AlexRenew

OVERVIEW OF PFAS IN WASTEWATER

ENVIRONMENTAL POLICY COMMISSION | JANUARY 26, 2026

Per- and Poly-fluoroalkyl Substances

Human-made
Naturally-occurring PFAS are extraordinarily rare

Do not break down naturally
Extremely strong carbon-fluorine bonds

Widely used in commercial applications
More than 5,000 PFAS compounds

Can have negative human health impacts
PFOA and PFOS have been linked to liver and cardiovascular issues, while the science is evolving on other compounds

PFAS

PFOS perfluorooctanesulfonic acid

PFOA perfluorooctanoic acid

Measuring PFAS

Typical wastewater limits are measured in parts per million (ppm); however, PFAS are measured in parts per billion (ppb) or parts per trillion (ppt), concentrations that are thousands of times smaller than normal. For comparison, 1 ppm would be 14 teaspoons in a swimming pool, 1 ppb would 1/100 of a teaspoon in the same swimming pool, and 1 ppt would be 1/100,000 of a teaspoon in a swimming pool

Illustrative aid; relative magnitude shown, not precise scale

Part

1

Part per thousand

1,000 times smaller than 1 part
0.0001

Parts per million

1,000 times smaller than 1 part per thousand
0.000001

Part per Billion

1,000 times smaller than 1 part per million
0.000000001

Part per Trillion

1,000 times smaller than 1 part per billion
0.000000000001

PFAS compounds are measured at these parts-per notation

PFAS in Everyday Products

PFAS compounds are used commonly in household products because they can repel water and stains, create smooth surfaces, or quickly extinguish fires. These chemical properties also make it very difficult to destroy PFAS compounds.

Firefighting foams

Water-repellent Clothing

Paint

Stain resistant products

Non-stick cookware

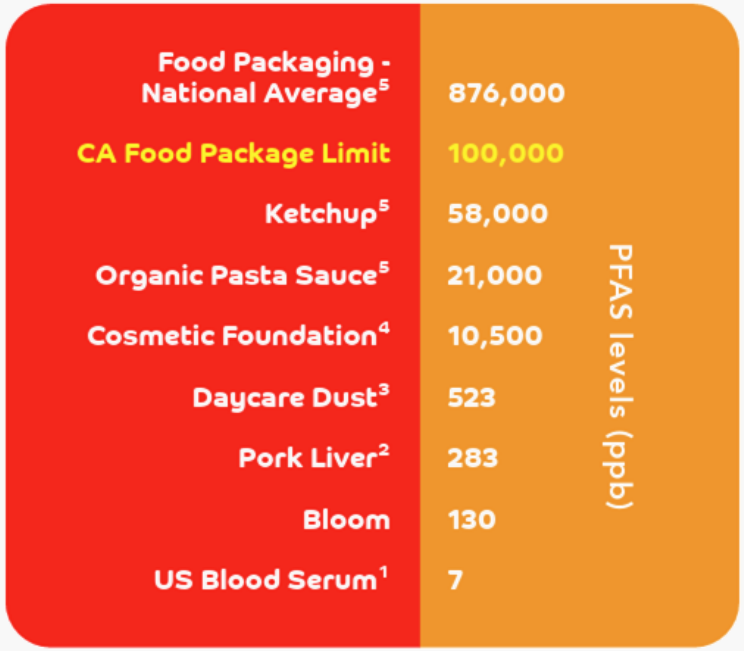
Stain resistant furniture

Food packaging

Cosmetics

PFAS Concentrations for Different Sources

The general population can be exposed to PFAS through a variety of sources, as demonstrated in this study conducted by DC Water in 2023.



[1] PFAS in the US population, ATSDR (cdc.gov)

[2] Concentrations of perfluoroalkyl substances in foods and the dietary exposure among Taiwan general population and pregnant women, ScienceDirect

[3] Per - and polyfluoroalkyl substances in paired dust and carpets from childcare centers, PubMed (nih.gov)

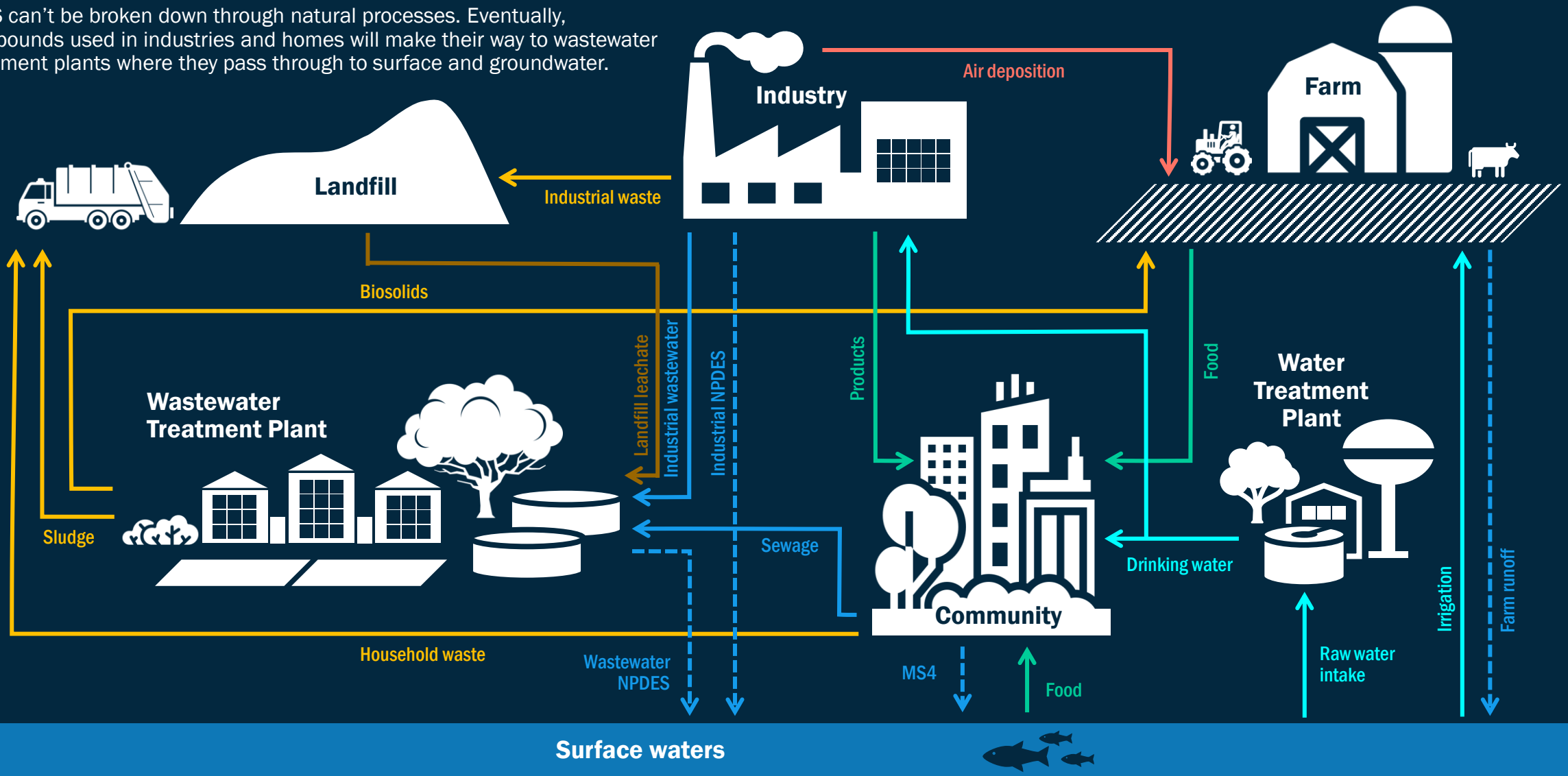
[4] Fluorinated Compounds in North American Cosmetics, Environmental Science & Technology Letters (acs.org)

