

ENVIRONMENTAL COUNCIL OF STATES  
(ECOS)

2021 ECOS Spring Meeting  
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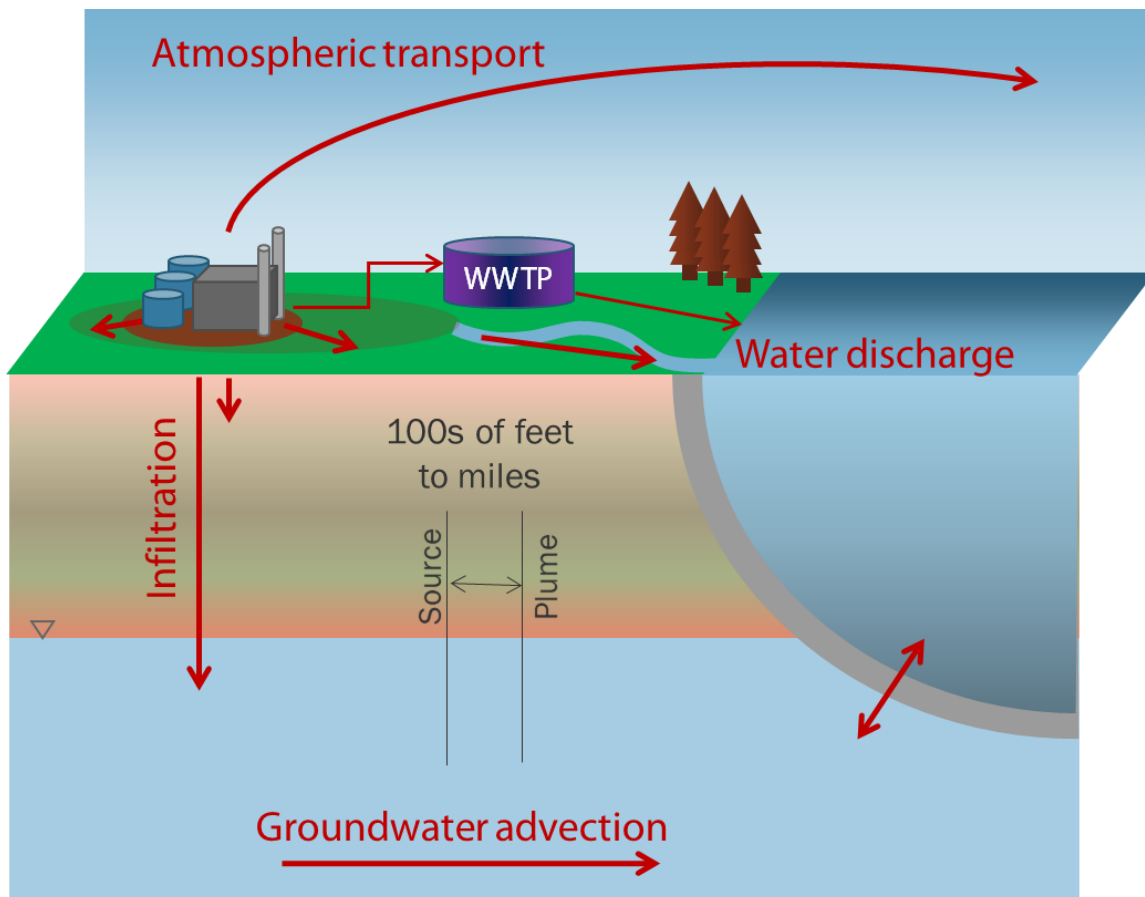
# Management Considerations for PFAS and 1,4-Dioxane



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Contaminants

# WHAT HAPPENS TO PFAS/1,4-DIOXANE WHEN RELEASED?



# TREATMENT OF PFAS IN WATER

## Things that don't work for PFAS

- Conventional wastewater treatment
- Standard chemical oxidants or reductants\*
- Air stripping
- Biodegradation
- In situ degradation

## What does work?

- Groundwater extraction/point of use treatment is typical
- Activated carbon/ion exchange (GAC/IX)
- Reverse osmosis, nanofiltration

## What is the fate of PFAS?

\*research in progress



GAC/IX system treating 80 gallons per minute  
(for 123-trichloropropane in this case)



# TREATMENT OF 1,4-DIOXANE IN WATER

## Things that don't work for 1,4-Dioxane

- Air stripping
- GAC

## What does work?

- Advanced oxidation processes (AOP)
- Select resins
- Biodegradation (conditionally...)

