



Investigation and Health Risk Screening for Per- and Poly Fluoroalkyl Substances (PFAS) In Surface Water and Shellfish At Former Air Force Base

Northeast Waste Management Officials Association Webinar
Series – PFAS In The Environment

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Presentation Overview

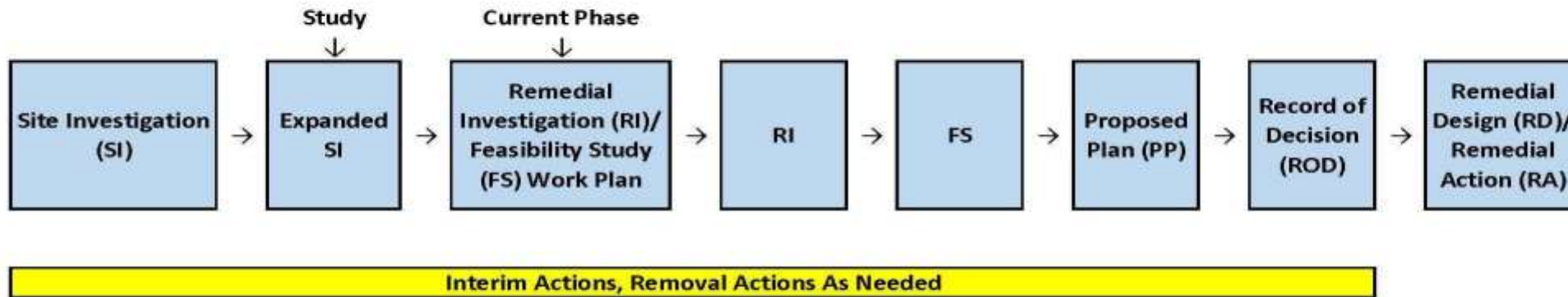
- Introduction
- Project Objectives
- Environmental Setting
- Scope Development
- Field Investigation
- Laboratory Analysis
- Results and Risk Screening
- Conclusions and Path Forward
- Discussion



Introduction

- Former Air Force Base with history of aqueous film-forming foam (AFFF)
- Previous RI/FS traditional contaminants
- Site inspection (SI for PFAS)
- AFFF-related per- and poly-fluorinated alkyl substances (PFAS) identified in soils, groundwater and drinking water sources
- Drinking water mitigation and groundwater remediation for PFAS
- Expanded SI for PFAS - soil, groundwater, surface water, sediment, aquatic biota
- Remedial investigation (RI) for PFAS will be conducted
- Investigation activities performed under contract with United States Air Force.