[5] Toxic PFAS, the "Everywhere Chemicals," Are in Organic Pasta Sauce and Ketchup, Drugs, Pesticides, and Foodware, Sierra Club

Excerpt from DC Water's "PFAS: Understanding the Relative Risks"
https://bloomsoil.com/wp-content/uploads/2023/04/PFAS_biosolids_final.pdf

PFAS in the Water Cycle

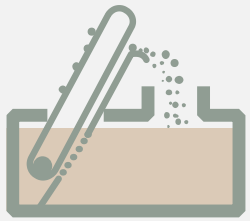
PFAS can't be broken down through natural processes. Eventually, compounds used in industries and homes will make their way to wastewater treatment plants where they pass through to surface and groundwater.



AlexRenew Wastewater Treatment Process

Preliminary

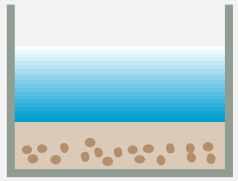
Raw Sewage



Coarse Screens and Raw Sewage Pumping Station

Wastewater generated from homes and businesses first passes through coarse screens to remove debris larger than a golf ball. Flows are then pumped up and through fine screens, and grit removal, which remove smaller debris.

Primary

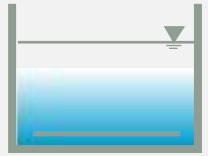


Primary Settling

The primary settling tanks allow heavier particles to sink to the bottom of the tanks for removal and lighter material like fats, oils, and grease to float to the top to be skimmed away.

Secondary

Biological Reactor Basins



Secondary Settling

AlexRenew's six (6) biological reactor basins use activated sludge, made up of millions of specialized microorganisms to consume organic material in wastewater. Next, our secondary settling tanks separate millions of microorganisms (biomass) from the treated, clear water.

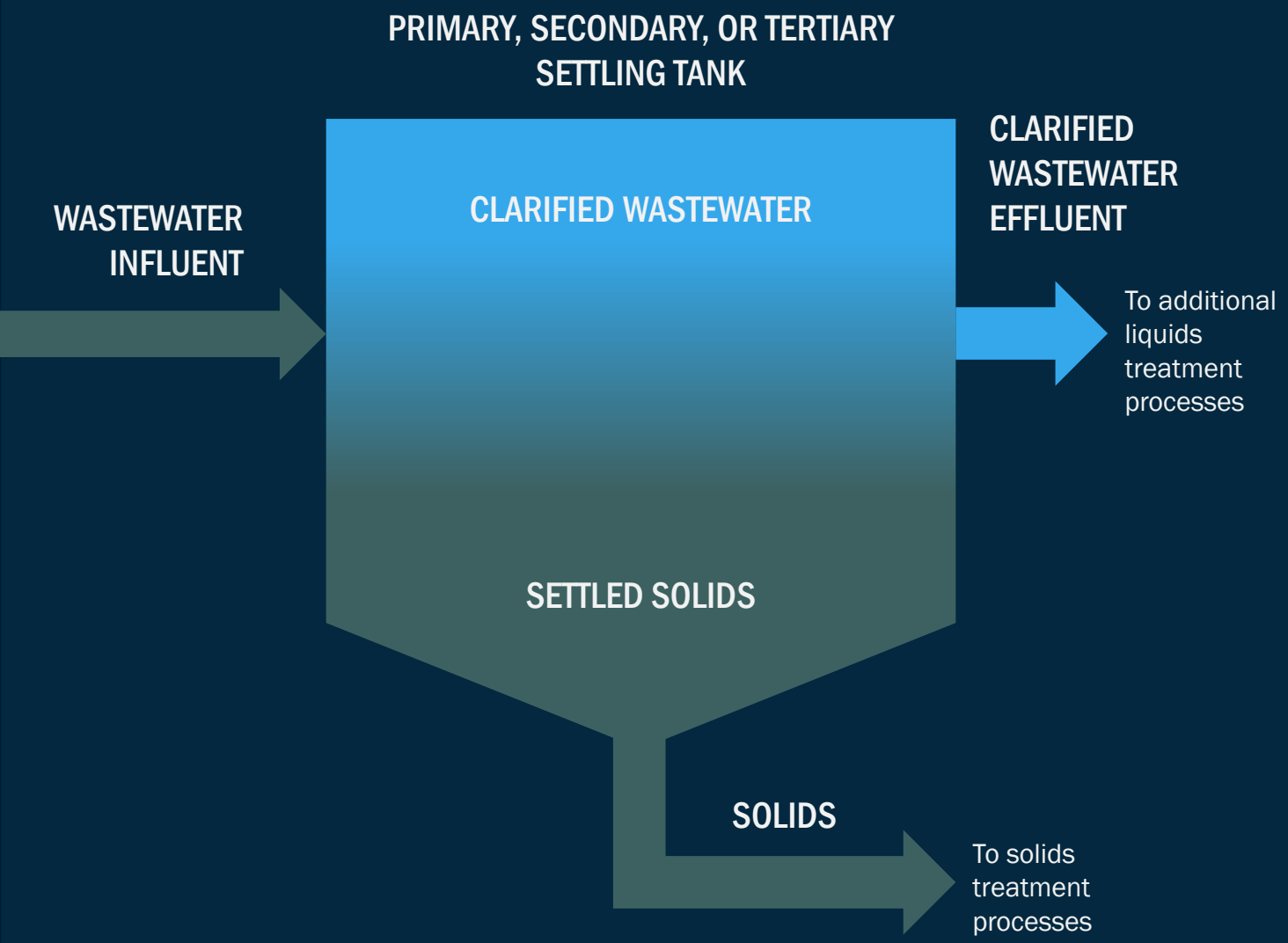
Tertiary and UV Disinfection

Tertiary Treatment

UV Disinfection

Final Effluent

The tertiary tanks and filters work to remove additional suspended solids and phosphorous through the settling and filtration process. In the final step of AlexRenew's treatment process, clean water passes under UV lights to sterilize pathogens — the final effluent is then safely returned to Hunting Creek.



What are Wastewater Solids?

Wastewater solids refers to the settled organic and inorganic solids that have been accumulated and separated from the liquid stream during the different phases of wastewater treatment.

