

# PFAS: AN EMERGING CONTAMINANT LURKING IN THE ENVIRONMENT— AN INTRODUCTION TO PFAS



An informational presentation for the Buzzards Bay Action Committee  
Prepared by BETA Group  
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## BETA GROUP CONTACT INFORMATION

### BETA GROUP INC.

701 George Washington Hwy.  
Lincoln, RI 02865  
(401) 333-2382

### Marylou Armstrong, LSP

Vice President  
[marmstrong@beta-inc.com](mailto:marmstrong@beta-inc.com)

### Mykel Mendes

Environmental Engineer  
[mmendes@beta-inc.com](mailto:mmendes@beta-inc.com)

### Roger Thibault, P.E., LSP

Senior Environmental Engineer  
[rthibault@beta-inc.com](mailto:rthibault@beta-inc.com)

# AGENDA

## 1. INTRODUCTION

## 2. PFAS – WHAT ARE THEY?

- HISTORY and USES
- ENVIRONMENTAL AND HEALTH CONCERNS – “The Forever Chemical”
- ENVIRONMENTAL IMPACTS – FATE AND TRANSPORT
- ASSESSMENT and REMEDIATION

## 4. QUESTION & ANSWER



# PFAS: PER- AND POLY-FLUOROALKYL SUBSTANCES

## What are PFAS?

Poly- and per-fluoroalkylated substances, or PFAS, are a group **man-made chemicals** that have been used in many industrial and consumer products.

Perfluorooctanoic acid (**PFOA**) and perfluorooctane sulfonic acid (**PFOS**) are PFASs.

PFASs are present in **coatings**, rubber and plastics, carpet, apparel, **textiles**, paper, cleaning products, and **fire-fighting foams**.

PFASs are persistent in the environment and in people.

PFASs are recognized as a source of environmental concern in communities throughout the US.

## HISTORY AND USES of PFAS:

- ✖️ PFAS were created “by accident” during development of a refrigerant in the 1930s
  - Commercially produced from 1940-early 2000s by Dupont and 3M
  - Acts as an emulsifier in the creation of other products such as Teflon (PTFE), waterproof clothing, textiles, food surface coatings, surfactants, AFFF, personal care products
- ✖️ PFAS were not widely documented in the environment or of a concern until the early 2000s
  - ✖️ Class-action lawsuit against Dupont, 3M, and Chemours filed in 2001
- ✖️ In 2009 Annex B of the Stockholm Convention includes PFOS
- ✖️ In 2016 USEPA issued a Lifetime Health Advisory for PFOA and PFOS set at 70 ng/L (ppt)

# PFAS: PER- AND POLY-FLUOROALKYL SUBSTANCES

## WHY ARE WE CONCERNED ABOUT PFAS?



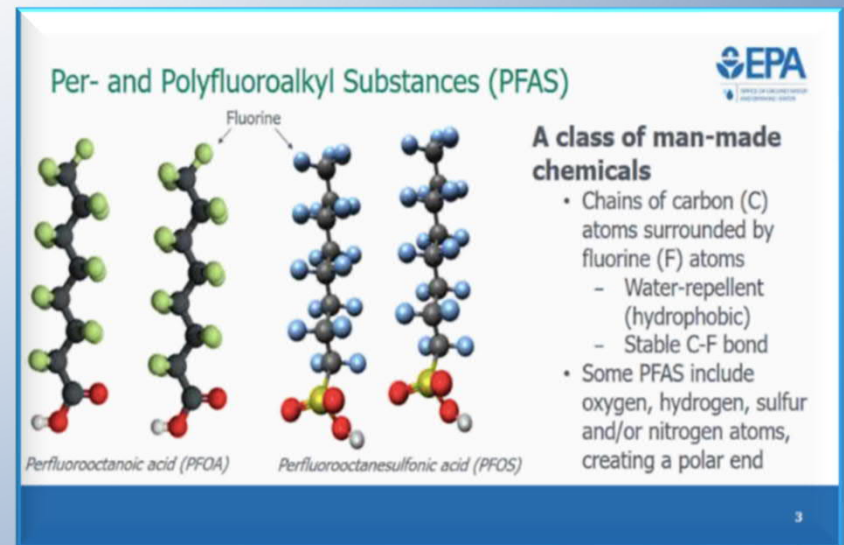
- ✚✚✚✚ EPA has identified the group of PFAS as a contaminants of emerging concern (CECs)  
CEC: chemicals that present known or potentially known negative risks to human health and/or the environment with evolving regulatory clean up standards as a result of new scientific research.
- ✚✚✚✚ Humans can be exposed to PFAS through a variety of pathways – most common/significant is through impacted drinking water
- ✚✚✚✚ Linked to numerous negative health effects including cancer, reproduction, infant growth/development, thyroid function, high cholesterol, Type 2 Diabetes, and immune system disruption







