

PFAS in Domestic Wastewater: Presence, Sources, and Potential Impacts to Groundwater Quality

Jennifer Harfmann, Ph.D.

NHDES Drinking Water and Groundwater Bureau

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Widespread PFAS detections in New Hampshire groundwater

Major site investigations:

- Pease Air Force Base
- Saint Gobain Performance Plastics

Other sources:

- Waste sites
(landfills, septage lagoons, etc.)
- AFFF releases
- Industrial/commercial facilities

NH Ambient Groundwater Quality Standards (AGQS)

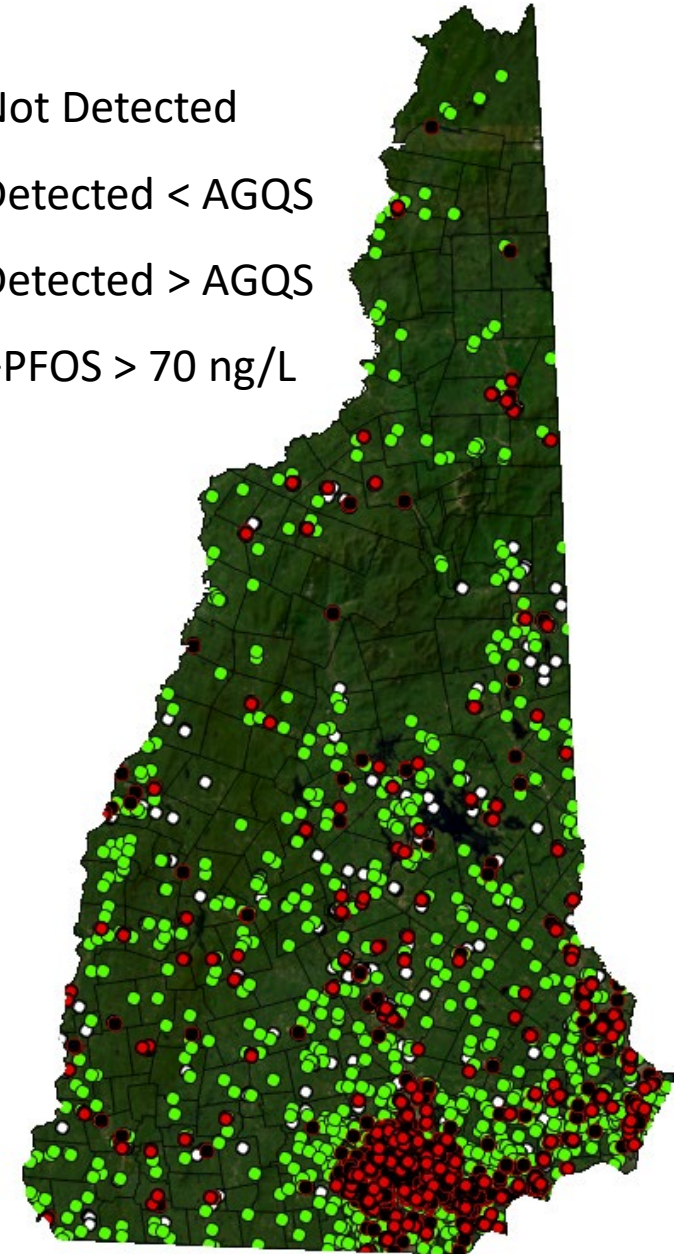
PFOA: 12 ng/L

PFOS: 15 ng/L

PFNA: 11 ng/L

PFHxS: 18 ng/L

- PFAS Not Detected
- PFAS Detected < AGQS
- PFAS Detected > AGQS
- PFOA+PFOS > 70 ng/L