CURRENT AND EMERGING PFAS REGULATIONS

DRINKING WATER

EPA NATIONAL PRIMARY DRINKING WATER STANDARDS

- Maximum Contaminant Levels for PFOA and PFOS at 4 ppt
- Solutions must be implemented by 2031

WASTEWATER

BIOSOLIDS

EPA Biosolids Regulations Revisions

- Published risk assessment as a first step

States

- Taking various approaches to limit PFAS in biosolids including monitoring, restrictions at ppb levels, and land application bans

EFFLUENT

EPA Aquatic Life Water Quality Criteria

- PFOA at 3,100,000 ppt
- PFOS at 71,000 ppt

AlexRenew's Approach to PFAS in Wastewater

AlexRenew is committed to protecting our waterways and community by taking proactive steps today to meet tomorrow's regulations. This includes identifying and minimizing PFAS entering our system, upgrading our infrastructure to minimize the impacts of PFAS, and establishing partnerships to explore treatment technologies.

Source minimization

- Sampling interceptors to understand PFAS levels in wastewater influent
- Sampling industrial users within the collection system to identify potential "hot spots"

Monitoring

- Monitoring influent, effluent, and biosolids PFAS levels on a quarterly basis
- Reviewing chemicals and equipment used in our processes to determine if we are adding PFAS during treatment

Investing

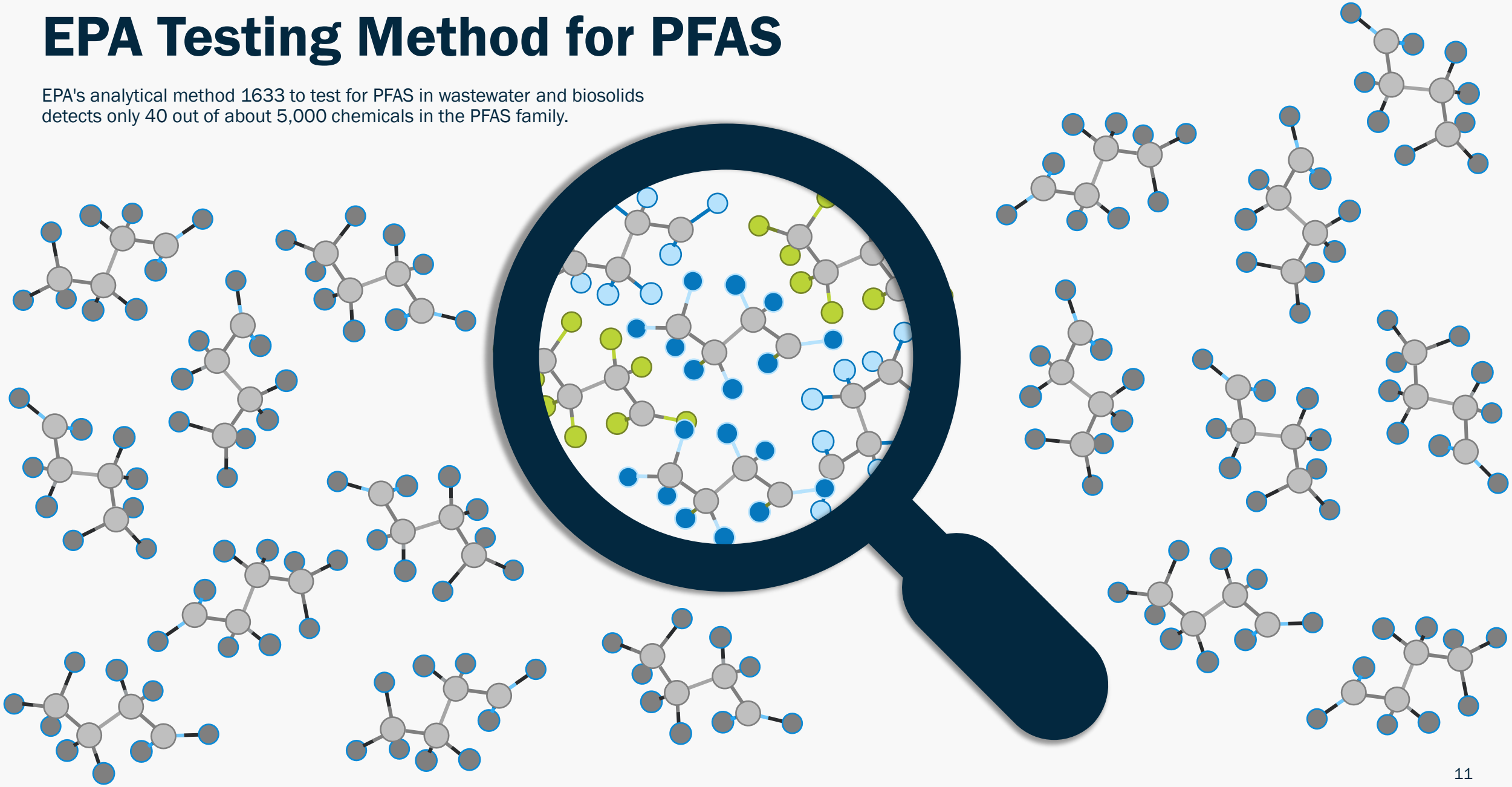
- Investing $355 million in the Biosolids Diversification project to develop alternative recycling options for biosolids at AlexRenew

Partnering

- Developing a regional study to explore alternatives to land application of biosolids
- Working with various stakeholders to establish statewide requirements for biosolids PFAS testing

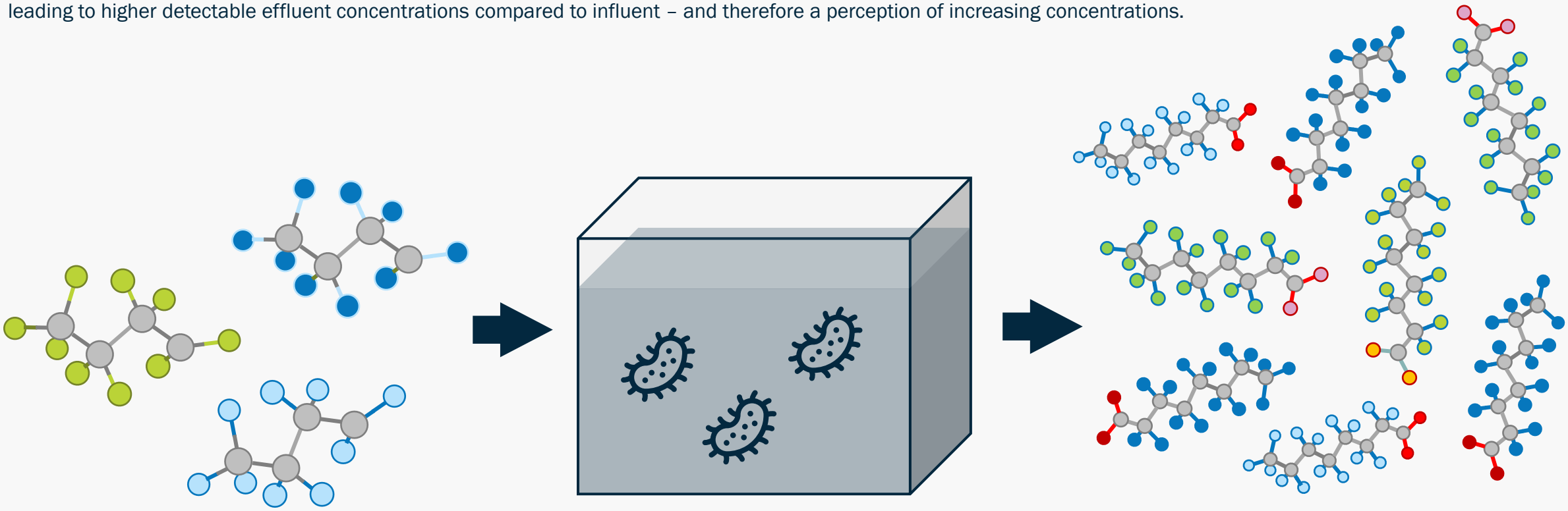
EPA Testing Method for PFAS

EPA's analytical method 1633 to test for PFAS in wastewater and biosolids detects only 40 out of about 5,000 chemicals in the PFAS family.



