55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO:	Ben Keefe, Town of Wayland Public Building Director
FROM:	Jill Getchell, Kevin MacKinnon, PG, CG, PH-GW
DATE:	December 17, 2021
SUBJECT:	Wayland High School Groundwater and Surface Water Perflourinated Alkyl Acids Results

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Introduction

Pursuant of the Town of Wayland's request, Weston & Sampson Engineers, Inc. collected groundwater and surface water samples over the course of nine months to provide insight on the potential distribution of Perflourinated Alkyl Acids (PFAS) upgradient of the Happy Hollow Wellfield, the Town of Wayland's largest drinking water supply source.

The Massachusetts Department of Environmental Protection (MassDEP) has determined a maximum contaminant level (MCL) of 20 parts per trillion (ppt) for the Total PFAS (6), which includes: Perfluorooctane Sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexane Sulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Perfluorohepatanoic Acid (PFHpA) and Perfluorodecanoic Acid (PFDA). All discussion of detections will be with respect to these six compounds.

Work Performed and Results

Weston & Sampson's most recent sampling event occurred on November 4, 2021 to sample five monitoring wells (SH-4, MW-1, MW-6, MW-7 and MW-8) and two surface water locations (SW-3 and SW-4). The Happy Hollow Wellfield was sampled by Town personnel on the same day. Locations are shown on Figure 1. A graphical representation of the total PFAS6 results are displayed on Figure 2.

Groundwater and Surface Water samples were taken in accordance with EPA Standards. Samples for laboratory analysis were collected by a qualified technician and analyzed by a Massachusetts and EPA certified laboratory, Alpha Analytical. The laboratory report can be found in attachments.

Groundwater Sampling

The compounds detected at SH-4 were Perfluoroheptanoic Acid-PFHpA (5.85 ng/l), Perfluorooctanoic Acid- PFOA (4.97 ng/l), Perfluorobutanoic Acid- PFBA (8.06 ng/l), Perfluoropentanoic Acid- PFPeA (31.0 ng/l) and Perfluorohexanoic Acid- PFHxA (39 ng/l). The Total PFAS6 concentration is reported to be 10.82 ng/l, which is below the MCL. Concentrations peaked on August 6, 2021 at 121.54 ng/l followed by a steep decline in the beginning of August. The sample collected on September 3, 2021 resulted in a non-detect result and appears to

be an anomaly.

The compounds detected at MW-1 were Perfluoroheptanoic Acid-PFHpA (3.21 ng/l), Perfluorooctanoic Acid-PFOA (5.78 ng/l), Perfluorooctanesulfonic Acid- PFOS (1.98 ng/), Perfluorobutanoic Acid- PFBA (12.1 ng/l), Perfluoropentanoic Acid- PFPeA (7.94 ng/l), Perfluorobutanesulfonic Acid-PFBS (2.96 ng/l) and Perfluorohexanoic Acid- PFHxA (6.9 ng/l). The Total PFAS6 concentration is reported to be 10.97 ng/l, which is below the MCL. MW-1 was trending upward until September 22, 2021 and now appears to be declining.

The compounds detected at MW-6 were Perfluoroheptanoic Acid-PFHpA (3.3 ng/l), Perfluorohexanesulfonic Acid-PFHxS (2.2 ng/l), Perfluorooctanoic Acid- PFOA (10.0 ng/l), Perfluorooctanesulfonic Acid- PFOS (9.86 ng/), Perfluorobutanoic Acid- PFBA (3.34 ng/l), Perfluoropentanoic Acid- PFPeA (7.94 ng/l), Perfluorobutanesulfonic Acid-PFBS (2.96 ng/l) and Perfluorohexanoic Acid- PFHxA (6.9 ng/l). The Total PFAS6 concentration is reported to be 25.36 ng/l, which is above the MCL. MW-6 appears to be stable, remaining almost constant.

The compounds detected at MW-7 were Perfluoroheptanoic Acid-PFHpA (3.46 ng/l), Perfluorohexanesulfonic Acid- PFHxS (2.72 ng/l), Perfluorooctanoic Acid- PFOA (9.77 ng/l), Perfluorooctanesulfonic Acid- PFOS (7.26 ng/), Perfluorobutanoic Acid- PFBA (3.85 ng/l), Perfluoropentanoic Acid- PFPeA (8.41 ng/l), Perfluorobutanesulfonic Acid-PFBS (3.52 ng/l) and Perfluorohexanoic Acid- PFHxA (6.06 ng/l). The Total PFAS6 concentration is reported to be 23.21 ng/l, which is above the MCL.

The compounds detected at MW-8 were Perfluoroheptanoic Acid-PFHpA (8.16 ng/l), Perfluorohexanesulfonic Acid- PFHxS (3.69 ng/l), Perfluorooctanoic Acid- PFOA (19.6 ng/l), Perfluorononanoic Acid-PFNA (1.98 ng/l) Perfluorooctanesulfonic Acid- PFOS (11.0 ng/), Perfluorobutanoic Acid- PFBA (10.6 ng/l), Perfluoropentanoic Acid-PFPeA (25.3 ng/l), Perfluorobutanesulfonic Acid-PFBS (5.48 ng/l) and Perfluorohexanoic Acid- PFHxA (19.5 ng/l). The Total PFAS6 concentration is reported to be 42.45 ng/l, which is above the MCL. The total PFAS6 concentration has increased since the sample collected on September 22, 2021.

