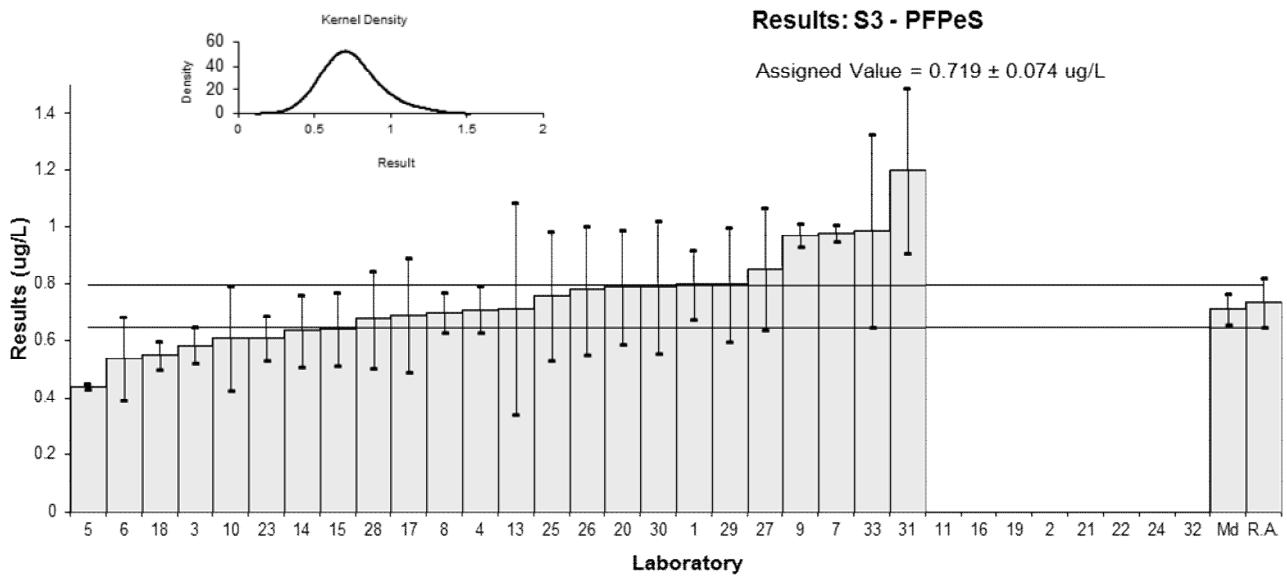
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.797	0.122	100	0.54	0.55
2	NT	NT	NT		
3	0.585	0.063	NR	-0.93	-1.38
4	0.710	0.081	109	-0.06	-0.08
5	0.44	0.01	NR	-1.94	-3.74
6	0.5381	0.1453	58	-1.26	-1.11
7	0.98	0.03	NR	1.82	3.27
8	0.70	0.07	100	-0.13	-0.19
9	0.971	0.04	NR	1.75	3.00
10	0.61	0.183	NR	-0.76	-0.55
11	NT	NT	NT		
13	0.714	0.3705	102	-0.03	-0.01
14	0.635	0.127	75	-0.58	-0.57
15	0.641	0.128	82	-0.54	-0.53
16	NT	NT	NT		
17	0.69	0.2	106	-0.20	-0.14
18	0.55	0.050	111	-1.18	-1.89
19	NT	NT	NT		
20	0.79	0.20	NR	0.49	0.33
21	NT	NT	NT		
22	NT	NT	NT		
23**	0.61	0.08	NR	-0.76	-1.00
24	NT	NT	NT		
25	0.76	0.227	NR	0.29	0.17
26	0.78	0.225	NR	0.42	0.26
27	0.852	0.213	68	0.92	0.59
28	0.675	0.16875	99.9	-0.31	-0.24
29	0.80	0.2	96	0.56	0.38
30	0.79	0.23	56	0.49	0.29
31	1.2	0.29	NR	3.34	1.61
32	NT	NT	NT		
33	0.986	0.340	NR	1.86	0.77

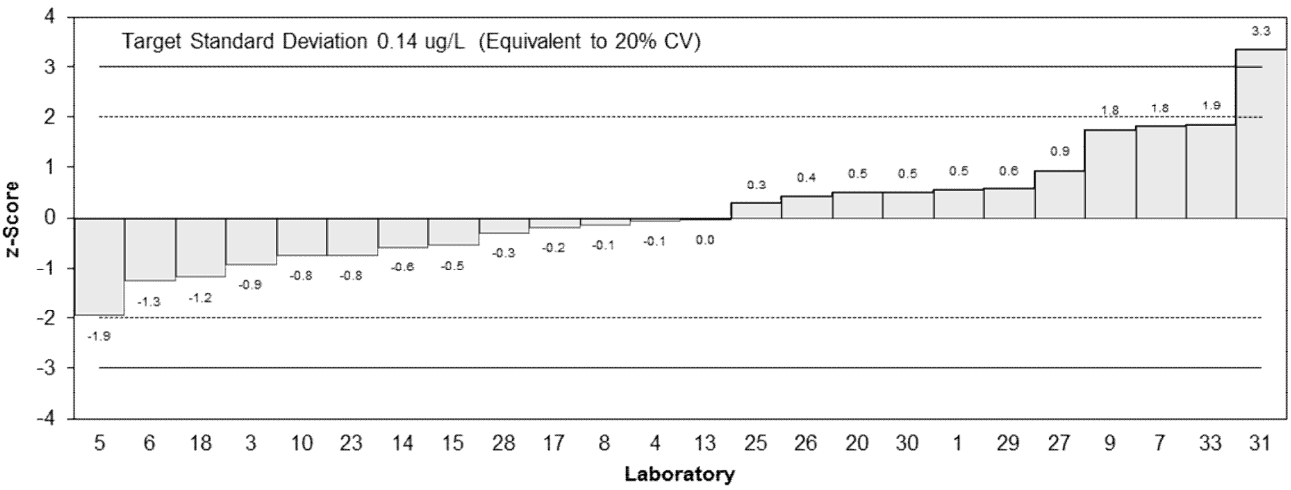
Statistics

Assigned Value*	0.719	0.074
Spike	Not Spiked	
Robust Average	0.734	0.084
Median	0.712	0.054
Mean	0.742	
N	24	
Max.	1.2	
Min.	0.44	
Robust SD	0.14	
Robust CV	19%	

*Assigned value is the robust average excluding laboratory 31.

**Laboratory 23 has $|E_n| > 1$ when E_n is not rounded; this is an unsatisfactory E_n-score.


Kernel Density
Density
Result
Results: S3 - PFPeS
Assigned Value = 0.719 ± 0.074 ug/L
Results (ug/L)
Laboratory
5 6 18 3 10 23 14 15 28 17 8 4 13 25 26 20 30 1 29 27 9 7 33 31 11 16 19 2 21 22 24 32 Md R.A.


z-Scores: S3 - PFPeS
Target Standard Deviation 0.14 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 6 18 3 10 23 14 15 28 17 8 4 13 25 26 20 30 1 29 27 9 7 33 31
-1.9 -1.3 -1.2 -0.9 -0.8 -0.8 -0.6 -0.5 -0.3 -0.2 -0.1 -0.1 0.0 0.3 0.4 0.5 0.5 0.5 0.6 0.9 1.8 1.8 1.9 3.3

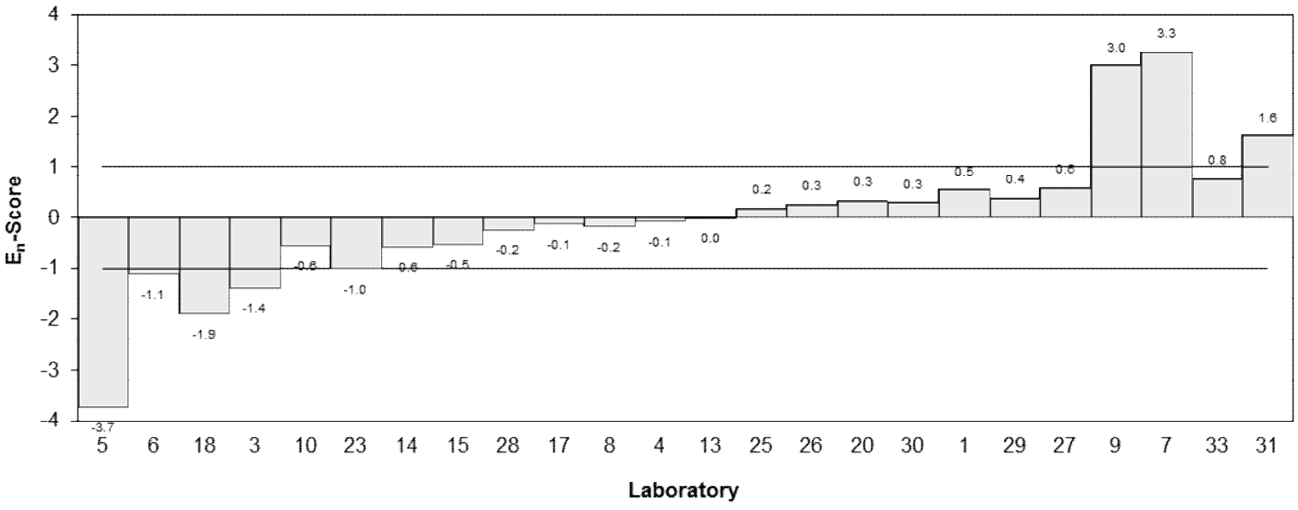

En-Scores: S3 - PFPeS
En-Score
Laboratory
5 6 18 3 10 23 14 15 28 17 8 4 13 25 26 20 30 1 29 27 9 7 33 31
-3.7 -1.1 -1.9 -1.4 -0.6 -1.0 -0.6 -0.5 -0.2 -0.1 -0.2 -0.1 0.0 0.2 0.3 0.3 0.3 0.5 0.4 0.6 3.0 3.3 0.8 1.6

Figure 58

Table 65

Sample Details

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

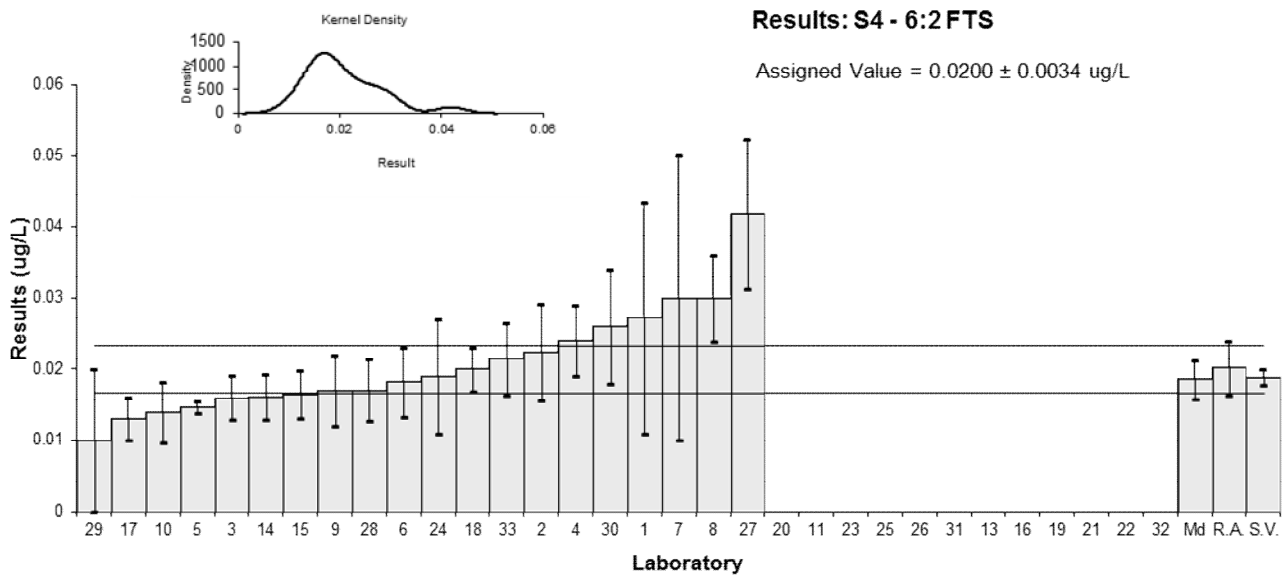
Participant Results

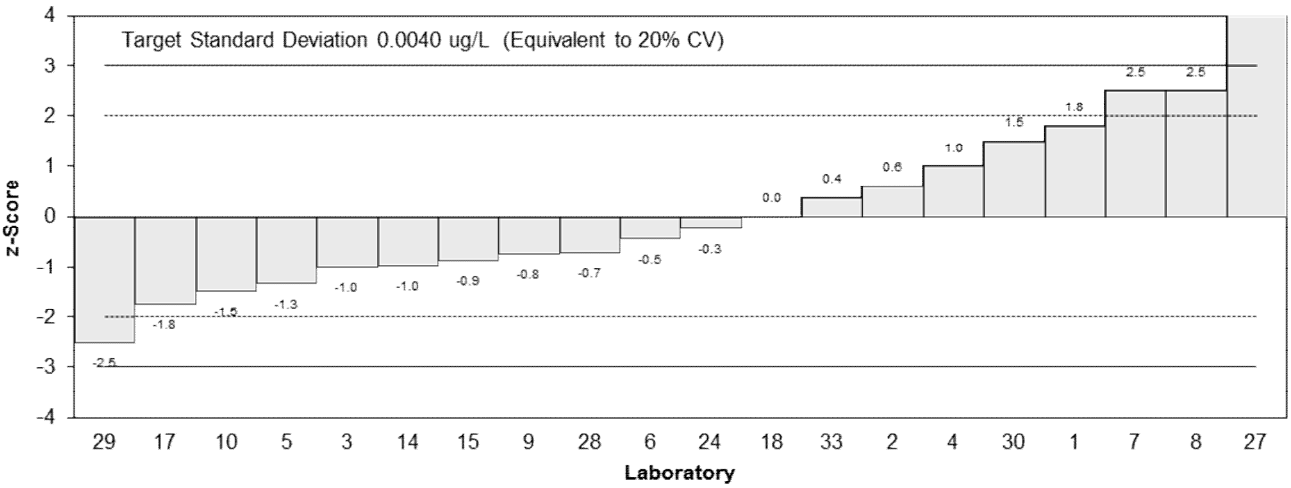
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0272	0.0162	114	1.80	0.43
2	0.0224	0.00672	1578	0.60	0.32
3	0.016	0.003	NR	-1.00	-0.88
4	0.024	0.005	116	1.00	0.66
5	0.014664	0.000774324	113	-1.33	-1.53
6	0.0182	0.0049	124	-0.45	-0.30
7	0.03	0.02	NR	2.50	0.49
8	0.030	0.006	104	2.50	1.45
9	0.017	0.005	79.5	-0.75	-0.50
10	0.014	0.0042	NR	-1.50	-1.11
11	<0.03	NR	225		
13	<0.0868	0.0434	99		
14	0.0161	0.0032	110	-0.98	-0.84
15	0.0165	0.00330	99	-0.87	-0.74
16	NR	NR	NR		
17	0.013	0.003	91	-1.75	-1.54
18	0.020	0.0030	140	0.00	0.00
19	NT	NT	NT		
20	< 0.05	0.013	NR		
21	NT	NT	NT		
22	NT	NT	NT		
23	<0.05	NR	NR		
24	0.019	0.008	NR	-0.25	-0.12
25	<0.05	0.016	NR		
26	<0.05	NR	NR		
27	0.0419	0.0105	103	5.48	1.98
28	0.0171	0.004275	99.2	-0.72	-0.53
29	0.01	0.01	167	-2.50	-0.95
30	0.026	0.008	96	1.50	0.69
31	<0.05	0.01	107		
32	NT	NT	NT		
33	0.0215	0.00503	101	0.37	0.25

Statistics

Assigned Value*	0.0200	0.0034
Spike	0.0189	0.0010
Robust Average	0.0202	0.0038
Median	0.0186	0.0027
Mean	0.0207	
N	20	
Max.	0.0419	
Min.	0.01	
Robust SD	0.0058	
Robust CV	29%	

*Assigned value is the robust average excluding laboratories 27 and 29.


Kernel Density
Density
Result
Results: S4 - 6:2 FTS
Assigned Value = 0.0200 ± 0.0034 ug/L
Results (ug/L)
Laboratory
29 17 10 5 3 14 15 9 28 6 24 18 33 2 4 30 1 7 8 27 20 11 23 25 26 31 13 16 19 21 22 32 Md R.A. S.V.


z-Scores: S4 - 6:2 FTS
Target Standard Deviation 0.0040 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
29 17 10 5 3 14 15 9 28 6 24 18 33 2 4 30 1 7 8 27

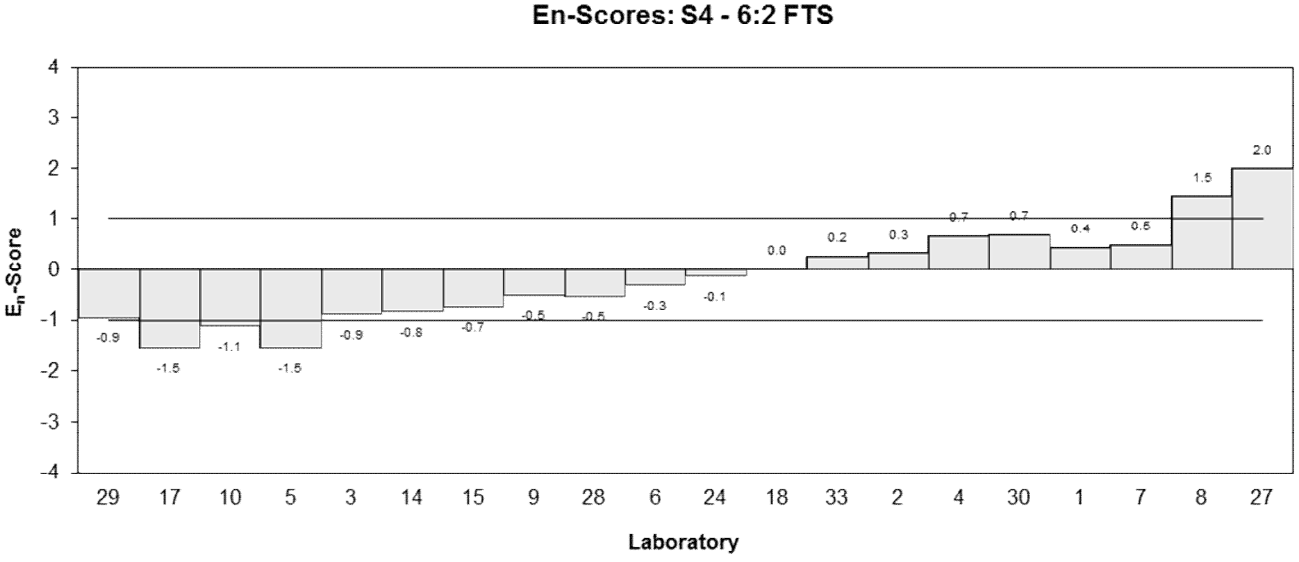

En-Scores: S4 - 6:2 FTS
En-Score
Laboratory
29 17 10 5 3 14 15 9 28 6 24 18 33 2 4 30 1 7 8 27

Figure 59

Table 66

Sample Details

Sample No.	S4
Matrix.	water
Analyte.	8:2 FTS
Units	µg/L

Participant Results

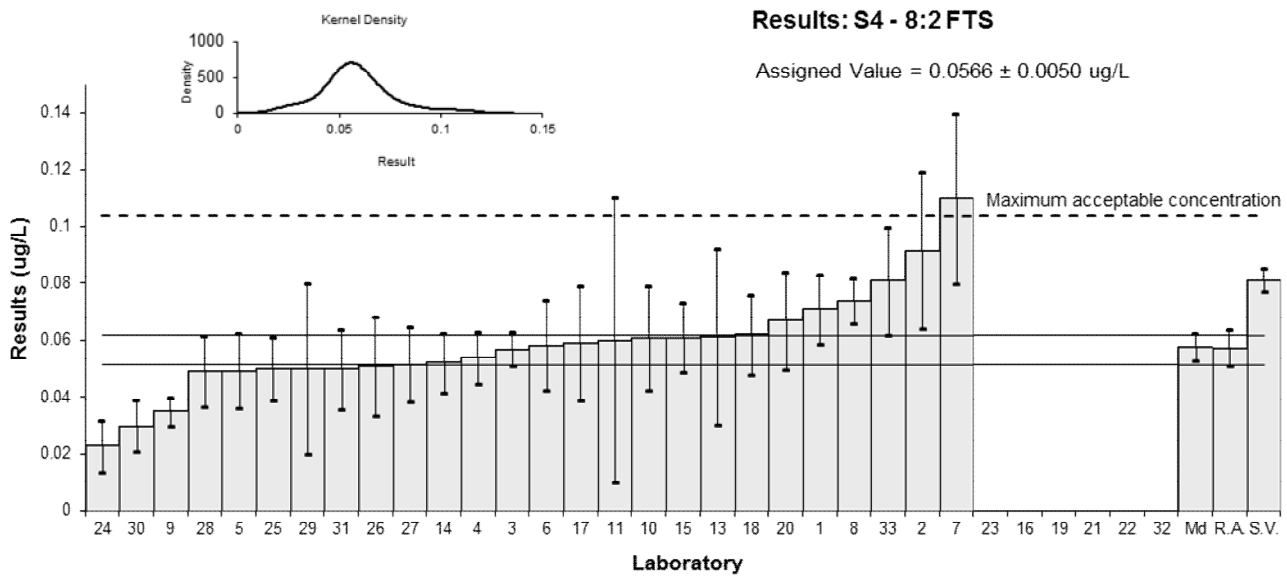
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0710	0.0123	108	1.27	1.08
2**	0.0916	0.0275	1578	2.00	1.00
3	0.057	0.006	NR	0.04	0.05
4	0.054	0.009	116	-0.23	-0.25
5	0.049309	0.013095855	95	-0.64	-0.52
6	0.0583	0.0157	127	0.15	0.10
7	0.11	0.03	NR	4.72	1.76
8	0.074	0.008	114	1.54	1.84
9	0.035	0.005	NR	-1.91	-3.05
10	0.061	0.0183	110	0.39	0.23
11	0.06	0.05	143	0.30	0.07
13	0.0613	0.03065	101	0.42	0.15
14	0.0521	0.0104	108	-0.40	-0.39
15	0.0610	0.0122	84	0.39	0.33
16	NR	NR	NR		
17	0.059	0.02	87	0.21	0.12
18	0.062	0.014	114	0.48	0.36
19	NT	NT	NT		
20	0.067	0.017	NR	0.92	0.59
21	NT	NT	NT		
22	NT	NT	NT		
23	<0.05	NR	NR		
24	0.023	0.009	NR	-2.97	-3.26
25	0.05	0.011	NR	-0.58	-0.55
26	0.051	0.0173	NR	-0.49	-0.31
27	0.0516	0.0129	103	-0.44	-0.36
28	0.0492	0.0123	104.1	-0.65	-0.56
29	0.05	0.03	155	-0.58	-0.22
30	0.03	0.009	96	-2.35	-2.58
31	0.05	0.014	86	-0.58	-0.44
32	NT	NT	NT		
33**	0.0810	0.0190	89	2.00	1.00

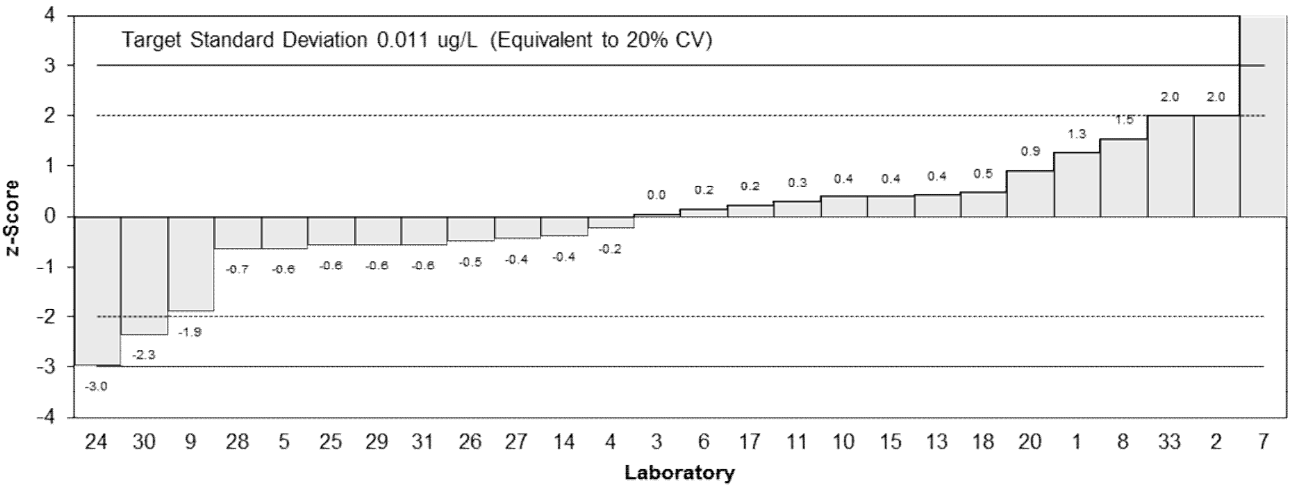
Statistics

Assigned Value*	0.0566	0.0050
Spike	0.0812	0.0041
Maximum acceptable conc.**	0.1032	
Robust Average	0.0574	0.0064
Median	0.0577	0.0046
Mean	0.0584	
N	26	
Max.	0.11	
Min.	0.023	
Robust SD	0.0096	
Robust CV	17%	

*Assigned value is the robust average excluding laboratories 2, 7, and 24.

**z-score adjusted to 2 (see Section 6.3).


Results: S4 - 8:2 FTS
Assigned Value = 0.0566 ± 0.0050 ug/L
Kernel Density
Density
Result
Maximum acceptable concentration
Results (ug/L)
Laboratory
24 30 9 28 5 25 29 31 26 27 14 4 3 6 17 11 10 15 13 18 20 1 8 33 2 7 23 16 19 21 22 32 Md R.A. S.V.


z-Scores: S4 - 8:2 FTS
Target Standard Deviation 0.011 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
24 30 9 28 5 25 29 31 26 27 14 4 3 6 17 11 10 15 13 18 20 1 8 33 2 7

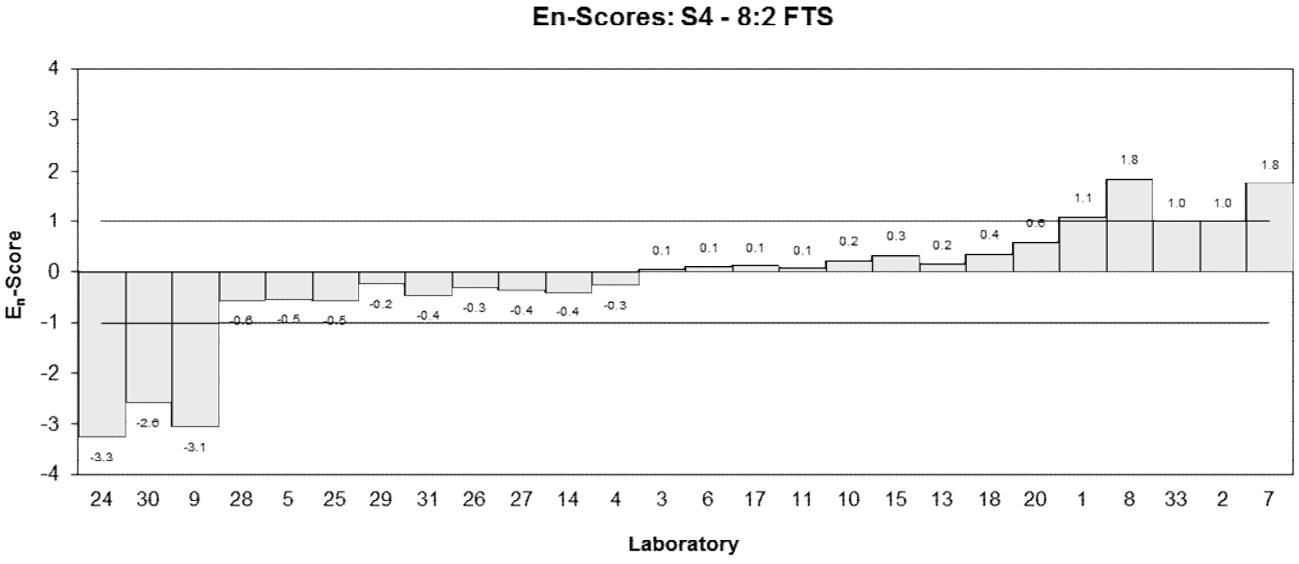

En-Scores: S4 - 8:2 FTS
En-Score
Laboratory
24 30 9 28 5 25 29 31 26 27 14 4 3 6 17 11 10 15 13 18 20 1 8 33 2 7

Figure 60

Table 67

Sample Details

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

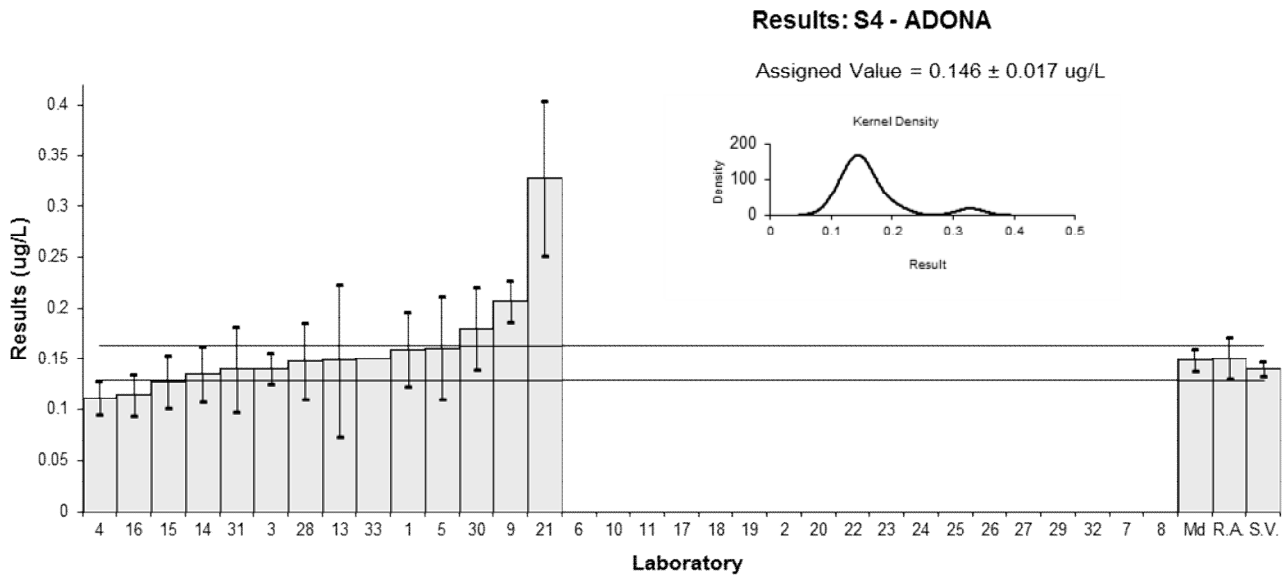
Participant Results

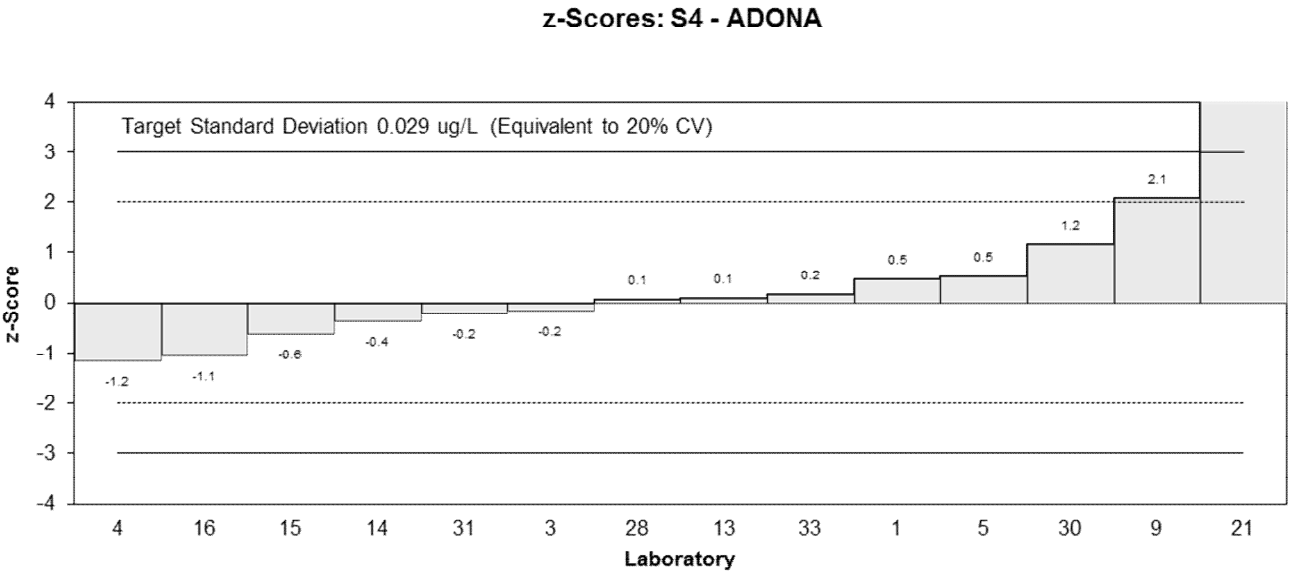
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.160	0.036	102	0.48	0.35
2	NT	NT	NT		
3	0.141	0.015	NR	-0.17	-0.22
4	0.112	0.016	116	-1.16	-1.46
5	0.161226	0.05	NT	0.52	0.29
6	NR	NR	NR		
7	NT	NT	NT		
8	NT	NT	NT		
9	0.207	0.02	NR	2.09	2.32
10	NT	NT	NT		
11	NT	NT	NT		
13	0.149	0.0745	90	0.10	0.04
14	0.135	0.0270	88	-0.38	-0.34
15	0.128	0.0256	92	-0.62	-0.59
16	0.115	0.02	NR	-1.06	-1.18
17	NT	NT	NT		
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	0.328	0.076	NR	6.23	2.34
22	NT	NT	NT		
23	NT	NT	NT		
24	NT	NT	NT		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	0.148	0.037	100.8	0.07	0.05
29	NT	NT	NT		
30	0.18	0.04	82	1.16	0.78
31	0.14	0.042	NR	-0.21	-0.13
32	NT	NT	NT		
33	0.151	NR	NR	0.17	0.29

Statistics

Assigned Value*	0.146	0.017
Spike	0.141	0.007
Robust Average	0.151	0.020
Median	0.149	0.011
Mean	0.161	
N	14	
Max.	0.328	
Min.	0.112	
Robust SD	0.025	
Robust CV	17%	

*Assigned value is the robust average excluding laboratory 21.