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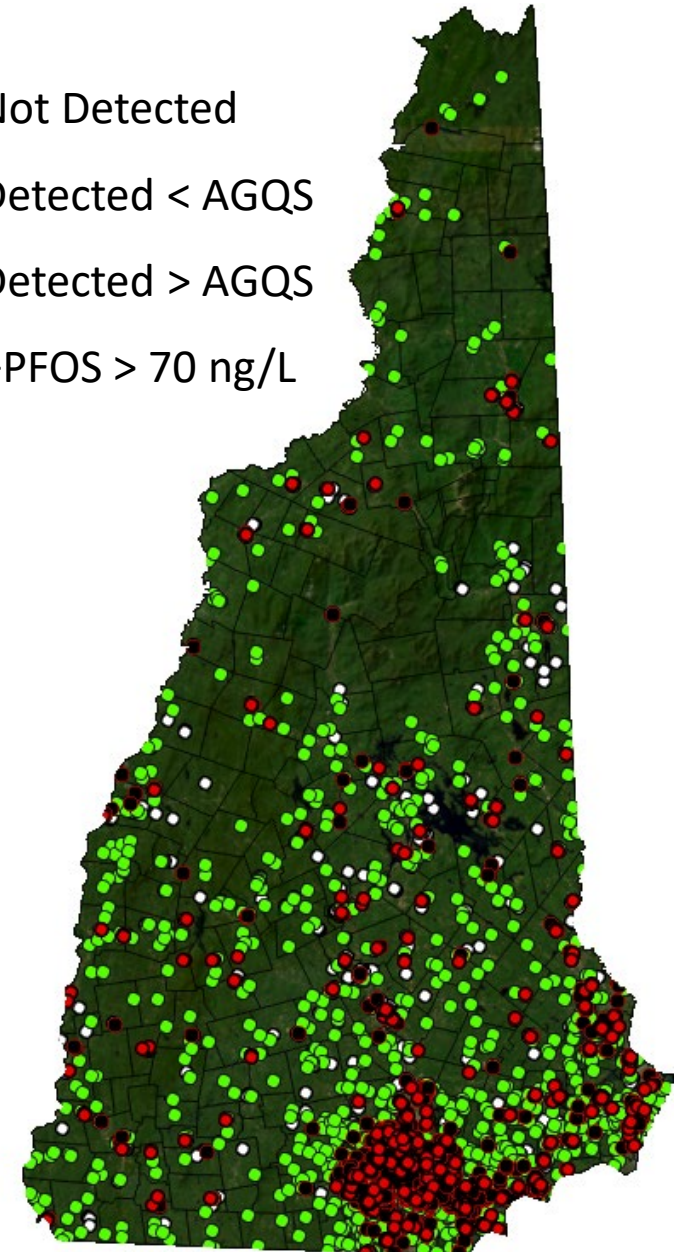
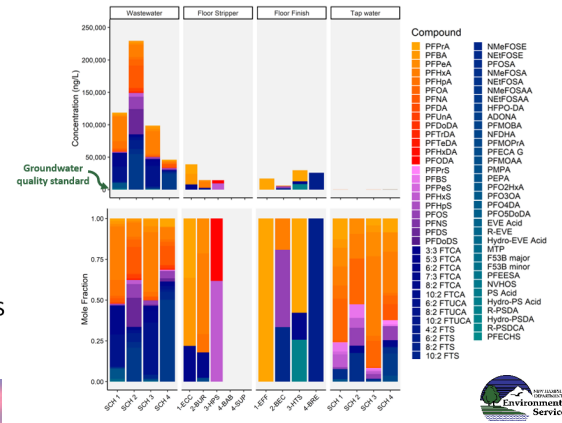
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- **Septic systems**
 - Small commercial businesses

Floor stripping and waxing activities can generate very high levels of PFAS.

- Up to 229,000 ng/L Σ 70 PFAS in floor stripping wastewater
- Up to 39,000 ng/L Σ 70 PFAS in floor strippers and finishes
- Up to 240 ng/L Σ 70 PFAS in untreated tap water.



<https://www.pfas.des.nh.gov/groundwater>

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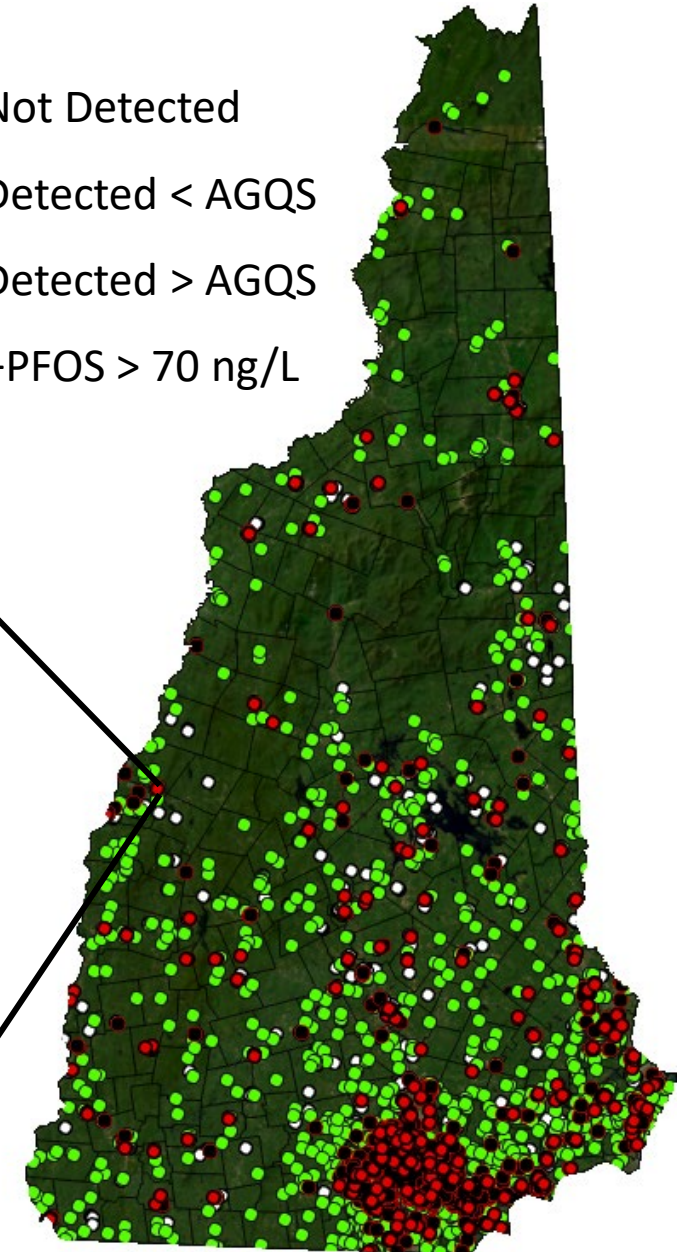
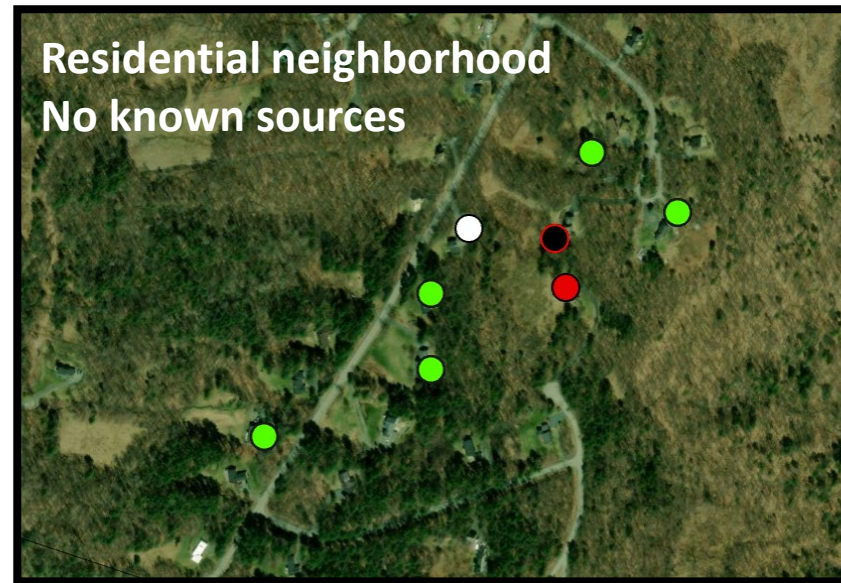
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 - **Domestic ??**