# PFAS: THE FOREVER CHEMICAL PER- AND POLY-FLUOROALKYL SUBSTANCES

- 🧪 A family of more than 3000 man-made complex compounds
  - (6) Massachusetts Regulated PFAS Compounds  
PFOS, PFOA, PFHxS, PFNA, PFHpA, PFDA
  - Regulated compounds selected based on MassDEP ORS toxicity values for longer chain (C6-C10 compounds)
- 🧪 Unique chemical make-up: fully fluorinated (aliphatic) carbon chains
  - Carboxylic Groups
  - Sulfonic Groups
  - Other



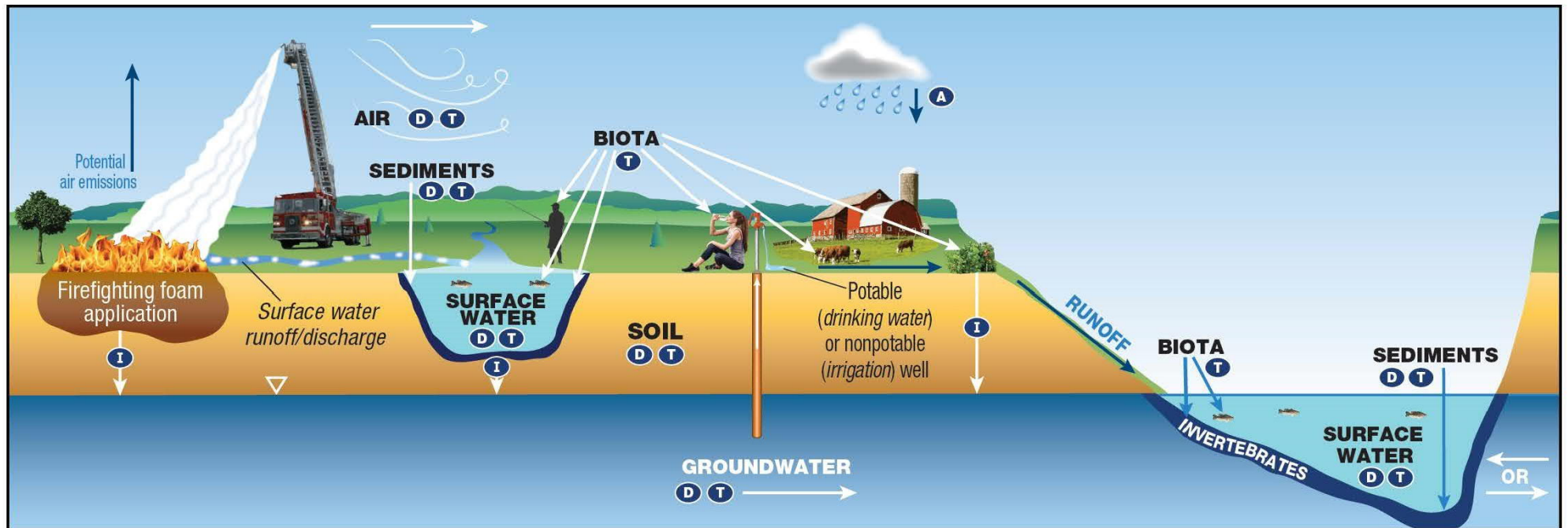
# PFAS: THE FOREVER CHEMICAL PER- AND POLY-FLUOROALKYL SUBSTANCES

-  Unique physical and chemical traits:
- Persistent in the environment – “Forever chemical”
  - Occur in various ionic states
  - Can be water repellent (hydrophobic)
  - Can be oil repellent (hydrophilic)
  - Resistant to extreme temperatures
  - Act as a surfactant – like a soap or oil on surface
  - Bioaccumulators – accumulate in animals and fish

