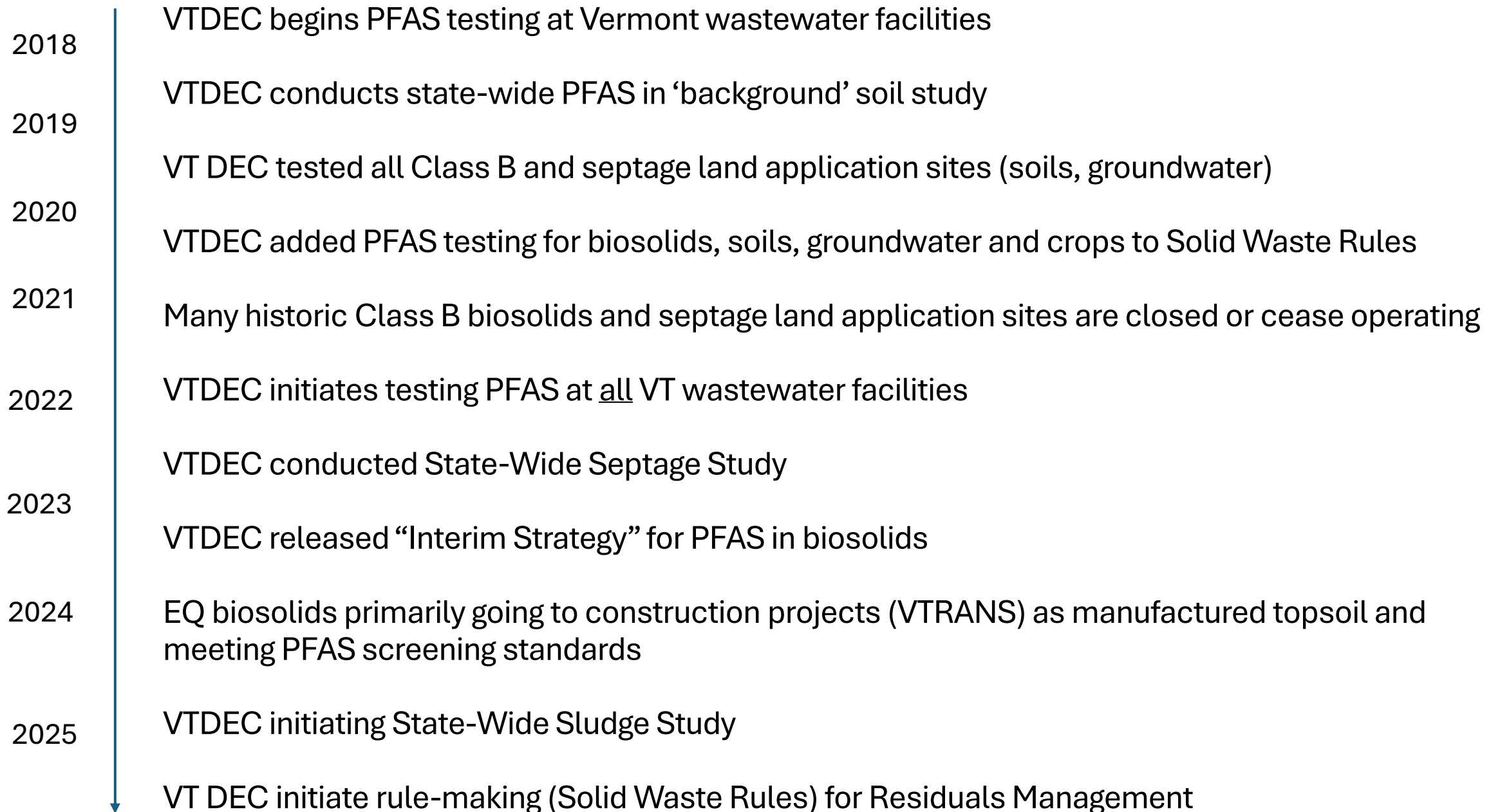


Managing Residuals in Vermont

April 2025

- 1) Vermont is a leader on understanding PFAS in wastewater
- 2) What are sludge, septage and biosolids?
- 3) How are these materials regulated/managed?
- 4) Septage Studies
- 5) Sludge Studies
- 6) PFAS and biosolids land application sites
- 7) Maine biosolids ban
- 8) VT Strategy for PFAS in biosolids
- 9) VT Strategy for PFAS in wastewater
- 10) Take Aways





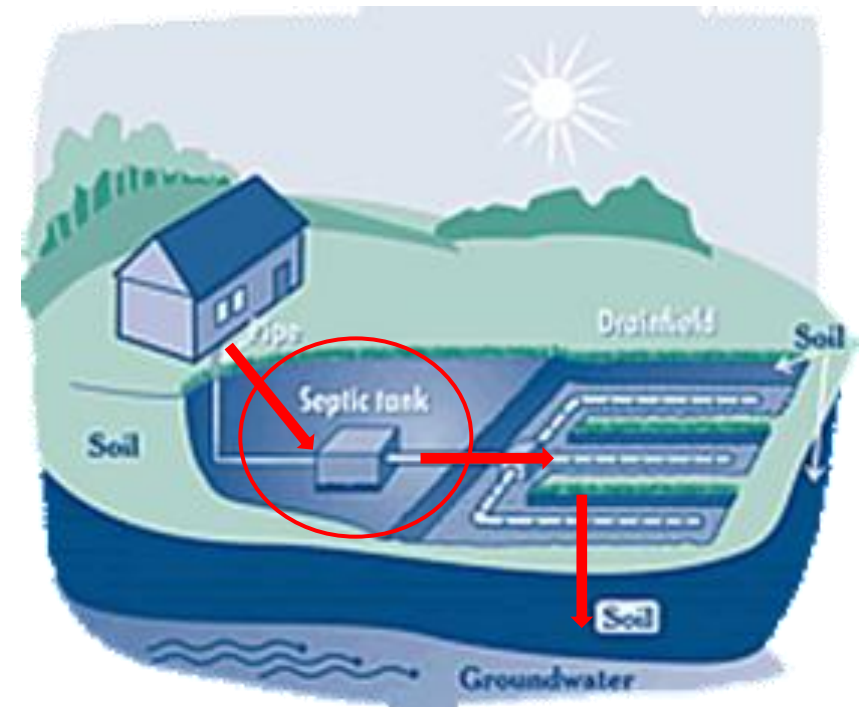
Sludge: semi-solid byproduct of treatment process at a wastewater treatment facility (WWTF)

- Primarily composted of organic matter (bacteria, dead cells), nutrients
- Management: Dewater and **Landfill**, haul to another WWTF, no sludge from VT is incinerated (other states like CT rely heavily on incineration)