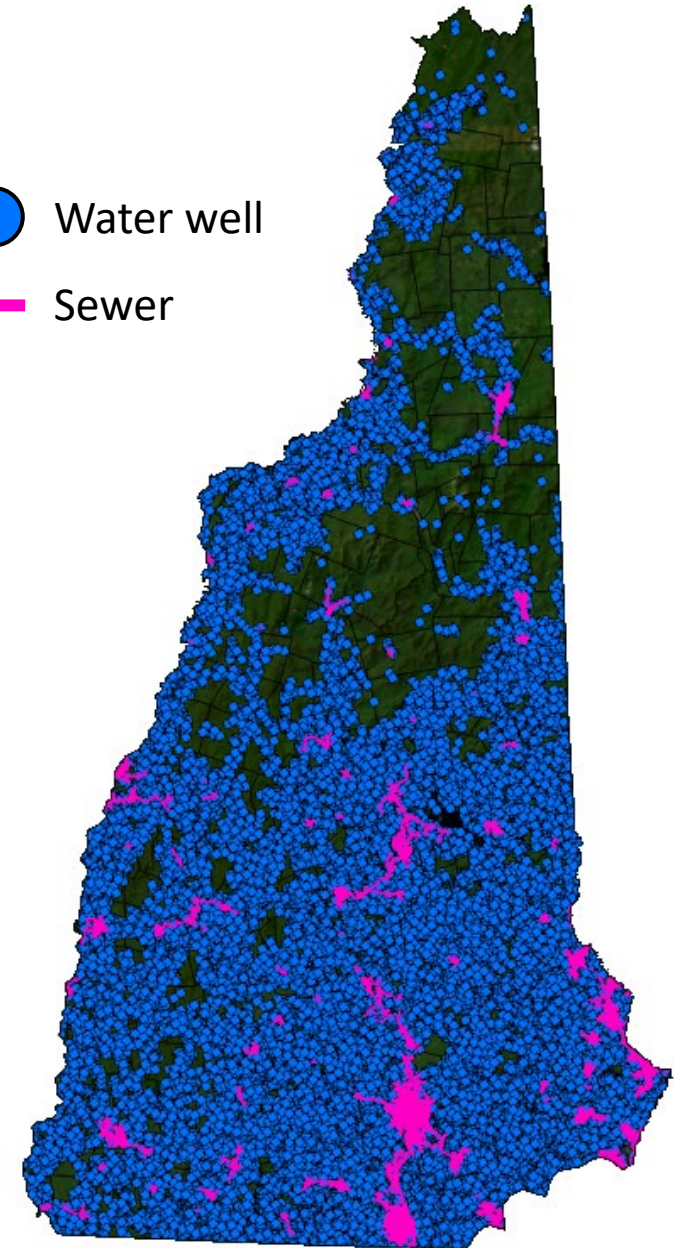
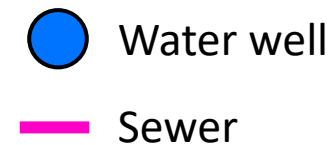


Most of New Hampshire is non-sewered.

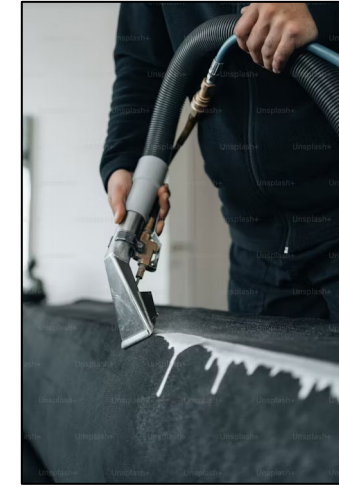
Nearly half of NH residents obtain their drinking water from **private wells** and discharge wastewater to **septic systems**.



Domestic wastewater may be a source of PFAS to groundwater in non-sewered regions.



Why might there be PFAS in domestic wastewater?



Soaps, detergents, toothpaste, cosmetics, shampoos, cleaning products, fabrics/textiles, toilet paper...



