

# ***Air Force Civil Engineer Center***

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## ***USAF Investigation of Non-Fire Training Area AFFF Releases***

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# Perfluorinated Compounds AF-Specific Background

## ■ PFC-based Aqueous Film Forming Foam (AFFF) widely used for fuel fires

- Nearly 1M gallons of PFOS-based AFFF in stock (3M product)
- Used from 1970 to present day for fire fighting training, petroleum fires, and in some hangar fire suppression systems
- Other non-PFOS based formulations also used





# AF PFC Timeline 2009 – Sept 2012

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- **2009** – AF EC Program began data gap investigations following results from Office of the Secretary of Defense's Phase I Impact Assessment which implied AF ERP had largest impact on future programs
- **Feb 2010** – Tyndall AFB Amended RCRA Order required basewide sampling for PFOA and PFOS
- **2012** – AFCEC and DoD began funding remedial technology & research
- **May 2012** – “Do Not Eat” Fish Advisory near former Wurtsmith AFB due to PFCs in fish tissue
- **2012** – AFCEC receives regulatory requests for sampling at bases
- **Sep 2012** – AF PFC Interim Guidance, released by AF Civil Engineer



# AF PFC Guidance - Sep 2012

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- **Air Force Interim Guidance on PFCs provides Installation RPMs and BRAC Environmental Coordinators (BECs) with a response to regulatory requests for PFC sampling**
- **Guidance for initiating AF Enterprise-wide strategy for PFCs**
  - **Preliminary assessment, site inspection, delineation, mitigation**
- **Supporting technical information for analysis and risk assessment**
- ***AFCEC Technical Division to sample non-FTA sites***



# Project Objectives

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- Evaluate potential AFFF releases at non-fire training areas at 10 installations
- Select 4 high probability sites for sampling
- Samples to include surface soil, subsurface soil, groundwater, surface water, sediment
- Analyze samples for presence of PFCs
- Assess potential impact – look for evidence of correlation (site type, frequency, physical features)



# Process

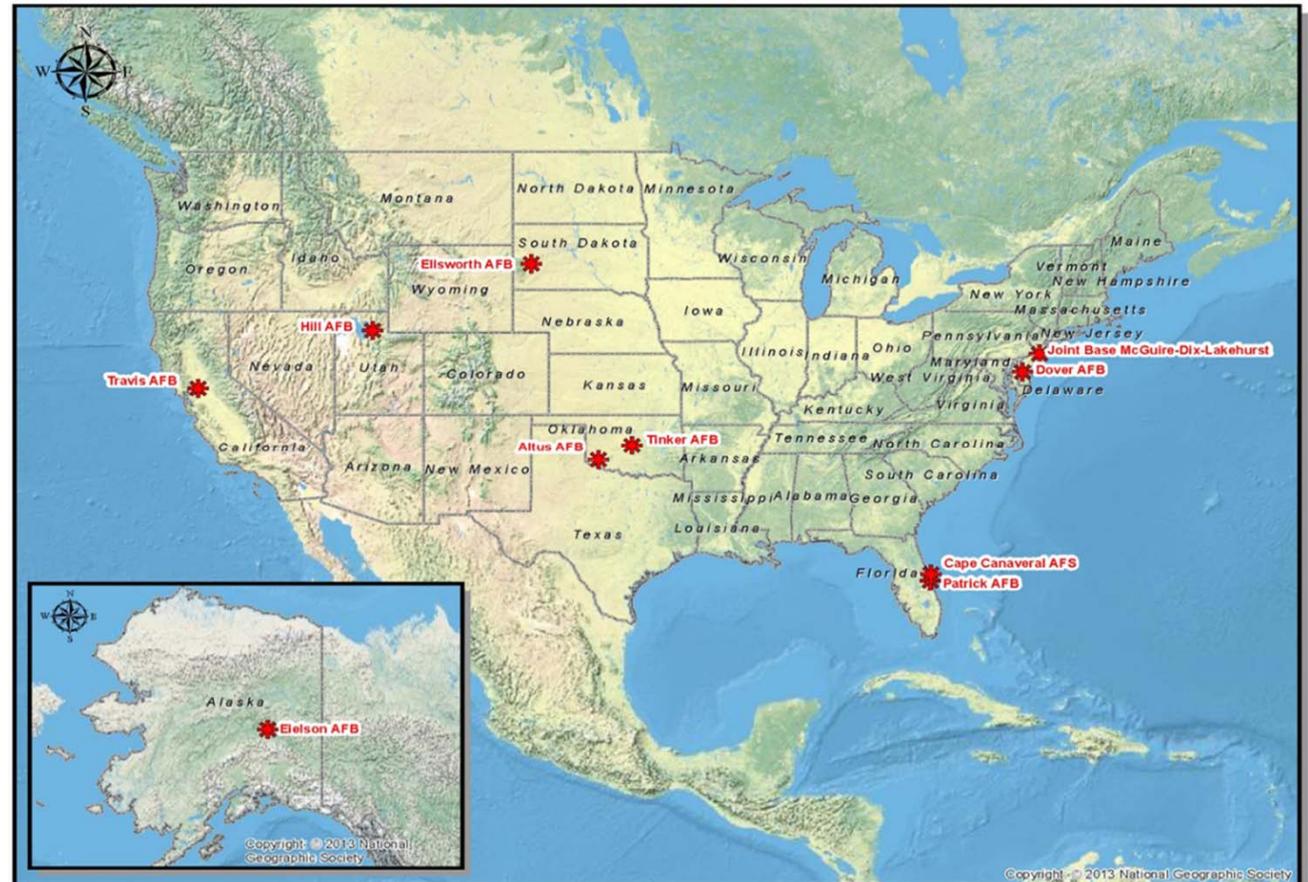
- Installation selection
- Identification of sampling locations
  - Interviews – environmental staff, fire department, hangar/building managers
  - Probable release sites
    - Storage
    - Emergency response
    - Accidental releases
    - Testing and maintenance
    - Waste management





