

Brunswick County Public Utilities - NC

PO Box 249
Bolivia, NC 28422-0249

Leland, N.C

Client Project# Northwest Water Plant
Samples Received: 6/15/2023

Analytical Report 0623-814

PFAS by Isotope Dilution (non-potable water)

PFAS - Custom List

Report Issue Date: 7/20/2023

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 21 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:



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Addendum:



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Summary of Results

Enthalpy Analytical

Job No.: 0623-814-1 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	061523-SO1 ng/L	061523-EO1 ng/L
Acids	PFBA	375-22-4	3.51	4.40
	PFPeA	2706-90-3	5.75	5.52
	PFHxA	307-24-4	5.61	5.69
	PFHpA	375-85-9	2.83	2.94
	PFOA	335-67-1	5.66	10.2
	PFNA	375-95-1	0.613	0.602
	PFDA	335-76-2	0.322 J	0.250 J
	PFUnDA	2058-94-8	ND U	ND U
	PFDoDA	307-55-1	0.0483 L	ND U
	PFTTrDA	72629-94-8	ND U	ND U
	PFTeDA	376-06-7	ND U	ND U
	PFHxDA	67905-19-5	0.0255 L	0.0504 L
Sulfonates	PFBS	375-73-5	3.31	3.13
	PFPeS	2706-91-4	0.662	0.675
	PFHxS	355-46-4	4.25	4.43
	PFHpS	375-92-8	0.121 L	0.114 L
	PFOS	1763-23-1	11.1	11.0
	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	0.0470 LB	0.176 L
	8:2 FTS	39108-34-4	0.00458 LB	0.00588 LB
	10:2 FTS	120226-60-0	ND U	ND U
	FBSA	30334-69-1	0.474 J	0.438 J
Sulfonamidos	N-EtFOSA	4151-50-2	ND U	ND U
	N-EtFOSAA	2991-50-6	ND U	ND U
	N-EtFOSE	1691-99-2	ND U	ND U
	N-MeFOSA	31506-32-8	ND U	ND U
	N-MeFOSAA	2355-31-9	0.00176 L	0.00383 L
	N-MeFOSE	24448-09-7	ND U	ND U
	PFOSA	754-91-6	0.0373 L	0.0585 L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND U	ND U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.227 L	0.203 L
PFECAs	ADONA	919005-14-4	ND U	ND U
	EVE Acid	69087-46-3	0.000178 L	0.0000476 L
	HFPO-DA	13252-13-6	2.96	2.59
	Hydro-EVE Acid	773804-62-9	0.111 L	0.119 L
	NFDHA	151772-58-6	0.0121 L	0.00924 L
	PEPA	267239-61-2	1.37	1.39
	PFECA-G	801212-59-9	ND U	ND U
	PFMOAA	674-13-5	22.1	21.0
	PFMOBA	863090-89-5	ND U	ND U
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	4.54	4.13
	PFO3OA	39492-89-2	1.50	ND U
	PFO4DA	39492-90-5	0.468 J	0.379 L
	PFO5DA	39492-91-6	0.0438 L	0.0545 L
	PMPA	13140-29-9	4.49	4.54
	R-EVE	2416366-22-6	4.51	3.96
PFESAs	11Cl-PF3OUdS	763051-92-9	ND U	ND U
	9Cl-PF3ONS	756426-58-1	ND U	ND U
	Hydrolyzed PSDA	2416366-19-1	1.88	2.17
	NVHOS	1132933-86-8	0.301 J	0.265 J
	PFEESA	113507-82-7	ND U	ND U
	R-PSDA	2416366-18-0	3.22	2.64
	R-PSDCA	241636-21-5	ND U	ND U

