

# Brunswick County Public Utilities - NC

3954 Clearwell Dr NE  
Leland, NC 28451

211 Water Plant  
Leland, NC  
Samples Received: 06/30/22

Analytical Report  
0622-800

*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.: 0622-800-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: NA Site: 211 Water Plant

### Summary

	Compound	CAS	063022-S02 ng/L	063022-E02 ng/L
Acids	PFBA	375-22-4	ND U	ND U
	PFPeA	2706-90-3	ND U	ND U
	PFHxA	307-24-4	ND U	ND U
	PFHpA	375-85-9	ND U	ND U
	PFOA	335-67-1	0.100 L	0.0877 L
	PFNA	375-95-1	ND U	ND U
	PFDA	335-76-2	ND U	ND U
	PFUnDA	2058-94-8	ND U	ND U
	PFDoDA	307-55-1	ND U	ND U
	PFTTrDA	72629-94-8	ND U	0.00913 LB
	PFTeDA	376-06-7	ND U	ND U
Sulfonates	PFBS	375-73-5	ND U	ND U
	PFPeS	2706-91-4	ND U	ND U
	PFHxS	355-46-4	0.0291 L	0.0186 L
	PFHpS	375-92-8	ND U	ND U
	PFOS	1763-23-1	0.0742 L	0.0807 L
	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	0.0108 L	ND U
8:2 FTS	39108-34-4	ND U	ND U	
Other	PFOSA	754-91-6	0.0556 LB	ND U
	N-MeFOSAA	2355-31-9	ND U	0.0603 L
	N-EtFOSAA	2991-50-6	ND U	ND U
	HFPO-DA	13252-13-6	0.138 L	0.131 L
	PFMOAA	674-13-5	1.99	1.93
	PFMOPrA	377-73-1	ND U	ND U
	PFO2HxA	39492-88-1	ND U	ND U
	PFO3OA	39492-89-2	ND U	ND U
	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	ND U	ND U
	Hydro-EVE Acid	773804-62-9	ND U	ND U
	Hydrolyzed PSDA	2416366-19-1	ND U	ND U
	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	ND U	ND U
	PFECA-G	801212-59-9	ND U	ND U
	PFEESA	113507-82-7	ND U	ND U
	PFHxDA	67905-19-5	ND U	0.108 L
	PFMOBA	863090-89-5	ND U	ND U
PFO5DA	39492-91-6	ND U	ND U	
PMPA	13140-29-9	ND U	ND U	
R-EVE	2416366-22-6	ND U	ND U	
R-PSDA	2416366-18-0	ND U	ND U	
R-PSDCA	241636-21-5	ND U	ND U	

# Detailed Results



**Enthalpy Analytical**

Job No.: 0622-800-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: NA Site: 211 Water Plant

