

County of Brunswick

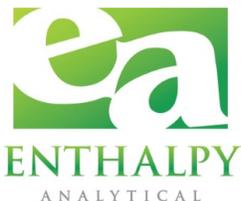
3954 Clearwell Dr NE
Leland, NC 28451

Northwest Water Plant

Leland, NC
Samples Received: 03/25/22

Analytical Report 0322-805

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.: 0322-805-1 PFAS by Isotope Dilution

Brunswick County Public Utilities - NC Northwest Water Plant Leland, NC

Summary

	Compound	CAS	032522-SO1 ng/L	032522-EO1 ng/L
Acids	PFBA	375-22-4	2.75	ND U
	PFPeA	2706-90-3	3.15	2.98
	PFHxA	307-24-4	3.03	2.56
	PFHpA	375-85-9	1.86	1.51
	PFOA	335-67-1	4.24	3.40
	PFNA	375-95-1	0.567	0.549
	PFDA	335-76-2	0.260 J	0.235 J
	PFUnDA	2058-94-8	0.0730 L	0.0997 L
	PFDODA	307-55-1	0.103 L	0.0375 L
	PFTTrDA	72629-94-8	0.218 J	0.0385 L
	PFTeDA	376-06-7	0.0913 L	ND U
Sulfonates	PFBS	375-73-5	2.14	1.78
	PFPeS	2706-91-4	0.539	0.475
	PFHxS	355-46-4	2.66	2.55
	PFHpS	375-92-8	0.224 J	0.203 J
	PFOS	1763-23-1	7.38	6.91
	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	0.123 J	0.189 J
8:2 FTS	39108-34-4	0.0701 L	ND U	
other	PFOSA	754-91-6	ND U	0.00221 L
	N-MeFOSAA	2355-31-9	0.0227 L	0.0340 L
	N-EtFOSAA	2991-50-6	0.0312 L	0.0367 L
	HFPO-DA	13252-13-6	2.21	2.97
	PFMOAA	674-13-5	21.2	19.6
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	1.80	1.67
	PFO3OA	39492-89-2	0.737 L	ND U
	PFO4DA	39492-90-5	0.319 L	ND U
	Nafion Byproduct 1	29311-67-9	ND U	ND U
	ADONA	919005-14-4	0.00941 L	ND U
	9Cl-PF3ONS	756426-58-1	ND U	ND U
	11Cl-PF3OUdS	763051-92-9	0.0573 L	0.0304 L
	10:2 FTS	120226-60-0	ND U	0.108 L
	EVE Acid	69087-46-3	0.0144 L	ND U
	FBSA	30334-69-1	0.221 J	0.128 L
	Hydro-EVE Acid	773804-62-9	0.123 L	0.165 L
	Hydrolyzed PSDA	2416366-19-1	1.14 L	1.73
	Nafion Byproduct 2	749836-20-2	0.189 L	0.153 L
	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	ND U	ND U
	PEPA	267239-61-2	ND U	ND U
	PFECA-G	801212-59-9	0.0639 L	ND U
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	0.0816 LB	ND U
	PFMOBA	863090-89-5	ND U	ND U
	PFO5DA	39492-91-6	0.0715 L	0.225 L
	PMPA	13140-29-9	ND U	ND U
R-EVE	2416366-22-6	3.60	5.45	
R-PSDA	2416366-18-0	ND U	ND U	
R-PSDCA	2416366-21-5	0.0232 LB	ND U	

