

County of Brunswick

3954 Clearwell Dr NE
Leland, NC 28451

Northwest Water Plant

Leland, NC
Samples Received: 05/26/22

Analytical Report 0522-822

Isotope Dilution Method PFAS



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



Enthalpy Analytical

Job No.: 0522-822-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant, Leland N.C.

Summary

	Compound	CAS	052622-SO1 ng/L	052622-EO1 ng/L
Acids	PFBA	375-22-4	6.22	5.08
	PFPeA	2706-90-3	11.2	10.8
	PFHxA	307-24-4	9.66	9.01
	PFHpA	375-85-9	4.29	3.96
	PFOA	335-67-1	6.55	6.12
	PFNA	375-95-1	0.841	0.812
	PFDA	335-76-2	0.362 J	0.358 J
	PFUnDA	2058-94-8	0.138 L	0.172 J
	PFDoDA	307-55-1	ND U	ND U
	PFTTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	ND U	ND U
Sulfonates	PFBS	375-73-5	5.71	5.60
	PFPeS	2706-91-4	0.949	0.952
	PFHxS	355-46-4	6.66	5.55
	PFHpS	375-92-8	0.398 J	0.341 J
	PFOS	1763-23-1	13.4	12.8
	PFNS	68259-12-1	ND U	ND U
	PFDS	335-77-3	ND U	ND U
	4:2 FTS	757124-72-4	ND U	ND U
	6:2 FTS	27619-97-2	0.673	1.02
8:2 FTS	39108-34-4	ND U	ND U	
Other	PFOSA	754-91-6	0.0879 L	ND U
	N-MeFOSAA	2355-31-9	ND U	ND U
	N-EtFOSAA	2991-50-6	0.110 J	0.158 J
	HFPO-DA	13252-13-6	4.25	3.89
	PFMOAA	674-13-5	55.5	43.6
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	6.39	6.18
	PFO3OA	39492-89-2	1.73	1.74
	PFO4DA	39492-90-5	ND U	ND U
	Nafion Byproduct 1	29311-67-9	ND U	ND U
	ADONA	919005-14-4	ND U	ND U
	9Cl-PF3ONS	756426-58-1	ND U	ND U
	11Cl-PF3OUdS	763051-92-9	0.0659 LB	ND U
	10:2 FTS	120226-60-0	ND U	ND U
	EVE Acid	69087-46-3	ND U	ND U
	FBSA	30334-69-1	1.31	1.17
	Hydro-EVE Acid	773804-62-9	0.242 L	0.241 L
	Hydrolyzed PSDA	2416366-19-1	11.1	17.2
	Nafion Byproduct 2	749836-20-2	0.493 J	0.422 J
	N-EtFOSA	4151-50-2	ND U	ND U
	N-EtFOSE	1691-99-2	ND U	ND U
	NFDHA	151772-58-6	ND U	ND U
	N-MeFOSA	31506-32-8	ND U	ND U
	N-MeFOSE	24448-09-7	ND U	ND U
	NVHOS	1132933-86-8	4.28	4.50
	PEPA	267239-61-2	3.14	2.66
	PFECA-G	801212-59-9	ND U	ND U
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	ND U	0.0425 L
	PFMOBA	863090-89-5	ND U	ND U
	PFO5DA	39492-91-6	ND U	ND U
	PMPA	13140-29-9	6.12	7.06
R-EVE	2416366-22-6	11.6	11.1	
R-PSDA	2416366-18-0	29.3	22.2	
R-PSDCA	241636-21-5	0.120 L	0.0925 L	

Detailed Results



Enthalpy Analytical

Job No.: 0522-822-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant, Leland N.C.

