



## Costs of PFAS Treatment and Destruction

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# Municipal wastewater and PFAS

Municipal wastewater treatment plants do not produce PFAS, but they do receive wastewater that contains PFAS.



# Study Questions

- 1) How do you treat and destroy PFAS in municipal wastewater & biosolids?
- 2) What are the costs?
- 3) Are the costs affordable?

- 1) With currently available technologies
- 2) To low levels (e.g. non-detect)





## Evaluation of Current Alternatives and Estimated Cost Curves for PFAS Removal and Destruction from Municipal Wastewater, Biosolids, Landfill Leachate, and Compost Contact Water

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### RESEARCH ARTICLE

## Is removal and destruction of perfluoroalkyl and polyfluoroalkyl substances from wastewater effluent affordable?

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#### Abstract

Several jurisdictions are currently evaluating regulatory standards for perfluoroalkyl and polyfluoroalkyl substances (PFAS) in municipal water resource recovery facility (WRRF) effluent. Effective and responsible implementation of PFAS effluent limits should consider the costs and capabilities of currently available technologies, because the costs of meeting WRRF PFAS limits could disproportionately fall to ratepayers. Cost curves were developed for currently available PFAS separation and destruction options, assuming effluent treatment targets near current analytical detection limits. Removing and destroying PFAS from municipal WRRF effluent is estimated to increase costs per household by a factor of between 2 and 210, using Minnesota-specific data as an example. Estimated costs per household would increase more for residents of smaller communities, averaging 33% of median household income (MHHI) in communities smaller than 1000 people. This exceeds the U.S. Environmental Protection Agency (EPA)-developed affordability index of 2% of MHHI by a factor of 16. Estimated costs per household to remove and destroy PFAS varied among locations, primarily based on WRRF and community size, median income, rural versus urban, and type of wastewater treatment processes currently used.

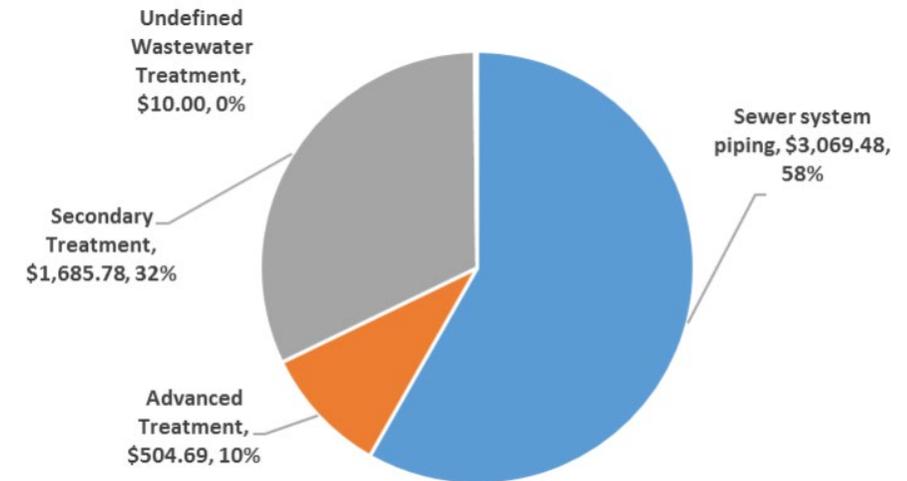
Final report complete

Published in peer-reviewed journal

# Major study results

**Table ES-2 Summary of estimated 20-year costs for managing PFAS in targeted waste streams in Minnesota<sup>[1]</sup>**

Waste Stream	Estimated Number of Facilities	Range of Flows	Estimated 20-year costs for Minnesota (Millions of USD) <sup>[2]</sup>
Municipal WRRF effluent <sup>[3]</sup>	283	0.1–300 MGD	\$12,000–\$25,000
Municipal WRRF biosolids <sup>[4]</sup>	1 regional facility, plus 50 on-site facilities	50 dry tons of wastewater solids per day (dtpd) regional facility, on-site for 1–10 dtpd	\$1,600–\$3,300

