



Mercury and Wastewater Treatment

Scott Kyser | Professional Engineer MPCA

wq-iw4-02h6

Hello! My name is Scott James Kyser

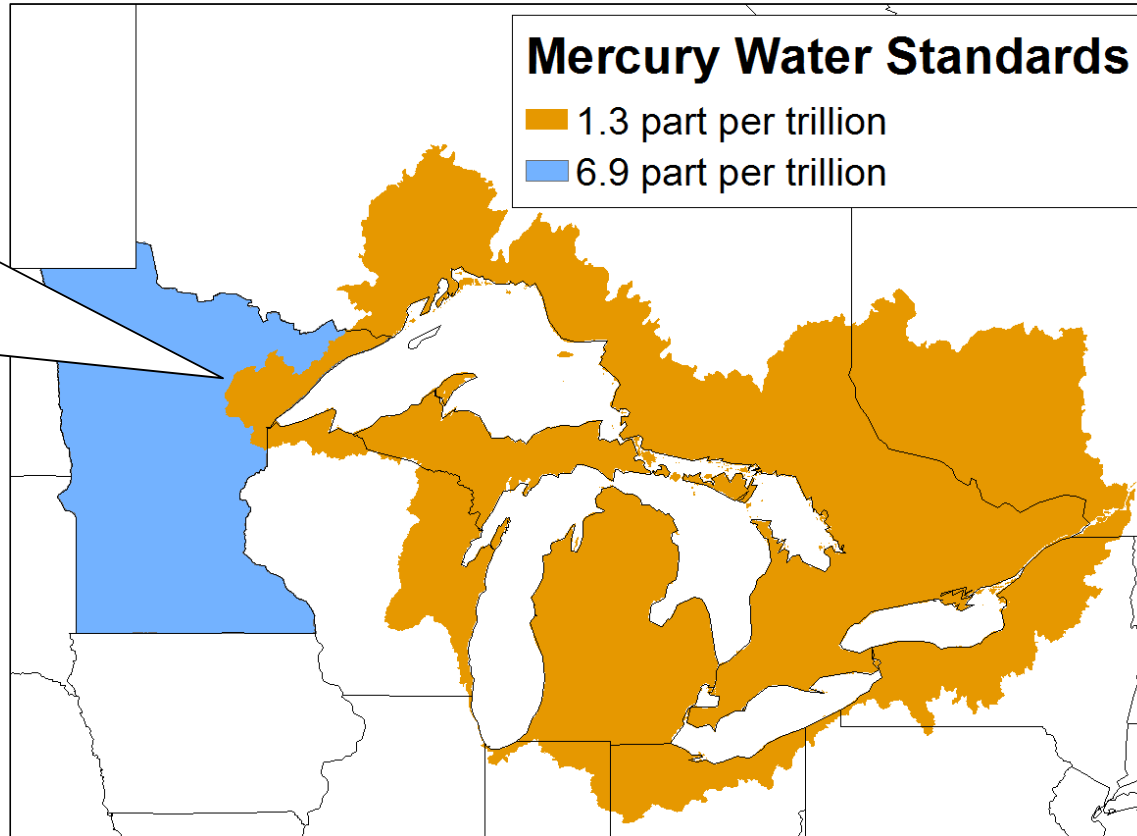
I am a MPCA
engineer
working in
wastewater
permitting