PFAS Transformation in Wastewater Processes

Biological processes in wastewater treatment plants can transform PFAS into compounds that are detectable by EPA's analytical method, leading to higher detectable effluent concentrations compared to influent – and therefore a perception of increasing concentrations.



Influent

Detectable and **non-detectable** PFAS compounds

Wastewater biological processes

PFAS compounds can undergo transformations, breaking down from **non-detectable** compounds into detectable PFAS compounds

Effluent

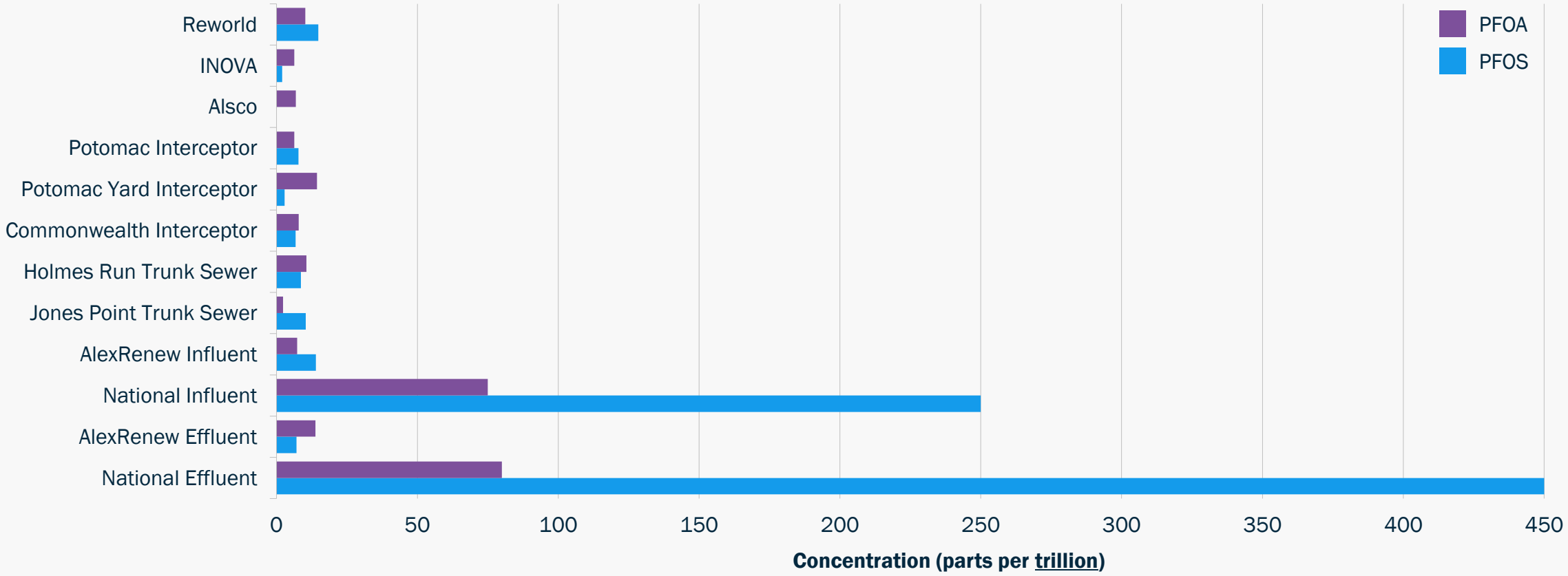
Studies have shown a greater number and concentration of detectable PFAS compounds in wastewater effluent than influent (due to the breakdown of **non-detectable** PFAS compounds)

Wastewater Collection Sampling

AlexRenew is currently sampling for PFAS within its service area, with a focus on its interceptors and industrial users.

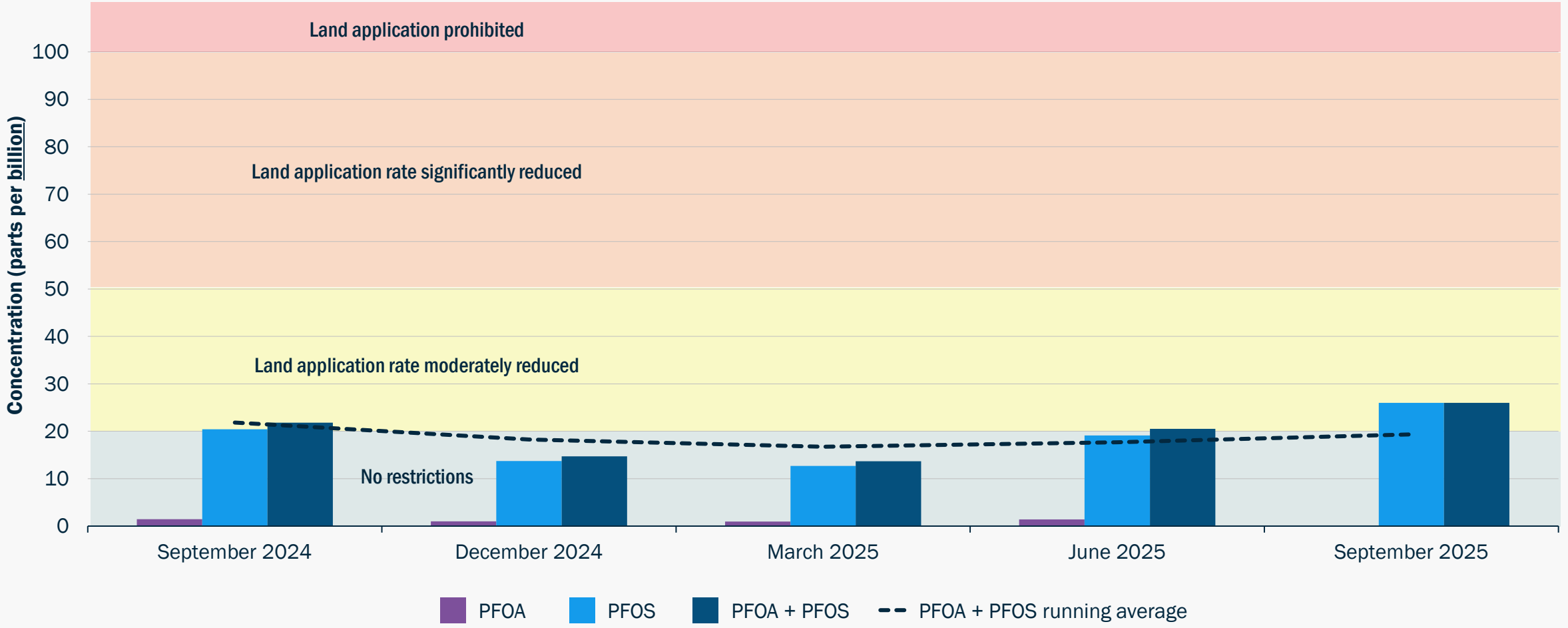
Results of Collection System and Industrial Sampling

AlexRenew is currently sampling for PFAS within its service area, with a focus on its interceptors and industrial users. Sampling results show PFOA and PFOS concentrations within the range typical for primarily residential communities with no outliers identified.



