Managing PFAS In Landfill Applications

Introductions

David Pannucci

Regional Engineer, Waste Connections
Seneca Falls

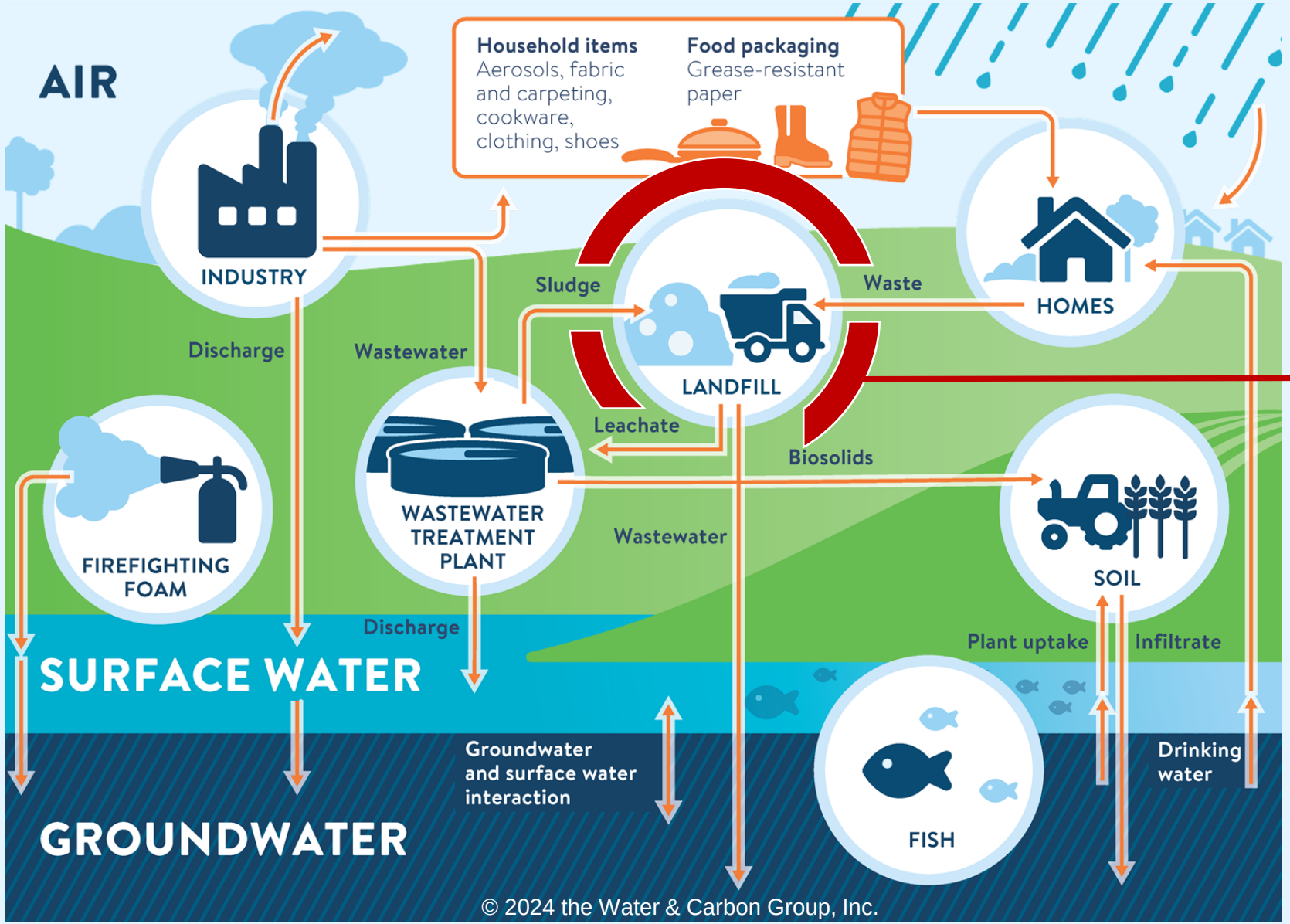
David was raised and currently resides in Seneca Falls and has spent the last 12 years in the solid waste industry, including 8 years at Seneca Meadows Landfill and the last 4 years as a Regional Engineer with Waste Connections overseeing operations in the Northeast including Seneca Meadows Landfill. David holds a Bachelors of Science in Environmental Engineering from Clarkson University.