Enthalpy ID	0522-822-001-1	Prep Batch	EU13531	Sample Vol (mL)	281.42
Sample Name	052622-SO1	Prep Date	2022-05-31 15:51	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-06-03 04:07	Split Factor	N/A
Sampling Date	20220526 00:00	Analyst	wicleve	Method Code	WM-026
Received Date	2022-05-26 10:06	Instrument	Aragorn	Sample Type	Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	4376.88	6.22	6.22	0.136	0.569			
	PFPeA	2706-90-3	7889.52	11.2	11.2	0.151	0.569			
	PFFhxA	307-24-4	6799.52	9.66	9.66	0.171	0.569			
	PFFHpA	375-85-9	3019.11	4.29	4.29	0.108	0.569			
	PFOA	335-67-1	4606.72	6.55	6.55	0.157	0.569			
	PFNA	375-95-1	591.67	0.841	0.841	0.0676	0.569			
	PFDA	335-76-2	254.44	0.362	0.362	0.0751	0.569			J
	PFUnDA	2058-94-8	97.42	0.138	0.138	0.164	0.569			L
	PFDoDA	307-55-1	ND	ND	ND	0.179	0.569			U
	PFTrDA	72629-94-8	ND	ND	ND	0.134	0.569			U
PFTeDA	376-06-7	ND	ND	ND	0.194	0.569			U	
Sulfonates	PFBs	375-73-5	4018.11	5.71	5.71	0.315	0.664			
	PFPeS	2706-91-4	667.84	0.949	0.949	0.183	0.536			
	PFFhS	355-46-4	4683.89	6.66	6.66	0.170	0.521			
	PFFHpS	375-92-8	280.12	0.398	0.398	0.120	0.542			J
	PFOS	1763-23-1	9406.46	13.4	13.4	0.142	0.527			
	PFNS	68259-12-1	ND	ND	ND	0.0768	0.548			U
	PFDS	335-77-3	ND	ND	ND	0.171	0.548			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.105	0.533			U
	6:2 FTS	27619-97-2	473.52	0.673	0.673	0.103	0.542			
	8:2 FTS	39108-34-4	ND	ND	ND	0.152	0.545			U
Other	PFOSA	754-91-6	61.88	0.0879	0.0879	0.115	0.569			L
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.128	0.569			U
	N-EiFOSAA	2991-50-6	77.29	0.110	0.110	0.0968	0.569			J
	HFPO-DA	13252-13-6	2991.50	4.25	4.25	0.203	0.569			
	PFMOAA	674-13-5	39057.92	55.5	55.5	1.28	1.28			
	PFMOPrA	377-73-1	ND	ND	ND	0.213	0.569			U
	PFO2HxA	39492-88-1	4494.02	6.39	6.39	1.28	1.28			
	PFO3OA	39492-89-2	1218.18	1.73	1.73	1.28	1.28			
	PFO4DA	39492-90-5	ND	ND	ND	1.35	1.35			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.270	0.569			U
	ADONA	919005-14-4	ND	ND	ND	0.107	0.539			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.107	0.530			U
	11Cl-PF3OUdS	763051-92-9	46.36	0.0659	0.0659	0.107	0.536			LB
	10:2 FTS	120226-60-0	ND	ND	ND	0.213	0.569			U
	EVE Acid	69087-46-3	ND	ND	ND	1.28	1.28			U
	FBSA	30334-69-1	918.34	1.31	1.31	0.213	0.569			
	Hydro-EVE Acid	773804-62-9	169.96	0.242	0.242	1.28	1.28			L
	Hydrolyzed PSDA	2416366-19-1	7811.71	11.1	11.1	1.28	1.28			
	Nafion Byproduct 2	749836-20-2	346.66	0.493	0.493	0.270	0.569			J
	N-EiFOSA	4151-50-2	ND	ND	ND	0.213	0.569			U
	N-EiFOSE	1691-99-2	ND	ND	ND	6.40	6.40			U
	NFDHA	151772-58-6	ND	ND	ND	0.213	0.569			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.213	0.569			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.40	6.40			U
	NVHOS	1132933-86-8	3013.72	4.28	4.28	1.28	1.28			
	PEPA	267239-61-2	2212.50	3.14	3.14	1.28	1.28			
	PFECA-G	801212-59-9	ND	ND	ND	0.270	1.28			U
	PFEESA	113507-82-7	ND	ND	ND	0.213	0.569			U
	PFFhDA	67905-19-5	ND	ND	ND	1.28	1.28			U
	PFFMOBA	863090-89-5	ND	ND	ND	1.28	1.28			U
PFO5DA	39492-91-6	ND	ND	ND	1.35	1.35			U	
PMPA	13140-29-9	4307.77	6.12	6.12	1.28	1.28				
R-EVE	2416366-22-6	8167.33	11.6	11.6	1.28	1.28				
R-PSDA	2416366-18-0	20583.54	29.3	29.3	1.28	1.28				
R-PSDCA	241636-21-5	84.39	0.120	0.120	1.28	1.28			L	
ES	MPPFA		4461.51	6.34				20-150%	89.2%	
	MSPFPeA		8396.42	11.9				20-150%	167.9%	Q
	M3PFBS		11141.30	15.8				20-150%	222.8%	Q
	M2-4:2 FTS		9638.51	13.7				20-150%	192.8%	Q
	MSPFFhxA		4074.82	5.79				20-150%	81.5%	
	M3HFPO-DA		4469.98	6.35				20-150%	89.4%	
	M4PFFHpA		4136.10	5.88				20-150%	82.7%	
	M3PFFhS		5516.31	7.84				20-150%	110.3%	
	M2-6:2 FTS		5670.62	8.06				20-150%	113.4%	
	M8PFOA		4307.04	6.12				20-150%	86.1%	
	M9PFNA		3753.52	5.34				20-150%	75.1%	
	M8PFOS		4049.19	5.76				20-150%	81.0%	
	M2-8:2 FTS		4538.75	6.45				20-150%	90.8%	
	M8FOSA-I		4121.23	5.86				20-150%	82.4%	
	M6PFDA		4004.80	5.69				20-150%	80.1%	
	d3-N-MeFOSAA		3817.75	5.43				20-150%	76.4%	
	d5-N-EiFOSAA		3367.79	4.79				20-150%	67.4%	
	M7PFUdA		3297.45	4.69				20-150%	65.9%	
	MPFDoA		3015.40	4.29				20-150%	60.3%	
	M2PFTeDA		1335.67	1.90				20-150%	26.7%	
d3-N-MeFOSA		619.82	0.881				10-200%	6.2%	Q	
d5-N-EiFOSA		398.44	0.566				10-200%	4.0%	Q	
d7-N-MeFOSE		2775.82	3.95				10-200%	27.8%		
d9-N-EiFOSE		2024.35	2.88				10-200%	20.2%		

Enthalpy Analytical

Job No.: 0522-822-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant, Leland N.C.