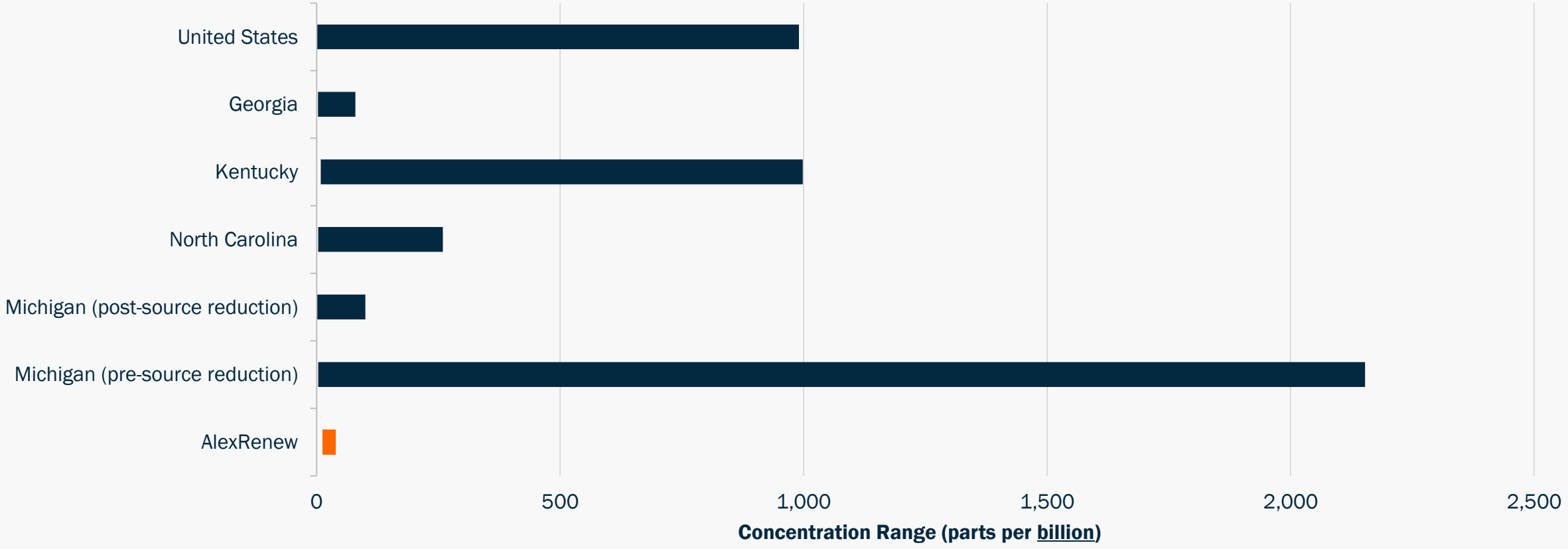
Concentrations of PFAS in AlexRenew Biosolids

Quarterly sampling of AlexRenew's biosolids show concentrations that are typical of residential communities. When compared to tiered regulatory limits, such as those adopted by Maryland and Michigan, these concentrations are at the upper limit for unrestricted land application.



National Biosolids PFOS Concentrations

On January 12, 2026 the North Carolina Department of Environmental Quality (DEQ) released a preliminary study of PFAS in biosolids and wastewater. The study is the agency's first investigation assessing PFAS concentrations in biosolids across the state. The graph below was developed using data provided in the North Carolina DEQ study, which shows AlexRenew PFOS concentrations are at the very lower end of PFAS ranges across the United States (and currently available).



NOVA Regional Biosolids Study

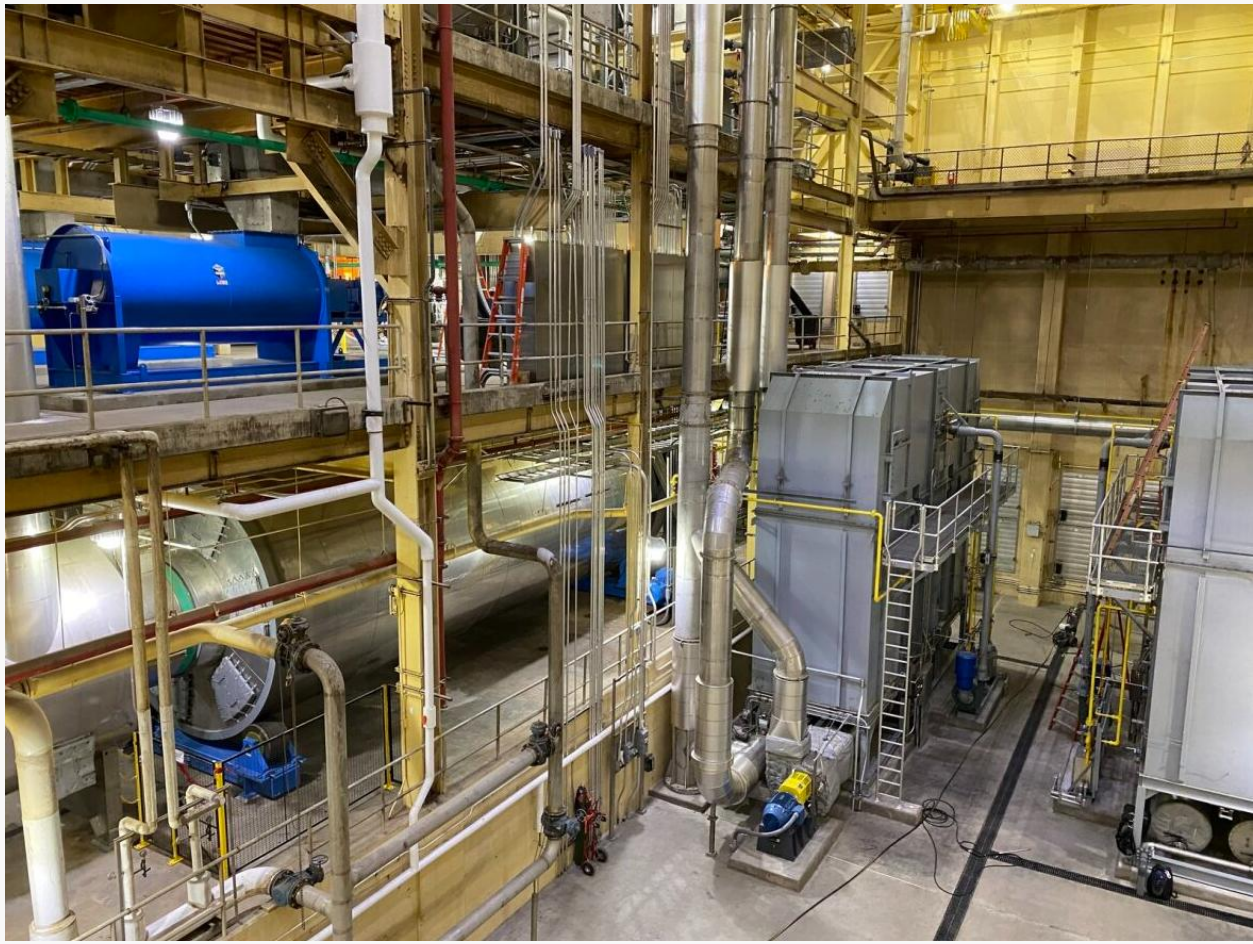
In anticipation of more stringent biosolids management regulations, AlexRenew, Arlington County, Fairfax County, Fauquier County Water and Sewer Authority, Loudoun Water, Prince William Water, and Upper Occoquan Service Authority are exploring viable alternatives to land application through a joint regional study.