Meanwhile, the Happy Hollow Wellfield has remained relatively constant since January 2021. The total PFAS6 peaked at a concentration of 33.2 ng/l on October 6, 2021 and was most recently sampled at a concentration of 25.9 on November 11, 2021.

The PFAS compounds detected in the groundwater samples collected in 2021 are summarized in Table 1 (attached).

Surface Water Sampling

The compounds detected at SW-3 were Perfluoroheptanoic Acid-PFHpA (2.86 ng/l), Perfluorohexanesulfonic Acid-PFHxS (3.25 ng/l), Perfluorooctanoic Acid- PFOA (7.41 ng/l), Perfluorooctanesulfonic Acid- PFOS (11.7 ng/), Perfluorobutanoic Acid- PFBA (2.21 ng/l), Perfluoropentanoic Acid- PFPeA (6.22 ng/l), Perfluorobutanesulfonic Acid-PFBS (3.05 ng/l) and Perfluorohexanoic Acid- PFHxA (5.46 ng/l). The Total PFAS6 concentration is reported to be 25.22 ng/l, which is above the MCL.

The compounds detected at SW-4 were Perfluoroheptanoic Acid-PFHpA (2.96 ng/l), Perfluorohexanesulfonic Acid-PFHxS (3.62 ng/l), Perfluorooctanoic Acid- PFOA (7.76 ng/l), Perfluorooctanesulfonic Acid- PFOS (12.0 ng/), Perfluorobutanoic Acid- PFBA (2.32 ng/l), Perfluoropentanoic Acid- PFPeA (6.74 ng/l), Perfluorobutanesulfonic Acid-PFBS (3.17 ng/l) and Perfluorohexanoic Acid- PFHxA (5.8 ng/l). The Total PFAS6 concentration is reported to be 26.34 ng/l, which is above the MCL.

The PFAS compounds detected in the surface water samples collected in 2021 are summarized in Table 2 (attached).

Conclusions

Based on a review of the nine months of sampling of both groundwater and surface water, there appears to be a background concentration of PFAS in the aquifer and surface water bodies upgradient of the Happy Hollow Wellfield consistent with the results at the wellfield. There is still some uncertainty as to the origin of the contamination. Additional groundwater sampling and analyses would be required to identify the source or sources of the contamination in the watershed.