# Installations

- Altus AFB, OK
- Cape Canaveral AFS, FL
- Dover AFB, DE
- Eielson AFB, AK
- Ellsworth AFB, SD
- Hill AFB, UT
- Joint Base McGuire-Dix-Lakehurst, NJ
- Patrick AFB, FL
- Tinker AFB, OK
- Travis AFB, CA





# Site Identification and Sampling

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- Attempted to ID all sites with suspected releases through the interview process
- Selected the 4 sites with highest probability of releases and developed simple CSM
- Developed sampling and analysis plan (UFP QAPP)
  - 4 GW samples (existing wells/temporary borings)
  - 4 soil sample locations
    - Surface soils
    - Subsurface soils at intervals using Geoprobe®
  - Sediment and SW where appropriate



# Total Samples by Media

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■ Groundwater	149 samples
■ Surface soil	102 samples
■ Subsurface soil	111 samples
■ Sediment	43 samples
■ Surface water	32 samples



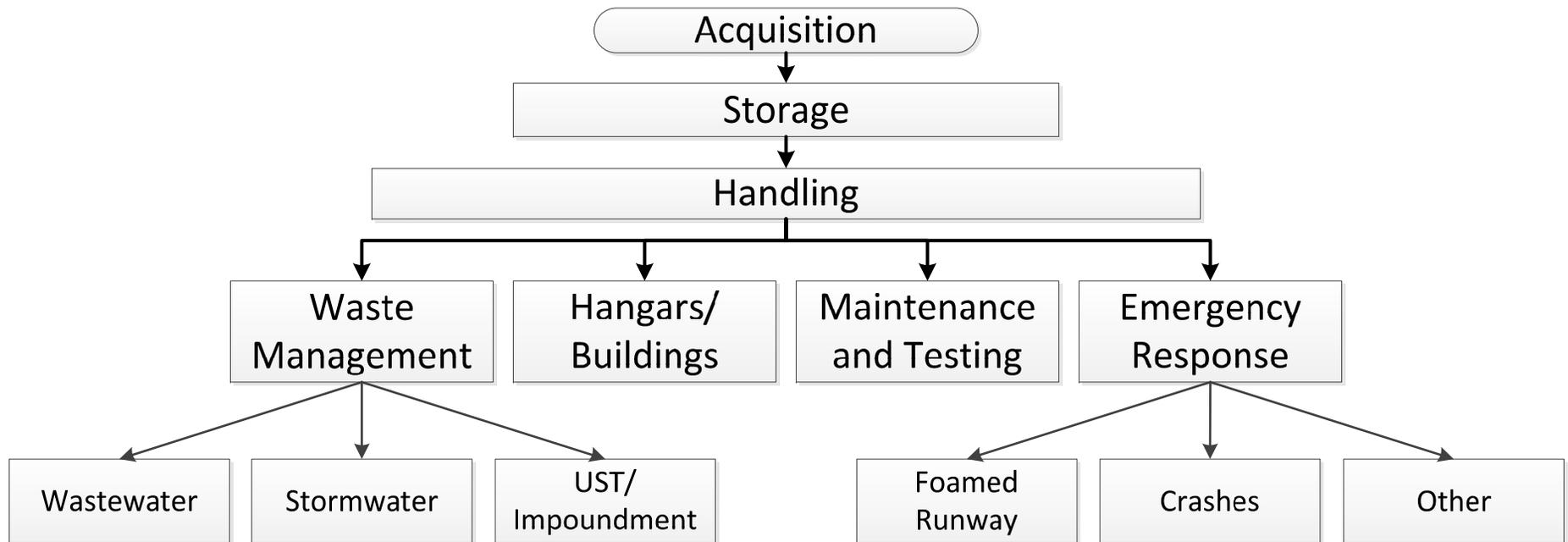
# Release Site Categories

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- **Hangars and buildings**
  - **Fire stations**
  - **Buildings with AFFF fire suppression systems**
- **Testing and maintenance**
  - **AFFF delivery spray tests**
- **Emergency response**
  - **Aircraft/drone/missile crashes**
  - **Vehicular accidents**
- **Waste Management**
  - **Wastewater, storm water, surface water**
  - **Sumps, AFFF ponds, storage tanks**