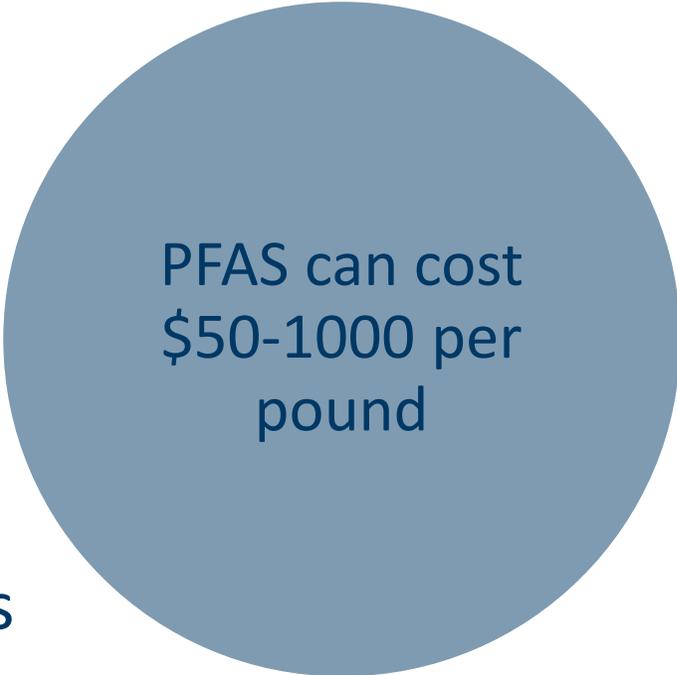


**Context:** Minnesota needs \$5.3 billion just to maintain current wastewater infrastructure.

# Why are PFAS so expensive to treat and destroy?

PFAS are challenging for engineers:

- Slippery
- Basically indestructible
- Cannot biodegrade
- Can biotransform
- Have low treatment targets
- Are always present

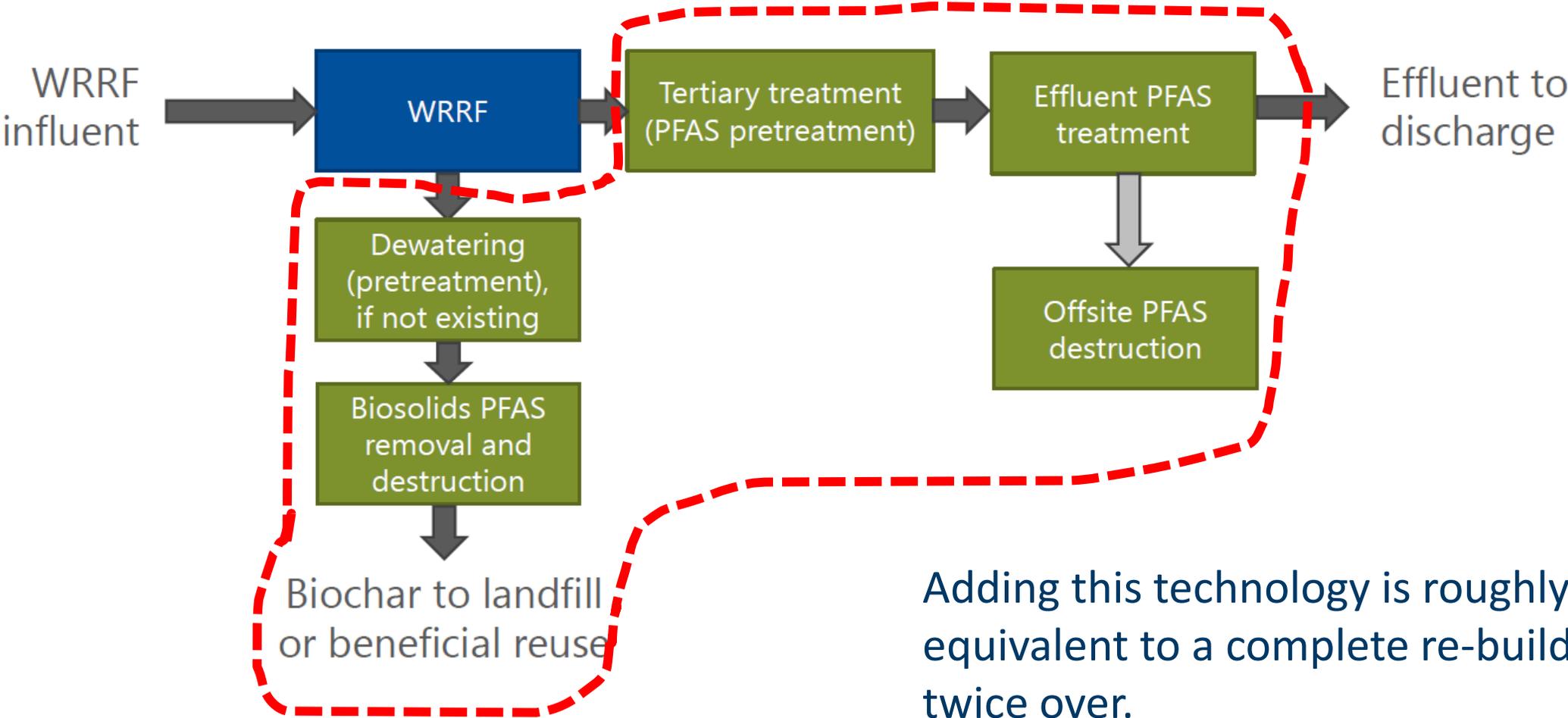


PFAS can cost  
\$50-1000 per  
pound



\$2.7-18 million  
per pound to  
remove and  
destroy PFAS  
from municipal  
wastewater

# Wastewater technologies for PFAS



Adding this technology is roughly equivalent to a complete re-build twice over.