Enthalpy ID 0622-800-001-1 Prep Batch EU13645 Sample Vol (mL) 283.84  
 Sample Name 063022-S02 Prep Date 2022-07-06 10:40 Extract Vol (mL) 0.4  
 Matrix Aqueous Analysis Date 2022-07-07 01:15 Split Factor N/A  
 Sampling Date 20220630 00:00 Analyst rappelle Method Code WM-026  
 Received Date 2022-06-30 14:15 Instrument Aragorn Sample Type Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	ND	ND	ND	0.135	0.564			U
	PFPeA	2706-90-3	ND	ND	ND	0.150	0.564			U
	PFHxA	307-24-4	ND	ND	ND	0.170	0.564			U
	PFHpA	375-85-9	ND	ND	ND	0.107	0.564			U
	PFOA	335-67-1	71.10	0.100	0.100	0.156	0.564			L
	PFNA	375-95-1	ND	ND	ND	0.0670	0.564			U
	PFDA	335-76-2	ND	ND	ND	0.0744	0.564			U
	PFUnDA	2058-94-8	ND	ND	ND	0.163	0.564			U
	PFDoDA	307-55-1	ND	ND	ND	0.178	0.564			U
	PFTtDA	72629-94-8	ND	ND	ND	0.133	0.564			U
PFTeDA	376-06-7	ND	ND	ND	0.192	0.564			U	
Sulfonates	PFBS	375-73-5	ND	ND	ND	0.313	0.658			U
	PFPeS	2706-91-4	ND	ND	ND	0.181	0.531			U
	PFHxS	355-46-4	20.68	0.0291	0.0291	0.168	0.516			L
	PFHpS	375-92-8	ND	ND	ND	0.119	0.537			U
	PFOS	1763-23-1	52.68	0.0742	0.0742	0.141	0.522			L
	PFNS	68259-12-1	ND	ND	ND	0.0761	0.543			U
	PFDS	335-77-3	ND	ND	ND	0.169	0.543			U
	4:2 FTS	757124-72-4	ND	ND	ND	0.104	0.528			U
	6:2 FTS	27619-97-2	7.65	0.0108	0.0108	0.102	0.537			L
	8:2 FTS	39108-34-4	ND	ND	ND	0.151	0.540			U
Other	PFOSA	754-91-6	39.42	0.0556	0.0556	0.115	0.564			LB
	N-MeFOSAA	2355-31-9	ND	ND	ND	0.127	0.564			U
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.0960	0.564			U
	HFPO-DA	13252-13-6	97.84	0.138	0.138	0.201	0.564			L
	PFMOAA	674-13-5	1414.56	1.99	1.99	1.27	1.27			U
	PFMOPrA	377-73-1	ND	ND	ND	0.211	0.564			U
	PFO2HxA	39492-88-1	ND	ND	ND	1.27	1.27			U
	PFO3OA	39492-89-2	ND	ND	ND	1.27	1.27			U
	PFO4DA	39492-90-5	ND	ND	ND	1.34	1.34			U
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.268	0.564			U
	ADONA	919005-14-4	ND	ND	ND	0.106	0.534			U
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.106	0.525			U
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.106	0.531			U
	10:2 FTS	120226-60-0	ND	ND	ND	0.211	0.564			U
