Community Water Quality Sampling Report:
PFAS Contamination of Anchorage and Fairbanks North Star Borough Lakes
May 9, 2022

Introduction

PFAS (per- and polyfluoroalkyl substances) are a class of more than 9,000 chemicals used in consumer products, industrial applications, and firefighting foams for Class B petroleum and chemical fires. PFAS are used in many consumer products such as food packaging, textiles, apparel, and non-stick pans because of their stain, grease, and water resistance. PFAS are extremely persistent in the environment because their multiple carbon-fluorine chemical bonds that form the basis of their structures are virtually indestructible. PFAS are thus known as "forever chemicals." In addition to their extreme persistence, PFAS are also highly mobile, and some are bioaccumulative. Low-level exposures to PFAS are associated with adverse health effects. Exposure to PFAS is linked with kidney and testicular cancer, ulcerative colitis, adverse reproductive health outcomes, liver diseases, thyroid disease, high cholesterol, and immunotoxic effects.[1]

In Alaska, the dispersive use of PFAS-based firefighting foams known as aqueous film forming foams (AFFF) on military bases and airports has contaminated surface and groundwater sources of drinking water in communities throughout Alaska. PFAS have been discovered at over 100 individual sites in nearly 30 locations. At least ten Alaska communities have PFAS in their drinking water at levels deemed unsafe by the U.S. Environmental Protection. PFAS contamination in Alaska has been confirmed at nearly every site that has been investigated in which aqueous film forming foam (AFFF) has been or is currently being used.[2] Several lakes in Alaska are closed to fishing as a result of PFAS contamination, including Polaris Lake on Eielson Air Force Base and Kimberly Lake near the former North Pole Refinery. According to Alaska Department of Fish and Game (ADFG), rainbow trout caught in Kimberly Lake had nearly *2,000 times* the concentrations of PFAS than levels measured in the water because PFAS are strongly bioaccumulative. According to the ADFG advisory, "water quality testing conducted in Polaris, Bear and Moose Lakes on Eielson Air Force Base indicated that surface waters from all three lakes exceeded Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (DEC) lifetime health advisory levels of 70 ppt for PFAS. Results from water quality testing at Bathing Beauty Pond, in the summer of 2020, indicated that per- and polyfluoroalkyl

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[1] Cordner et al. 2021. The True Cost of PFAS and the Benefits of Acting Now. Environ. Sci. and Technology 55:9630-9633.

[2] Defazio, D. et al. 2019. Threats to Drinking Water in Alaska: The Scope of the Problem, Consequences of Regulatory Inaction, and Recommendations. An Investigative Report of Alaska Community Action on Toxics: https://www.akaction.org/new-investigative-report-from-alaska-community-action-on-toxics-threats-to-drinking-water-and-public-health-in-alaska/

substances (PFAS) levels were below EPA and DEC action levels (21–26 ppt). However, *these concentrations can result in the bioaccumulation of PFAS in fish tissues to levels that may be unsafe for consumption*. Therefore, Bathing Beauty Pond and Bear, Moose, and Polaris Lakes are being restricted to catch-and-release fishing out of an abundance of caution."[3] The full extent of contamination from identified sites throughout Alaska is unknown and new sites are likely to be identified in the future.

Background

In October 2021, Alaska Community Action on Toxics (ACAT) collected twelve lake samples in Anchorage, Fairbanks, and North Pole, Alaska. These lakes are in areas with known or suspected PFAS contamination associated with the dispersive use of PFAS-containing firefighting foams known as aqueous film forming foams (AFFF) used to extinguish fuel or chemical fires in training facilities, airports, and military bases.

We conducted this testing because people near the former Kulis Air National Guard Base and Anchorage International Airport expressed concern and contacted ACAT for assistance. The data concerning PFAS in our local lakes are of concern to environmental and public health. The information is a public right-to-know issue. Some of the lakes that have elevated levels of PFAS are used for fishing. We need action now to protect fish, wildlife, pets, and people.