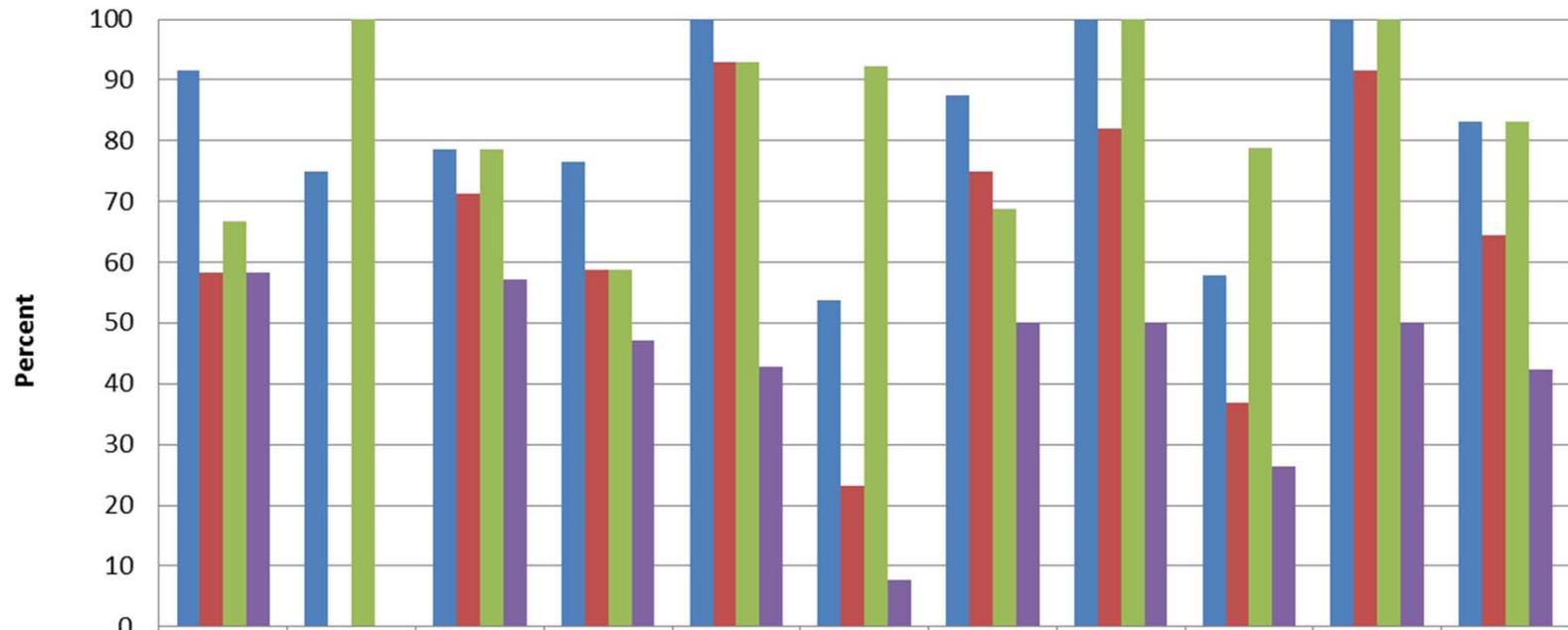


# AFFF Release Model





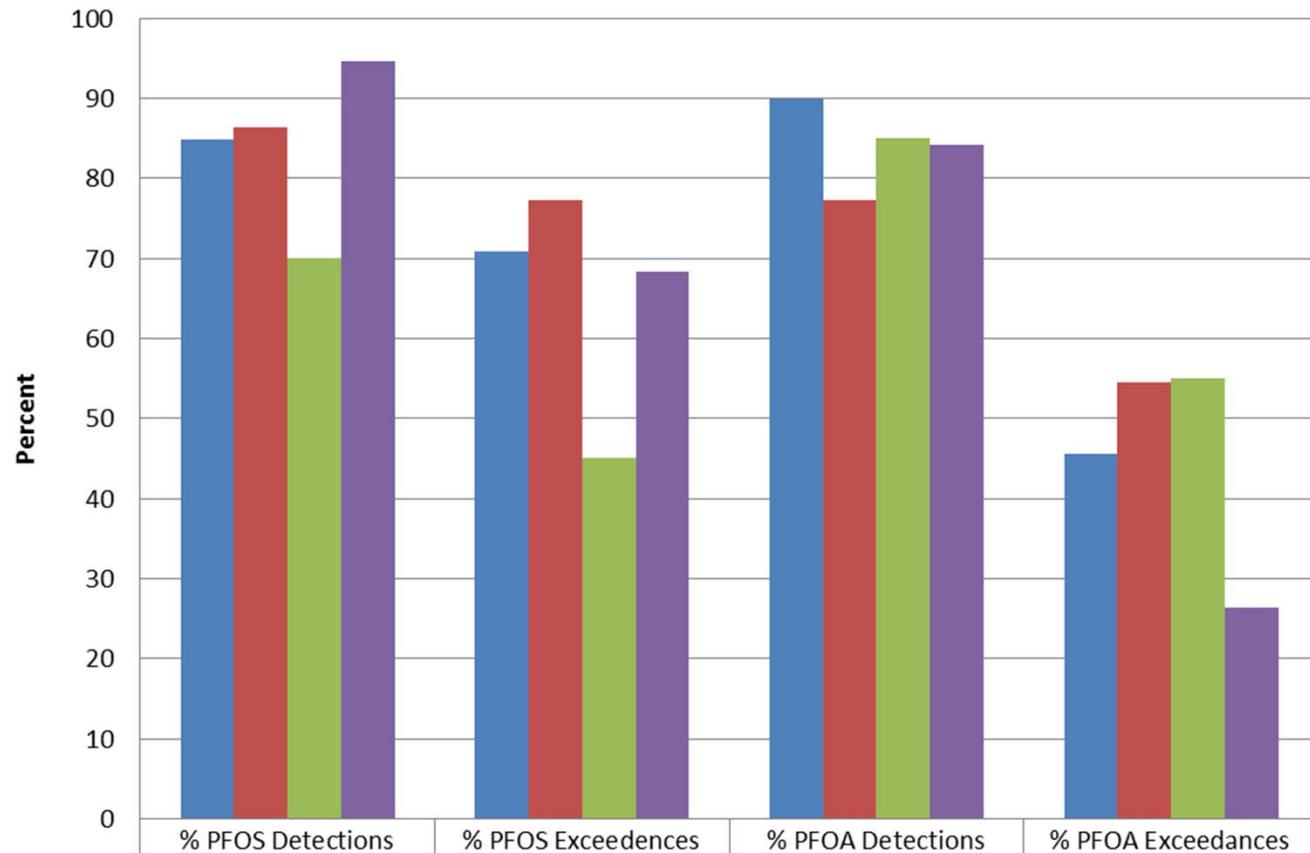
# PFOS and PFOA in Groundwater Detection Frequency by Installation



