

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Plant Lab

Leland, NC
Samples Received: 10/11/19

Analytical Report 1019-719

Isotope Dilution Method

PFAS – Legacy 24 + Gen-X, PFMOAA



Enthalpy Analytical, LLC – Ultratrace

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I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains _____ pages.

....."Report Issued Date: _____"



Summary of Results

Summary of Results: PFAS
Enthalpy Ultratrace Batch #
10498
PFAS

Analyte	Method Blank ng/L	101119 - S01 ng/L	101119 - E01 ng/L
Acids			
PFBA	ND U	12.7	ND U
PFPeA	ND U	29.4	32.8
PFHxA	ND U	29.8	30.4
PFHpA	0.00360 J L	22.2	21.9
PFOA	0.00580 J L	7.99	7.96
PFNA	ND U	1.22	1.23
PFDA	0.0478 J L	0.918	0.808
PFUnA	0.00870 J L	0.403	0.178 J
PFDoA	0.0747 J	0.379 B	0.101 J B
PFTTrA	0.130 J	0.557 B	0.0761 J B
PFTA	0.198 J	0.826 B	0.0860 J B
Sulfonates			
L-PFBS	ND U	ND U	ND U
PFPeS	ND U	1.60	1.40
PFHxS	ND U	6.81	6.44
PFHpS	ND U	0.291	0.196 J
PFOS	ND U	12.3	13.0
PFNS	0.0276 J L	0.216 B	0.0617 J B
PFDS	0.0466 J L	0.189 J B	0.0422 J B L
4:2 FTS	ND U	ND U	ND U
6:2 FTS	ND U	0.103 J	0.125 J
8:2 FTS	0.0179 J L	0.180 J	0.0338 J B L
Other			
PFOSA	ND U	0.180 J L	ND U
N-MeFOSAA	0.0897 J	0.264 B	0.205 J B
N-EtFOSAA	0.134 J	0.282 B	0.166 J B
HFPO-DA (Gen-X)	ND U	15.5	18.9
PFMOAA*	ND U	184	168
Lab Sample ID	MB-10498-PFAS	1019-719-001-1	1019-719-002-1

* - Analytical standard used is a non-accredited quality control standard

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	County of Brunswick
Job#	1019-719 PFAS – Legacy 24, Gen X, PFMOAA
Client Project #	N/A

Custody	<p>Robin Appelle of Enthalpy Analytical Wilmington received the samples (via client courier) on 10/11/19 on ice at 5.2°C in good condition.</p> <p>Prior to, during, and after analysis, the samples were stored in the laboratory with access only by authorized personnel of Enthalpy Analytical, LLC.</p>
Analysis	<p>The samples were analyzed by isotope dilution method for PFAS using Waters Acquity UPLC equipped with Xevo TQ MS (LC/MS/MS “Kili”).</p> <p>For aqueous samples, 250mL aliquot was weighed and spiked with Extraction Standard (ES). The sample was then mixed well and centrifuged.</p> <p>Cleanup procedures were performed on the supernatant and then extracted via SPE. Each final sample extract was transferred to an autosampler vial and spiked with 400 µL of Injection Standard (IS), prior to analysis.</p>
Calibration	<p>The analytes and labeled standards in the initial calibration exhibited RSDs less than 50%. All analytes passed the R2 coefficient correlation criteria. The internal calibration verification (ICV) met the ±30% criteria for native analytes and ±50% criteria for labeled standard (ES) recoveries. The continuing calibrations (concal) met the ±30% criteria for native analytes and ±50% criteria for ES recoveries.</p>
QC Notes	<p>The QC injection (OPR) met the ±30% criteria for % Recovery and ±50% criteria for ES recoveries for most analytes.</p> <p>Analytes were detected in the method blank (MB) below the Reporting Limit (RL) with values more than 1/10 the sample amount. Any analytes detected in the samples were notated with a B qualifier. ES recoveries for all analytes met the ±50% criteria with the exception of M2PFTeDA which fell out of the lower limit. There is no impact on data due to this analyte meeting method criteria in the OPR.</p> <p>The samples were extracted within the 14-day from collection holding time. Extracts were analyzed within the 28-days from extraction to analysis holding time required by the method.</p>
Reporting Notes	<p>Some analytes in the samples fell outside the limits for ES recoveries. Although the cause was undetermined, it is theorized to be matrix effects. Based on the native results in the OPR meeting criteria, the out-of-range ES recoveries have no impact on the accuracy of the target analyte (native) compounds. Therefore, the data are considered acceptable.</p>