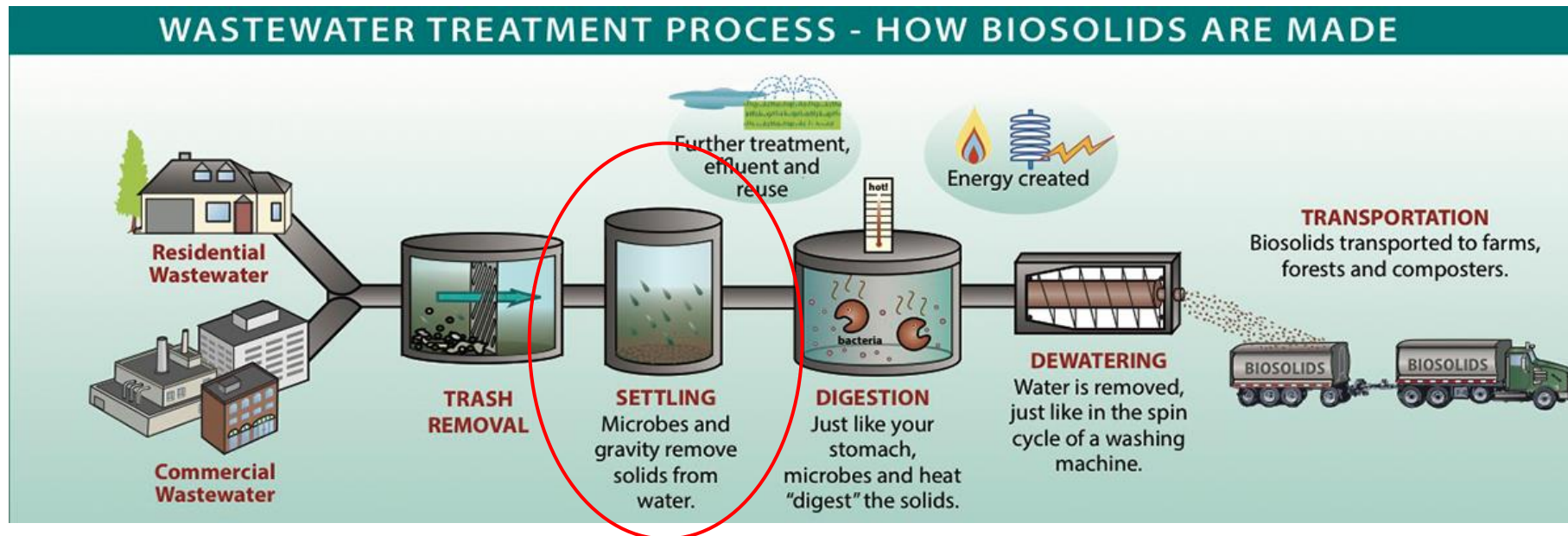


Septage: semi-solid material that accumulates in a septic tank

- Management : pump & haul to a WWTF, treat to biosolid standards and land apply via permit
- Note: 55% of VT's population has a septic tank



- **Biosolids:** sludge treated to reduce pathogens and vector attraction, meets pollutant limits, and regulated by EPA (40 CFR Part 503) and Vermont (SW Rules)... there are two classes...
 - **Class B biosolids**
 - pathogen significantly reduced (example, anaerobic digestion)
 - requires site-specific, **land application** permit with site restrictions
 - testing of biosolids, soils, groundwater, and crops
 - **EQ “Exceptional Quality” biosolids (aka Class A)**
 - pathogens further reduced (example, high temperature composting)
 - distributed from facility for eventual land application and can cross state-lines similar to a compost/fertilizer
 - testing of biosolids, potentially soils depending on PFAS levels



- **Biosolids Testing:**

- Bacteria
- Metals (arsenic, lead, cadmium, nickel, zinc, etc)
- Nutrients (nitrogen, phosphorus, potassium, etc)
- Polychlorinated biphenyls (PCBs)
- Per- and Polyfluoroalkyl Substances (PFAS) (since 2020)

- **Biosolids Benefits:**

- Builds Soil Health
 - Erosion reduction, promotes flood resiliency
- Recycles nutrients
- Reduces Greenhouse Gas Emissions/Sequesters Carbon
- Conserves Landfill Capacity
- Restores Degraded Lands

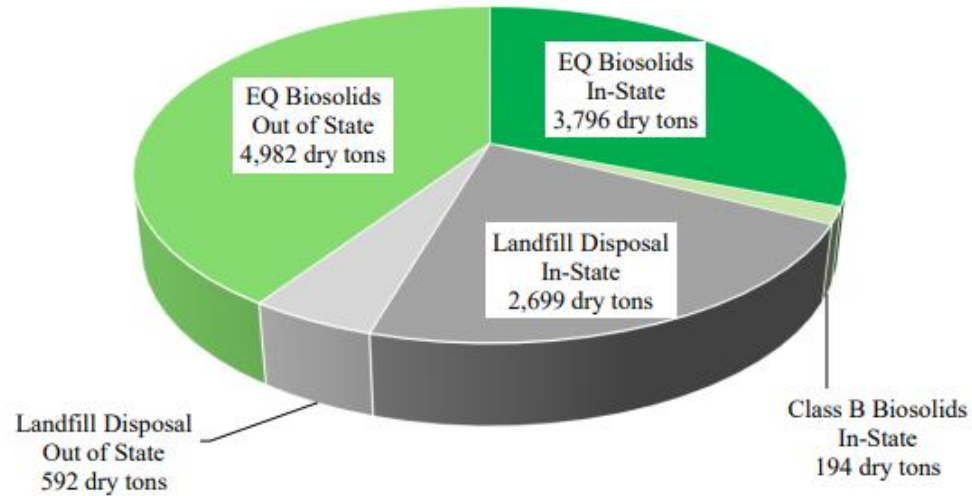
- **Biosolids Risks:**

- Transfer of emerging contaminants to environment
(MORE ON THIS LATER....)



How is VT's Wastewater Sludge Managed?

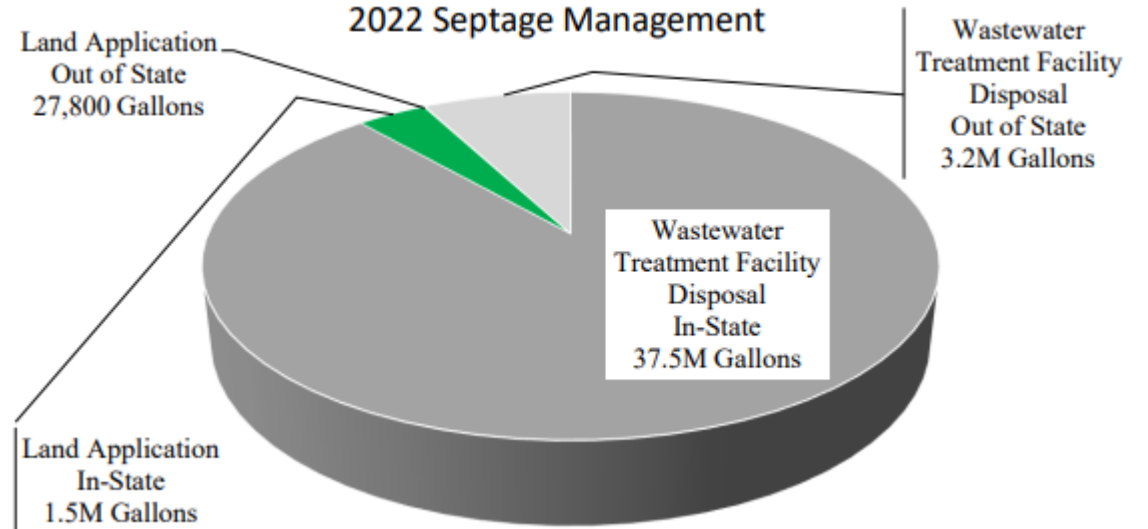
2022 Sludge & Biosolids Management



- 73% ultimately recycled as biosolids (over half out of state)
- 27% landfilled (4/5 of that goes to Coventry LF)

How is VT's Septage Managed?