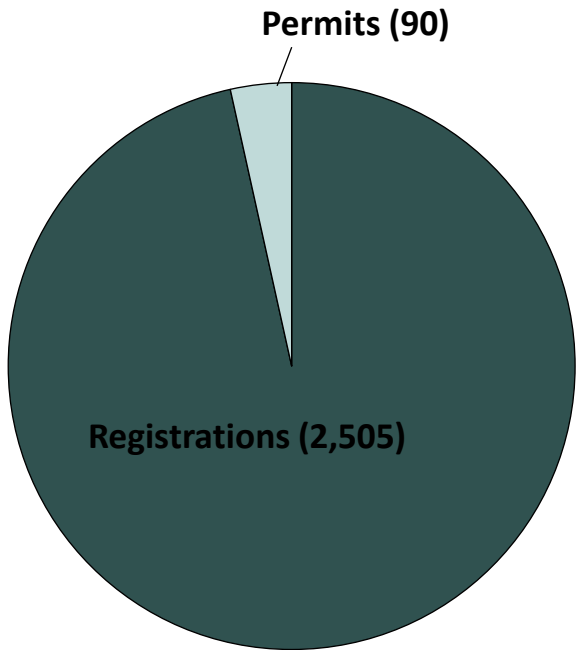
NHDES investigation of PFAS in domestic waste streams

- What are typical PFAS concentrations in domestic wastewater?

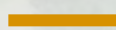

Approach: Sample wastewater monthly from a residential community septic system

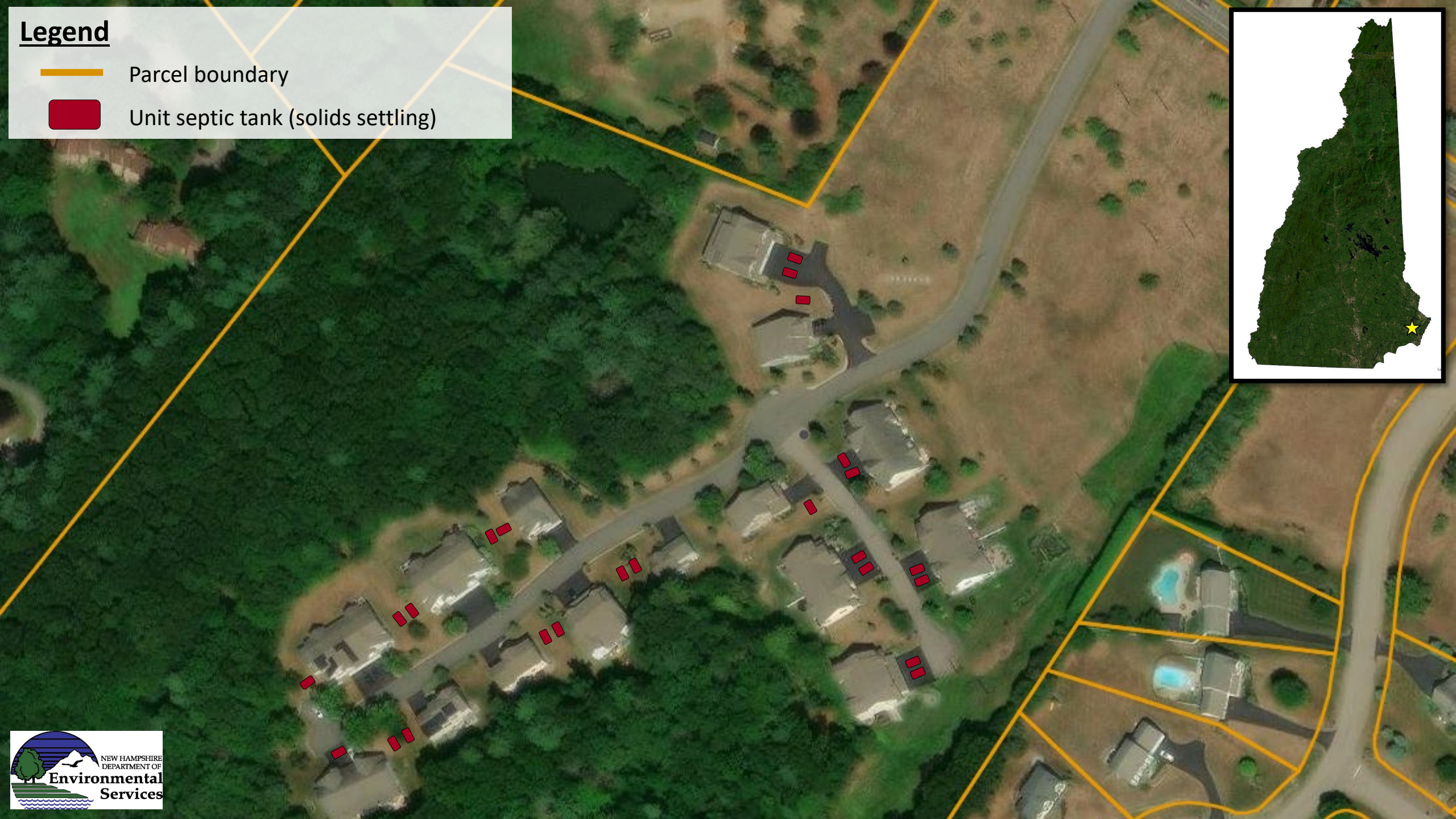
Groundwater Discharge and UIC Programs in New Hampshire