	Altus AFB, OK	Cape Canaveral AFS, FL	Dover AFB, DE	Eielson AFB, AK	Ellsworth AFB, SD	Hill AFB, UT	Joint Base McGuire-Dix-Lakehurst, NJ	Patrick AFB, FL	Tinker AFB, OK	Travis AFB, CA	TOTALS
■ % PFOS Detections	91.7	75	78.6	76.5	100	53.8	87.5	100	57.9	100	83.2
■ % PFOS Exceedences	58.3	0	71.4	58.8	92.9	23.1	75	82.1	36.8	91.7	64.4
■ % PFOA Detections	66.7	100	78.6	58.8	92.9	92.3	68.8	100	78.9	100	83.2
■ % PFOA Exceedances	58.3	0	57.1	47.1	42.9	7.7	50	50	26.3	50	42.3



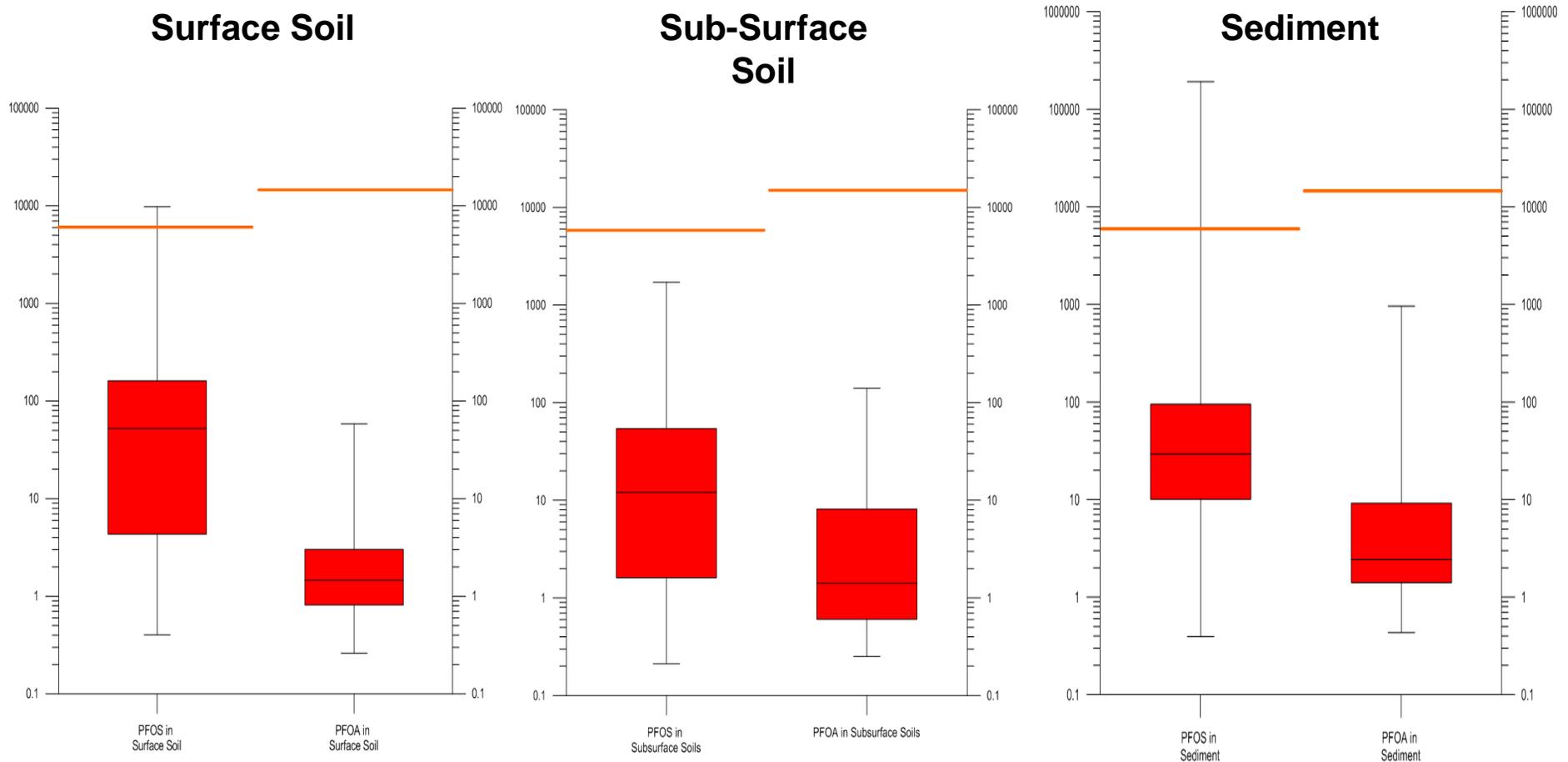
# PFOS and PFOA in Groundwater Detection Frequency by Site Category