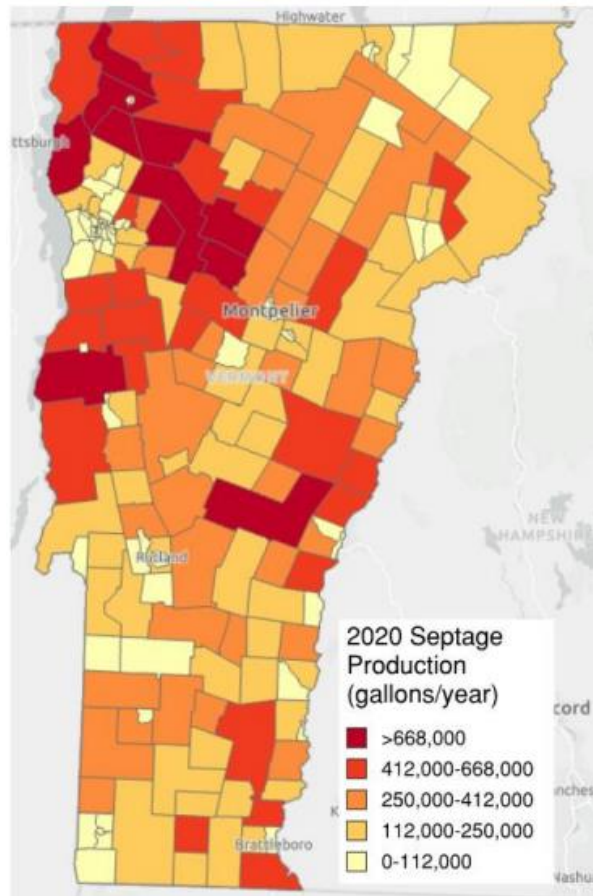
2022 Septage Management



- ~42M gallons of septage is managed annually
- Majority is hauled to VT WWTFs that accept septage
- **Septage increases sludge production at WWTFs**

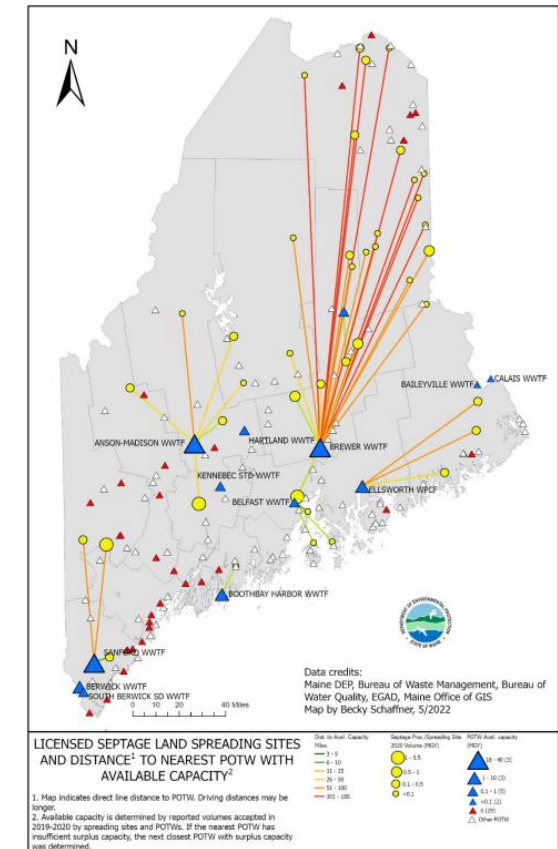
Vermont Septage Study 2024

- Statewide, capacity for septage processing meets VT's total septage production needs
- However, only certain WWTF except septage and their locations and hauling distances creates regional constraints where capacity is limited and vulnerable to changes.
- For example, two WWTFs accept over 35% of all VT's septage (Montpelier 20% and Richmond 15%)



Maine Septage Study – Jan 2023

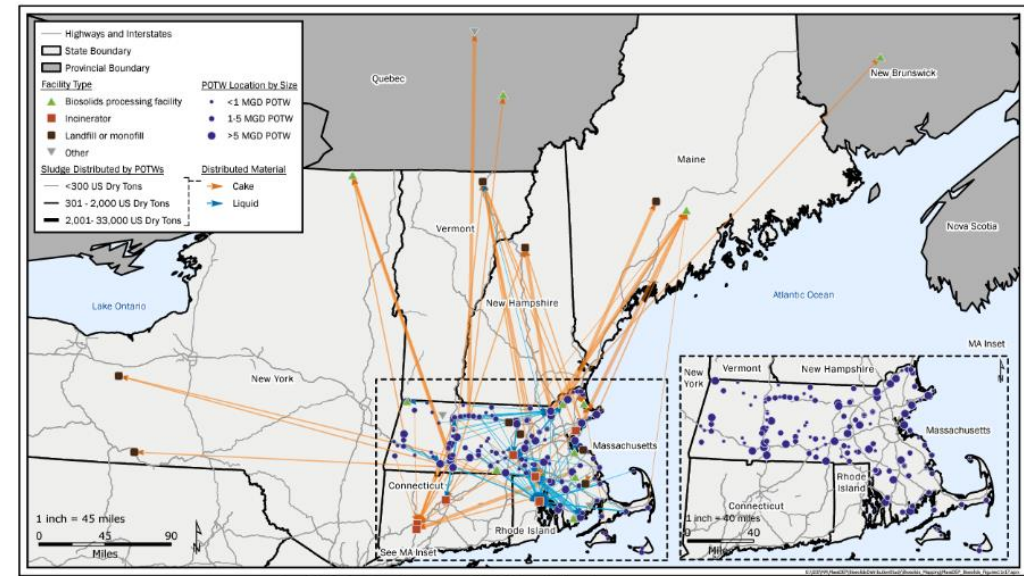
- Maine did not ban land application of septage
- Septage generated in northern Maine would need to be hauled up to 180 miles to nearest WWTF that accepts septage



Regional Sludge Studies

Maine Sludge Study - Feb 2024:

- Increase in landfill capacity needed
- Study bulking agents (to mix with sludge)
- Fund pilot studies for PFAS removal of landfill leachate
- Reduce sludge volumes via dryers, etc.