Detailed Results

Enthalpy Analytical

Job No.: 0623-814-1 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	0623-814-001-2	Prep Batch	EU15530	Sample Vol (mL)	290.64
Sample Name	061523-SO1	Prep Date	2023-06-22 13:15	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-06-23 09:25	Split Factor	N/A
Sampling Date	2023-06-15 10:15	Analyst	brneff	Method Code	WM-026
Received Date	2023-06-15	Instrument	Pippin/Aragorn	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	3.51	0.218	0.551			
	PFPeA	2706-90-3	5.75	0.157	0.551			
	PFHxA	307-24-4	5.61	0.184	0.551			
	PFHpA	375-85-9	2.83	0.193	0.551			
	PFOA	335-67-1	5.66	0.126	0.551			
	PFNA	375-95-1	0.613	0.124	0.551			
	PFDA	335-76-2	0.322	0.157	0.551			J
	PFUnDA	2058-94-8	ND	0.124	0.551			U
	PFDoDA	307-55-1	0.0483	0.224	0.551			L
	PFTrDA	72629-94-8	ND	0.182	0.551			U
	PFTeDA	376-06-7	ND	0.210	0.551			U
	PFHxDA	67905-19-5	0.0255	0.292	0.551			L
Sulfonates	PFBS	375-73-5	3.31	0.292	0.551			
	PFPeS	2706-91-4	0.662	0.113	0.519			
	PFHxS	355-46-4	4.25	0.425	0.504			
	PFHpS	375-92-8	0.121	0.267	0.524			L
	PFOS	1763-23-1	11.1	0.291	0.510			
	PFNS	68259-12-1	ND	0.171	0.530			U
	PFDS	335-77-3	ND	0.289	0.530			U
	4:2 FTS	757124-72-4	ND	0.0714	0.516			U
	6:2 FTS	27619-97-2	0.0470	0.260	0.524			LB
	8:2 FTS	39108-34-4	0.00458	0.123	0.527			LB
	10:2 FTS	120226-60-0	ND	0.421	0.551			U
Sulfonamidos	FBSA	30334-69-1	0.474	0.261	0.551			J
	N-EiFOSA	4151-50-2	ND	0.341	0.551			U
	N-EiFOSAA	2991-50-6	ND	0.224	0.551			U
	N-EiFOSE	1691-99-2	ND	0.843	2.48			U
	N-MeFOSA	31506-32-8	ND	0.227	0.551			U
	N-MeFOSAA	2355-31-9	0.00176	0.155	0.551			L
	N-MeFOSE	24448-09-7	ND	0.523	2.48			U
	PFOSA	754-91-6	0.0373	0.0772	0.551			L
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.294	0.551			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.227	0.456	0.551			L
PFECAs	ADONA	919005-14-4	ND	0.149	0.522			U
	EVE Acid	69087-46-3	0.000178	0.175	1.24			L
	HFPO-DA	13252-13-6	2.96	0.0583	0.551			
	Hydro-EVE Acid	773804-62-9	0.111	0.181	0.551			L
	NFDHA	151772-58-6	0.0121	0.116	0.551			L
	PEPA	267239-61-2	1.37	0.103	0.551			
	PFECA-G	801212-59-9	ND	0.0735	0.551			U
	PFMOAA	674-13-5	22.1	0.279	0.551			
	PFMOBA	863090-89-5	ND	0.924	1.24			U
	PFMOPrA	377-73-1	ND	0.196	0.551			U
	PFO2HxA	39492-88-1	4.54	0.177	0.551			
	PFO3OA	39492-89-2	1.50	0.253	0.551			
	PFO4DA	39492-90-5	0.468	0.435	2.75			J
	PFO5DA	39492-91-6	0.0438	0.440	2.75			L
	PMPA	13140-29-9	4.49	0.130	0.551			
	R-EVE	2416366-22-6	4.51	0.914	1.24			
PFESAs	11Cl-PF3OUdS	763051-92-9	ND	0.260	0.519			U
	9Cl-PF3ONS	756426-58-1	ND	0.353	0.513			U
	Hydrolyzed PSDA	2416366-19-1	1.88	0.366	0.551			
	NVHOS	1132933-86-8	0.301	0.0848	0.551			J
	PFEESA	113507-82-7	ND	0.165	0.551			U
	R-PSDA	2416366-18-0	3.22	2.43	2.43			
	R-PSDCA	241636-21-5	ND	0.232	0.551			U
ES	MPFBA					20-150%	97.0%	
	M5PFPeA					20-150%	194.3%	Q
	M3PFBS					20-150%	199.2%	Q
	M2-4:2 FTS					20-150%	120.7%	
	M5PFHxA					20-150%	108.5%	
	M3HFPO-DA					20-150%	92.3%	
	M4PFHpA					20-150%	100.7%	
	M3PFFHxS					20-150%	95.8%	
	M2-6:2 FTS					20-150%	69.0%	
	M8PFOA					20-150%	84.4%	
	M9PFNA					20-150%	74.7%	
	M8PFOS					20-150%	78.9%	
	M2-8:2 FTS					20-150%	74.5%	
	M8FOSA-I					20-150%	62.7%	
	M6PFDA					20-150%	74.6%	
	d3-N-MeFOSAA					20-150%	71.1%	
	d5-N-EiFOSAA					20-150%	73.3%	
	M7PFUdA					20-150%	75.9%	
	MPFDoA					20-150%	64.5%	
	M2PFTeDA					20-150%	42.5%	
	d3-N-MeFOSA					10-200%	2.8%	Q
	d5-N-EiFOSA					10-200%	3.1%	Q
	d7-N-MeFOSE					10-200%	54.2%	
	d9-N-EiFOSE					10-200%	49.6%	

