Brunswick County Public Utilities - NC

PO Box 249
Bolivia, NC 28422-0249

Northwest Water Plant

Leland, NC
Samples Received: 1/20/2023

Analytical Report
0123-794

PFAS by Isotope Dilution
PFAS

Report Issue Date: 2/9/2023

I certify that to the best of my knowledge all analytical data presented in this report have been checked for completeness, accuracy, errors and legibility in addition to having 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 __20__ pages. This report shall not be reproduced except in full without approval of the laboratory. This will provide assurance that parts of the report are not taken out of context.

Signature:

Laura Boivin, QA Associate II

Amendments:

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Summary of Results

Enthalpy Analytical

Job No.: 0123-794-1 PFAS by Isotope Dilution (non-potable water)

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

Summary

	Compound	CAS	012023E01 ng/L	012023S01 ng/L
Acids	PFBA	375-22-4	5.91	4.04
	PFPeA	2706-90-3	8.67	6.42
	PFHxA	307-24-4	7.76	6.36
	PFHpA	375-85-9	3.85	3.46
	PFOA	335-67-1	7.10	6.51
	PFNA	375-95-1	0.799	0.737
	PFDA	335-76-2	0.327 J	0.390 J
	PFUnDA	2058-94-8	ND U	ND U
	PFDoDA	307-55-1	ND U	ND U
	PFTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	ND U	ND U
Sulfonates	PFBS	375-73-5	6.16	5.27
	PFPeS	2706-91-4	0.866	0.506 J
	PFHxS	355-46-4	4.85	3.61
	PFHpS	375-92-8	0.168 L	0.310 J
	PFOS	1763-23-1	10.6	11.1
	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	0.264 J	0.199 L
	8:2 FTS	39108-34-4	ND U	ND U
Other	PFOSA	754-91-6	ND U	0.198 J
	N-MeFOSAA	2355-31-9	ND U	ND U
	N-EtFOSAA	2991-50-6	ND U	ND U
	HFPO-DA	13252-13-6	1.91	1.70
	PFMOAA	674-13-5	9.97	9.92
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	2.71	2.16
	PFO3OA	39492-89-2	0.696	0.698
	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	ND U	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	0.923	0.714
	Hydro-EVE Acid	773804-62-9	ND U	ND U
	Hydrolyzed PSDA	2416366-19-1	2.59	1.89
	Nafion Byproduct 2	749836-20-2	ND U	ND U
	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	0.556 J	0.456 J
	PFECA-G	801212-59-9	ND U	ND U
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	ND U	ND U
	PFMOBA	863090-89-5	ND U	ND U
	PFO5DA	39492-91-6	ND U	ND U
	PMPA	13140-29-9	2.58	2.49
	R-EVE	2416366-22-6	1.72	1.44
	R-PSDA	2416366-18-0	ND U	ND U
	R-PSDCA	241636-21-5	ND U	ND U