Results: S4 - ADONA
Assigned Value = 0.146 ± 0.017 ug/L
Kernel Density
Density
Result
Results (ug/L)
Laboratory
4 16 15 14 31 3 28 13 33 1 5 30 9 21 6 10 11 17 18 19 2 20 22 23 24 25 26 27 29 32 7 8 Md R.A. S.V.


z-Scores: S4 - ADONA
Target Standard Deviation 0.029 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
4 16 15 14 31 3 28 13 33 1 5 30 9 21
-1.2 -1.1 -0.6 -0.4 -0.2 -0.2 0.1 0.1 0.2 0.5 0.5 1.2 2.1

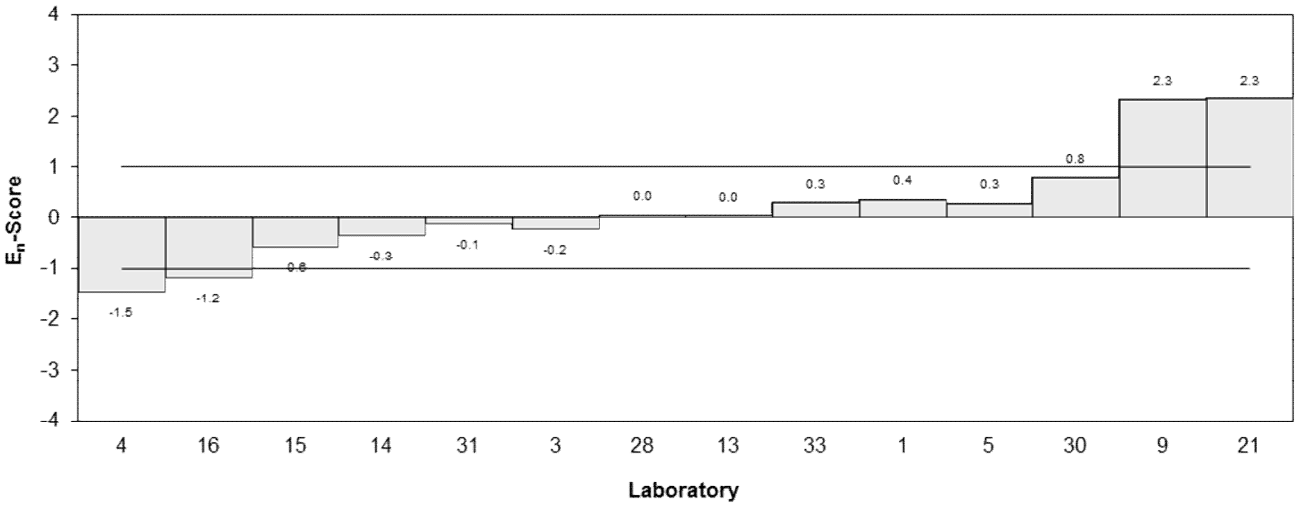

En-Scores: S4 - ADONA
En-Score
Laboratory
4 16 15 14 31 3 28 13 33 1 5 30 9 21
-1.5 -1.2 -0.6 -0.3 -0.1 -0.2 0.0 0.0 0.3 0.4 0.3 0.8 2.3 2.3

Figure 61

Table 68

Sample Details

Sample No.	S4
Matrix.	water
Analyte.	EtFOSA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.0752	0.0115	42
2	NT	NT	NT
3	NT	NT	NT
4	0.05	0.01	116
5	<0.0002	NR	NT
6	0.0223	0.0060	85
7	<5	NR	NR
8	0.078	0.022	74
9	0.070	0.005	72.7
10	0.02	0.01	138
11	NT	NT	NT
13	NT	NT	NT
14	0.0344	0.0069	66
15	0.0382	0.00764	68
16	NR	NR	NR
17	0.061	0.02	70
18	0.022	0.0074	155
19	NT	NT	NT
20	0.041	0.035	36
21	NT	NT	NT
22	NT	NT	NT
23	<0.05	NR	NR
24	NT	NT	NT
25	<0.05	0.001	NR
26	<0.05	NR	NR
27	NT	NT	NT
28	0.016	0.004	8
29	<0.1	NR	97
30	0.02	0.006	94
31	<0.05	0.01	89
32	NT	NT	NT
33	0.0770	0.0173	72

Statistics

Assigned Value	Not Set	
Spike	0.125	0.006
Robust Average	0.045	0.018
Median	0.040	0.017
Mean	0.045	
N	14	
Max.	0.078	
Min.	0.016	
Robust SD	0.027	
Robust CV	60%	

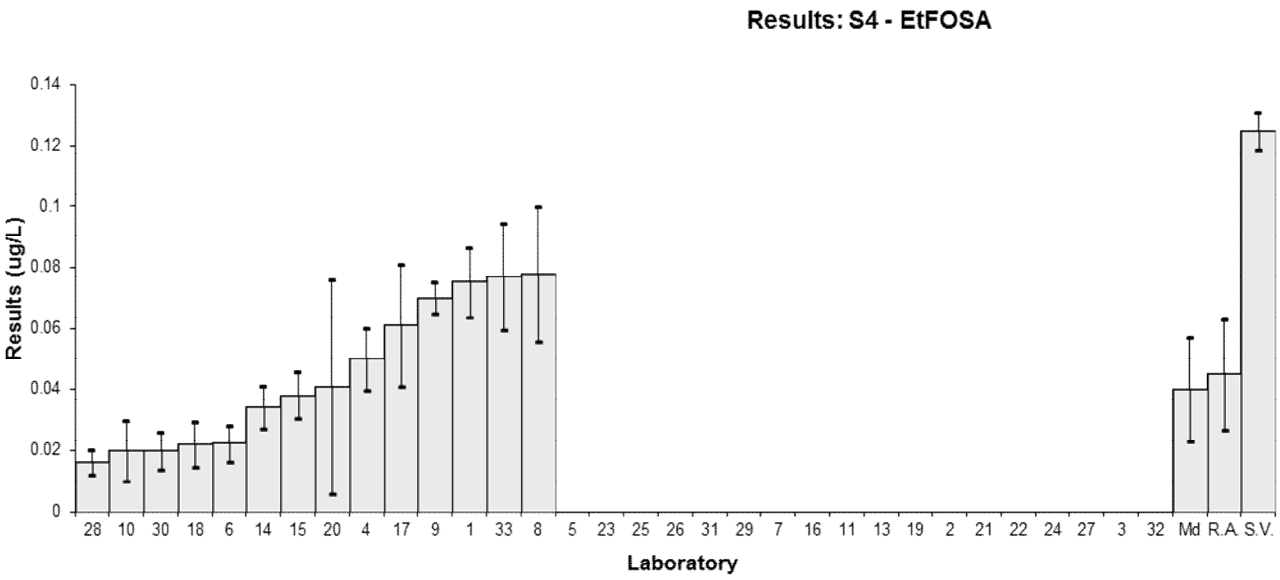

Results: S4 - EtFOSA
Results (ug/L)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
28 10 30 18 6 14 15 20 4 17 9 1 33 8 5 23 25 26 31 29 7 16 11 13 19 2 21 22 24 27 3 32 Md R.A. S.V.
Laboratory

Figure 62

Table 69

Sample Details

Sample No.	S4
Matrix.	water
Analyte.	EtFOSAA
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.0438	0.0086	92
2	NT	NT	NT
3	NT	NT	NT
4	0.024	0.005	116
5	0.031008	0.014579951	62
6	0.0217	0.0059	113
7	<1.0	NR	NR
8	0.036	0.013	109
9	0.036	0.005	82.2
10	0.024	0.0072	NR
11	NT	NT	NT
13	0.0675	0.02025	70
14	0.0238	0.0048	81
15	0.0237	0.00474	101
16	0.0241	0.009	91.5
17	0.032	0.008	79
18	0.025	0.0071	129
19	NT	NT	NT
20	< 0.025	0.017	NR
21	0.0374	0.0295	97
22	NT	NT	NT
23	0.020	0.005	NR
24	NT	NT	NT
25	<0.02	0.001	NR
26	0.027	0.009	NR
27	NT	NT	NT
28	0.04	0.01	87
29	0.02	0.02	126
30	0.027	0.006	184
31	<0.05	0.01	73
32	NT	NT	NT
33	0.0429	0.0136	76

Statistics

Assigned Value	Not Set	
Spike	0.0698	0.0035
Robust Average	0.0302	0.0052
Median	0.0270	0.0036
Mean	0.0313	
N	20	
Max.	0.0675	
Min.	0.02	
Robust SD	0.0093	
Robust CV	31%	

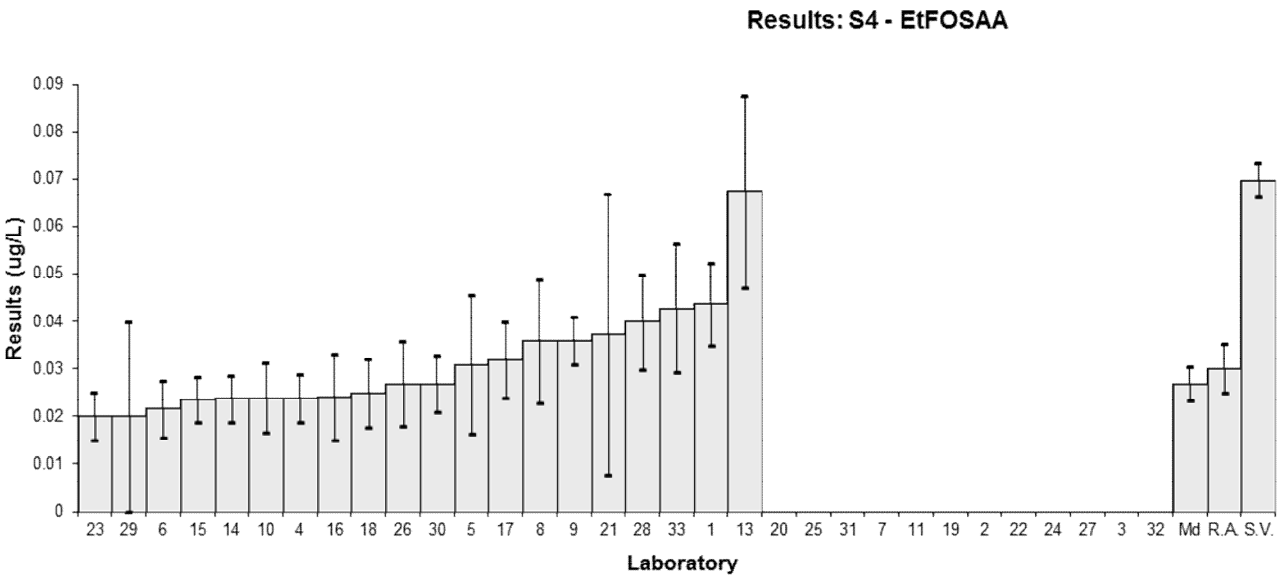

Results: S4 - EtFOSAA
Results (ug/L)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
23 29 6 15 14 10 4 16 18 26 30 5 17 8 9 21 28 33 1 13 20 25 31 7 11 19 2 22 24 27 3 32 Md R.A. S.V.
Laboratory

Figure 63

Table 70

Sample Details

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

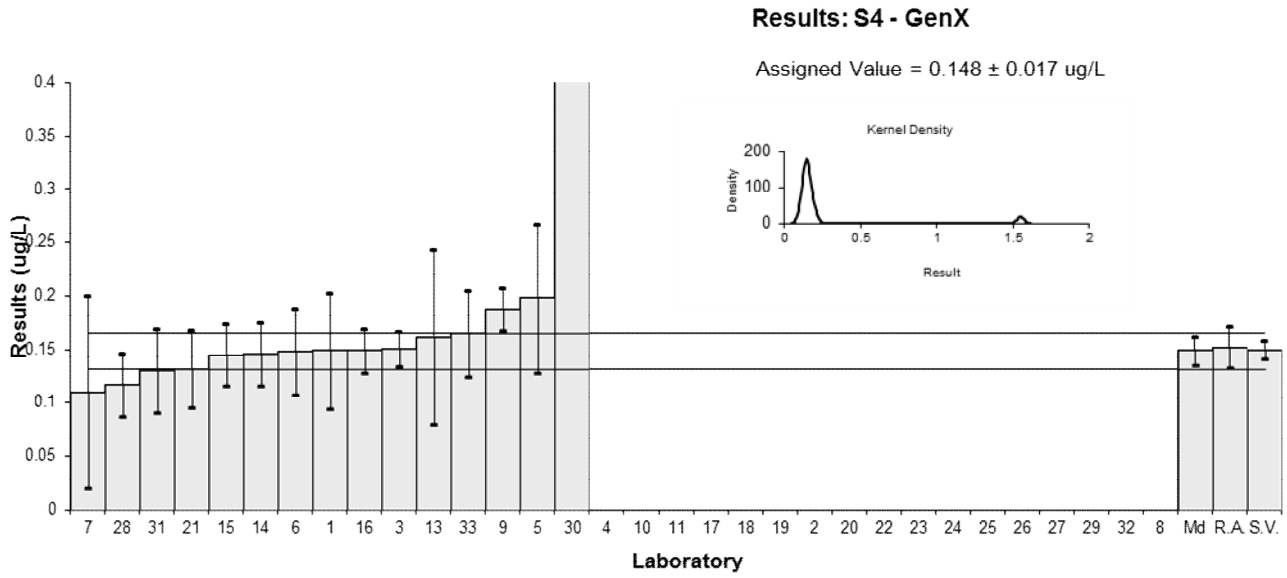
Participant Results

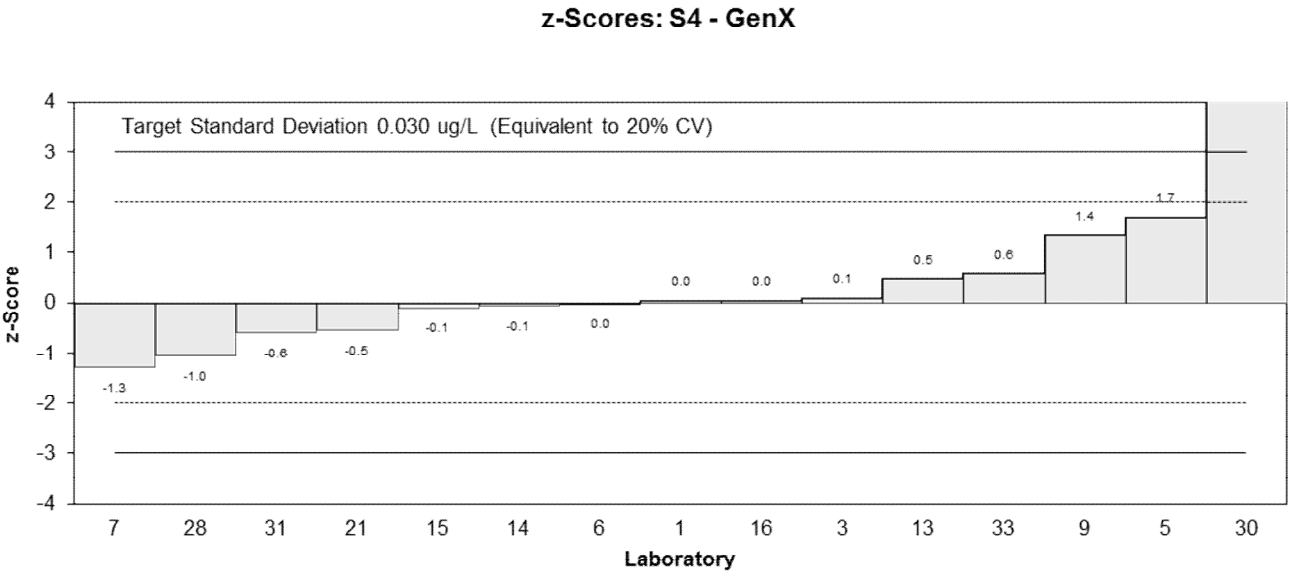
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.149	0.054	111	0.03	0.02
2	NT	NT	NT		
3	0.151	0.016	NR	0.10	0.13
4	<0.5	NR	116		
5	0.198024	0.07	NT	1.69	0.69
6	0.1479	0.0399	110	0.00	0.00
7	0.11	0.09	NR	-1.28	-0.41
8	NT	NT	NT		
9	0.188	0.02	120.2	1.35	1.52
10	NT	NT	NT		
11	NT	NT	NT		
13	0.162	0.081	86	0.47	0.17
14	0.146	0.0292	87	-0.07	-0.06
15	0.145	0.0290	100	-0.10	-0.09
16	0.149	0.02	124.6	0.03	0.04
17	NT	NT	NT		
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
21	0.132	0.036	81	-0.54	-0.40
22	NT	NT	NT		
23	NT	NT	NT		
24	NT	NT	NT		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	0.117	0.02925	116.9	-1.05	-0.92
29	NT	NT	NT		
30	1.55	0.53	91	47.36	2.64
31	0.13	0.039	92	-0.61	-0.42
32	NT	NT	NT		
33	0.165	0.0404	93	0.57	0.39

Statistics

Assigned Value*	0.148	0.017
Spike	0.150	0.008
Robust Average	0.152	0.019
Median	0.149	0.013
Mean	0.243	
N	15	
Max.	1.55	
Min.	0.11	
Robust SD	0.025	
Robust CV	17%	

*Assigned value is the robust average excluding laboratory 30.


Results: S4 - GenX
Assigned Value = 0.148 ± 0.017 ug/L
Kernel Density
Density
Result
Results (ug/L)
Laboratory
7 28 31 21 15 14 6 1 16 3 13 33 9 5 30 4 10 11 17 18 19 2 20 22 23 24 25 26 27 29 32 8 Md R.A. S.V.


z-Scores: S4 - GenX
Target Standard Deviation 0.030 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
7 28 31 21 15 14 6 1 16 3 13 33 9 5 30
-1.3 -1.0 -0.6 -0.5 -0.1 -0.1 0.0 0.0 0.0 0.1 0.5 0.6 1.4 1.7

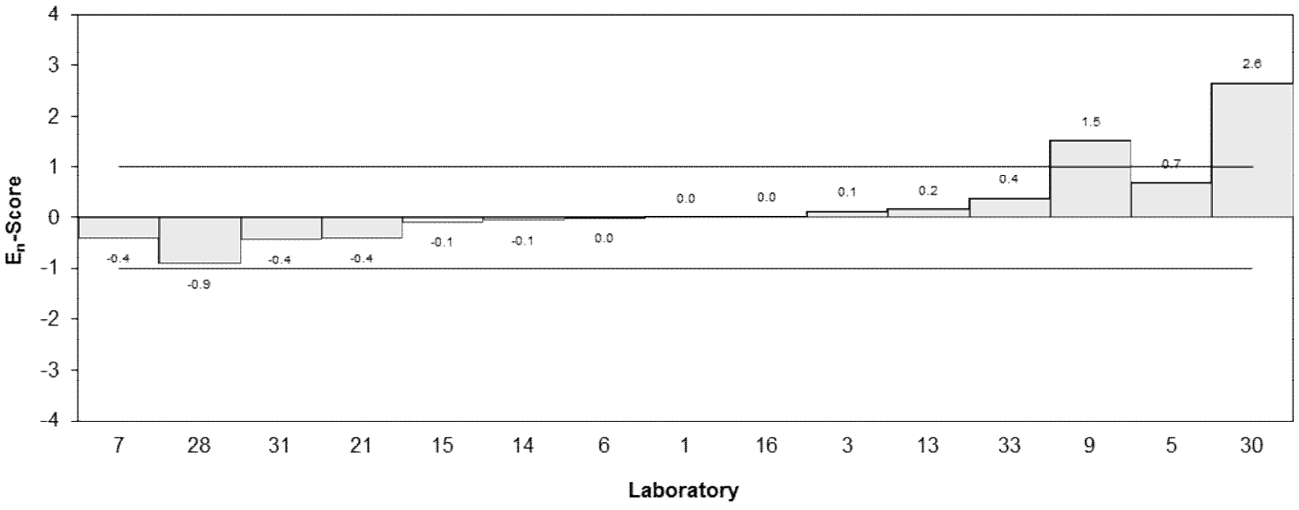

En-Scores: S4 - GenX
En-Score
Laboratory
7 28 31 21 15 14 6 1 16 3 13 33 9 5 30
-0.4 -0.9 -0.4 -0.4 -0.1 -0.1 0.0 0.0 0.0 0.1 0.2 0.4 1.5 0.7 2.6

Figure 64

Table 71

Sample Details

Sample No.	S4
Matrix.	water
Analyte.	MeFOSE
Units	µg/L

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.195	0.041	44
2	NT	NT	NT
3	NT	NT	NT
4	0.042	0.011	116
5	<0.002	NR	NT
6	0.0503	0.0136	91
7	NT	NT	NT
8	0.23	0.035	74
9	0.133	0.01	NR
10	0.04	0.01	NR
11	NT	NT	NT
13	NT	NT	NT
14	0.0492	0.0098	71
15	0.0460	0.00920	106
16	NR	NR	NR
17	0.17	0.043	72
18	0.060	0.015	114
19	NT	NT	NT
20	0.033	0.031	NR
21	NT	NT	NT
22	NT	NT	NT
23	<0.05	NR	NR
24	NT	NT	NT
25	<0.05	0.006	NR
26	<0.05	NR	NR
27	NT	NT	NT
28	0.095	0.02375	42
29	< 0.05	NR	128
30	0.06	0.017	112
31	0.06	0.018	44
32	NT	NT	NT
33	0.180	0.0431	75

Statistics

Assigned Value	Not Set	
Spike	0.208	0.010
Robust Average	0.094	0.046
Median	0.060	0.016
Mean	0.096	
N	15	
Max.	0.23	
Min.	0.033	
Robust SD	0.071	
Robust CV	76%	

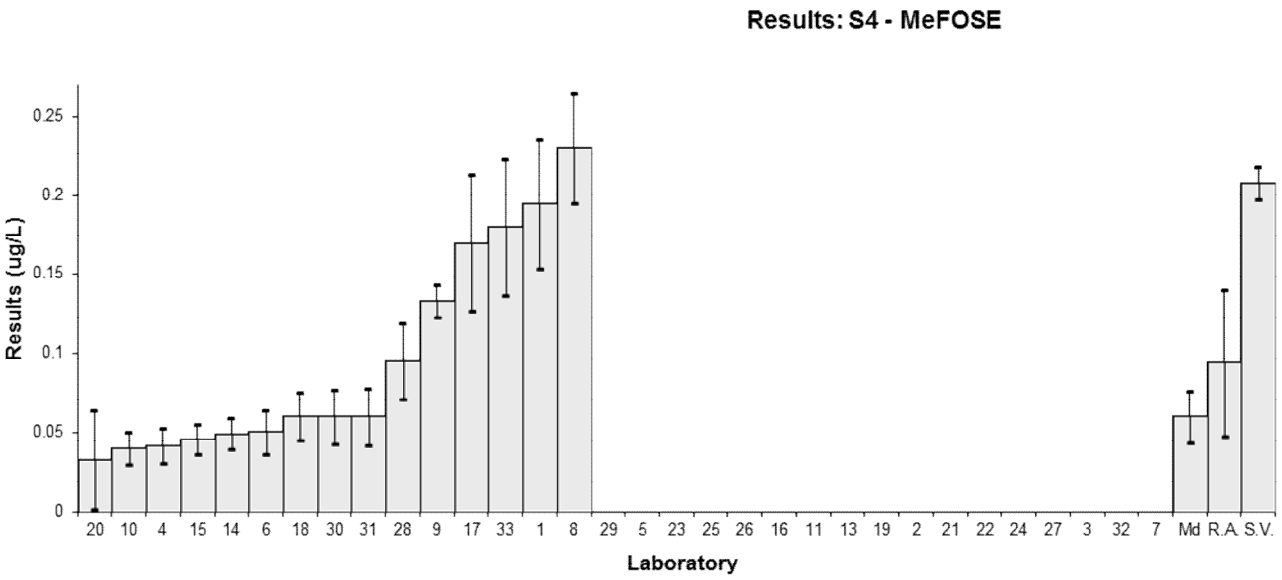

Results: S4 - MeFOSE
Results (ug/L)
0.25
0.2
0.15
0.1
0.05
0
20 10 4 15 14 6 18 30 31 28 9 17 33 1 8 29 5 23 25 26 16 11 13 19 2 21 22 24 27 3 32 7 Md R.A. S.V.
Laboratory

Figure 65

Table 72

Sample Details

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

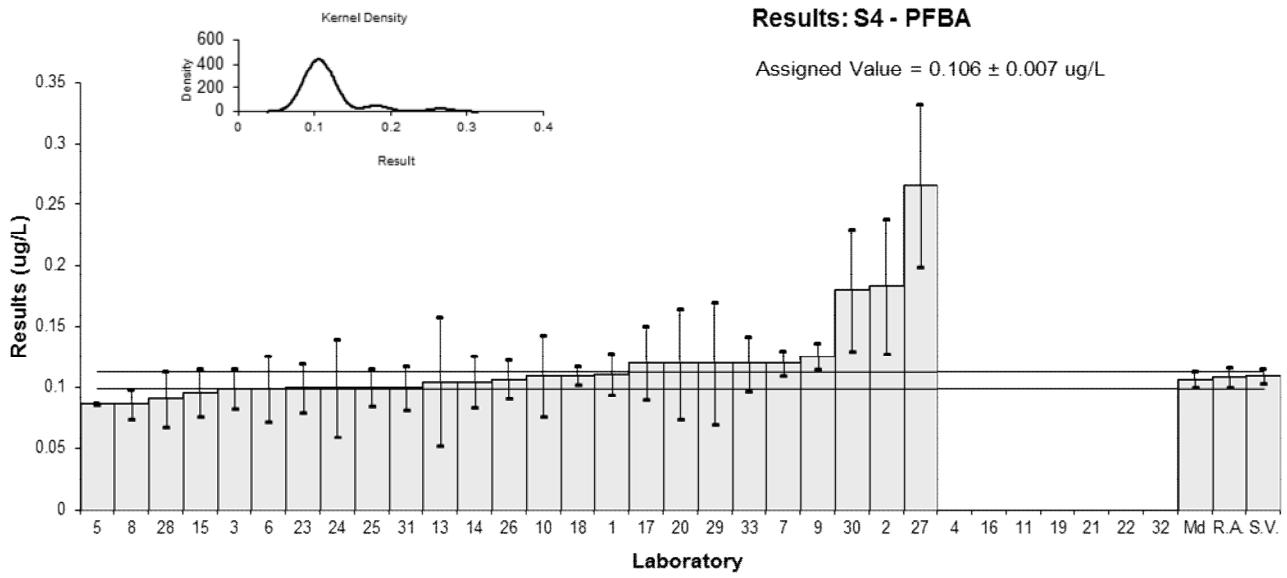
Participant Results

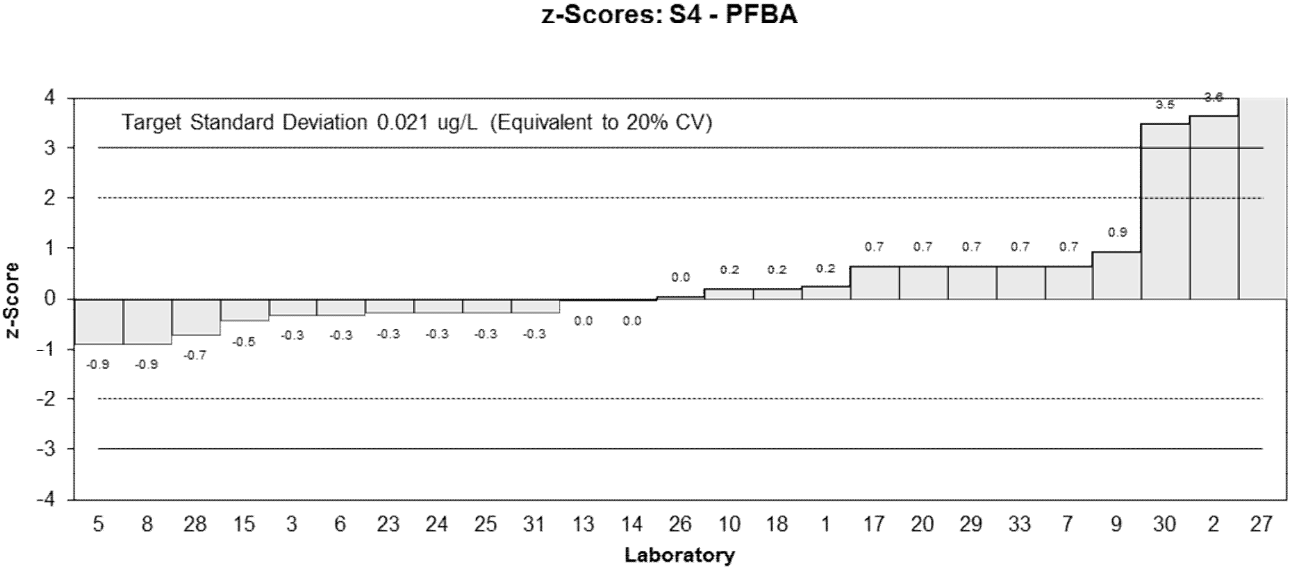
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.111	0.017	100	0.24	0.27
2	0.183	0.0549	77	3.63	1.39
3	0.099	0.016	NR	-0.33	-0.40
4	<0.1	NR	116		
5	0.086692	0.0004	99	-0.91	-2.75
6	0.0990	0.0267	96	-0.33	-0.25
7	0.12	0.01	NR	0.66	1.15
8	0.087	0.012	100	-0.90	-1.37
9	0.126	0.01	86.0	0.94	1.64
10	0.11	0.033	113	0.19	0.12
11	NT	NT	NT		
13	0.105	0.0525	89	-0.05	-0.02
14	0.105	0.0210	79	-0.05	-0.05
15	0.0964	0.0193	103	-0.45	-0.47
16	NR	NR	NR		
17	0.12	0.03	103	0.66	0.45
18	0.11	0.0074	88	0.19	0.39
19	NT	NT	NT		
20	0.12	0.045	102	0.66	0.31
21	NT	NT	NT		
22	NT	NT	NT		
23	0.10	0.02	NR	-0.28	-0.28
24	0.10	0.040	NR	-0.28	-0.15
25	0.1	0.015	NR	-0.28	-0.36
26	0.107	0.016	NR	0.05	0.06
27	0.266	0.0665	93	7.55	2.39
28	0.0906	0.02265	106.8	-0.73	-0.65
29	0.12	0.05	105	0.66	0.28
30	0.18	0.05	70	3.49	1.47
31	0.1	0.018	66	-0.28	-0.31
32	NT	NT	NT		
33	0.120	0.0219	84	0.66	0.61

Statistics

Assigned Value*	0.106	0.007
Spike	0.110	0.006
Robust Average	0.109	0.008
Median	0.107	0.006
Mean	0.118	
N	25	
Max.	0.266	
Min.	0.086692	
Robust SD	0.013	
Robust CV	12%	

*Assigned value is the robust average excluding laboratories 2, 27, and 30.