Detailed Results

Enthalpy Analytical

Job No.: 0322-805-1 PFAS by Isotope Dilution

Brunswick County Public Utilities - NC Northwest Water Plant, Leland, NC

Enthalpy ID	0322-805-001-1	Prep Batch	EU13197	Sample Vol (mL)	290.34
Sample Name	032522-S01	Prep Date	2022-03-28 10:00	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-02 23:00	Split Factor	N/A
Sampling Date	20220325 00:00	Analyst	avheadrick	Method Code	WM-026
Received Date	2022-03-25 09:45	Instrument	Kill	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	1997.69	2.75	2.75	0.132	0.262			
	PFPeA	2706-90-3	2283.30	3.15	3.15	0.146	0.262			
	PFHxA	307-24-4	2202.60	3.03	3.03	0.166	0.262			
	PFHpA	375-85-9	1351.70	1.86	1.86	0.105	0.262			
	PFOA	335-67-1	3079.35	4.24	4.24	0.152	0.262			
	PFNA	375-95-1	411.50	0.567	0.567	0.0655	0.262			
	PFDA	335-76-2	189.08	0.260	0.260	0.0728	0.262			J
	PFUnDA	2058-94-8	52.98	0.0730	0.0730	0.159	0.262			L
	PFDoDA	307-55-1	74.68	0.103	0.103	0.174	0.262			L
	PFTriDA	72629-94-8	157.95	0.218	0.218	0.130	0.262			J
Sulfonates	PFTeDA	376-06-7	66.25	0.0913	0.0913	0.188	0.262			L
	PFBS	375-73-5	1552.64	2.14	2.14	0.306	0.306			
	PFPeS	2706-91-4	391.32	0.539	0.539	0.177	0.247			
	PFHxS	355-46-4	1930.29	2.66	2.66	0.164	0.240			
	PFHpS	375-92-8	162.27	0.224	0.224	0.116	0.249			J
	PFOS	1763-23-1	5358.35	7.38	7.38	0.138	0.242			
	PFNS	68259-12-1	ND	ND	ND	0.0744	0.252			U
	PFDS	335-77-3	ND	ND	ND	0.165	0.252			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.102	0.245			U
	6:2 FTS	27619-97-2	89.50	0.123	0.123	0.0999	0.249			J
other	8:2 FTS	39108-34-4	50.88	0.0701	0.0701	0.147	0.251			L
	PFOSA	754-91-6	ND	ND	ND	0.112	0.262			U
	N-MeFOSAA	2355-31-9	16.49	0.0227	0.0227	0.124	0.262			L
	N-EiFOSAA	2991-50-6	22.68	0.0312	0.0312	0.0939	0.262			L
	HFPO-DA	13252-13-6	1600.87	2.21	2.21	0.196	0.262			
	PFMOAA	674-13-5	15362.76	21.2	21.2	1.24	1.24			
	PFMOPrA	377-73-1	ND	ND	ND	0.207	0.262			U
	PF02HxA	39492-88-1	1304.70	1.80	1.80	1.24	1.24			
	PFO3OA	39492-89-2	534.64	0.737	0.737	1.24	1.24			
	PFO4DA	39492-90-5	231.43	0.319	0.319	1.31	1.31			L
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.262	0.262			U