Enthalpy Analytical

Job No.: 0623-814-1 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	0623-814-002-2	Prep Batch	EU15530	Sample Vol (mL)	290.03
Sample Name	061523-EO1	Prep Date	2023-06-22 13:15	Extract Vol (mL)	0.4
Matrix	AQ	Analysis Date	2023-06-23 09:48	Split Factor	N/A
Sampling Date	2023-06-15 10:15	Analyst	brneff	Method Code	WM-026
Received Date	2023-06-15	Instrument	Pippin/Aragorn	Sample Type	Sample

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	4.40	0.219	0.552			
	PFPeA	2706-90-3	5.52	0.158	0.552			
	PFHxA	307-24-4	5.69	0.184	0.552			
	PFHpA	375-85-9	2.94	0.193	0.552			
	PFOA	335-67-1	10.2	0.126	0.552			
	PFNA	375-95-1	0.602	0.125	0.552			
	PFDA	335-76-2	0.250	0.158	0.552			J
	PFUnDA	2058-94-8	ND	0.125	0.552			U
	PFDoDA	307-55-1	ND	0.224	0.552			U
	PFTrDA	72629-94-8	ND	0.183	0.552			U
	PFTeDA	376-06-7	ND	0.210	0.552			U
	PFHxDA	67905-19-5	0.0504	0.293	0.552			L
	PFBS	375-73-5	3.13	0.293	0.552			
	PFPeS	2706-91-4	0.675	0.113	0.520			
Sulfonates	PFHxS	355-46-4	4.43	0.426	0.505			
	PFHpS	375-92-8	0.114	0.267	0.526			L
	PFOS	1763-23-1	11.0	0.291	0.511			
	PFNS	68259-12-1	ND	0.171	0.531			U
	PFDS	335-77-3	ND	0.290	0.531			U
	4:2 FTS	757124-72-4	ND	0.0715	0.517			U
	6:2 FTS	27619-97-2	0.176	0.260	0.526			L
	8:2 FTS	39108-34-4	0.00588	0.124	0.528			LB
	10:2 FTS	120226-60-0	ND	0.422	0.552			U
	FBSA	30334-69-1	0.438	0.262	0.552			J
	N-EtFOSA	4151-50-2	ND	0.341	0.552			U
Sulfonamidos	N-EtFOSAA	2991-50-6	ND	0.224	0.552			U
	N-EtFOSE	1691-99-2	ND	0.845	2.48			U
	N-MeFOSA	31506-32-8	ND	0.228	0.552			U
	N-MeFOSAA	2355-31-9	0.00383	0.155	0.552			L
	N-MeFOSE	24448-09-7	ND	0.524	2.48			U
	PFOSA	754-91-6	0.0585	0.0774	0.552			L
	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.295	0.552			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	0.203	0.457	0.552			L
Other	ADONA	919005-14-4	ND	0.149	0.523			U
	EVE Acid	69087-46-3	0.0000476	0.176	1.24			L
PFECAs	HFPO-DA	13252-13-6	2.59	0.0584	0.552			