Kernel Density
Density
Result
Results: S4 - PFBA
Assigned Value = 0.106 ± 0.007 ug/L
Results (ug/L)
Laboratory
5 8 28 15 3 6 23 24 25 31 13 14 26 10 18 1 17 20 29 33 7 9 30 2 27 4 16 11 19 21 22 32 Md R.A. S.V.


z-Scores: S4 - PFBA
Target Standard Deviation 0.021 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 8 28 15 3 6 23 24 25 31 13 14 26 10 18 1 17 20 29 33 7 9 30 2 27

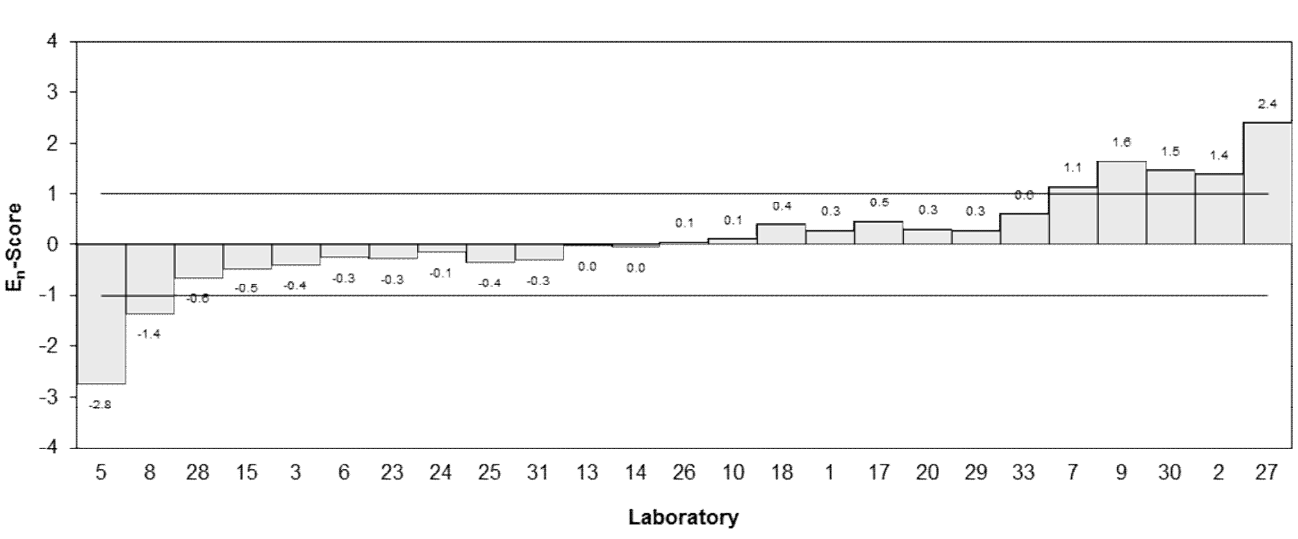

En-Scores: S4 - PFBA
En-Score
Laboratory
5 8 28 15 3 6 23 24 25 31 13 14 26 10 18 1 17 20 29 33 7 9 30 2 27

Figure 66

Table 73

Sample Details

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

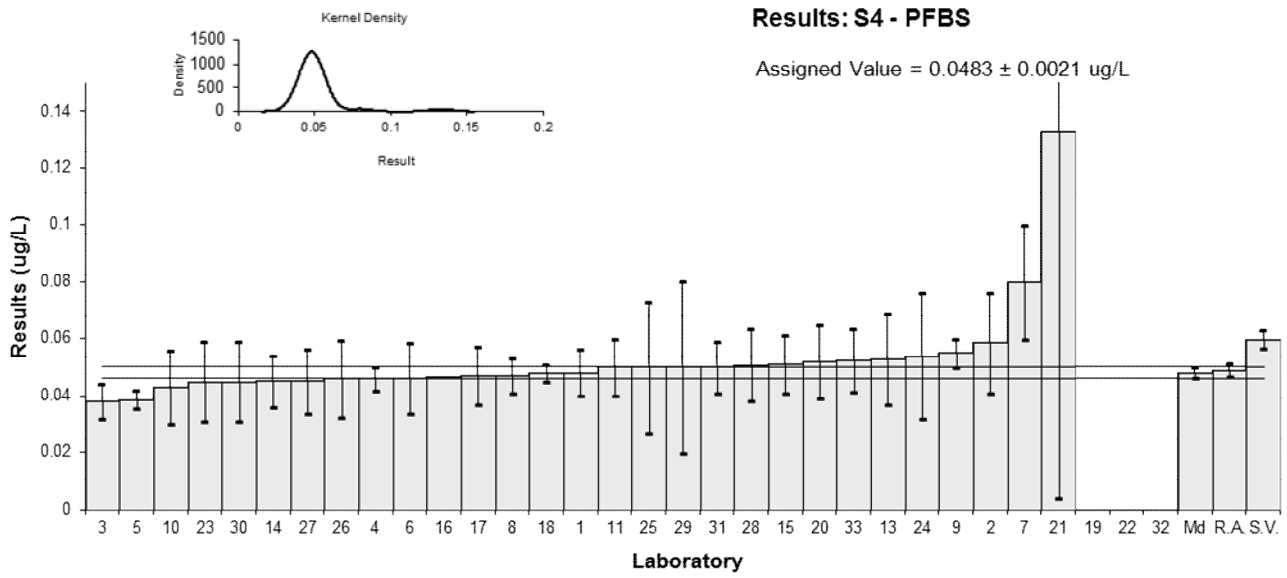
Participant Results

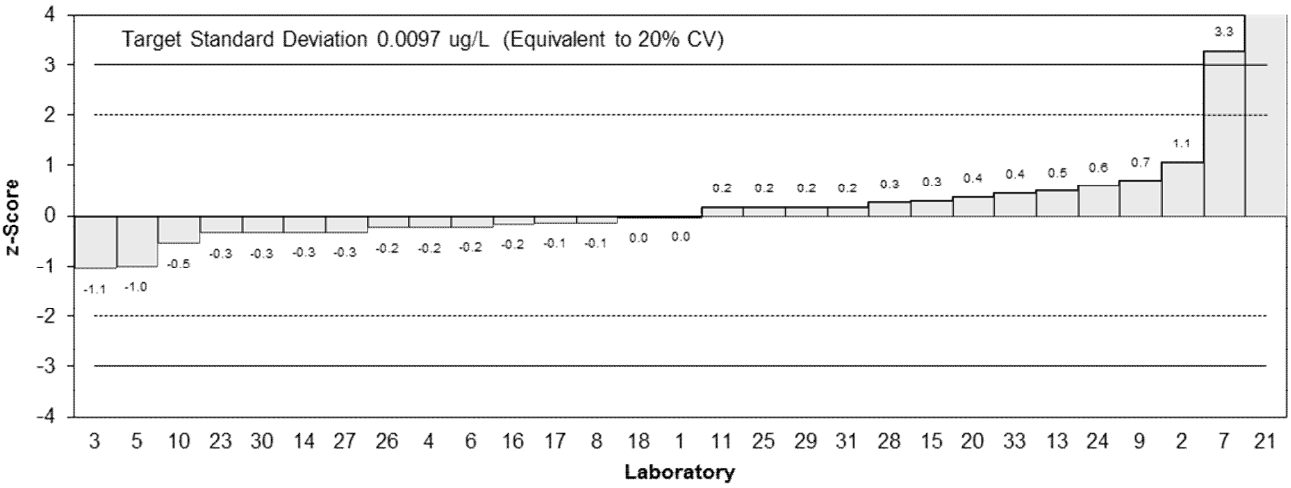
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0481	0.0081	112	-0.02	-0.02
2	0.0586	0.0176	260	1.07	0.58
3	0.038	0.006	NR	-1.07	-1.62
4	0.046	0.004	116	-0.24	-0.51
5	0.038608	0.003121995	102	-1.00	-2.58
6	0.0461	0.0124	112	-0.23	-0.17
7	0.08	0.02	86.7	3.28	1.58
8	0.047	0.006	97	-0.13	-0.20
9	0.055	0.005	102.9	0.69	1.24
10	0.043	0.0129	124	-0.55	-0.41
11	0.05	0.01	70	0.18	0.17
13	0.0530	0.0159	103	0.49	0.29
14	0.0451	0.0090	89	-0.33	-0.35
15	0.0512	0.0102	79	0.30	0.28
16	0.0467	NR	NR	-0.17	-0.76
17	0.047	0.01	109	-0.13	-0.13
18	0.048	0.0029	104	-0.03	-0.08
19	NT	NT	NT		
20	0.052	0.013	108	0.38	0.28
21	0.133	0.129	NR	8.77	0.66
22	NT	NT	NT		
23	0.045	0.014	NR	-0.34	-0.23
24	0.054	0.022	NR	0.59	0.26
25	0.05	0.023	NR	0.18	0.07
26	0.046	0.0134	NR	-0.24	-0.17
27	0.0451	0.0113	103	-0.33	-0.28
28	0.0508	0.0127	75.2	0.26	0.19
29	0.05	0.03	97	0.18	0.06
30	0.045	0.014	83	-0.34	-0.23
31	0.05	0.009	90	0.18	0.18
32	NT	NT	NT		
33	0.0526	0.0110	71	0.45	0.38

Statistics

Assigned Value*	0.0483	0.0021
Spike	0.0598	0.0030
Robust Average	0.0489	0.0023
Median	0.0481	0.0017
Mean	0.0522	
N	29	
Max.	0.133	
Min.	0.038	
Robust SD	0.0043	
Robust CV	8.9%	

*Assigned value is the robust average excluding laboratories 7 and 21.


Kernel Density
Density
Result
Results: S4 - PFBS
Assigned Value = 0.0483 ± 0.0021 ug/L
Results (ug/L)
Laboratory
3 5 10 23 30 14 27 26 4 6 16 17 8 18 1 11 25 29 31 28 15 20 33 13 24 9 2 7 21 19 22 32 Md R.A S.V.


z-Scores: S4 - PFBS
Target Standard Deviation 0.0097 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
3 5 10 23 30 14 27 26 4 6 16 17 8 18 1 11 25 29 31 28 15 20 33 13 24 9 2 7 21

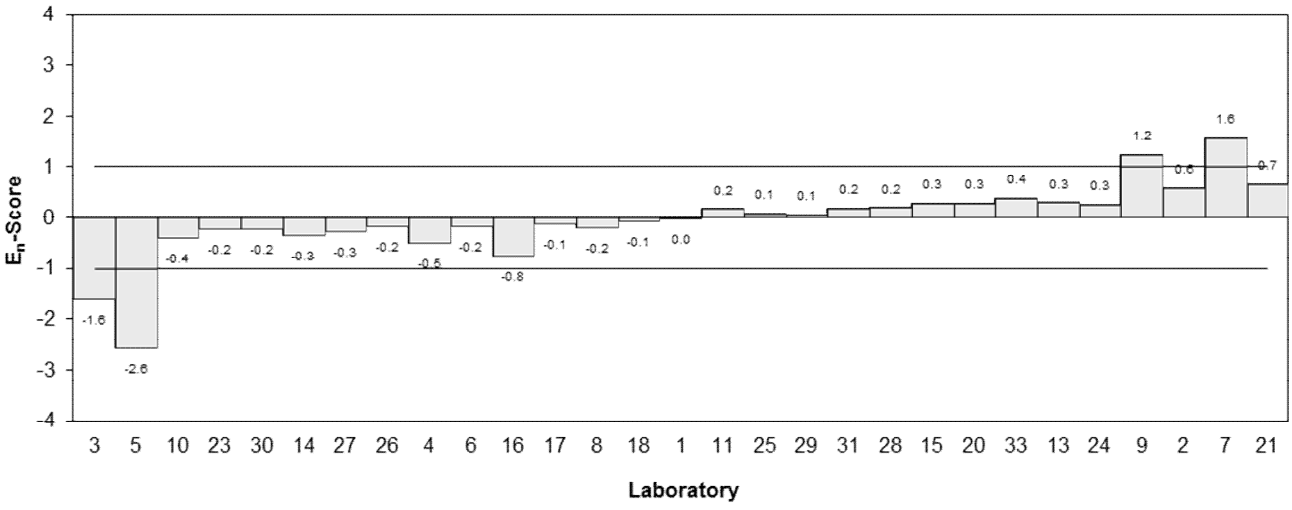

En-Scores: S4 - PFBS
En-Score
Laboratory
3 5 10 23 30 14 27 26 4 6 16 17 8 18 1 11 25 29 31 28 15 20 33 13 24 9 2 7 21

Figure 67

Table 74

Sample Details

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

Participant Results

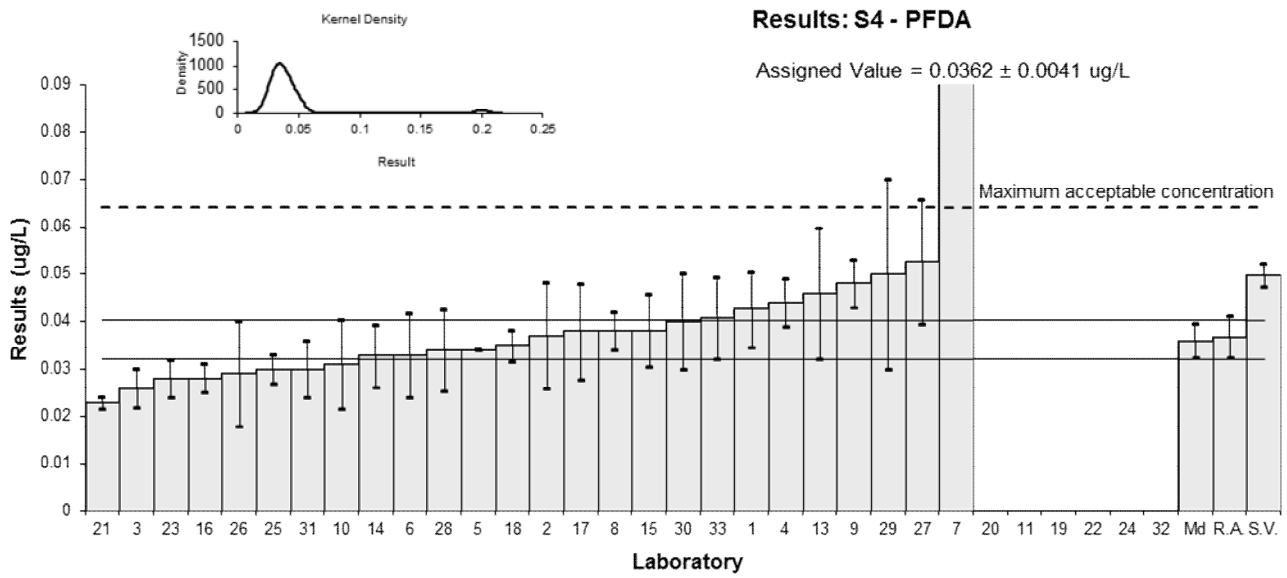
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0426	0.0078	104	0.88	0.73
2	0.0370	0.0111	172	0.11	0.07
3	0.026	0.004	NR	-1.41	-1.78
4	0.044	0.005	116	1.08	1.21
5	0.034116	0.00002695	85	-0.29	-0.51
6	0.0329	0.0089	118	-0.46	-0.34
7	0.20	0.02	NR	22.62	8.02
8	0.038	0.004	114	0.25	0.31
9	0.048	0.005	90.9	1.63	1.82
10	0.031	0.0093	106	-0.72	-0.51
11	NT	NT	NT		
13	0.0460	0.0138	102	1.35	0.68
14	0.0328	0.0066	111	-0.47	-0.44
15	0.0381	0.00761	95	0.26	0.22
16	0.0281	0.003	89.8	-1.12	-1.59
17	0.038	0.01	92	0.25	0.17
18	0.035	0.0033	108	-0.17	-0.23
19	NT	NT	NT		
20	< 0.05	0.017	84		
21	0.0229	0.0011	58	-1.84	-3.13
22	NT	NT	NT		
23	0.028	0.004	NR	-1.13	-1.43
24	NT	NT	NT		
25	0.03	0.003	NR	-0.86	-1.22
26	0.029	0.011	NR	-0.99	-0.61
27**	0.0527	0.0132	71	2.00	1.00
28	0.034	0.0085	74.8	-0.30	-0.23
29	0.05	0.02	112	1.91	0.68
30	0.04	0.01	96	0.52	0.35
31	0.03	0.006	99	-0.86	-0.85
32	NT	NT	NT		
33	0.0407	0.00856	79	0.62	0.47

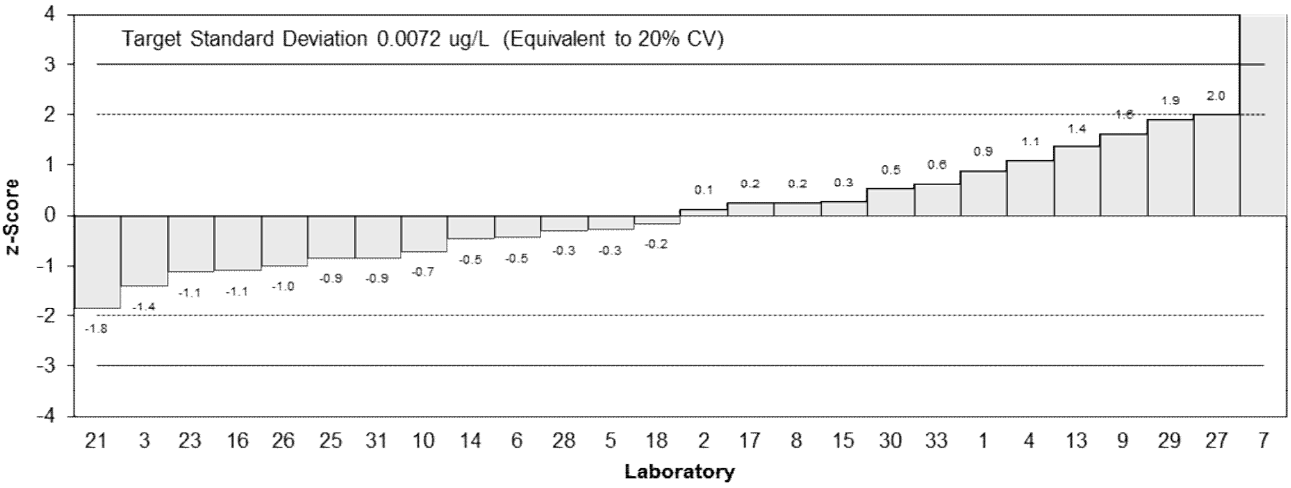
Statistics

Assigned Value*	0.0362	0.0041
Spike	0.0498	0.0025
Maximum acceptable conc.**	0.0642	
Robust Average	0.0368	0.0044
Median	0.0360	0.0036
Mean	0.0427	
N	26	
Max.	0.2	
Min.	0.0229	
Robust SD	0.0082	
Robust CV	23%	

*Assigned value is the robust average excluding laboratory 7.

**z-score adjusted to 2 (see Section 6.3).


Kernel Density
Density
Result
Results: S4 - PFDA
Assigned Value = 0.0362 ± 0.0041 ug/L
Maximum acceptable concentration
Results (ug/L)
Laboratory
21 3 23 16 26 25 31 10 14 6 28 5 18 2 17 8 15 30 33 1 4 13 9 29 27 7 20 11 19 22 24 32 Md R.A. S.V.


z-Scores: S4 - PFDA
Target Standard Deviation 0.0072 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
21 3 23 16 26 25 31 10 14 6 28 5 18 2 17 8 15 30 33 1 4 13 9 29 27 7

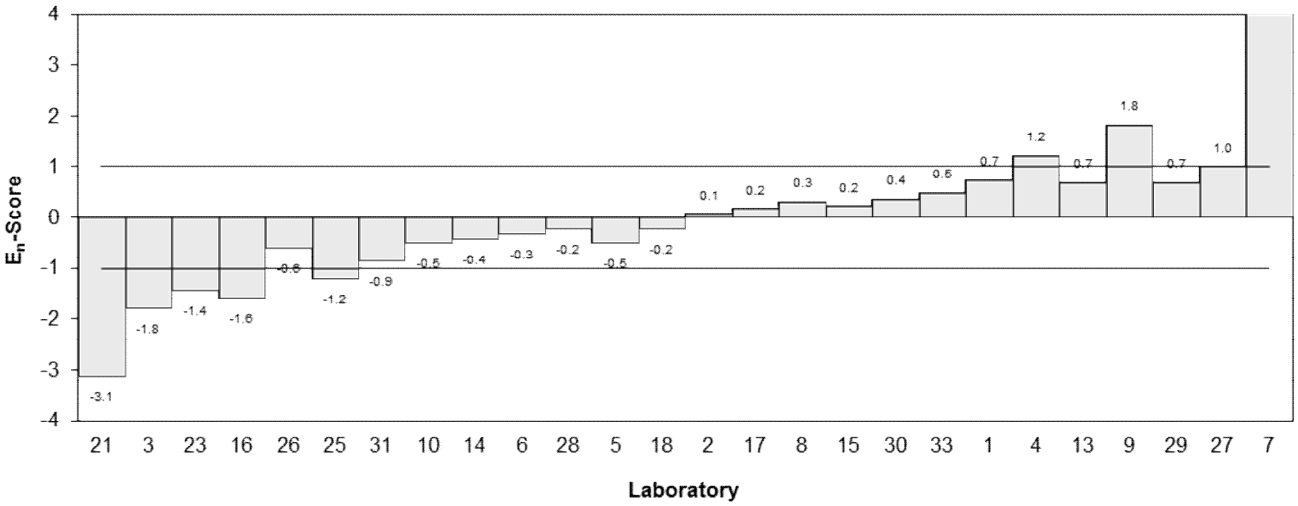

En-Scores: S4 - PFDA
En-Score
Laboratory
21 3 23 16 26 25 31 10 14 6 28 5 18 2 17 8 15 30 33 1 4 13 9 29 27 7

Figure 68

Table 75

Sample Details

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

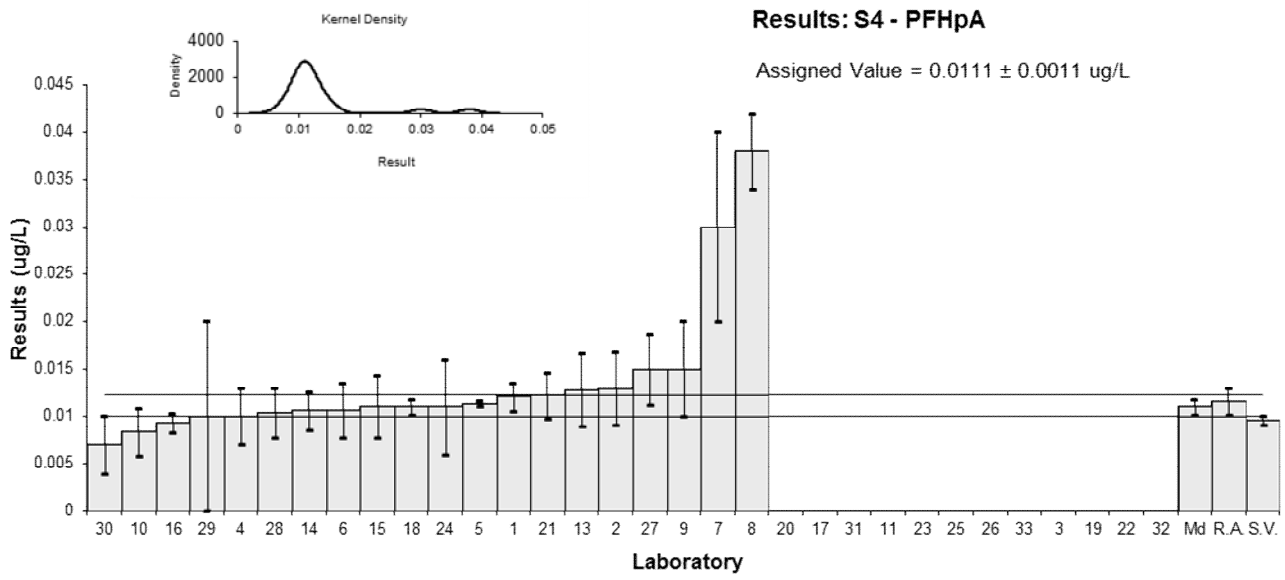
Participant Results

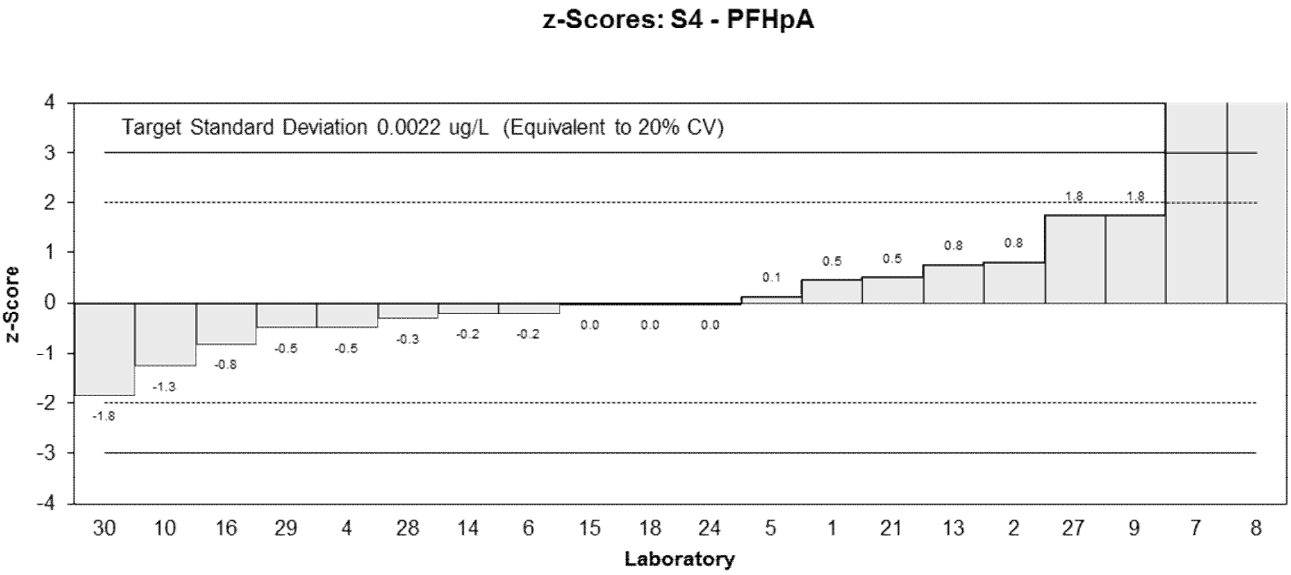
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0121	0.0015	102	0.45	0.54
2	0.0129	0.00387	151	0.81	0.45
3	NR	NR	NR		
4	0.01	0.003	116	-0.50	-0.34
5	0.01138	0.00024783	93	0.13	0.25
6	0.0106	0.0029	114	-0.23	-0.16
7	0.03	0.01	NR	8.51	1.88
8	0.038	0.004	116	12.12	6.48
9	0.015	0.005	106.0	1.76	0.76
10	0.0083	0.00249	114	-1.26	-1.03
11	<0.02	NR	98		
13	0.0128	0.00384	103	0.77	0.43
14	0.01060	0.0020	108	-0.23	-0.22
15	0.0110	0.00330	91	-0.05	-0.03
16	0.00928	0.001	NR	-0.82	-1.22
17	<0.01	NR	108		
18	0.011	0.00080	105	-0.05	-0.07
19	NT	NT	NT		
20	< 0.025	0.017	110		
21	0.0122	0.0024	NR	0.50	0.42
22	NT	NT	NT		
23	<0.02	NR	NR		
24	0.011	0.005	NR	-0.05	-0.02
25	<0.02	0.009	NR		
26	<0.02	NR	NR		
27	0.0150	0.00375	74	1.76	1.00
28	0.0104	0.0026	100.8	-0.32	-0.25
29	0.01	0.01	108	-0.50	-0.11
30	0.007	0.003	82	-1.85	-1.28
31	<0.01	0.002	102		
32	NT	NT	NT		
33	<0.0208	NR	98		

Statistics

Assigned Value*	0.0111	0.0011
Spike	0.00950	0.00047
Robust Average	0.0116	0.0014
Median	0.0110	0.0008
Mean	0.0134	
N	20	
Max.	0.038	
Min.	0.007	
Robust SD	0.0019	
Robust CV	17%	

*Assigned value is the robust average excluding laboratories 7 and 8.