	ADONA	919005-14-4	6.83	0.00941	0.00941	0.103	0.248			L
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.103	0.244			U
	11Cl-PF3OUdS	763051-92-9	41.59	0.0573	0.0573	0.103	0.247			L
	10:2 FTS	120226-60-0	ND	ND	ND	0.207	0.262			U
	EVE Acid	69087-46-3	10.49	0.0144	0.0144	1.24	1.24			L
	FBSA	30334-69-1	160.19	0.221	0.221	0.207	0.262			J
	Hydro-EVE Acid	773804-62-9	89.10	0.123	0.123	1.24	1.24			L
	Hydrolyzed PSDA	2416366-19-1	825.59	1.14	1.14	1.24	1.24			L
	Nafion Byproduct 2	749836-20-2	137.22	0.189	0.189	0.262	0.262			L
N-EiFOSA	4151-50-2	ND	ND	ND	0.207	0.262			U	
N-EiFOSE	1691-99-2	ND	ND	ND	6.20	6.20			U	
NFDHA	151772-58-6	ND	ND	ND	0.207	0.262			U	
N-MeFOSA	31506-32-8	ND	ND	ND	0.207	0.262			U	
N-MeFOSE	24448-09-7	ND	ND	ND	6.20	6.20			U	
NVHOS	1132933-86-8	ND	ND	ND	1.24	1.24			U	
PEPA	267239-61-2	ND	ND	ND	1.24	1.24			U	
PFECA-G	801212-59-9	46.42	0.0639	0.0639	0.262	1.24			L	
PFEESA	113507-82-7	ND	ND	ND	0.207	0.262			U	
PFHxDA	67905-19-5	59.24	0.0816	0.0816	1.24	1.24			LB	
PFMOBA	863090-89-5	ND	ND	ND	1.24	1.24			U	
PFO5DA	39492-91-6	51.89	0.0715	0.0715	1.31	1.31			L	
PMPA	13140-29-9	ND	ND	ND	1.24	1.24			U	
R-EVE	2416366-22-6	2615.95	3.60	3.60	1.24	1.24			U	
R-PSDA	2416366-18-0	ND	ND	ND	1.24	1.24			U	
R-PSDCA	2416366-21-5	16.82	0.0232	0.0232	1.24	1.24			LB	
ES	MPFBA		4386.87	6.04				20-150%	87.7%	
	M5PFPeA		9270.52	12.8				20-150%	185.4%	Q
	M3PFBS		15030.97	20.7				20-150%	300.6%	Q
	M2-4:2 FTS		12564.39	17.3				20-150%	251.3%	Q
	M5PFHxA		3910.60	5.39				20-150%	78.2%	
	M3HFPO-DA		3036.90	4.18				20-150%	60.7%	
	M4PFHpA		4394.22	6.05				20-150%	87.9%	
	M3PFHxS		4693.89	6.47				20-150%	93.9%	
	M2-6:2 FTS		5809.03	8.00				20-150%	116.2%	
	M8PFOA		4224.92	5.82				20-150%	84.5%	
	M9PFNA		3714.49	5.12				20-150%	74.3%	
	M8PFOS		4414.56	6.08				20-150%	88.3%	
	M2-8:2 FTS		5112.81	7.04				20-150%	102.3%	
	M8FOSA-I		3601.65	4.96				20-150%	72.0%	
	M6PFDA		4207.84	5.80				20-150%	84.2%	
	d3-N-MeFOSAA		4901.70	6.75				20-150%	98.0%	
	d5-N-EiFOSAA		4184.82	5.77				20-150%	83.7%	
	M7PFUdA		3675.19	5.06				20-150%	73.5%	
	MPFDaA		3079.43	4.24				20-150%	61.6%	
	M2PFTeDA		1423.50	1.96				20-150%	28.5%	