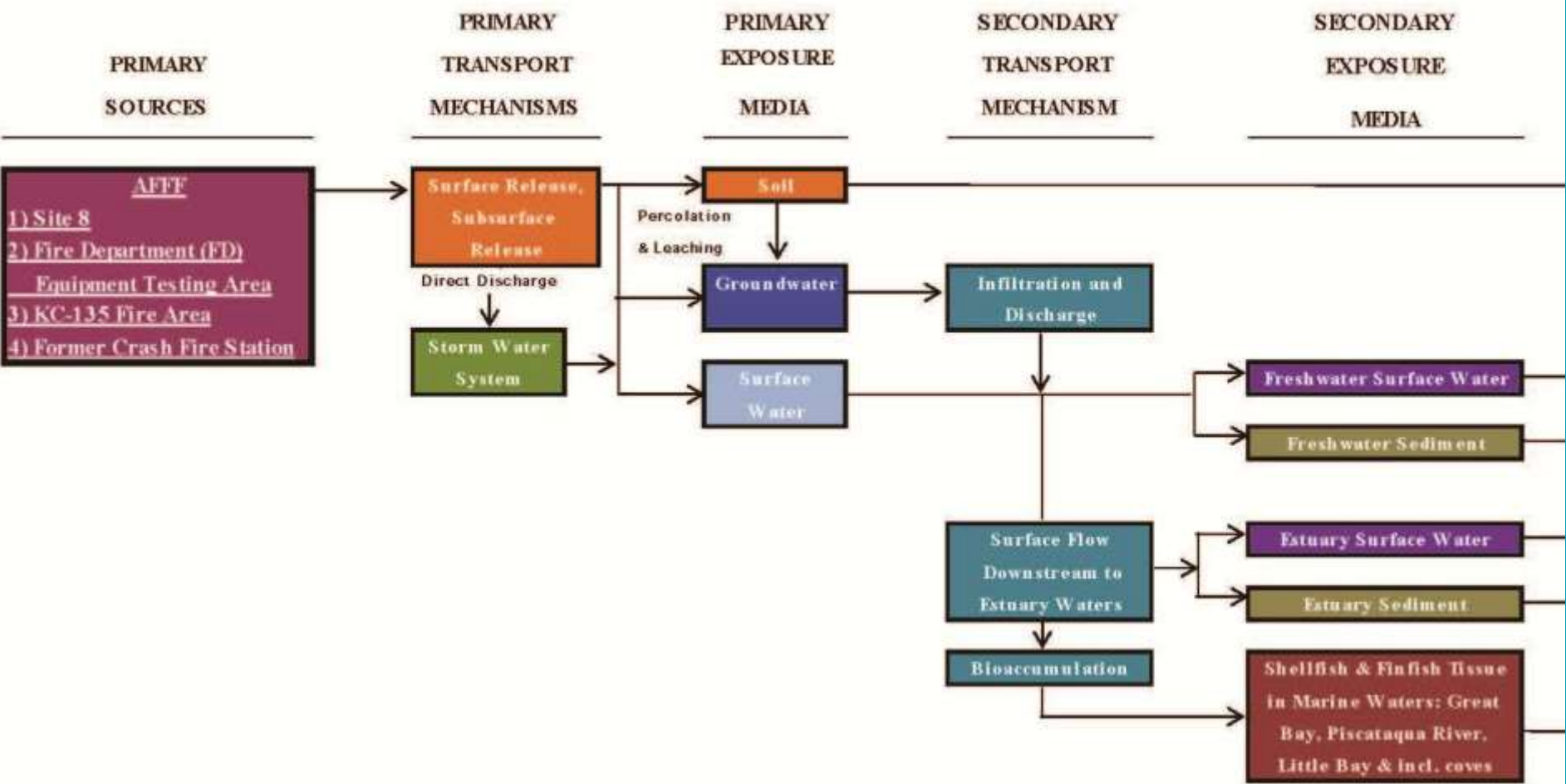
Regulatory Context - CERCLA



Project Objectives -

- Evaluate migration of PFAS from source areas into multiple surface drainage features and receiving water bodies and conduct a screening of potential human exposures and risks
- Part of Expanded SI
 - Surface water, sediment, biota
 - Identify impacted media & nature & extent
 - Identify human activities related to potential exposures
 - Develop physical & human health and ecological risk CSM,
 - Evaluate need for further investigation
 - Inform RI Work Plan development
 - Evaluate need for interim actions

Physical Conceptual Site Model



This preliminary CSM identified the need for an Expanded SI for surface water, sediment, and aquatic biota consumption.