# What do these technologies look like?



Metro plant would need more than 450 of these 60,000-lb granular activated carbon vessels.



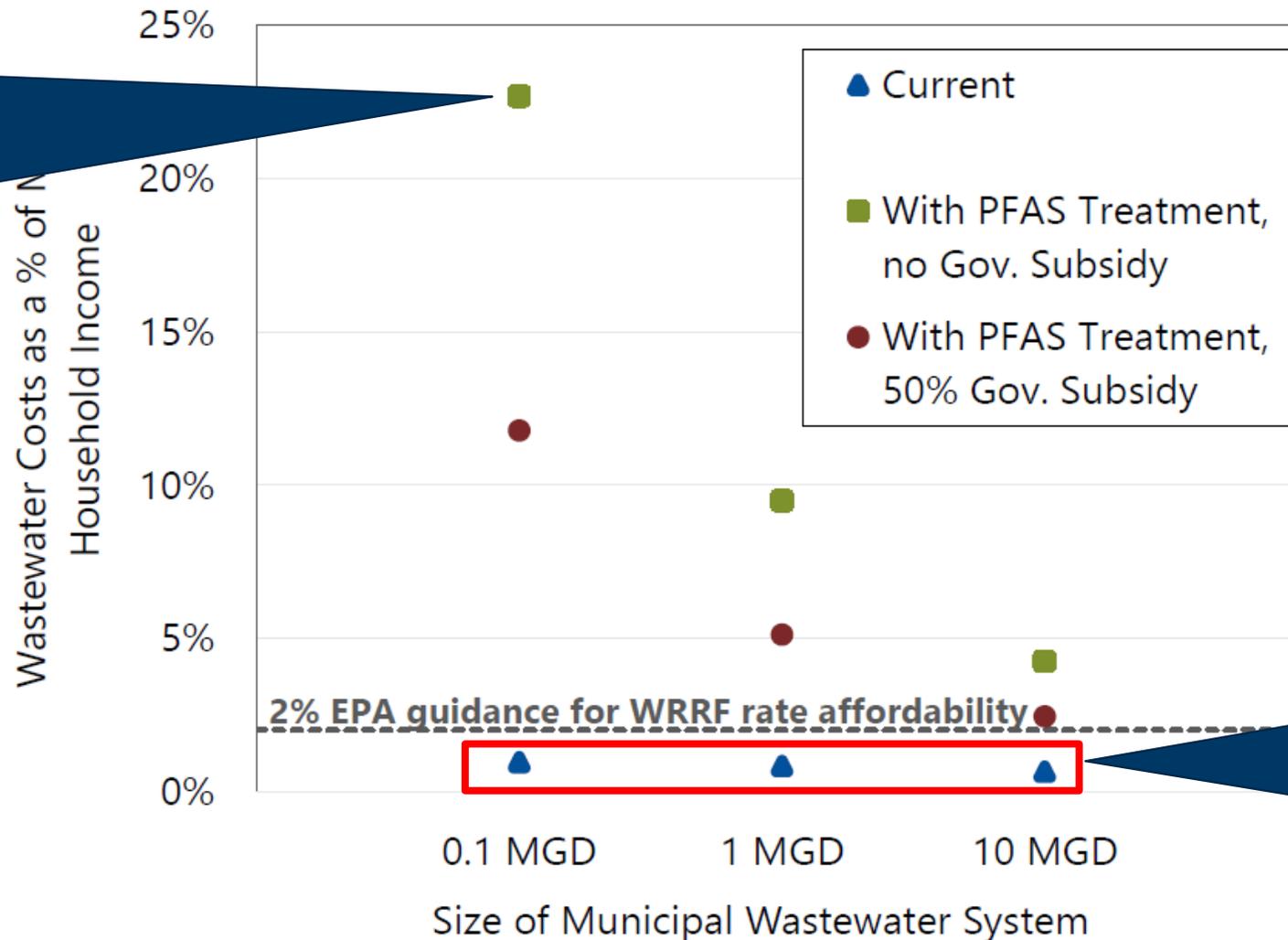
Pyrolysis/gasification facility



Large hazardous waste incinerator

# Are these PFAS treatment costs affordable?

Rates of \$300-\$400 per month are unaffordable



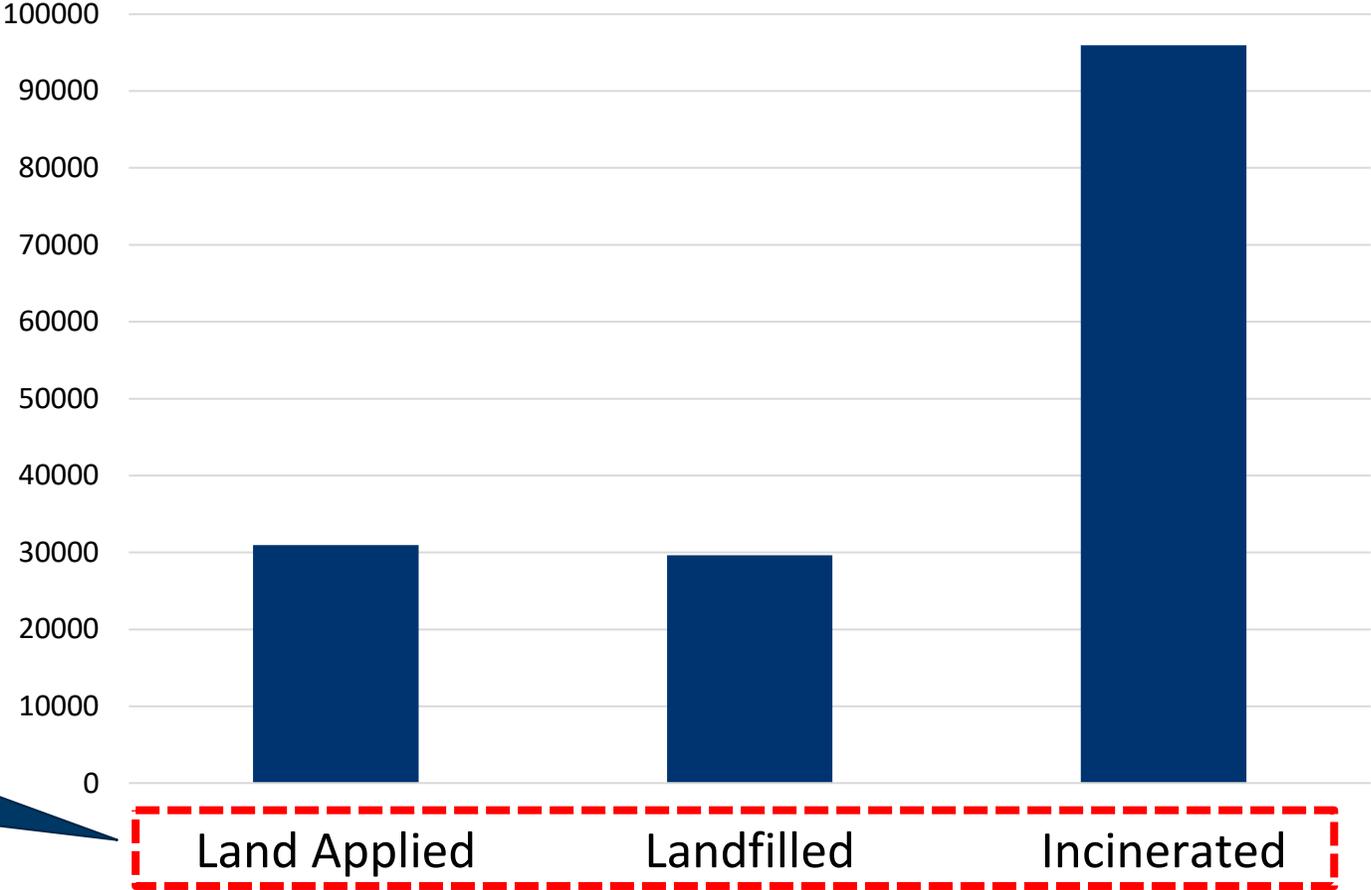
Current wastewater rates are affordable

# What about PFAS in biosolids?

All municipal biosolids contain PFAS at low levels\*

**Dry Tons per Year (5 Year Avg)**

**Minnesota biosolids production rates**



Current disposal methods just move PFAS around

# New biosolids technologies are promising

## PFAS biosolids destruction technologies:

- GHG-neutral energy
- All-organic contaminant destruction
- Volume reduction
- 5-7 year cost payback