	Hydro-EVE Acid	773804-62-9	0.119	0.181	0.552			L
	NFDHA	151772-58-6	0.00924	0.116	0.552			L
	PEPA	267239-61-2	1.39	0.103	0.552			
	PFECA-G	801212-59-9	ND	0.0736	0.552			U
	PFMOAA	674-13-5	21.0	0.279	0.552			
	PFMOBA	863090-89-5	ND	0.926	1.24			U
	PFMOPrA	377-73-1	ND	0.197	0.552			U
	PFO2HxA	39492-88-1	4.13	0.178	0.552			
	PFO3OA	39492-89-2	ND	0.253	0.552			U
	PFO4DA	39492-90-5	0.379	0.436	2.76			L
	PFO5DA	39492-91-6	0.0545	0.441	2.76			L
	PMPA	13140-29-9	4.54	0.130	0.552			
	R-EVE	2416366-22-6	3.96	0.915	1.24			
	11Cl-PF3OUdS	763051-92-9	ND	0.260	0.520			U
	9Cl-PF3ONS	756426-58-1	ND	0.353	0.514			U
	Hydrolyzed PSDA	2416366-19-1	2.17	0.367	0.552			
	NVHOS	1132933-86-8	0.265	0.0850	0.552			J
	PFEESA	113507-82-7	ND	0.166	0.552			U
	R-PSDA	2416366-18-0	2.64	2.43	2.43			
	R-PSDCA	241636-21-5	ND	0.233	0.552			U
ES	MPFBA					20-150%	100.9%	
	M5PFPeA					20-150%	190.9%	Q
	M3PFBS					20-150%	211.3%	Q
	M2-4:2 FTS					20-150%	161.9%	Q
	M5PFHxA					20-150%	116.8%	
	M3HFPO-DA					20-150%	105.1%	
	M4PFHpA					20-150%	119.1%	
	M3PFFHxS					20-150%	111.5%	
	M2-6:2 FTS					20-150%	89.0%	
	M8PFOA					20-150%	98.2%	
	M9PFNA					20-150%	96.8%	
	M8PFOS					20-150%	102.7%	
	M2-8:2 FTS					20-150%	109.5%	
	M8FOSA-I					20-150%	89.4%	
	M6PFDA					20-150%	102.4%	
	d3-N-MeFOSAA					20-150%	92.0%	
	d5-N-EtFOSAA					20-150%	96.7%	
	M7PFUdA					20-150%	107.3%	
	MPFDoA					20-150%	100.0%	
	M2PFTeDA					20-150%	71.0%	
	d3-N-MeFOSA					10-200%	8.8%	Q
	d5-N-EtFOSA					10-200%	9.7%	Q
	d7-N-MeFOSE					10-200%	92.9%	
	d9-N-EtFOSE					10-200%	91.7%	

QC Data

Enthalpy Analytical

Job No.: 0623-814-1 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-15530-PFAS	Prep Batch	EU15530	Sample Vol (mL)	250
Sample Name	MB-15530-PFAS	Prep Date	2023-06-22 13:15	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2023-06-23 06:45	Split Factor	N/A
Sampling Date		Analyst	brneff	Method Code	WM-026
Received Date		Instrument	Pippin/Aragorn	Sample Type	Blank