## What is the fate of 1,4-dioxane?

- Unlike PFAS, it's destructible



# FINAL PFAS DISPOSAL OPTIONS

## Incineration

- (+) Commercially available/destructive
- (+) Works for all types of media
- (-) Temperatures 900 - 1400°C
- (-) Emissions issues/lawsuits – need for improved monitoring



## Landfills

- (+) All types of media
- (+) Well established/understood
- (-) Not destructive
- (-) Perpetual need for leachate control



## Deep Well Injection

- (+) Permitted wells >6,000 ft
- (+) Relatively simple to employ
- (-) Few locations, long-distance trucking
- (-) Not destructive

## Storage (?)

- (-) Not “disposal” but may be appropriate under certain circumstances

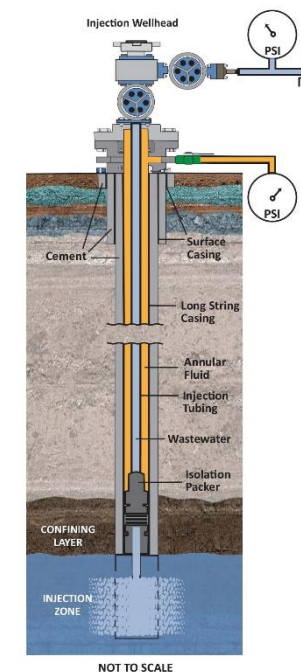


Image provided by Buckeye Brine

All PFAS disposal methods have limitations – solutions are site-specific.  
Resources being dedicated to solving these problems.

# SITE CHARACTERIZATION & SAMPLING

## PFAS and 1,4-Dioxane

### PFAS

- Cross contamination – need to understand restricted equipment list
- Note Rodowa et al. 2020: maybe not as bad as was thought?
- Disposable/dedicated equipment is preferred
- Plan ahead, follow protocols
- Simplify, remove clutter, minimize
- Change gloves often
- Quality control – field & equipment blanks
- Analytical methods...

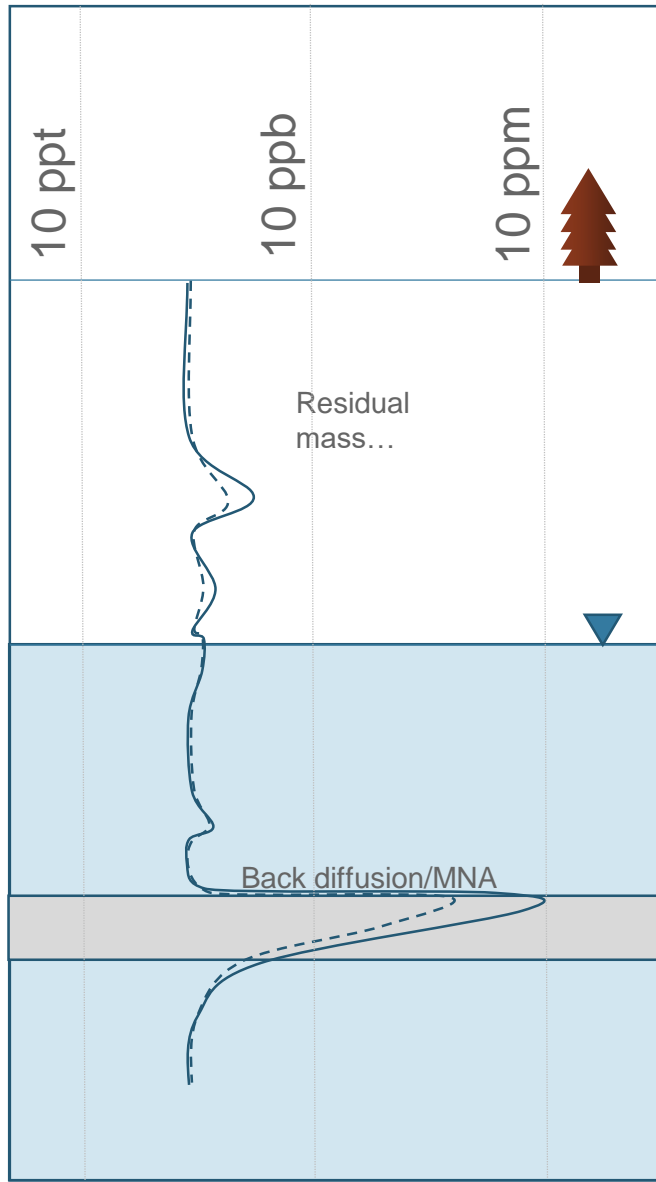


<https://www.solinst.com/products/groundwater-samplers/peristaltic-pump.php>

### 1,4-Dioxane

- Comparable to VOCs
- Analytical methods...