Enthalpy Analytical

Job No.: 0322-805-1 PFAS by Isotope Dilution

Brunswick County Public Utilities - NC Northwest Water Plant, Leland, NC

Enthalpy ID	0322-805-002-1	Prep Batch	EU13197	Sample Vol (mL)	289.04
Sample Name	032522-E01	Prep Date	2022-03-28 10:00	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-02 23:24	Split Factor	N/A
Sampling Date	20220325 00:00	Analyst	avheadrick	Method Code	WM-026
Received Date	2022-03-25 09:45	Instrument	Kill	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	ND	ND	ND	0.132	0.263			U
	PFPeA	2706-90-3	2152.16	2.98	2.98	0.147	0.263			
	PFHxA	307-24-4	1852.11	2.56	2.56	0.167	0.263			
	PFHpA	375-85-9	1088.66	1.51	1.51	0.106	0.263			
	PFOA	335-67-1	2458.56	3.40	3.40	0.153	0.263			
	PFNA	375-95-1	396.49	0.549	0.549	0.0658	0.263			
	PFDA	335-76-2	170.12	0.235	0.235	0.0731	0.263			J
	PFUnDA	2058-94-8	72.07	0.0997	0.0997	0.160	0.263			L
	PFDoDA	307-55-1	27.10	0.0375	0.0375	0.175	0.263			L
	PFTtDA	72629-94-8	27.82	0.0385	0.0385	0.131	0.263			L
	PFTeDA	376-06-7	ND	ND	ND	0.189	0.263			U
	PFBS	375-73-5	1284.64	1.78	1.78	0.307	0.307			
	PFPeS	2706-91-4	343.45	0.475	0.475	0.178	0.248			
	PFHxS	355-46-4	1841.17	2.55	2.55	0.165	0.241			
PFHpS	375-92-8	146.74	0.203	0.203	0.117	0.250			J	
PFOS	1763-23-1	4990.41	6.91	6.91	0.138	0.244				
PFNS	68259-12-1	ND	ND	ND	0.0747	0.253			U	
PFDS	335-77-3	ND	ND	ND	0.166	0.253			U	
4:2 FTS	757124-72-4	ND	ND	ND	0.102	0.246			U	
6:2 FTS	27619-97-2	136.25	0.189	0.189	0.100	0.250			J	
8:2 FTS	39108-34-4	ND	ND	ND	0.148	0.252			U	
other	PFOSA	754-91-6	1.60	0.00221	0.00221	0.112	0.263			L
	N-MeFOSAA	2355-31-9	24.54	0.0340	0.0340	0.125	0.263			L
	N-EFOSAA	2991-50-6	26.49	0.0367	0.0367	0.0943	0.263			L
	HFPO-DA	13252-13-6	2142.56	2.97	2.97	0.197	0.263			
	PFMOAA	674-13-5	14148.33	19.6	19.6	1.25	1.25			
	PFMOPrA	377-73-1	ND	ND	ND	0.208	0.263			U
	PFO2HxA	39492-88-1	1207.70	1.67	1.67	1.25	1.25			
	PFO3OA	39492-89-2	ND	ND	ND	1.25	1.25			U
	PFO4DA	39492-90-5	ND	ND	ND	1.31	1.31			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.263	0.263			U