Sources of PFAS to Area Lakes, Other Surface Waters, and Groundwater

Anchorage

- Former Kulis Air National Guard Base (now managed by Ted Stevens International Airport as the Kulis Business Park)—PFAS-containing AFFF stored, handled, released and /or used at ten areas. The highest PFAS concentrations found in stormwater that drains to wetlands and area lakes (including DeLong Lake and Meadow Lake): 40,400 ppt PFOS, 2,200 PFOA, and 13,000 PFHxS

- Anchorage International Airport—levels of PFAS found in waters downgradient of the Aircraft Rescue and Fire Training Facility (PFOS levels of 23,000 ppt in shallow groundwater and 6,600 ppt in surface water).

- Joint Base Elmendorf and Fort Richardson (JBER)—several source areas of AFFF are contaminating soils and groundwater on base and may contribute to contamination of Ship Creek and near shore environment of Knik Arm

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[3] Alaska Department of Fish and Game Advisory. 2021. Sport Fishing Closed at Kimberly Lake, Bathing Beauty Pond and Bear, Moose, and Polaris Lakes Catch-and-Release Only: https://www.adfg.alaska.gov (accessed May 8, 2022).

Fairbanks North Star Borough

PFAS source areas in the Fairbanks North Star Borough include eight locations and associated plumes: Eielson Air Force Base, Fairbanks International Airport, the Fairbanks Regional Fire Training Center, North Pole Refinery, Fort Wainwright, Alyeska Pipeline Services' Nordale Storage Yard, and two commercial properties where AFFF was used—Napa Auto Parts and Bloom Enterprises.

Summary of Results

Our sampling analyses revealed total PFAS levels in Anchorage lakes ranging from 10.2 ppt (Sundi Lake) to 674.7 ppt (Lake Spenard/Lake Hood). In the Fairbanks North Star Borough, levels ranged from 2.8 ppt (Ballaine Lake) to 167.7 ppt in Nordale Gravel Pit. The complete set of our results can be found in Table 1.

<u>Highest Levels</u>:

- The water sample taken from Nordale Gravel Pit, North Pole - 167.7 ppt total PFAS.
- The water sample taken from Lake Hood, Anchorage - 674.7 ppt total PFAS.

Anchorage Lakes	
DeLong Lake	22.2 ppt total PFAS
Lake Spenard/Lake Hood	674.7 ppt total PFAS
Little Campbell Lake	13.7 ppt total PFAS
Sand Lake	11.5 ppt total PFAS
Sundi Lake	10.2 ppt total PFAS

Fairbanks North Star Borough	
Airport Lake	179.4 ppt total PFAS (Fairbanks)
Badger Slough	27.8 ppt total PFAS (North Pole)
Ballaine Lake	2.8 ppt total PFAS (Fairbanks)
Bathing Beauty Pond	51.8 ppt total PFAS (North Pole)
Gravel Pit, Van Horn Road	39.9 ppt total PFAS (Fairbanks)
Gravel Pit, 30th Avenue	44.0 ppt total PFAS (Fairbanks)
Nordale Gravel Pit	167.7 ppt total PFAS (North Pole)

Alaska has not established State drinking water guidelines for PFAS at this time and follows the EPA Health Advisory Level (HAL) of 70 ppt for a combination of PFOA and PFOS. There are no enforceable drinking water standards either at the state or federal level. Health effects may occur at levels 700 times lower than the guidance level established by EPA of 70 ppt, at the 0.1-1 ppt level. For surface waters that support aquatic life, it is important to note that water concentrations found in this study can result in the bioaccumulation of PFAS in fish to levels that may be unsafe for consumption.