Nick Ganzon, PE

President, Americas – the Water & Carbon Group
Seneca Falls

Nick is a life-long resident of Seneca Falls and has spent over 32 years in the water industry, including 25 years with ITT Goulds Pumps and 8 years with Watts Water Technologies. Nick holds a Masters of Science in Product Development from Rochester Institute of Technology and a Bachelor of Science in Mechanical Engineering from Worcester Polytechnic Institute

PFAS Fate & Transport | Municipal Landfills

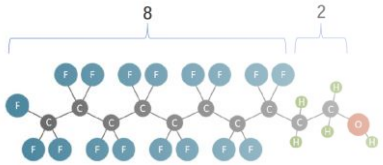


Our Focus Today

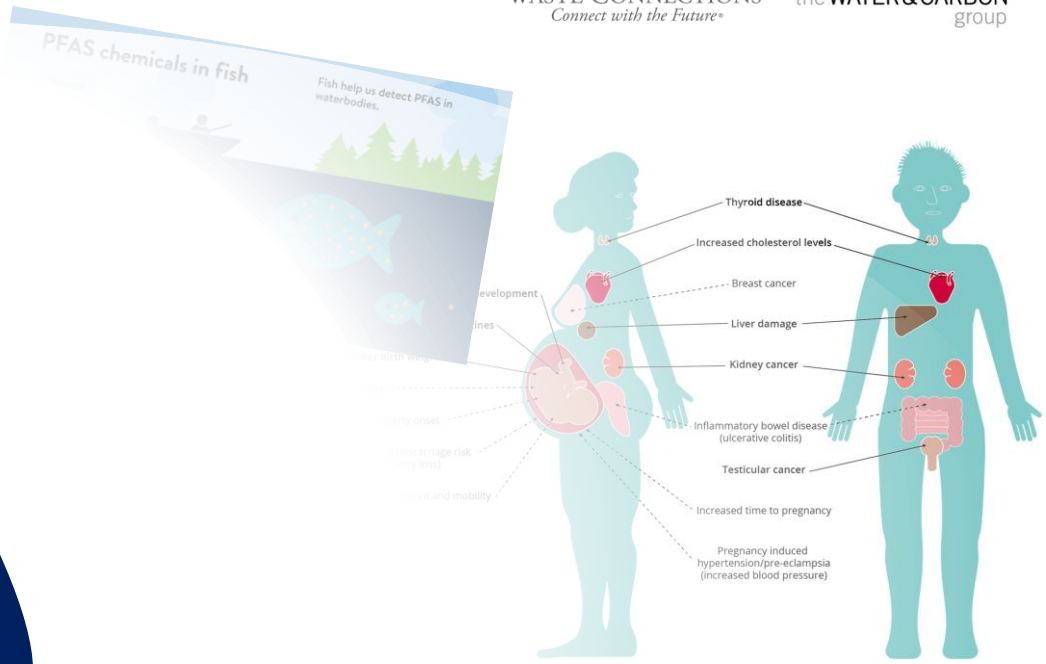
Image Source: University of Nebraska-Lincoln Institute of Agriculture and Natural Resources

Keeping It Simple Today | PFAS Bad >4.0 PPT

Per- and polyfluoroalkyl substances (PFAS[1] or PFASs[2]) are a group of synthetic organofluorine chemical compounds that have multiple fluorine atoms attached to an alkyl chain; there are 7 million such chemicals according to PubChem.[3] PFAS came into use after the invention in 1938 to make fluoropolymer coatings and products that resist stains, grease, and water. They are now used in products such as waterproof fabric such as Nylon, yoga pants, carpets, shampoo, hygiene products, mobile phone screens, wall paint, fuel, food packaging, heat-resistant non-stick cooking surfaces, AstroTurf,[5] firefighting foam, and the insulation of electrical wire. PFAS are also used by the cosmetic industry in most personal care products, including lipstick, eye liner, mascara, foundation, balm, blush, and nail polish.[9][10] - Wikipedia