Massachusetts Sludge Study – Part 1 Oct 2024:

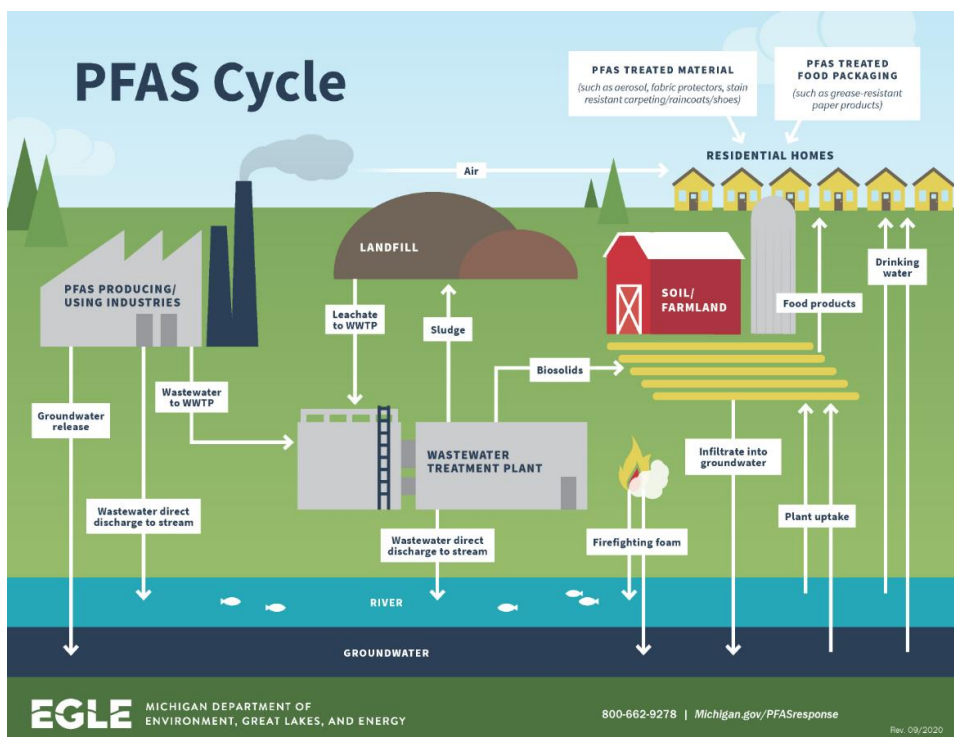
- Minimal existing capacity at MA WWTFs, landfills, incinerators, and composting facilities to take more sludges
- No new outlets or capacity on the horizon; current outlets – like landfills – are reaching capacity
- Vulnerable to what adjacent states decide to do with sludge management
- Part 2 – Summer 2025

*** Vermont Sludge Study – started April 2025 ***

- Regional landfill capacity
- Sludge processing infrastructure at VT WWTFs
- Economic forecasts, etc.
- Vulnerability due to out-of-state/exportation

PFAS Contamination in Maine Example Case

- A wastewater facility receiving a significant amount of inflow from a paper facility
- The sludge/biosolids were industrially contaminated with high concentrations of PFAS, likely PFOS
- Biosolids land applied at farm in Arundel, Maine
- PFOS transferred from soil to crop to cow (bioaccumulation)
- Maine DEP is developing risk calculation for soil to crop uptake and soil to crop to milk



Location(s)	Average (ppb)	Highest Value (ppb)
Vermont Background Soils	1.0 - 3.4	4.4**
VT Biosolids Sites	9.8 - 11.9*	35
Stoneridge Farm (ME)	123	878

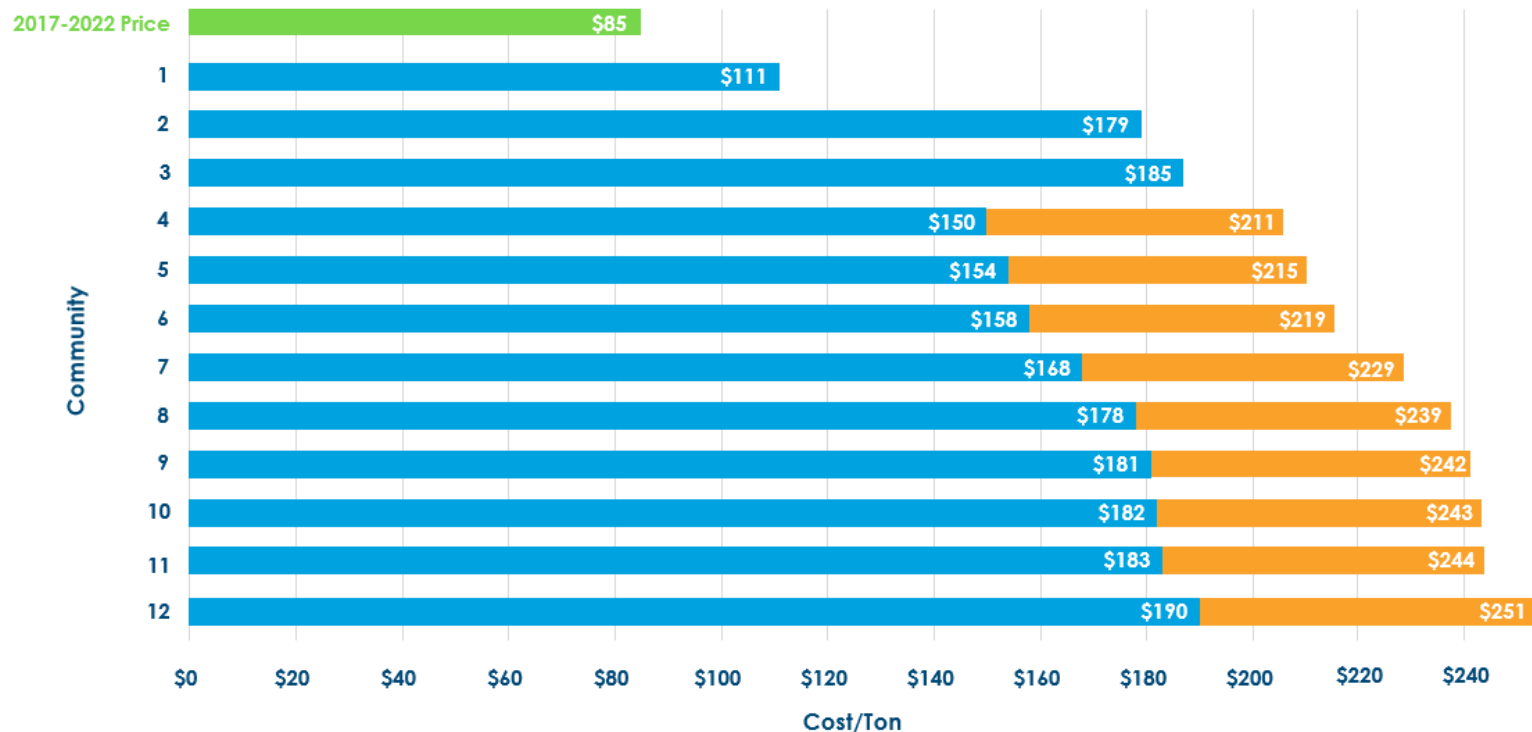
*includes septage land app sites

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**outlier removed
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What is Happening in Maine post LD1911 land application ban?