Enthalpy Analytical Narrative Summary (continued)

Reporting Notes (continued)

The results presented in this report are representative of the samples as provided to the laboratory.

Enthalpy Analytical, LLC in Wilmington NC is accredited by the Louisiana Department of Environmental Quality to the 2009 TNI Standard under certificate number 05075.

These analyses met the requirements of the TNI Standard. Gen-X and related compounds are currently not accredited analytes under the TNI standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.



General Reporting Notes – Data Qualifiers

The following are general reporting notes that are applicable to all Enthalpy Analytical, Inc.-Wilmington, NC data reports, unless specifically noted otherwise.

General Data Qualifiers / Data Attributes

- B – The analyte was found in the method blank, at a concentration that was at least 10% of the concentration in the sample.
- Cxx – Two or more congeners co-elute. In EDDs, C denotes the lowest IUPAC congener in a co-elution group and additional co-eluters for the group ('xx') are shown with the number of the lowest IUPAC co-eluter.
- E – The reported concentration exceeds the calibration range (upper point of the calibration curve) and is considered an estimate.
- EMPC – Represents an estimated maximum possible concentration. EMPCs arise in cases where the signal/noise ratio is not sufficient for peak identification (the determined ion-abundance ratio is outside the allowed theoretical range), or where there is a co-eluting interference. Indicates that a peak is identified but did not meet the method specified ion-abundance ratio.
- J – Indicates that an analyte has a concentration below the reporting limit (lowest point of the calibration curve). The value is less than the minimum calibration level but greater than the Reporting Limit (RL) or Estimated Detection Limit (EDL).
- L - Indicates that an analyte has a concentration below the Minimum Detection Limit (MDL). The reported concentration is not recommended for regulatory use as the value may have a S/N less than 3.
- ND – Indicates a non-detect.
- NR – Indicates a value that is not reportable due to issues observed in sample preparation or analysis.
- PR – Due to interference, the associated congener is poorly resolved.
- DI – Indicates the presence of a quantitative interference.
- SI – Denotes “Single Ion Mode” and is utilized for PCBs where the secondary ion trace has a significantly elevated noise level due to background PFK. Responses for such peaks are calculated using an EMPC approach based solely on the primary ion area(s) and may be considered estimates.
- U – The analyte was not detected. The Minimum Detection Limit (MDL) or Estimated Detection Limit (EDL) may be reported for this analyte.
- V – The labeled standard recovery is not within method control limits.



General Reporting Notes – Data Qualifiers

- Q – The ion ratio between the primary and secondary ions was observed to be outside the method criteria therefore the actual analyte concentration cannot be accurately determined as defined by DoD QSM 5.3 Table B-15.

DRBC/TMDL Specific Data Qualifiers / Data Attributes

- D – Dilution Data. Result was obtained from the analysis of a dilution. The number that follows the “D” indicates the dilution factor.
- X – Results from re-injection/repeat/second-column analysis.

Lab Identifiers

- AR – Indicates use of the archived portion of the sample extract.
- CU – Indicates a sample that required additional clean-up prior to HRMS injection/processing.
- DE – Indicates a dilution performed with the addition of ES (Extraction Standard) solution.
- DUP – Designation for a duplicate sample.
- MS – Designation for a matrix spike.
- MSD – Designation for a matrix spike duplicate.
- RJ – Indicates a reinjection of the sample extract.
- S – Indicates a sample split. The number that follows the “S” indicates the split factor.