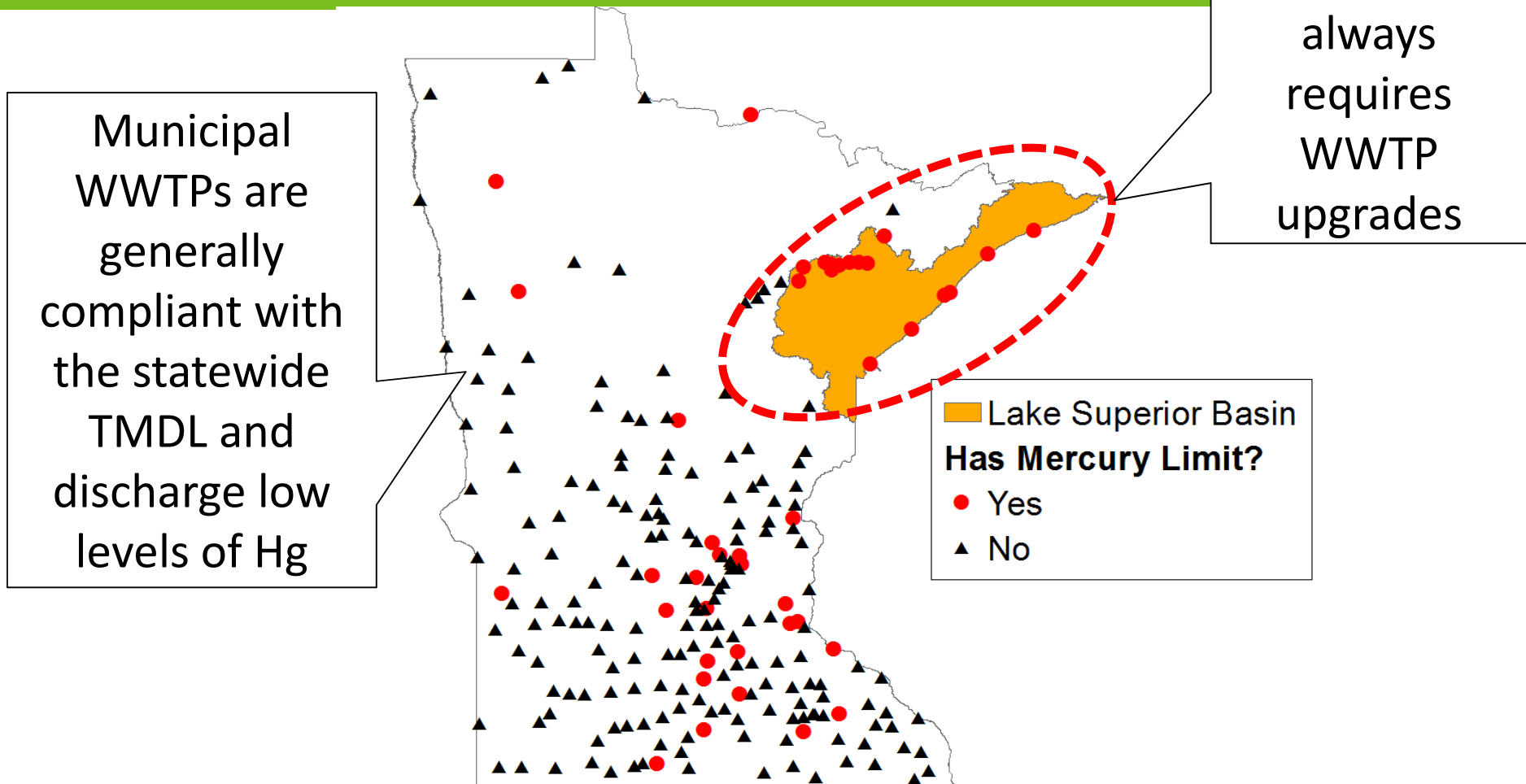
Mercury Water Quality Standards

KS

Wastewater dischargers in NE face lower discharge requirements



Municipal Mercury limits in MN



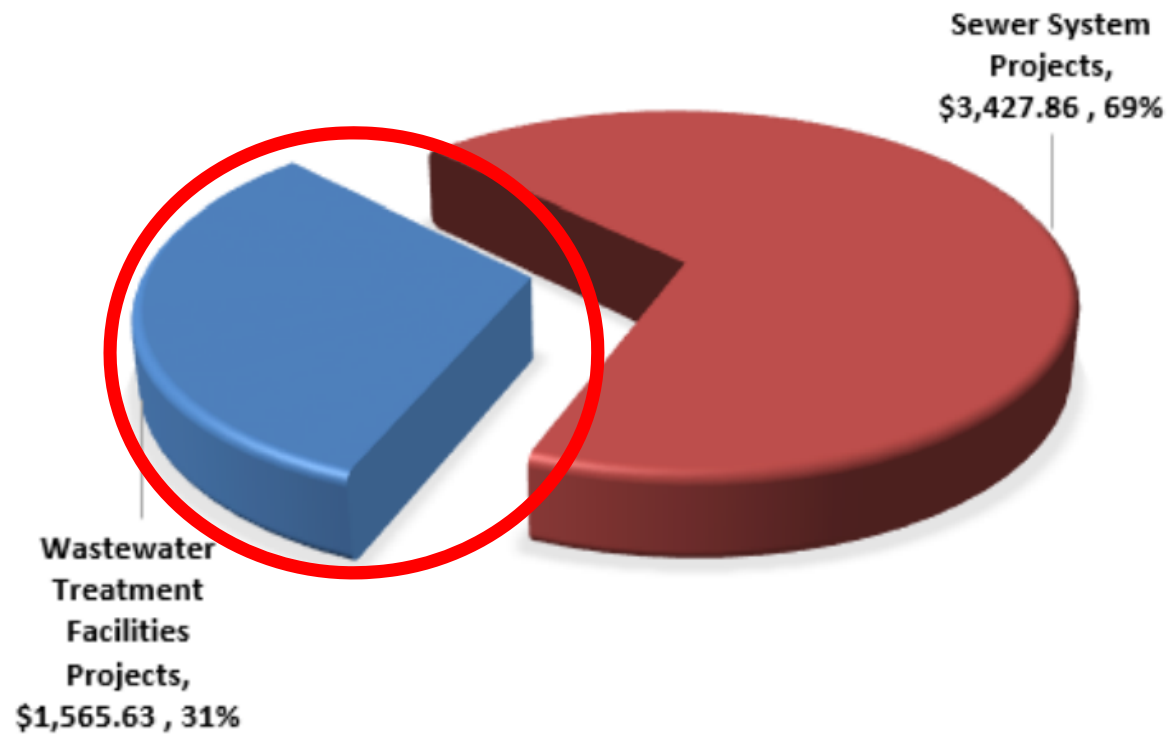
Digression on Wastewater Infrastructure Funding

“I don’t use the word crisis lightly, but I do think we’re at that point”



Marty Seifert, CGMC lobbyist & former MN house majority leader

\$5 Billion in Wastewater Funding Needs