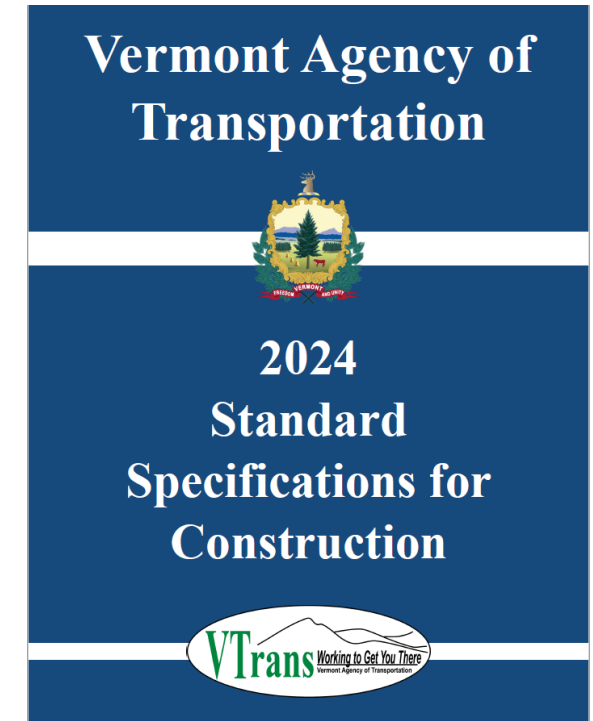
- Sludge disposed at landfills
- Sludge disposal costs increase for municipalities
- Proposing \$50M bond to help WWTFs upgrade sludge processing (digesters, dryers)
- Conducts Landfill Capacity Study in 2023-2024

Sludge Disposal Costs



Vermont's Interim Strategy for Mitigating PFAS Risks Associated with Residuals Management

- Developed in consultation with a working group comprised of regional residuals management experts from both the public and private sectors, and the VDH and VAAFM.
- Intended to help Vermont mitigate risks associated with potential transfer of per and polyfluoroalkyl substances (PFAS) to the environment via the management of residual materials
 - potential for leaching to groundwater and contamination of drinking water supplies
 - crop uptake into food-chain crops
- Residual materials covered under this strategy include:
 - Exceptional Quality (EQ) Biosolids – produced in or imported to Vermont
 - Short Paper Fiber (SPF)
 - Manufactured topsoil (MFT) or soil amendments containing EQ biosolids and/or SPF
- Implementation date: April 1, 2024.



Interim Strategy for Mitigating PFAS Risks Associated with Residuals Management

In 2019, Vermont conducted a [study](#) of PFAS occurrence in shallow soils across the state.

- PFAS were detected in every sample.
- PFOS was the dominant compound detected.
- The **screening standards** established in this strategy were adopted from this study (used UTL, so 95% of the PFAS soil levels are below the limit)

PFAS Compound	Concentration (ug/kg; ppb)
Perfluorooctane sulfonic acid (PFOS)	3.40
Perfluorooctanoic acid (PFOA)	1.60
Perfluoroheptanoic acid (PFHpA)	0.84
Perfluorononanoic acid (PFNA)	0.44
Perfluorohexane sulfonate (PFHxS)	0.38

- **Tracking/Reporting Requirements:**
 - **Material testing data**
 - **Amount of material**
 - **Recipient names**
 - **Addresses/Location**
- Provide recipient info on management practices (update EQ Biosolids labelling)

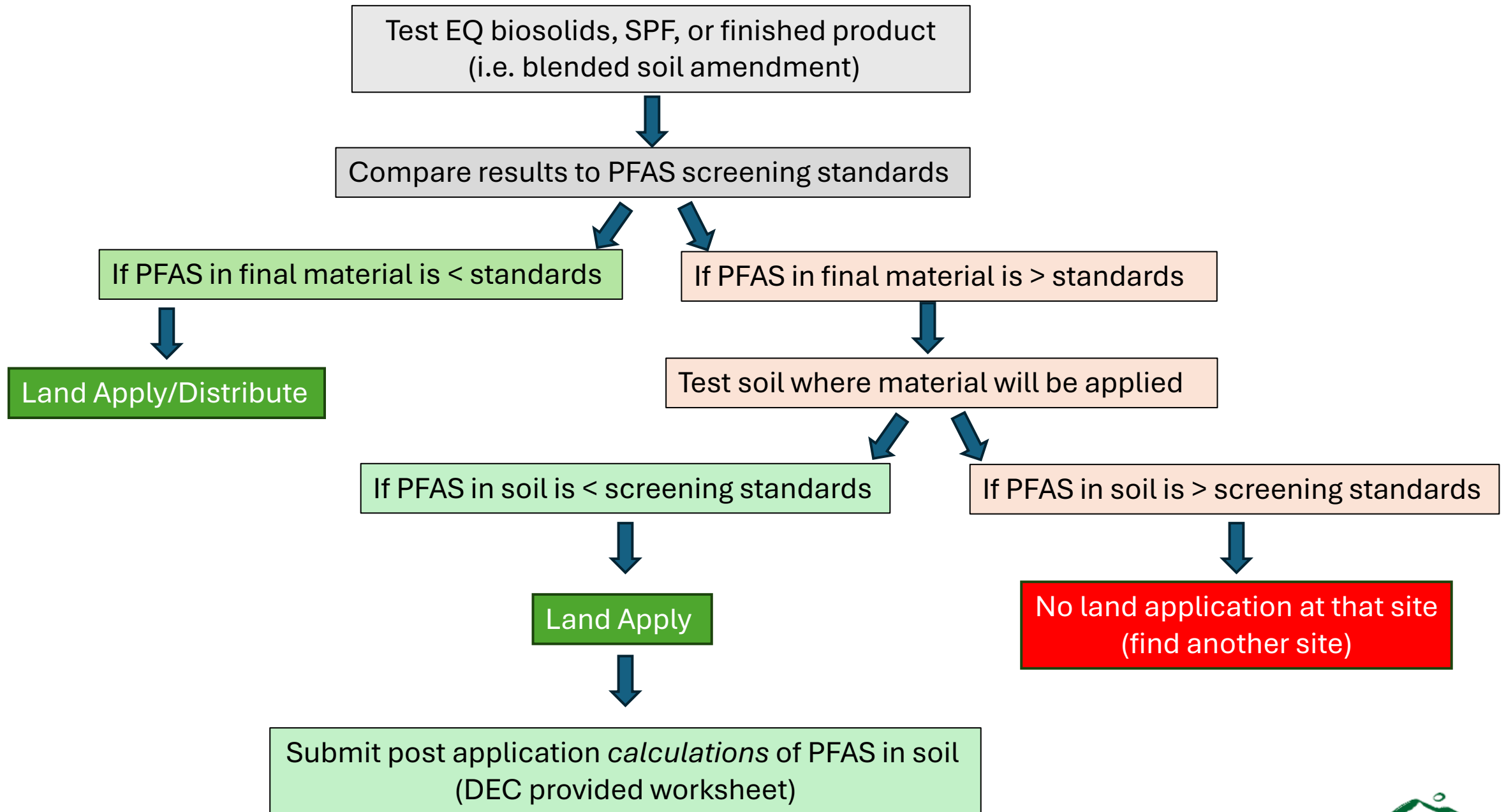
PFAS BACKGROUND IN VERMONT SHALLOW SOILS