	EVE Acid	69087-46-3	ND	ND	ND	1.27	1.27			U
	FBSA	30334-69-1	ND	ND	ND	0.211	0.564			U
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	1.27	1.27			U
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	1.27	1.27			U
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.268	0.564			U
	N-EiFOSA	4151-50-2	ND	ND	ND	0.211	0.564			U
	N-EiFOSE	1691-99-2	ND	ND	ND	6.34	6.34			U
	NFDHA	151772-58-6	ND	ND	ND	0.211	0.564			U
	N-MeFOSA	31506-32-8	ND	ND	ND	0.211	0.564			U
	N-MeFOSE	24448-09-7	ND	ND	ND	6.34	6.34			U
	NVHOS	1132933-86-8	ND	ND	ND	1.27	1.27			U
	PEPA	267239-61-2	ND	ND	ND	1.27	1.27			U
	PFECA-G	801212-59-9	ND	ND	ND	0.268	1.27			U
	PFEESA	113507-82-7	ND	ND	ND	0.211	0.564			U
	PFHxDA	67905-19-5	ND	ND	ND	1.27	1.27			U
	PFMOBA	863090-89-5	ND	ND	ND	1.27	1.27			U
PFO5DA	39492-91-6	ND	ND	ND	1.34	1.34			U	
PMPA	13140-29-9	ND	ND	ND	1.27	1.27			U	
R-EVE	2416366-22-6	ND	ND	ND	1.27	1.27			U	
R-PSDA	2416366-18-0	ND	ND	ND	1.27	1.27			U	
R-PSDCA	241636-21-5	ND	ND	ND	1.27	1.27			U	
ES	MPFBA		4730.06	6.67				20-150%	94.6%	
	M5PFPeA		9968.05	14.0				20-150%	199.4%	Q
	M3PFBS		24052.31	33.9				20-150%	481.0%	Q
	M2-4:2 FTS		14297.83	20.1				20-150%	286.0%	Q
	M5PFHxA		4262.15	6.01				20-150%	85.2%	
	M3HFPO-DA		3710.41	5.23				20-150%	74.2%	
	M4PFHpA		5052.04	7.12				20-150%	101.0%	
	M3PFHxS		4739.39	6.68				20-150%	94.8%	
	M2-6:2 FTS		6134.25	8.64				20-150%	122.7%	
	M8PFOA		5201.45	7.33				20-150%	104.0%	
	M9PFNA		4669.36	6.58				20-150%	93.4%	
	M8PFOS		5377.22	7.58				20-150%	107.5%	
	M2-8:2 FTS		5977.34	8.42				20-150%	119.5%	
	M8FOSA-I		4848.20	6.83				20-150%	97.0%	
	M6PFDA		5476.84	7.72				20-150%	109.5%	
	d3-N-MeFOSAA		5120.44	7.22				20-150%	102.4%	
	d5-N-EiFOSAA		4690.72	6.61				20-150%	93.8%	
	M7PFUDa		5501.51	7.75				20-150%	110.0%	
	MPFDoA		4315.55	6.08				20-150%	86.3%	
	M2PFTeDA		3852.39	5.43				20-150%	77.0%	
d3-N-MeFOSA		4122.48	5.81				10-200%	41.2%		
d5-N-EiFOSA		3596.90	5.07				10-200%	36.0%		
d7-N-MeFOSE		6023.65	8.49				10-200%	60.2%		
d9-N-EiFOSE		5049.15	7.12				10-200%	50.5%		