Methods

Alaska Community Action on Toxics scientific staff and volunteers collected surface water samples using PFAS test kits developed by Cyclopure (www.cyclopure.com), using passive sampling methods with DEXSORB loaded extraction discs in 250 mL collection cups. Sample analyses were performed in the Cyclopure laboratory using Thermo QExactive LC-MS/MS. Measurements were quantified to 1-2 ppt for all PFAS compounds. The laboratory uses isotope dilution methods for the measurement of PFAS on LC-MS/MS, with validated extraction and recovery criteria for 55 PFAS analytes (listed in Table 2). The analysis of drinking water samples is validated to the requirements of EPA Methods 537 and 533, with a limit of quantification of 1-2 parts per trillion (ppt) for all PFAS. The analysis of other matrices including groundwater and surface water follow the criteria of the newly released EPA 1633 draft. All methods follow instrument procedures for internal standardization and calibration certification.

Conclusions and Recommendations

- House Bill (HB) 171 and Senate Bill (SB) 121 would require greater protections for communities by preventing and addressing PFAS contamination. In order prevent further harm to water quality, fish, wildlife, and public health, state legislators should pass HB 171/SB 121 this session. These bills would establish enforceable drinking water standards and phase out the use of PFAS in firefighting foams (AFFF). Safe and effective alternatives are readily available and in use at major airport, military installations, and oil and gas facilities throughout the world. Passing HB 171/SB 121 to address PFAS in Alaska is the right thing to do and the time to do it is now.

- Conduct a comprehensive monitoring program. The State of Alaska must institute a comprehensive monitoring program of all potentially contaminated areas and media to assess the full extent of PFAS contamination in Alaska—this should include soils, ground- and surface waters, drinking water sources, fish and wildlife, traditional foods (including fish, terrestrial and marine mammals), garden produce, and wild plants used for food or medicine. Monitoring should include vulnerable receiving waters, lands, and communities in proximity to military bases, aviation facilities, fire training areas, oil and gas facilities, and mining operations. The State of Alaska and Department of Defense should require analyses of the full panel of PFAS and report these to the public.

- Establish surface water action levels to protect aquatic life and public health. Other states are taking the lead in protecting streams, rivers, wetlands, and lakes by setting enforceable standards to prevent PFAS contamination. For example, Massachusetts set a surface water action level of 23 ppt for five PFAS. PFAS be regulated as a whole class of compounds rather than individually.

- Depending on the outcome of fish testing, additional restrictions on fishing on certain lakes may be needed to protect public health.

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Table 1 – Levels of PFAS in Surface Water Samples—attached as a separate document.

Table 2 – List of PFAS Analytes

Compound	Abbreviation	CAS#	EPA Method 1633
Perfluorobutanoic Acid	PFBA	375-22-4	Y
Perfluoropentanoic Acid	PFPeA	2706-90-3	Y
Perfluorohexanoic Acid	PFHxA	307-24-4	Y
Perfluorohepanoic Acid	PFHpA	375-85-9	Y
Perfluorooctanoic Acid	PFOA	335-67-1	Y
Perfluorononanoic Acid	PFNA	375-95-1	Y
Perfluorodecanoic Acid	PFDA	335-76-2	Y
Perfluoroundecanoic Acid	PFUnA	2058-94-8	Y
Perfluorododecanoic Acid	PFDoA	307-55-1	Y
Perfluorotridecanoic Acid	PFTrDA	72629-94-8	Y
Perfluorotetradecanoic Acid	PFTeA	376-06-7	Y
Perfluoropropane Sulfonic Acid	PFPrS	423-41-6	
Perfluorobutane Sulfonic Acid	PFBS	375-73-5	Y
Perfluoropentane Sulfonic Acid	PFPeS	2706-91-4	Y
Perfluorohexane Sulfonic Acid	PFHxS	355-46-4	Y
Perfluoroheptane Sulfonic Acid	PFHpS	375-92-8	Y
Perfluorooctane Sulfonic Acid	PFOS	1763-23-1	Y
Perfluorononane Sulfonic Acid	PFNS	474511-07-4	Y
Perfluorodecane Sulfonic Acid	PFDS	335-77-3	Y
Perfluorododecane Sulfonic Acid	PFDoS	79780-39-5	Y
4:2 Fluorotelomer Sulfonate	4:2 FTS	414911-30-1	Y
6:2 Fluorotelomer Sulfonate	6:2 FTS	425670-75-3	Y
8:2 Fluorotelomer Sulfonate	8:2 FTS	481071-78-7	Y
10:2 Fluorotelomer Sulfonate	10:2 FTS	120226-60-0	
Perfluorobutane Sulfonamide	FBSA	30334-69-1	
N-Methylperfluorobutanesulfonamide	MeFBSA	68298-12-4	
Perfluorohexane Sulfonamide	FHxSA	41997-13-1	
Perfluorooctane Sulfonamide	PFOSA	754-13-1	Y
Perfluorodecane Sulfonamide	FDSA	N/A	