FIGURES

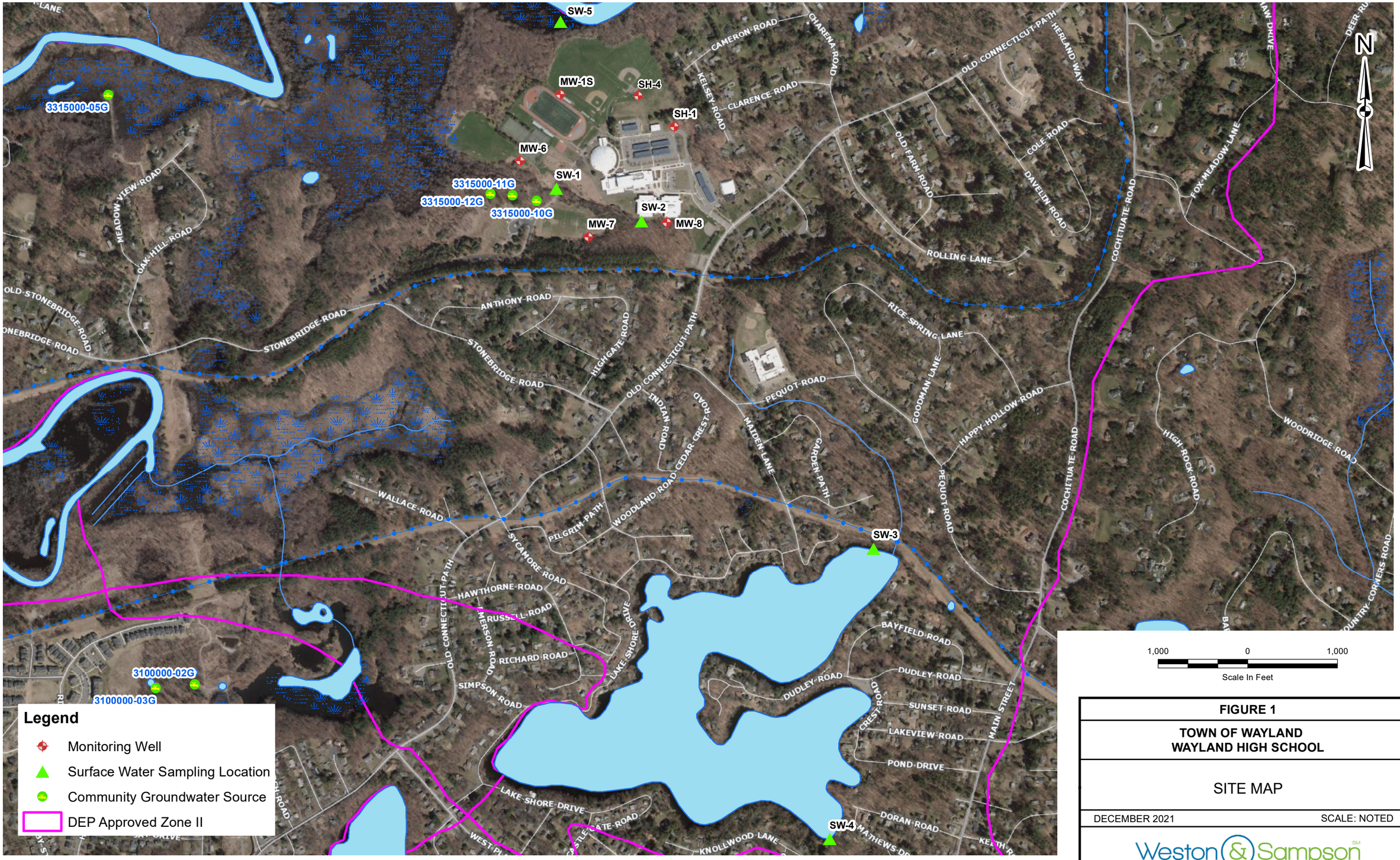


FIGURE 1

TOWN OF WAYLAND
WAYLAND HIGH SCHOOL

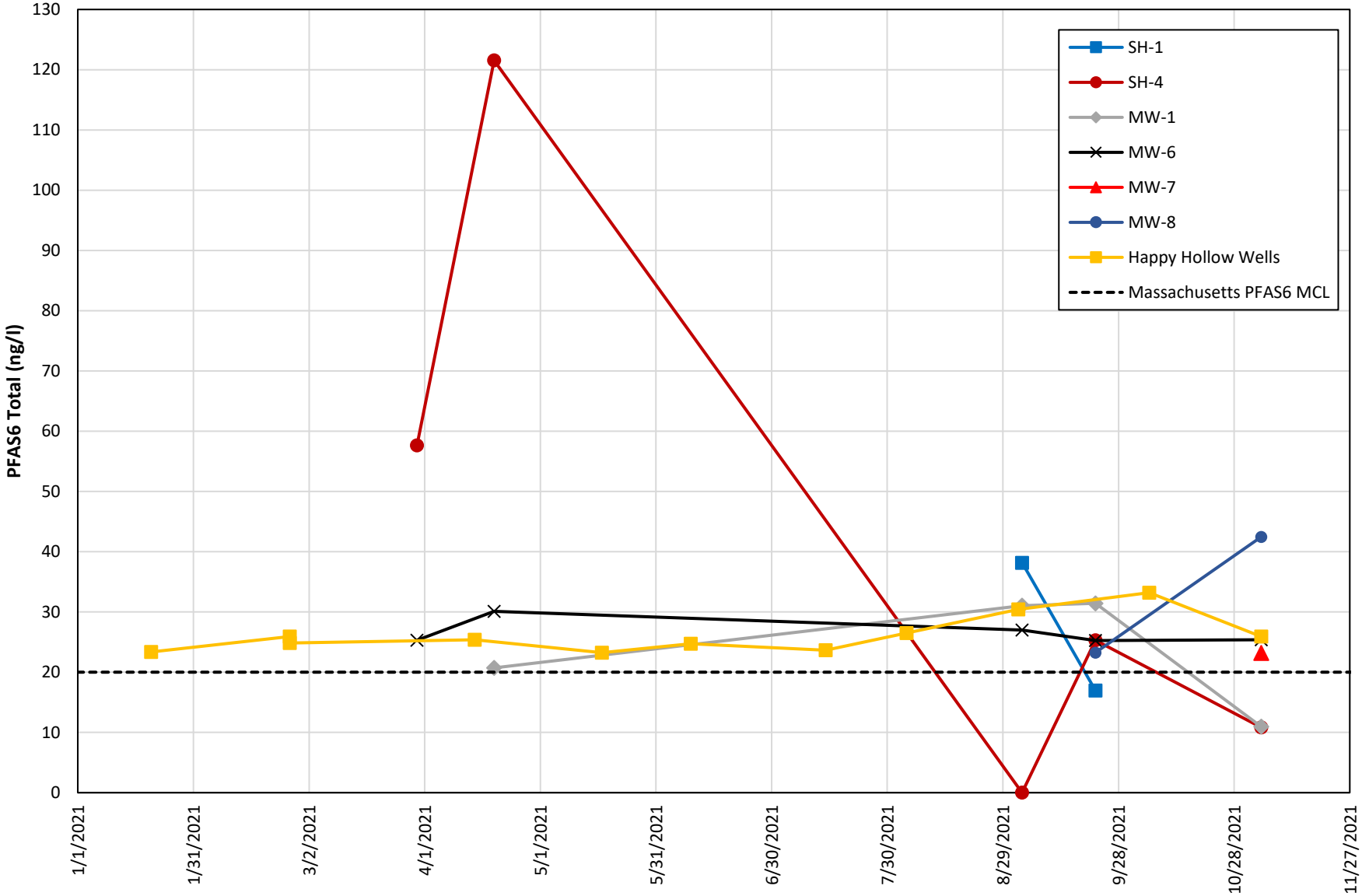
SITE MAP

DECEMBER 2021 SCALE: NOTED

Weston & Sampson

Path: P:\MA\Wayland MA\Wayland High School Athletic Facilities\Hydrogeo\GIS\Mapfiles\Site Map.mxd User: GetcheiU Saved: 9/20/2021 3:25:51 PM Opened: 12/14/2021 8:28:39 PM

Wayland High School, Wayland, Massachusetts
2021 Total PFSA6 Groundwater Results
Figure 2