Detailed Results

Enthalpy Analytical

Job No.: 0123-794-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	0123-794-001-2	Prep Batch	EU14639	Sample Vol (mL)	285.86
Sample Name	012023E01	Prep Date	2023-01-26 12:45	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	1/27/2023 1:47:51 AM	Split Factor	N/A
Sampling Date	20230120 13:10	Analyst	bmay	Method Code	WM-026
Received Date	2023-01-20 01:49	Instrument	Pippin	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	4220.41	5.91	5.91	0.222	0.560			
	PFPeA	2706-90-3	6196.18	8.67	8.67	0.160	0.560			
	PFHxA	307-24-4	5549.24	7.76	7.76	0.187	0.560			
	PFHpA	375-85-9	2753.13	3.85	3.85	0.196	0.560			
	PFOA	335-67-1	5071.76	7.10	7.10	0.128	0.560			
	PFNA	375-95-1	570.72	0.799	0.799	0.126	0.560			
	PFDA	335-76-2	233.60	0.327	0.327	0.160	0.560			J
	PFUnDA	2058-94-8	ND	ND	ND	0.126	0.560			U
	PFDoDA	307-55-1	ND	ND	ND	0.227	0.560			U
	PFTrDA	72629-94-8	ND	ND	ND	0.185	0.560			U
	PFTeDA	376-06-7	ND	ND	ND	0.213	0.560			U
Sulfonates	PFBS	375-73-5	4401.98	6.16	6.16	0.297	0.560			
	PFPeS	2706-91-4	619.05	0.866	0.866	0.115	0.527			
	PFHxS	355-46-4	3467.51	4.85	4.85	0.432	0.513			
	PFHpS	375-92-8	119.91	0.168	0.168	0.271	0.533			L
	PFOS	1763-23-1	7605.28	10.6	10.6	0.296	0.518			
	PFNS	68259-12-1	ND	ND	ND	0.174	0.539			U
	PFDS	335-77-3	ND	ND	ND	0.294	0.539			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.0726	0.524			U
	6:2 FTS	27619-97-2	188.81	0.264	0.264	0.264	0.533			J
	8:2 FTS	39108-34-4	ND	ND	ND	0.125	0.536			U
Other	PFOSA	754-91-6	ND	ND	ND	0.0785	0.560			U
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.157	0.560			U
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.227	0.560			U
	HFPO-DA	13252-13-6	1365.78	1.91	1.91	0.0593	0.560			
	PFMOAA	674-13-5	7126.73	9.97	9.97	0.283	0.560			
	PFMOPrA	377-73-1	ND	ND	ND	0.199	0.560			U
	PFO2HxA	39492-88-1	1939.01	2.71	2.71	0.180	0.560			
	PFO3OA	39492-89-2	497.74	0.696	0.696	0.257	0.560			
	PFO4DA	39492-90-5	ND	ND	ND	0.443	2.80			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.299	0.560			U
	ADONA	919005-14-4	ND	ND	ND	0.152	0.530			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.359	0.521			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.264	0.527			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.429	0.560			U