Former Pease
Air Force
Base

Pease
Tradeport

Air National
Guard

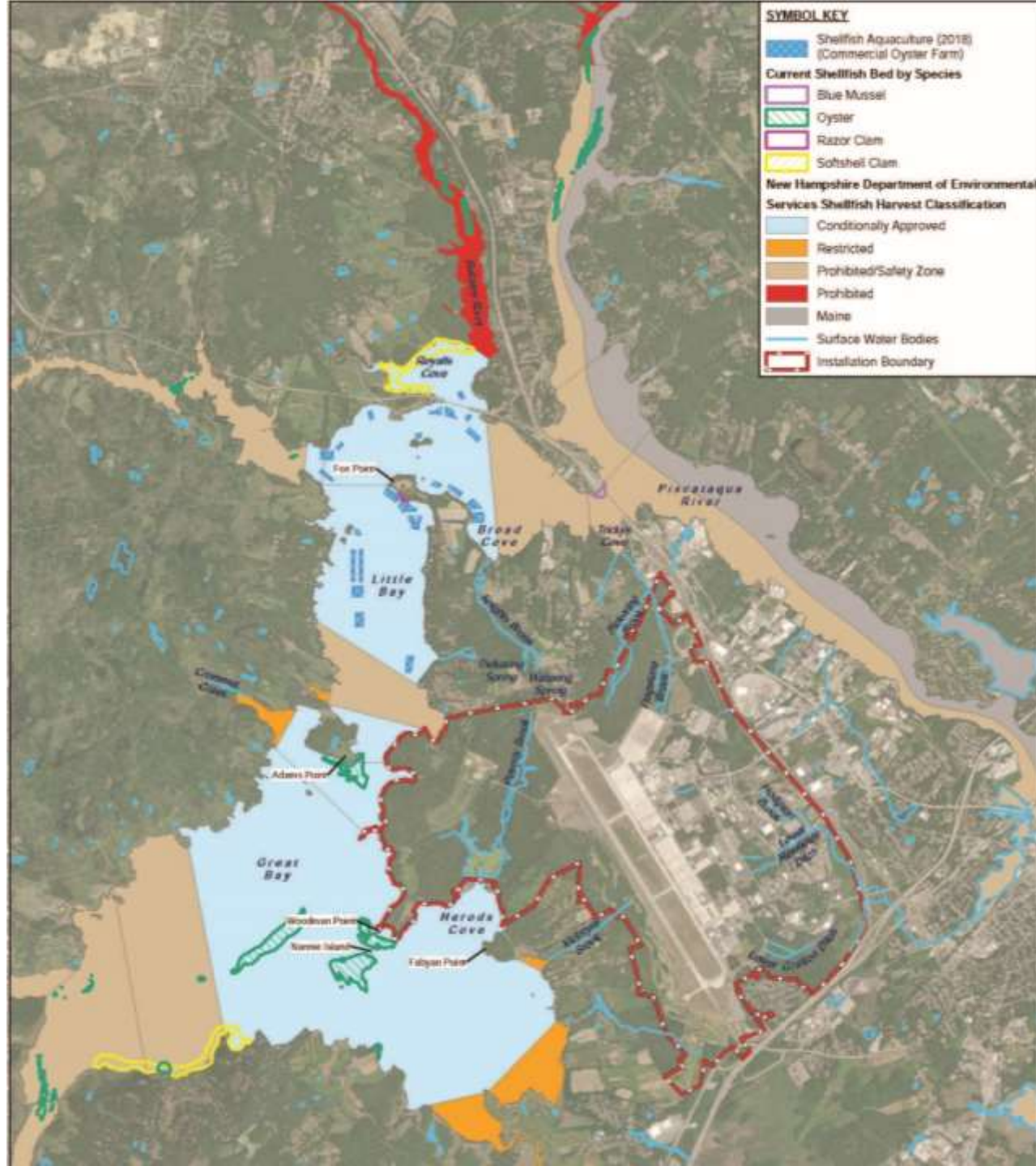
National
Wildlife
Refuge

Site Reconnaissance & Other Research

- Identify drainage areas
- Visit each drainage area, follow the surface water flow
- Opportunities for human exposure
 - Physical – accessibility, depth, width
 - Evidence of fishing, boating, swimming, hunting, gathering
 - Land use – residential, industrial, undeveloped, etc.
- New Hampshire Marine Fisheries and Shellfish Program inquiries
 - Shellfish harvesting areas, shellfish harvesting permits
 - Commercial and recreational fishing Great Bay and Little Bay
- Engage members of Remediation Advisory Board

Knight's Brook Drainage To Broad Cove





Shellfish Harvest Area Classifications



Surface Water Samples

- 26 freshwater
- 11 estuarine

Sediment Samples

- 21 freshwater
- 9 estuarine

Shellfish Samples

- 61 estuarine

Shellfish Samples

- 61 shellfish tissue samples collected
 - 23 softshell clams
 - 15 American oysters
 - 23 Blue mussels
- 5 Target Locations (potential Site impacts)
 - Broad Cove - Mouth of Knights Brook (4 clam, 3 mussel, 3 oyster samples)
 - Trickys Cove - Mouth of Pickering Brook (4 clam, 1 mussel, 2 oyster samples)
 - Herods Cove - Mouth of Peverly Brook (4 mussel, 1 oyster samples)
 - Great Bay - Mouth of McIntyre Brook (2 clam, 3 mussel, 1 oyster samples)
 - Woodman Point (4 clam, 3 mussel, 5 oyster samples)
- 3 Reference Locations
 - Royalls Cove / Bellamy River (4 clam, 3 mussel samples)
 - Little Bay - Mouth of Crommet Creek (1 clam, 3 mussel, 3 oyster samples)
 - Hampton Harbor (4 clam, 3 mussel samples)

Softshell Clams, Blue Mussel, and American Oyster



Laboratory Analysis

Analyte List and Typical Reporting Limits

		15 ppt		0.88 ppb		0.567 ppb	
		Surface Water		Sediment		Shellfish	
Analyte		Reporting Limit	Units	Reporting Limit	Units	Reporting Limit	Units
6:2 Fluorotelomer sulfonate (6:2 FTS)		0.015	µg/L	0.00088	mg/kg	0.0134	mg/kg
8:2 Fluorotelomer sulfonate (8:2 FTS)		0.015	µg/L	0.00088	mg/kg	0.0132	mg/kg
Perfluorobutanesulfonic acid (PFBS)		0.015	µg/L	0.00055	mg/kg	0.000567	mg/kg
Perfluorobutanoic acid (PFBA)		0.015	µg/L	0.00055	mg/kg	0.000567	mg/kg
Perfluoroheptane sulfonate (PFHpS)		0.018	µg/L	0.00088	mg/kg	0.000635	mg/kg
Perfluoroheptanoic acid (PFHpA)		0.015	µg/L	0.00055	mg/kg	0.000567	mg/kg
Perfluorohexanesulfonic acid (PFHxS)		0.015	µg/L	0.0005	mg/kg	0.000567	mg/kg
Perfluorohexanoic acid (PFHxA)		0.01	µg/L	0.00055	mg/kg	0.000567	mg/kg
Perfluorononanoic acid (PFNA)		0.018	µg/L	0.00055	mg/kg	0.000567	mg/kg
Perfluorooctane sulfonamide (PFOSA)		0.01	µg/L	0.0005	mg/kg	0.000567	mg/kg
Perfluorooctanesulfonic acid (PFOS)		0.015	µg/L	0.00088	mg/kg	0.000567	mg/kg
Perfluorooctanoic acid (PFOA)		0.01	µg/L	0.00088	mg/kg	0.000567	mg/kg
Perfluoropentanoic acid (PFPeA)		0.018	µg/L	0.00088	mg/kg	0.000567	mg/kg
Lowest USEPA Screening Level (ppt)		2.03	µg/L	0.609	mg/kg	0.00678	mg/kg

