## October 11, 2022 RISK-BASED ENVIRONMENTAL REAL ESTATE ASSESSMENT OF PFAS





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# WHAT WE WILL BE COVERING **OVERVIEW**

- PFAS increasingly recognized as a potential contamination risk in land transactions
- Wide historical and present use:
  - Detected in water/wastewater& biosolids/rainwater/soil
- Hazardous substance designation under CERCLA on its way (rule drafted)
- Federal and state water regulations/permitting on the rise
- Characterization and remediation challenging, but increasingly commonplace



# **MOUNTING CHALLENGE**

Pragmatic/practical risk interpretation of PFAS analytical data of steadily increasing size and complexity.



...but we are still "PFAS blind."

# ANALOGY

#### **PFAS Acuity, Resolution, Detection** Using USEPA's Regulatory "PFAS Shortlisted Species"



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PFAS	<u>20</u> 200
<b>PFOS</b>	<u>20</u> 100
PFOA	<u>-20</u> 70
PFBS	<u>20</u> 50
PFNA	<u>-20</u> 40
PFHxS	$\frac{20}{30}$ PQ
PFBA	20 25
РГНРА	20 20
H F P O - D A	<u>20</u> 15
РЬСТ	<u>20</u> 13
	<sup>20</sup> / <sub>10</sub> (0
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But wait, there are thousands more PFAS that we do not see (due to current analytical methods limitations)























# COLOR RESOLUTION TEST SHIMARA TEST

## Total Organofluorine (TOF) Method = informative as to the possible presence of PFAS we do not see





#### WHY

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- Environmental Fate:
  - Some PFAS can be persistent, bioaccumulative, and pervasive
- Human Health Risks (per USEPA):
  - Increased blood cholesterol levels
  - Increased liver enzyme levels in the blood
  - Decreased antibody response to vaccines
  - Thyroid hormone regulation/disease risk
  - Decreases in birthweight/fertility
- Wildlife Health Risks:
  - Potential for adverse effects
  - Actual impacts not fully understood



# FOR REAL ESTATE BUT WHY REALLY

- Business Environmental Risks:
  - Property value diminution (actual/perceived)
  - Resale/return on investment
  - Potential cleanup costs (now/future)
  - Toxic torts
  - Increased liabilities/land use limitations
  - Property transferability/financing/insurance
  - Disclosure and securities reporting
  - Looming/uncertain/evolving federal& state regulations of ever-increasing stringency





# **PROBLEM FORMULATION**

Mission: Overcome Business Environmental Risks/Uncertainties with Site-Specific Risk-Based Assessment (beyond ASTM Phase I/II ESAs, little like RBCA, but not a Superfund Risk Assessment)

Formula = Specific Objective(s) + ASTM Phase I/II ESAs + Risk Assessment Toolbox





#### BEGIN WITH THE END IN MIND FIT FOR PURPOSE RISK-BASED PFAS ASSESSMENT (RBPA)

1 Identify& Define Stakeholder Objectives	6 Devise Sampling Design
2 Set Scope Boundaries	7 Outline Data Analysis Approach
<b>3</b> Draft Basic Conceptual Site Model	8 Risk Assessment
4 Settle on Analyte List & Laboratory Method(s)	9 Gap/Uncertainty Analysis
5 Establish Risk Screening Criteria (Tiered)	10 Conclusions& Recommendations

#### BEST OUTCOME ENHANCED SITE-SPECIFICITY

- Stakeholder Directives:
  - "Clear and present danger" screening vs. comprehensive look "under the hood"
  - Desired Land Use
- Scope:
  - Soil& Groundwater (less frequently Biological Materials, Air?)
- Conceptual Site Model:
  - PFAS sources on- and off-site
  - Transport pathways
  - Impacted media



## GEARING UP FOR RBPA DATA USEABILITY

- Settle on Analyte List& Laboratory Method(s):
  - Media-specific
  - Field-screening supplemental data/alternate (e.g., TOF)
  - How many PFAS species to analyze/report (up to ~80 PFAS species available by some commercial laboratories)
- Establish Risk Screening Criteria (Tiered):
  - Tier 1: Federal, State, International PFAS benchmarks
  - Tier 2: Site-Specific Screening Levels
  - Tier 3: Specialized