	EVE Acid	69087-46-3	ND	ND	ND	0.178	1.26			U
	FBSA	30334-69-1	659.51	0.923	0.923	0.266	0.560			
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	0.184	0.560			U
	Hydrolyzed PSDA	2416366-19-1	1851.05	2.59	2.59	0.373	0.560			
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.464	0.560			U
	N-EtFOSA	4151-50-2	ND	ND	ND	0.346	0.560			U
	N-EtFOSE	1691-99-2	ND	ND	ND	0.857	2.52			U
	NFDHA	151772-58-6	ND	ND	ND	0.118	0.560			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.231	0.560			U
	N-MeFOSE	24448-09-7	ND	ND	ND	0.532	2.52			U
	NVHOS	1132933-86-8	ND	ND	ND	0.0862	0.560			U
	PEPA	267239-61-2	397.54	0.556	0.556	0.105	0.560			J
	PFECA-G	801212-59-9	ND	ND	ND	0.0747	0.560			U
	PFEESA	113507-82-7	ND	ND	ND	0.168	0.560			U
	PFHxDA	67905-19-5	ND	ND	ND	0.297	0.560			U
	PFMOBA	863090-89-5	ND	ND	ND	0.939	1.26			U
	PFO5DA	39492-91-6	ND	ND	ND	0.448	2.80			U
	PMPA	13140-29-9	1842.28	2.58	2.58	0.132	0.560			
	R-EVE	2416366-22-6	1227.84	1.72	1.72	0.929	1.26			
	R-PSDA	2416366-18-0	ND	ND	ND	2.47	2.47			U
	R-PSDCA	241636-21-5	ND	ND	ND	0.236	0.560			U
ES	MPFBA		4677.46	6.55				20-150%	93.5%	
	M5PFPeA		5074.28	7.10				20-150%	101.5%	
	M3PFBS		4937.54	6.91				20-150%	98.8%	
	M2-4:2 FTS		6943.02	9.72				20-150%	138.9%	
	M5PFHxA		4829.91	6.76				20-150%	96.6%	
	M3HFPO-DA		4933.28	6.90				20-150%	98.7%	
	M4PFHpA		4782.29	6.69				20-150%	95.6%	
	M3PFHxS		4599.32	6.44				20-150%	92.0%	
	M2-6:2 FTS		5563.94	7.79				20-150%	111.3%	
	M8PFOA		4616.55	6.46				20-150%	92.3%	
	M9PFNA		4805.30	6.72				20-150%	96.1%	
	M8PFOS		5588.90	7.82				20-150%	111.8%	
	M2-8:2 FTS		5929.57	8.30				20-150%	118.6%	
	M8FOSA-I		5287.98	7.40				20-150%	105.8%	
	M6PFDA		4833.01	6.76				20-150%	96.7%	
	d3-N-MeFOSAA		5107.22	7.15				20-150%	102.1%	
	d5-N-EtFOSAA		5316.58	7.44				20-150%	106.3%	
	M7PFUdA		4359.06	6.10				20-150%	87.2%	
	MPFDoA		4185.62	5.86				20-150%	83.7%	
	M2PFTeDA		2166.56	3.03				20-150%	43.3%	
	d3-N-MeFOSA		5060.84	7.08				10-200%	50.6%	
	d5-N-EtFOSA		4254.41	5.95				10-200%	42.5%	
	d7-N-MeFOSE		7084.41	9.91				10-200%	70.8%	
	d9-N-EtFOSE		5732.05	8.02				10-200%	57.3%	