**Enthalpy Analytical**

Job No.: 0622-800-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: NA Site: 211 Water Plant

Enthalpy ID	0622-800-002-1	Prep Batch	EU13645	Sample Vol (mL)	283.28
Sample Name	063022-E02	Prep Date	2022-07-06 10:40	Extract Vol (mL)	0.4
Matrix	Aqueous	Analysis Date	2022-07-07 01:38	Split Factor	N/A
Sampling Date	20220630 00:00	Analyst	rappelle	Method Code	WM-026
Received Date	2022-06-30 14:15	Instrument	Aragorn	Sample Type	Sample

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags	
Acids	PFBA	375-22-4	ND	ND	ND	0.135	0.565			U	
	PFPeA	2706-90-3	ND	ND	ND	0.150	0.565			U	
	PFHxA	307-24-4	ND	ND	ND	0.170	0.565			U	
	PFHpA	375-85-9	ND	ND	ND	0.108	0.565			U	
	PFOA	335-67-1	62.11	0.0877	0.0877	0.156	0.565			L	
	PFNA	375-95-1	ND	ND	ND	0.0672	0.565			U	
	PFDA	335-76-2	ND	ND	ND	0.0746	0.565			U	
	PFUnDA	2058-94-8	ND	ND	ND	0.163	0.565			U	
	PFDoDA	307-55-1	ND	ND	ND	0.178	0.565			U	
	PFTtDA	72629-94-8	6.47	0.00913	0.00913	0.133	0.565			LB	
	PFTeDA	376-06-7	ND	ND	ND	0.192	0.565			U	
	PFBS	375-73-5	ND	ND	ND	0.313	0.660			U	
	PFPeS	2706-91-4	ND	ND	ND	0.182	0.532			U	
	PFHxS	355-46-4	13.21	0.0186	0.0186	0.169	0.517			L	
Sulfonates	PFHpS	375-92-8	ND	ND	ND	0.119	0.538			U	
	PFOS	1763-23-1	57.18	0.0807	0.0807	0.141	0.523			L	
	PFNS	68259-12-1	ND	ND	ND	0.0762	0.544			U	
	PFDS	335-77-3	ND	ND	ND	0.169	0.544			U	
	4:2 FTS	757124-72-4	ND	ND	ND	0.104	0.529			U	
	6:2 FTS	27619-97-2	ND	ND	ND	0.102	0.538			U	
	8:2 FTS	39108-34-4	ND	ND	ND	0.151	0.541			U	
	PFOSA	754-91-6	ND	ND	ND	0.115	0.565			U	
	N-MeFOSAA	2355-31-9	42.71	0.0603	0.0603	0.127	0.565			L	
	N-EiFOSAA	2991-50-6	ND	ND	ND	0.0962	0.565			U	
Other	HFPO-DA	13252-13-6	92.60	0.131	0.131	0.201	0.565			L	
	PFMOA	674-13-5	1367.03	1.93	1.93	1.27	1.27			U	
	PFMOPrA	377-73-1	ND	ND	ND	0.212	0.565			U	
	PFO2HxA	39492-88-1	ND	ND	ND	1.27	1.27			U	
	PFO3OA	39492-89-2	ND	ND	ND	1.27	1.27			U	
	PFO4DA	39492-90-5	ND	ND	ND	1.34	1.34			U	
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.268	0.565			U	
	ADONA	919005-14-4	ND	ND	ND	0.106	0.535			U	
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.106	0.526			U	
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.106	0.532			U	
	10:2 FTS	120226-60-0	ND	ND	ND	0.212	0.565			U	
	EVE Acid	69087-46-3	ND	ND	ND	1.27	1.27			U	
	FBSA	30334-69-1	ND	ND	ND	0.212	0.565			U	
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	1.27	1.27			U	