■ Hangars and Buildings	84.8	70.9	89.9	45.6
■ Testing and Maintenance	86.4	77.3	77.3	54.5
■ Emergency Response	70	45	85	55
■ Waste Management	94.7	68.4	84.2	26.3



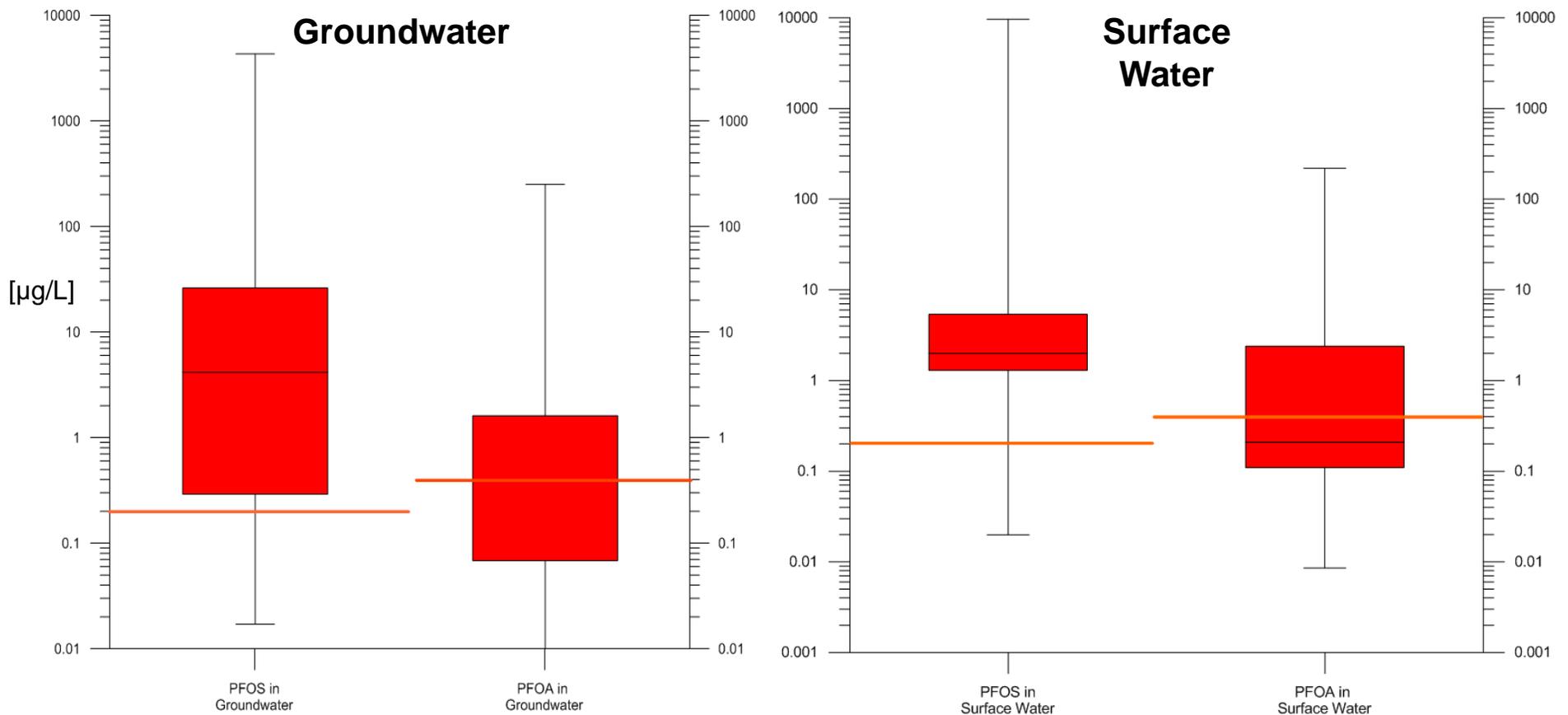
# PFOS and PFOA in Soil and Sediment



- RSSL for PFOS in soil = 6,000 µg/kg