N-Ethylperfluorooctane-1-Sulfonamide	**NEtFOSA**	**4151-50-2**	**Y**
N-Methylperfluorooctane-1-Sulfonamide	**NMeFOSA**	**31506-32-8**	**Y**
Perfluorooctane Sulfonamido Acetic Acid	**FOSAA**	**2806-24-8**	
N-Ethyl Perfluorooctane Sulfonamido Acetic Acid	**NEtFOSAA**	**2991-50-6**	**Y**
N-Methyl Perfluorooctane Sulfonamido Acetic Acid	**NMeFOSAA**	**2355-31-9**	**Y**
N-Methyl Perfluorooctanesulfonamidoethanol	**NMeFOSE**	**24448-09-7**	**Y**
N-Ethyl Perfluorooctanesulfonamidoethanol	**NEtFOSE**	**1691-99-2**	**Y**
Hexafluoropropylene Oxide Dimer Acid	**HFPO-DA**	**13252-13-6**	**Y**
4,8-Dioxa-3H-Perfluorononanoate	**ADONA**	**919005-14-4**	**Y**
Perfluoro-3-Methoxypropanoic Acid	**PFMPA**	**377-73-1**	**Y**
Perfluoro-3-Methoxybutanoic Acid	**PFMBA**	**863090-89-5**	**Y**
Perfluoro-3,6-Dioxaheptanoic Acid	**NFDHA**	**151722-58-6**	**Y**
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	**9Cl-PF3ONS**	**756426-58-1**	**Y**
11-Chloroeicosafluoro-3-Oxanonane-1-Sulfonic Acid	**11Cl-PF3OUdS**	**763051-92-9**	**Y**
Perfluoro(2-ethoxyethane) Sulfonic Acid	**PFEESA**	**113507-82-7**	**Y**
Perfluoro-4-ethylcyclohexane Sulfonic Acid	**PFECHS**	**646-83-3**	
8-Chlorperfluoro-1-Octanesulfonic Acid	**8Cl-PFOS**	**777011-38-8**	
3-Perfluoropropyl Propanoic Acid	**3:3FTCA**	**356-02-5**	**Y**
2h,2h,3h,3h-Perfluorooctanoic Acid	**5:3FTCA**	**914637-49-3**	**Y**
3-Perfluoroheptyl Propanoic Acid	**7:3FTCA**	**812-70-4**	**Y**
2H-Perfluoro-2-Dodecenoic Acid	**FDUEA**	**70887-94-4**	
2H-Perfluoro-2-Decenoic Acid	**FOUEA**	**70887-84-2**	
Bis(perfluorohexyl)phosphinic Acid	**6:6PFPi**	**40143-77-9**	
(Heptadecafluorooctyl)(tridecafluorohexyl) Phosphinic Acid	**6:8PFPi**	**610800-34-5**	
Bis(perfluorooctyl)phosphinic Acid	**8:8PFPi**	**40143-79-1**	
N-(3-dimethylaminopropan-1-yl) perfluoro-1-hexanesulfonamide	**N-AP-FHxSA**	**50598-28-2**	