Enthalpy Analytical

Job No.: 0123-794-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	0123-794-002-2	Prep Batch	EU14639	Sample Vol (mL)	290.21
Sample Name	012023S01	Prep Date	2023-01-26 12:45	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	1/27/2023 2:10:30 AM	Split Factor	N/A
Sampling Date	20230120 13:10	Analyst	bmay	Method Code	WM-026
Received Date	2023-01-20 01:49	Instrument	Pippin	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	2928.90	4.04	4.04	0.219	0.551			
	PFPeA	2706-90-3	4659.32	6.42	6.42	0.158	0.551			
	PFHxA	307-24-4	4615.37	6.36	6.36	0.184	0.551			
	PFHpA	375-85-9	2511.28	3.46	3.46	0.193	0.551			
	PFOA	335-67-1	4722.02	6.51	6.51	0.126	0.551			
	PFNA	375-95-1	535.02	0.737	0.737	0.125	0.551			
	PFDA	335-76-2	282.88	0.390	0.390	0.158	0.551			J
	PFUnDA	2058-94-8	ND	ND	ND	0.125	0.551			U
	PFDoDA	307-55-1	ND	ND	ND	0.224	0.551			U
	PFTrDA	72629-94-8	ND	ND	ND	0.183	0.551			U
	PFTeDA	376-06-7	ND	ND	ND	0.210	0.551			U
Sulfonates	PFBS	375-73-5	3826.16	5.27	5.27	0.293	0.551			
	PFPeS	2706-91-4	366.97	0.506	0.506	0.113	0.519			J
	PFHxS	355-46-4	2619.65	3.61	3.61	0.426	0.505			
	PFHpS	375-92-8	224.55	0.310	0.310	0.267	0.525			J
	PFOS	1763-23-1	8048.71	11.1	11.1	0.291	0.511			
	PFNS	68259-12-1	ND	ND	ND	0.171	0.531			U
	PFDS	335-77-3	ND	ND	ND	0.289	0.531			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.0715	0.517			U
	6:2 FTS	27619-97-2	144.13	0.199	0.199	0.260	0.525			L
	8:2 FTS	39108-34-4	ND	ND	ND	0.124	0.528			U
Other	PFOSA	754-91-6	143.90	0.198	0.198	0.0774	0.551			J
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.155	0.551			U
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.224	0.551			U
	HFPO-DA	13252-13-6	1235.90	1.70	1.70	0.0584	0.551			
	PFMOAA	674-13-5	7195.59	9.92	9.92	0.279	0.551			
	PFMOPrA	377-73-1	ND	ND	ND	0.196	0.551			U
	PFO2HxA	39492-88-1	1565.32	2.16	2.16	0.177	0.551			
	PFO3OA	39492-89-2	506.42	0.698	0.698	0.253	0.551			
	PFO4DA	39492-90-5	ND	ND	ND	0.436	2.76			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.295	0.551			U
	ADONA	919005-14-4	ND	ND	ND	0.149	0.522			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.353	0.514			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.260	0.519			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.422	0.551			U
	EVE Acid	69087-46-3	ND	ND	ND	0.176	1.24			U
	FBSA	30334-69-1	518.27	0.714	0.714	0.262	0.551			
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	0.181	0.551			U
	Hydrolyzed PSDA	2416366-19-1	1372.42	1.89	1.89	0.367	0.551			
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.457	0.551			U
	N-EtFOSA	4151-50-2	ND	ND	ND	0.341	0.551			U
	N-EtFOSE	1691-99-2	ND	ND	ND	0.844	2.48			U
	NFDHA	151772-58-6	ND	ND	ND	0.116	0.551			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.227	0.551			U
	N-MeFOSE	24448-09-7	ND	ND	ND	0.524	2.48			U
	NVHOS	1132933-86-8	ND	ND	ND	0.0849	0.551			U
	PEPA	267239-61-2	331.11	0.456	0.456	0.103	0.551			J
	PFECA-G	801212-59-9	ND	ND	ND	0.0736	0.551			U
	PFEESA	113507-82-7	ND	ND	ND	0.166	0.551			U
	PFHxDA	67905-19-5	ND	ND	ND	0.293	0.551			U
	PFMOBA	863090-89-5	ND	ND	ND	0.925	1.24			U
	PFO5DA	39492-91-6	ND	ND	ND	0.441	2.76			U
	PMPA	13140-29-9	1803.88	2.49	2.49	0.130	0.551			
	R-EVE	2416366-22-6	1044.66	1.44	1.44	0.915	1.24			
	R-PSDA	2416366-18-0	ND	ND	ND	2.43	2.43			U
	R-PSDCA	241636-21-5	ND	ND	ND	0.233	0.551			U
ES	MPFBA		4292.95	5.92				20-150%	85.9%	
	M5PFPeA		4661.27	6.42				20-150%	93.2%	
	M3PFBS		4914.69	6.77				20-150%	98.3%	
	M2-4:2 FTS		5695.09	7.85				20-150%	113.9%	
	M5PFHxA		4504.64	6.21				20-150%	90.1%	
	M3HFPO-DA		4661.30	6.42				20-150%	93.2%	
	M4PFHpA		4260.83	5.87				20-150%	85.2%	
	M3PFHxS		4992.13	6.88				20-150%	99.8%	
	M2-6:2 FTS		4459.50	6.15				20-150%	89.2%	
	M8PFOA		4196.61	5.78				20-150%	83.9%	
	M9PFNA		4263.15	5.88				20-150%	85.3%	
	M8PFOS		5435.29	7.49				20-150%	108.7%	
	M2-8:2 FTS		5038.58	6.94				20-150%	100.8%	
	M8FOSA-I		5000.04	6.89				20-150%	100.0%	
	M6PFDA		4682.27	6.45				20-150%	93.6%	
	d3-N-MeFOSAA		5225.67	7.20				20-150%	104.5%	
	d5-N-EtFOSAA		4544.85	6.26				20-150%	90.9%	
	M7PFUdA		4251.24	5.86				20-150%	85.0%	
	MPFDoA		3890.82	5.36				20-150%	77.8%	
	M2PFTeDA		2145.38	2.96				20-150%	42.9%	
	d3-N-MeFOSA		4606.41	6.35				10-200%	46.1%	
	d5-N-EtFOSA		3517.36	4.85				10-200%	35.2%	
	d7-N-MeFOSE		6825.62	9.41				10-200%	68.3%	
	d9-N-EtFOSE		5344.08	7.37				10-200%	53.4%	