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	ND	0.254	0.640			U
	PFPeA	2706-90-3	ND	0.183	0.640			U
	PFHxA	307-24-4	ND	0.214	0.640			U
	PFHpA	375-85-9	ND	0.224	0.640			U
	PFOA	335-67-1	ND	0.146	0.640			U
	PFNA	375-95-1	ND	0.145	0.640			U
	PFDA	335-76-2	ND	0.183	0.640			U
	PFUnDA	2058-94-8	ND	0.145	0.640			U
	PFDoDA	307-55-1	ND	0.260	0.640			U
	PFTtDA	72629-94-8	ND	0.212	0.640			U
	PFTeDA	376-06-7	ND	0.244	0.640			U
	PFHxDA	67905-19-5	ND	0.340	0.640			U
	PFBS	375-73-5	ND	0.340	0.640			U
	PFPeS	2706-91-4	ND	0.131	0.603			U
Sulfonates	PFHxS	355-46-4	0.0213	0.494	0.586			L
	PFHpS	375-92-8	ND	0.310	0.610			U
	PFOS	1763-23-1	ND	0.338	0.593			U
	PFNS	68259-12-1	ND	0.199	0.616			U
	PFDS	335-77-3	ND	0.336	0.616			U
	4:2 FTS	757124-72-4	ND	0.0830	0.600			U
	6:2 FTS	27619-97-2	0.00933	0.302	0.610			L
	8:2 FTS	39108-34-4	0.00259	0.143	0.613			L
	10:2 FTS	120226-60-0	ND	0.490	0.640			U
	FBSA	30334-69-1	ND	0.304	0.640			U
Sulfonamides	N-EiFOSA	4151-50-2	ND	0.396	0.640			U
	N-EiFOSAA	2991-50-6	0.0129	0.260	0.640			L
	N-EiFOSE	1691-99-2	ND	0.980	2.88			U
	N-MeFOSA	31506-32-8	ND	0.264	0.640			U
	N-MeFOSAA	2355-31-9	0.000180	0.180	0.640			L
	N-MeFOSE	24448-09-7	ND	0.608	2.88			U
	PFOSA	754-91-6	ND	0.0898	0.640			U
Other	Nafion Byproduct 1 (PS Acid)	29311-67-9	ND	0.342	0.640			U
	Nafion Byproduct 2 (Hydro-PS Acid)	749836-20-2	ND	0.530	0.640			U
PFECAs	ADONA	919005-14-4	ND	0.173	0.606			U
	EVE Acid	69087-46-3	ND	0.204	1.44			U
	HFPO-DA	13252-13-6	0.00459	0.0678	0.640			L
	Hydro-EVE Acid	773804-62-9	ND	0.210	0.640			U
	NFDHA	151772-58-6	ND	0.135	0.640			U
	PEPA	267239-61-2	ND	0.120	0.640			U
	PFECA-G	801212-59-9	ND	0.0854	0.640			U
	PFMOAA	674-13-5	ND	0.324	0.640			U
	PFMOBA	863090-89-5	ND	1.07	1.44			U
	PFMOPrA	377-73-1	ND	0.228	0.640			U
	PFO2HxA	39492-88-1	ND	0.206	0.640			U
	PFO3QA	39492-89-2	ND	0.294	0.640			U
	PFO4DA	39492-90-5	ND	0.506	3.20			U
	PFO5DA	39492-91-6	ND	0.512	3.20			U
	PMPA	13140-29-9	ND	0.151	0.640			U
	R-EVE	2416366-22-6	ND	1.06	1.44			U
PFESAs	11Cl-PF3OUdS	763051-92-9	ND	0.302	0.603			U
	9Cl-PF3ONS	756426-58-1	ND	0.410	0.596			U
	Hydrolyzed PSDA	2416366-19-1	ND	0.426	0.640			U
	NVHOS	1132933-86-8	ND	0.0986	0.640			U
	PFEESA	113507-82-7	ND	0.192	0.640			U
	R-PSDA	2416366-18-0	ND	2.82	2.82			U
	R-PSDCA	241636-21-5	ND	0.270	0.640			U
ES	MPFBA					20-150%	104.4%	
	M5PFPeA					20-150%	113.0%	
	M3PFBS					20-150%	97.1%	
	M2-4:2 FTS					20-150%	107.1%	
	M5PFHxA					20-150%	118.8%	
	M3HFPO-DA					20-150%	92.1%	
	M4PFHpA					20-150%	112.4%	
	M3PFHxS					20-150%	108.1%	
	M2-6:2 FTS					20-150%	72.1%	
	M8PFOA					20-150%	94.7%	
	M9PFNA					20-150%	91.0%	
	M8PFOS					20-150%	95.7%	
	M2-8:2 FTS					20-150%	79.0%	
	M8FOSA-I					20-150%	72.3%	
	M6PFDA					20-150%	100.7%	
	d3-N-MeFOSAA					20-150%	90.5%	
	d5-N-EiFOSAA					20-150%	89.0%	
	M7PFUDa					20-150%	110.3%	
	MPFDoA					20-150%	97.6%	
	M2PFTeDA					20-150%	58.1%	
	d3-N-MeFOSA					10-200%	2.4%	Q
	d5-N-EiFOSA					10-200%	2.4%	Q
	d7-N-MeFOSE					10-200%	66.6%	
	d9-N-EiFOSE					10-200%	63.0%	