	ADONA	919005-14-4	ND	ND	ND	0.104	0.249			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.104	0.245			U
	11Cl-PF3OUdS	763051-92-9	22.00	0.0304	0.0304	0.104	0.248			L
	10:2 FTS	120226-60-0	78.30	0.108	0.108	0.208	0.263			L
	EVE Acid	69087-46-3	ND	ND	ND	1.25	1.25			U
	FBSA	30334-69-1	92.65	0.128	0.128	0.208	0.263			L
	Hydro-EVE Acid	773804-62-9	119.08	0.165	0.165	1.25	1.25			L
	Hydrolyzed PSDA	2416366-19-1	1249.31	1.73	1.73	1.25	1.25			
	Nafion Byproduct 2	749836-20-2	110.23	0.153	0.153	0.263	0.263			L
	N-EFOSA	4151-50-2	ND	ND	ND	0.208	0.263			U
	N-EIFOSE	1691-99-2	ND	ND	ND	6.23	6.23			U
	NFDHA	151772-58-6	ND	ND	ND	0.208	0.263			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.208	0.263			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.23	6.23			U
	NVHOS	1132933-86-8	ND	ND	ND	1.25	1.25			U
	PEPA	267239-61-2	ND	ND	ND	1.25	1.25			U
	PFECA-G	801212-59-9	ND	ND	ND	0.263	1.25			U
	PFEESA	113507-82-7	ND	ND	ND	0.208	0.263			U
	PFHxDA	67905-19-5	ND	ND	ND	1.25	1.25			U
	PFMOBA	863090-89-5	ND	ND	ND	1.25	1.25			U
	PFO5DA	39492-91-6	162.47	0.225	0.225	1.31	1.31			L
	PMPA	13140-29-9	ND	ND	ND	1.25	1.25			U
	R-EVE	2416366-22-6	3938.74	5.45	5.45	1.25	1.25			
R-PSDA	2416366-18-0	ND	ND	ND	1.25	1.25			U	
R-PSDCA	2416366-21-5	ND	ND	ND	1.25	1.25			U	
ES	MPFBA		4233.25	5.86				20-150%	84.7%	
	M5PFPeA		7730.79	10.7				20-150%	154.6%	Q
	M3PFBS		14049.40	19.4				20-150%	281.0%	Q
	M2-4:2 FTS		11931.05	16.5				20-150%	238.6%	Q
	M5PFHxA		3142.26	4.35				20-150%	62.8%	
	M3HFPO-DA		2407.12	3.33				20-150%	48.1%	
	M4PFHpA		3820.44	5.29				20-150%	76.4%	
	M3PFHxS		4085.37	5.65				20-150%	81.7%	
	M2-6:2 FTS		10782.10	14.9				20-150%	215.6%	Q
	M8PFOA		4056.28	5.61				20-150%	81.1%	
	M9PFNA		3457.99	4.79				20-150%	69.2%	
	M8PFOS		3726.48	5.16				20-150%	74.5%	
	M2-8:2 FTS		7825.59	10.8				20-150%	156.5%	Q
	M8FOSA-I		3229.65	4.47				20-150%	64.6%	
	M6PFDA		3820.77	5.29				20-150%	76.4%	
	d3-N-MeFOSAA		4388.95	6.07				20-150%	87.8%	
	d5-N-EFOSAA		4111.72	5.69				20-150%	82.2%	
	M7PFUdA		3170.89	4.39				20-150%	63.4%	
	MPFDa		2553.60	3.53				20-150%	51.1%	
	M2PFTeDA		1514.75	2.10				20-150%	30.3%	