Kernel Density
Density
Result
Results: S4 - PFHpA
Assigned Value = 0.0111 ± 0.0011 ug/L
Results (ug/L)
Laboratory
30 10 16 29 4 28 14 6 15 18 24 5 1 21 13 2 27 9 7 8 20 17 31 11 23 25 26 33 3 19 22 32 Md R.A. S.V.


z-Scores: S4 - PFHpA
Target Standard Deviation 0.0022 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
30 10 16 29 4 28 14 6 15 18 24 5 1 21 13 2 27 9 7 8

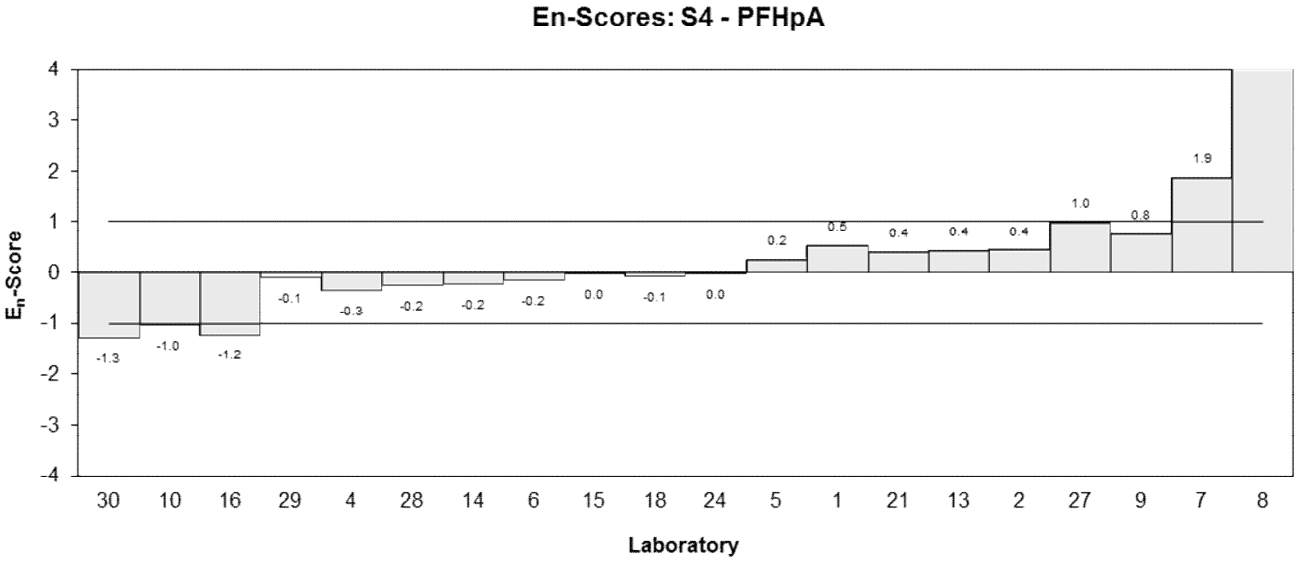

En-Scores: S4 - PFHpA
En-Score
Laboratory
30 10 16 29 4 28 14 6 15 18 24 5 1 21 13 2 27 9 7 8

Figure 69

Table 76

Sample Details

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

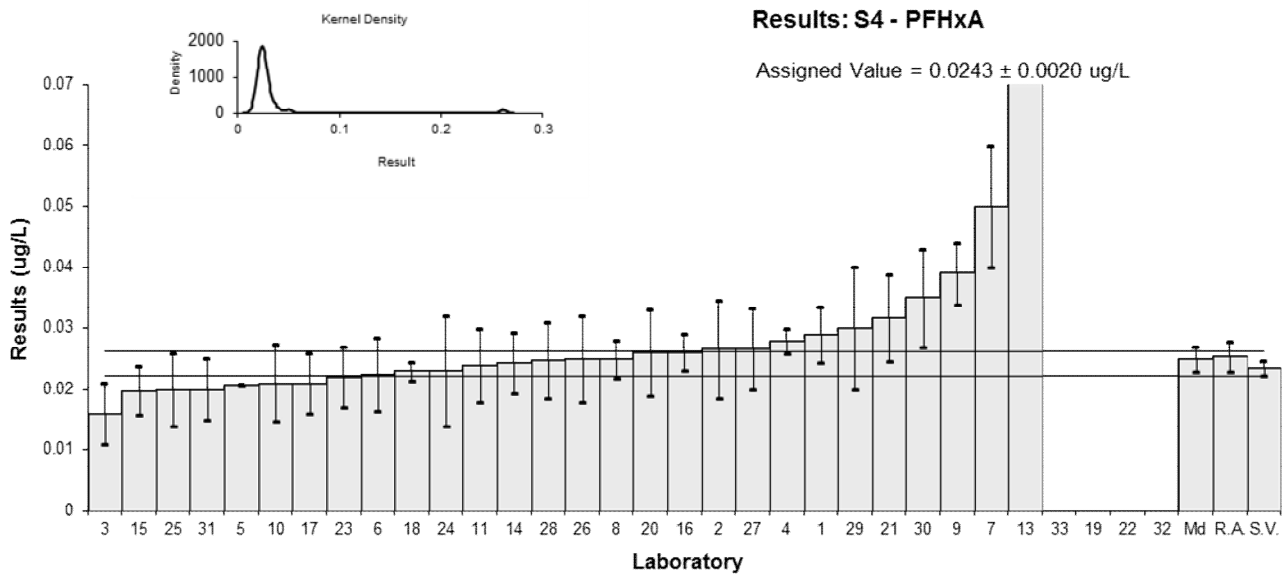
Participant Results

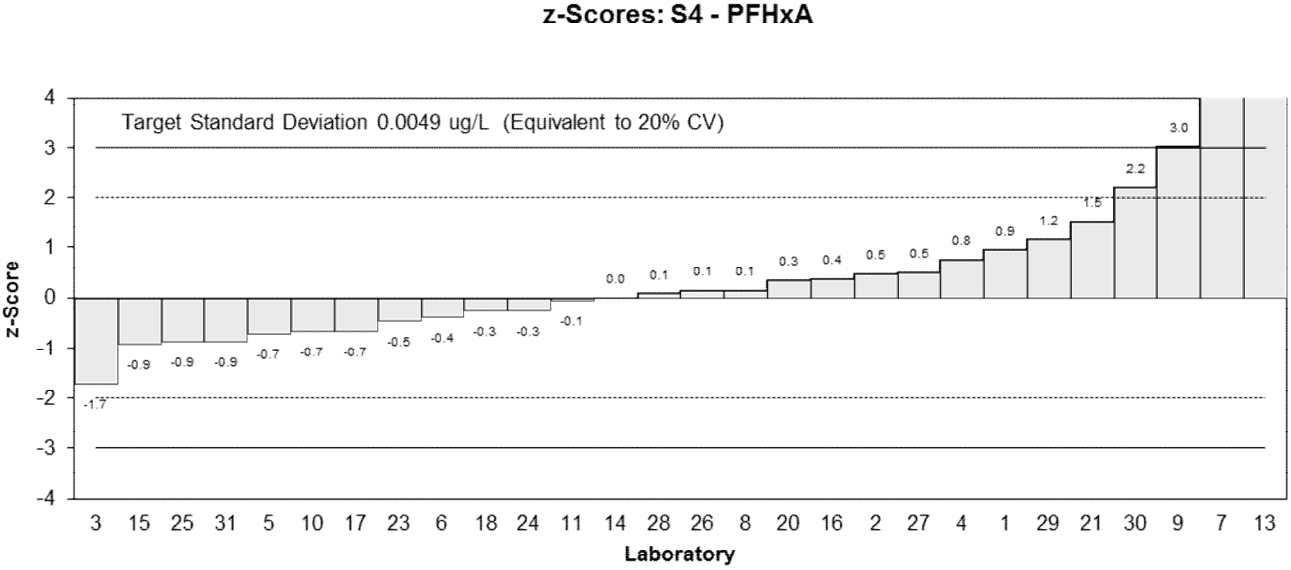
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0289	0.0045	97	0.95	0.93
2	0.0266	0.00798	156	0.47	0.28
3	0.016	0.005	NR	-1.71	-1.54
4	0.028	0.002	116	0.76	1.31
5	0.020779	0.00005483	103	-0.72	-1.76
6	0.0224	0.0060	111	-0.39	-0.30
7	0.05	0.01	NR	5.29	2.52
8	0.025	0.003	94	0.14	0.19
9	0.039	0.005	120.7	3.02	2.73
10	0.021	0.0063	121	-0.68	-0.50
11	0.024	0.006	68	-0.06	-0.05
13	0.261	0.0783	96	48.70	3.02
14	0.0243	0.0049	100	0.00	0.00
15	0.0198	0.00395	75	-0.93	-1.02
16	0.0261	0.003	111.4	0.37	0.50
17	0.021	0.005	116	-0.68	-0.61
18	0.023	0.0014	108	-0.27	-0.53
19	NT	NT	NT		
20	0.026	0.007	109	0.35	0.23
21	0.0317	0.0070	124	1.52	1.02
22	NT	NT	NT		
23	0.022	0.005	NR	-0.47	-0.43
24	0.023	0.009	NR	-0.27	-0.14
25	0.02	0.006	NR	-0.88	-0.68
26	0.025	0.007	NR	0.14	0.10
27	0.0267	0.00668	74	0.49	0.34
28	0.0247	0.006175	90.6	0.08	0.06
29	0.03	0.01	103	1.17	0.56
30	0.035	0.008	90	2.20	1.30
31	0.02	0.005	94	-0.88	-0.80
32	NT	NT	NT		
33	<0.0417	NR	79		

Statistics

Assigned Value*	0.0243	0.0020
Spike	0.0235	0.0012
Robust Average	0.0254	0.0025
Median	0.0249	0.0020
Mean	0.0343	
N	28	
Max.	0.261	
Min.	0.016	
Robust SD	0.0040	
Robust CV	16%	

*Assigned value is the robust average excluding laboratories 7, 9, and 13.


Kernel Density
Density
Result
Results: S4 - PFHxA
Assigned Value = 0.0243 ± 0.0020 ug/L
Results (ug/L)
Laboratory
3 15 25 31 5 10 17 23 6 18 24 11 14 28 26 8 20 16 2 27 4 1 29 21 30 9 7 13 33 19 22 32 Md R.A. S.V.


z-Scores: S4 - PFHxA
Target Standard Deviation 0.0049 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
3 15 25 31 5 10 17 23 6 18 24 11 14 28 26 8 20 16 2 27 4 1 29 21 30 9 7 13

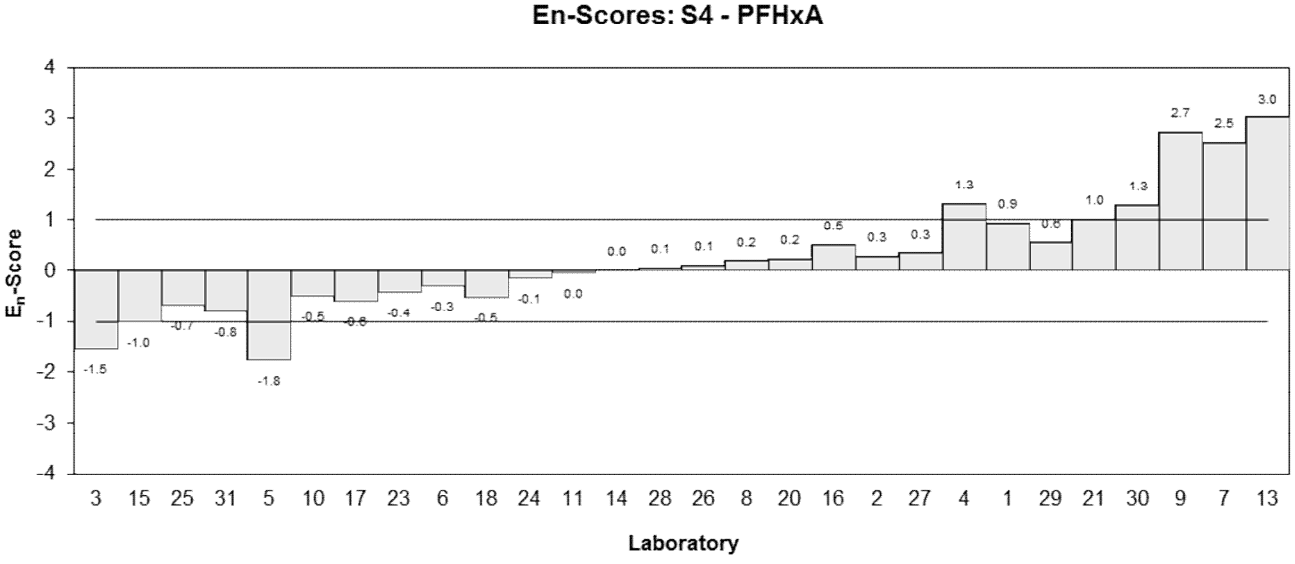

En-Scores: S4 - PFHxA
En-Score
Laboratory
3 15 25 31 5 10 17 23 6 18 24 11 14 28 26 8 20 16 2 27 4 1 29 21 30 9 7 13

Figure 70

Table 77

Sample Details

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

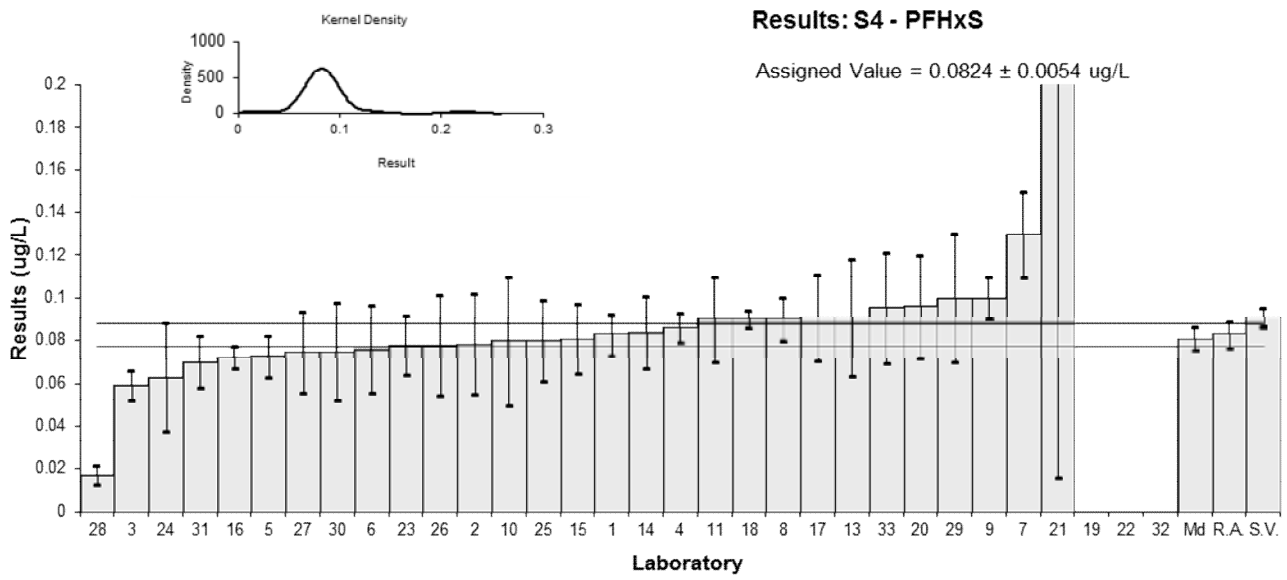
Participant Results

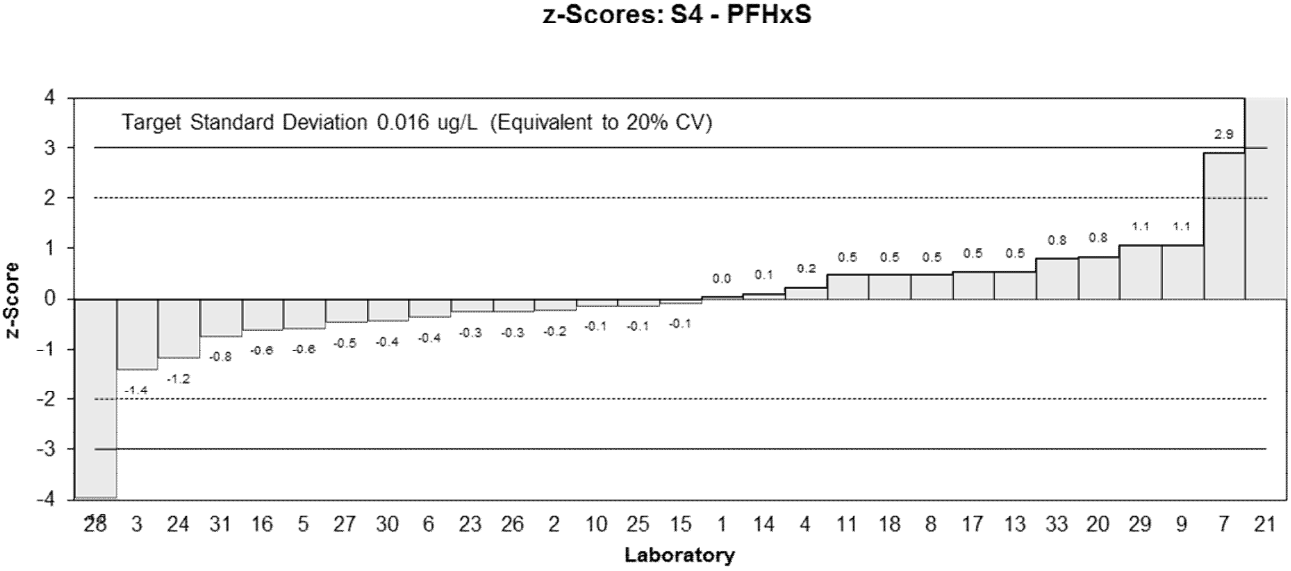
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0829	0.0096	112	0.03	0.05
2	0.0786	0.0236	278	-0.23	-0.16
3	0.059	0.007	NR	-1.42	-2.65
4	0.086	0.007	116	0.22	0.41
5	0.072668	0.009701668	93	-0.59	-0.88
6	0.0762	0.0206	117	-0.38	-0.29
7	0.13	0.02	81.5	2.89	2.30
8	0.090	0.010	102	0.46	0.67
9	0.100	0.01	104.2	1.07	1.55
10	0.08	0.03	106	-0.15	-0.08
11	0.09	0.02	100	0.46	0.37
13	0.0911	0.02733	104	0.53	0.31
14	0.0839	0.0167	114	0.09	0.09
15	0.0810	0.0162	92	-0.08	-0.08
16	0.0723	0.005	NR	-0.61	-1.37
17	0.091	0.02	106	0.52	0.42
18	0.090	0.0042	101	0.46	1.11
19	NT	NT	NT		
20	0.096	0.024	105	0.83	0.55
21	0.221	0.205	NR	8.41	0.68
22	NT	NT	NT		
23	0.078	0.014	NR	-0.27	-0.29
24	0.063	0.025	NR	-1.18	-0.76
25	0.08	0.019	NR	-0.15	-0.12
26	0.078	0.0231	NR	-0.27	-0.19
27	0.0748	0.0187	103	-0.46	-0.39
28	0.0171	0.004275	89.2	-3.96	-9.48
29	0.10	0.03	102	1.07	0.58
30	0.075	0.023	72	-0.45	-0.31
31	0.07	0.012	134	-0.75	-0.94
32	NT	NT	NT		
33	0.0955	0.0257	92	0.79	0.50

Statistics

Assigned Value*	0.0824	0.0054
Spike	0.0907	0.0045
Robust Average	0.0828	0.0062
Median	0.0810	0.0051
Mean	0.0863	
N	29	
Max.	0.221	
Min.	0.0171	
Robust SD	0.011	
Robust CV	13%	

*Assigned value is the robust average excluding laboratories 7, 21, and 28.


Kernel Density
Density
Result
Results: S4 - PFHxS
Assigned Value = 0.0824 ± 0.0054 ug/L
Results (ug/L)
Laboratory
28 3 24 31 16 5 27 30 6 23 26 2 10 25 15 1 14 4 11 18 8 17 13 33 20 29 9 7 21 19 22 32 Md R.A. S.V.


z-Scores: S4 - PFHxS
Target Standard Deviation 0.016 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
28 3 24 31 16 5 27 30 6 23 26 2 10 25 15 1 14 4 11 18 8 17 13 33 20 29 9 7 21

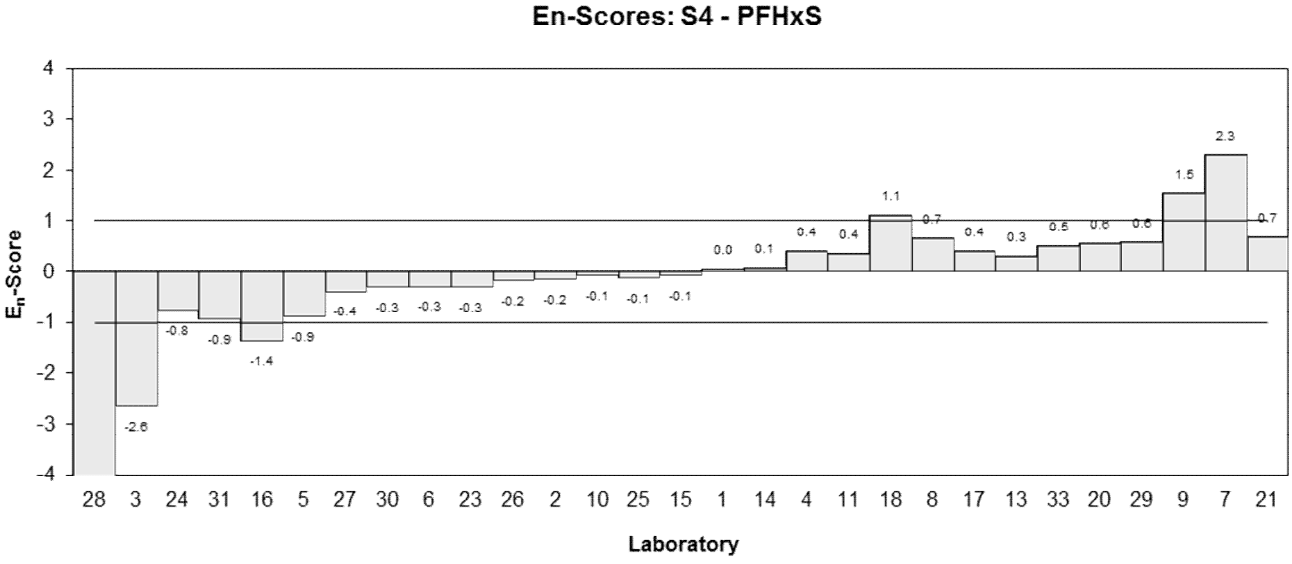

En-Scores: S4 - PFHxS
En-Score
Laboratory
28 3 24 31 16 5 27 30 6 23 26 2 10 25 15 1 14 4 11 18 8 17 13 33 20 29 9 7 21

Figure 71

Table 78

Sample Details

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

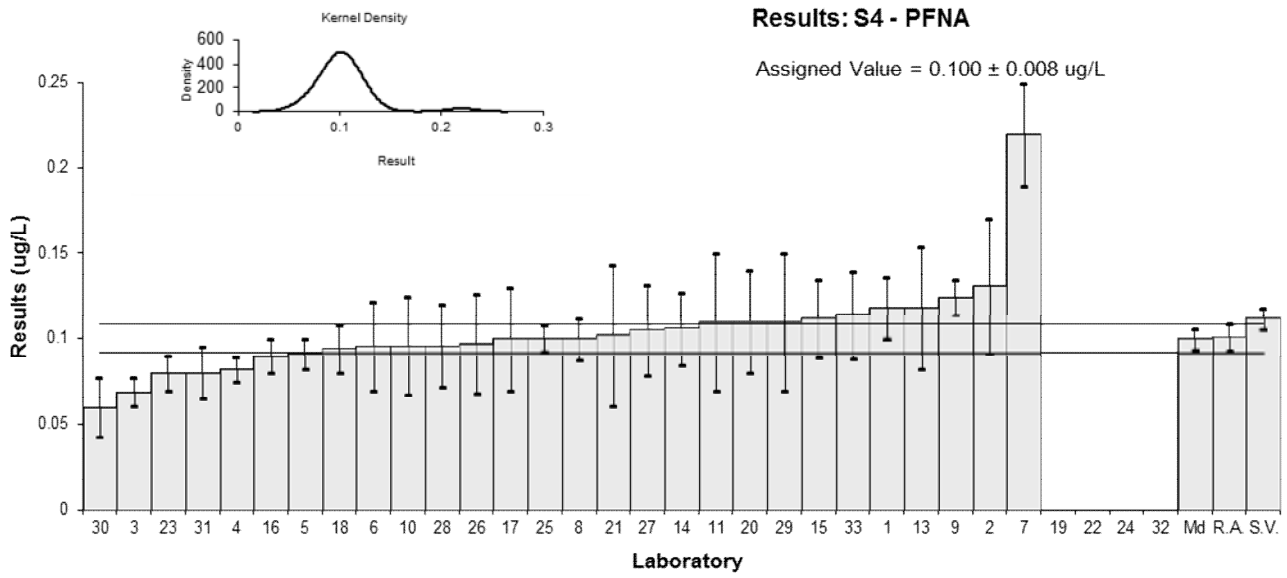
Participant Results

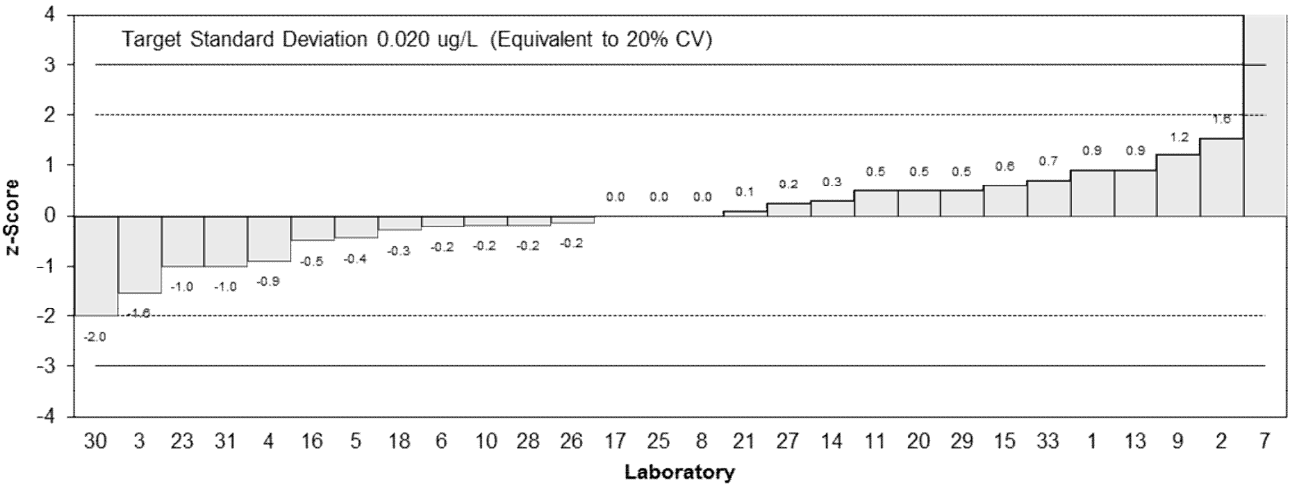
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.118	0.018	100	0.90	0.91
2	0.131	0.0393	118	1.55	0.77
3	0.069	0.008	NR	-1.55	-2.74
4	0.082	0.007	116	-0.90	-1.69
5	0.091126	0.008679335	94	-0.44	-0.75
6	0.0955	0.0258	108	-0.23	-0.17
7	0.22	0.03	NR	6.00	3.86
8	0.10	0.012	129	0.00	0.00
9	0.124	0.01	110.1	1.20	1.87
10	0.096	0.0288	103	-0.20	-0.13
11	0.11	0.04	73	0.50	0.25
13	0.118	0.0354	97	0.90	0.50
14	0.106	0.0210	116	0.30	0.27
15	0.112	0.0225	104	0.60	0.50
16	0.0900	0.01	NR	-0.50	-0.78
17	0.10	0.03	92	0.00	0.00
18	0.094	0.014	104	-0.30	-0.37
19	NT	NT	NT		
20	0.11	0.030	92	0.50	0.32
21	0.102	0.041	NR	0.10	0.05
22	NT	NT	NT		
23	0.08	0.01	NR	-1.00	-1.56
24	NT	NT	NT		
25	0.10	0.008	NR	0.00	0.00
26	0.097	0.0289	NR	-0.15	-0.10
27	0.105	0.0263	93	0.25	0.18
28	0.096	0.024	90.3	-0.20	-0.16
29	0.11	0.04	120	0.50	0.25
30	0.06	0.017	66	-2.00	-2.13
31	0.08	0.015	104	-1.00	-1.18
32	NT	NT	NT		
33	0.114	0.0257	104	0.70	0.52

Statistics

Assigned Value*	0.100	0.008
Spike	0.112	0.006
Robust Average	0.101	0.008
Median	0.100	0.006
Mean	0.104	
N	28	
Max.	0.22	
Min.	0.06	
Robust SD	0.016	
Robust CV	16%	

*Assigned value is the robust average excluding laboratory 7.