WENYU ZHU, PH.D.
POSTDOCTORAL ASSOCIATE
CIVIL AND ENVIRONMENTAL ENGINEERING
UNIVERSITY OF VERMONT

HARRISON ROAKES, P.E.
PROJECT MANAGER
SANBORN, HEAD & ASSOCIATES, INC.

STEPHEN G. ZEMBA, PH.D., P.E.
PROJECT DIRECTOR
SANBORN, HEAD & ASSOCIATES, INC.

APPALA RAJU BADIREDDY, PH.D.
ASSISTANT PROFESSOR
CIVIL AND ENVIRONMENTAL ENGINEERING
UNIVERSITY OF VERMONT
CONTACT EMAIL: RAJULBADIREDDY@UVM.EDU



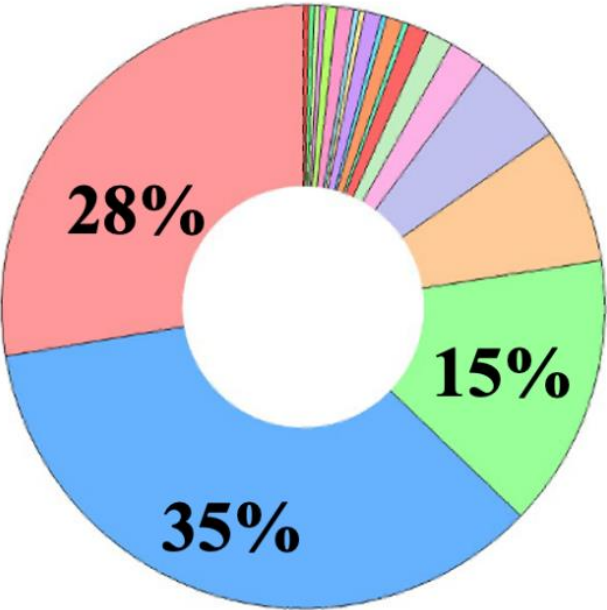
Interim Strategies Limiting PFAS in Biosolids

State	PFOA (ppb)	PFOS (ppb)	Notes
Colorado	n/a	50	Develop source control plan, report to State
New York	20	20	20 to <50 ppb, allows one year to reduce to < 20 ppb
Michigan	20	20	20 to <100 ppb land application allowed at reduced rate, source reduction plan
Wisconsin	20	20	20 to <100 ppb land application allowed at reduced rate
Vermont	1.6	3.4	Quarterly testing, labelling, tracking of distribution for EQ biosolids

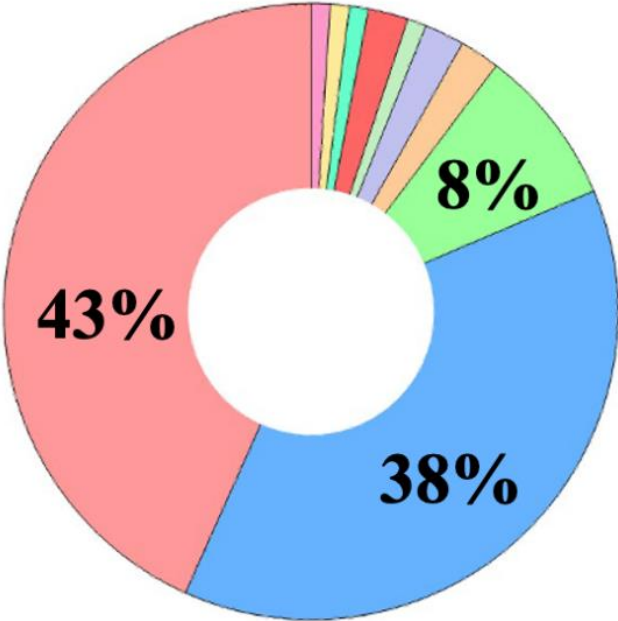


Vermont PFAS in Wastewater Study 2023-2025

- Phase 1 quarterly sampling at all VT POTWs (91) – draft report under review
 - PFAS were detected in the influent and effluent of all POTWs
 - Total PFAS entering and leaving the WWTF is typically less than 150 ng/L (ppt)