QC Data



Enthalpy Analytical

Job No.: 0322-805-1 PFAS by Isotope Dilution

Brunswick County Public Utilities - NC Northwest Water Plant, Leland, NC

Enthalpy ID	MB-13197-PFAS	Prep Batch	EU13197	Sample Vol (mL)	250
Sample Name	MB-13197-PFAS	Prep Date	2022-03-28 10:00	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-02 22:14	Split Factor	N/A
Sampling Date		Analyst	avheadrick	Method Code	WM-026
Received Date		Instrument	Killi	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	0.304			U	
	PFPeA	2706-90-3	ND	ND	ND	0.170	0.304			U	
	PFHxA	307-24-4	ND	ND	ND	0.193	0.304			U	
	PFHpA	375-85-9	0.22	0.000353	0.000353	0.122	0.304			L	
	PFOA	335-67-1	ND	ND	ND	0.177	0.304			U	
	PFNA	375-95-1	ND	ND	ND	0.0761	0.304			U	
	PFDA	335-76-2	ND	ND	ND	0.0845	0.304			U	
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.304			U	
	PFDoDA	307-55-1	ND	ND	ND	0.202	0.304			U	
	PFTeDA	72629-94-8	ND	ND	ND	0.151	0.304			U	
	PFTeDA	376-06-7	ND	ND	ND	0.218	0.304			U	
	PFBS	375-73-5	ND	ND	ND	0.355	0.355			U	
	Sulfonates	PFPeS	2706-91-4	ND	ND	ND	0.206	0.286			U
		PFHxS	355-46-4	ND	ND	ND	0.191	0.278			U
		PFHpS	375-92-8	ND	ND	ND	0.135	0.290			U
PFOS		1763-23-1	ND	ND	ND	0.160	0.282			U	
PFNS		68259-12-1	ND	ND	ND	0.0864	0.293			U	
PFDS		335-77-3	ND	ND	ND	0.192	0.293			U	
4:2 FTS		757124-72-4	ND	ND	ND	0.118	0.285			U	
6:2 FTS		27619-97-2	ND	ND	ND	0.116	0.290			U	
8:2 FTS		39108-34-4	ND	ND	ND	0.171	0.291			U	
PFOSA		754-91-6	ND	ND	ND	0.130	0.304			U	
other	N-MeFOSAA	2355-31-9	ND	ND	ND	0.144	0.304			U	
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.109	0.304			U	
	HFPO-DA	13252-13-6	ND	ND	ND	0.228	0.304			U	
	PFMOAA	674-13-5	ND	ND	ND	1.44	1.44			U	
	PFMOPrA	377-73-1	ND	ND	ND	0.240	0.304			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	0.304			U	
	ADONA	919005-14-4	ND	ND	ND	0.120	0.288			U	
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.120	0.283			U	
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.120	0.286			U	
	10:2 FTS	120226-60-0	ND	ND	ND	0.240	0.304			U	
	EVE Acid	69087-46-3	ND	ND	ND	1.44	1.44			U	
	FBSA	30334-69-1	ND	ND	ND	0.240	0.304			U	
	Hydro-EVE Acid	773804-62-9	1.64	0.00263	0.00263	1.44	1.44			L	
	Hydrolyzed PSDA	2416366-19-1	39.17	0.0627	0.0627	1.44	1.44			L	
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.304	0.304			U	
	N-EtFOSA	4151-50-2	ND	ND	ND	0.240	0.304			U	
	N-EtFOSE	1691-99-2	ND	ND	ND	7.20	7.20			U	
	NFDHA	151772-58-6	ND	ND	ND	0.240	0.304			U	
	N-MeFOSA	31506-32-8	ND	ND	ND	0.240	0.304			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	
	PFEEESA	113507-82-7	ND	ND	ND	0.240	0.304			U	
	PFHxDA	67905-19-5	11.33	0.0181	0.0181	1.44	1.44			L	
	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	2416366-21-5	4.81	0.00769	0.00769	1.44	1.44			L	
	ES	MPFBA		4807.21	7.69				20-150%	96.1%	
M5PFPeA			4690.74	7.51				20-150%	93.8%		
M3PFBS			4776.12	7.64				20-150%	95.5%		
M2-4:2 FTS			4979.34	7.97				20-150%	99.6%		
M5PFHxA			4564.99	7.30				20-150%	91.3%		
M3HFPO-DA			4796.69	7.67				20-150%	95.9%		
M4PFHpA			4683.97	7.49				20-150%	93.7%		
M3PFHxS			4986.16	7.98				20-150%	99.7%		
M2-6:2 FTS			4492.82	7.19				20-150%	89.9%		
M8PFOA			4706.86	7.53				20-150%	94.1%		
M9PFNA			4202.15	6.72				20-150%	84.0%		
M8PFOS			4506.55	7.21				20-150%	90.1%		
M2-8:2 FTS			5837.59	9.34				20-150%	116.8%		
M8FOSA-I			3588.16	5.74				20-150%	71.8%		
M6PFDA			4784.79	7.66				20-150%	95.7%		
d3-N-MeFOSAA			5258.10	8.41				20-150%	105.2%		
d5-N-EtFOSAA			5222.96	8.36				20-150%	104.5%		
M7PFUdA			4609.10	7.37				20-150%	92.2%		
MPFDaA			4401.68	7.04				20-150%	88.0%		
M2PFTeDA			3321.57	5.31				20-150%	66.4%		