13 compounds that had previously been detected in Site groundwater

Laboratory Analysis

PFAS by LC/MS/MS

- Maxxam Analytics International – surface water and sediment
 - *EPA Method 537 modified*
- Bureau Veritas (BV) – surface water and sediment
- General Engineering Laboratories (GEL) - shellfish
 - BV and GEL, per DoD QSM 5.3 Table B-15, used method
 - *Per- and Polyfluoroalkyl Substances (PFAS) Using Liquid Chromatography Tandem Mass Spectrometry (LC/MS/MS) With Isotope Dilution or Internal Standard Quantification in Matrices Other Than Drinking Water*
 - Department of Defense (DoD)-Environmental Laboratory Accreditation Program (ELAP) accredited laboratories. Compliant with modified EPA Method 537, 537.1 and Method 533

USEPA Health Risk-based Screening Levels

Parameter	USEPA Region 1 Pease-Specific Screening Levels ^a						
	Sediment Child Wading ^b	Surface Water Child Swimming ^c	Surface Water Adult Swimming ^c	Fish Consumption Adult	Fish Consumption Child	Shellfish Consumption Adult	Shellfish Consumption Child
	(mg/kg)	(µg/L)	(µg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
PFBS	609	2030	18300	7.22	5.21	6.78	5.59
PFOA	0.609	2.03	18.3	0.00722	0.00521	0.00678	0.00559
PFOS	0.609	2.03	18.3	0.00722	0.00521	0.00678	0.00559
PFOA / PFOS	0.609	2.03	18.3	0.00722	0.00521	0.00678	0.00559
	ppm	ppb	ppb	ppm	ppm	ppm	ppm

Notes:

^aUSEPA Region 1 PFAS Surface Water, Sediment, Soil, and Fish and Shellfish Consumption Screening Levels calculated using USEPA Regional Screening Level calculator. Screening Levels are set at hazard quotient of 0.1. Values were provided in: Re: Remedial Investigations of Perfluorinated Compounds under the Pease Air Force Base Federal Facility Agreement. 7 November 2017 (USEPA, 2017). USEPA provided values for "PFOA/PFOS", which have been interpreted as screening values for the individual compounds.

^bValue based on ingestion and dermal contact.

^cValue based on ingestion.

For perspective USEPA, 2016. Drinking Water Health Advisories for PFOA and PFOS are 0.07 ug/L and the USEPA Tapwater RSL for PFBS is 40 ug/L.

µg/L = micrograms per liter

mg/kg = milligrams per kilogram

USEPA = United States Environmental Protection Agency

New Hampshire DES Health Risk Screening Levels

Parameter	NHDES Screening Levels ^a						
	Sediment Child Wading ^b	Surface Water Child Swimming ^c	Surface Water Adult Swimming ^c	Fish Consumption Adult	Fish Consumption Child	Shellfish Consumption Adult	Shellfish Consumption Child
	(mg/kg)	(µg/L)	(µg/L)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
PFBS	305	1,014	9,131	3.61	2.61	3.39	2.79
PFOA	0.18587	0.618	5.57	0.00220	0.00159	0.00207	0.00170
PFOS	0.09141	0.304	2.74	0.00108	0.00078	0.00102	0.00084
PFHxS	0.12188	0.406	3.66	0.00144	0.00104	0.00136	0.00112
PFNA	0.13103	0.436	3.93	0.00155	0.00112	0.00146	0.00120
	ppm	ppb	ppb	ppm	ppm	ppm	ppm

Notes:

^a NHDES, 2019. Fish, Shellfish, Recreational Swimming and Wading Screening Levels (SLs) for Five Perfluoroalkyl Substances Including: PFOA, PFOS, PFHxS, PFNA and PFBS. These values utilize the same exposure parameter values as USEPA screening levels but utilize NHDES Reference Doses (RfDs).

^b Value based on ingestion and dermal contact.

^c Value based on ingestion.