TABLES

Table 1

2021 Wayland High School Perfluorinated Alkyl Acids Groundwater Results

	1/20/2021	2/25/2021	3/16/2021	3/30/2021		4/14/2021	4/19/2021			5/17/2021	6/9/2021	7/14/2021	8/4/2021	8/6/2021			9/2/2021	9/3/2021[4]				9/22/2021					10/6/2021	11/4/2021					
	Happy Hollow Wells	Happy Hollow Wells	Happy Hollow Wells	SH-4	MW-6	Happy Hollow Wells	SH-4	MW-1	MW-6	Happy Hollow Wells	Happy Hollow Wells	Happy Hollow Wells	Happy Hollow Wells	SH-4	MW-1	MW-6	Happy Hollow Wells	SH-4	MW-1	MW-6	SH-1	SH-4	MW-1	MW-6	SH-1	MW-8	Happy Hollow Wells	Happy Hollow Wells	SH-4	MW-1	MW-6	MW-7	MW-8
Perfluoroheptanoic Acid (PFHpA)	–	–	–	14.4	1.98	–	9.4	2.16	3.66	–	–	–	–	27.6	14	3.3	–	ND	4.76	3.47	5.36	9.95	5.56	3.44	2.58	3.56	–	–	5.85	3.21	3.3	3.46	8.16
Perfluorohexanesulfonic Acid (PFHxS)	–	–	–	3.15	2.12	–	2.43	4.22	3.44	–	–	–	–	5.79	4.8	2.1	–	ND	2.82	2.22	ND	2.06	2.87	2.3	ND	2.79	–	–	ND	ND	2.2	2.72	3.69
Perfluorooctanoic Acid (PFOA)	–	–	–	40.1	11.4	–	27.8	9.36	12.2	–	–	–	–	84	49.6	11.9	–	ND	15.8	10.8	18.9	13.3	16.3	10.4	7.78	9.15	–	–	4.97	5.78	10	9.77	19.6
Perfluorononanoic Acid (PFNA)	–	–	–	ND	NS	–	ND	ND	ND	–	–	–	–	1.85	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	1.98
Perfluorooctanesulfonic Acid (PFOS)	–	–	–	ND	9.79	–	ND	4.99	10.8	–	–	–	–	2.3	7.97	9.7	–	ND	7.68	10.6	13.9	ND	6.7	9.11	6.61	7.75	–	–	ND	1.98	9.86	7.26	11
Perfluorodecanoic Acid (PFDA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorobutanoic Acid (PFBA)	–	–	–	10.6	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	ND	NS	3.33	3.58	14.8	20	3.48	2.9	4.06	–	–	8.06	12.1	3.34	3.85	10.6
Perfluoropentanoic Acid (PFPeA)	–	–	–	36	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	ND	NS	7.27	5.6	56.8	12.9	8.07	4.96	9.19	–	–	31	9.21	7.94	8.41	25.3
Perfluorobutanesulfonic Acid (PFBS)	–	–	–	1.99	2.54	–	ND	6.78	3.27	–	–	–	–	2.65	9.26	2.5	–	ND	5.52	3.11	3.31	1.8	5.79	2.91	3.24	4.21	–	–	ND	2.42	2.96	3.52	5.48
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorohexanoic Acid (PFHxA)	–	–	–	40.9	7.49	–	30.4	2.84	7.89	–	–	–	–	82.5	25.9	7.2	–	ND	8.39	7.01	7.25	65.5	9.56	7.25	5.02	8.22	–	–	39	6.39	6.9	6.06	19.5
Perfluoropentanesulfonic Acid (PFPeS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
Perfluoroheptanesulfonic Acid (PFHpS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
Perfluorononanesulfonic Acid (PFNS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluoroundecanoic Acid (PFUnA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorodecanesulfonic Acid (PFDS)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
Perfluorooctanesulfonamide (FOSA)	–	–	–	ND	NS	–	NS	NS	NS	–	–	–	–	NS	NS	NS	–	NS	NS	NS	NS	NS	NS	NS	NS	NS	–	–	NS	NS	NS	NS	NS
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorododecanoic Acid (PFDoA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorotridecanoic Acid (PFTrDA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
Perfluorotetradecanoic Acid (PFTA)	–	–	–	ND	ND	–	ND	ND	ND	–	–	–	–	ND	ND	ND	–	ND	ND	ND	ND	ND	ND	ND	ND	ND	–	–	ND	ND	ND	ND	ND
PFAS, Total (6)[5]	**23.36**	**25.91**	**24.86**	**57.65**	**25.29**	**25.39**	**39.63**	**20.73**	**30.1**	**23.24**	**24.71**	**23.64**	**26.5**	**121.54**	**76.37**	**27**	**30.4**	ND	**31.06**	**27.09**	**38.16**	**25.31**	**31.43**	**25.25**	**16.97**	**23.25**	**33.2**	**25.9**	**10.82**	**10.97**	**25.36**	**23.21**	**42.45**

Notes:

1. All results reported in nanograms per liter (ng/l) which is equivalent to parts per trillion (ppt).
2. ND= Not Detected
3. NS= Not Sampled
4. Sampling event immediately followed occurrence of significant precipitation event of 4.07 inches over 24 hours (Bedford Hanscom Field, MA Station- NOAA NowData).
5. The Massachusetts Department of Environmental Protection (MassDEP) has determined a maximum contaminant level (MCL) of 20 parts per trillion (ppt) for the Total PFAS (6), which includes: Perfluorooctane Sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexane Sulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Perfluorohepatanoic Acid (PFHpA) and Perfluorodecanoic Acid (PFDA).
6. Happy Hollow Wells were sampled by the Town of Wayland. Results retrieved from the Town.