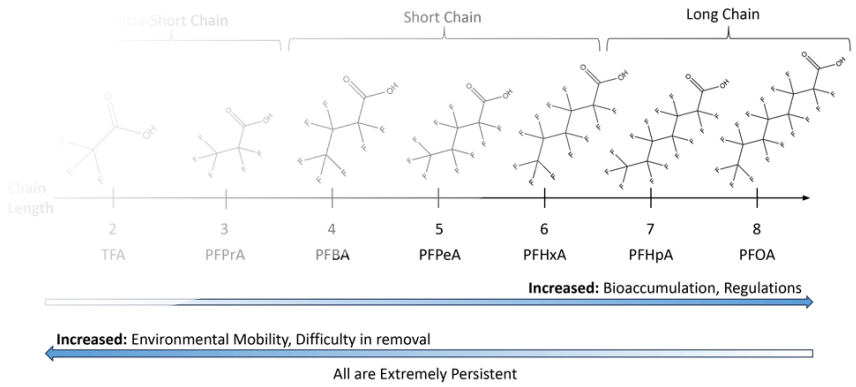


MCL
4
PPT



Chemical	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFNA	10 ppt	10 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX chemicals)	10 ppt	10 ppt
Mixture of two or more: PFNA, PFHxS, HFPO-DA, and PFBS	Hazard Index of 1	Hazard Index of 1

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.



PFAS Fate & Transport | Relative Concentrations

Food Packaging

15,000,000 PPT

Cosmetics / Personal Care

700-900,000 PPT

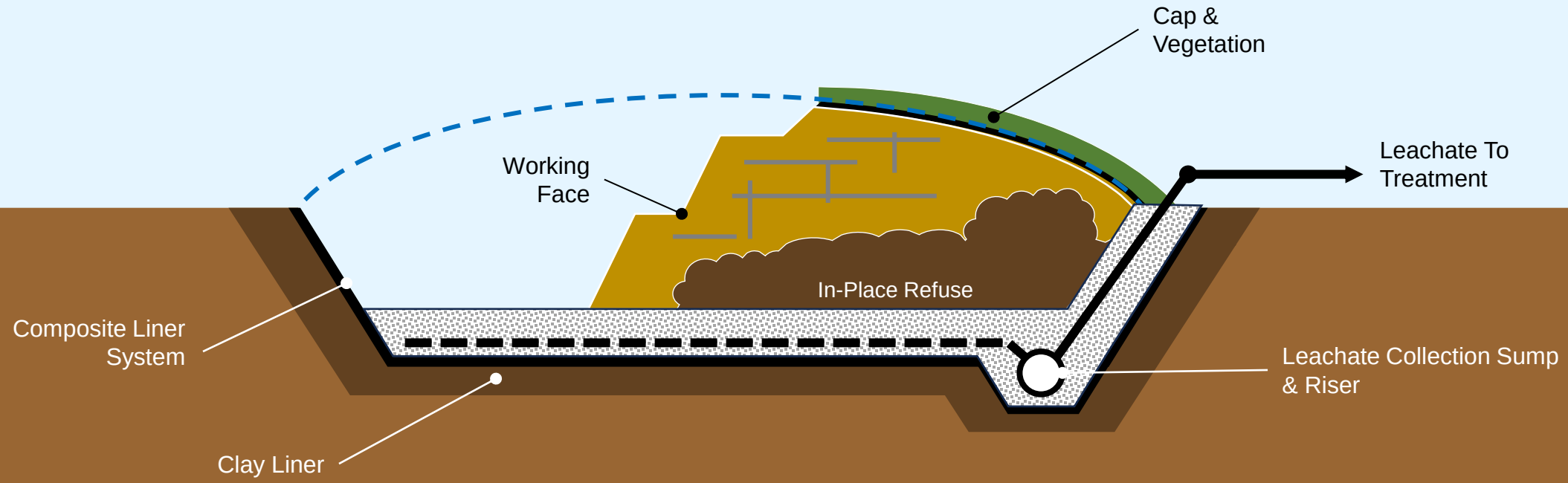
Carpet / Fabrics

470,000 PPT

Landfill Leachate

1,000-15,000 PPT

Landfill Design | Composite Liner System



Modern Landfills Can Be Used To Sequester And Protect The Environment From PFAS Contamination