Enthalpy ID	0522-822-002-1	Prep Batch	EU13531	Sample Vol (mL)	287.77
Sample Name	052622-EO1	Prep Date	2022-05-31 15:51	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-06-03 04:29	Split Factor	N/A
Sampling Date	20220526 00:00	Analyst	wicleve	Method Code	WM-026
Received Date	2022-05-26 10:06	Instrument	Aragorn	Sample Type	Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags	
Acids	PFBA	375-22-4	3657.46	5.08	5.08	0.133	0.556				
	PFPeA	2706-90-3	7772.48	10.8	10.8	0.148	0.556				
	PFFhxA	307-24-4	6478.78	9.01	9.01	0.168	0.556				
	PFFHpA	375-85-9	2847.33	3.96	3.96	0.106	0.556				
	PFOA	335-67-1	4403.47	6.12	6.12	0.154	0.556				
	PFNA	375-95-1	584.11	0.812	0.812	0.0661	0.556				
	PFDA	335-76-2	257.47	0.358	0.358	0.0734	0.556			J	
	PFUnDA	2058-94-8	124.07	0.172	0.172	0.161	0.556			J	
	PFDoDA	307-55-1	ND	ND	ND	0.175	0.556			U	
	PFTrDA	72629-94-8	ND	ND	ND	0.131	0.556			U	
	PFTeDA	376-06-7	ND	ND	ND	0.189	0.556			U	
	Sulfonates	PFBs	375-73-5	4027.42	5.60	5.60	0.308	0.649			
		PFPeS	2706-91-4	684.97	0.952	0.952	0.179	0.524			
		PFFhS	355-46-4	3995.63	5.55	5.55	0.166	0.509			
PFFHpS		375-92-8	245.16	0.341	0.341	0.117	0.530			J	
PFOS		1763-23-1	9205.03	12.8	12.8	0.139	0.515				
PFNS		68259-12-1	ND	ND	ND	0.0751	0.536			U	
PFDS		335-77-3	ND	ND	ND	0.167	0.536			U	
4:2 FTS		757124-72-4	ND	ND	ND	0.103	0.521			U	
6:2 FTS		27619-97-2	731.71	1.02	1.02	0.101	0.530				
8:2 FTS		39108-34-4	ND	ND	ND	0.149	0.533			U	
Other	PFOSA	754-91-6	ND	ND	ND	0.113	0.556			U	
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.125	0.556			U	
	N-EiFOSAA	2991-50-6	113.40	0.158	0.158	0.0947	0.556			J	
	HFPO-DA	13252-13-6	2800.32	3.89	3.89	0.198	0.556				
	PFMOAA	674-13-5	31368.11	43.6	43.6	1.25	1.25				
	PFMOPrA	377-73-1	ND	ND	ND	0.208	0.556			U	
	PFO2HxA	39492-88-1	4448.59	6.18	6.18	1.25	1.25				
	PFO3OA	39492-89-2	1248.83	1.74	1.74	1.25	1.25				
	PFO4DA	39492-90-5	ND	ND	ND	1.32	1.32			U	
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.264	0.556			U	
	ADONA	919005-14-4	ND	ND	ND	0.104	0.527			U	
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.104	0.518			U	
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.104	0.524			U	
	10:2 FTS	120226-60-0	ND	ND	ND	0.208	0.556			U	
	EVE Acid	69087-46-3	ND	ND	ND	1.25	1.25			U	
	FBSA	30334-69-1	840.52	1.17	1.17	0.208	0.556				
	Hydro-EVE Acid	773804-62-9	173.02	0.241	0.241	1.25	1.25			L	
	Hydrolyzed PSDA	2416366-19-1	12404.75	17.2	17.2	1.25	1.25				
	Nafion Byproduct 2	749836-20-2	303.32	0.422	0.422	0.264	0.556			J	
	N-EiFOA	4151-50-2	ND	ND	ND	0.208	0.556			U	
	N-EiFOSE	1691-99-2	ND	ND	ND	6.25	6.25			U	
	NFDHA	151772-58-6	ND	ND	ND	0.208	0.556			U	
	N-MeFOA	31506-32-8	ND	ND	ND	0.208	0.556			U	
	N-MeFOSE	24448-09-7	ND	ND	ND	6.25	6.25			U	
	NVHOS	1132933-86-8	3234.44	4.50	4.50	1.25	1.25				
	PEPA	267239-61-2	1916.80	2.66	2.66	1.25	1.25				
	PFECA-G	801212-59-9	ND	ND	ND	0.264	1.25			U	
	PFEESA	113507-82-7	ND	ND	ND	0.208	0.556			U	
	PFFhDA	67905-19-5	30.55	0.0425	0.0425	1.25	1.25			L	
	PFMOBA	863090-89-5	ND	ND	ND	1.25	1.25			U	
PFO5DA	39492-91-6	ND	ND	ND	1.32	1.32			U		
PMPA	13140-29-9	5081.47	7.06	7.06	1.25	1.25					
R-EVE	2416366-22-6	7999.54	11.1	11.1	1.25	1.25					
R-PSDA	2416366-18-0	15960.15	22.2	22.2	1.25	1.25					
R-PSDCA	241636-21-5	66.54	0.0925	0.0925	1.25	1.25			L		
ES	MPFBA		4789.08	6.66				20-150%	95.8%		
	MSPFPeA		7772.17	10.8				20-150%	155.4%	Q	
	M3PFBS		10543.07	14.7				20-150%	210.9%	Q	
	M2-4:2 FTS		8282.63	11.5				20-150%	165.7%	Q	
	MSPFFhxA		4539.04	6.31				20-150%	90.8%		
	M3HFPO-DA		4782.51	6.65				20-150%	95.7%		
	M4PFFHpA		4524.73	6.29				20-150%	90.5%		
	M3PFFhS		5746.26	7.99				20-150%	114.9%		
	M2-6:2 FTS		5739.55	7.98				20-150%	114.8%		
	M8PFOA		4843.29	6.73				20-150%	96.9%		
	M9PFNA		4888.78	6.80				20-150%	97.8%		
	M8PFOS		4747.60	6.60				20-150%	95.0%		
	M2-8:2 FTS		5560.58	7.73				20-150%	111.2%		
	M8FOSA-I		4710.40	6.55				20-150%	94.2%		
	M6PFDA		5269.33	7.32				20-150%	105.4%		
	d3-N-MeFOSAA		4499.95	6.25				20-150%	90.0%		
	d5-N-EiFOSAA		3901.39	5.42				20-150%	78.0%		
	M7PFUdA		4324.11	6.01				20-150%	86.5%		
	MPFDoA		4185.84	5.82				20-150%	83.7%		
	M2PFTeDA		2289.84	3.18				20-150%	45.8%		
	d3-N-MeFOA		2097.13	2.92				10-200%	21.0%		
	d5-N-EiFOA		1480.61	2.06				10-200%	14.8%		
	d7-N-MeFOSE		4984.55	6.93				10-200%	49.8%		
	d9-N-EiFOSE		3824.12	5.32				10-200%	38.2%		