µg/L = micrograms per liter

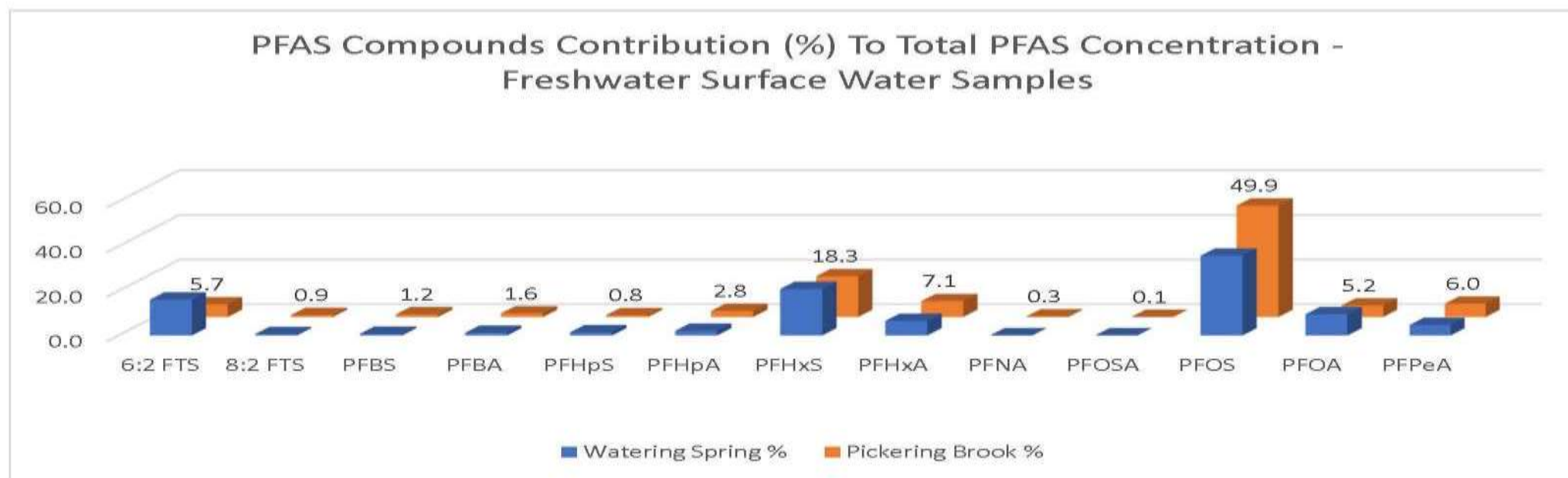
mg/kg = milligrams per kilogram

NHDES = New Hampshire Department of Environmental Services

Investigation Results and Risk Screening

Freshwater Surface Water Summary and Risk Screening Summary

Compound	Child Swimming SL ¹	Adult Swimming SL ¹	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
PFBS	2,030	18,300	µg/L	17/26	0.0061	0.13	None
PFOS	2.03	18.3	µg/L	21/26	0.0072 J	6	5
PFOA	2.03	18.3	µg/L	24/26	0.0037	1.6	None

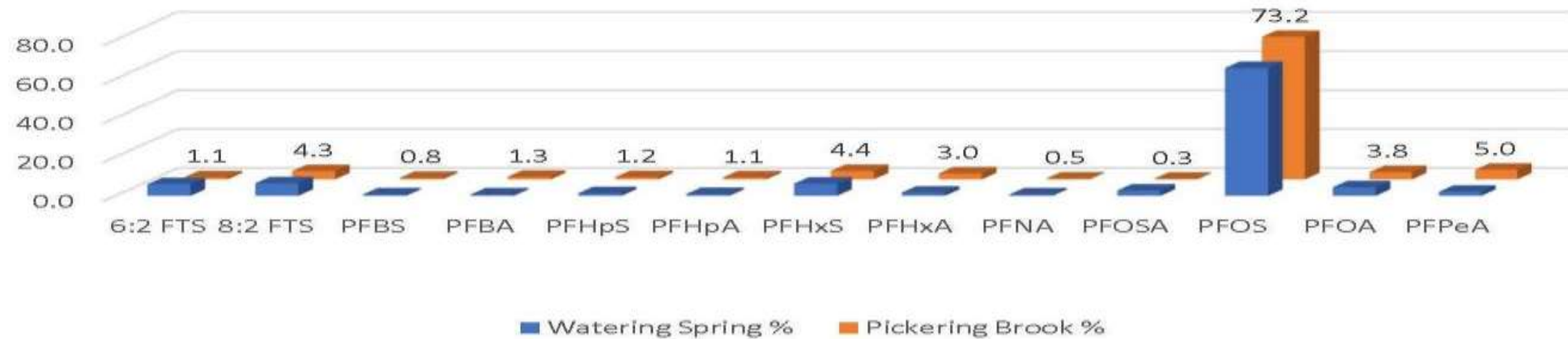


PFOS concentration > Child SL : Pickering Brook, Watering Brook, Flagstone Brook, Paul Brook, and Knight's Brook)