Kernel Density
Density
Result
Results: S4 - PFNA
Assigned Value = 0.100 ± 0.008 ug/L
Results (ug/L)
Laboratory
30 3 23 31 4 16 5 18 6 10 28 26 17 25 8 21 27 14 11 20 29 15 33 1 13 9 2 7 19 22 24 32 Md R.A. S.V.


z-Scores: S4 - PFNA
Target Standard Deviation 0.020 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
30 3 23 31 4 16 5 18 6 10 28 26 17 25 8 21 27 14 11 20 29 15 33 1 13 9 2 7

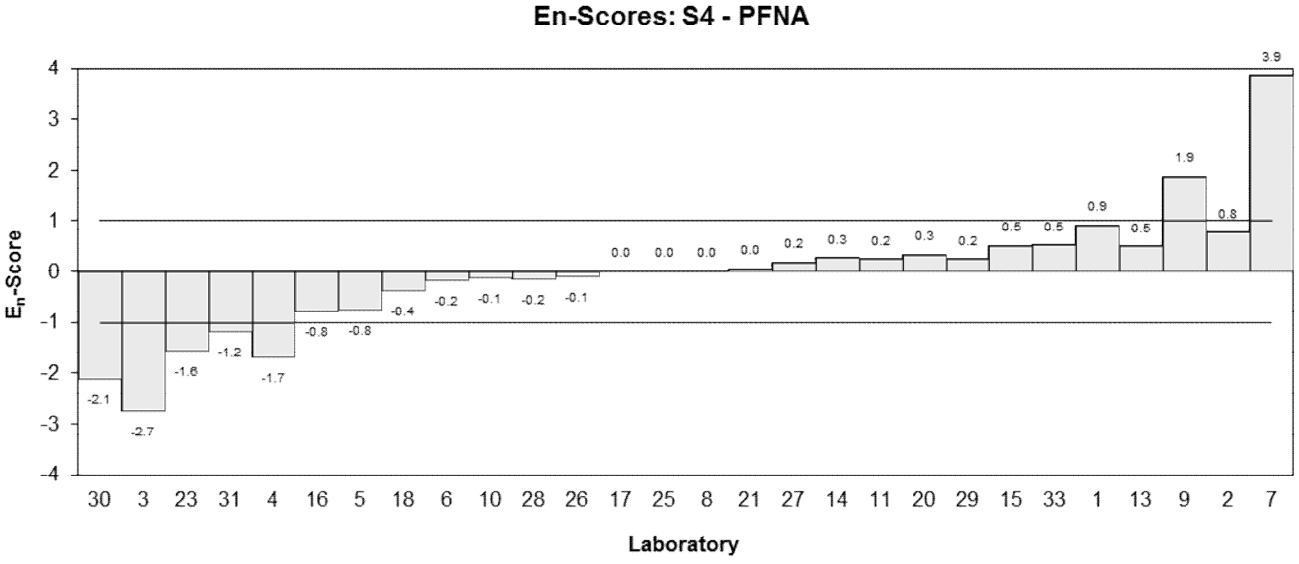

En-Scores: S4 - PFNA
En-Score
Laboratory
30 3 23 31 4 16 5 18 6 10 28 26 17 25 8 21 27 14 11 20 29 15 33 1 13 9 2 7

Figure 72

Table 79

Sample Details

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

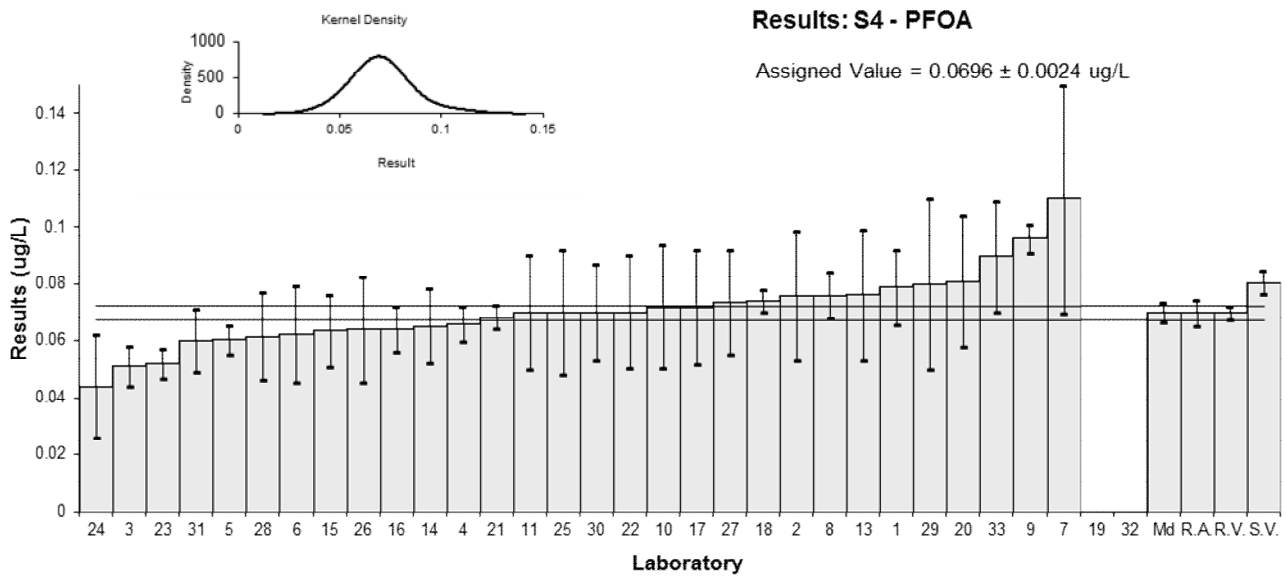
Participant Results

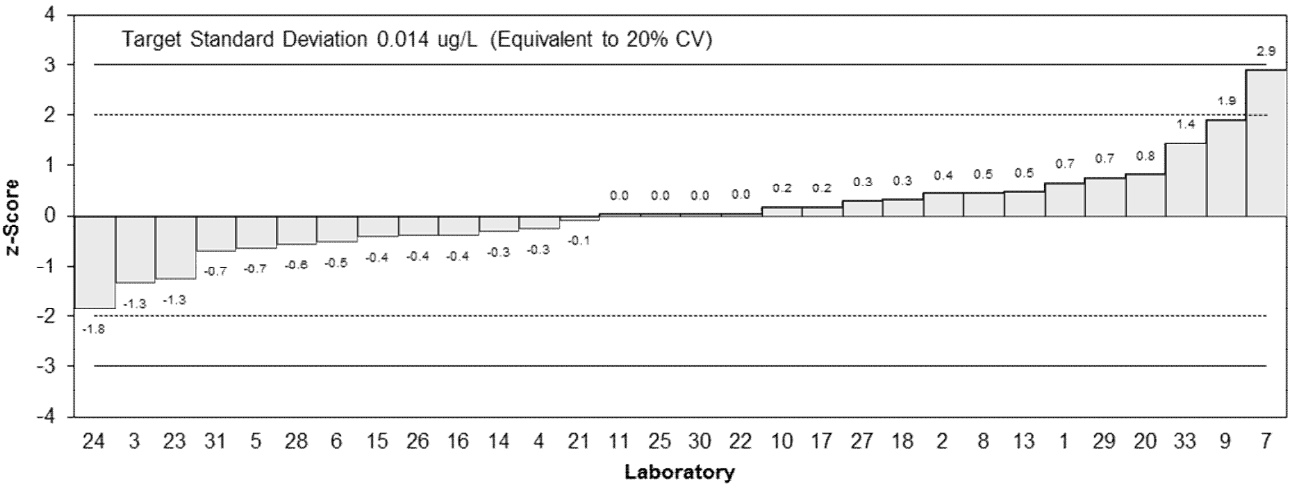
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0788	0.0132	103	0.66	0.69
2	0.0757	0.0227	129	0.44	0.27
3	0.051	0.007	NR	-1.34	-2.51
4	0.066	0.006	116	-0.26	-0.56
5	0.060416	0.004851482	100	-0.66	-1.70
6	0.0625	0.0169	117	-0.51	-0.42
7	0.11	0.04	77.6	2.90	1.01
8	0.076	0.008	104	0.46	0.77
9	0.096	0.005	95.4	1.90	4.76
10	0.072	0.0216	106	0.17	0.11
11	0.07	0.02	88	0.03	0.02
13	0.0762	0.02286	94	0.47	0.29
14	0.0652	0.0130	113	-0.32	-0.33
15	0.0636	0.0127	100	-0.43	-0.46
16	0.0642	0.008	NR	-0.39	-0.65
17	0.072	0.02	105	0.17	0.12
18	0.074	0.0039	106	0.32	0.96
19	NT	NT	NT		
20	0.081	0.023	108	0.82	0.49
21	0.0683	0.0041	NR	-0.09	-0.27
22	0.0702	0.0197	109.4	0.04	0.03
23	0.052	0.005	100	-1.26	-3.17
24	0.044	0.018	NR	-1.84	-1.41
25	0.07	0.022	99.7	0.03	0.02
26	0.064	0.0183	110	-0.40	-0.30
27	0.0736	0.0184	24	0.29	0.22
28	0.0617	0.015425	96.4	-0.57	-0.51
29	0.08	0.03	119	0.75	0.35
30	0.07	0.017	77	0.03	0.02
31	0.06	0.011	104	-0.69	-0.85
32	NT	NT	NT		
33	0.0897	0.0194	84	1.44	1.03

Statistics

Assigned Value*	0.0696	0.0024
Spike	0.0805	0.0040
Reference Value	0.0696	0.0024
Robust Average	0.0698	0.0046
Median	0.0700	0.0034
Mean	0.0706	
N	30	
Max.	0.11	
Min.	0.044	
Robust SD	0.010	
Robust CV	14%	

*Assigned value is the reference value, determined by ID-LC-MSMS.


Kernel Density
Density
Result
Results: S4 - PFOA
Assigned Value = 0.0696 ± 0.0024 ug/L
Results (ug/L)
Laboratory
24 3 23 31 5 28 6 15 26 16 14 4 21 11 25 30 22 10 17 27 18 2 8 13 1 29 20 33 9 7 19 32 Md R.A. R.V. S.V.


z-Scores: S4 - PFOA
Target Standard Deviation 0.014 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
24 3 23 31 5 28 6 15 26 16 14 4 21 11 25 30 22 10 17 27 18 2 8 13 1 29 20 33 9 7

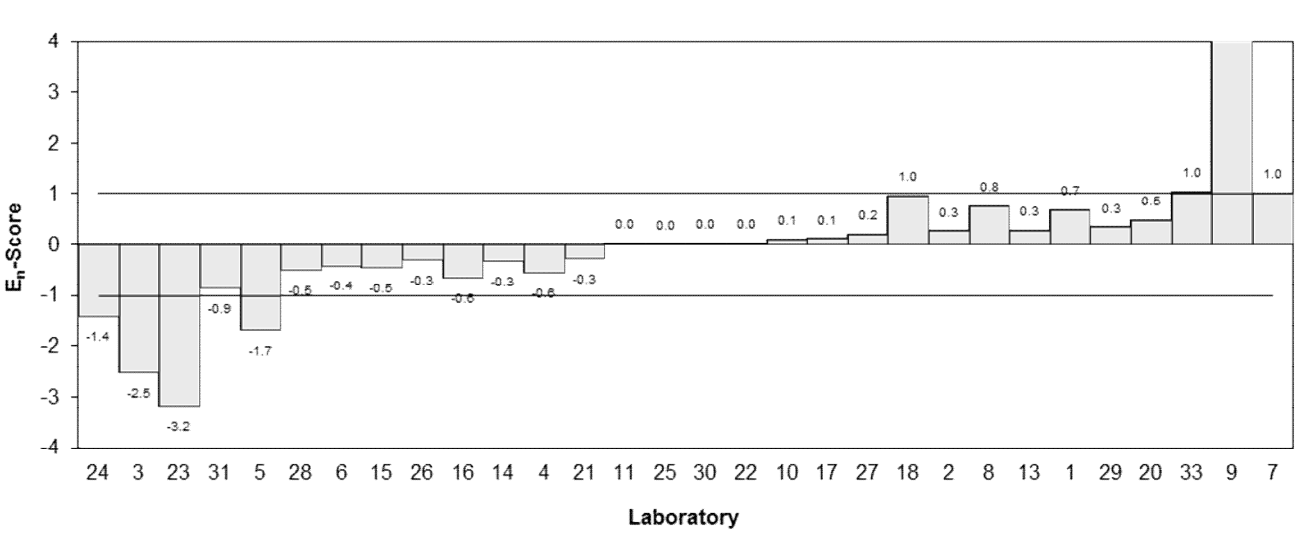

En-Scores: S4 - PFOA
En-Score
Laboratory
24 3 23 31 5 28 6 15 26 16 14 4 21 11 25 30 22 10 17 27 18 2 8 13 1 29 20 33 9 7

Figure 73

Table 80

Sample Details

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

Participant Results

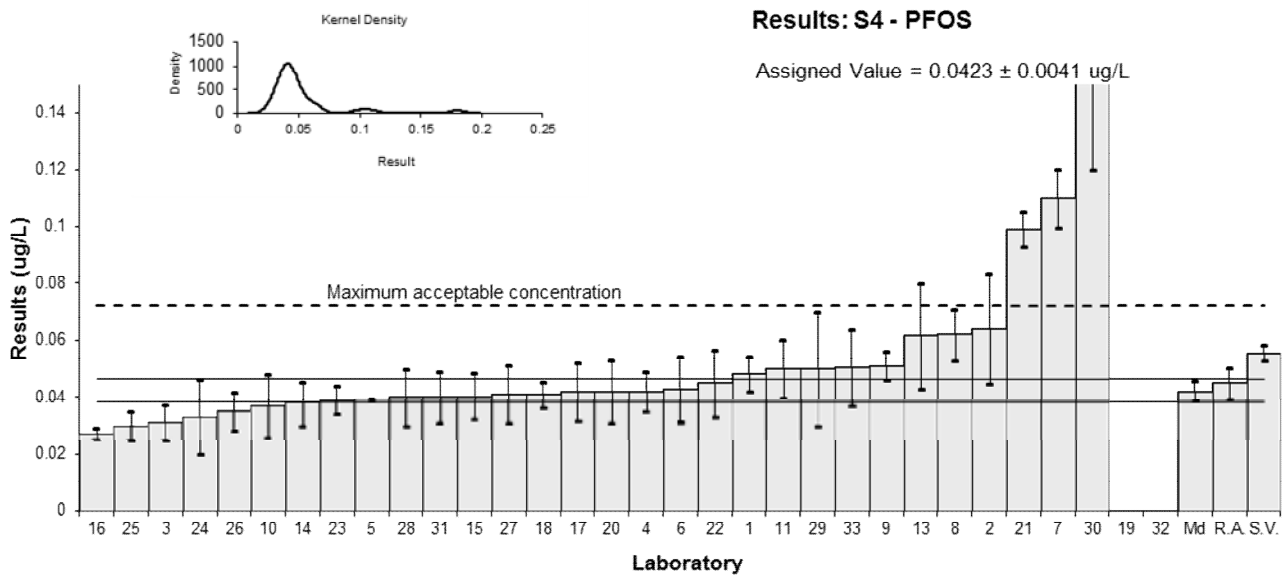
Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0481	0.0061	102	0.69	0.79
2**	0.0642	0.0193	276	2.00	1.00
3	0.031	0.006	NR	-1.34	-1.55
4	0.042	0.007	116	-0.04	-0.04
5	0.039028	0.000513464	84	-0.39	-0.79
6	0.0428	0.0116	111	0.06	0.04
7	0.11	0.01	93.7	8.00	6.26
8**	0.062	0.009	104	2.00	1.00
9	0.051	0.005	98.0	1.03	1.35
10	0.037	0.0111	110	-0.63	-0.45
11	0.05	0.01	80	0.91	0.71
13**	0.0617	0.01851	90	2.00	1.00
14	0.0377	0.0076	98	-0.54	-0.53
15	0.0403	0.00805	85	-0.24	-0.22
16	0.0273	0.002	NR	-1.77	-3.29
17	0.042	0.01	103	-0.04	-0.03
18	0.041	0.0045	115	-0.15	-0.21
19	NT	NT	NT		
20	0.042	0.011	96	-0.04	-0.03
21	0.0991	0.0060	NR	6.71	7.82
22	0.0449	0.0117	96.4	0.31	0.21
23	0.039	0.005	101	-0.39	-0.51
24	0.033	0.013	NR	-1.10	-0.68
25	0.03	0.005	97.6	-1.45	-1.90
26	0.035	0.0067	110	-0.86	-0.93
27	0.0409	0.0102	76	-0.17	-0.13
28	0.04	0.01	104.7	-0.27	-0.21
29	0.05	0.02	103	0.91	0.38
30	0.18	0.06	77	16.28	2.29
31	0.04	0.009	118	-0.27	-0.23
32	NT	NT	NT		
33	0.0504	0.0135	100	0.96	0.57

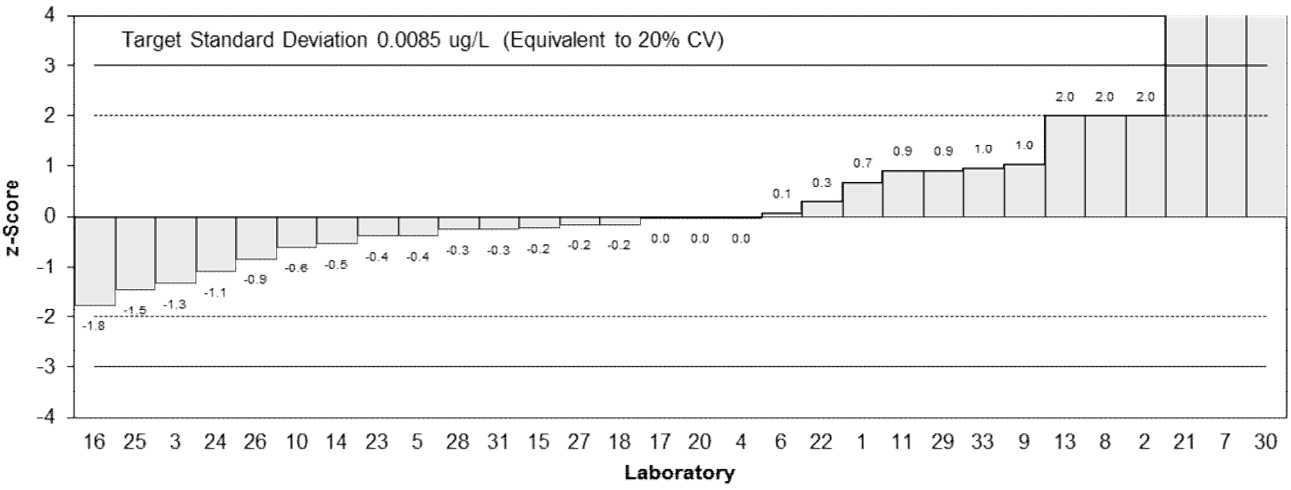
Statistics

Assigned Value*	0.0423	0.0041
Spike	0.0556	0.0028
Maximum acceptable conc.**	0.0726	
Robust Average	0.0450	0.0055
Median	0.0420	0.0036
Mean	0.0517	
N	30	
Max.	0.18	
Min.	0.0273	
Robust SD	0.0085	
Robust CV	20%	

*Assigned value is the robust average excluding laboratories 7, 21, 30.

**z-score adjusted to 2 (see Section 6.3).


Results: S4 - PFOS
Assigned Value = 0.0423 ± 0.0041 ug/L
Kernel Density
Density
Result
Maximum acceptable concentration
Results (ug/L)
Laboratory
16 25 3 24 26 10 14 23 5 28 31 15 27 18 17 20 4 6 22 1 11 29 33 9 13 8 2 21 7 30 19 32 Md R.A. S.V.


z-Scores: S4 - PFOS
Target Standard Deviation 0.0085 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
16 25 3 24 26 10 14 23 5 28 31 15 27 18 17 20 4 6 22 1 11 29 33 9 13 8 2 21 7 30

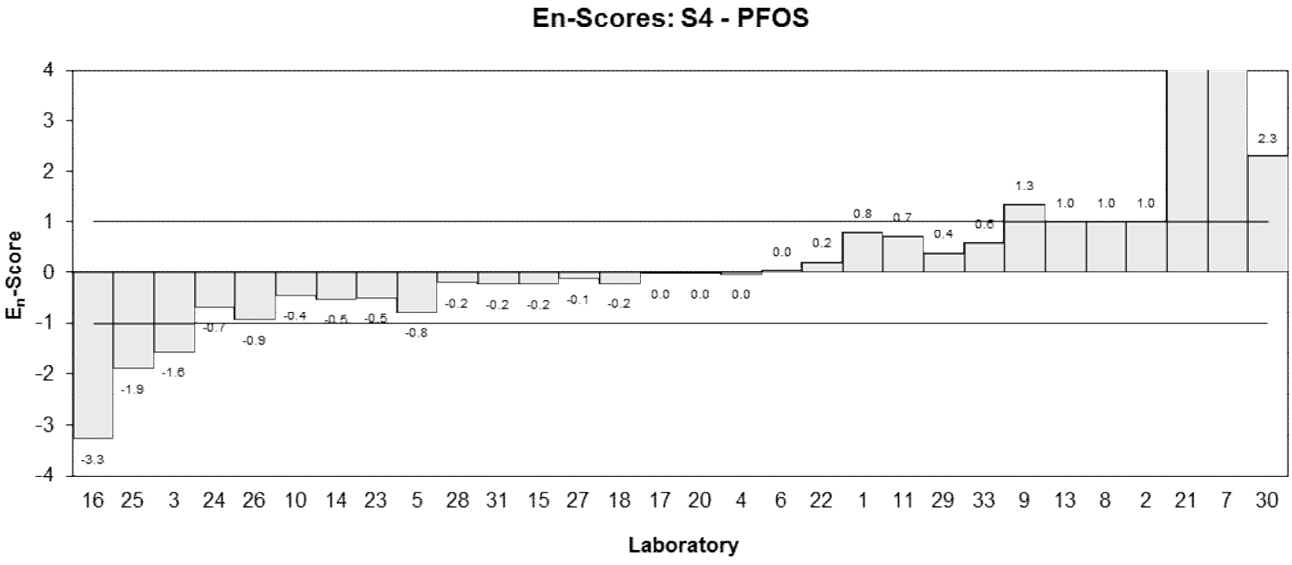

En-Scores: S4 - PFOS
En-Score
Laboratory
16 25 3 24 26 10 14 23 5 28 31 15 27 18 17 20 4 6 22 1 11 29 33 9 13 8 2 21 7 30

Figure 74

Table 81

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.388	0.052	97
2	0.282	0.0846	93
3	0.156	0.017	NR
4	0.244	0.023	116
5	0.19283	0.078770978	43
6	0.1654	0.0447	113
7	0.42	0.05	NR
8	0.14	0.015	109
9	0.254	0.02	71.8
10	0.18	0.054	153
11	NT	NT	NT
13	0.273	0.1365	92
14	0.193	0.0385	51
15	0.209	0.0418	96
16	NR	NR	NR
17	0.19	0.05	79
18	0.16	0.015	111
19	NT	NT	NT
20	0.19	0.049	77
21	NT	NT	NT
22	NT	NT	NT
23	0.13	0.03	NR
24	NT	NT	NT
25	0.15	0.025	NR
26	0.207	0.001	NR
27	0.174	0.0435	41
28	0.204	0.051	42.3
29	0.2	0.1	109
30	0.24	0.06	83
31	0.14	0.032	93
32	NT	NT	NT
33	0.190	0.0382	70

Statistics

Assigned Value	Not Set	
Spike	0.0630	0.0032
Robust Average	0.201	0.026
Median	0.193	0.020
Mean	0.211	
N	25	
Max.	0.42	
Min.	0.13	
Robust SD	0.053	
Robust CV	26%	

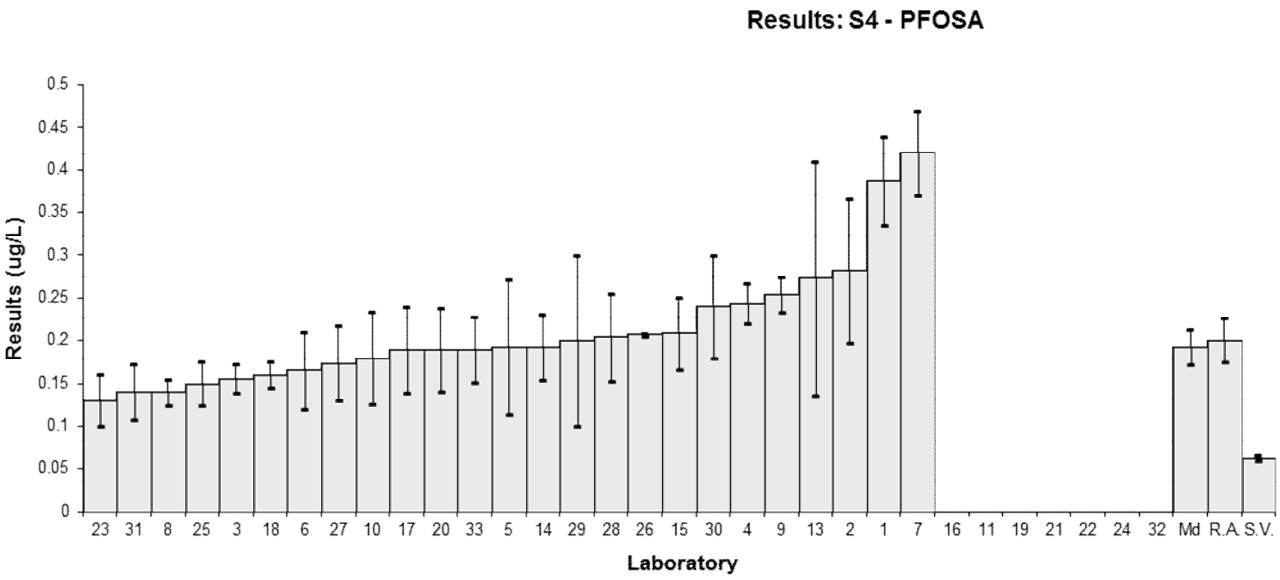

Results: S4 - PFOSA
Results (ug/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
23 31 8 25 3 18 6 27 10 17 20 33 5 14 29 28 26 15 30 4 9 13 2 1 7 16 11 19 21 22 24 32 Md R.A S.V.
Laboratory

Figure 75

Table 82

Sample Details

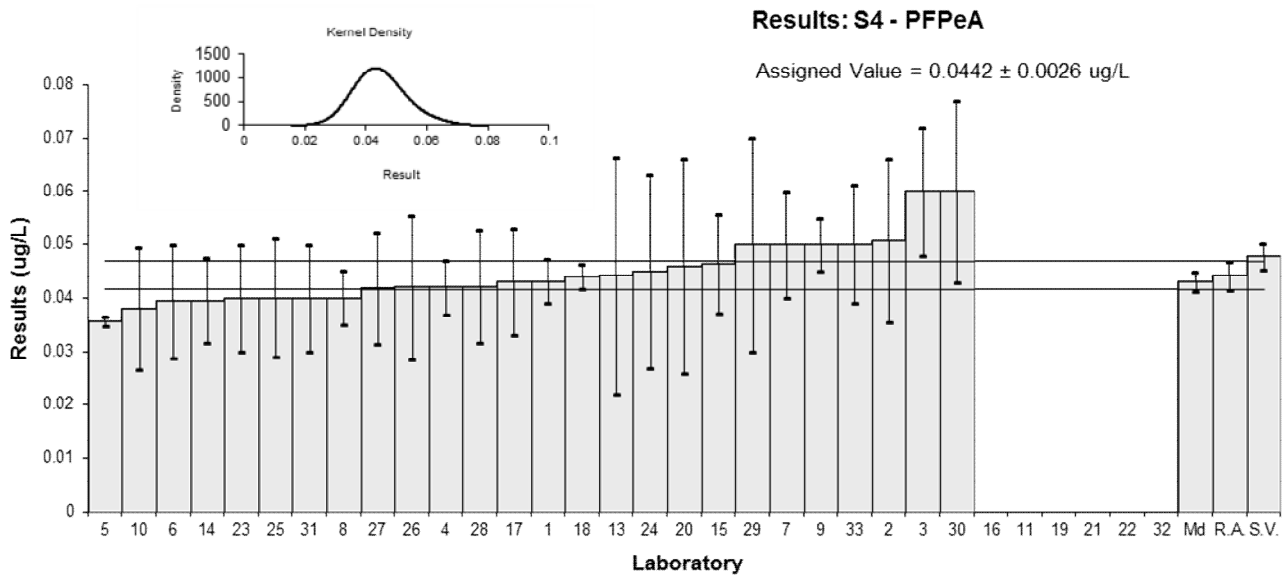
Sample No.	S4
Matrix.	water
Analyte.	PFPeA
Units	µg/L

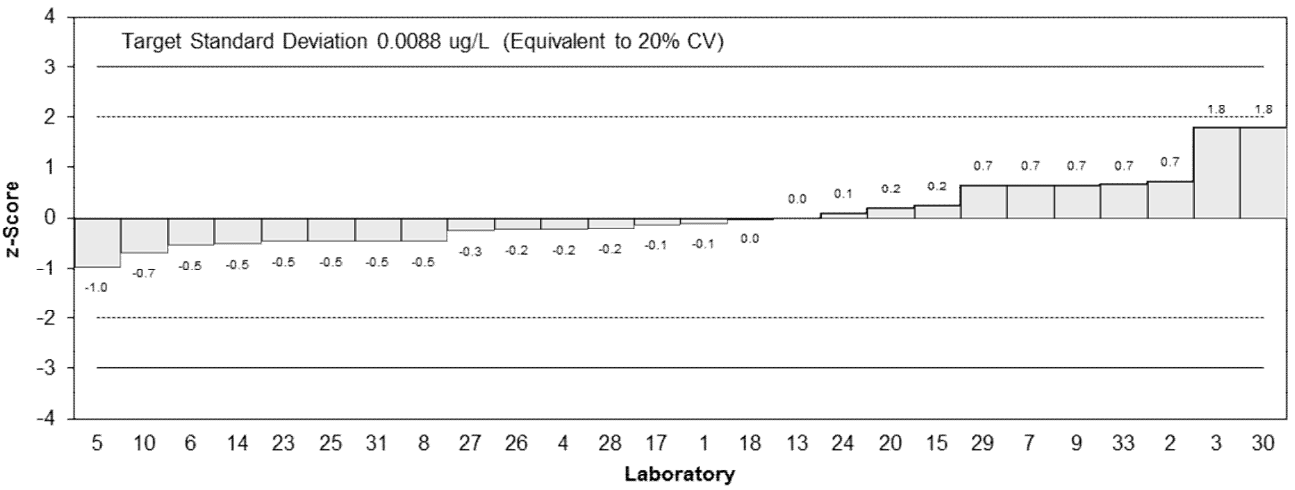
Participant Results

Lab Code	Result	Uncertainty	Recovery	z-Score	E_n-Score
1	0.0431	0.0041	100	-0.12	-0.23
2	0.0507	0.0152	117	0.74	0.42
3	0.060	0.012	NR	1.79	1.29
4	0.042	0.005	116	-0.25	-0.39
5	0.035624	0.0008	98	-0.97	-3.15
6	0.0394	0.0106	113	-0.54	-0.44
7	0.05	0.01	NR	0.66	0.56
8	0.040	0.005	100	-0.48	-0.75
9	0.050	0.005	110.4	0.66	1.03
10	0.038	0.0114	102	-0.70	-0.53
11	NT	NT	NT		
13	0.0442	0.0221	98	0.00	0.00
14	0.0395	0.0079	89	-0.53	-0.57
15	0.0464	0.00928	70	0.25	0.23
16	NR	NR	NR		
17	0.043	0.01	101	-0.14	-0.12
18	0.044	0.0023	100	-0.02	-0.06
19	NT	NT	NT		
20	0.046	0.02	113	0.20	0.09
21	NT	NT	NT		
22	NT	NT	NT		
23	0.04	0.01	NR	-0.48	-0.41
24	0.045	0.018	NR	0.09	0.04
25	0.04	0.011	NR	-0.48	-0.37
26	0.042	0.0135	NR	-0.25	-0.16
27	0.0419	0.0105	103	-0.26	-0.21
28	0.0422	0.01055	93.8	-0.23	-0.18
29	0.05	0.02	104	0.66	0.29
30	0.06	0.017	89	1.79	0.92
31	0.04	0.010	83	-0.48	-0.41
32	NT	NT	NT		
33	0.0501	0.0110	77	0.67	0.52

Statistics

Assigned Value	0.0442	0.0026
Spike	0.0478	0.0024
Robust Average	0.0442	0.0026
Median	0.0431	0.0018
Mean	0.0447	
N	26	
Max.	0.06	
Min.	0.035624	
Robust SD	0.0053	
Robust CV	12%	


Results: S4 - PFPeA
Assigned Value = 0.0442 ± 0.0026 ug/L
Kernel Density
Density
Result
Results (ug/L)
Laboratory
5 10 6 14 23 25 31 8 27 26 4 28 17 1 18 13 24 20 15 29 7 9 33 2 3 30 16 11 19 21 22 32 Md R.A. S.V.


z-Scores: S4 - PFPeA
Target Standard Deviation 0.0088 ug/L (Equivalent to 20% CV)
z-Score
Laboratory
5 10 6 14 23 25 31 8 27 26 4 28 17 1 18 13 24 20 15 29 7 9 33 2 3 30