# Trichloroethene



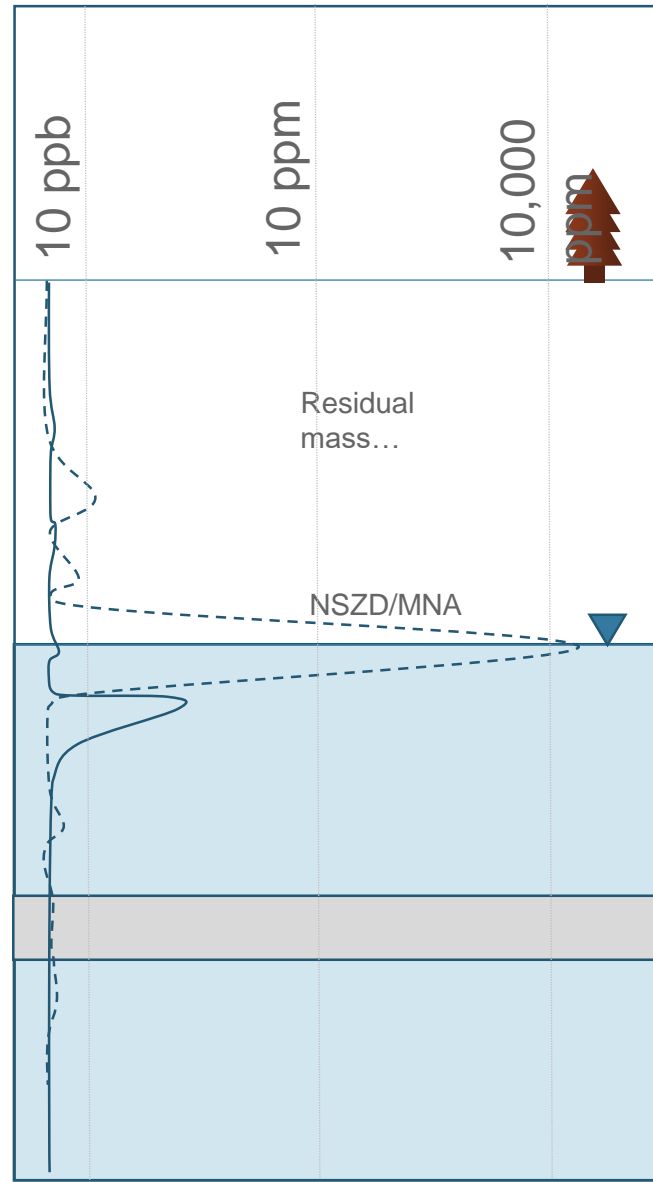
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Total Cl. ethenes

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# Petroleum



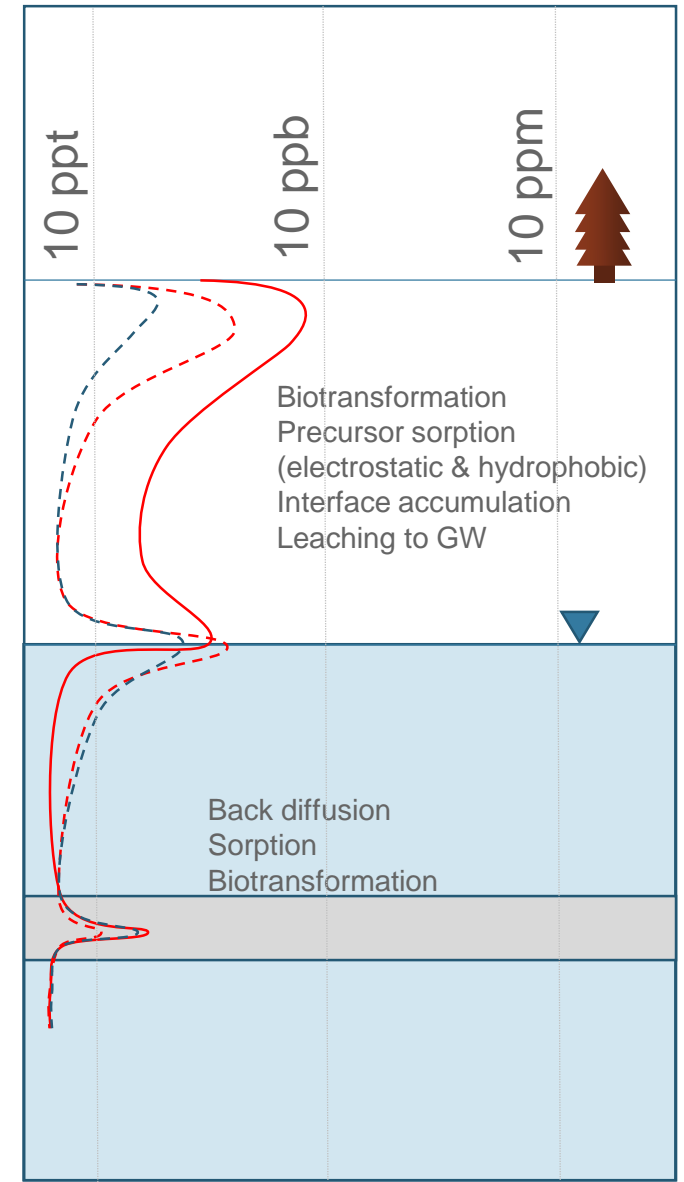
Total/free-phase

Dissolved phase

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# PFAS



Precursors

Long chain PFAAs

Short chain PFAAs

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