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	1.27	1.27			U	
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.268	0.565			U	
	N-EiFOA	4151-50-2	ND	ND	ND	0.212	0.565			U	
	N-EiFOSE	1691-99-2	ND	ND	ND	6.35	6.35			U	
	NFDHA	151772-58-6	ND	ND	ND	0.212	0.565			U	
	N-MeFOA	31506-32-8	ND	ND	ND	0.212	0.565			U	
	N-MeFOSE	24448-09-7	ND	ND	ND	6.35	6.35			U	
	NVHOS	1132933-86-8	ND	ND	ND	1.27	1.27			U	
	PEPA	267239-61-2	ND	ND	ND	1.27	1.27			U	
	PFECA-G	801212-59-9	ND	ND	ND	0.268	1.27			U	
	PFEEA	113507-82-7	ND	ND	ND	0.212	0.565			U	
	PFHxDA	67905-19-5	76.25	0.108	0.108	1.27	1.27			L	
	PFMOBA	863090-89-5	ND	ND	ND	1.27	1.27			U	
	PFO5DA	39492-91-6	ND	ND	ND	1.34	1.34			U	
	PMPA	13140-29-9	ND	ND	ND	1.27	1.27			U	
	R-EVE	2416366-22-6	ND	ND	ND	1.27	1.27			U	
	R-PSDA	2416366-18-0	ND	ND	ND	1.27	1.27			U	
	R-PSDCA	241636-21-5	ND	ND	ND	1.27	1.27			U	
	ES	MPFBA		5144.31	7.26				20-150%	102.9%	
		M5PFPeA		9265.81	13.1				20-150%	185.3%	Q
M3PFBS			21813.26	30.8				20-150%	436.3%	Q	
M2-4:2 FTS			12648.31	17.9				20-150%	253.0%	Q	
M5PFHxA			4185.31	5.91				20-150%	83.7%		
M3HFPO-DA			4001.26	5.65				20-150%	80.0%		
M4PFHpA			4841.54	6.84				20-150%	96.8%		
M3PFHxS			4519.98	6.38				20-150%	90.4%		
M2-6:2 FTS			5781.04	8.16				20-150%	115.6%		
M8PFOA			4982.32	7.04				20-150%	99.6%		
M9PFNA			5102.78	7.21				20-150%	102.1%		
M8PFOS			5170.66	7.30				20-150%	103.4%		
M2-8:2 FTS			6103.26	8.62				20-150%	122.1%		
M8FOSA-I			5672.62	8.01				20-150%	113.5%		
M6PFDA			5580.60	7.88				20-150%	111.6%		
d3-N-MeFOSAA			5239.58	7.40				20-150%	104.8%		
d5-N-EiFOSAA			4725.25	6.67				20-150%	94.5%		
M7PFUDa			5500.16	7.77				20-150%	110.0%		
MPFDoA			4738.46	6.69				20-150%	94.8%		
M2PFTeDA			3896.86	5.50				20-150%	77.9%		
d3-N-MeFOA		5287.67	7.47				10-200%	52.9%			
d5-N-EiFOA		4433.57	6.26				10-200%	44.3%			
d7-N-MeFOSE		6242.49	8.81				10-200%	62.4%			
d9-N-EiFOSE		5214.61	7.36				10-200%	52.1%			

# QC Data



### Enthalpy Analytical

Job No.: 0622-800-1 PFAS by Isotope Dilution (non-potable water)  
 Brunswick County Public Utilities - NC Client Project: NA Site: 211 Water Plant

Enthalpy ID	MB-13645-PFAS	Prep Batch	EU13645	Sample Vol (mL)	250
Sample Name	MB-13645-PFAS	Prep Date	2022-07-06 10:40	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-07-06 23:44	Split Factor	N/A
Sampling Date		Analyst	rappelle	Method Code	WM-026
Received Date		Instrument	Aragorn	Sample Type	Blank