Table 2

2021 Wayland High School Perfluorinated Alkyl Acids Surface Water Results

	8/6/2021					*9/2/2021* [4]	*9/22/2021*	*11/4/2021*	
	SW-1	**SW-2**	**SW-3**	**SW-4**	**SW-5**	**Discharge Pipe**[5,6]	**SW-3**	**SW-3**	**SW-4**
Perfluoroheptanoic Acid (PFHpA)	3.07	3.15	2.86	2.76	2.8	*ND*	3.17	2.86	2.96
Perfluorohexanesulfonic Acid (PFHxS)	1.84	2.31	3.16	3.4	1.95	*ND*	3.16	3.25	3.62
Perfluorooctanoic Acid (PFOA)	8.39	8.31	8.06	7.18	6.67	*ND*	7.69	7.41	7.76
Perfluorononanoic Acid (PFNA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorooctanesulfonic Acid (PFOS)	8.24	11.6	11.5	20.7	9.63	*ND*	9.71	11.7	12
Perfluorodecanoic Acid (PFDA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorobutanoic Acid (PFBA)	1.93	1.91	2.04	2.08	3.77	*ND*	2.84	2.21	2.32
Perfluoropentanoic Acid (PFPeA)	5.18	4.98	5.48	5.32	5.45	2.26	5.7	6.22	6.74
Perfluorobutanesulfonic Acid (PFBS)	2.32	2.37	3.17	3.21	2.43	*ND*	3.51	3.05	3.17
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorohexanoic Acid (PFHxA)	5.2	5	5.58	5.59	4.49	*ND*	5.9	5.46	5.8
Perfluoropentanesulfonic Acid (PFPeS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluoroheptanesulfonic Acid (PFHpS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorononanesulfonic Acid (PFNS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluoroundecanoic Acid (PFUnA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorodecanesulfonic Acid (PFDS)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorooctanesulfonamide (FOSA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorododecanoic Acid (PFDoA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorotridecanoic Acid (PFTrDA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Perfluorotetradecanoic Acid (PFTA)	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
PFAS, Total (6)[7]	**21.54**	**25.37**	**25.58**	**34.04**	**21.05**	*ND*	**23.73**	**25.22**	**26.34**

Notes:

1. All results reported in nanograms per liter (ng/l) which is equivalent to parts per trillion (ppt).
2. ND= Not Detected
3. NS= Not Sampled
4. Sampling event immediately followed occurrence of significant precipitation event of 4.07 inches over 24 hours (Bedford Hanscom Field, MA Station- NOAA NowData).
5. Sampled by Town Staff.
6. No Field Blank associated with sample.
7. The Massachusetts Department of Environmental Protection (MassDEP) has determined a maximum contaminant level (MCL) of 20 parts per trillion (ppt) for the Total PFAS (6), which includes: Perfluorooctane Sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexane Sulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Perfluorohepatanoic Acid (PFHpA) and Perfluorodecanoic Acid (PFDA).

LABORATORY REPORT

ANALYTICAL REPORT

Lab Number:	L2160701
Client:	Weston & Sampson 55 Walkers Brook Drive Suite 100 Reading, MA 01867
ATTN:	Kevin MacKinnon
Phone:	(978) 532-1900
Project Name:	WAYLAND HS
Project Number:	ENG20-0296
Report Date:	11/29/21

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2160701-01	MW-6	WATER	WAYLAND MA	11/04/21 09:00	11/04/21
L2160701-02	MW-7	WATER	WAYLAND MA	11/04/21 10:00	11/04/21
L2160701-03	MW-8	WATER	WAYLAND MA	11/04/21 10:45	11/04/21
L2160701-04	SH-4	WATER	WAYLAND MA	11/04/21 11:45	11/04/21
L2160701-05	MW-1	WATER	WAYLAND MA	11/04/21 12:15	11/04/21
L2160701-06	SW-3	WATER	WAYLAND MA	11/04/21 13:30	11/04/21
L2160701-07	SW-4	WATER	WAYLAND MA	11/04/21 13:00	11/04/21
L2160701-08	FB-01	WATER	WAYLAND MA	11/04/21 13:00	11/04/21

Project Name:	WAYLAND HS	**Lab Number:**	L2160701
Project Number:	ENG20-0296	**Report Date:**	11/29/21

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	WAYLAND HS	**Lab Number:**	L2160701
Project Number:	ENG20-0296	**Report Date:**	11/29/21

Case Narrative (continued)

Perfluorinated Alkyl Acids by Isotope Dilution

L2160701-01, -02, -03, and -05: The sample was centrifuged and decanted prior to extraction due to sample matrix.

L2160701-01, -02, and -03: The sample was re-extracted due to M8FOSA failures (less than 5%) in the original extraction; however, the criteria was achieved upon re-extraction outside of holding time. The results of both extractions are reported for FOSA.