QC Data



Enthalpy Analytical

Job No.: 0522-822-1 PFAS by Isotope Dilution (non-potable water)
 Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant, Leland N.C.

Enthalpy ID	MB-13531-PFAS	Prep Batch	EU13531	Sample Vol (mL)	250
Sample Name	MB-13531-PFAS	Prep Date	2022-05-31 15:51	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-06-03 02:58	Split Factor	N/A
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date		Instrument	Aragorn	Sample Type	Blank

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags	
Acids	PFBA	375-22-4	ND	ND	ND	0.153	0.640			U	
	PFPeA	2706-90-3	ND	ND	ND	0.170	0.640			U	
	PFFhxA	307-24-4	37.28	0.0596	0.0596	0.193	0.640			L	
	PFFHpA	375-85-9	ND	ND	ND	0.122	0.640			U	
	PFOA	335-67-1	ND	ND	ND	0.177	0.640			U	
	PFNA	375-95-1	ND	ND	ND	0.0761	0.640			U	
	PFDA	335-76-2	4.90	0.00784	0.00784	0.0845	0.640			L	
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.640			U	
	PFDoDA	307-55-1	ND	ND	ND	0.202	0.640			U	
	PFTrDA	72629-94-8	68.20	0.109	0.109	0.151	0.640			L	
	PFTeDA	376-06-7	29.63	0.0474	0.0474	0.218	0.640			L	
	PFBs	375-73-5	19.63	0.0314	0.0314	0.355	0.747			L	
	PFPeS	2706-91-4	15.92	0.0255	0.0255	0.206	0.603			L	
	PFFhS	355-46-4	ND	ND	ND	0.191	0.586			U	
PFFHpS	375-92-8	ND	ND	ND	0.135	0.610			U		
Sulfonates	PFOS	1763-23-1	47.86	0.0766	0.0766	0.160	0.593			L	
	PFNS	68259-12-1	ND	ND	ND	0.0864	0.616			U	
	PFDS	335-77-3	ND	ND	ND	0.192	0.616			U	
	4:2 FTS	757124-72-4	ND	ND	ND	0.118	0.600			U	
	6:2 FTS	27619-97-2	ND	ND	ND	0.116	0.610			U	
	8:2 FTS	39108-34-4	ND	ND	ND	0.171	0.613			U	
	PFOSA	754-91-6	ND	ND	ND	0.130	0.640			U	
	N-MeFOSAA	2355-31-9	11.05	0.0177	0.0177	0.144	0.640			L	
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.109	0.640			U	
	HFPO-DA	13252-13-6	ND	ND	ND	0.228	0.640			U	
Other	PFMOAA	674-13-5	ND	ND	ND	1.44	1.44			U	
	PFMOPrA	377-73-1	ND	ND	ND	0.240	0.640			U	
	PFO2HxA	39492-88-1	ND	ND	ND	1.44	1.44			U	
	PFO3OA	39492-89-2	ND	ND	ND	1.44	1.44			U	
	PFO4DA	39492-90-5	ND	ND	ND	1.52	1.52			U	
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.304	0.640			U	
	ADONA	919005-14-4	ND	ND	ND	0.120	0.606			U	
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.120	0.596			U	
	11Cl-PF3OUdS	763051-92-9	54.23	0.0868	0.0868	0.120	0.603			L	
	10:2 FTS	120226-60-0	18.78	0.0300	0.0300	0.240	0.640			L	
	EVE Acid	69087-46-3	ND	ND	ND	1.44	1.44			U	
	FBSA	30334-69-1	ND	ND	ND	0.240	0.640			U	