AlexRenew's Biosolids Diversification Project

AlexRenew is investing $355M to upgrade its biosolids system by replacing aging equipment and adding a thermal drying facility.

Goals

1. Reinvest in equipment that has reached its useful life
2. Replace equipment with reliable, proven technology
3. Reduce the volume of AlexRenew biosolids
4. Diversify the end use of AlexRenew's biosolids
5. Support AlexRenew's sustainability goals
6. Build environmentally-beneficial local partnerships
7. Adapt to future regulatory requirements



Louisville, KY thermal drying system for biosolids

Diversifying the End Use of AlexRenew Biosolids

AlexRenew's Biosolids Diversification Project will result in a system that produces a dried product that can be used in several beneficial applications.

Dewatered biosolids 'cake' is produced in the anaerobic digesters. The cake typically has a 75% moisture content. This is what AlexRenew currently land-applies.

Thermal drying is a proven technology that uses heat and motion to dry and consolidate biosolids cake into dried pellets.

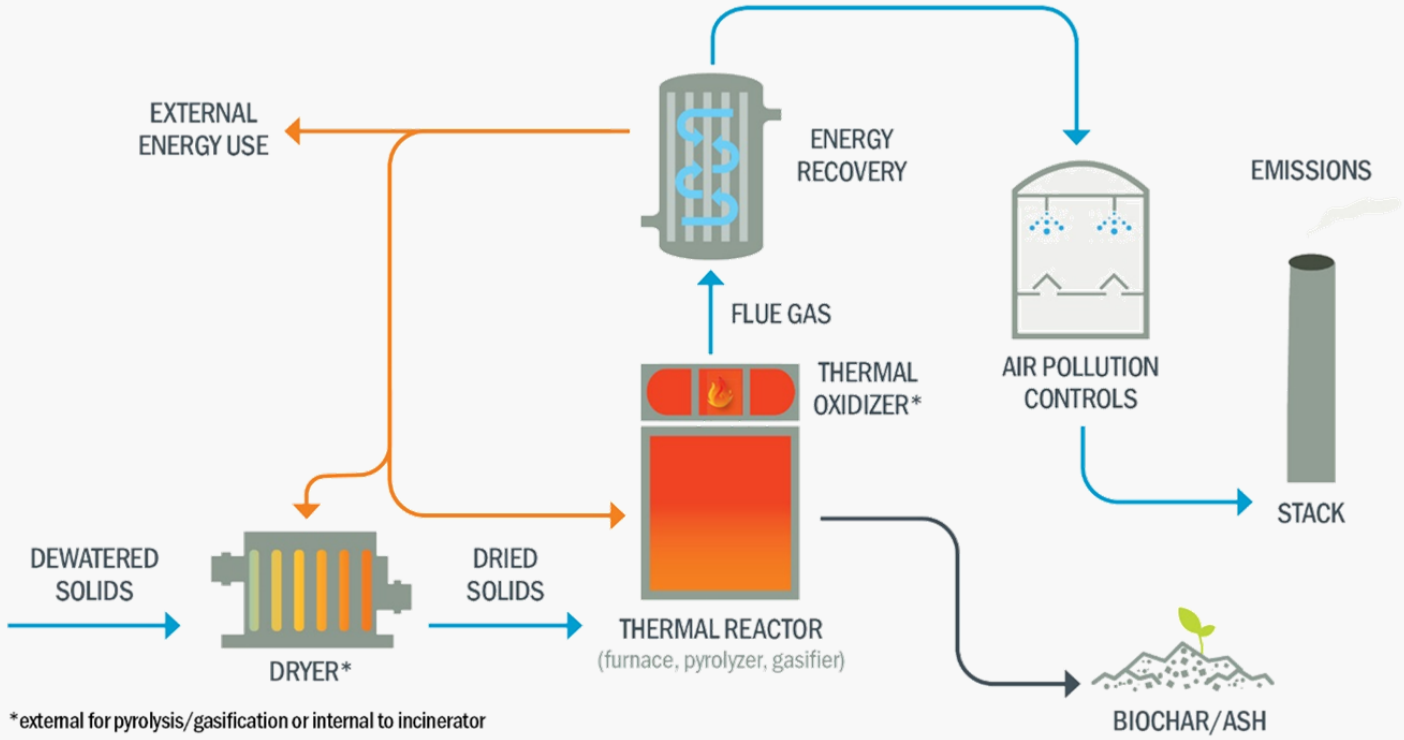
Resulting dried pellets have a 5% moisture content. Going from cake to pellets reduces the produced volume of solids by 60% and expands potential end-uses.

- Land application
- Waste-to-energy
- Regional facility
- Future technologies (e.g. pyrolysis, other)

Thermal Technologies for Biosolids Management

Incineration is the only proven at-scale (AlexRenew level) thermal process for biosolids processing. Emerging technologies such as pyrolysis, gasification, and others are still being evaluated for scale and broader adoption.