L2160701-01, -04, -05, -06, and -07: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Alycia Mogayzel

Title: Technical Director/Representative Date: 11/29/21

ORGANICS

SEMIVOLATILES

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-01
Client ID: MW-6
Sample Location: WAYLAND MA

Date Collected: 11/04/21 09:00
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 12:09
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	3.34		ng/l	1.78	--	1
Perfluoropentanoic Acid (PFPeA)	7.94		ng/l	1.78	--	1
Perfluorobutanesulfonic Acid (PFBS)	2.96		ng/l	1.78	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.78	--	1
Perfluorohexanoic Acid (PFHxA)	6.90		ng/l	1.78	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.78	--	1
Perfluoroheptanoic Acid (PFHpA)	3.30		ng/l	1.78	--	1
Perfluorohexanesulfonic Acid (PFHxS)	2.20		ng/l	1.78	--	1
Perfluorooctanoic Acid (PFOA)	10.0		ng/l	1.78	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.78	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.78	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.78	--	1
Perfluorooctanesulfonic Acid (PFOS)	9.86		ng/l	1.78	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.78	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.78	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.78	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.78	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.78	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.78	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.78	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.78	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.78	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.78	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.78	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-01 Date Collected: 11/04/21 09:00

Client ID: MW-6 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	69		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	72		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	102		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**172**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	74		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	75		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	103		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	70		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	102		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	73		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	74		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	80		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	54		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	73		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**4**	Q	10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	62		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	66		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-01 RE
Client ID: MW-6
Sample Location: WAYLAND MA

Date Collected: 11/04/21 09:00
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/26/21 22:00
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 11/26/21 11:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.79	--	1

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	68		10-112

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-02
Client ID: MW-7
Sample Location: WAYLAND MA

Date Collected: 11/04/21 10:00
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 12:26
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	3.85		ng/l	1.79	--	1
Perfluoropentanoic Acid (PFPeA)	8.41		ng/l	1.79	--	1
Perfluorobutanesulfonic Acid (PFBS)	3.52		ng/l	1.79	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.79	--	1
Perfluorohexanoic Acid (PFHxA)	6.06		ng/l	1.79	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.79	--	1
Perfluoroheptanoic Acid (PFHpA)	3.46		ng/l	1.79	--	1
Perfluorohexanesulfonic Acid (PFHxS)	2.72		ng/l	1.79	--	1
Perfluorooctanoic Acid (PFOA)	9.77		ng/l	1.79	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.79	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.79	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.79	--	1
Perfluorooctanesulfonic Acid (PFOS)	7.26		ng/l	1.79	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.79	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.79	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.79	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.79	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.79	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.79	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.79	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.79	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.79	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.79	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.79	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-02 Date Collected: 11/04/21 10:00

Client ID: MW-7 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	65		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	72		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	105		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	122		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	69		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	70		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	68		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	92		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	73		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	72		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	89		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	55		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	74		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**3**	Q	10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	53		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	65		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	60		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-02 RE
Client ID: MW-7
Sample Location: WAYLAND MA

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/26/21 22:07
Analyst: SG

Date Collected: 11/04/21 10:00
Date Received: 11/04/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 11/26/21 11:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.77	--	1

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	72		10-112

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-03
Client ID: MW-8
Sample Location: WAYLAND MA

Date Collected: 11/04/21 10:45
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 12:42
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	10.6		ng/l	1.75	--	1
Perfluoropentanoic Acid (PFPeA)	25.3		ng/l	1.75	--	1
Perfluorobutanesulfonic Acid (PFBS)	5.48		ng/l	1.75	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.75	--	1
Perfluorohexanoic Acid (PFHxA)	19.5		ng/l	1.75	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.75	--	1
Perfluoroheptanoic Acid (PFHpA)	8.16		ng/l	1.75	--	1
Perfluorohexanesulfonic Acid (PFHxS)	3.69		ng/l	1.75	--	1
Perfluorooctanoic Acid (PFOA)	19.6		ng/l	1.75	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.75	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.75	--	1
Perfluorononanoic Acid (PFNA)	1.98		ng/l	1.75	--	1
Perfluorooctanesulfonic Acid (PFOS)	11.0		ng/l	1.75	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.75	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.75	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.75	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.75	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.75	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.75	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.75	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.75	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.75	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.75	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.75	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-03 Date Collected: 11/04/21 10:45

Client ID: MW-8 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	67		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	76		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	121		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	68		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	70		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	102		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	69		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	87		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	76		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	74		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	78		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	57		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	71		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**4**	Q	10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	57		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	61		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	57		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-03 RE
Client ID: MW-8
Sample Location: WAYLAND MA

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/26/21 22:14
Analyst: SG

Date Collected: 11/04/21 10:45
Date Received: 11/04/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 11/26/21 11:30

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.73	--	1

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	69		10-112

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-04
Client ID: SH-4
Sample Location: WAYLAND MA

Date Collected: 11/04/21 11:45
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 12:59
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	8.06		ng/l	1.80	--	1
Perfluoropentanoic Acid (PFPeA)	31.0		ng/l	1.80	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.80	--	1
Perfluorohexanoic Acid (PFHxA)	39.0		ng/l	1.80	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.80	--	1
Perfluoroheptanoic Acid (PFHpA)	5.85		ng/l	1.80	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.80	--	1
Perfluorooctanoic Acid (PFOA)	4.97		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.80	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.80	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.80	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.80	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.80	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.80	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.80	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.80	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.80	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.80	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.80	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.80	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-04 Date Collected: 11/04/21 11:45

Client ID: SH-4 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	73		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	77		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	130		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	73		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	71		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	66		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	86		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	67		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	63		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	84		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	50		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	63		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	**8**	Q	10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	53		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	56		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	52		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-05
Client ID: MW-1
Sample Location: WAYLAND MA