Federal / State / Local Rules Regarding Leachate

Federal / EPA

CERCLA
a.k.a. Superfund

RCRA
Resource Conservation & Recovery Act
Proposed Change

PLAN 15
Industrial Effluent Guidelines
Proposed Change

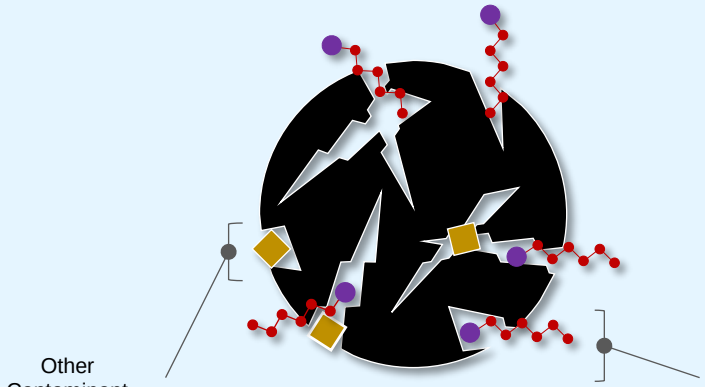
State / DEC

NYCRR Parts 360 & 363
Proposed Change

PFAS Treatment Technologies | Landfill Leachate

ADSORPTION

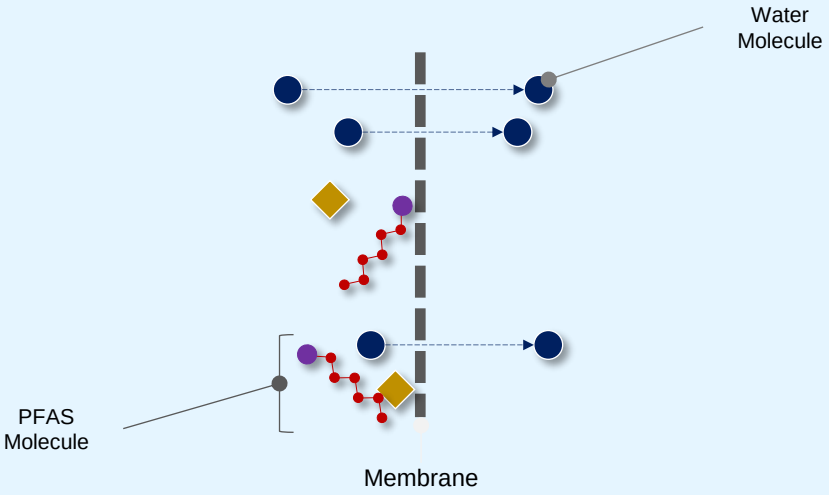
Granulated Activated Carbon



- \+ Targets ALL Organics, including PFAS
- \- High operating costs
- \- High volume of treatment residuals

FILTRATION

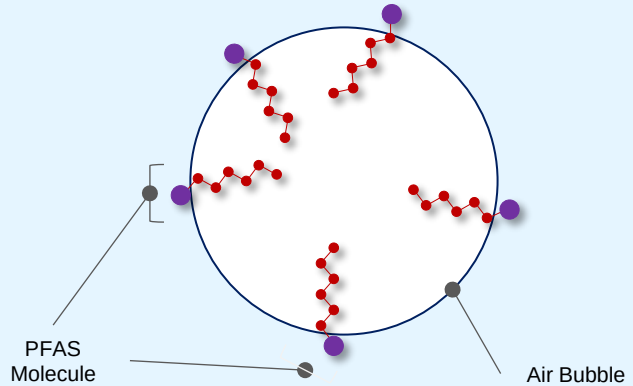
Reverse Osmosis



- \+ Removes **ALL** contaminants
- \- High cost
- \- High volume of treatment residuals