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	1.44	1.44			U	
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	1.44	1.44			U	
	Nafion Byproduct 2	749836-20-2	9.63	0.0154	0.0154	0.304	0.640			L	
	N-EiFOA	4151-50-2	ND	ND	ND	0.240	0.640			U	
	N-EiFOSE	1691-99-2	ND	ND	ND	7.20	7.20			U	
	NFDHA	151772-58-6	ND	ND	ND	0.240	0.640			U	
	N-MeFOA	31506-32-8	ND	ND	ND	0.240	0.640			U	
	N-MeFOSE	24448-09-7	ND	ND	ND	7.20	7.20			U	
	NVHOS	1132933-86-8	ND	ND	ND	1.44	1.44			U	
	PEPA	267239-61-2	ND	ND	ND	1.44	1.44			U	
	PFECA-G	801212-59-9	ND	ND	ND	0.304	1.44			U	
	PFEESA	113507-82-7	ND	ND	ND	0.240	0.640			U	
	PFFhDA	67905-19-5	ND	ND	ND	1.44	1.44			U	
	PFMOBA	863090-89-5	ND	ND	ND	1.44	1.44			U	
	PFO5DA	39492-91-6	ND	ND	ND	1.52	1.52			U	
	PMPA	13140-29-9	ND	ND	ND	1.44	1.44			U	
	R-EVE	2416366-22-6	ND	ND	ND	1.44	1.44			U	
	R-PSDA	2416366-18-0	ND	ND	ND	1.44	1.44			U	
	R-PSDCA	241636-21-5	ND	ND	ND	1.44	1.44			U	
	ES	MPFBA		4643.84	7.43				20-150%	92.9%	
		MSPFPeA		4621.05	7.39				20-150%	92.4%	
		M3PFBS		3861.96	6.18				20-150%	77.2%	
M2-4:2 FTS			5514.93	8.82				20-150%	110.3%		
MSPFFhxA			4234.24	6.77				20-150%	84.7%		
M3HFPO-DA			5357.21	8.57				20-150%	107.1%		
M4PFFHpA			4398.12	7.04				20-150%	88.0%		
M3PFFhS			5473.54	8.76				20-150%	109.5%		
M2-6:2 FTS			6037.17	9.66				20-150%	120.7%		
M8PFOA			4953.20	7.93				20-150%	99.1%		
M9PFNA			5144.98	8.23				20-150%	102.9%		
M8PFOS			5228.38	8.37				20-150%	104.6%		
M2-8:2 FTS			6172.94	9.88				20-150%	123.5%		
M8FOSA-I			5277.93	8.44				20-150%	105.6%		
M6PFDA			5226.86	8.36				20-150%	104.5%		
d3-N-MeFOSAA			4861.08	7.78				20-150%	97.2%		
d5-N-EiFOSAA			3927.34	6.28				20-150%	78.5%		
M7PFUdA			4399.48	7.04				20-150%	88.0%		
MPFDoA			4035.33	6.46				20-150%	80.7%		
M2PFTeDA			1652.63	2.64				20-150%	33.1%		
d3-N-MeFOA		585.08	0.936				10-200%	5.9%	Q		
d5-N-EiFOA		445.71	0.713				10-200%	4.5%	Q		
d7-N-MeFOSE		3991.01	6.39				10-200%	39.9%			
d9-N-EiFOSE		2951.45	4.72				10-200%	29.5%			

Enthalpy Analytical

Job No.: 0522-822-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: N/A Site: Northwest Water Plant, Leland N.C.

Enthalpy ID	OPR-13531-PFAS	Prep Batch	EU13531	Sample Vol (mL)	250
Sample Name	OPR-13531-PFAS	Prep Date	2022-05-31 15:51	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-06-03 03:21	Split Factor	N/A
Sampling Date		Analyst	wicleve	Method Code	WM-026
Received Date		Instrument	Aragorn	Sample Type	Control