Enthalpy Analytical

Job No.: 0623-814-1 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-15530-PFAS	Prep Batch	EU15530	Sample Vol (mL)	250
Sample Name	OPR-15530-PFAS	Prep Date	2023-06-22 13:15	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2023-06-23 07:08	Split Factor	N/A
Sampling Date		Analyst	brneff	Method Code	WM-026
Received Date		Instrument	Pippin/Aragorn	Sample Type	Control

	Compound	CAS	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	16.5	0.254	0.640	69.1-122%	82.7%	
	PFPeA	2706-90-3	17.0	0.183	0.640	68.5-121%	85.1%	
	PFHxA	307-24-4	18.0	0.214	0.640	68.3-121%	90.2%	
	PFHpA	375-85-9	19.3	0.224	0.640	62.4-128%	96.4%	
	PFOA	335-67-1	18.2	0.146	0.640	66.3-124%	90.8%	
	PFNA	375-95-1	17.9	0.145	0.640	70.5-120%	89.4%	
	PFDA	335-76-2	19.2	0.183	0.640	68.9-117%	95.9%	
	PFUnDA	2058-94-8	17.1	0.145	0.640	58.1-132%	85.3%	
	PFDoDA	307-55-1	16.8	0.260	0.640	52.1-140%	83.9%	
	PFTriDA	72629-94-8	32.0	0.212	0.640	65-144%	159.8%	Q
Sulfonates	PFTeDA	376-06-7	19.8	0.244	0.640	36.1-161%	99.1%	
	PFBS	375-73-5	15.1	0.340	0.640	67.5-111.6%	85.3%	
	PFPeS	2706-91-4	15.0	0.131	0.603	51.8-142%	79.8%	
	PFHxS	355-46-4	15.0	0.494	0.586	59.6-128%	82.1%	
	PFHpS	375-92-8	17.2	0.310	0.610	46.9-157%	90.1%	
	PFOS	1763-23-1	17.3	0.338	0.593	59.2-132%	93.2%	
	PFNS	68259-12-1	17.4	0.199	0.616	53.9-133%	90.4%	
	PFDS	335-77-3	18.1	0.336	0.616	38.1-142%	94.0%	
	4:2 FTS	757124-72-4	17.7	0.0830	0.600	61.9-131%	94.5%	
	6:2 FTS	27619-97-2	17.1	0.302	0.610	62.3-129%	90.2%	
Sulfonamidos	8:2 FTS	39108-34-4	17.7	0.143	0.613	37.5-159%	92.0%	
	N-EtFOSAA	2991-50-6	16.5	0.260	0.640	61.5-133%	82.6%	
	N-MeFOSAA	2355-31-9	20.1	0.180	0.640	57.3-138%	100.6%	
	PFOSA	754-91-6	18.5	0.0898	0.640	49.1-143%	92.6%	
PFECAs	HFPO-DA	13252-13-6	18.4	0.0678	0.640	57.2-130%	92.2%	
ES	MPFBA					20-150%	107.1%	
	M5PFPeA					20-150%	120.6%	
	M3PFBS					20-150%	104.0%	
	M2-4:2 FTS					20-150%	100.5%	
	M5PFHxA					20-150%	135.4%	
	M3HFPO-DA					20-150%	114.6%	
	M4PFHpA					20-150%	125.5%	
	M3PFHxS					20-150%	102.1%	
	M2-6:2 FTS					20-150%	68.7%	
	M8PFOA					20-150%	106.1%	
	M9PFNA					20-150%	96.5%	
	M8PFOS					20-150%	88.6%	
	M2-8:2 FTS					20-150%	68.9%	
	M8FOSA-I					20-150%	76.7%	
	M6PFDA					20-150%	85.0%	
	d3-N-MeFOSAA					20-150%	71.4%	
	d5-N-EtFOSAA					20-150%	78.2%	
	M7PFUdA					20-150%	98.6%	
	MPFDoA					20-150%	83.3%	
	M2PFTeDA					20-150%	48.5%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0623-814-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	Northwest Water Plant Site: Leland, N.C