Freshwater Sediment Summary and Risk Screening Summary

Compound	Child Wading Sediment SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
PFBS	609	mg/kg	0/21	-	-	None
PFOS	0.609	mg/kg	13/21	0.00041 B	0.06	None
PFOA	0.609	mg/kg	8/21	0.00036 J	0.0048	None

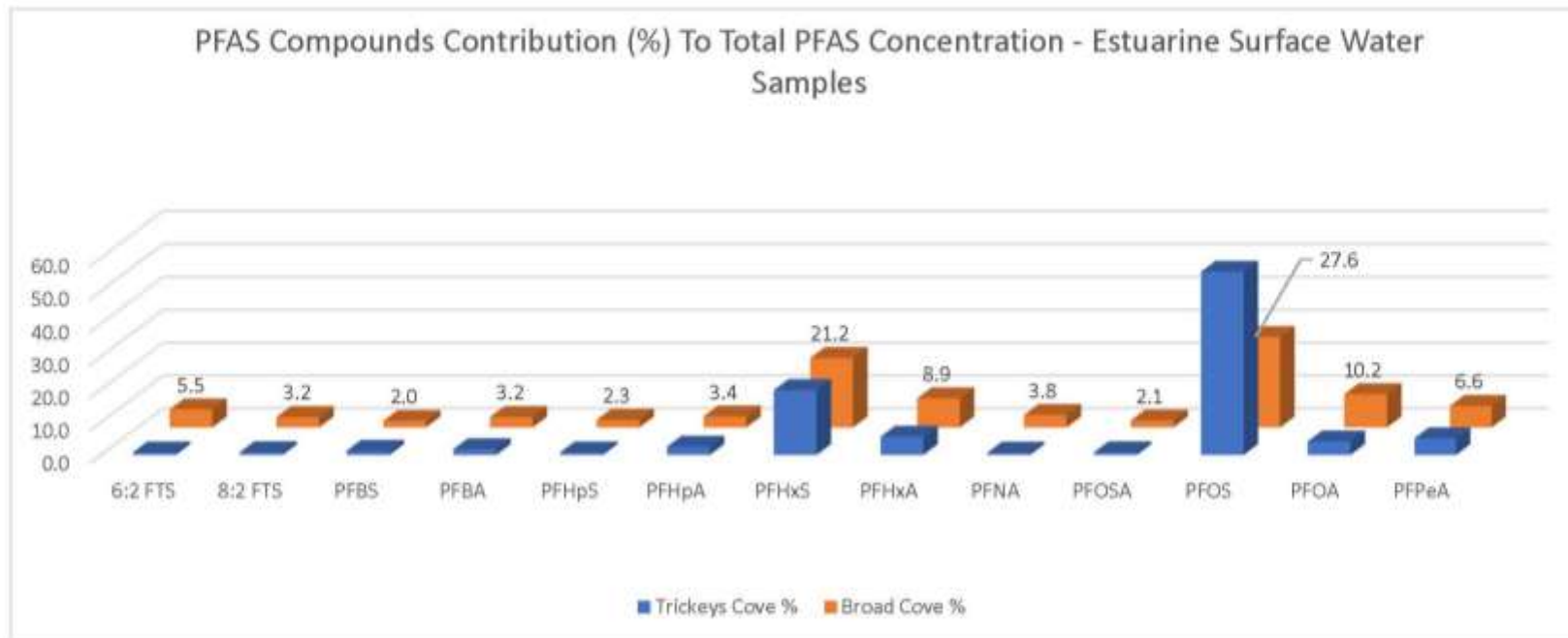
PFAS Compounds Contribution (%) To Total PFAS Concentration - Freshwater Sediment Samples



Pickering Brook, Watering Spring, Pickering Brook/Knights Brook, and Watering Spring/Knights Brook have 6 - 11 compounds detected. Other sample locations have either no detected compounds or one or two detected compounds (most often PFOS, PFOA, or PFHxS).

Estuarine Surface Water Summary and Risk Screening Summary

Analyte	Child Swimming SL	Adult Swimming SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
Perfluorobutanesulfonic acid (PFBS)	2,030	18,300	µg/L	7/9	0.0094 J	0.027	None
Perfluorooctanesulfonic acid (PFOS)	2.03	18.3	µg/L	9/9	0.026	1.1	None
Perfluorooctanoic acid (PFOA)	2.03	18.3	µg/L	9/9	0.016 J	0.082	None



- Samples from Trickeys Cove and Broad Cove have 11 and 9 PFAS compounds detected.
- Samples from Reference Areas at Mouth of Bellamy River, at Nannie Island, at Hampton Harbor have no PFAS compounds detected. At Reference Area at Mouth of Crommet Creek, only one compound (6:2 FTS) was detected.