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	13075.19	20.9	20.9	0.153	0.640	73-129%	104.6%	
	PFPeA	2706-90-3	12038.40	19.3	19.3	0.170	0.640	72-129%	96.3%	
	PFHxA	307-24-4	12719.68	20.4	20.4	0.193	0.640	72-129%	101.8%	
	PFHpA	375-85-9	11287.13	18.1	18.1	0.122	0.640	72-130%	90.3%	
	PFOA	335-67-1	11350.35	18.2	18.2	0.177	0.640	71-133%	90.8%	
	PFNA	375-95-1	11642.06	18.6	18.6	0.0761	0.640	69-130%	93.1%	
	PFDA	335-76-2	10500.32	16.8	16.8	0.0845	0.640	71-129%	84.0%	
	PFUnDA	2058-94-8	13038.25	20.9	20.9	0.185	0.640	69-133%	104.3%	
	PFDODA	307-55-1	11897.40	19.0	19.0	0.202	0.640	72-134%	95.2%	
	PFTrDA	72629-94-8	22829.36	36.5	36.5	0.151	0.640	65-144%	182.6%	Q
PFTeDA	376-06-7	13787.74	22.1	22.1	0.218	0.640	71-132%	110.3%		
Sulfonates	PFBS	375-73-5	10967.14	17.5	17.5	0.355	0.747	72-134%	98.9%	
	PFPeS	2706-91-4	11123.57	17.8	17.8	0.206	0.603	71-127%	94.6%	
	PFHxS	355-46-4	12554.96	20.1	20.1	0.191	0.586	68-131%	109.9%	
	PFHpS	375-92-8	14315.59	22.9	22.9	0.135	0.610	69-134%	120.2%	
	PFOS	1763-23-1	12216.41	19.5	19.5	0.160	0.593	65-140%	105.3%	
	PFNS	68259-12-1	11043.48	17.7	17.7	0.0864	0.616	69-127%	91.8%	
	PFDS	335-77-3	10408.21	16.7	16.7	0.192	0.616	53-142%	86.3%	
	4:2 FTS	757124-72-4	11885.76	19.0	19.0	0.118	0.600	63-143%	101.5%	
6:2 FTS	27619-97-2	11752.02	18.8	18.8	0.116	0.610	64-140%	98.9%		
8:2 FTS	39108-34-4	10522.50	16.8	16.8	0.171	0.613	67-138%	87.7%		
Other	PFOSA	754-91-6	11497.53	18.4	18.4	0.130	0.640	67-137%	92.0%	
	N-MeFOSAA	2355-31-9	12352.69	19.8	19.8	0.144	0.640	65-136%	98.8%	
	N-EtFOSAA	2991-50-6	12332.13	19.7	19.7	0.109	0.640	61-135%	98.7%	
	HFPO-DA	13252-13-6	10678.95	17.1	17.1	0.228	0.640	70-130%	85.4%	
ES	MPFBA		4488.39	7.18				20-150%	89.8%	
	M5PFPeA		4288.25	6.86				20-150%	85.8%	
	M3PFBS		3868.31	6.19				20-150%	77.4%	
	M2-4:2 FTS		4492.26	7.19				20-150%	89.8%	
	M5PFHxA		4069.25	6.51				20-150%	81.4%	
	M3HFPO-DA		4393.29	7.03				20-150%	87.9%	
	M4PFHpA		4021.14	6.43				20-150%	80.4%	
	M3PFHxS		4520.30	7.23				20-150%	90.4%	
	M2-6:2 FTS		4785.18	7.66				20-150%	95.7%	
	M8PFOA		4573.18	7.32				20-150%	91.5%	
	M9PFNA		4373.91	7.00				20-150%	87.5%	
	M8PFOS		4122.89	6.60				20-150%	82.5%	
	M2-8:2 FTS		4731.17	7.57				20-150%	94.6%	
	M8FOSA-I		4068.85	6.51				20-150%	81.4%	
	M6PFDA		4390.94	7.03				20-150%	87.8%	
	d3-N-MeFOSAA		3348.70	5.36				20-150%	67.0%	
	d5-N-EtFOSAA		2888.18	4.62				20-150%	57.8%	
	M7PFUdA		3340.30	5.34				20-150%	66.8%	
MPFDaA		2705.07	4.33				20-150%	54.1%		
M2PFTeDA		1122.22	1.80				20-150%	22.4%		

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0522-822-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant, Leland N.C.

1. Custody

Braidy May received the samples on May 26, 2022 at 2.9 °C after being relinquished by Brunswick County Public Utilities - NC. The samples were received in good condition.

Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, LLC

Table 1 - Sample Inventory

EU Lab Sample ID	Client Sample ID	Matrix
0522-822-001-1	052622-SO1	aqueous
0522-822-002-1	052622-EO1	aqueous

2. Methods and Analytes

A list of analytes of interest and corresponding methods of analysis is shown in Table 3. Abbreviations are defined in the listed Appendices.

Table 3 - Methods and Analytes

EU Method	Analytes	Cleanup Method
EU-047	PFAS - Brunswick Custom List	ENVI-Carb

3. Analysis

The samples were analyzed using Waters Acquity UPLC equipped with Xevo TQ MS (LC/MS/MS "Aragorn").

For aqueous samples, the sample volume was measured gravimetrically by the laboratory, and spiked with Extraction Standard (ES). The sample was then mixed well and centrifuged, if needed. The samples were then extracted via SPE, and the extracts were cleaned up using ENVI-Carb.

Each final sample extract was transferred to an autosampler vial, spiked with Injection Standard (IS), and brought to a final volume of 400µL prior to analysis.

A second injection was performed for the samples to report the analyte PFHxDA using the alternate ES (M2PFTeDA) due to the low recovery of matching labeled ES (M2PFHxDA) in the initial injection.

4. Calibration

The analytes of interest in the initial calibration exhibited R² values of ≥ 0.99. The analytes of interest in the calibration, continuing calibration and Initial Calibration Verification (ICV) standards met the 30% accuracy criterion for native analytes.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0522-822-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant, Leland N.C.