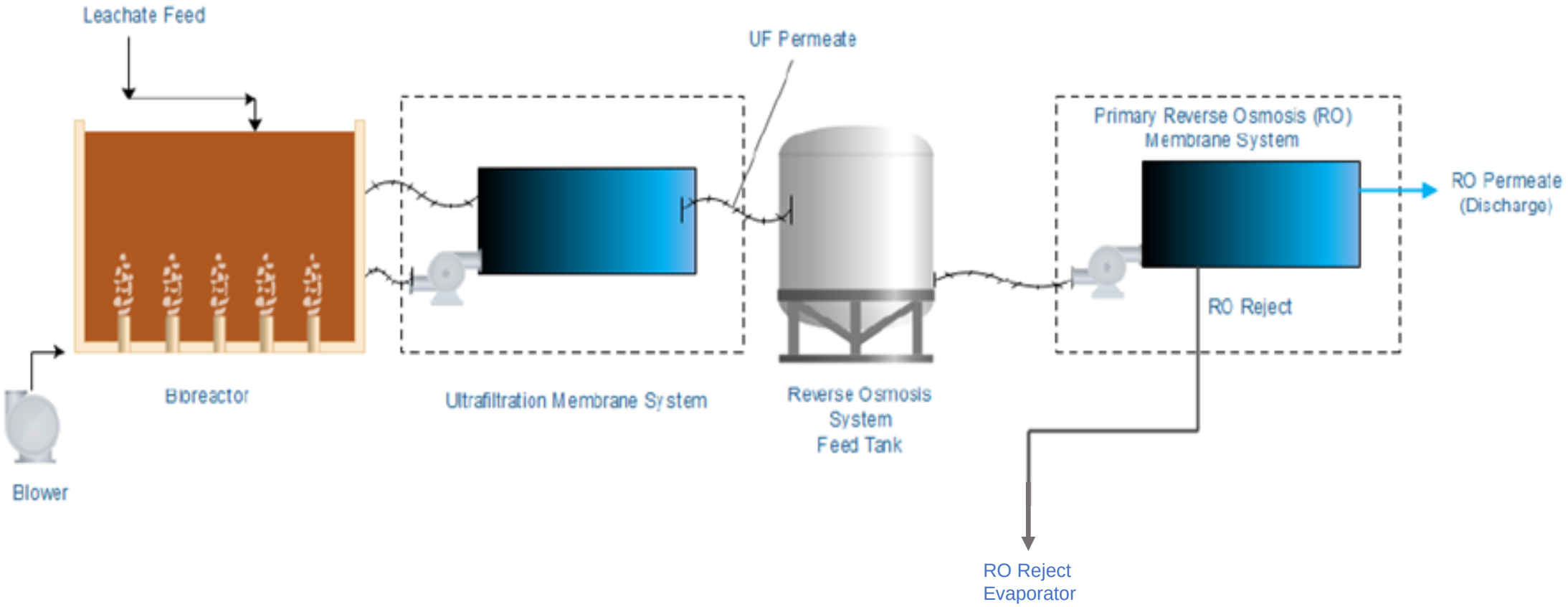
SEPARATION

Foam Fractionation



- \+ Targeted PFAS removal
- \+ Low operating costs
- \+ Low volume of treatment residuals
- \- Poor short / ultrashort chain removal performance