-  PFAS are commonly released into the environment from:
- Use of aqueous firefighting foams (AFFF)
  - Landfill leachate
  - Wastewater treatment plants/biosolids
    - CSOs/SSOs



# PFAS: ENVIRONMENTAL IMPACT PFAS CONTAINING FIRE FIGHTING FOAMS



KEY **A** Atmospheric Deposition **D** Diffusion/Dispersion/Advection **I** Infiltration **T** Transformation of precursors (abiotic/biotic)

Figure 1. Conceptual site model for fire training areas.

Source: Environmental Fate and Transport for PFAS, April 2020, ITRCweb.org





# PFAS: ENVIRONMENTAL IMPACT PFAS MANUFACTURING INDUSTRIAL SITES

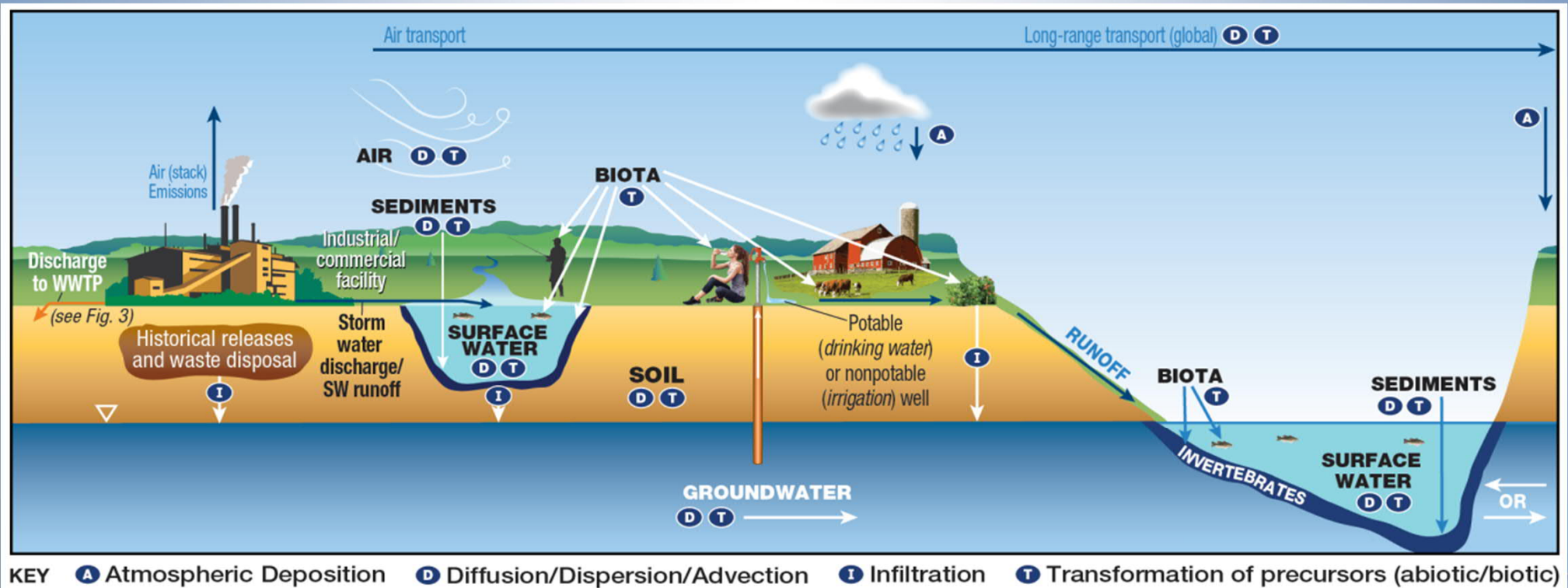


Figure 2. Conceptual site model for industrial sites.