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 13:15
Analyst: HT

Date Collected: 11/04/21 12:15
Date Received: 11/04/21
Field Prep: Not Specified

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	12.1		ng/l	1.76	--	1
Perfluoropentanoic Acid (PFPeA)	9.21		ng/l	1.76	--	1
Perfluorobutanesulfonic Acid (PFBS)	2.42		ng/l	1.76	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.76	--	1
Perfluorohexanoic Acid (PFHxA)	6.39		ng/l	1.76	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.76	--	1
Perfluoroheptanoic Acid (PFHpA)	3.21		ng/l	1.76	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.76	--	1
Perfluorooctanoic Acid (PFOA)	5.78		ng/l	1.76	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.76	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.76	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.76	--	1
Perfluorooctanesulfonic Acid (PFOS)	1.98	F	ng/l	1.76	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.76	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.76	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.76	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.76	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.76	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.76	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.76	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.76	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.76	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.76	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.76	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-05 Date Collected: 11/04/21 12:15

Client ID: MW-1 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	77		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	75		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**239**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	73		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	81		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	110		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	78		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	147		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	77		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	104		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	78		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	90		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	61		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	74		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	11		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	66		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	59		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	61		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-06
Client ID: SW-3
Sample Location: WAYLAND MA

Date Collected: 11/04/21 13:30
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 13:32
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	2.21		ng/l	1.77	--	1
Perfluoropentanoic Acid (PFPeA)	6.22		ng/l	1.77	--	1
Perfluorobutanesulfonic Acid (PFBS)	3.05		ng/l	1.77	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.77	--	1
Perfluorohexanoic Acid (PFHxA)	5.46		ng/l	1.77	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.77	--	1
Perfluoroheptanoic Acid (PFHpA)	2.86		ng/l	1.77	--	1
Perfluorohexanesulfonic Acid (PFHxS)	3.25		ng/l	1.77	--	1
Perfluorooctanoic Acid (PFOA)	7.41		ng/l	1.77	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.77	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.77	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.77	--	1
Perfluorooctanesulfonic Acid (PFOS)	11.7		ng/l	1.77	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.77	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.77	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.77	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.77	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.77	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.77	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.77	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.77	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.77	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.77	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.77	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-06 Date Collected: 11/04/21 13:30

Client ID: SW-3 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	86		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	88		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	99		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**259**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	87		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	91		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	108		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	88		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	132		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	93		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	99		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	82		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	107		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	70		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	75		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	22		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	61		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	57		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	54		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-07
Client ID: SW-4
Sample Location: WAYLAND MA

Date Collected: 11/04/21 13:00
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 13:48
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	2.32		ng/l	1.80	--	1
Perfluoropentanoic Acid (PFPeA)	6.74		ng/l	1.80	--	1
Perfluorobutanesulfonic Acid (PFBS)	3.17		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.80	--	1
Perfluorohexanoic Acid (PFHxA)	5.80		ng/l	1.80	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.80	--	1
Perfluoroheptanoic Acid (PFHpA)	2.96		ng/l	1.80	--	1
Perfluorohexanesulfonic Acid (PFHxS)	3.62	F	ng/l	1.80	--	1
Perfluorooctanoic Acid (PFOA)	7.76		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.80	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.80	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonic Acid (PFOS)	12.0		ng/l	1.80	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.80	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.80	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.80	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.80	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.80	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.80	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.80	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.80	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.80	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-07 Date Collected: 11/04/21 13:00

Client ID: SW-4 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	85		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	89		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	100		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	**242**	Q	12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	85		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	89		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	106		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	87		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	136		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	90		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	80		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	97		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	64		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	70		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	14		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	62		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	53		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	49		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-08
Client ID: FB-01
Sample Location: WAYLAND MA

Date Collected: 11/04/21 13:00
Date Received: 11/04/21
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/24/21 14:05
Analyst: HT

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.80	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.80	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.80	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.80	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.80	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.80	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.80	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.80	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.80	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.80	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.80	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.80	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.80	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.80	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.80	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.80	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.80	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.80	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.80	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.80	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.80	--	1

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

SAMPLE RESULTS

Lab ID: L2160701-08 Date Collected: 11/04/21 13:00

Client ID: FB-01 Date Received: 11/04/21

Sample Location: WAYLAND MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	94		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	94		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	106		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	98		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	98		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	100		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	103		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	97		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	84		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	98		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	85		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	85		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	86		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	79		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	32		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	82		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	68		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	62		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/23/21 02:04
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-08 Batch: WG1570529-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/l	2.00	--
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	2.00	--
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	2.00	--
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	2.00	--
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	2.00	--
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/23/21 02:04
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 11/12/21 08:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-08 Batch: WG1570529-1					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	95		58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	95		62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98		70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	90		12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	96		57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	95		60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	99		71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	91		62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	93		14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	103		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	101		69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	96		62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	116		10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	84		24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	88		55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	43		10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	87		27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	80		48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	75		22-136

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 11/26/21 21:45
Analyst: SG

Extraction Method: ALPHA 23528
Extraction Date: 11/26/21 11:30

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-03 Batch: WG1576022-1					
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	2.00	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	69		10-112