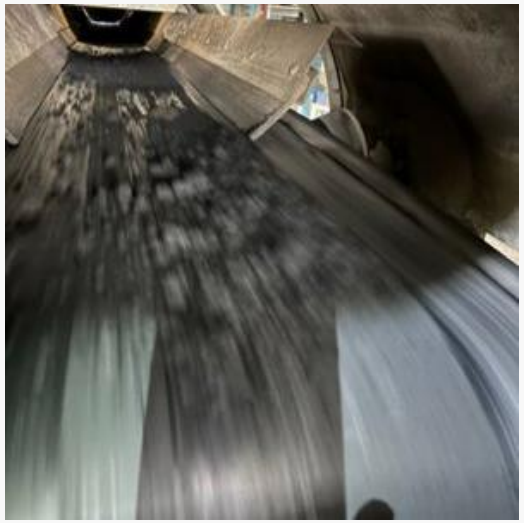
- Incineration (combustion) offers the only thermal process with historical track record
- Pyrolysis and gasification are emerging technologies
  - Only about 5 demonstration units in the U.S.
  - None have been proven at scale
- Other emerging technologies further behind:
  - Hydrothermal liquefaction
  - Hydrothermal carbonization
  - Supercritical water oxidation
  - Smoldering



Winchell, L. J., Ross, J. J., Brose, D. A., Pluth, T. B., Fonoll, X., Norton, Jr., J. W., and Bell, K. Y. (2022a). High-temperature Technology Survey and Comparison Among Incineration, Pyrolysis, and Gasification Systems for Water Resource Recovery Facilities. Water Environment Research, 94. https://onlinelibrary.wiley.com/doi/10.1002/wer.10715

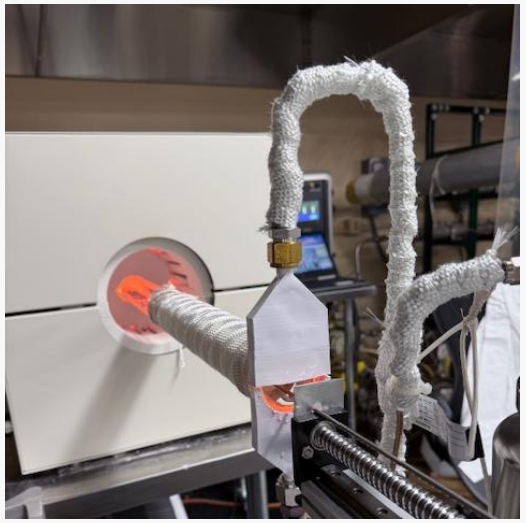
AlexRenew Incineration Study

AlexRenew biosolids are being tested in a laboratory incineration system using current analytical methods to track PFAS under conditions to mimic full-scale solid waste incineration systems.



Sample biosolids

Collect biosolids and then spike with PFAS for experimental assessment



Mimic incinerator

Bench scale system set up to mimic municipal solid waste incineration conditions – University of Dayton Research Institute

Burn samples

Introduction of biosolids into experimental furnace

Analyze samples for PFAS

Use USEPA methods (1633A, OTM-45, and OTM-50) to track PFAS through incineration system

Co-incineration Case Study

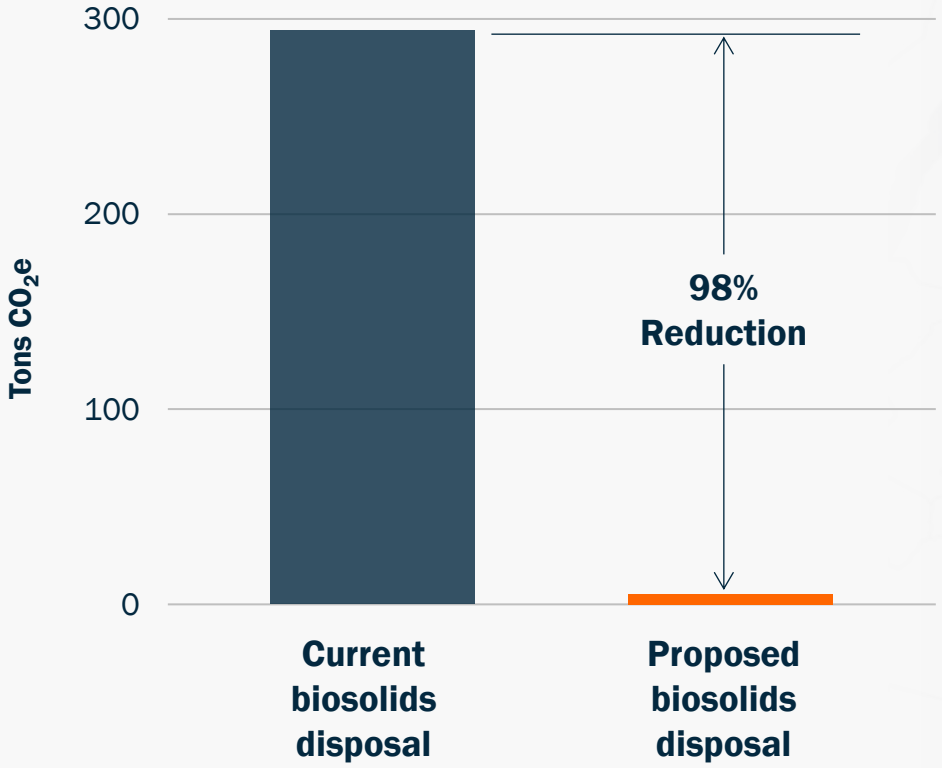
Reworld operates a waste-to-energy facility in Kapolei, HI that co-incinerates municipal waste and biosolids.

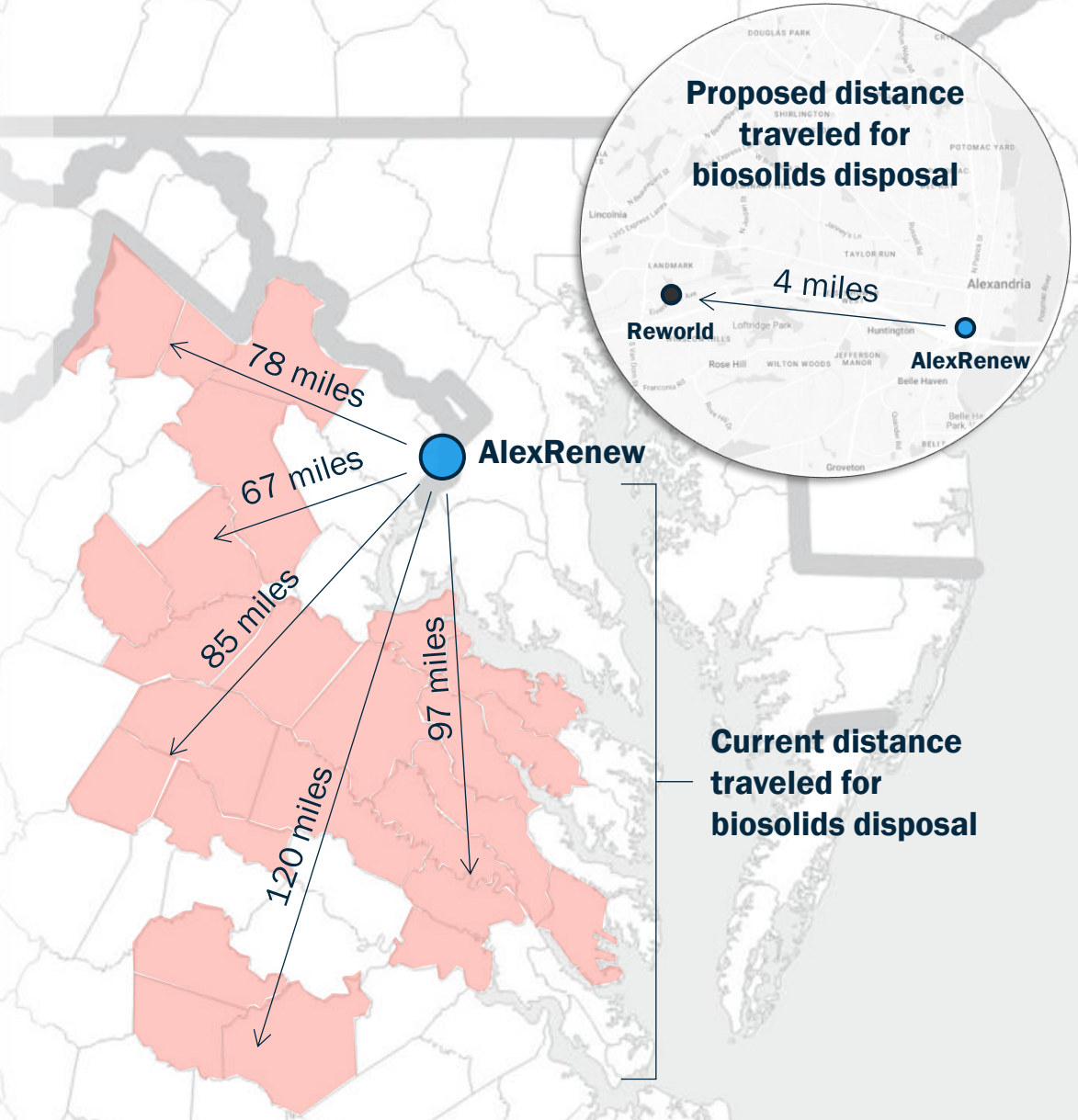
H-POWER co-incineration facility in Kapolei, HI