Enthalpy Analytical

Job No.: 0322-805-1 PFAS by Isotope Dilution

Brunswick County Public Utilities - NC Northwest Water Plant Leland, NC

Enthalpy ID	OPR-13197-PFAS	Prep Batch	EU13197	Sample Vol (mL)	250
Sample Name	OPR-13197-PFAS	Prep Date	2022-03-28 10:00	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-04-02 22:37	Split Factor	N/A
Sampling Date		Analyst	avheadrick	Method Code	WM-026
Received Date		Instrument	Killi	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	12453.20	19.9	19.9	0.153	0.304	73-129%	99.6%		
	PFPeA	2706-90-3	11946.82	19.1	19.1	0.170	0.304	72-129%	95.6%		
	PFHxA	307-24-4	12519.05	20.0	20.0	0.193	0.304	72-129%	100.2%		
	PFHpA	375-85-9	11389.64	18.2	18.2	0.122	0.304	72-130%	91.1%		
	PFOA	335-67-1	12765.61	20.4	20.4	0.177	0.304	71-133%	102.1%		
	PFNA	375-95-1	12199.94	19.5	19.5	0.0761	0.304	69-130%	97.6%		
	PFDA	335-76-2	12039.43	19.3	19.3	0.0845	0.304	71-129%	96.3%		
	PFUnDA	2058-94-8	11945.92	19.1	19.1	0.185	0.304	69-133%	95.6%		
	PFDoDA	307-55-1	13279.08	21.2	21.2	0.202	0.304	72-134%	106.2%		
	PFTTrDA	72629-94-8	13378.27	21.4	21.4	0.151	0.304	65-144%	107.0%		
Sulfonates	PFTeDA	376-06-7	12687.46	20.3	20.3	0.218	0.304	71-132%	101.5%		
	PFBS	375-73-5	10750.83	17.2	17.2	0.355	0.355	72-134%	97.0%		
	PFPeS	2706-91-4	11943.86	19.1	19.1	0.206	0.286	71-127%	101.5%		
	PFHxS	355-46-4	12412.74	19.9	19.9	0.191	0.278	68-131%	108.6%		
	PFHpS	375-92-8	14263.82	22.8	22.8	0.135	0.290	69-134%	119.7%		
	PFOS	1763-23-1	12210.60	19.5	19.5	0.160	0.282	65-140%	105.3%		
	PFNS	68259-12-1	12269.55	19.6	19.6	0.0864	0.293	69-127%	102.0%		
	PFDS	335-77-3	12483.50	20.0	20.0	0.192	0.293	53-142%	103.5%		
	4:2 FTS	757124-72-4	12500.40	20.0	20.0	0.118	0.285	63-143%	106.7%		
	6:2 FTS	27619-97-2	12358.54	19.8	19.8	0.116	0.290	64-140%	104.0%		
Other	8:2 FTS	39108-34-4	11171.00	17.9	17.9	0.171	0.291	67-138%	93.1%		
	PFOSA	754-91-6	12038.76	19.3	19.3	0.130	0.304	67-137%	96.3%		
	N-MeFOSAA	2355-31-9	12429.01	19.9	19.9	0.144	0.304	65-136%	99.4%		
	N-EtFOSAA	2991-50-6	13064.78	20.9	20.9	0.109	0.304	61-135%	104.5%		
	HFPO-DA	13252-13-6	11960.87	19.1	19.1	0.228	0.304	70-130%	95.7%		
	ES	MPFBA		4775.20	7.64				20-150%	95.5%	
		M5PFPeA		4840.05	7.74				20-150%	96.8%	
		M3PFBS		4520.97	7.23				20-150%	90.4%	
		M2-4:2 FTS		4767.02	7.63				20-150%	95.3%	
		M5PFHxA		4522.56	7.24				20-150%	90.5%	
M3HFPO-DA			4681.14	7.49				20-150%	93.6%		
M4PFHpA			4617.72	7.39				20-150%	92.4%		
M3PFHxS			4708.56	7.53				20-150%	94.2%		
M2-6:2 FTS			4823.56	7.72				20-150%	96.5%		
M8PFOA			4549.85	7.28				20-150%	91.0%		
M9PFNA			4142.41	6.63				20-150%	82.8%		
M8PFOS			4643.99	7.43				20-150%	92.9%		
M2-8:2 FTS			5483.06	8.77				20-150%	109.7%		
M8FOSA-I			4315.02	6.90				20-150%	86.3%		
M6PFDA			4433.49	7.09				20-150%	88.7%		
d3-N-MeFOSAA			5582.90	8.93				20-150%	111.7%		
d5-N-EtFOSAA		5317.27	8.51				20-150%	106.3%			
M7PFUDa		4312.25	6.90				20-150%	86.2%			
MPFDa		4153.69	6.65				20-150%	83.1%			
M2PFTeDA		3434.57	5.50				20-150%	68.7%			

Narrative Summary



Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0322-805-1 PFAS by Isotope Dilution
Client ID.	N/A Site: Northwest Water Plant, Leland, NC

1. Custody

Megan Holden received the samples on March 25, 2022 at 2.4 °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
0322-805-001-1	032522-SO1	Aqueous
0322-805-002-1	032522-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	Brunswick PFAS list	ENVI-Carb

3. Analysis

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

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.

Due to acquisition requirements for analytes requested, the sample was analyzed in more than one sequence.

4. Calibration

In the initial calibration, the reported analytes exhibited R^2 of ≥ 0.99 . The reported analytes in the calibration standards, continuing calibration (concal) and Initial Calibration Verification (ICV) met the 30% accuracy criterion for native analytes.

Supplemental compounds were run using a single point calibration forced through zero.

The Technical Director extended the method criteria for certain non-legacy analytes that do not have their own internal standard and exhibit observed variability during calibration.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0322-805-1 PFAS by Isotope Dilution
Client ID.	N/A Site: Northwest Water Plant, Leland, NC

5. QC Notes

The QC sample analyses passed all method criteria.

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

This report provides all results including detections below LOD following client instruction.

Analyte(s) were detected in the method blank (MB) at less than 1/2 LOQ that may also be less than LOD. Any analyte(s) detected in the samples with less than 10 times the amount detected in MB were notated with a B qualifier and are reported with no adverse impact.

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)
11Cl-PF3OUdS	763051-92-9	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
9Cl-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-(1,1,2,2-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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Of This Report.**