Source: Environmental Fate and Transport for PFAS, April 2020, ITRCweb.org



# PFAS: ENVIRONMENTAL IMPACT

## PFAS IN LANDFILLS, WWTPS, AND SEPTIC SYSTEMS

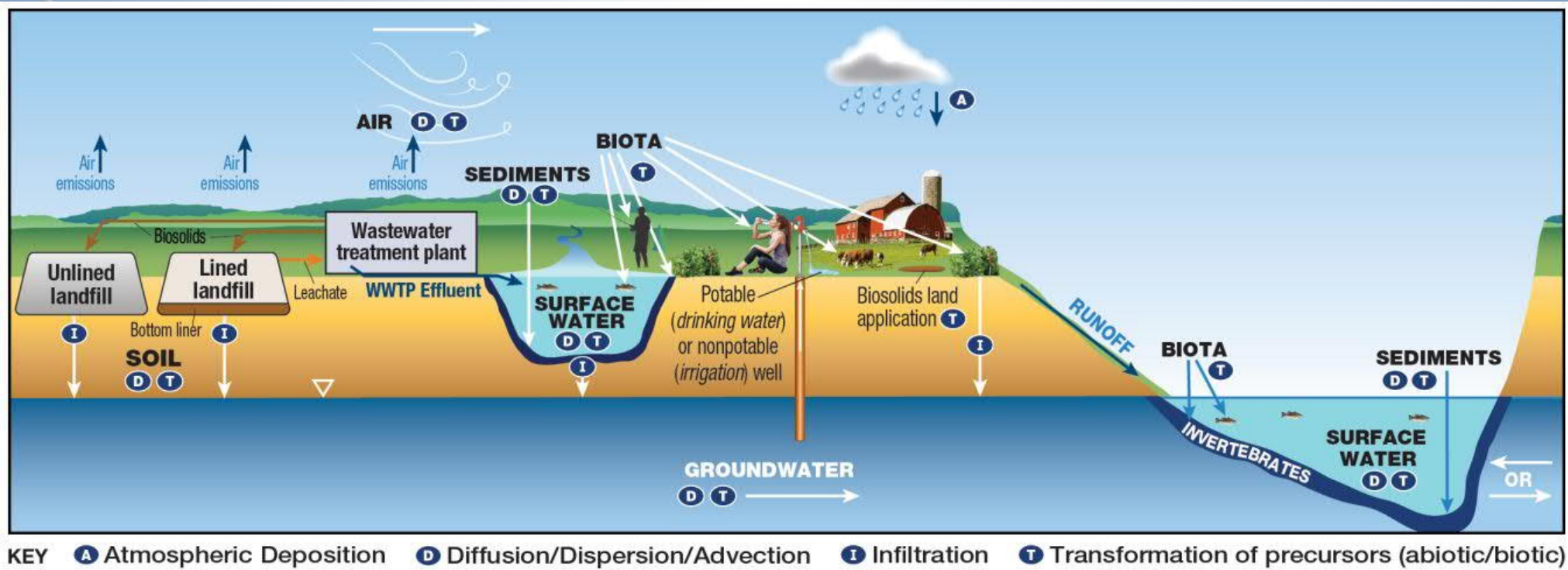


Figure 3. Conceptual site model for landfills and WWTPs.