Influent



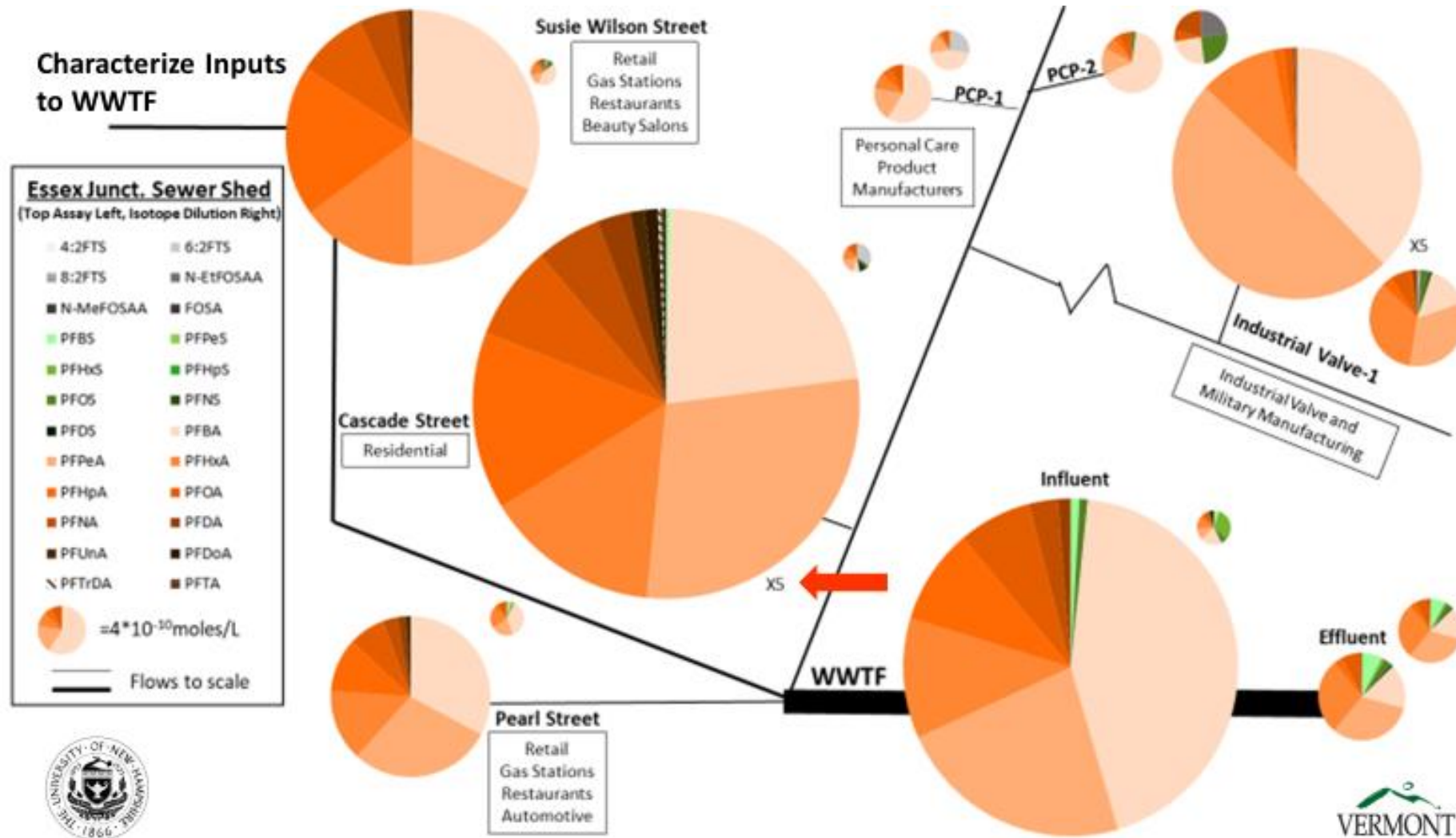
Effluent



Concentration Range

Vermont PFAS in Wastewater Study 2023-2025

- Phase 2 is looking for PFAS 'hot spots' in selected towns – Starting Soon!





FACT SHEET

Draft Sewage Sludge Risk Assessment for PFOA and PFOS

January 2025

- Draft Risk Assessment (comments until 4/16/25)
- Not a regulation
- Does not model risk for general public
- Modelled human health risk for families consuming farm products (e.g., food crops, animal products, drinking water) from land application sites
- Elevated risk at concentrations of PFOA or PFOS in the biosolids of 1 ppb at 10 dry metric tons/hectare

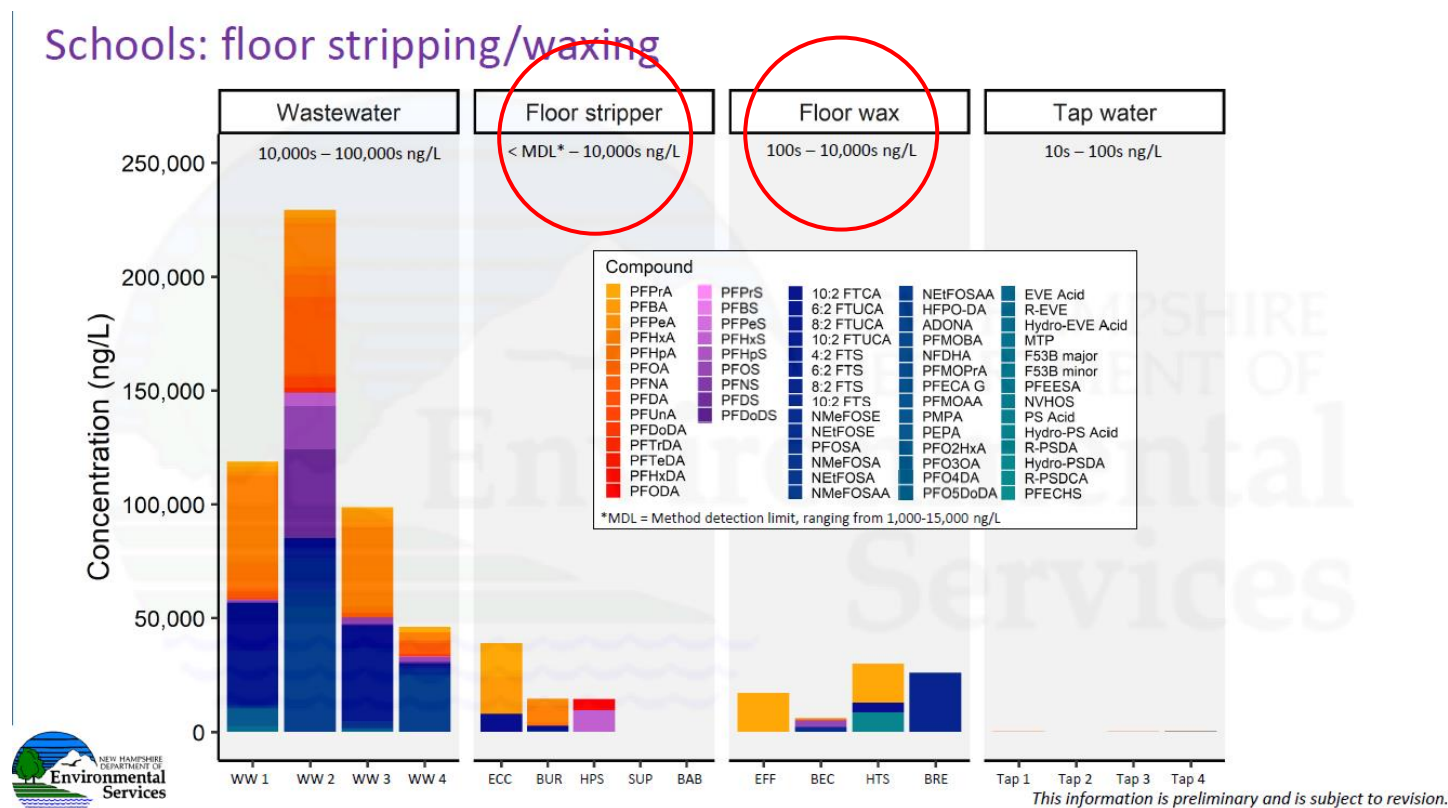
How do we get PFAS out of Vermont's wastewater, biosolids, septage?

Act 36, July 1, 2023:

- Food Packaging
- Rugs and Carpets, Aftermarket Treatments
- Ski Waxes
- Firefighting Foam (class B) (July 1, 2022)

Act 131, January 2026 ???