5. QC Notes

Except where noted below, the QC samples met all method acceptance criteria. The recovery values for the labeled standards d3-N-MeFOSA and d5-N-EtFOSA fell below the low control limit in the analysis of the method blank (MB-13531). The recovery for the analyte PFTrDA exceeded the high control limit in the analysis of the laboratory control sample (OPR-13531); however, PFTrDA was not detected in the analysis of the samples. The data for the QC samples have been accepted and reported with no further actions.

The samples were extracted within the 28-day from collection holding time and analyzed within the 28-day from extraction to analysis holding time required by the method.

6. Reporting Notes

Some labeled extraction standards in the sample analyses fell outside the control limits for ES recovery, as denoted by the "Q" qualifier. The target analytes are quantified based on their ratio to their labeled standard analogs. As a result, low or high labeled standard recovery do not cause any change to ratios or contribute any additional error in the measurement of the target analytes. The data have been accepted and reported with no further actions.

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

These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.

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



General Reporting Notes – Data Qualifiers

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

General Data Qualifiers

- B – The analyte was found in the method blank, at a concentration that was at least 10% of the amount 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). For HRMS data, this condition does not imply additional measurement uncertainty. For LC-MS/MS data, these values should be considered as having measurement uncertainty higher than values within the calibration range.
- EDL – Estimated Detection Level: The EDL is unique to isotope dilution methods and reflects the conditions of analysis at the time of analysis, including the equipment used. Where the MDL is a static value, the EDL is a dynamic value.
- EMPC – Estimated Maximum Possible Concentration: EMPC is specific to Dioxin/Furan tests to indicate the determined ion-abundance ratio was outside the allowed theoretical range (usually due to being near the detection limit, although it can very rarely be caused by a co-eluting interference). The EMPC concentration is adjusted to reflect the value at the theoretical ion-abundance ratio.
- IR – The ion ratio between the primary and secondary ions was observed to be outside the method criteria. The analyte concentration may be inaccurate due to interference.
- J – The analyte has a concentration below the minimum calibration level (LOQ value) but greater than the LOD. These values should be considered as having measurement uncertainty higher than values within the calibration range
- 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 analyte signal may have a signal-to-noise ratio less than the criteria deemed necessary to be considered a detected analyte.
- LOD – Limit of Detection: For reports conforming to the DOD ELAP QSM, this is the QSM-defined LOD. For reports conforming to TNI requirements (but not DOD ELAP QSM requirements), this value is the minimum detection limit (MDL). The LOD is adjusted for sample weight or volume.
- LOQ – Limit of Quantitation: For reports conforming to the DOD ELAP QSM, this is the QSM-defined LOQ. For reports conforming to TNI requirements (but not DOD ELAP QSM requirements), this value is the reporting limit (RL). The LOQ is adjusted for sample weight or volume.

General Reporting Notes – Data Qualifiers

- <LOD() – Analyte was not found at a concentration high enough to be reported as detected. It is reported as less than the LOD, and the LOD is given in the parentheses.
- <LOQ() – Analyte was not found at a concentration high enough to be reported as above the QSM-defined LOQ or TNI defined Reporting Limit. It is reported as less than the LOQ, and the LOQ is given in the parentheses.
- ND – Indicates a non-detect.
- NR – Indicates a value that is not reportable due to issues observed in sample preparation or analysis.
- PR – The associated congener(s) is(are) poorly resolved.
- QI – Indicates the presence of a quantitative interference.
- RL – Reporting Limit. Lowest reportable value. The level is higher than the MDL.
- 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.
- V / Q – The labeled standard recovery is not within method control limits.
- X – Indicates the result is from re-injection/repeat/second-column analysis.

Lab Identifiers/ Data Attributes

- 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.
- D – Dilution Data. Result was obtained from the analysis of a dilution. The number that follows the “D” indicates the dilution factor.
- 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.
- R – Indicates a re-extraction of the sample.
- RJ – Indicates a reinjection of the sample extract.



General Reporting Notes – Data Qualifiers

- S – Indicates a sample split. The number that follows the “S” indicates the split factor.
- SAT – Indicates an analyte saturated the detector.