Reverse Osmosis | Seneca Meadows



Reverse Osmosis | Seneca Meadows

Low Energy PFAS Removal

LEEF

BETHLEHEM, PA

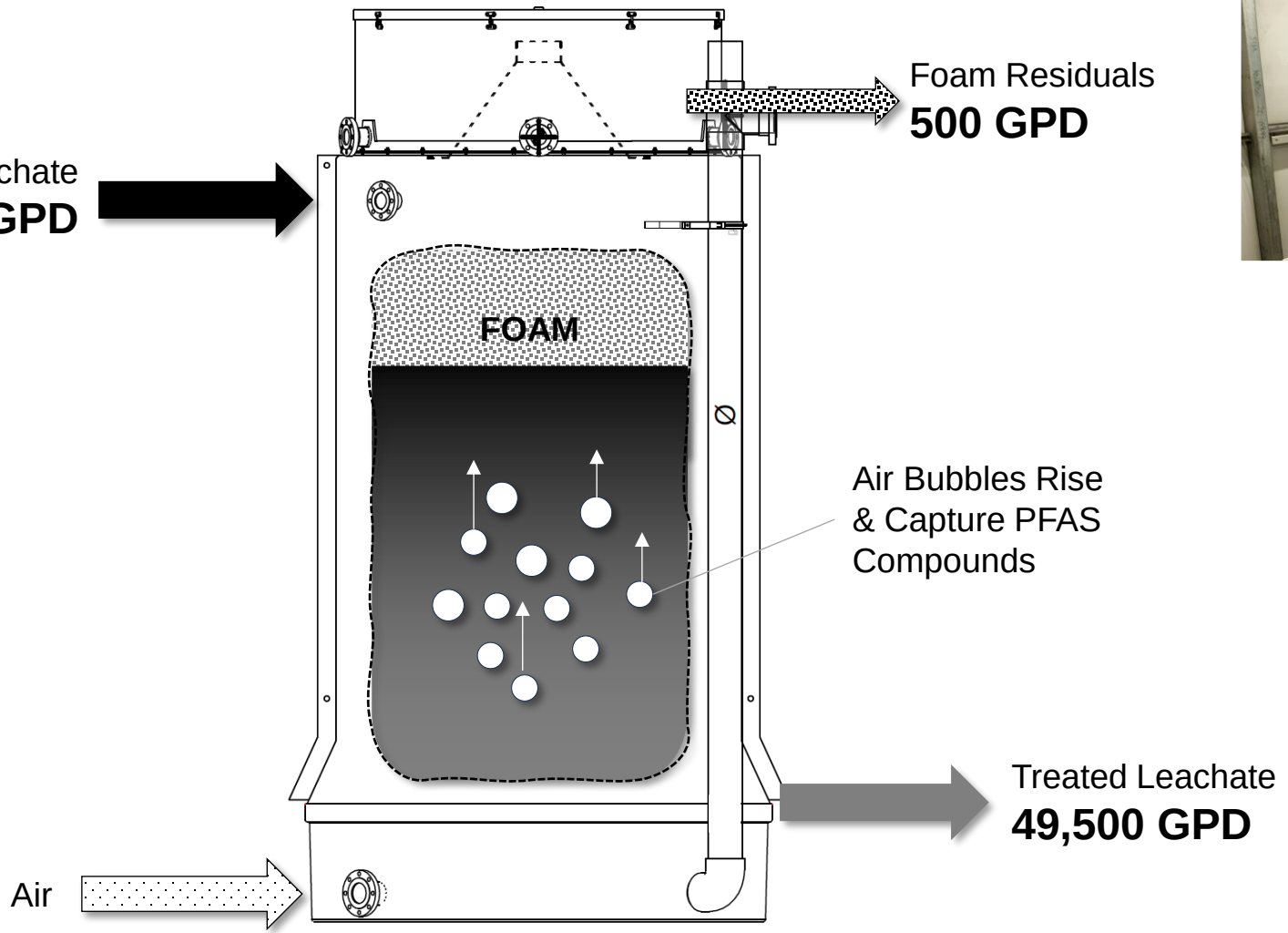
USA №1

BETHLEHEM LANDFILL

Safety • Integrity • Service

Foam Fractionation | Bethlehem Landfill

Raw Leachate
50,000 GPD



Foam Residuals
500 GPD

Air Bubbles Rise
& Capture PFAS
Compounds

Treated Leachate
49,500 GPD

Air

PFOS / PFOA
95-99%
Removal Per
Stage

Limit of Detection
Achieved

Current Status:

- ✓ Clear-water operation since late April
- ✓ Pennsylvania DEP approval received
- ✓ City of Bethlehem IWDP change approved
- ✓ Leachate operation started July 1st

- Awaiting certified test performance data

Final Thoughts

1. Modern landfills can be a key resource in protecting our environment from PFAS contamination

2. Federal & State rules managing / handling PFAS waste streams are in process

3. All major landfill operators are evaluating the best way to handle PFAS contaminated leachate