Criteria	Permit	Registration
Discharge volumes	Large (> 20,000 gpd)	Small (< 20,000 gpd)
Source of wastewater	Domestic and non-domestic	Nondomestic with no contaminants
Common types	Unlined lagoons, spray irrigation, rapid infiltration basins (RIBs), large septic systems	Geothermal systems, holding tanks, stormwater infiltration systems, small septic systems
Examples	WWTFs, community septic systems , manufacturing facilities, septage facilities	Drinking water treatment wastewater (backwash), stormwater, small businesses
Monitoring/sampling?	2x per year	One time sampling
Expiration	5 years	Indefinite



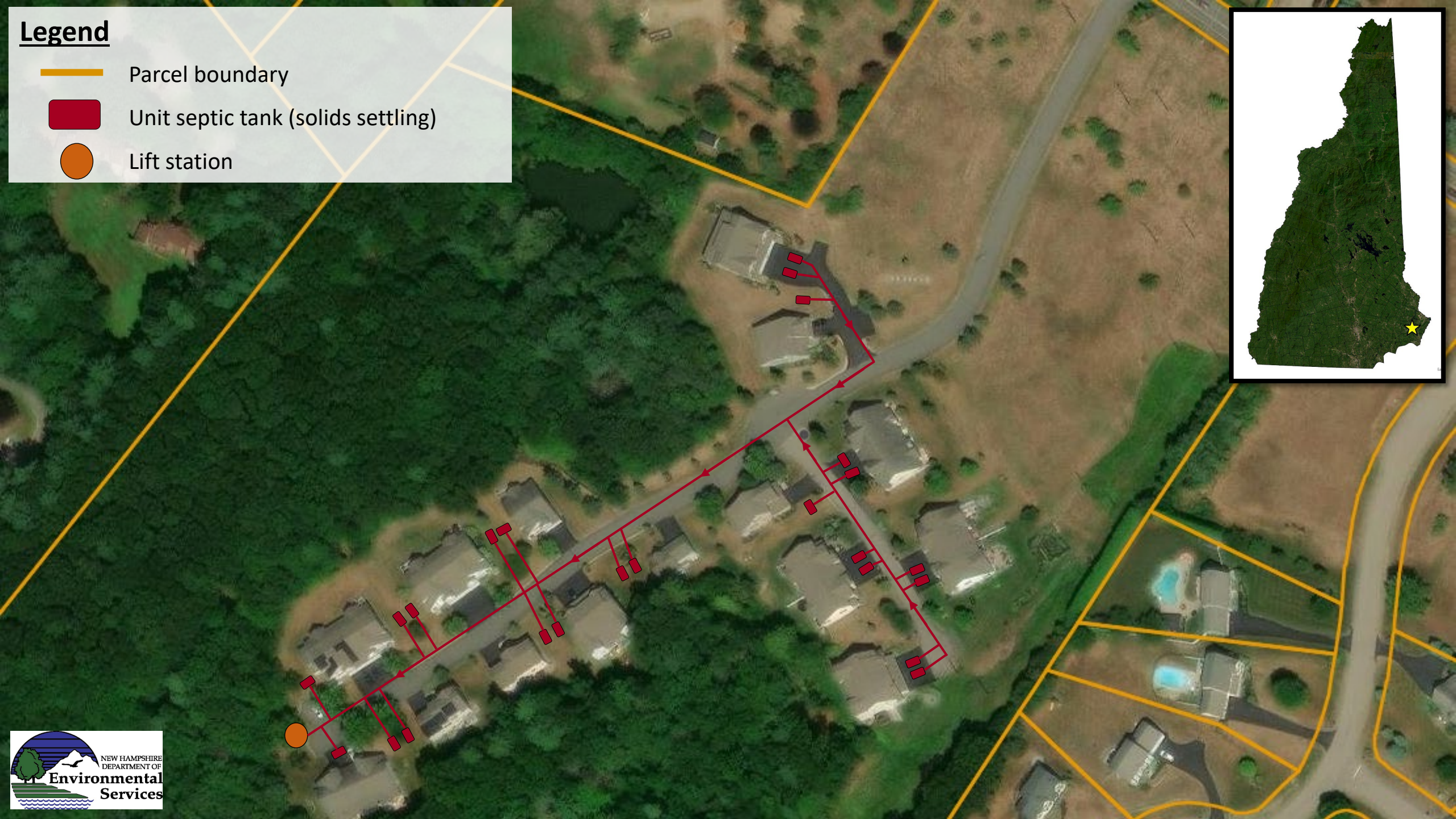
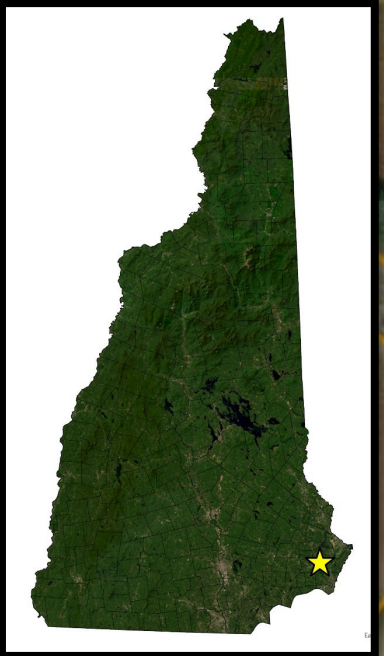
Legend

-  Parcel boundary
-  Unit septic tank (solids settling)



Legend

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- Lift station



Legend

- Parcel boundary
- Unit septic tank (solids settling)
- Lift station
- Nitrification/denitrification treatment