Source: Environmental Fate and Transport for PFAS, April 2020, ITRCweb.org



# ENVIRONMENTAL REMEDIATION & ASSESSMENT

## WHEN/WHERE TO SAMPLE FOR PFAS?

- After review of case/site –specific information
- After developing a site-specific sampling strategy with an Massachusetts LSP
- Review of the nature of site operations
- Locations near drinking water supply and/or sensitive receptor areas:
  - PFAS manufacturing Facilities
  - Landfills
  - Junkyards
  - DoD sites
  - Airports
  - Fire Training Facilities
  - Crash Sites
  - Metal coating and plating facilities

## CURRENT REGULATIONS

- USEPA – Drinking Water Health Advisory
  - Applies to PFOS & PFOA
  - Effective in July 2016
  - 70 parts per trillion (ppt)
- MassDEP – MCP Soil, Groundwater, & Drinking Water Risk Standards
  - Applies to six (6) regulated PFAS Compounds: PFOA, PFOS, PFNA, PFHpA, PFHxS, PFDA
  - Drafted in April 2019 by the Office of Research and Standards; Effective December 27, 2019
  - Finalization of Drinking Water Maximum Contaminant Limit (MCL) by 2021



# ENVIRONMENTAL REMEDIATION & ASSESSMENT:

## CURRENT REGULATIONS

- USEPA – Drinking Water Health Advisory : PFOS & PFOA

| PFAS Compound | EPA Limit |
|---------------|-----------|
| PFOS          | 70 ppt    |
| PFOA          | 70 ppt    |

MassDEP – MCP Risk Standards:

MA 6 Compounds (PFOA, PFOS, PFNA, PFHpA, PFHxS, PFDA)

- GW-1: Applies to Drinking Water Supply Areas, GW-3 Applies to all Groundwaters in MA State
- Soil Standards in micrograms per kilogram (ppb)

| PFAS Compound | (Draft) MCL | GW-1   | GW-2 | GW-3        | S-1      | S-2      | S-3      |
|---------------|-------------|--------|------|-------------|----------|----------|----------|
| PFOS          | 20 ppt      | 20 ppt | NA   | 5,000 ppt   | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| PFOA          | 20 ppt      | 20 ppt | NA   | 400,000 ppt | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| PFNA          | 20 ppt      | 20 ppt | NA   | 400,000 ppt | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| PFHpA         | 20 ppt      | 20 ppt | NA   | 400,000 ppt | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| PFDA          | 20 ppt      | 20 ppt | NA   | 400,000 ppt | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| PFHxS         | 20 ppt      | 20 ppt | NA   | 5,000 ppt   | 30 µg/kg | 40 µg/kg | 40 µg/kg |
| Σ6-PFAS       | 20 ppt      | 20 ppt | NA   | NA          | 30 µg/kg | 40 µg/kg | 40 µg/kg |



# ENVIRONMENTAL REMEDiation & ASSESSMENT

## Intro to the Regulations:



### Why are regulations important?

- The regulations guide or control what we do at the site,
- The investigation or assessment of the Site, and
- Its cleanup or remediation.

### What is the MCP?

- Mass. Department of Environmental Protection Regulations- Mass. Contingency Plan 310 CMR 40.000

### LSP

- Licensed site professionals (MA)

LSP Program Fact Sheet

<https://www.lspa.org/what-is-an-lsp>

### Regulations and Town By-Laws:

- Wetlands Protection Act
- Clean Water Act

## REFERENCE SOURCES:

- [USEPA -https://www.epa.gov/pfas](https://www.epa.gov/pfas)
- [MassDEP -https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas](https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas)
- [ITRC - https://pfas-1.itrcweb.org/references](https://pfas-1.itrcweb.org/references)

# PFAS: PER- AND POLY-FLUOROALKYL SUBSTANCES

- 2011 CLASS ACTION LAWSUIT AGAINST DUPONT
  - DARK WATERS, 2019
  - THE DEVIL WE KNOW, (DOCUMENTARY) 2018 (NETFLIX)



[Dark Waters Trailer](#)



# PLEASE CONTACT BETA GROUP WITH ANY QUESTIONS

Marylou Armstrong, LSP  
Vice President  
[marmstrong@beta-inc.com](mailto:marmstrong@beta-inc.com)

Roger Thibault, P.E., LSP  
Senior Environmental Engineer  
[rthibault@beta-inc.com](mailto:rthibault@beta-inc.com)

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