Lab Control Sample Analysis
Batch Quality Control

Project Name: WAYLAND HS
Project Number: ENG20-0296
Lab Number: L2160701
Report Date: 11/29/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-08 Batch: WG1570529-2								
Perfluorobutanoic Acid (PFBA)	96		-		67-148	-		30
Perfluoropentanoic Acid (PFPeA)	98		-		63-161	-		30
Perfluorobutanesulfonic Acid (PFBS)	93		-		65-157	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	102		-		37-219	-		30
Perfluorohexanoic Acid (PFHxA)	96		-		69-168	-		30
Perfluoropentanesulfonic Acid (PFPeS)	100		-		52-156	-		30
Perfluoroheptanoic Acid (PFHpA)	95		-		58-159	-		30
Perfluorohexanesulfonic Acid (PFHxS)	107		-		69-177	-		30
Perfluorooctanoic Acid (PFOA)	101		-		63-159	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	121		-		49-187	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	97		-		61-179	-		30
Perfluorononanoic Acid (PFNA)	88		-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	106		-		52-151	-		30
Perfluorodecanoic Acid (PFDA)	94		-		63-171	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	105		-		56-173	-		30
Perfluorononanesulfonic Acid (PFNS)	99		-		48-150	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	107		-		60-166	-		30
Perfluoroundecanoic Acid (PFUnA)	94		-		60-153	-		30
Perfluorodecanesulfonic Acid (PFDS)	98		-		38-156	-		30
Perfluorooctanesulfonamide (FOSA)	96		-		46-170	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	103		-		45-170	-		30
Perfluorododecanoic Acid (PFDoA)	100		-		67-153	-		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: WAYLAND HS
Project Number: ENG20-0296
Lab Number: L2160701
Report Date: 11/29/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-08 Batch: WG1570529-2								
Perfluorotridecanoic Acid (PFTrDA)	124		-		48-158	-		30
Perfluorotetradecanoic Acid (PFTA)	104		-		59-182	-		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	94				58-132
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	89				62-163
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98				70-131
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	99				12-142
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94				57-129
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	94				60-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	96				71-134
Perfluoro[13C8]Octanoic Acid (M8PFOA)	91				62-129
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	99				14-147
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	102				59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	98				69-131
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	95				62-124
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	105				10-162
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	86				24-116
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	92				55-137
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	44				10-112
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	99				27-126
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	81				48-131
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	81				22-136

Lab Control Sample Analysis

Batch Quality Control

Project Name: WAYLAND HS

Project Number: ENG20-0296

Lab Number: L2160701

Report Date: 11/29/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-03 Batch: WG1576022-2								
Perfluorooctanesulfonamide (FOSA)	116		-		46-170	-		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	72				10-112

Matrix Spike Analysis

Batch Quality Control

Project Name: WAYLAND HS

Project Number: ENG20-0296

Lab Number: L2160701

Report Date: 11/29/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1570529-3 QC Sample: L2160858-01 Client ID: MS Sample												
Perfluorooctanoic Acid (PFOA)	ND	35.9	36.2	100		-	-		63-159	-		30
Perfluorononanoic Acid (PFNA)	ND	35.9	31.8	89		-	-		68-171	-		30
Perfluorooctanesulfonic Acid (PFOS)	ND	33.3	36.9	111		-	-		52-151	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95				69-131
Perfluoro[13C8]Octanoic Acid (M8PFOA)	84				62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96				59-139

Lab Duplicate Analysis
Batch Quality Control

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1570529-4 QC Sample: L2160858-03 Client ID: DUP Sample						
Perfluorooctanoic Acid (PFOA)	23.1	22.3	ng/l	4		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/l	NC		30
Perfluorooctanesulfonic Acid (PFOS)	27.0	26.3	ng/l	3		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C8]Octanoic Acid (M8PFOA)	78		81		62-129
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	87		90		59-139
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	94		93		69-131

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2160701-01A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-01B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-02A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-02B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-03A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-03B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-04A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-04B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-05A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-05B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-06A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-06B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-07A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-07B	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)
L2160701-08A	Plastic 250ml unpreserved	A	NA		4.1	Y	Absent		A2-537-ISOTOPE(14)

*Values in parentheses indicate holding time in days

Project Name: WAYLAND HS
Project Number: ENG20-0296

Lab Number: L2160701
Report Date: 11/29/21

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name:	WAYLAND HS	**Lab Number:**	L2160701
Project Number:	ENG20-0296	**Report Date:**	11/29/21

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Project Name:	WAYLAND HS	**Lab Number:**	L2160701
Project Number:	ENG20-0296	**Report Date:**	11/29/21

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Project Name: WAYLAND HS **Lab Number:** L2160701

Project Number: ENG20-0296 **Report Date:** 11/29/21

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name: WAYLAND HS
Project Number: ENG20-0296
Lab Number: L2160701
Report Date: 11/29/21

REFERENCES

134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Date Rec'd in Lab: 11/4/21

ALPHA Job #: C2160701

Client Information

Client: Weston & Sampson
Address: 55 Walkers Brook Dr
Reading MA
Phone: 978-532-1900
Email: machinnk@wseinc.com
gerchelly@wseinc.com

Additional Project Information:

Project Information

Project Name: Wayland HS
Project Location: Wayland MA
Project #: EN620-0296
Project Manager:
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☐ ADEx ☒ EMAIL

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; PFAS (isotope Dilution)

SAMPLE INFO
Filtration: ☐ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	PFAS (isotope Dilution)	Sample Comments	TOTAL # BOTTLES
60701-01	MW-6	11/4/21	0900	DW	JAG	X		
-02	MW-7		1000					
-03	MW-8		1045					
-04	SH-4		1145					
-05	MW-1		1215					
-06	SW-3		1330	SW				
-07	SW-4		1300					
-08	FB-01							

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

ARCC-NAL 11/4/21 2158

Container Type																			
Preservative																			

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	11/4/21 1420	[signature]	11/4/21 1420
[signature]	11/4/21 1730	[signature]	11/4 1730
[signature]	11/4/21 1950	[signature]	11/4 1950
New Jersey	11/4/21 2030	[signature]	11/4/21 2030

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

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