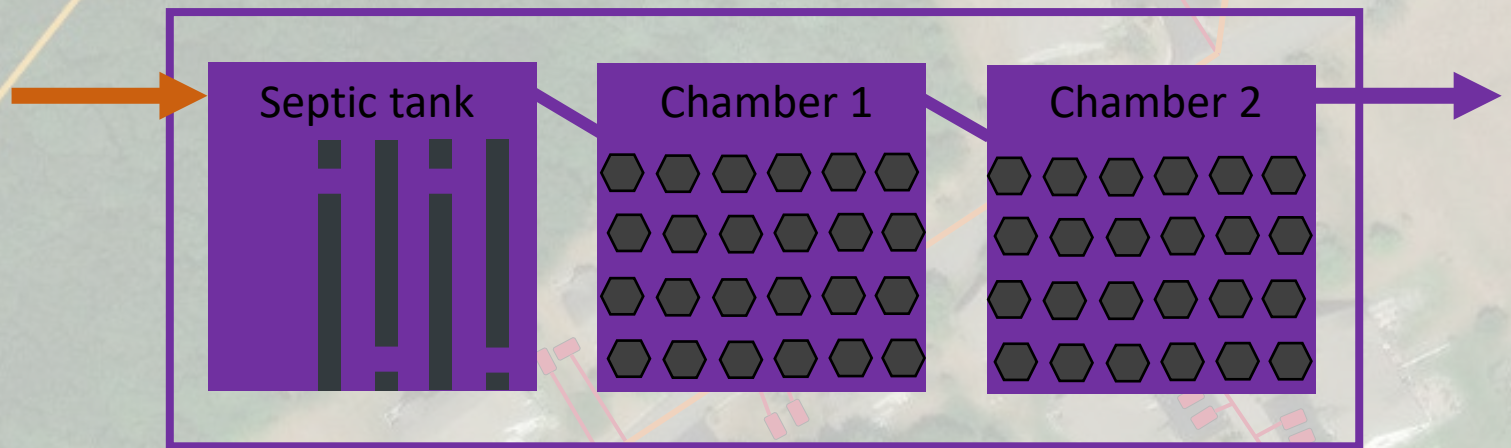


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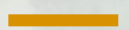




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Nitrification/denitrification treatment system



Legend

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-  Lift station
-  Nitrification/denitrification treatment
-  Leach field



Legend

- Parcel boundary
- Unit septic tank (solids settling)
- Lift station
- Nitrification/denitrification treatment
- Leach field
- Groundwater contour and flow
- Monitoring well



Legend

- Parcel boundary
- Unit septic tank (solids settling)
- Lift station
- Nitrification/denitrification treatment
- Leach field
- Groundwater contour and flow
- Monitoring well
- Private well