- H-POWER facility in Kapolei, HI (Honolulu)
- Operated by Reworld
- Opened in 2015
- First-of-its-kind
- Injects biosolids directly into the facility's mass burn unit
- Benefits:
  - Redirects 20,000 tons of biosolids per year from the landfill
  - Equivalent to 20,000 barrels of oil, generating enough electricity to power 1,500 homes

AlexRenew Greenhouse Gas Emission Reductions

Using a local facility for future biosolids pellet incineration is projected to reduce greenhouse gas emissions from AlexRenew's biosolids transportation by 98 percent, providing a local, sustainable option to land-application.





Reductions are equivalent to removing 50 passenger cars from the road, permanently

Pivoting from land-application to local processing would reduce GHG emissions from almost 300 tons of CO_2e per year to less than 6. This is the yearly equivalent to removing 50 passenger cars from the road permanently.

Local Energy Generation

Drying biosolids releases its embedded energy. AlexRenew's future biosolids pellets will have more than 6,000 British thermal units (BTU) per pound; which, at current production levels can power 2,800 houses for one year.

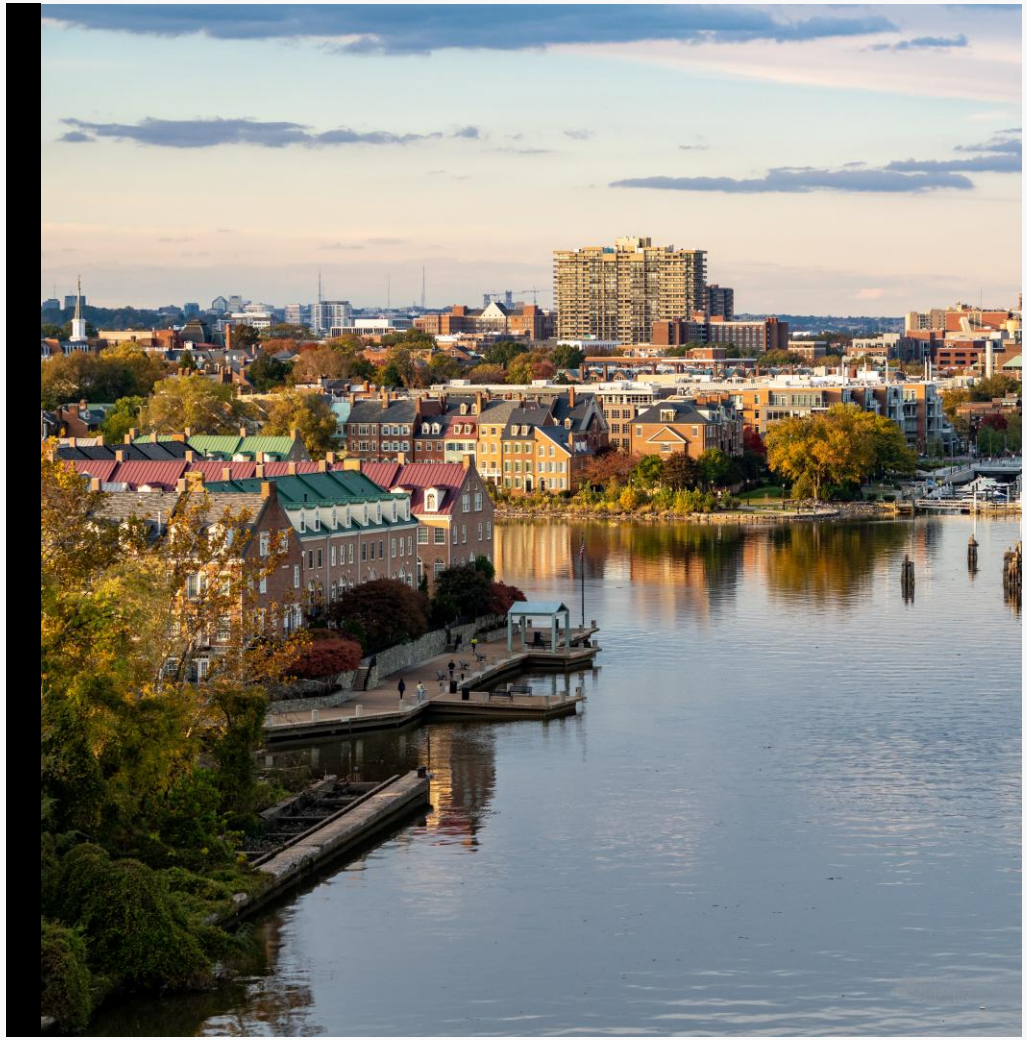
33,695,705
Total kWh (per year)

92,317
Total kWh (per day)

Enough energy to power 2,800 houses for one year

Major Takeaways

- PFAS are widely used in everyday products like non-stick cookware, stain-resistant fabrics, and firefighting foam
- Traditional wastewater treatment technology does not remove or destroy PFAS
- These substances typically accumulate in wastewater biosolids
- AlexRenew's multiprong approach includes strategic regional partnerships and a $355 million investments to reduce the volume and diversify the end use of AlexRenew biosolids
    - Our plan supports the City's environmental goals and local partners



Working with local stakeholders to drive change

- Tackling this challenge in will require a united effort from producers, users, and receivers of PFAS
- Together, we can reduce PFAS use, promote sustainable alternatives, protect public health and our environment


AlexRenew