## GETTING AND PROCESSING PFAS DATA

- Sampling Design:
  - Biased (on-site sources, off-site source trespass points)
  - Local background
  - Multiple sampling locations (3 7)
  - Aerial extent/perimeter probing for PFAS (e.g., TOF)
  - Blanks (trip, field, equipment)
- Data Processing& Analysis:
  - Several issues to look for



#### **BASIC** SITE-SPECIFIC RISK ASSESSMENT

#### Step 1. Initial Screening Risk Assessment Step

- Compare results to available Tier 1 Levels (EPA, States)
- How to address missing PFAS risk-based screening levels:
  - a) Keep it blank but instant data gap/uncertainty
  - b) Multijurisdictional search for alternate values (international benchmarks, CERCLA site documentation)
  - c) Substitution/equivalency/surrogates for individual PFAS species (equipotency assumption)
  - d) Calculate total PFAS (or measure TOF) and compare to screening levels for key indicators (PFOA/PFOS; highly conservative)



## INTERMEDIATE SITE-SPECIFIC RISK ASSESSMENT

#### **Step 2. Refined Data Screening**

- Compare results to calculated, Site-Specific Tier 2 Levels
- Procedures, methodologies, on-line calculators readily available
- Toxicity reference values can be found in accessible databases



## ADVANCED SITE-SPECIFIC RISK ASSESSMENT

#### Step 3. "Higher Grade" Risk Assessment

- Exposure averaging (e.g., 95% Upper Confidence Limit on the average concentration)
- Estimation of single/cumulative risks and comparing them to acceptable risk criteria (hazard quotients/indices)
- Source contribution refinement (soil/water/food intake proportion)
- Development of more realistic, clinical-effect based Tier 3 site-specific cleanup levels
- Multiple lines of evidence (MOE) analysis
- **Exposure routes/pathways assessment**
- Presumptive/actual exposure controls (i.e., land use, restrictive covenants on groundwater access, surface barriers)



## **RESULTS INTERPRETATION**

- Possible Outcomes:
  - PFAS < Tier 1, 2, 3 Levels → No Action (No unacceptable risks anticipated)</li>
  - PFAS ≥ Tier 1, 2 Levels → Additional Evaluation/Risk Assessment (≠ unacceptable risks)
  - PFAS  $\geq$  Tier 3 Levels and/or HQ/HI  $> 3 \rightarrow$  Risk Management
- Gap/Uncertainty Analysis:
  - Information gaps significant enough to preclude decisions on real estate transactions?
  - Residual/unresolved potential liabilities
- Conclusions& Recommendations:
  - Scientific/risk-based basis for real estate transactions





# SUMMARY

- PFAS becoming "standard" analytes/potential risk drivers in real estate ESAs
- Historical and ongoing PFAS use  $\rightarrow$  common in the environment
- Analytical methods increasingly sensitive, with ever growing list of analytes (~80 and counting)
- PFAS detections in soil and groundwater likely (especially parts-per-trillion detection limits)
- Risk-Based Assessment for Real Estate Transactions:
  - Fit-for-purpose and tiered (efficient application of resources)
  - Fairly low-bar to training, use of existing risk tools, execution (especially basic and intermediate assessments)
  - Better alternative to no assessment of PFAS (gap, ballooning liability)
  - A "way out" for "dead-end detections" and conservative screening level exceedances
  - Data gap/uncertainty management
  - Effective in providing actionable, risk science-based information in property transfer decisions





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- Air Toxic Health Risk Assessment



#### ENGINEERING AND SURVEYING

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#### ENVIRONMENTAL

Remediation

Site Characterization

**Risk Management** 

- Solid Waste Management
- Land Reclamation

Chemical Data Evaluation & Analysis Natural Resource Planning & Management Compliance, Permitting & Auditing



#### WATER RESOURCES

Water Resource Planning & Management Water & Wastewater Engineering



#### INFORMATION TECHNOLOGY

Data Management Software Development GIS Design & Analysis



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# MY EXPERIENCE AND EXPERTISE WHAT "I" DO

- Risk-Based Site Assessment/Closure
- Environmental Risk Assessment
- Cleanup Level Development
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- Product Registration/Stewardship