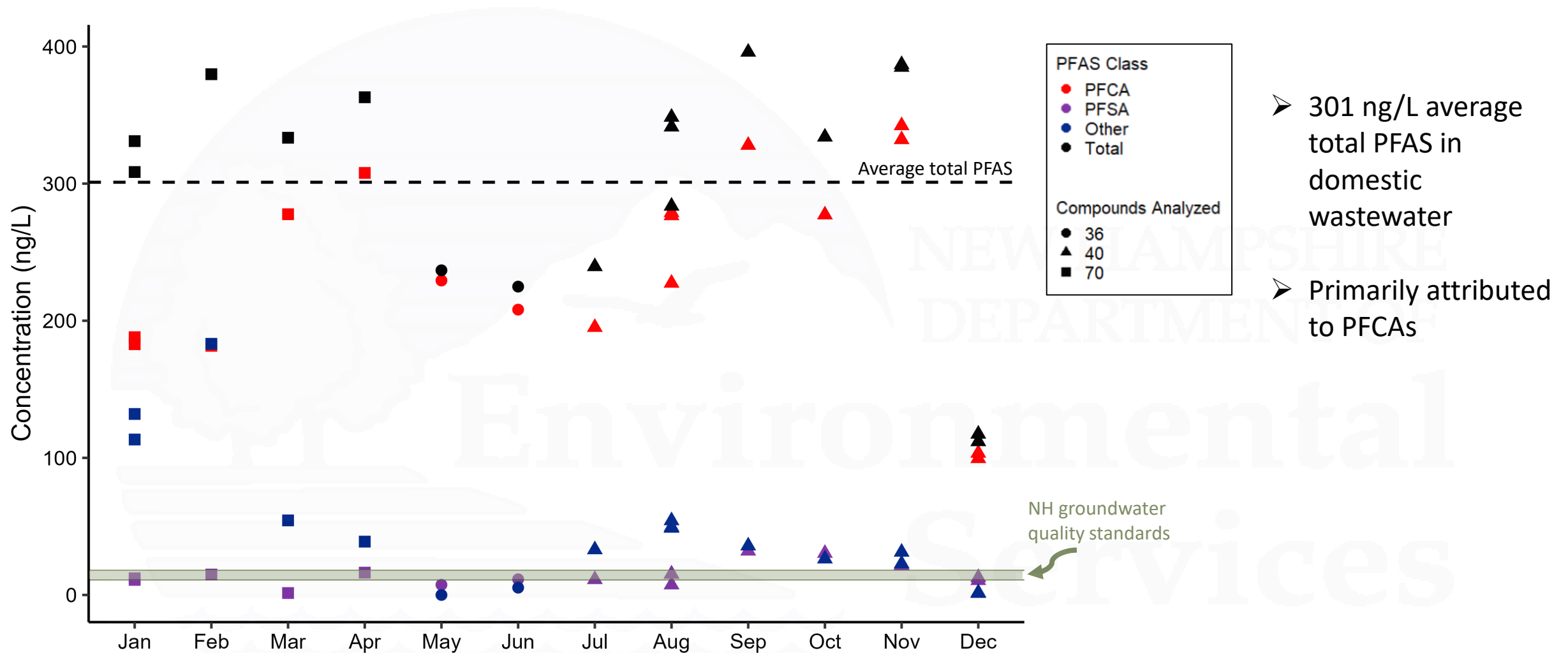
Domestic wastewater effluent sampling



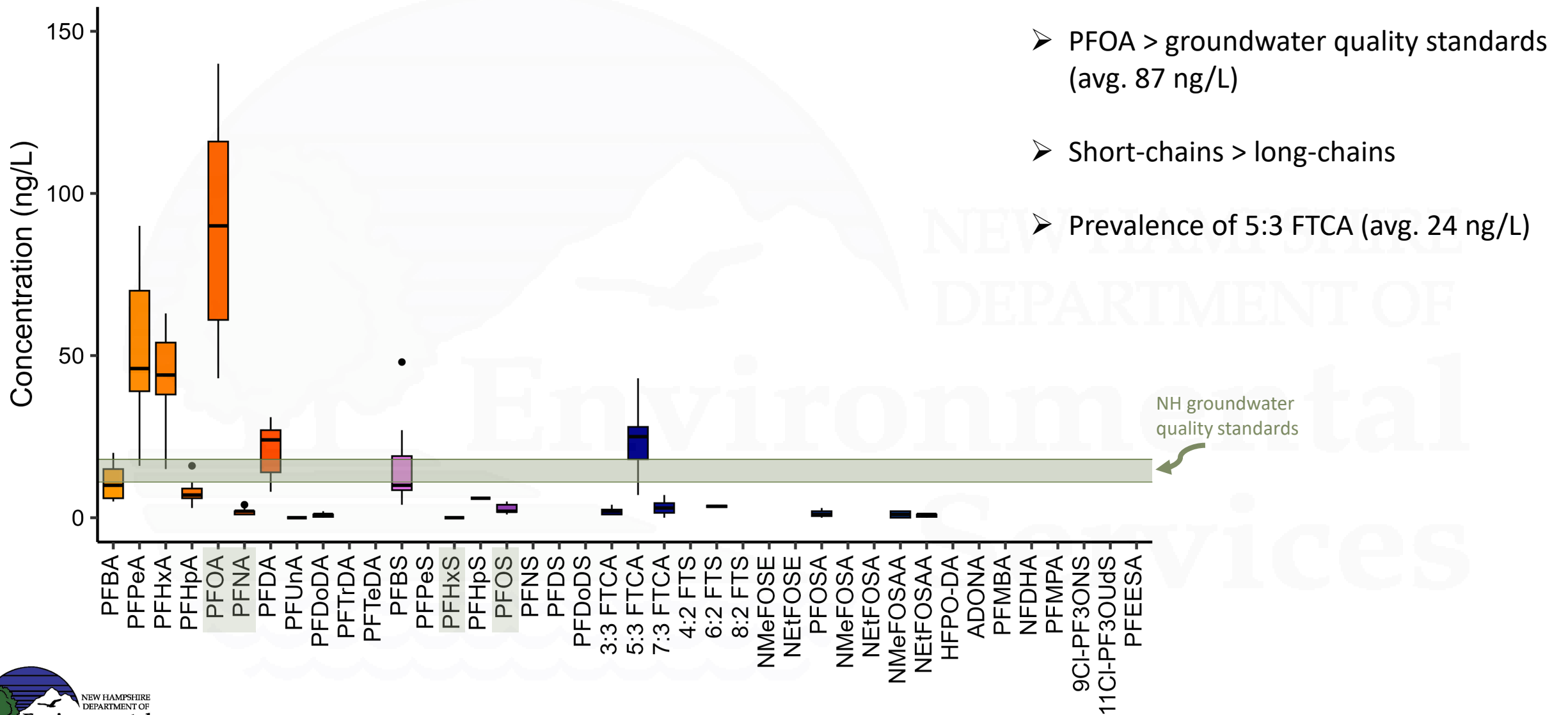
- Monthly grab samples of wastewater effluent (Jan to Dec 2023)
- PFAS analyses: 70 PFAS custom (4), 36 PFAS custom (2), EPA 1633 (6)



PFAS in domestic wastewater effluent



PFAS in domestic wastewater effluent



NHDES investigation of PFAS in domestic waste streams

➤ What are typical PFAS concentrations in domestic wastewater?

~300 ng/L, primarily attributed to PFOA, short-chain PFCAs, and 5:3 FTCA

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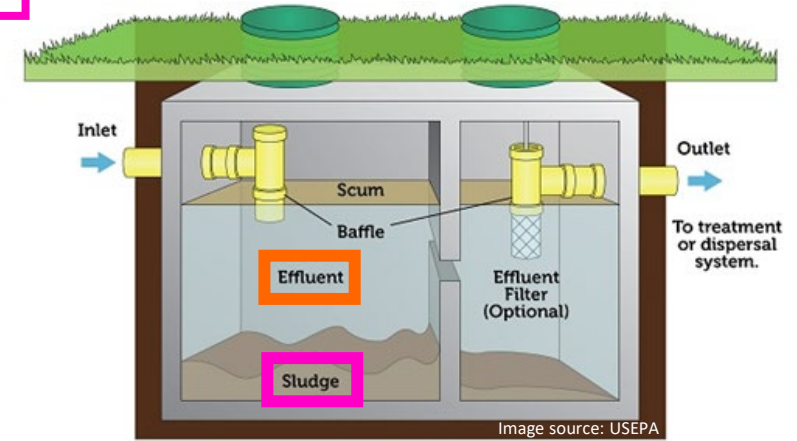
- Are PFAS selectively removed from wastewater during solids settling?