QC Data

Enthalpy Analytical

Job No.: 0123-794-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	MB-14639-PFAS	Prep Batch	EU14639	Sample Vol (mL)	250
Sample Name	MB-14639-PFAS	Prep Date	2023-01-26 12:45	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	1/26/2023 10:01:13 PM	Split Factor	N/A
Sampling Date		Analyst	bmay	Method Code	WM-026
Received Date		Instrument	Pippin	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	0.254	0.640			U
	PFPeA	2706-90-3	ND	ND	ND	0.183	0.640			U
	PFHxA	307-24-4	ND	ND	ND	0.214	0.640			U
	PFHpA	375-85-9	ND	ND	ND	0.224	0.640			U
	PFOA	335-67-1	ND	ND	ND	0.146	0.640			U
	PFNA	375-95-1	ND	ND	ND	0.145	0.640			U
	PFDA	335-76-2	ND	ND	ND	0.183	0.640			U
	PFUnDA	2058-94-8	ND	ND	ND	0.145	0.640			U
	PFDoDA	307-55-1	ND	ND	ND	0.260	0.640			U
	PFTrDA	72629-94-8	ND	ND	ND	0.212	0.640			U
	PFTeDA	376-06-7	ND	ND	ND	0.244	0.640			U
Sulfonates	PFBS	375-73-5	ND	ND	ND	0.340	0.640			U
	PFPeS	2706-91-4	ND	ND	ND	0.131	0.603			U
	PFHxS	355-46-4	ND	ND	ND	0.494	0.586			U
	PFHpS	375-92-8	ND	ND	ND	0.310	0.610			U
	PFOS	1763-23-1	ND	ND	ND	0.338	0.593			U
	PFNS	68259-12-1	ND	ND	ND	0.199	0.616			U
	PFDS	335-77-3	ND	ND	ND	0.336	0.616			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.0830	0.600			U
	6:2 FTS	27619-97-2	ND	ND	ND	0.302	0.610			U
	8:2 FTS	39108-34-4	ND	ND	ND	0.143	0.613			U
Other	PFOSA	754-91-6	ND	ND	ND	0.0898	0.640			U
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.180	0.640			U
	N-EtFOSAA	2991-50-6	ND	ND	ND	0.260	0.640			U
	HFPO-DA	13252-13-6	ND	ND	ND	0.0678	0.640			U
	PFMOAA	674-13-5	ND	ND	ND	0.324	0.640			U
	PFMOPrA	377-73-1	ND	ND	ND	0.228	0.640			U
	PFO2HxA	39492-88-1	ND	ND	ND	0.206	0.640			U
	PFO3OA	39492-89-2	ND	ND	ND	0.294	0.640			U
	PFO4DA	39492-90-5	ND	ND	ND	0.506	3.20			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.342	0.640			U
	ADONA	919005-14-4	ND	ND	ND	0.173	0.606			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.410	0.596			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.302	0.603			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.490	0.640			U
	EVE Acid	69087-46-3	ND	ND	ND	0.204	1.44			U
	FBSA	30334-69-1	ND	ND	ND	0.304	0.640			U
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	0.210	0.640			U
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	0.426	0.640			U
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.530	0.640			U
	N-EtFOSA	4151-50-2	ND	ND	ND	0.396	0.640			U
	N-EtFOSE	1691-99-2	ND	ND	ND	0.980	2.88			U
	NFDHA	151772-58-6	ND	ND	ND	0.135	0.640			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.264	0.640			U
	N-MeFOSE	24448-09-7	ND	ND	ND	0.608	2.88			U
	NVHOS	1132933-86-8	ND	ND	ND	0.0986	0.640			U
	PEPA	267239-61-2	ND	ND	ND	0.120	0.640			U
	PFECA-G	801212-59-9	ND	ND	ND	0.0854	0.640			U
	PFEESA	113507-82-7	ND	ND	ND	0.192	0.640			U
	PFHxDA	67905-19-5	ND	ND	ND	0.340	0.640			U
	PFMOBA	863090-89-5	ND	ND	ND	1.07	1.44			U
	PFO5DA	39492-91-6	ND	ND	ND	0.512	3.20			U
	PMPA	13140-29-9	ND	ND	ND	0.151	0.640			U
	R-EVE	2416366-22-6	ND	ND	ND	1.06	1.44			U
	R-PSDA	2416366-18-0	ND	ND	ND	2.82	2.82			U
	R-PSDCA	241636-21-5	ND	ND	ND	0.270	0.640			U
ES	MPFBA		4164.34	6.66				20-150%	83.3%	
	M5PFPeA		4324.09	6.92				20-150%	86.5%	
	M3PFBS		4061.66	6.50				20-150%	81.2%	
	M2-4:2 FTS		5687.49	9.10				20-150%	113.7%	
	M5PFHxA		4370.69	6.99				20-150%	87.4%	
	M3HFPO-DA		4794.62	7.67				20-150%	95.9%	
	M4PFHpA		4229.90	6.77				20-150%	84.6%	
	M3PFHxS		4327.25	6.92				20-150%	86.5%	
	M2-6:2 FTS		5512.65	8.82				20-150%	110.3%	
	M8PFOA		4459.83	7.14				20-150%	89.2%	
	M9PFNA		4343.92	6.95				20-150%	86.9%	
	M8PFOS		4375.54	7.00				20-150%	87.5%	
	M2-8:2 FTS		4877.00	7.80				20-150%	97.5%	
	M8FOSA-I		5247.45	8.40				20-150%	104.9%	
	M6PFDA		4600.14	7.36				20-150%	92.0%	
	d3-N-MeFOSAA		5184.05	8.29				20-150%	103.7%	
	d5-N-EtFOSAA		4470.78	7.15				20-150%	89.4%	
	M7PFUdA		4066.92	6.51				20-150%	81.3%	
	MPFDoA		4328.23	6.93				20-150%	86.6%	
	M2PFTeDA		3885.01	6.22				20-150%	77.7%	
	d3-N-MeFOSA		5611.19	8.98				10-200%	56.1%	
	d5-N-EtFOSA		5645.73	9.03				10-200%	56.5%	
	d7-N-MeFOSE		7831.20	12.5				10-200%	78.3%	
	d9-N-EtFOSE		7233.69	11.6				10-200%	72.3%	