1. Custody

Summer Banning received the samples on June 15, 2023 at 4.3 °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
0623-814-001-2	061523-SO1	AQ
0623-814-002-2	061523-EO1	AQ

Table 2 - Sample Inventory – not reported

EU Lab Sample ID	Client Sample ID
0623-814-001-1	061523-SO1
0623-814-002-1	061523-EO1

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 "Pippin" and "Aragorn").

For aqueous samples, unless otherwise indicated by a screening analysis, the sample volume was measured gravimetrically by the laboratory, and all contents spiked with Extraction Standard (ES). The samples were mixed well and centrifuged (if needed), and then extracted by SPE.

If the extracts are discolored after initial SPE, ENVI-Carb cleanup procedure is used. Injection Standards (IS) were added prior to analysis.

Samples that were run in more than one sequence and their comments are as follows:

061523-SO1, 061523-EO1

PFO3OA fell outside method control limits in the opening concal of the initial injection sequence. Samples and QCs were reinjected on Aragorn for this analyte of interest and its ES/IS.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0623-814-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	Northwest Water Plant Site: Leland, N.C

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 accuracy criterion for native analytes, except as noted below.

PFO4DA fell above method control limits in the initial injection sequence concals. This analyte was not detected above LOQ in the samples; therefore, the data is reportable without adverse impact.

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, except where noted below.

PFTTrDA fell above method recovery limits in OPR-15530-PFAS. This analyte was not detected above LOQ in the samples. The data is accepted with no adverse impact.

Analyte(s) were detected in the method blank (MB) less than 1/2 LOQ and less than LOD. Analyte(s) detected in the samples with less than 10 times the amount detected in MB were notated with a B qualifier. The data is accepted without further action.

Target analytes are quantified based on their ratio to their labeled standard analogs. As a result, low or high labeled standard recovery in the method blank (MB) and OPR does not cause any change to ratios or contribute any additional error in the measurement of the target analyte(s). The data has been accepted and reported with no further action.

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

Samples were initially screened by direct inject analysis to determine extraction volume.

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

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.

Manual integrations were performed on analytes in the ICAL, controls, and samples to correct baseline-to-baseline integration as well as integrate all isomers for compounds that have both linear and branched isomers.

Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0623-814-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	Northwest Water Plant Site: Leland, N.C

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 for SOP EU047 # Method 537.1 Accredited ^ Method 533 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-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 for SOP EU047 # Method 537.1 Accredited ^ Method 533 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



Enthalpy Ultratrace Job#: _____ COC Page 1 of 1

X Standard Turn Around Time

☐ Rush Turn Around Time -- Date Needed

1 • 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 Number: _____

PO#:

Project Manager: **GLENN WALKER**

Site Name: **NORTHWEST WATER PLANT**

Telephone#:

Report To: **SAME**

Location: **LELAND N.C.**

Email:

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

Client Special Instructions:

Sample Containers

Analyses:

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

[illegible]

counter, codes, on ice, no seals, good condition					
28 6/15/23					

Relinquished By:

Date: _____

Received By:

Date:

Time:

Sample Temperature Upon Receipt:

BILLY BENTON

6/15/2023

45	23	14:30
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☒ Iced ☐ Ambient °C. 4.3071☐ Iced ☐ Ambient °C☐ Iced ☐ Ambient °C

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