- RSSL for PFOA in soil = 16,000 µg/kg



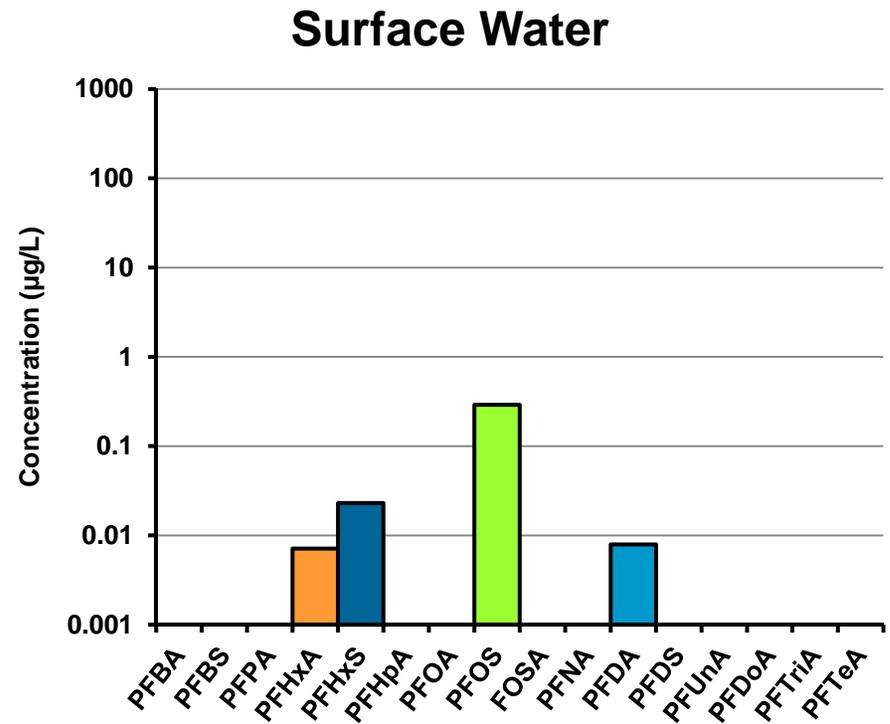
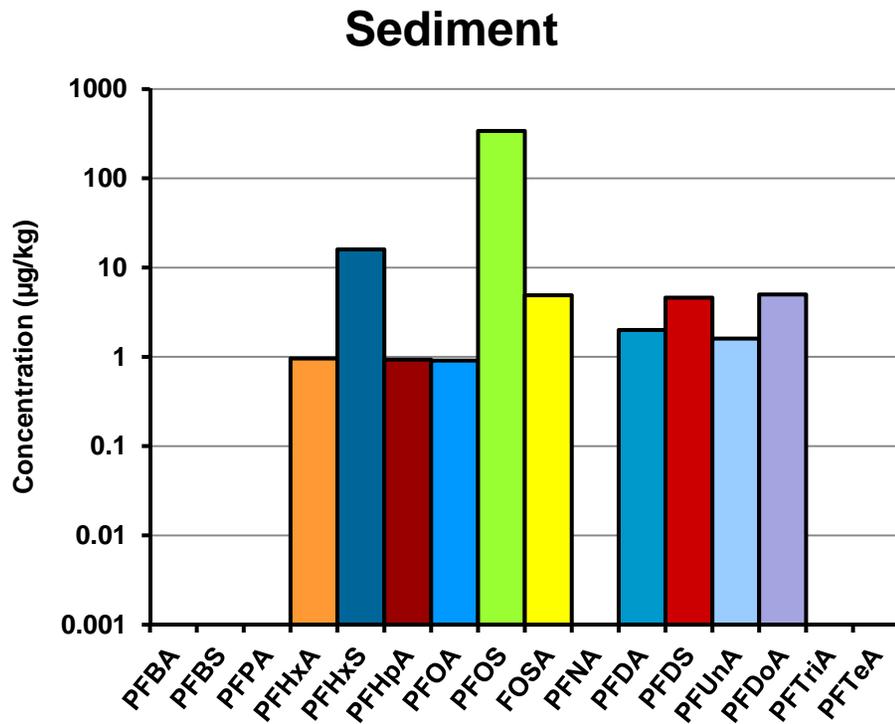
# PFOS and PFOA in Groundwater and Surface Water



- Reference values:
  - Provisional Health Advisory, PFOS = 0.2 µg/L
  - Provisional Health Advisory, PFOA = 0.4 µg/L