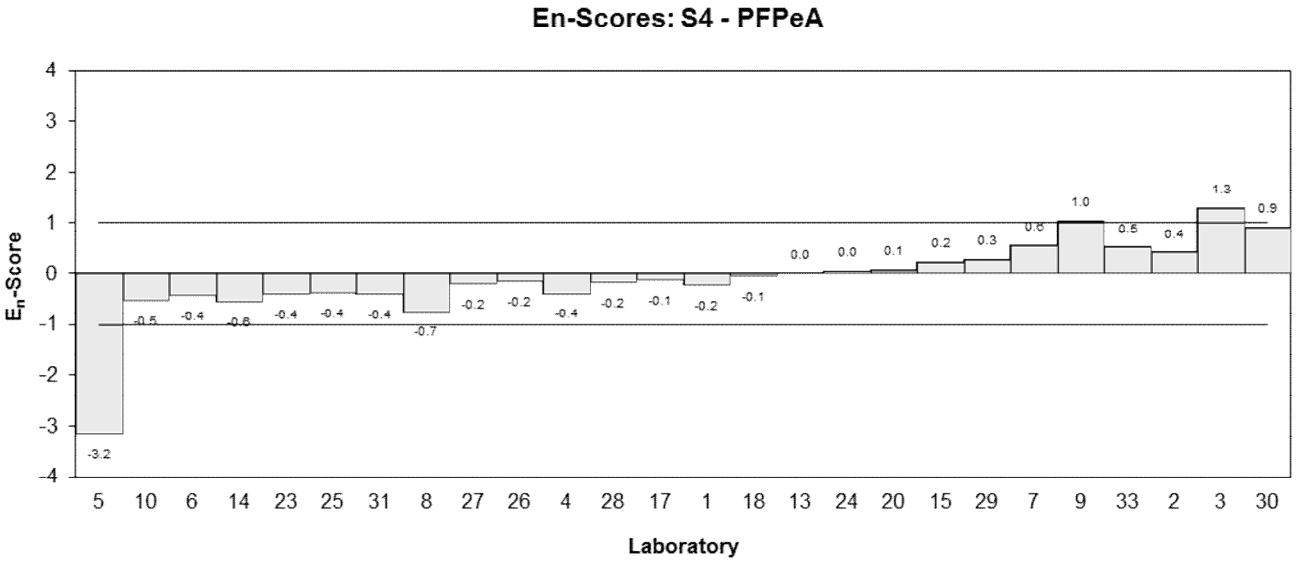

En-Scores: S4 - PFPeA
En-Score
Laboratory
5 10 6 14 23 25 31 8 27 26 4 28 17 1 18 13 24 20 15 29 7 9 33 2 3 30

Figure 76

Table 83

Sample Details

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

Participant Results

Lab Code	Result	Uncertainty	Recovery
1	0.0746	0.0092	101
2	0.0237	0.00711	208
3	0.160	0.024	NR
4	<0.025	NR	116
5	0.054686	0.002388411	9
6	0.0178	0.0048	100
7	<0.05	NR	NR
8	0.077	0.009	74
9	0.047	0.005	NR
10	0.012	0.0036	107
11	NT	NT	NT
13	0.0962	0.002604	71
14	0.0465	0.0093	65
15	0.0438	0.0131	96
16	0.0171	0.005	NR
17	0.070	0.02	82
18	0.019	0.0071	133
19	NT	NT	NT
20	0.15	0.084	45
21	0.0972	0.0603	NR
22	NT	NT	NT
23	<0.05	NR	NR
24	NT	NT	NT
25	<0.05	0.009	NR
26	<0.05	NR	NR
27	0.0201	0.00503	22
28	0.0616	0.0154	85.4
29	< 0.5	NR	85
30	0.03	0.01	83
31	0.02	0.006	63
32	NT	NT	NT
33	0.103	0.0265	64

Statistics

Assigned Value	Not Set	
Spike	0.0840	0.0042
Robust Average	0.055	0.022
Median	0.047	0.019
Mean	0.059	
N	21	
Max.	0.16	
Min.	0.012	
Robust SD	0.039	
Robust CV	71%	

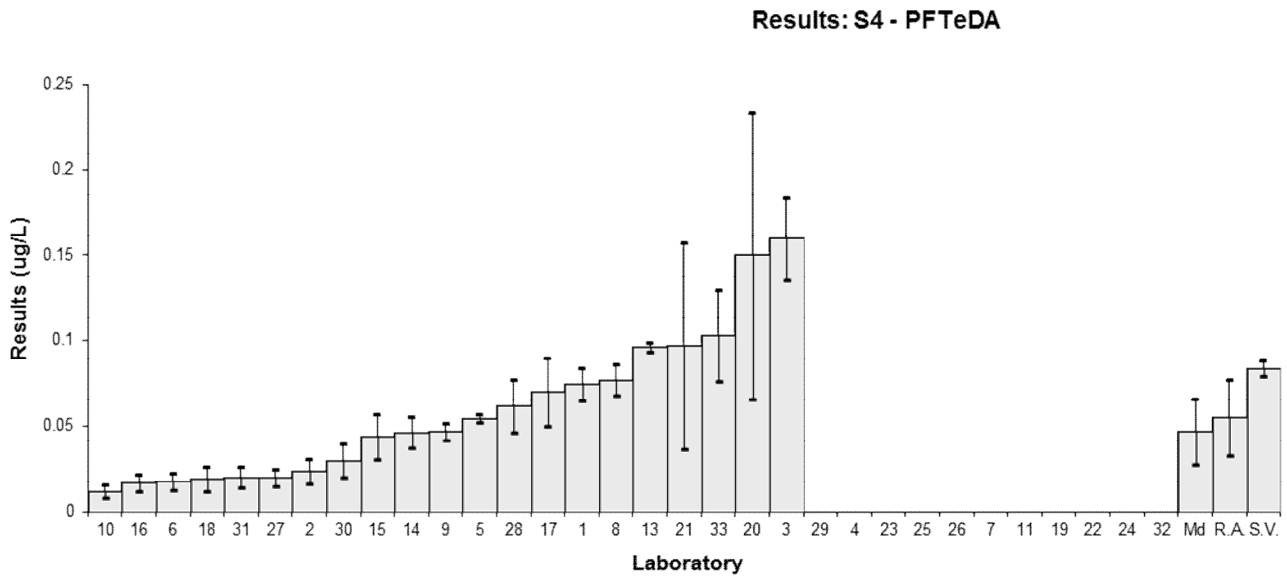
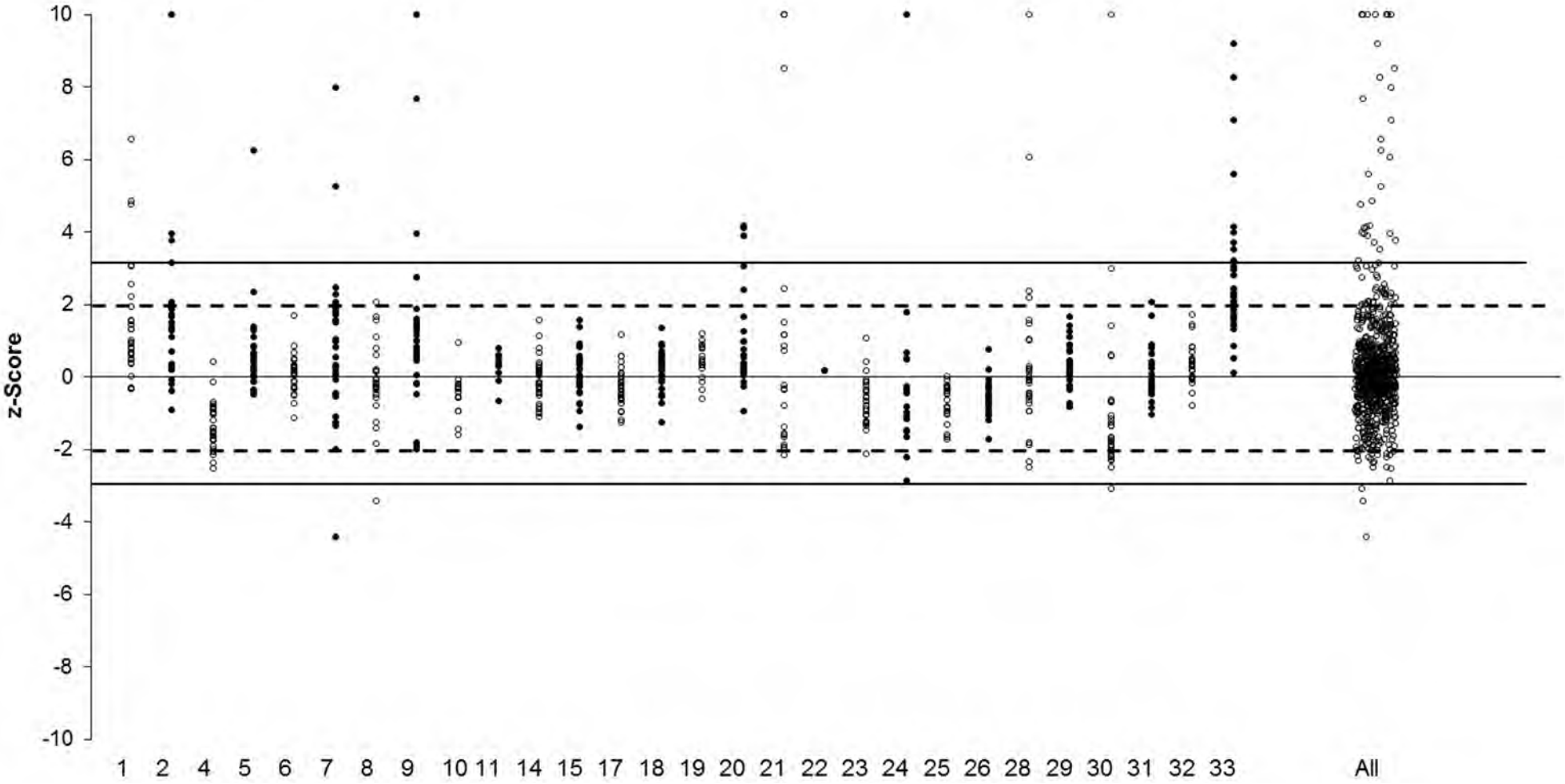
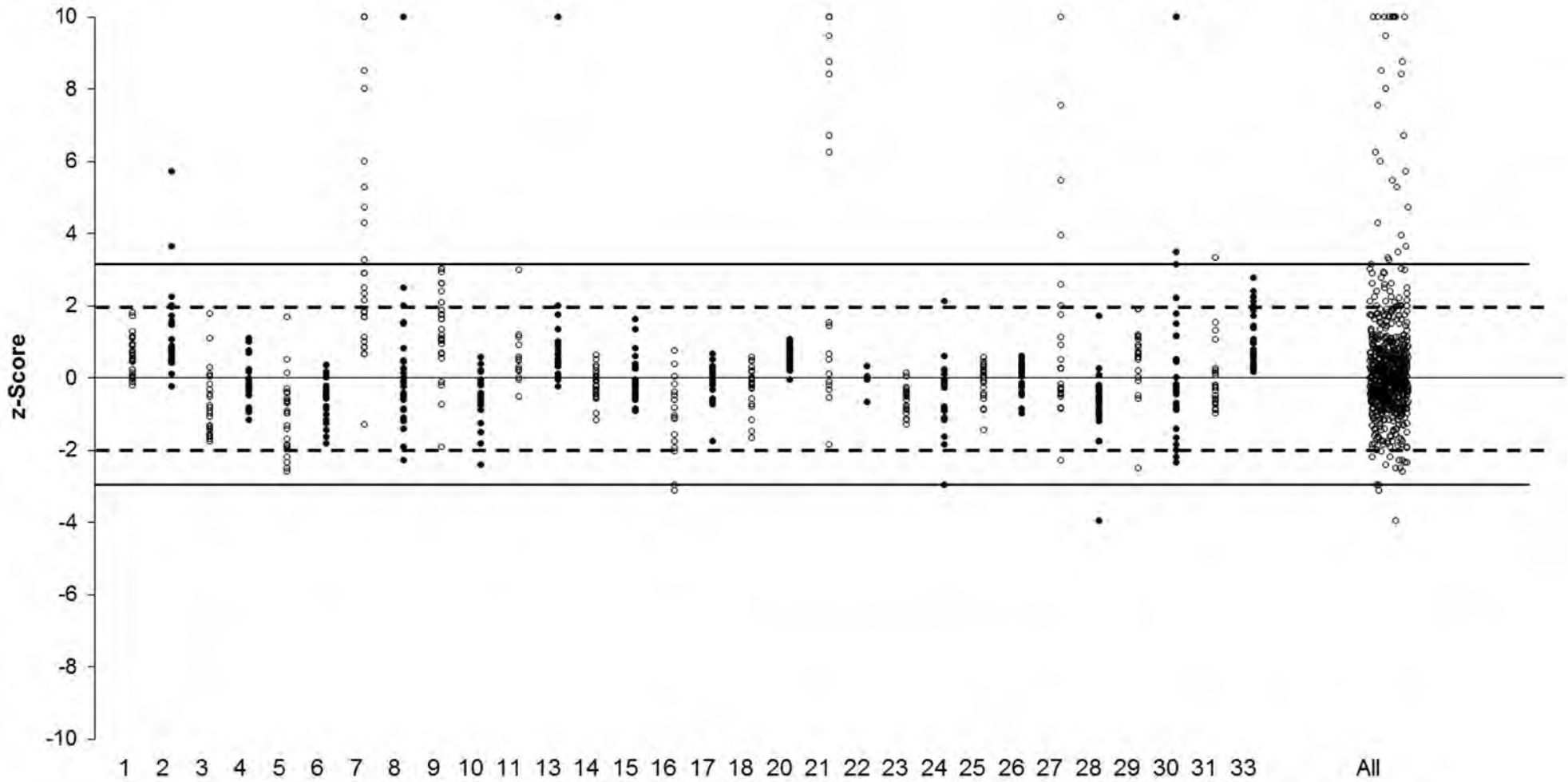

Results: S4 - PFTeDA
Results (ug/L)
0.25
0.2
0.15
0.1
0.05
0
10 16 6 18 31 27 2 30 15 14 9 5 28 17 1 8 13 21 33 20 3 29 4 23 25 26 7 11 19 22 24 32 Md R.A S.V.
Laboratory

Figure 77



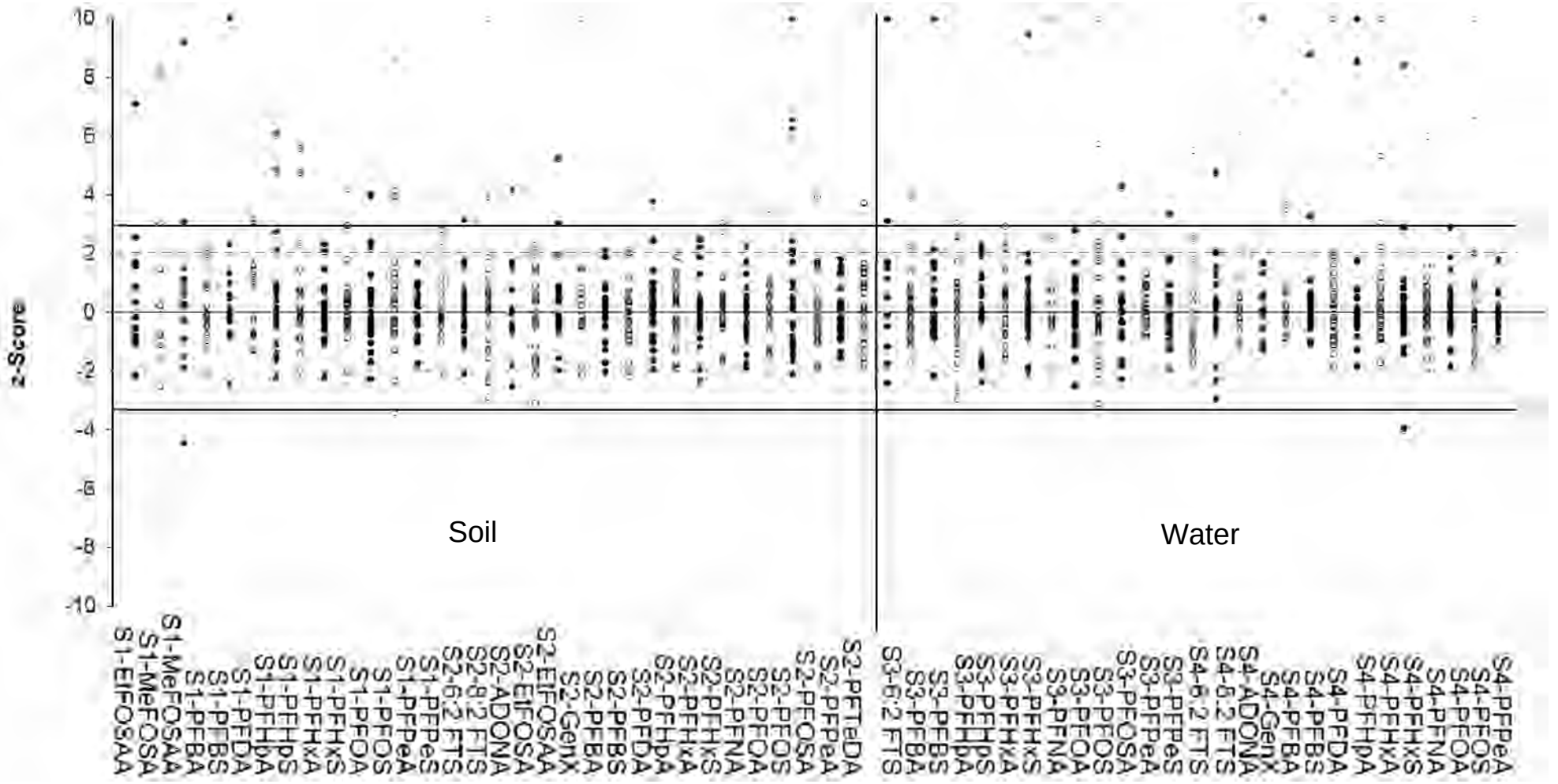
Scores greater than 10 have been plotted as 10.

Figure 78 z-Score Dispersal by Laboratory for Soil Samples S1 and S2



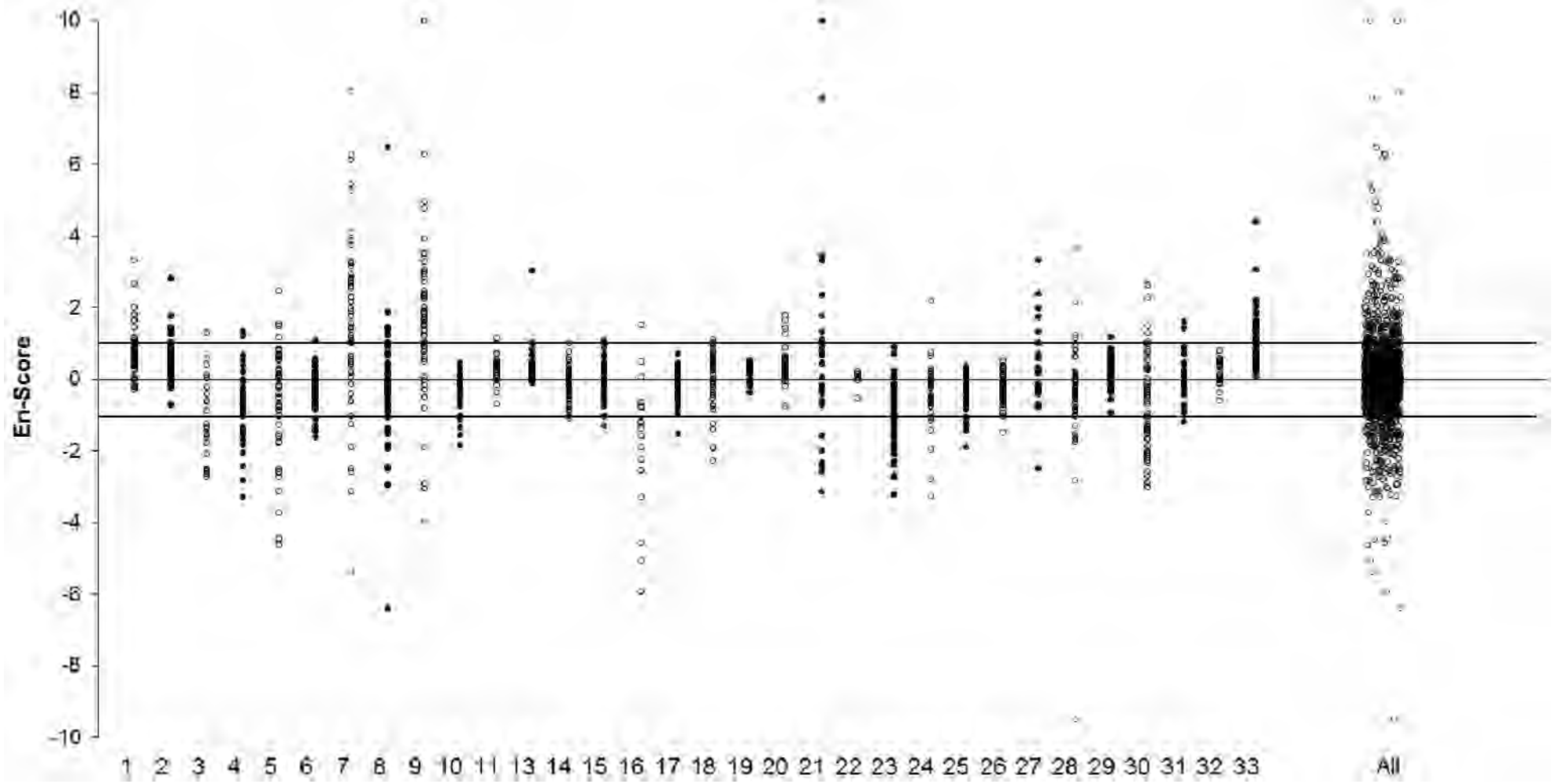
Scores greater than 10 have been plotted as 10.

Figure 79 z-Score Dispersal by Laboratory for Water Samples S3 and S4



Scores greater than 10 have been plotted as 10.

Figure 80 z-Score Dispersal by Analyte



Scores greater than 10 have been plotted as 10.

Figure 81 E_n-Score Dispersal by Laboratory

6 DISCUSSION OF RESULTS

6.1 Assigned Value

A reference value was obtained for PFOA in water Sample S4. The uncertainty of the reference value was estimated from an uncertainty budget of the measurement process. The reference value was used as the assigned value for this analyte.

Traceability: The reference value of PFOA in Sample S4 relies on gravimetric sample preparation, quantification by LC-MSMS, and density measurement. Gravimetric measurements are traceable to the SI unit for mass, the kilogram, through the Australian standard for mass. LC-MSMS measurements are traceable to the SI unit for mass via calibration with pure standard reference material certified by the National Metrology Institute, Japan (NMIJ 4056-a). Density measurement was calibrated using ultra high purity water and is traceable to the NMI Australia determination of the density of water.

The robust average of participants' results was used as the assigned value for all other analytes. The robust averages and associated expanded uncertainties were calculated using the procedure described in 'ISO 13528:2015(E), Statistical methods for use in proficiency testing by interlaboratory comparisons'.[8] The calculation of the expanded uncertainty for the robust average of PFBA in Sample S2 is presented in Appendix 2.

Results less than 50% and greater than 150% of the robust average were removed before calculation of the assigned value.[4,5]

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

Assigned values for spiked analytes in Samples S2 and S4 were within the range 70 – 168% of the spiked concentration for that analyte (Table 84).

No assigned values were calculated for EtFOSA, EtFOSE, MeFOSE, PFDoA, PFDS, PFNA, PFNS, PFOSA, PFTeDA, PFTrA, and PFUnA in Sample S1, MeFOSE in Sample S2, and PFTeDA in Sample S4, because few laboratories reported numeric results and/or these results were too variable. No assigned values were calculated for PFOSA, EtFOSA, EtFOSAA, and MeFOSE in Sample S4 because of instability due to possible analyte interconversion.[9-13]

Table 84 Comparison of Assigned Value and Spiked Concentration.

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	6:2 FTS	µg/kg	9.51	9.03	95
S2	Soil	8:2 FTS	µg/kg	9.61	9.0	94
S2	Soil	ADONA	µg/kg	78.2	69	88
S2	Soil	EtFOSA	µg/kg	9.36	8.4	90
S2	Soil	EtFOSAA	µg/kg	5.35	4.17	78
S2	Soil	GenX	µg/kg	75.0	60.3	80
S2	Soil	PFBA	µg/kg	30.1	27.5	91
S2	Soil	PFBS	µg/kg	20.3	15.9	78
S2	Soil	PFDA	µg/kg	60.3	53.9	89
S2	Soil	PFHpA	µg/kg	5.03	4.51	90
S2	Soil	PFHxA	µg/kg	10.1	9.70	96

Sample	Matrix	Analyte	Units	Spiked Concentration	Assigned Value	Assigned/ Spike (%)
S2	Soil	PFHxS	µg/kg	9.12	8.01	88
S2	Soil	PFNA	µg/kg	6.87	6.41	93
S2	Soil	PFOA	µg/kg	1.99	1.70	85
S2	Soil	PFOS	µg/kg	4.64	7.8	168
S2	Soil	PFOSA	µg/kg	14.9	11.3	76
S2	Soil	PFPeA	µg/kg	7.32	6.86	94
S2	Soil	PFTeDA	µg/kg	19.6	15.8	81
S4	Water	6:2 FTS	µg/L	0.0189	0.0200	106
S4	Water	8:2 FTS	µg/L	0.0812	0.0566	70
S4	Water	ADONA	µg/L	0.141	0.146	104
S4	Water	GenX	µg/L	0.150	0.148	99
S4	Water	PFBA	µg/L	0.110	0.106	96
S4	Water	PFBS	µg/L	0.0598	0.0483	81
S4	Water	PFDA	µg/L	0.0498	0.0362	73
S4	Water	PFHpA	µg/L	0.00950	0.0111	117
S4	Water	PFHxA	µg/L	0.0235	0.0243	103
S4	Water	PFHxS	µg/L	0.0907	0.0824	91
S4	Water	PFNA	µg/L	0.112	0.100	89
S4	Water	PFOA	µg/L	0.0805	0.0696	86
S4	Water	PFOS	µg/L	0.0556	0.0423	76
S4	Water	PFPeA	µg/L	0.0478	0.0442	92

6.2 Measurement Uncertainty Reported by Participants

Participants were asked to report an estimate of the expanded uncertainty associated with their results and the basis of this uncertainty estimate (Table 6).

It is a requirement of the ISO Standard 17025 that laboratories have procedures to estimate the uncertainty of chemical measurements and to report this uncertainty in specific circumstances, including when the client's instruction so requires.

One thousand, six hundred and sixteen of one thousand, six hundred and twenty results were reported with an associated estimate of expanded measurement uncertainty. Laboratories **4**, **16**, and **33** did not report expanded measurement uncertainties for all their tested analytes.

The magnitude of the reported expanded uncertainties was within the range 0.1% to 100% of the reported value. Two hundred and two were less than 10% relative, which the study coordinator believes are unrealistically small for a routine PFAS measurement and thirty-one were larger than 50% relative.

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

Some participants attached an estimate of the expanded measurement uncertainty to a result reported as less than their limit of reporting.

In some cases the 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 instead of 12.808 ± 2.818 µg/kg, it is better to report 12.8 ± 2.8 µg/kg).[7]

6.3 z-Score

A target standard deviation equivalent to 20% coefficient of variation (CV) was used to calculate z-scores. The between-laboratory coefficient of variation predicted by the modified Horwitz equation[14] and the between laboratories CV are presented for comparison in Table 85.

Table 85 Performance Target standard deviation, modified Horwitz values and between laboratories CV

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between laboratories' CV (%)
S1	EtFOSAA	1.91	µg/kg	20	22	31
S1	MeFOSA	2.00	µg/kg	20	22	30
S1	MeFOSAA	5.29	µg/kg	20	22	25
S1	PFBA	9.3	µg/kg	20	22	20
S1	PFBS	11.7	µg/kg	20	22	14
S1	PFDA	3.48	µg/kg	20	22	25
S1	PFHpA	17.6	µg/kg	20	22	20
S1	PFHpS	43.4	µg/kg	20	22	18
S1	PFHxA	205	µg/kg	20	20	15
S1	PFHxS	398	µg/kg	20	18	12
S1	PFOA	104	µg/kg	20	22	21
S1	PFOS	60300	µg/kg	20	9	18
S1	PFPeA	24.0	µg/kg	20	22	17
S1	PFPeS	20.3	µg/kg	20	22	17
S2	6:2 FTS	9.03	µg/kg	20	22	20
S2	8:2 FTS	9.0	µg/kg	20	22	23
S2	ADONA	69	µg/kg	20	22	25
S2	EtFOSA	8.4	µg/kg	20	22	30
S2	EtFOSAA	4.17	µg/kg	20	22	17
S2	GenX	60.3	µg/kg	20	22	23
S2	PFBA	27.5	µg/kg	20	22	15
S2	PFBS	15.9	µg/kg	20	22	17
S2	PFDA	53.9	µg/kg	20	22	19
S2	PFHpA	4.51	µg/kg	20	22	24
S2	PFHxA	9.70	µg/kg	20	22	15

Sample	Analyte	Assigned value	Unit	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between laboratories' CV (%)
S2	PFHxS	8.01	µg/kg	20	22	12
S2	PFNA	6.41	µg/kg	20	22	20
S2	PFOA	1.70	µg/kg	20	22	19
S2	PFOS	7.8	µg/kg	20	22	29
S2	PFOSA	11.3	µg/kg	20	22	25
S2	PFPeA	6.86	µg/kg	20	22	17
S2	PFTeDA	15.8	µg/kg	20	22	25
S3	6:2 FTS	0.0123	µg/L	20	22	27
S3	PFBA	0.197	µg/L	20	22	16
S3	PFBS	0.659	µg/L	20	22	18
S3	PFHpA	0.167	µg/L	20	22	20
S3	PFHpS	0.341	µg/L	20	22	28
S3	PFHxA	1.53	µg/L	20	22	22
S3	PFHxS	5.80	µg/L	20	22	19
S3	PFNA	0.00526	µg/L	20	22	19
S3	PFOA	0.404	µg/L	20	22	22
S3	PFOS	4.76	µg/L	20	22	25
S3	PFOSA	0.0645	µg/L	20	22	26
S3	PFPeA	0.350	µg/L	20	22	15
S3	PFPeS	0.719	µg/L	20	22	19
S4	6:2 FTS	0.0200	µg/L	20	22	29
S4	8:2 FTS	0.0566	µg/L	20	22	17
S4	ADONA	0.146	µg/L	20	22	17
S4	GenX	0.148	µg/L	20	22	17
S4	PFBA	0.106	µg/L	20	22	12
S4	PFBS	0.0483	µg/L	20	22	8.9
S4	PFDA	0.0362	µg/L	20	22	23
S4	PFHpA	0.0111	µg/L	20	22	17
S4	PFHxA	0.0243	µg/L	20	22	16
S4	PFHxS	0.0824	µg/L	20	22	13
S4	PFNA	0.100	µg/L	20	22	16
S4	PFOA	0.0696	µg/L	20	22	14
S4	PFOS	0.0423	µg/L	20	22	20
S4	PFPeA	0.0442	µg/L	20	22	12

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 predictive mathematical model (modified Horwitz equation).

To account for possible bias in the consensus values due to laboratories using inefficient analytical/extraction techniques, z-scores were adjusted for PFBS in Sample S2 and 8:2 FTS, PFDA, and PFOS in Sample S4. For these analytes, z-scores greater than 2 were set at 2. A maximum acceptable concentration was set to two target standard deviations more than the spiked level. For results higher than the maximum acceptable concentration, z-scores were not adjusted. This ensured 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 78 and 79 and by analyte in Figure 80.

Of the 1382 results for which z-scores were calculated, 1228 (89%) returned a satisfactory z-score of $|z| \leq 2$.

Twenty-six laboratories analysed both matrices. The total number of results for which z-scores were calculated and the number of satisfactory z and E_n-scores reported by each of these laboratories are presented in Figure 82. Laboratories **14** and **15** returned satisfactory z-scores for all analytes for which z-scores were calculated (59). All the results reported by laboratories **6** (57), **18** (52), **17** (51), **26** (47), **25** (43), and **22** (6) returned satisfactory z-scores.