Enthalpy Analytical

Job No.: 0123-794-1 PFAS by Isotope Dilution (non-potable water)

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

Enthalpy ID	OPR-14639-PFAS	Prep Batch	EU14639	Sample Vol (mL)	250
Sample Name	OPR-14639-PFAS	Prep Date	2023-01-26 12:45	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	1/26/2023 10:23:53 PM	Split Factor	N/A
Sampling Date		Analyst	bmay	Method Code	WM-026
Received Date		Instrument	Pippin	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	13160.88	21.1	21.1	0.254	0.640	73-129%	105.3%	
	PFPeA	2706-90-3	12702.40	20.3	20.3	0.183	0.640	72-129%	101.6%	
	PFHxA	307-24-4	12181.58	19.5	19.5	0.214	0.640	72-129%	97.5%	
	PFHpA	375-85-9	12549.82	20.1	20.1	0.224	0.640	72-130%	100.4%	
	PFOA	335-67-1	12452.54	19.9	19.9	0.146	0.640	71-133%	99.6%	
	PFNA	375-95-1	12415.57	19.9	19.9	0.145	0.640	69-130%	99.3%	
	PFDA	335-76-2	12339.36	19.7	19.7	0.183	0.640	71-129%	98.7%	
	PFUnDA	2058-94-8	12260.62	19.6	19.6	0.145	0.640	69-133%	98.1%	
	PFDoDA	307-55-1	13444.92	21.5	21.5	0.260	0.640	72-134%	107.6%	
	PFTrDA	72629-94-8	12573.20	20.1	20.1	0.212	0.640	65-144%	100.6%	
	PFTeDA	376-06-7	11932.97	19.1	19.1	0.244	0.640	71-132%	95.5%	
Sulfonates	PFBS	375-73-5	11356.62	18.2	18.2	0.340	0.640	72-134%	102.4%	
	PFPeS	2706-91-4	11164.99	17.9	17.9	0.131	0.603	71-127%	94.9%	
	PFHxS	355-46-4	12166.49	19.5	19.5	0.494	0.586	68-131%	106.5%	
	PFHpS	375-92-8	13501.27	21.6	21.6	0.310	0.610	69-134%	113.3%	
	PFOS	1763-23-1	12862.89	20.6	20.6	0.338	0.593	65-140%	110.9%	
	PFNS	68259-12-1	14180.25	22.7	22.7	0.199	0.616	69-127%	117.9%	
	PFDS	335-77-3	12372.39	19.8	19.8	0.336	0.616	53-142%	102.6%	
	4:2 FTS	757124-72-4	11798.47	18.9	18.9	0.0830	0.600	63-143%	100.7%	
	6:2 FTS	27619-97-2	13065.14	20.9	20.9	0.302	0.610	64-140%	109.9%	
	8:2 FTS	39108-34-4	11467.78	18.3	18.3	0.143	0.613	67-138%	95.6%	
Other	PFOSA	754-91-6	12796.50	20.5	20.5	0.0898	0.640	67-137%	102.4%	
	N-MeFOSAA	2355-31-9	12172.80	19.5	19.5	0.180	0.640	65-136%	97.4%	
	N-EtFOSAA	2991-50-6	12756.36	20.4	20.4	0.260	0.640	61-135%	102.1%	
	HFPO-DA	13252-13-6	11346.12	18.2	18.2	0.0678	0.640	70-130%	90.8%	
ES	MPFBA		4426.61	7.08				20-150%	88.5%	
	M5PFPeA		4339.65	6.94				20-150%	86.8%	
	M3PFBS		4570.94	7.31				20-150%	91.4%	
	M2-4:2 FTS		4707.63	7.53				20-150%	94.2%	
	M5PFHxA		4141.60	6.63				20-150%	82.8%	
	M3HFPO-DA		4584.01	7.33				20-150%	91.7%	
	M4PFHpA		3908.57	6.25				20-150%	78.2%	
	M3PFHxS		4621.10	7.39				20-150%	92.4%	
	M2-6:2 FTS		4450.03	7.12				20-150%	89.0%	
	M8PFOA		4147.29	6.64				20-150%	82.9%	
	M9PFNA		3731.71	5.97				20-150%	74.6%	
	M8PFOS		4160.59	6.66				20-150%	83.2%	
	M2-8:2 FTS		4760.27	7.62				20-150%	95.2%	
	M8FOSA-I		4491.39	7.19				20-150%	89.8%	
	M6PFDA		4492.77	7.19				20-150%	89.9%	
	d3-N-MeFOSAA		4516.09	7.23				20-150%	90.3%	
	d5-N-EtFOSAA		4352.09	6.96				20-150%	87.0%	
	M7PFUdA		4313.41	6.90				20-150%	86.3%	
	MPFDoA		4026.01	6.44				20-150%	80.5%	
	M2PFTeDA		3826.17	6.12				20-150%	76.5%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0123-794-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant

1. Custody

Josie Morton received the samples on January 20, 2023 at 4.8 °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
0123-794-001-2	012023E01	AQ
0123-794-002-2	012023S01	AQ

Table 2 - Sample Inventory – not reported

EU Lab Sample ID	Client Sample ID
0123-794-001-1	012023E01
0123-794-002-1	012023S01

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 "Pippin").

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.

4. Calibration

In the initial calibration, the reported analytes exhibited R^2 of ≥ 0.99.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0123-794-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	N/A Site: Northwest Water Plant

The reported analytes in the calibration standards, continuing calibration (concal) and Initial Calibration Verification (ICV) met the 30% accuracy criterion for native analytes.

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.

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

Initial batch extraction did not meet method requirements. Samples were re-extracted and reported successfully.

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

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.

- <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.

- 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
PFTrDA (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-dioxahexanoic) 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
*	PFODA	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

Chain of Custody Record

ENTHALPY analytical

0123-794 Enthalpy Ultratrace Job#: _____ COC Page__1__of__1__

Special Handling:

X Standard Turn Around Time

☐ Rush Turn Around Time -- Date Needed_____

• All Fast TATs Subject to Approval by Enthalpy Analytical, Inc.

• All Samples Disposed of After 6 months Unless Otherwise Instructed.

Enthalpy Analytical-Wilmington, NC has added enhancements to standard methods to improve accuracy, precision and permit an assessment of laboratory performance in the context of your specific data needs. For more information email Cindy.James@enthalpy.com

Client Name: BRUNSWICK COUNTY UTILITIES

Project Manager: GLENN WALKER

Report To: SAME

Project Number:

Site Name: NORTHWEST WATER PLANT

Location: LELAND N.C.

PO#:

Telephone#:

Email:

This Chain of Custody is applicable to Non-Air samples. Standard TAT differ per analysis and are provided by request.

Client Special Instructions:

Matrix: GW-Groundwater, WW-Wastewater, NW-Non-Potable Water, DW-Drinking Water, S-Soil, SL-Sludge, BT-Biological Tissue, O-Other

Type: G=Grab C=Composite Q=Quality Control

Sample ID	Date	Time	Sample Volume	Type	Matrix	Sample Containers: # of Bottles	# of Jars	# of Bags	# Other	Analyses: Method 1613	Method 8290	Method 1668A/B/C PCB	PFAS by LC/MS/MS	PAHs by HRGC/HRMS	Sample on Hold	Method 23	ALL PFAS	Notes:
012023E01	1/20/2023	1310	250 ml	G	NW	2											X	
012023S01	1/20/2023	1310	250 ml	G	DW	2											X	
Courier, cooler, on ice, no seals, good condition																		
jmm 1-20-23																		

Relinquished By:	Date:	Received By:	Date:	Time:	Sample Temperature Upon Receipt:
Billy Benton	1/20/2023	Josie Morton	1-20-23	149	☒ Iced ☐ Ambient °C 4.8 T11
					☐ Iced ☐ Ambient °C_____
					☐ Iced ☐ Ambient °C_____

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