Estuarine Sediment Summary and Risk Screening Summary

Compound	Child Wading Sediment SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
6:2 FTS	NA	mg/kg	1/5	0.00073 J	0.00073 J	NA
8:2 FTS	NA	mg/kg	0/5	-	-	NA
PFBS	609	mg/kg	0/5	-	-	None
PFBA	NA	mg/kg	0/5	-	-	NA
PFHpS	NA	mg/kg	0/5	-	-	NA
PFHpA	NA	mg/kg	0/5	-	-	NA
PFHxS	NA	mg/kg	0/5	-	-	NA
PFHxA	NA	mg/kg	0/5	-	-	NA
PFNA	NA	mg/kg	0/5	-	-	NA
PFOSA	NA	mg/kg	0/5	-	-	NA
PFOS	0.609	mg/kg	4/5	0.0022 B	0.008 B	None
PFOA	0.609	mg/kg	3/5	0.0004 J	0.0018 B	None
PFPeA	NA	mg/kg	0/5	-	-	NA

PFOS and PFOA are the only PFAS compounds detected in more than one Site sample

PFOS and PFOA account for nearly 100% of the total detected PFAS concentrations

PFOS and PFOA were also detected in blank samples

No PFAS compounds were detected in the three Reference Area sediment samples

Surface Water and Sediment Conclusions

- Very little evidence of recreational use of freshwater features.
- Concentrations of PFOS, PFOA, and PFBS (where detected) were below surface water screening levels at potential swimming areas and below sediment wading screening levels in all surface water features (freshwater and estuarine) evaluated.

Soft Shell Clam Tissue Data and Risk Screening Summary

Analyte	Shellfish Consumption Child SL	Shellfish Consumption Adult SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
Target Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/14	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/14	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/14	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	6/14	0.000311 J	0.000471 J	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/14	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/14	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	10/14	0.000659 J	0.00284	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/14	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	14/14	0.00125	0.0118	-
Reference Area Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/9	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/9	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/9	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	0/9	-	-	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/9	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/9	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	0/9	-	-	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/9	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	14/14	0.000421 J	0.0123	-

Blue Mussel Tissue Data and Risk Screening Summary

Analyte	Shellfish Consumption Child SL	Shellfish Consumption Adult SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
Target Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/14	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/14	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/14	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	11/14	0.000381 J	0.00273	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/14	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/14	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	0/14	-	-	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	9/14	0.000391 J	0.00165 J	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/14	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	14/14	0.00175 J	0.00861 J	-
Reference Area Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/9	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/9	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/9	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	5/9	0.000445 J	0.000992	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/9	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/9	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/9	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	3/9	0.000304 J	0.000337 J	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	0/9	-	-	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/9	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	14/14	0.00157	0.00964	-

American Oyster Tissue Data and Risk Screening Summary

Analyte	Shellfish Consumption Child SL	Shellfish Consumption Adult SL	Units	Frequency of Detection	Minimum Detection	Maximum Detection	Number of Detects > Child SL
Target Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/12	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/12	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/12	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	0/12	-	-	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/12	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/12	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/12	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/12	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/12	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	9/12	0.000337 J	0.00129	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	6/12	0.000315 J	0.00162 J	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/12	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	12/12	0.017	0.083	-
Reference Area Sample Locations							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	mg/kg	0/3	-	-	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	NA	mg/kg	0/3	-	-	-
Perfluorobutanesulfonic acid (PFBS)	5.59	6.78	mg/kg	0/3	-	-	None
Perfluorobutanoic acid (PFBA)	NA	NA	mg/kg	0/3	-	-	-
Perfluoroheptane sulfonate (PFHpS)	NA	NA	mg/kg	0/3	-	-	-
Perfluoroheptanoic acid (PFHpA)	NA	NA	mg/kg	0/3	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	NA	NA	mg/kg	0/3	-	-	-
Perfluorohexanoic acid (PFHxA)	NA	NA	mg/kg	0/3	-	-	-
Perfluorononanoic acid (PFNA)	NA	NA	mg/kg	0/3	-	-	-
Perfluorooctane sulfonamide (PFOSA)	NA	NA	mg/kg	3/3	0.00138	0.00201	-
Perfluorooctanesulfonic acid (PFOS)	0.00559	0.00678	mg/kg	0/3	-	-	None
Perfluorooctanoic acid (PFOA)	0.00559	0.00678	mg/kg	0/3	-	-	None
Perfluoropentanoic acid (PFPeA)	NA	NA	mg/kg	3/3	0.0135	0.0235 J	-

Shellfish Data Observations & Conclusions

- Among all shellfish samples, only four PFAS compounds were detected
 - PFBA, PFOSA, PFOS, and PFPeA
- For target areas:
 - PFOS frequently detected (all 3 species) and all detected concentrations were below Shellfish Consumption Screening Levels
 - PFOA and PFBS were not detected in any samples
 - PFBA detected frequently in clams and mussels, but not detected in oysters
 - PFPeA was detected in all shellfish samples, concentrations typically higher than those of PFBA, PFOS, and PFOA
- For Reference Areas:
 - PFOS, PFOA, and PFBS were not detected in any shellfish samples