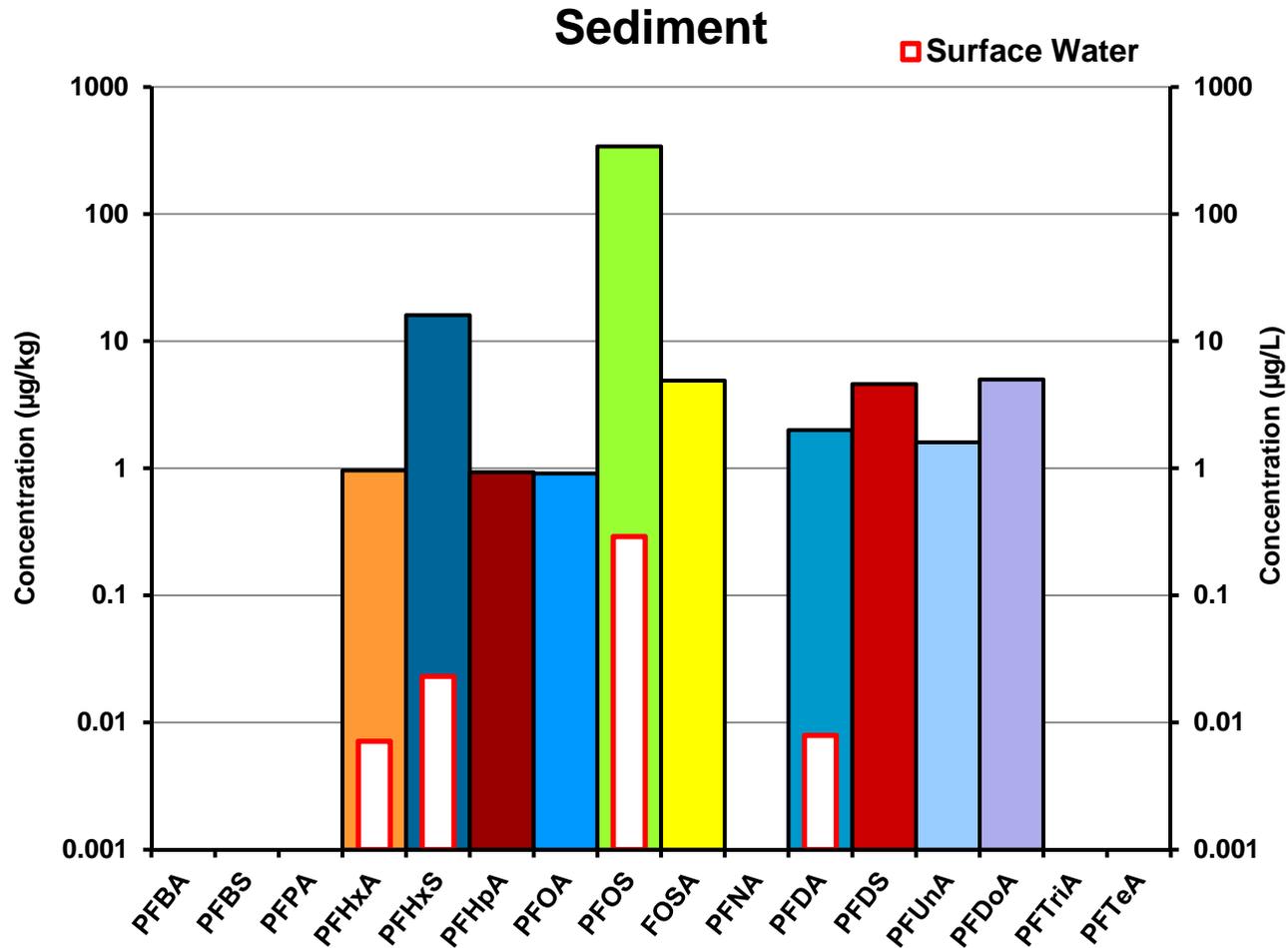


# Co-located Sediment and Surface Water



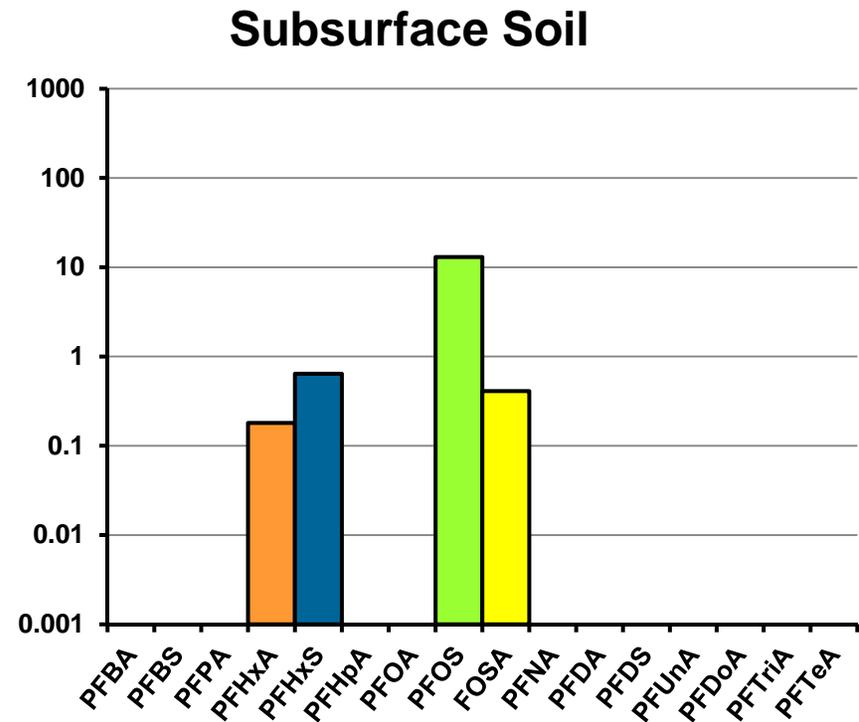
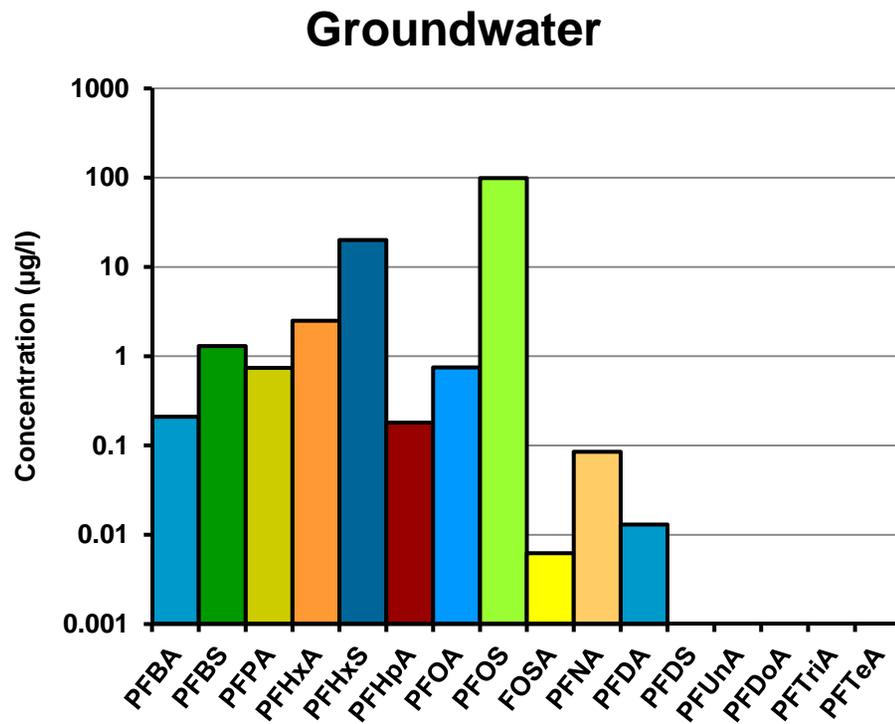