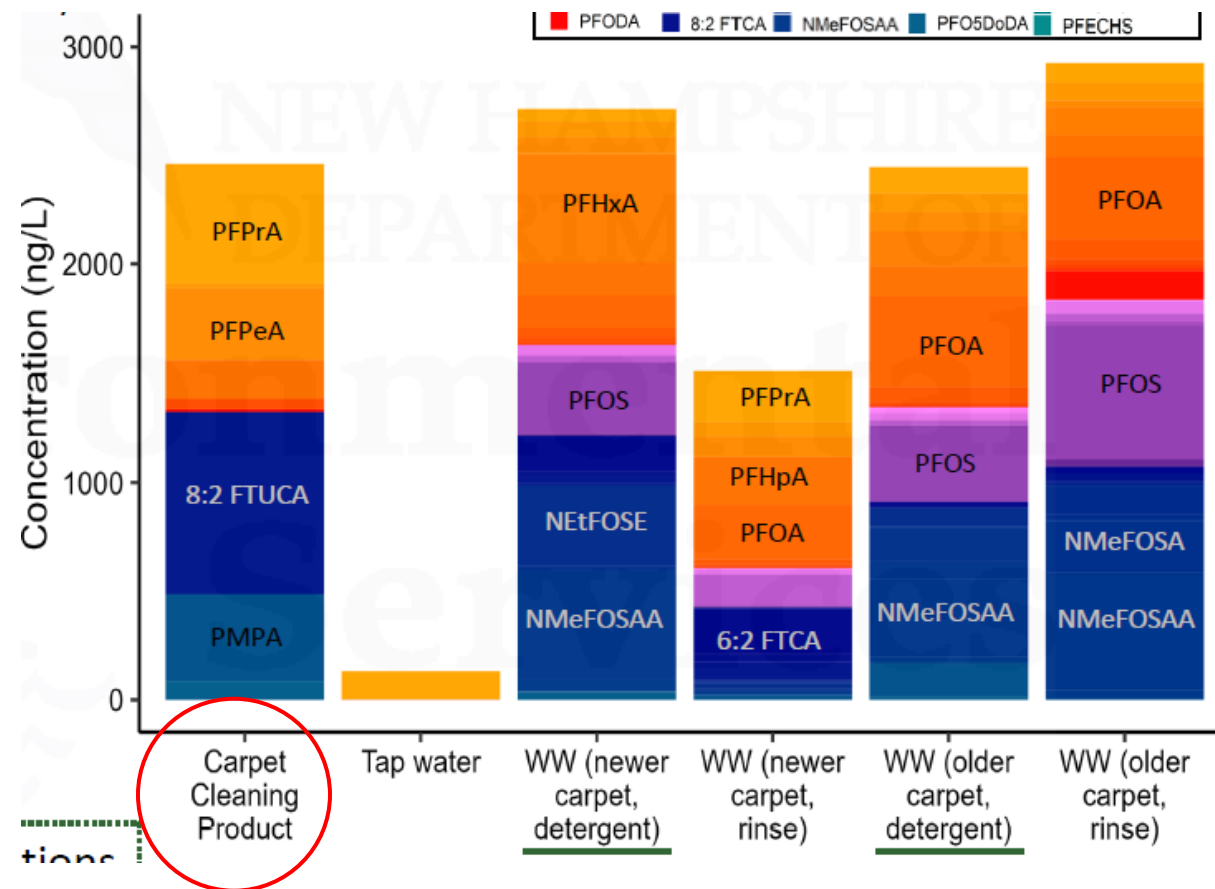
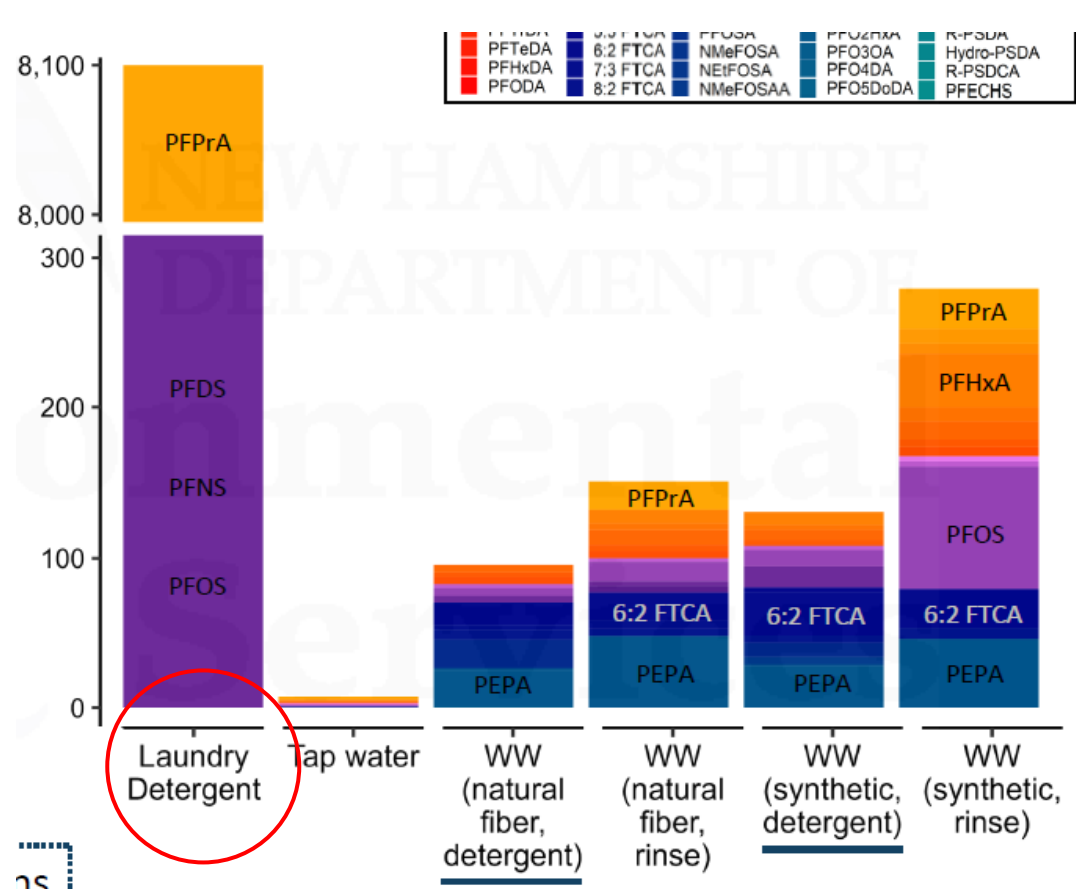
- Cleaning Products
- Fluorinated Containers
- Dental Floss



How do we get PFAS out of Vermont's wastewater, biosolids, septage?

Act 131, January 2026 ???

- Cleaning Products
- Fluorinated Containers
- Dental Floss





Take Aways:

- 1) VT manages wastewater sludge via landfill, biosolids or exportation
- 2) Over half of the population has septic tanks
- 3) Landfill capacity in VT and across the region is limited and declining
- 4) ME's ban on biosolids has resulted in increased costs to municipalities and additional strain on landfill capacity
- 5) VTDEC has tested PFAS in wastewater, biosolids and land application sites

Actions:

- 1) Rule-making to adopt restrictive PFAS limits on biosolids into Solid Waste Rules
- 2) To reduce PFAS in WW & biosolids, ban PFAS in domestic products
- 3) Invest/incentivize septage receiving and sludge treatment at WWTFs