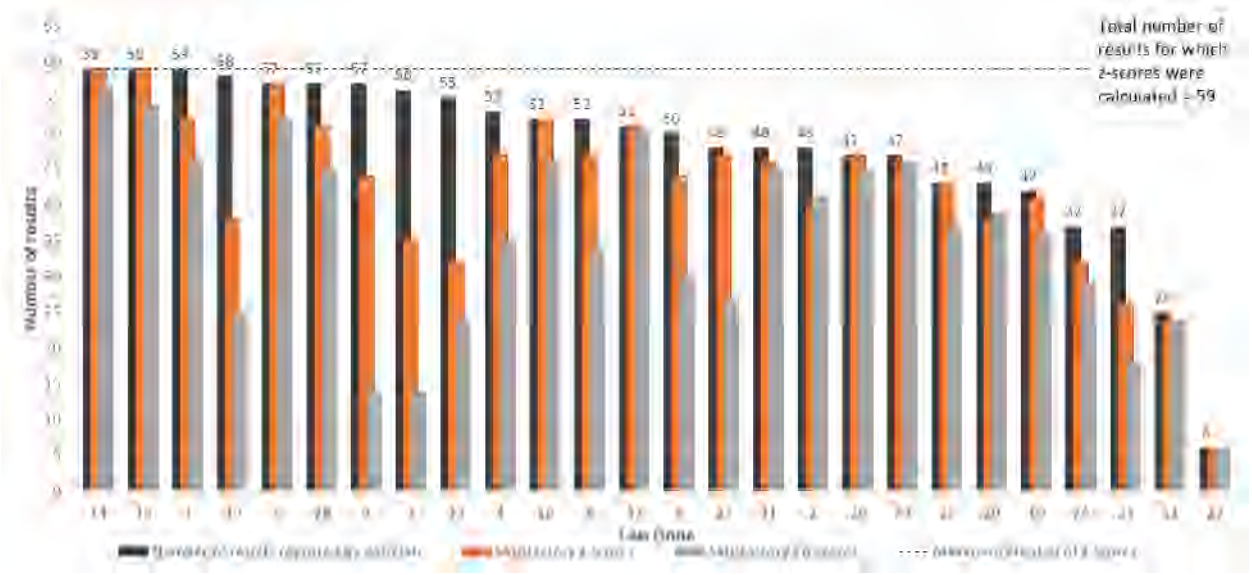


Figure 82 Total number of results for which z-scores were calculated and the numbers of satisfactory z and E_n-scores for laboratories that analysed both matrices

Six laboratories analysed one matrix only (Figure 83). None of these laboratories returned satisfactory z-scores for all analytes for which z-scores were calculated, for either soil (32) or water (27). For the laboratories which analysed soil only, laboratory **32** returned the highest number of satisfactory z-scores (25), which are all the results reported by this laboratory. All the results reported by laboratory **19** (18) returned satisfactory z-scores. For the laboratories which analysed water only, laboratory **3** returned highest number of satisfactory z-scores (25), which are all the results reported by this laboratory.

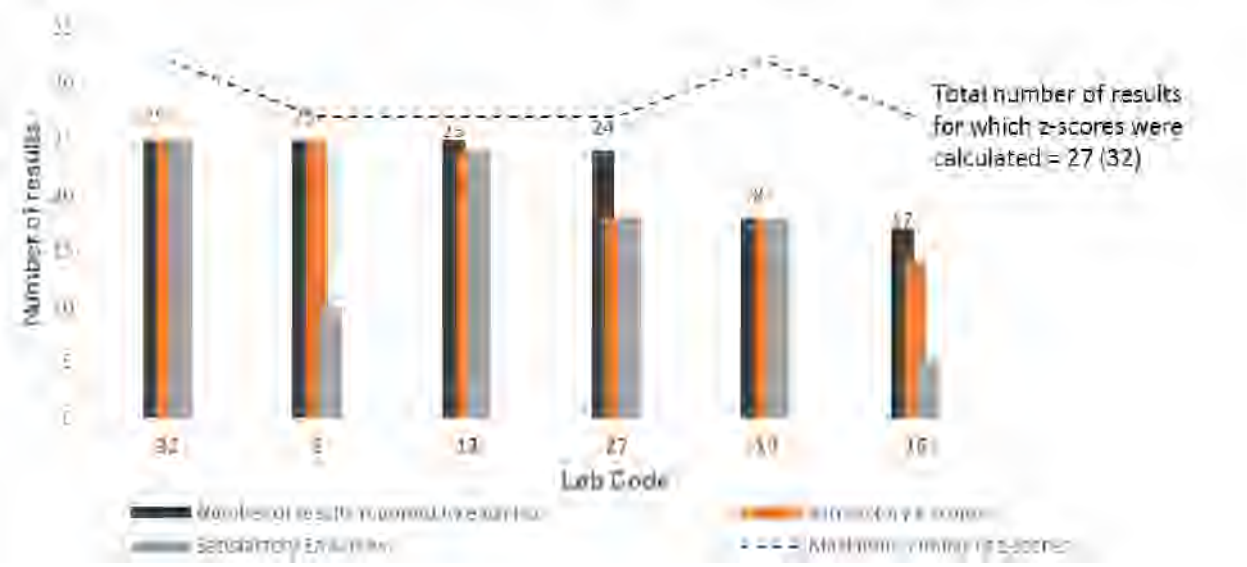
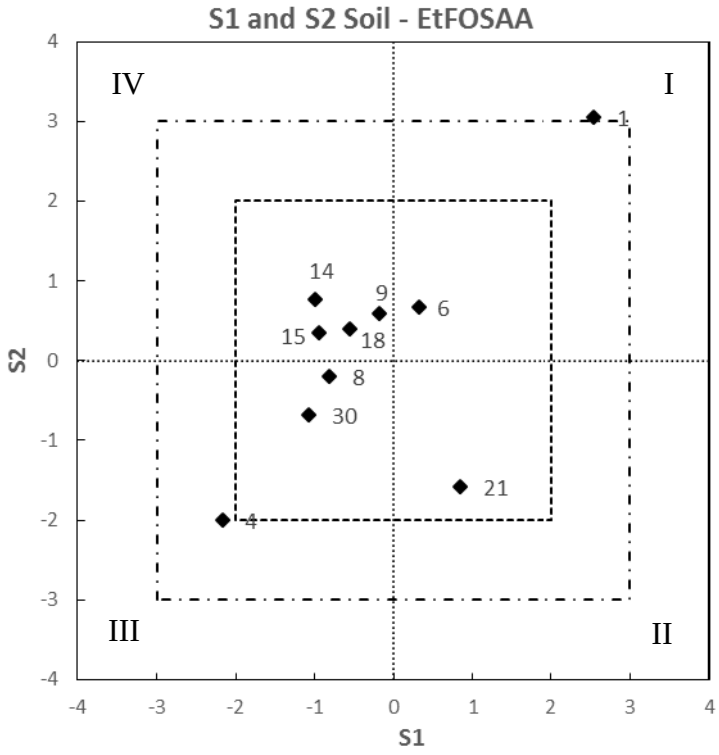


Figure 83 Total number of results for which z-scores were calculated and the numbers of satisfactory z and E_n-scores for laboratories that analysed one matrix only

6.4 z-Score Scatter Plots

Scatter plots of z-scores for all analytes are presented in Figures 84 to 103. Scores are predominantly plotted in quadrants I and III, indicating that laboratory bias is the major contributor to the variability of results.



Laboratories 7 and 33 are offscale.

Figure 84 Soil z-score scatter plot EtFOSAA

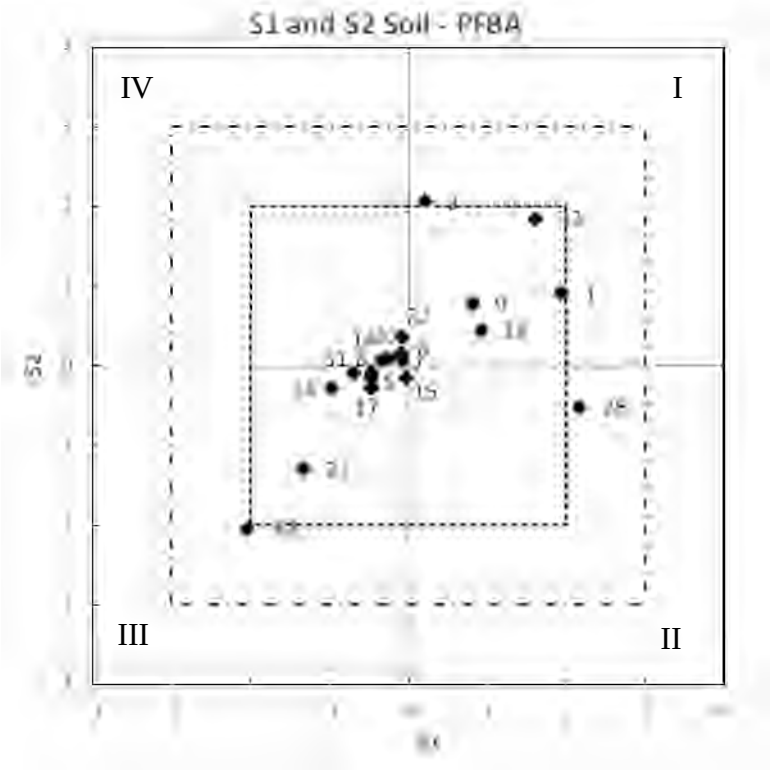
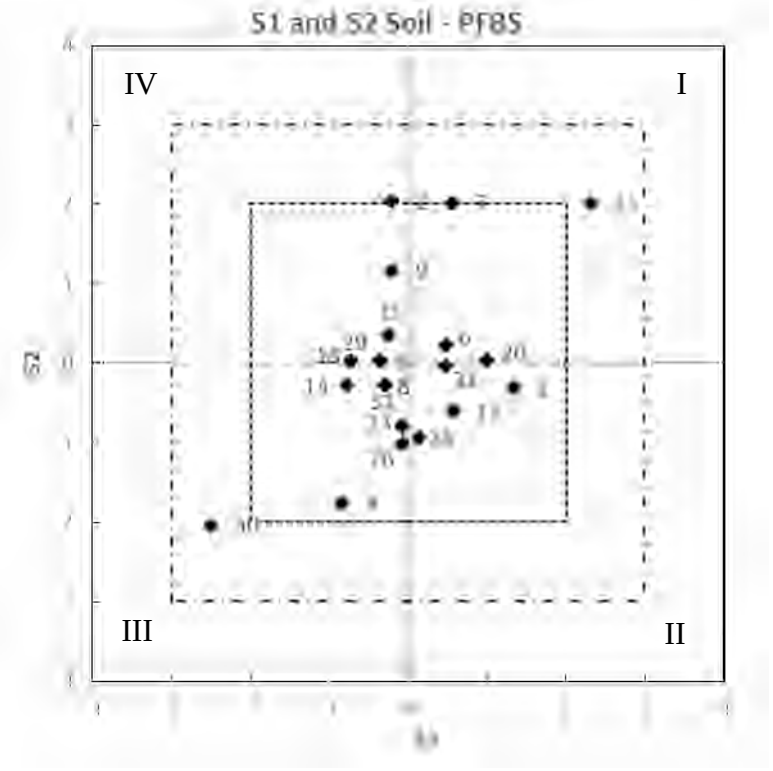


Figure 85 Soil z-score scatter plot PFBA



Laboratories 21 and 24 are offscale.

Figure 86 Soil z-score scatter plot PFBS

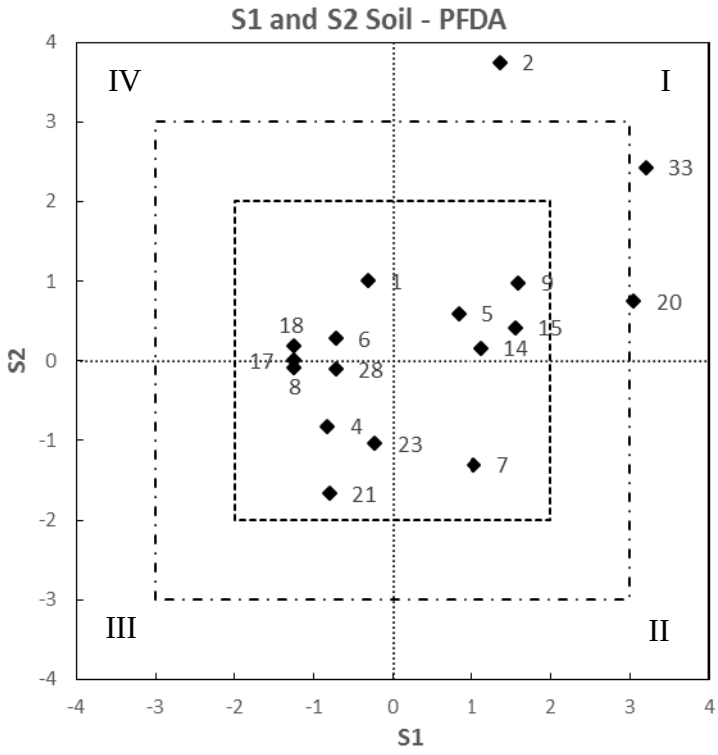
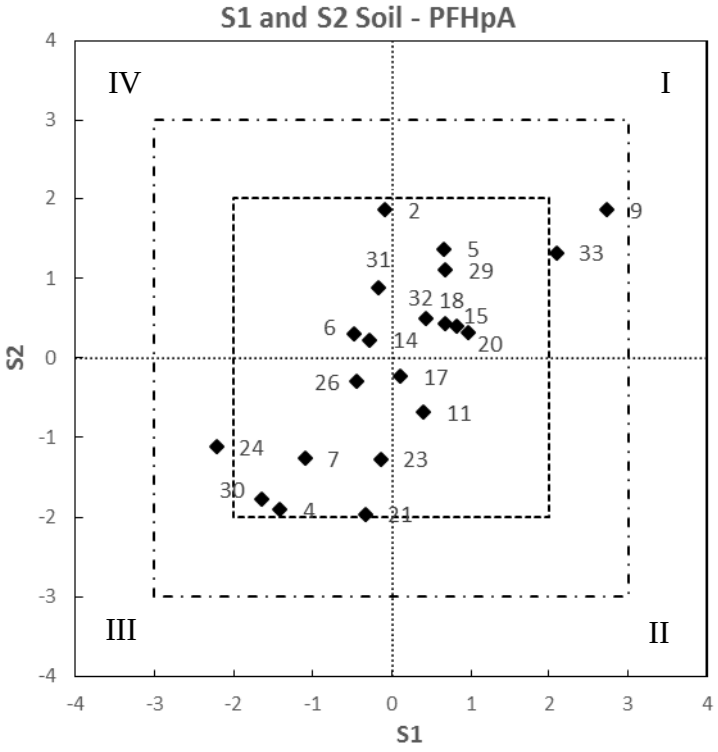


Figure 87 Soil z-score scatter plot PFDA



Laboratories 1 and 28 are offscale.

Figure 88 Soil z-score scatter plot PFHpA

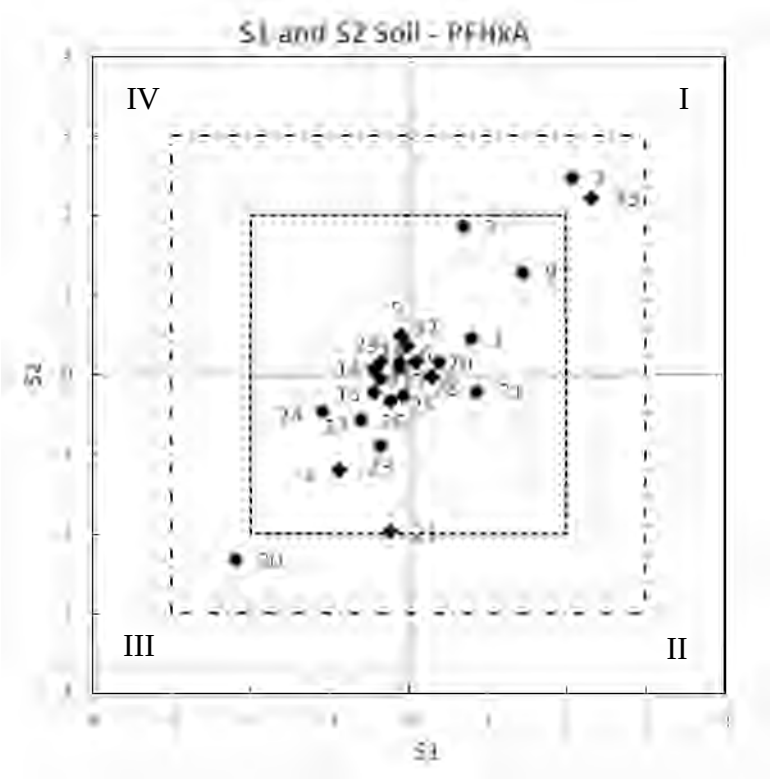
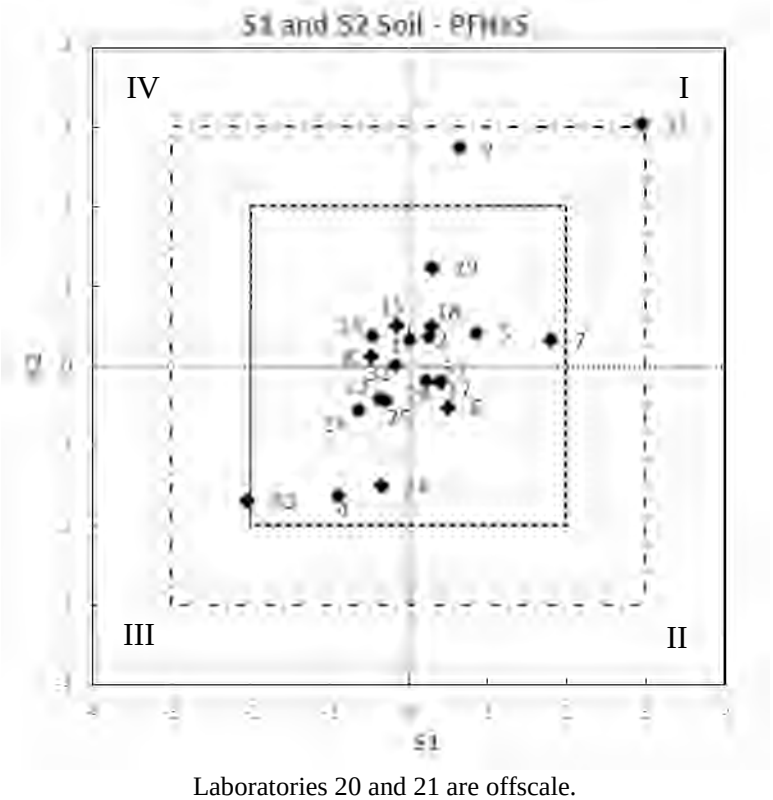
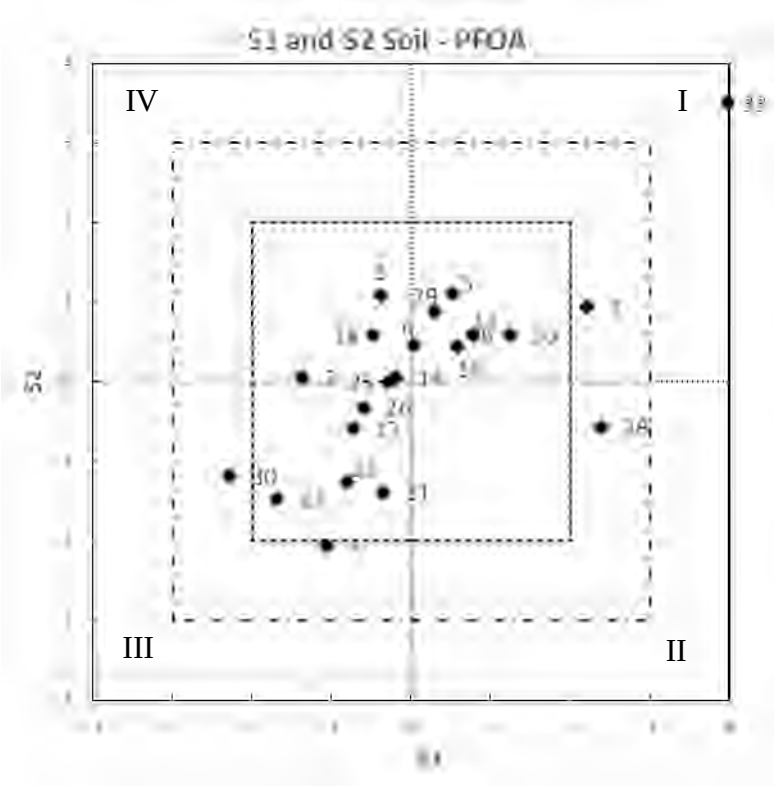


Figure 89 Soil z-score scatter plot PFHxA



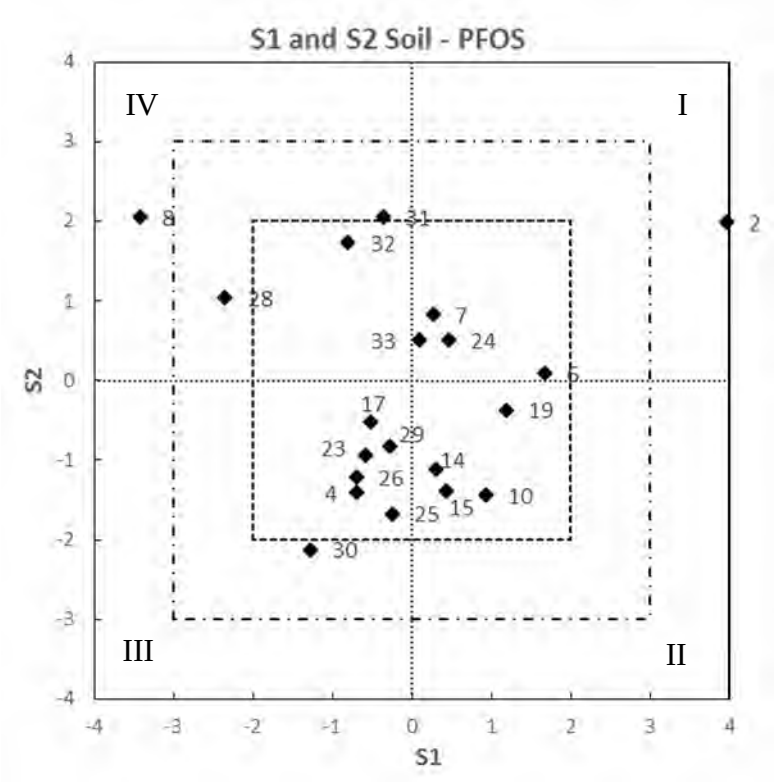
Laboratories 20 and 21 are offscale.

Figure 90 Soil z-score scatter plot PFHxS



Laboratory 9 is offscale.

Figure 91 Soil z-score scatter plot PFOA



Laboratories 1, 5, 9, 20, and 21 are offscale.

Figure 92 Soil z-score scatter plot PFOS

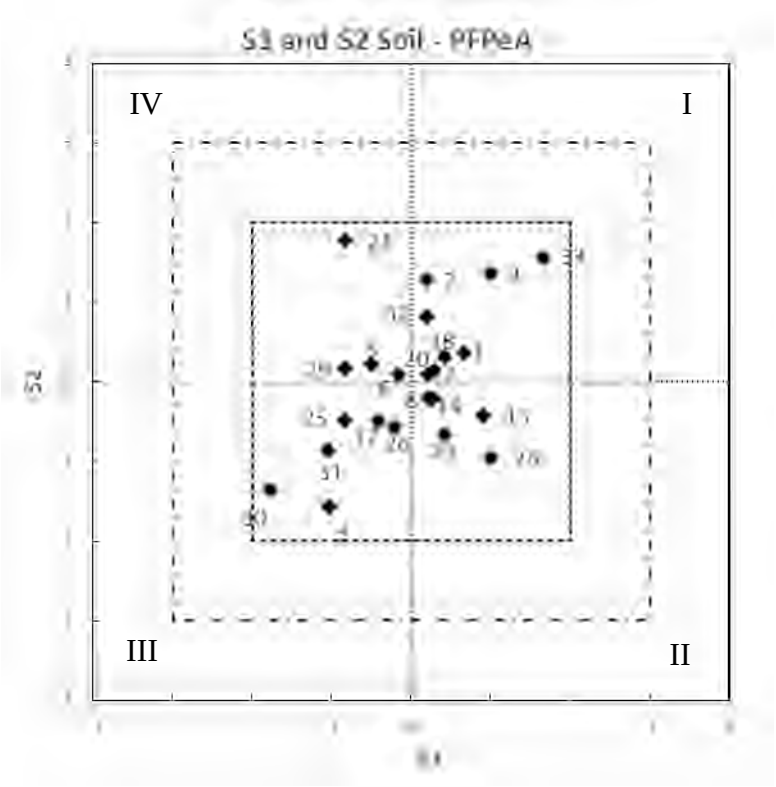
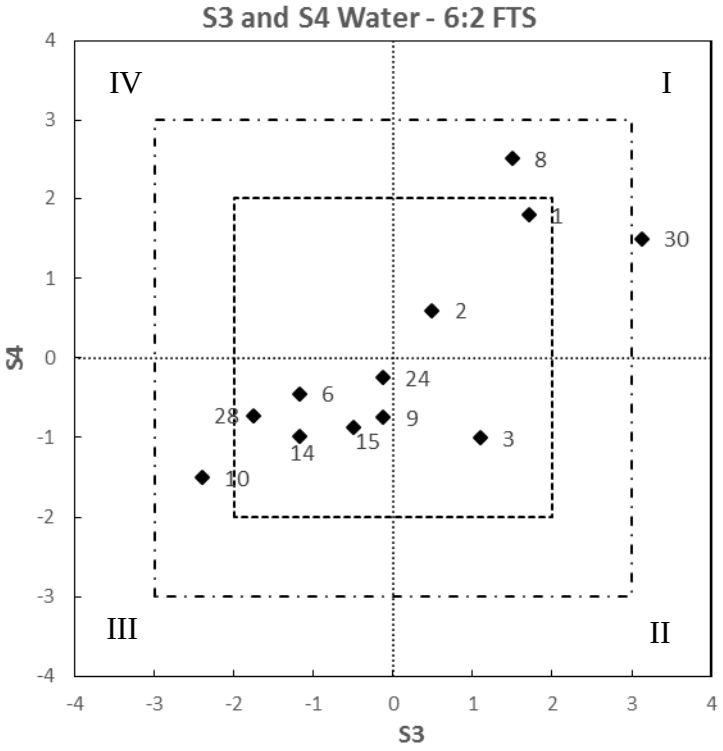
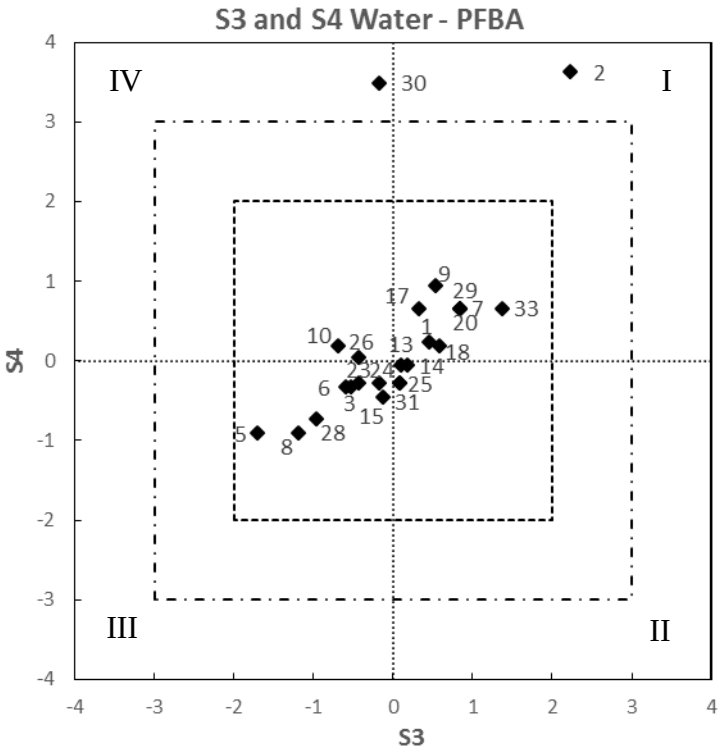


Figure 93 Soil z-score scatter plot PFPeA



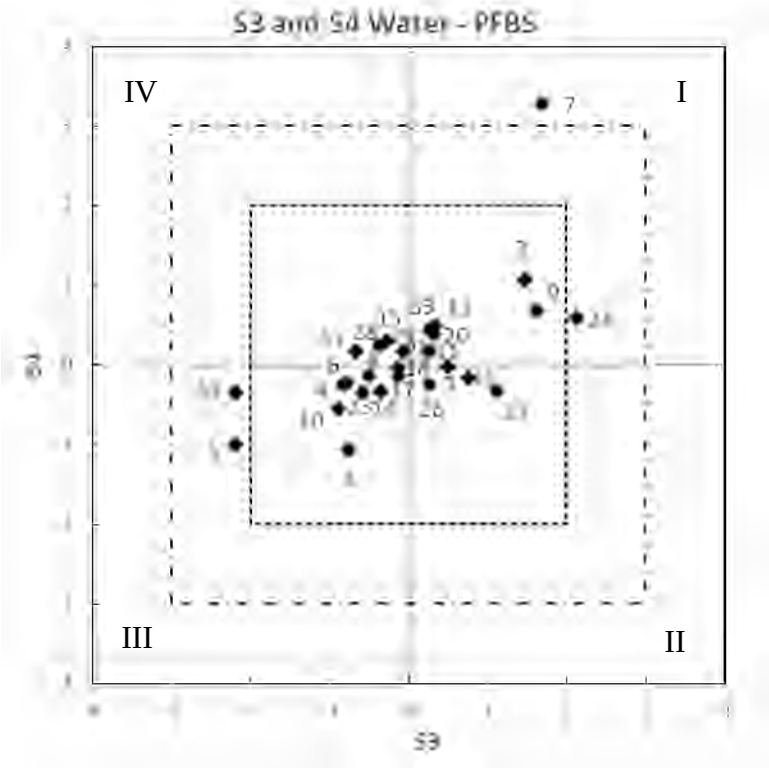
Laboratory 27 is offscale.

Figure 94 Water z-score scatter plot 6:2 FTS



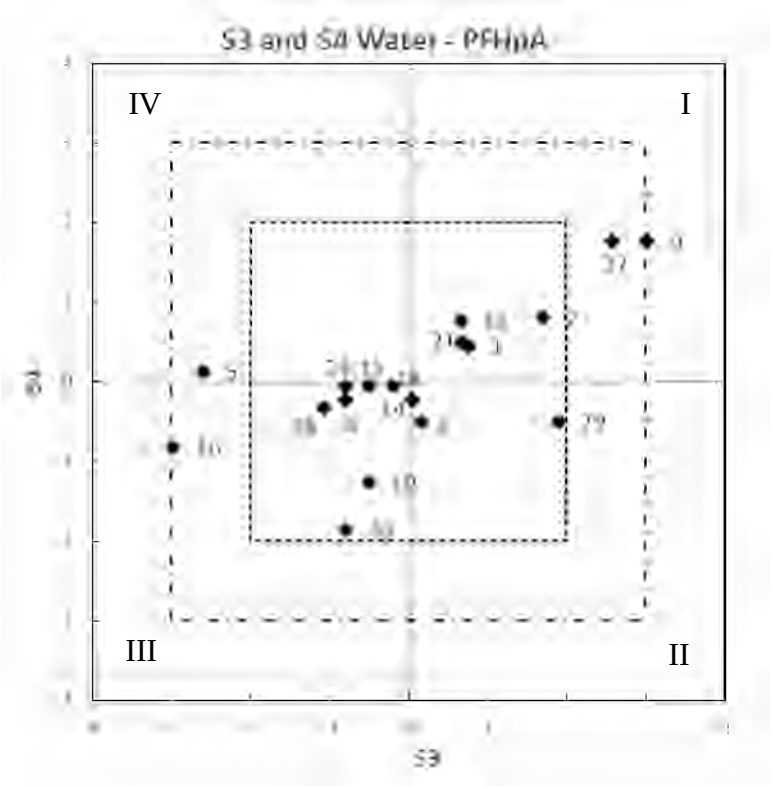
Laboratory 27 is offscale.