Approach: Sample septic tank supernatant and solids

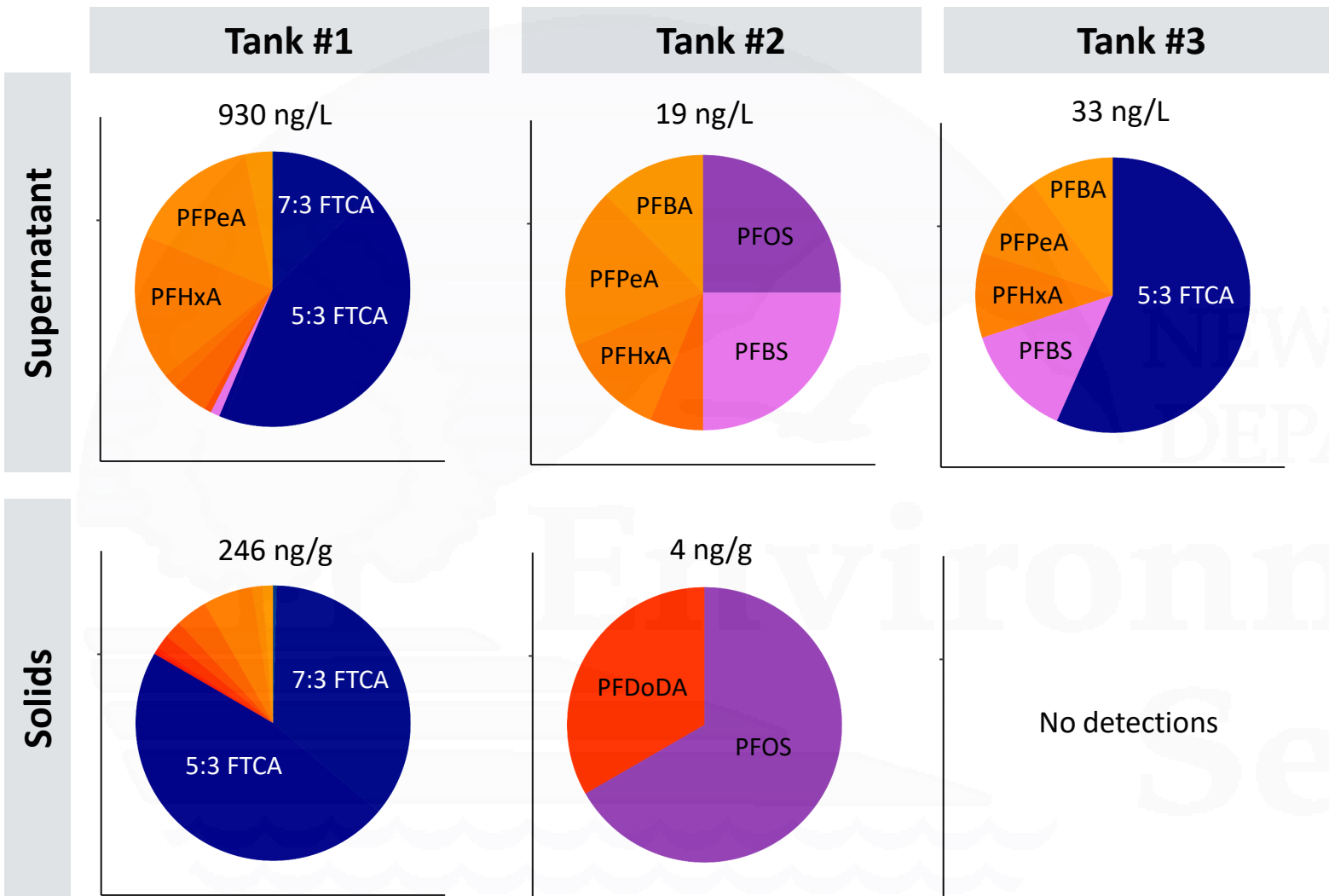
Domestic septic tank sampling



- Three grab samples from septic tanks (Sep 2023)
 - Supernatant and solids
- PFAS analysis by EPA 1633



PFAS in domestic septic tank supernatant and solids



➤ Tank to tank variability in PFAS concentration and composition

➤ PFAS fractionation: Long-chains/sulfonates in solids

➤ Prevalence of FTCAs

NHDES investigation of PFAS in domestic waste streams

- What is a typical PFAS load to the environment from domestic wastewater?

~300 ng/L, primarily attributed to PFOA, short-chain PFCAs, and 5:3 FTCA

- Are PFAS selectively removed from wastewater during solids settling?

Yes; however selectivity is dependent on influent PFAS levels

Ongoing domestic wastewater initiatives

- Expand scope of sampling
 - Other residential communities
 - Additional emerging contaminants
- Source identification
 - Wastewater derived from specific residential activities (e.g. laundry, carpet cleaning, etc.)
 - Off-the-shelf product sampling



Thank you



Jennifer Harfmann, Ph.D.

PFAS Discharge Analyst

NHDES Drinking Water and Groundwater Bureau

Jennifer.L.Harfmann@des.nh.gov

(603) 271-8647