PFAS Compound Acronym List		
Acronym	CAS #	Compound Name
Target Analytes		
* Analyte is not accredited		
PFBA	375-22-4	Perfluorobutanoic Acid
PFPeA	2706-90-3	Perfluoropentanoic Acid
PFHxA	307-24-4	Perfluorohexanoic Acid
PFHpA	375-85-9	Perfluoroheptanoic Acid
PFOA	335-67-1	Perfluorooctanoic Acid
PFNA	375-95-1	Perfluorononanoic Acid
PFDA	335-76-2	Perfluorodecanoic acid
PFUnA (PFUnDA)	2058-94-8	Perfluoroundecanoic acid
PFDoA (PFDoDA)	307-55-1	Perfluorododecanoic acid
PFTriA (PFTriA)	72629-94-8	Perfluorotridecanoic acid
PFTeDA (PFTA)	376-06-7	Perfluorotetradecanoic acid
PFBS	375-73-5	Perfluorobutane sulfonic acid
PFPeS	2706-91-4	Perfluoropentane sulfonic acid
PFHxS	355-46-4	Perfluorohexane sulfonic acid
PFHpS	375-92-8	Perfluoroheptane sulfonic acid
PFOS	1763-23-1	Perfluorooctane sulfonic acid
PFNS	68259-12-1	Perfluorononane sulfonic acid
PFDS	335-77-3	Perfluorodecane sulfonic acid
4:2 FTS	757124-72-4	4:2 fluorotelomer sulfonic acid
6:2 FTS	27619-97-2	6:2 fluorotelomer sulfonic acid
8:2 FTS	39108-34-4	8:2 fluorotelomer sulfonic acid
PFOSA (FOSA)	754-91-6	Perfluorooctane sulfonamide
N-MeFOSAA	2355-31-9	N-methyl perfluorooctane sulfonamido acetic acid
N-EtFOSAA	2991-50-6	N-ethyl perfluorooctane sulfonamido acetic acid
HFPO-DA	13252-13-6	2,3,3,3-Tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (Gen-X)
11CI-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
9CI-PF3ONS	756426-58-1	9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ADONA	919005-14-4	4,8-dioxa-3H-perfluorononanoic acid
PFEESA	113507-82-7	Perfluoro(2-ethoxyethane)sulphonic acid
PFMOBA (PFMBA)	863090-89-5	Perfluoro-4-methoxybutanic acid
NFDHA	151772-58-6	Nonafluoro-3,6-dioxaheptanoic acid
PFMOPra (PFMPA)	377-73-1	Perfluoro-3-methoxypropanoic acid
* PFMOAA	674-13-5	Perfluoro-2-methoxyacetic acid
* PFO2HxA	39492-88-1	Perfluoro (3,5-dioxaheptanoic) acid
* PFO3OA	39492-89-2	Perfluoro (3,5,7-trioxaoctanoic) acid
* PFO4DA	39492-90-5	Perfluoro (3,5,7,9-tetraoxadecanoic) acid
* PFO5DA	39492-91-6	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid
* Nafion Byproduct 1	29311-67-9	Nafion Byproduct 1
* Nafion Byproduct 2	749836-20-2	Nafion Byproduct 2
* PEPA	267239-61-2	Perfluoro-2-ethoxypropanoic acid
* PMPA	13140-29-9	Perfluoro-2-methoxypropanoic acid
* 10:2 FTS	120226-60-0	Fluorotelomer sulfonate 10:2
* N-EtFOSA	4151-50-2	N-ethylperfluoro-1-octanesulfonamide
* N-EtFOSE	1691-99-2	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
* N-MeFOSA	31506-32-8	N-methylperfluoro-1-octanesulfonamide
* N-MeFOSE	24448-09-7	2-(N-methylperfluoro-1-octanesulfonamido)-ethanol
* PFECA-G	801212-59-9	4-(Heptafluoroisopropoxy)hexafluorobutanoic acid
* PFHxDA	67905-19-5	Perfluorohexadecanoic acid
* R-PSDA (Nafion Byproduct 4)	2416366-18-0	Perfluoro-4-(2-sulfoethoxy)pentanoic acid

PFAS Compound Acronym List		
Acronym	CAS #	Compound Name
Target Analytes		
* Analyte is not accredited		
* Hydrolyzed PSDA (Nafion Byproduct 5)	2416366-19-1	2-fluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2-tetrafluoro-2-sulfoethoxy)propoxy]-acetic acid
* R-PSDCA (Nafion Byproduct 6)	2416366-21-5	1,1,2,2-tetrafluoro-2-[1,2,2,3,3-pentafluoro-1-(trifluoromethyl)propoxy] ethanesulfonic acid
* EVE Acid	69087-46-3	2,2,3,3-tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-[(1,2,2-trifluoroethenyl)oxy]propan-2-yl)oxy}propionic acid
* FBSA	30334-69-1	Perfluorobutylsulfonamide
* Hydro-EVE Acid	773804-62-9	2,2,3,3-Tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-(1,2,2,2-tetrafluoroethoxy)propan-2-yl)oxy}propanoic acid
* R-EVE Acid	2416366-22-6	4-(2-carboxy-1,1,2,2-tetrafluoroethoxy)-2,2,3,3,4,5,5,5-octafluoro-pentanoic acid
* NVHOS	1132933-86-8	Perfluoroethoxysulfonic acid
* PFDoS	79780-39-5	Perfluorododecane sulfonic acid
* PFOA	16517-11-6	Perfluorooctadecanoic acid
* 3:3 FTCA	356-02-5	2H,2H,3H,3H-Perfluorohexanoic acid
* 5:3 FTCA	914637-49-3	2H,2H,3H,3H-Perfluorooctanoic acid
* 7:3 FTCA	812-70-4	2H,2H,3H,3H-Perfluorodecanoic acid
* N-AP-FHxSA	50598-28-2	N-(3-(Dimethylamino)propyl)tridecafluoro-1-hexanesulfonamide
* N-CMAmP-6:2 FOSA	34455-29-3	N-(Carboxymethyl)-N,N-dimethyl-3-(((3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl)sulfonyl)amino)1-propanaminium

Sample Custody



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