# What do biosolids destruction technologies look like?



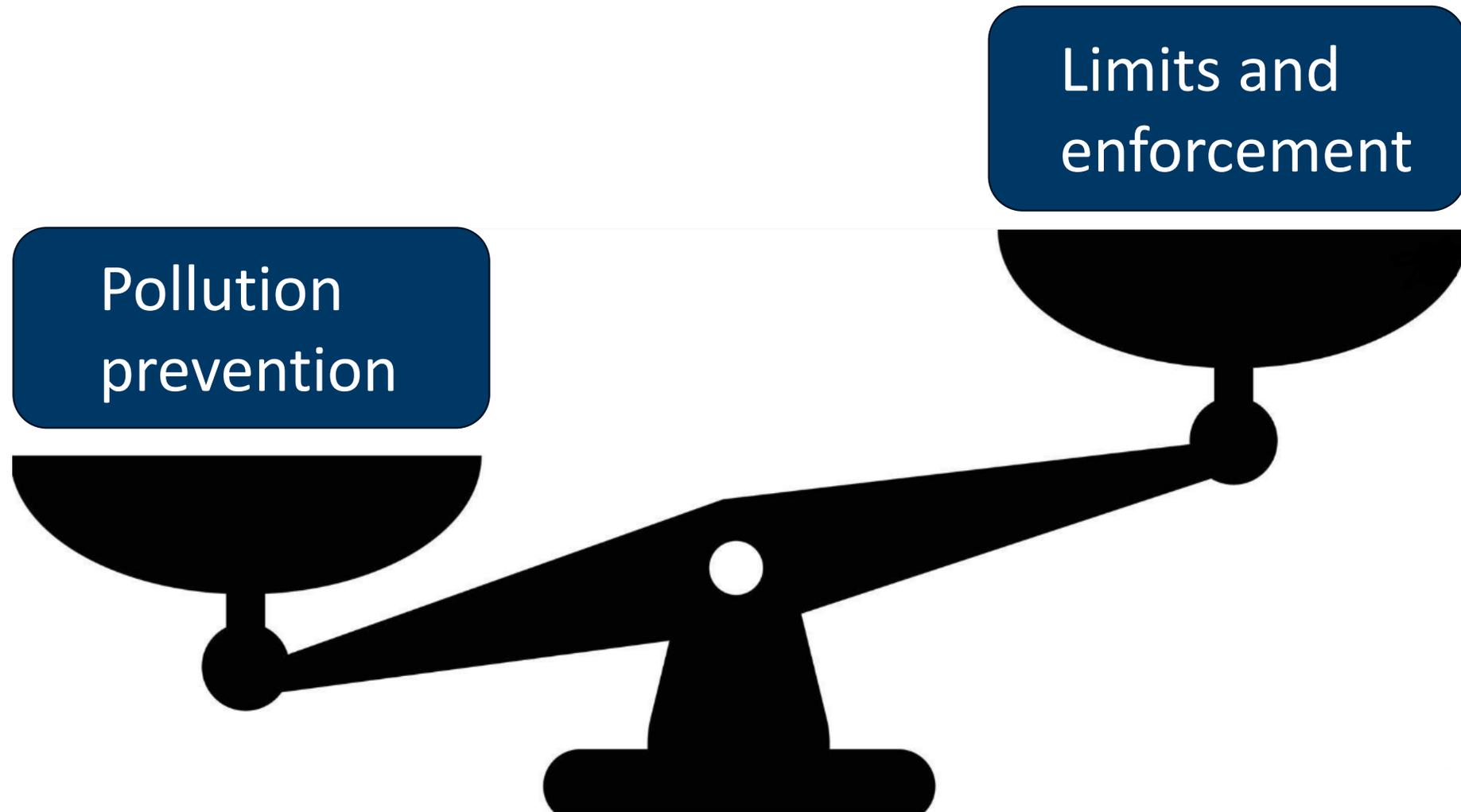
**Supercritical water oxidation**

LCCMR recommended funding to test supercritical water oxidation at the St. Cloud municipal WWTP.



**Pyrolysis gasification**

# How will MPCA use this report?



# PFAS wastewater treatment and destruction takeaways

- **Pollution prevention is >1,000x more cost-effective than engineered solutions**
- Current Minnesota infrastructure is not capable of treating and destroying PFAS
- PFAS treatment and destruction technologies are technologically feasible
- PFAS treatment and destruction costs are unaffordable for cities
- Regionalization of PFAS destruction technologies makes financial sense
- **MPCA is focusing on pollution prevention strategies over enforcement**

Thank you