# Co-located Sediment and Surface Water



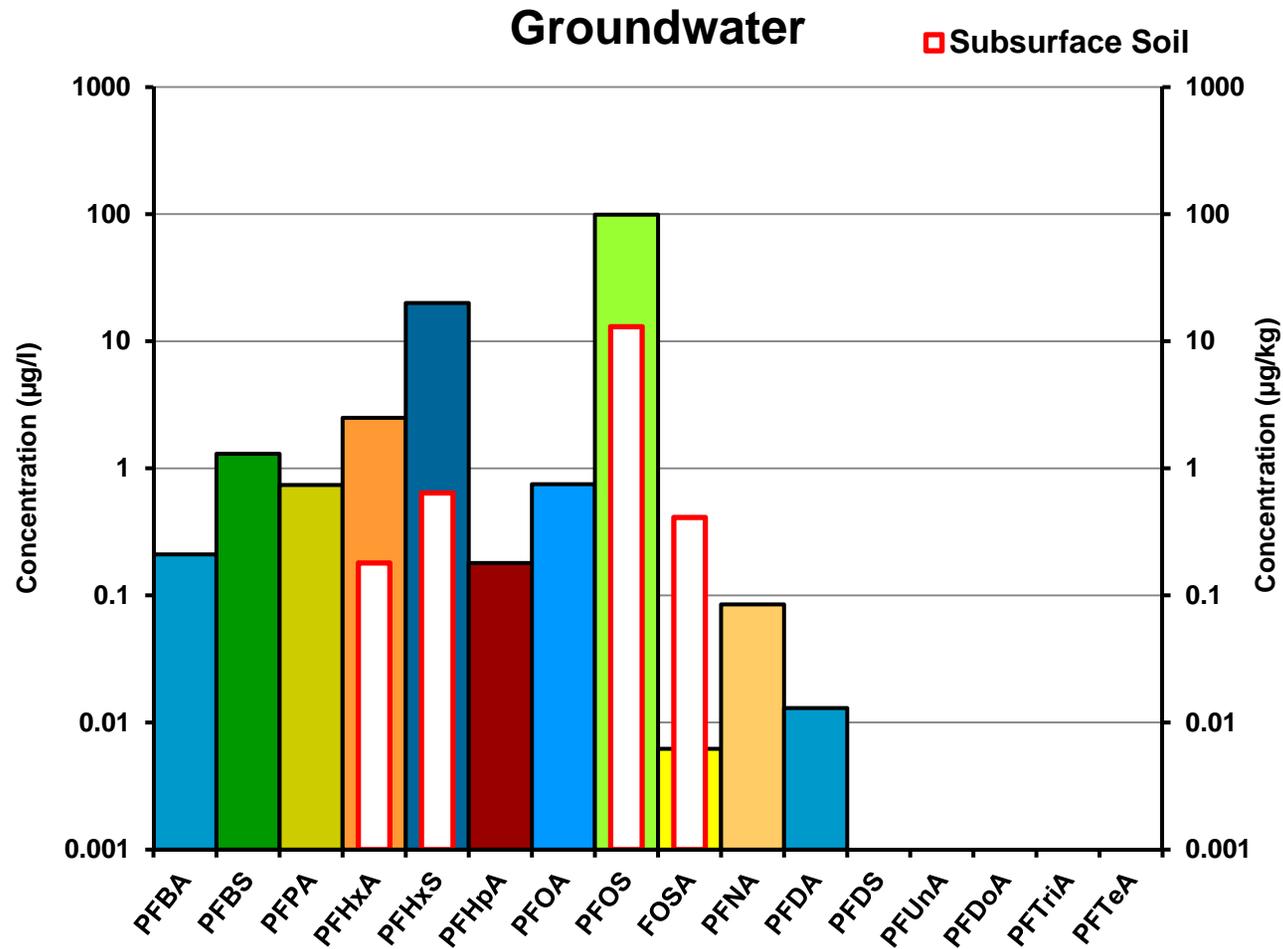


# Groundwater and Subsurface Soil





# Groundwater and Subsurface Soil





# Conclusions: What Did We Learn?

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## General

- Each installation has different infrastructure and processes for management of PFCs
- Factors affecting the environmental distribution of PFCs - Design and construction; Fire department operations/practices/training; Waste handling; Accidental releases
- No clear correlation between release sites and detections

## Data Observations

- At AFFF release sites, PFOS and PFOA detected at relatively high rates (83%)
- PFOS concentrations are higher; more frequently exceed the PHA
- Low concentrations of PFOS and PFOA in soil makes it difficult to identify or predict potential "source" areas
- General differences observed in relative ratios of PFCs in sediment/surface water and soil/groundwater



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# Questions?

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