Conclusions and Path Forward

- **Freshwater surface water and sediment data indicate minimal health risks for PFOS, PFOA, and PFBS for current recreational exposure pathways (wading and swimming).**
- **Consumption of freshwater finfish from identified Site-related drainage features is unlikely.**
- **Low concentrations of PFOS relative to screening levels and absence of PFOA and PFBS in shellfish collected from the mouths of drainage features indicates minimal risk from shellfish harvesters.**
- **The primary sport fish in Great Bay and Little Bay is the migratory striped bass, with limited residence time in the area and limited time for uptake of PFOS, PFOA, and PFBS.**
- **Additional investigation of direct human exposures to PFOS, PFOA, and PFBS in freshwater and estuarine surface water and sediment or associated with consumption of freshwater or estuarine shellfish and finfish is not planned. Data gaps are currently being evaluated and the RI Work Plan is in progress.**

Additional Path Forward Comments

- Additional potential human exposure pathways (indirect exposures) for PFOS, PFOA, and PFBS have been considered in the expanded SI and the development of the RI Work Plan as shown below.
 - Consumption of wild game that drink surface water.
 - Consumption of backyard produce (fruits and vegetables and animal products (meat, eggs, dairy) irrigated with or fed surface water.

Acknowledgements

- A large number of people contributed to this investigation and risk screening including folks from:
 - United States Air Force
 - Wood Offices in Maine and Massachusetts
 - Maxxam, BV, and GEL laboratories
 - USEPA New England
 - New Hampshire Department of Environmental Services
 - New Hampshire Division of Marine Fisheries
 - New Hampshire Shellfish Program
 - Members of the Pease Restoration Advisory Board
 - Representatives of the Pease Tradeport
 - Citizens of Newington and Portsmouth, New Hampshire

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Discussion

Question Session

- Were the concentrations of PFAS compounds consistent among the three shellfish species?
- Concentrations are reasonably consistent. An example of data for one shellfish sampling area is provided below.

Shellfish PFAS Concentrations from Broad Cove - Mouth of Knights Brook
 For Comparison of Concentrations of Each Compound Among the Three Species
 Concentrations shown also in µg/kg to facilitate visual comparisons (eliminate the numerous zeros)
 Only these compounds were detected in any shellfish samples

	SOFT SHELL CLAMS				BLUE MUSSELS			AMERICAN OYSTER		
Sample ID:	401-30022-CL-01_20190821	401-30022-CL-02_2019082	401-30022-CL-03_2019082	401-30022-CL-04_20190821	401-30022-MU-01_20190821	401-30022-MU-02_20190821	401-30022-MU-03_20190821	401-30022-OY-01_2019082	401-30022-OY-02_2019082	401-30022-OY-03_201908
PFBA (mg/kg)	0.000471	0.000323	0.000431	0.000589	0.00111	0.000705	0.00273	0.000589	0.000595	0.000603
PFOSA (mg/kg)	0.000592	0.000587	0.000589	0.000589	0.0006	0.000592	0.000584	0.000589	0.000595	0.000347
PFOS (mg/kg)	0.000788	0.000659	0.00125	0.00106	0.00145	0.00165	0.00122	0.00162	0.000636	0.000976
PFPeA (mg/kg)	0.00963	0.0118	0.00335	0.00686	0.00409	0.00368	0.0063	0.049	0.0177	0.0212

Grayed out values represent reporting limit for non-detects

PFBA (µg/kg)	0.471	0.323	0.431	0.589	1.11	0.705	2.73	0.589	0.595	0.603
PFOSA (µg/kg)	0.592	0.587	0.589	0.589	0.6	0.592	0.584	0.589	0.595	0.347
PFOS (µg/kg)	0.788	0.659	1.25	1.06	1.45	1.65	1.22	1.62	0.636	0.976
PFPeA (µg/kg)	9.63	11.8	3.35	6.86	4.09	3.68	6.3	49	17.7	21.2

Question Session

- **What shellfish consumption rate did USEPA use to derive the Shellfish Consumption Screening Levels?**
- Child: average of 5.6 grams /day which is equivalent to 5.6 ounces per a 28-day month. This is approximately one 5.6-ounce meal per month or two 2.8-ounce meals per month.
- Adult: average of 24.6 grams per day which is equivalent to 24.6 ounces per a 28-day month. This is approximately four 6-ounce meals per month or one 6-ounce meal per week.
- Source: Letter dated November 7, 2017 from USEPA to United States Air Force, Re: *Remedial Investigations of Perfluorinated Compounds under the Pease Air Force Base Federal Facility Agreement*

Question Session

- **Blue Crab are present in an estuary near another Air Force base. Are there blue crab present in the vicinity of this base and if so, should they be sampled?**
- We will look into the presence of blue crab.

wood.