Figure 95 Water z-score scatter plot PFBA



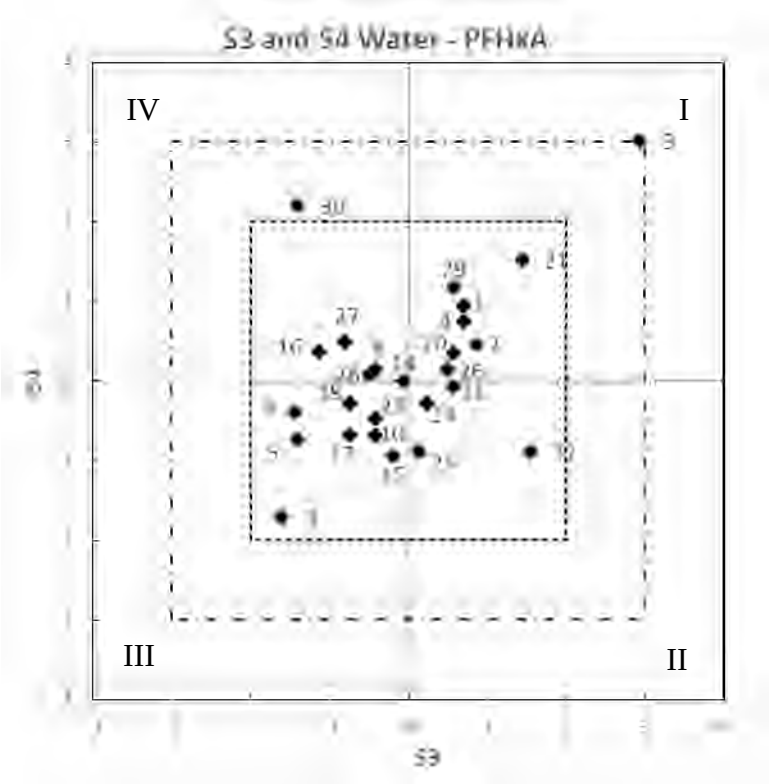
Laboratory 21 is offscale.

Figure 96 Water z-score scatter plot PFBS



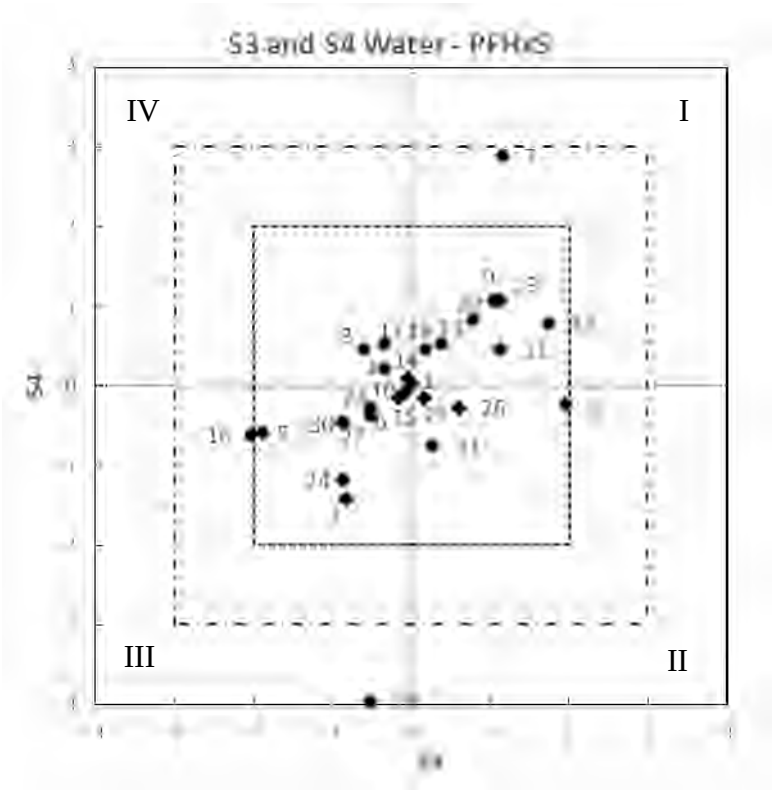
Laboratories 7 and 8 are offscale.

Figure 97 Water z-score scatter plot PFHpA



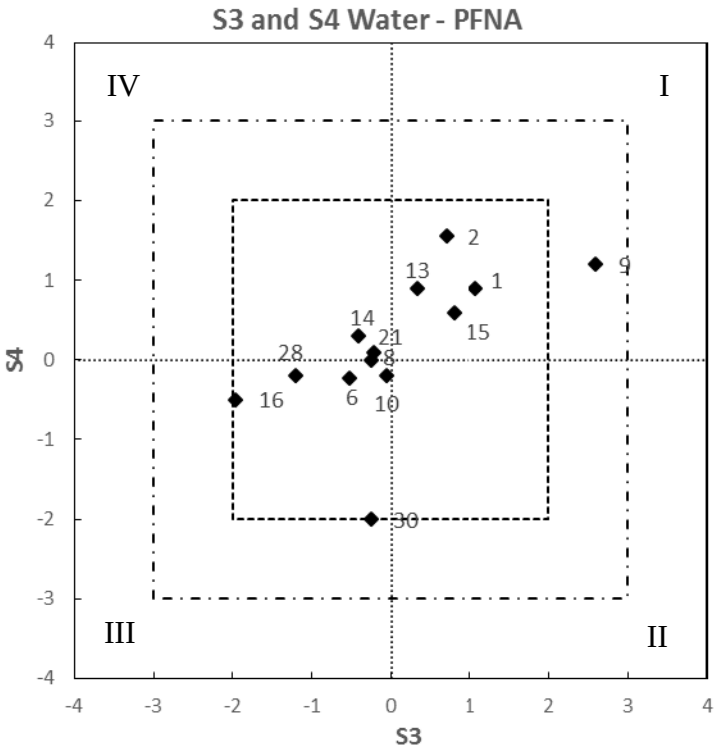
Laboratories 7 and 13 are offscale.

Figure 98 Water z-score scatter plot PFHxA



Laboratory 21 is offscale.

Figure 99 Water z-score scatter plot PFHxS



Laboratory 7 is offscale.

Figure 100 Water z-score scatter plot PFNA

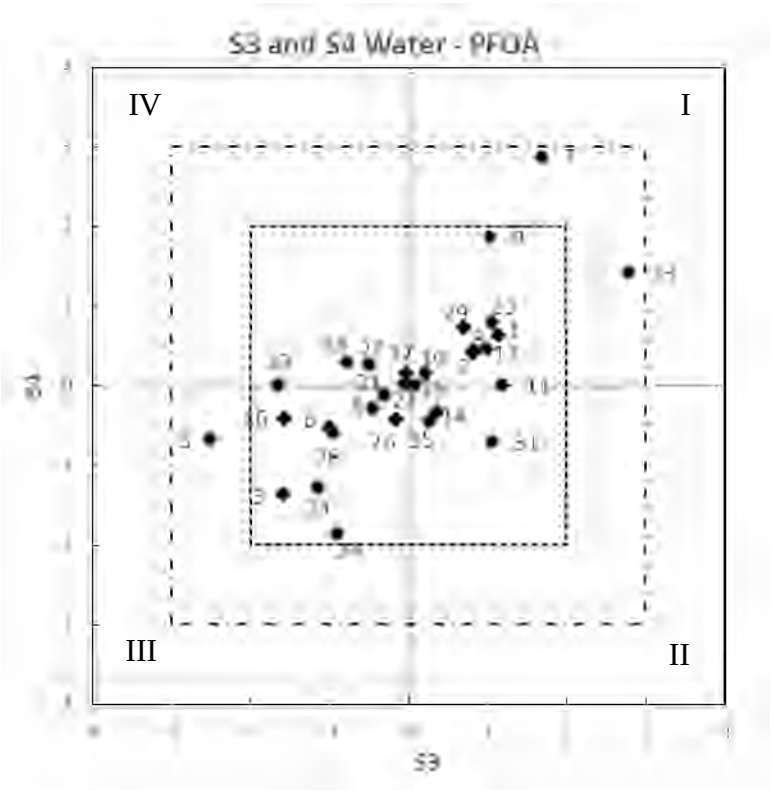
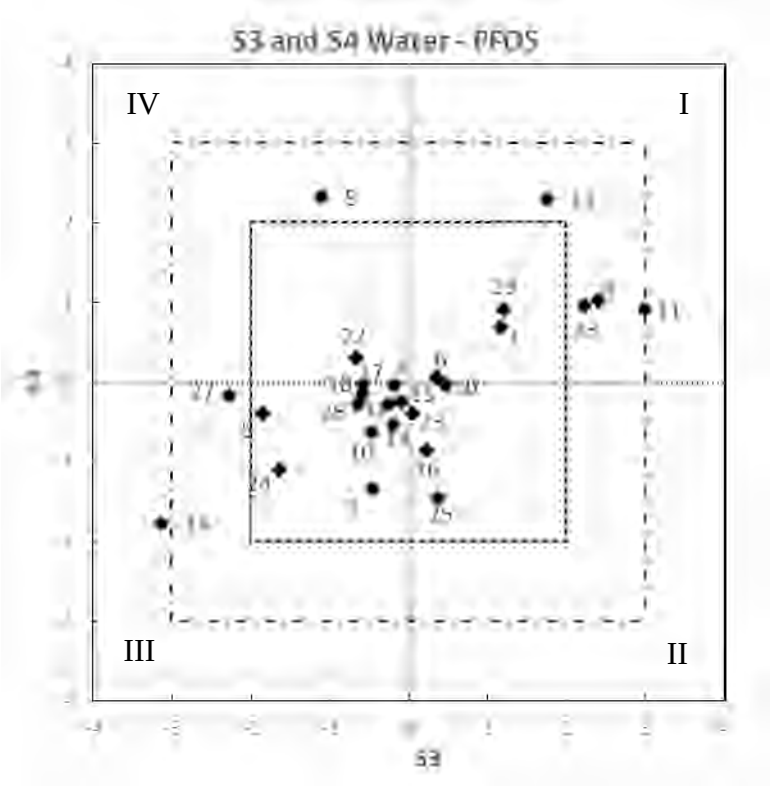


Figure 101 Water z-score scatter plot PFOA



Laboratories 2, 7, 21, and 30 are offscale.

Figure 102 Water z-score scatter plot PFOS

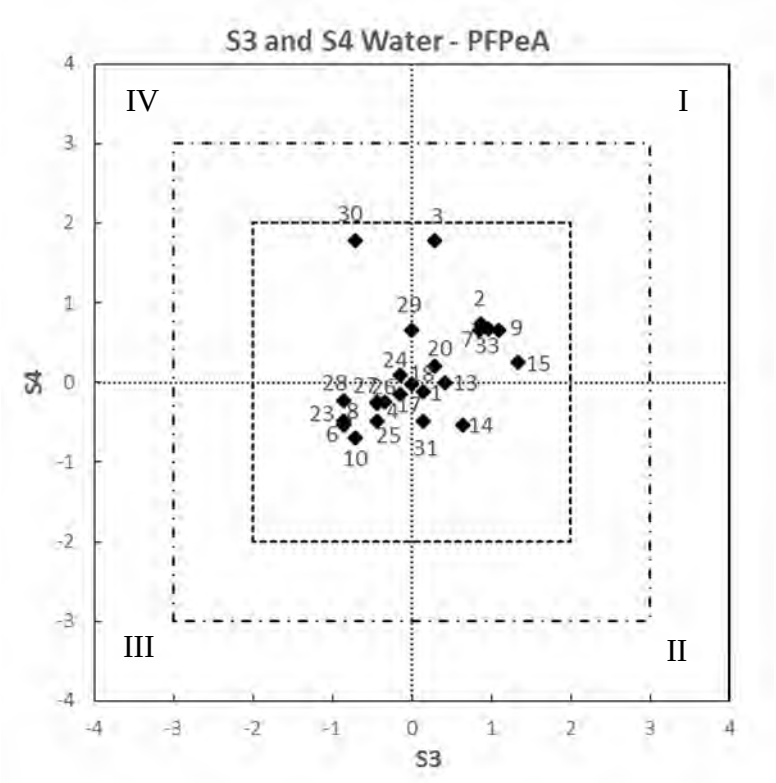


Figure 103 Water z-score scatter plot PFPeA

6.5 E_n-Score

Where a laboratory did not report an uncertainty estimate, an uncertainty of zero (0) was used to calculate the E_n-score.

Of 1382 E_n-scores, 1019 (74%) were satisfactory with $|E_n| \leq 1$. The dispersal of participants' E_n-scores is presented in Figure 81.

From the laboratories that analysed both matrices, Laboratory **14** had the highest number of satisfactory E_n-scores (57 out of 59). Laboratory **22** returned satisfactory E_n-scores for all analytes reported (6).

From the laboratories that analysed soil only, laboratory **32** returned the highest number of satisfactory E_n-scores (25), which are all the results reported by this laboratory. Laboratory **19** returned satisfactory E_n-scores for all analytes reported (18).

From the laboratories that analysed water only, laboratory **13** returned the highest number of satisfactory E_n-scores (24).

6.6 Participants' Methods

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. Results reported in this way reflect the true variability of results reported to clients. The method descriptions provided by participants are presented in Tables 2 to 5. The study coordinator thanks all laboratories that completed the method questionnaire. A summary is presented below.

Soil samples

Pre-treatment: homogenisation (15), pH adjustment (4).

Extraction technique: alkaline digestion (5), liquid-liquid extraction (2), solid-liquid extraction (11), solid phase extraction (5), direct injection (2), sonication (1), ion pair extraction (3).

Extraction process: shaking (11), sonication (14), pH adjustment (1), SPE (2), tumbling (4), vortex (5), centrifuge (1).

Clean-up: SPE (10), carbon (10), centrifugation (2), filtration (3).

Extraction solvents: methanol/base e.g. KOH, NH_4OH, NH_3, NaOH (12), methanol/other e.g. acetic acid, water (3), methanol (6), sodium hydroxide solution (1), acetonitrile (2), MTBE (3)

Water samples

Pre-treatment: pH adjustment (10), homogenisation (5), Trizma preset crystals added (1), dilution (1).

Extraction technique: solid phase extraction (22), direct injection (4), alkaline digestion (1), sonication (1), solid-liquid extraction (1), liquid-liquid extraction (1).

Extraction process: vortex (1), shaking (5), sonication (3), SPE (6).

Clean-up: SPE (14), carbon (1), filtration (2).

Extraction solvents: methanol/base e.g. NH_4OH, NH_3 (9), methanol/ammonium acetate (1), methanol (9), acetonitrile (2), acetonitrile/acetone (1).

For all matrices the analytical detection method of choice was LC-MS. Three laboratories used LC Orbitrap, one laboratory used LC-TOF, and all the other participants used LC-MSMS (QQQ).

Due to the limited amount of data and the variety of analytical methods used no significant trend with extraction and sample preparation was identified.

6.7 Effects of Sample Matrix

Samples S1 and S2 were soil and Samples S3 and S4 were water. Incurred soil Sample S1 had the lowest percentage of results for which z-scores were calculated, which may be due to the higher concentration of **PFOS** in this sample. Sample S4 also had a low percentage of analytes where z-scores could be calculated possibly due to the low level of some analytes (below the LOR of some participants). All samples received similar percentage of satisfactory z-scores (Table 86).

Table 86 Satisfactory z-scores for each matrix

Sample		Expected number of z-scores	Actual number of z-scores (% of expected no of z-scores)	Satisfactory	% satisfactory
S1 Soil	Incurred	700	287 (41%)	240	84
S2 Soil	Spiked	532	424 (80%)	383	90
S3 Water	Incurred	390	325 (83%)	289	89
S4 Water	Spiked	570	346 (61%)	316	91

Preparation of spiked **Sample S4** was modified from the previous PFAS PT studies. PFTeDA, PFOSA, EtFOSA and MeFOSE were identified from previous experience and literature[15,16] as analytes which may potentially degrade or being adsorbed on the wall of the container during sample preparation. These analytes were combined into a composite spiked solution which was added directly into the final bottles rather than during the bulk sample preparation. The spiked composite solution has been analysed at NMI to ensure accurate preparation. The spiked levels for these four analytes, the participants' robust average and the percentage recovery of the spiked value vs robust average are presented in Table 87.

Table 87 Satisfactory z-scores for each matrix

Sample	Matrix	Analyte	Units	Spiked Concentration	Robust average	Robust average/ Spiked (%)
S4	Water	PFTeDA	µg/L	0.084	0.055	65
S4	Water	PFOSA	µg/L	0.063	0.192	305
S4	Water	EtFOSA	µg/L	0.125	0.045	36
S4	Water	MeFOSE	µg/L	0.208	0.094	45

A possible explanation for high recovery of **PFOSA** is analyte interconversion in the sample bottle from EtFOSAA (spiked in the bulk sample with a recovery of the robust average vs spiked level of 43%), EtFOSA and MeFOSE, though the exact reaction pathway is unknown. This type of conversion has been previously reported due to microbial activity,[10-13] however Sample S4 was autoclaved.

PFTeDA was spiked at 0.084 µg/L in water Sample S4. Figures 104 and 105 show the normalised results (against the spiked concentration) vs sample volume reported by participants for PFTeDA in water in this study and the previous study respectively.[17] As mentioned before, in this study PFTeDA was added directly into the final packaged bottles to avoid losses in preparation. Eleven participants used the entire contents of the bottle for analysis in this study, and they reported on average higher normalised results when compared to the eight participants using the entire contents of the bottle in the previous study. Participants did not report on whether they rinsed the sample bottle during analysis, and this may also be a contributing factor to lower normalised results.

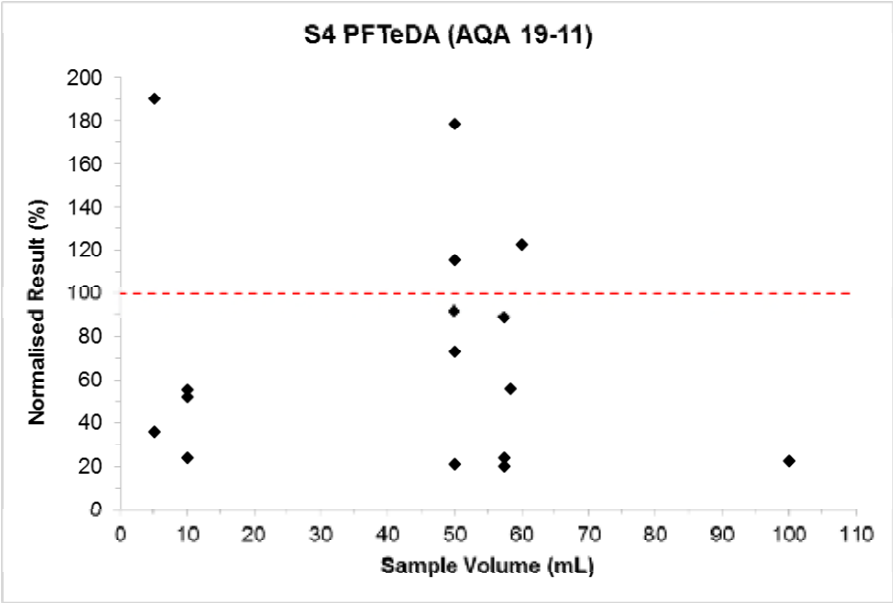


Figure 104 Normalised results (against spike level) vs sample volume for PFTeDA in water Sample S4 in AQA 19-11 (analyte added directly into final bottles).

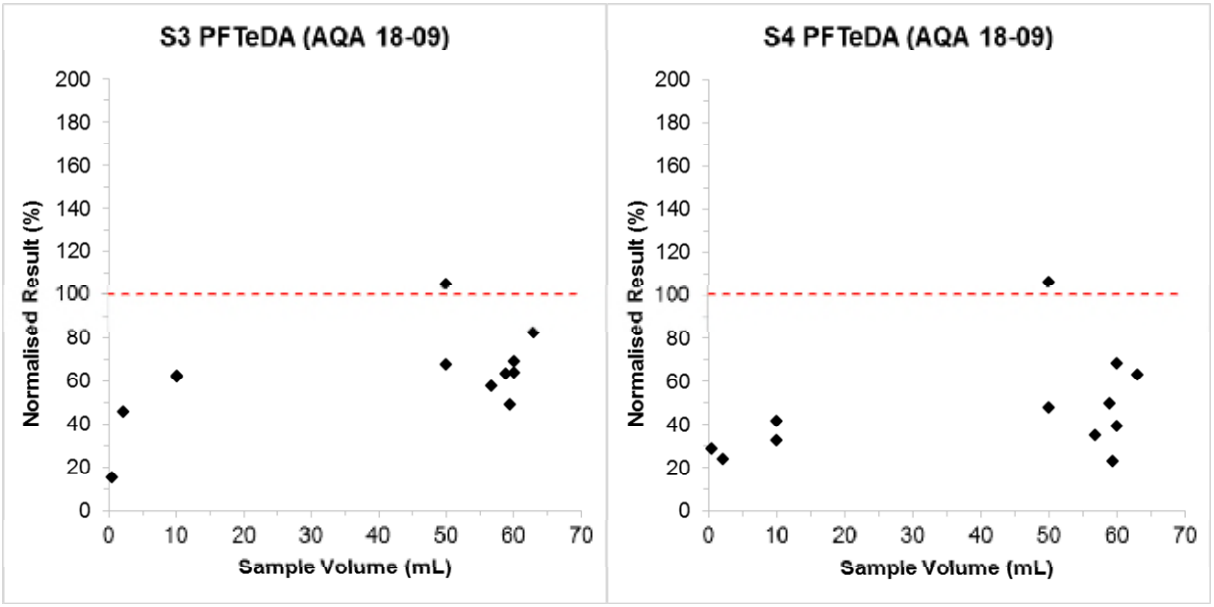


Figure 105 Normalised results (against spike level) vs sample volume for PFTeDA in water Samples S3 and S4 in AQA 18-09 (analyte spiked into bulk sample during preparation).

6.8 False negatives

Table 88 lists false negative results – an analyte for which a laboratory tested but did not report a result (e.g. laboratories reporting as '<' or NR result, when the assigned value or spiked value was significantly higher than the participants' reporting limit, or laboratories that left the cell blank instead of entering NT as per instructions).

Table 88 False Negatives

Lab Code	Sample	Analyte
3	S4	PFHpA
4	S4	PFTeDA
5	S2	EtFOSAA, MeFOSE, GenX, ADONA
5	S4	EtFOSA, MeFOSE
6	S2	ADONA
6	S4	ADONA
7	S4	PFTeDA
8	S2	PFHpA
9	S2	8:2 FTS
16	S4	6:2 FTS, 8:2 FTS, EtFOSA, MeFOSE, PFBA, PFOSA, PFPeA
19	S2	EtFOSAA
20	S4	EtFOSAA
23	S4	PFTeDA, EtFOSA, MeFOSE
25	S4	EtFOSAA, PFTeDA, EtFOSA, MeFOSE
26	S4	PFTeDA, EtFOSA, MeFOSE
28	S2	EtFOSAA
29	S4	MeFOSE
31	S2	6:2 FTS
31	S4	EtFOSAA, EtFOSA

7 REFERENCES

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APPENDIX 1 - SAMPLE PREPARATION AND REFERENCE VALUE

A1.1 Sample Preparation

Analytical standards used for spiking samples in AQA 19-11 were purchased from HPC Standards GmbH, Toronto Research Chemicals, Sigma-Aldrich and Wellington Laboratories Canada. On the analytical reports provided with the standards, all analytes have a stated purity of >95%.

Sample S1: Contaminated and uncontaminated soil were separately dried and sieved through a 850 µm sieve. 601.4 g of the contaminated soil and 603.1 g of the uncontaminated soil were mixed for 3 hours using a V-mixer. The soil was divided into 20 – 25 g portions using a Retsch rotary divider, packed into labelled Greiner tubes.

Sample S2: 1121.4 g of dried and sieved uncontaminated soil was placed in a 3 L round bottom flask. A slurry was produced by adding acetone. The slurry was spiked with analyte solutions prepared in methanol. The slurry was placed on the Rotavap, and the acetone was evaporated off with a slight vacuum and the heater being set at no more than 40°C. The dry soil was divided into 20 – 25 g portions using a Retsch rotary divider, packed into labelled Greiner tubes.

Sample S3: Contaminated water was filtered through an ADVANTEC GB140 glass fibre filter paper. The filtered contaminated water was autoclaved, and sediment present was left to settle out over a period of days. The contaminated water was filtered again through an ADVANTEC GB140 glass fibre filter paper, and the final mass of the water was 5373.6 g. The water was dispensed into labelled 60 mL HDPE bottles using a peristaltic pump.

Sample S4: 6013.4 g of autoclaved tap water was spiked with analyte solutions prepared in methanol (15 analytes). The spiked water was stirred using an IKA stirrer for approximately 4 hours, and dispensed into labelled 65 mL HDPE bottles using a peristaltic pump. Each bottle was then spiked with a composite solution containing PFTeDA, PFOSA, EtFOSA, and MeFOSE.

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

A1.2 Reference Value

A reference value for PFOA was obtained for sample S4. Five sample bottles were selected at random for the purpose of assigning the reference value.

PFOA mass fraction was determined using exact matching isotope dilution with liquid chromatography tandem mass spectrometry (LC-MSMS) in selected reaction monitoring mode. Isotopically labelled $^{13}C_8$–PFOA was used as the internal standard. Chromatography was conducted using two independent methods and two characteristic transitions per method were monitored for both PFOA and the internal standard.

Sample blends were prepared by weighing an entire sample bottle before gravimetric addition of the internal standard. The sample blend was then incubated for 48 hours at 40°C before cooling to room temperature, ultra-sonication for 10 minutes, and end-over-end tumbling for 60 minutes. The sample blend was then acidified with 0.23 mL of acetic acid and applied to a preconditioned Waters Oasis WAX SPE cartridge (150 mg, 6cc).

Once the sample was passed through the cartridge, the sample bottle was rinsed with two 5 mL portions of acetic acid acidified water and two 5 mL portions of acetic acid acidified methanol, with the rinsates successively applied to the SPE cartridge. The SPE cartridge was then dried under vacuum for 5 minutes. The sample bottle was then rinsed with two 5 mL portions of 0.4% ammonia (28%) in methanol with the rinsates used to elute the SPE cartridge. The eluate was dried using nitrogen at 50°C and then reconstituted to 100 µL in 1:1 methanol:water.

Matching calibration blends were prepared from certified reference material PFOA sourced from NMIJ by accurately weighing internal standard and reference material solutions prepared in methanol treated with 4 mol equivalent sodium hydroxide, reducing the blend to dryness using nitrogen at 50°C and then reconstituting to 100 µL in 1:1 methanol:water.

The average of the mass fractions determined for each sample was used as the reference value. Measurement uncertainty was estimated according to the ISO GUM, combining uncertainty terms for method precision/homogeneity, balance precision and bias, uncertainty from the NMIJ certified reference material, and matrix effects on chromatography and ionisation in the sample blends.

Mass fraction reference values were converted to mass concentration using the density of the samples measured with an oscillating u-tube density meter (Anton Paar DMA 35N). The measured density of AQA 19-11 Sample S4 was 0.9975 ug/L ± 0.0013 ug/L. The measurement uncertainty associated with density measurement has been determined such that the mass concentration reference values are valid for a temperature range of 15 to 25°C at atmospheric pressure.

Traceability: The reference value of PFOA in Sample S4 relies on gravimetric sample preparation, quantification by LC-MSMS, and density measurement. Gravimetric measurements are traceable to the SI unit for mass, the kilogram, through the Australian standard for mass. LC-MSMS measurements are traceable to the SI unit for mass via calibration with pure standard reference material certified by the National Metrology Institute, Japan (NMIJ 4056-a). Density measurement was calibrated using ultra high purity water and is traceable to the NMI Australia determination of the density of water.[1]

APPENDIX 2 - ROBUST AVERAGE AND ASSOCIATED UNCERTAINTY

The robust average was calculated using the procedure described in 'ISO 13528:2015(E), Statistical methods for use in proficiency testing by interlaboratory comparisons – Annex C'.[8]

The uncertainty was estimated as:

$$u_{rob\ av} = 1.25 * S_{rob\ av} / \sqrt{p} \qquad \text{Equation 4}$$

where:

$u_{rob\ av}$	robust average standard uncertainty
$S_{rob\ av}$	robust average standard deviation
p	number of results

The expanded uncertainty ($U_{rob\ av}$) 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 88.

Table 89 Uncertainty Estimate for PFBA in Sample S2

No. results (p)	24
Robust Average	27.51 µg/kg
$S_{rob\ av}$	4.08 µg/kg
$u_{rob\ av}$	1.04 µg/kg
k	2
$U_{rob\ av}$	2.08 µg/kg

The robust average for PFBA in Sample S2 is 27.5 ± 2.1 µg/kg.

APPENDIX 3 - ACRONYMS AND ABBREVIATIONS

10:2 FTS	1H, 1H, 2H, 2H-perfluorododecane sulfonate
6:2 FTS	1H, 1H, 2H, 2H-perfluorooctane sulfonate
8:2 FTS	1H, 1H, 2H, 2H-perfluorodecane sulfonate
ADONA	Ammonium 4,8-dioxa-3H-perfluorononanoate
AV	Assigned Value
CRM	Certified Reference Material
CV	Coefficient of Variation
EPA	Environment Protection Authority
EtFOSA	N-Ethyl perfluorooctane sulfonamide
EtFOSAA	N-Ethyl perfluorooctane sulfonamido acetic acid
EtFOSE	N-Ethyl perfluorooctane sulfonamidoethanol
FOSA	Perfluoro-1-octanesulfonamide
GenX	Ammonium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propanoate
GUM	Guide for Uncertainty Measurement
ID-LC-MSMS	Isotope Dilution – Liquid Chromatography – Tandem Mass Spectrometry
ISO	International Standards Organisation
LC	Liquid Chromatography
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
Min	Minimum value in a set of results
MS	Mass Spectrometry
NMI	National Measurement Institute (of Australia)
NMIJ	National Metrology Institute, Japan
NR	Not Reported
NT	Not Tested
PFAS	Per- and poly fluorinated alkyl substances
PFBA	Perfluoro-n-butanoic acid
PFBS	Potassium perfluoro-1-butanesulfonate
PFDA	Perfluoro-n-decanoic acid
PFDoA	Perfluorododecanoic acid

PFDS	Perfluorodecane sulfonate
PFHpA	Perfluoro-n-heptanoic acid
PFHpS	Perfluoroheptane sulfonate
PFHxA	Perfluoro-n-hexanoic acid
PFHxS	Potassium perfluorohexanesulfonate
PFNA	Perfluoro-n-nonanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PFOSA	Perfluoro-1-octanesulfonamide
PFPeA	Perfluoro-n-pentanoic acid
PFPeS	Perfluoropentane sulfonate
PFTeDA	Perfluorotetradecanoic acid
PFTrA	Perfluorotridecanoic acid
PFUnA	Perfluoroundecanoic acid
PT	Proficiency Test
Q	Quadrupole mass analyser
QTOF	Quadrupole Time-of-Flight
QQQ	Triple Quadrupole (mass spectrometry)
QuEChERS	Quick, Easy, Cheap, Effective, Rugged and Safe extraction method
Robust CV	Robust Coefficient of Variation
Robust SD	Robust Standard Deviation
RV	Reference Value
SV	Spiked or formulated concentration of a PT sample (Spike Value)
SPE	Solid Phase Extraction
Target SD	Target standard deviation
σ	Target standard deviation

End of Report