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags	
Acids	PFBA	375-22-4	ND	ND	ND	0.153	0.640			U	
	PFPeA	2706-90-3	ND	ND	ND	0.170	0.640			U	
	PFHxA	307-24-4	ND	ND	ND	0.193	0.640			U	
	PFHpA	375-85-9	ND	ND	ND	0.122	0.640			U	
	PFOA	335-67-1	ND	ND	ND	0.177	0.640			U	
	PFNA	375-95-1	ND	ND	ND	0.0761	0.640			U	
	PFDA	335-76-2	ND	ND	ND	0.0845	0.640			U	
	PFUnDA	2058-94-8	ND	ND	ND	0.185	0.640			U	
	PFDoDA	307-55-1	20.35	0.0326	0.0326	0.202	0.640			L	
	PFTriDA	72629-94-8	67.98	0.109	0.109	0.151	0.640			L	
	PFTeDA	376-06-7	ND	ND	ND	0.218	0.640			U	
	PFBS	375-73-5	21.71	0.0347	0.0347	0.355	0.747			L	
	PFPeS	2706-91-4	ND	ND	ND	0.206	0.603			U	
	PFHxS	355-46-4	ND	ND	ND	0.191	0.586			U	
	PFHpS	375-92-8	ND	ND	ND	0.135	0.610			U	
	PFOS	1763-23-1	ND	ND	ND	0.160	0.593			U	
	Sulfonates	PFNS	68259-12-1	ND	ND	ND	0.0864	0.616			U
PFDS		335-77-3	ND	ND	ND	0.192	0.616			U	
4:2 FTS		757124-72-4	ND	ND	ND	0.118	0.600			U	
6:2 FTS		27619-97-2	ND	ND	ND	0.116	0.610			U	
8:2 FTS		39108-34-4	ND	ND	ND	0.171	0.613			U	
PFOSA		754-91-6	31.39	0.0502	0.0502	0.130	0.640			L	
N-MeFOSAA		2355-31-9	ND	ND	ND	0.144	0.640			U	
N-EiFOSAA		2991-50-6	69.75	0.112	0.112	0.109	0.640			J	
HFPO-DA		13252-13-6	ND	ND	ND	0.228	0.640			U	
PFMOA		674-13-5	ND	ND	ND	1.44	1.44			U	
Other	PFMOPrA	377-73-1	ND	ND	ND	0.240	0.640			U	
	PFO2HxA	39492-88-1	ND	ND	ND	1.44	1.44			U	
	PFO3OA	39492-89-2	ND	ND	ND	1.44	1.44			U	
	PFO4DA	39492-90-5	ND	ND	ND	1.52	1.52			U	
	Nafion Byproduct 1	29311-67-9	ND	ND	ND	0.304	0.640			U	
	ADONA	919005-14-4	ND	ND	ND	0.120	0.606			U	
	9Cl-PF3ONS	756426-58-1	ND	ND	ND	0.120	0.596			U	
	11Cl-PF3OUdS	763051-92-9	ND	ND	ND	0.120	0.603			U	
	10:2 FTS	120226-60-0	ND	ND	ND	0.240	0.640			U	
	EVE Acid	69087-46-3	ND	ND	ND	1.44	1.44			U	
	FBSA	30334-69-1	ND	ND	ND	0.240	0.640			U	
	Hydro-EVE Acid	773804-62-9	ND	ND	ND	1.44	1.44			U	
	Hydrolyzed PSDA	2416366-19-1	ND	ND	ND	1.44	1.44			U	
	Nafion Byproduct 2	749836-20-2	ND	ND	ND	0.304	0.640			U	
	N-EiFOSA	4151-50-2	ND	ND	ND	0.240	0.640			U	
	N-EiFOSE	1691-99-2	ND	ND	ND	7.20	7.20			U	
	NFDHA	151772-58-6	ND	ND	ND	0.240	0.640			U	
	N-MeFOSA	31506-32-8	20.73	0.0332	0.0332	0.240	0.640			L	
	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	
	PFEEA	113507-82-7	ND	ND	ND	0.240	0.640			U	
	PFHxDA	67905-19-5	ND	ND	ND	1.44	1.44			U	
	PFMOBA	863090-89-5	ND	ND	ND	1.44	1.44			U	
	PFO5DA	39492-91-6	ND	ND	ND	1.52	1.52			U	
	PMPA	13140-29-9	ND	ND	ND	1.44	1.44			U	
	R-EVE	2416366-22-6	ND	ND	ND	1.44	1.44			U	
	R-PSDA	2416366-18-0	ND	ND	ND	1.44	1.44			U	
	R-PSDCA	241636-21-5	ND	ND	ND	1.44	1.44			U	
	ES	MPFBA		4948.38	7.92				20-150%	99.0%	
		M5PFPeA		3971.12	6.35				20-150%	79.4%	
M3PFBS			3901.79	6.24				20-150%	78.0%		
M2-4:2 FTS			5717.53	9.15				20-150%	114.4%		
M5PFHxA			4449.50	7.12				20-150%	89.0%		
M3HFPO-DA			4405.25	7.05				20-150%	88.1%		
M4PFHpA			4761.04	7.62				20-150%	95.2%		
M3PFHxS			4242.31	6.79				20-150%	84.8%		
M2-6:2 FTS			5314.81	8.50				20-150%	106.3%		
M8PFOA			5004.50	8.01				20-150%	100.1%		
M9PFNA			4730.06	7.57				20-150%	94.6%		
M8PFOS			5153.86	8.25				20-150%	103.1%		
M2-8:2 FTS			6115.22	9.78				20-150%	122.3%		
M8FOSA-I			5234.19	8.37				20-150%	104.7%		
M6PFDA			5410.94	8.66				20-150%	108.2%		
d3-N-MeFOSAA			5375.67	8.60				20-150%	107.5%		
d5-N-EiFOSAA			4568.93	7.31				20-150%	91.4%		
M7PFUDA			5596.30	8.95				20-150%	111.9%		
MPFDoA			4832.89	7.73				20-150%	96.7%		
M2PFTeDA			3904.34	6.25				20-150%	78.1%		
d3-N-MeFOSA			6094.11	9.75				10-200%	60.9%		
d5-N-EiFOSA		5607.58	8.97				10-200%	56.1%			
d7-N-MeFOSE		7435.55	11.9				10-200%	74.4%			
d9-N-EiFOSE		6484.39	10.4				10-200%	64.8%			