PFAS Compound Acronym List	
Acronym	Compound Name
Target Analytes	
PFBA	Perfluorobutanoic Acid
PFPeA	Perfluoropentanoic Acid
PFHxA	Perfluorohexanoic Acid
PFHpA	Perfluoroheptanoic Acid
PFOA	Perfluorooctanoic Acid
PFNA	Perfluorononanoic Acid
PFDA	Perfluorodecanoic acid
PFUnA (PFUnDA)	Perfluoroundecanoic acid
PFDoA (PFDoDA)	Perfluorododecanoic acid
PFTriDA (PFTriA)	Perfluorotridecanoic acid
PFTeDA (PFTA)	Perfluorotetradecanoic acid
PFBS	Perfluorobutane sulfonic acid
PFPeS	Perfluoropentane sulfonic acid
PFHxS	Perfluorohexane sulfonic acid
PFHpS	Perfluoroheptane sulfonic acid
PFOS	Perfluorooctane sulfonic acid
PFNS	Perfluorononane sulfonic acid
PFDS	Perfluorodecane sulfonic acid
4:2 FTS	4:2 fluorotelomer sulfonic acid
6:2 FTS	6:2 fluorotelomer sulfonic acid
8:2 FTS	8:2 fluorotelomer sulfonic acid
PFOSA (FOSA)	Perfluorooctane sulfonamide
N-MeFOSAA	N-methyl perfluorooctane sulfonamido acetic acid
N-EtFOSAA	N-ethyl perfluorooctane sulfonamido acetic acid
HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)
Extraction Standards	
MPFBA	Perfluoro-n-[13C4]butanoic acid
M5PFPeA	Perfluoro-n-[13C5]pentanoic acid
M3PFBS	Sodium perfluoro-1-[2,3,4-13C3]-butanesulfonic acid
M2-4:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-hexane sulfonic acid
M5PFHxA	Perfluoro-n-[1,2,3,4,6-13C5]hexanoic acid
M3HFPO-DA	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-13C3-propanoic acid
M4PFHpA	Perfluoro-n-[1,2,3,4-13C4]heptanoic acid
M3PFHxS	Sodium perfluoro-1-[1,2,3-13C3]-hexanesulfonic acid
M2-6:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-octane sulfonic acid
M8PFOA	Perfluoro-n-[13C8]octanoic acid
M9PFNA	Perfluoro-n-[13C9]nonanoic acid
M8PFOS	Sodium perfluoro-1-[13C8]-octanesulfonic acid
M2-8:2 FTS	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-13C2]-decane sulfonic acid
M8FOSA	Perfluoro-1-[13C8]octanesulfonamide
M6PFDA	Perfluoro-n-[1,2,3,4,5,6-13C6]decanoic acid
d3-N-MeFOSAA	N-methyl-d3-perfluoro-1-octanesulfonamide
d5-N-EtFOSAA	N-ethyl-d5-perfluoro-1-octanesulfonamide
M7PFUnDA (M7PFUdA)	Perfluoro-n-[1,2,3,4,5,6,7-13C7]undecanoic acid
MPFDoA	Perfluoro-n-[1,2-13C2]dodecanoic acid
M2PFTeDA	Perfluoro-n-[1,2-13C2]tetradecanoic acid



Injection Standards	
M3PFBA	Perfluoro-n-[2,3,4-13C3]butanoic acid
M2PFOA	Perfluoro-n-[1,2-13C2]octanoic acid
MPFDA	Perfluoro-n-[1,2-13C2]decanoic acid
MPFOS	Sodium perfluoro-1-[1,2,3,4-13C4]-octanesulfonic acid

Sample Custody

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Of This Report.**