# Enthalpy Analytical

Job No.: 0622-800-1 PFAS by Isotope Dilution (non-potable water)

Brunswick County Public Utilities - NC Client Project: NA Site: 211 Water Plant

Enthalpy ID	OPR-13645-PFAS	Prep Batch	EU13645	Sample Vol (mL)	250
Sample Name	OPR-13645-PFAS	Prep Date	2022-07-06 10:40	Extract Vol (mL)	0.4
Matrix	aqueous	Analysis Date	2022-07-07 00:07	Split Factor	N/A
Sampling Date		Analyst	rappelle	Method Code	WM-026
Received Date		Instrument	Aragorn	Sample Type	Control

	Compound	CAS	Extract Concentration ng/L	Sample Concentration ng/L	Formatted Result ng/L	LOD ng/L	LOQ ng/L	Recovery Limits	Recovery	Flags
Acids	PFBA	375-22-4	13321.30	21.3	21.3	0.153	0.640	73-129%	106.6%	
	PFPeA	2706-90-3	12808.70	20.5	20.5	0.170	0.640	72-129%	102.5%	
	PFHxA	307-24-4	14022.26	22.4	22.4	0.193	0.640	72-129%	112.2%	
	PFHpA	375-85-9	10529.11	16.8	16.8	0.122	0.640	72-130%	84.2%	
	PFOA	335-67-1	11955.01	19.1	19.1	0.177	0.640	71-133%	95.6%	
	PFNA	375-95-1	13079.98	20.9	20.9	0.0761	0.640	69-130%	104.6%	
	PFDA	335-76-2	11047.06	17.7	17.7	0.0845	0.640	71-129%	88.4%	
	PFUnDA	2058-94-8	8800.63	14.1	14.1	0.185	0.640	69-133%	70.4%	
	PFDoDA	307-55-1	12337.37	19.7	19.7	0.202	0.640	72-134%	98.7%	
	PFTriDA	72629-94-8	13877.96	22.2	22.2	0.151	0.640	65-144%	111.0%	
PFTeDA	376-06-7	11336.02	18.1	18.1	0.218	0.640	71-132%	90.7%		
Sulfonates	PFBS	375-73-5	11081.78	17.7	17.7	0.355	0.747	72-134%	99.9%	
	PFPeS	2706-91-4	10227.75	16.4	16.4	0.206	0.603	71-127%	87.0%	
	PFHxS	355-46-4	11996.82	19.2	19.2	0.191	0.586	68-131%	105.0%	
	PFHpS	375-92-8	12345.86	19.8	19.8	0.135	0.610	69-134%	103.6%	
	PFOS	1763-23-1	11217.67	17.9	17.9	0.160	0.593	65-140%	96.7%	
	PFNS	68259-12-1	12117.36	19.4	19.4	0.0864	0.616	69-127%	100.8%	
	PFDS	335-77-3	10755.40	17.2	17.2	0.192	0.616	53-142%	89.2%	
	4:2 FTS	757124-72-4	12924.32	20.7	20.7	0.118	0.600	63-143%	110.3%	
6:2 FTS	27619-97-2	13654.36	21.8	21.8	0.116	0.610	64-140%	114.9%		
8:2 FTS	39108-34-4	8709.39	13.9	13.9	0.171	0.613	67-138%	72.6%		
Other	PFOSA	754-91-6	10821.88	17.3	17.3	0.130	0.640	67-137%	86.6%	
	N-MeFOSAA	2355-31-9	13124.84	21.0	21.0	0.144	0.640	65-136%	105.0%	
	N-EtFOSAA	2991-50-6	13973.40	22.4	22.4	0.109	0.640	61-135%	111.8%	
	HFPO-DA	13252-13-6	13813.57	22.1	22.1	0.228	0.640	70-130%	110.5%	
ES	MPFBA		4786.99	7.66				20-150%	95.7%	
	M5PFPeA		4147.24	6.64				20-150%	82.9%	
	M3PFBS		4678.29	7.49				20-150%	93.6%	
	M2-4:2 FTS		5041.51	8.07				20-150%	100.8%	
	M5PFHxA		4336.07	6.94				20-150%	86.7%	
	M3HFPO-DA		4459.51	7.14				20-150%	89.2%	
	M4PFHpA		4887.21	7.82				20-150%	97.7%	
	M3PFHxS		4132.14	6.61				20-150%	82.6%	
	M2-6:2 FTS		4621.88	7.40				20-150%	92.4%	
	M8PFOA		4884.03	7.81				20-150%	97.7%	
	M9PFNA		4273.44	6.84				20-150%	85.5%	
	M8PFOS		4642.97	7.43				20-150%	92.9%	
	M2-8:2 FTS		5634.20	9.01				20-150%	112.7%	
	M8FOSA-I		5281.18	8.45				20-150%	105.6%	
	M6PFDA		5175.44	8.28				20-150%	103.5%	
	d3-N-MeFOSAA		4870.50	7.79				20-150%	97.4%	
	d5-N-EtFOSAA		4371.94	7.00				20-150%	87.4%	
	M7PFUdA		5149.29	8.24				20-150%	103.0%	
	MPFDoA		4800.82	7.68				20-150%	96.0%	
	M2PFTeDA		3983.88	6.37				20-150%	79.7%	
d3-N-MeFOSA		5752.57	9.20				10-200%	57.5%		
d5-N-EtFOSA		5287.37	8.46				10-200%	52.9%		
d7-N-MeFOSE		6708.20	10.7				10-200%	67.1%		
d9-N-EtFOSE		5379.49	8.61				10-200%	53.8%		

# Narrative Summary



# Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0622-800-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	NA Site: 211 Water Plant

## 1. Custody

Megan Holden received the samples on June 30, 2022 at 3.3 °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
0622-800-001-1	063022-S02	Aqueous
0622-800-002-1	063022-E02	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 "Aragorn").

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

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

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  $\geq 0.99$ . Except where noted below, the reported analytes in the calibration standards, continuing calibration (concal) and Initial Calibration Verification (ICV) met the 30% accuracy criterion for native analytes.

PFAS 10:2 FTS fell above method control requirements in concals. However, there is no adverse impact as these analytes were not detected in the samples.

# Enthalpy Analytical Narrative Summary

Company	Brunswick County Public Utilities - NC
Job No.	0622-800-1 PFAS by Isotope Dilution (non-potable water)
Client ID.	NA Site: 211 Water Plant

## 4. Calibration, continued

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

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

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

# Sample Custody





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