Wastewater

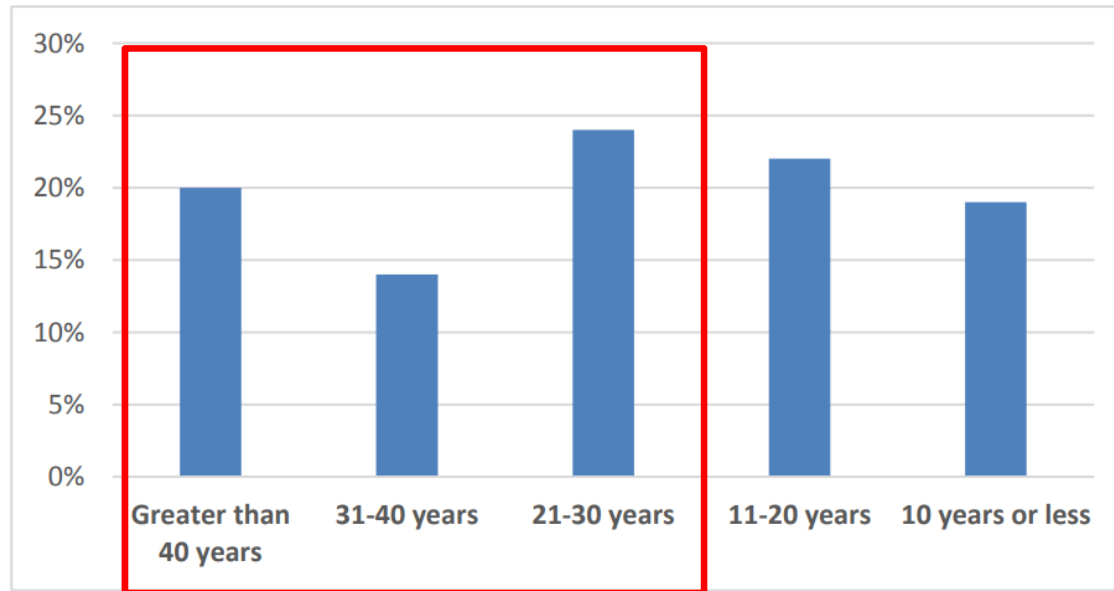
Future wastewater infrastructure needs and capital costs

Fiscal Year 2018 Biennial Survey of Wastewater Collection and Treatment

mi MINNESOTA POLLUTION CONTROL AGENCY

MN Has Aging Wastewater Infrastructure

Chart 15: Greater Minnesota - Age of Wastewater Treatment Facilities (503 facilities surveyed)



58% of MN WWTP are over 20 years old!

Wastewater

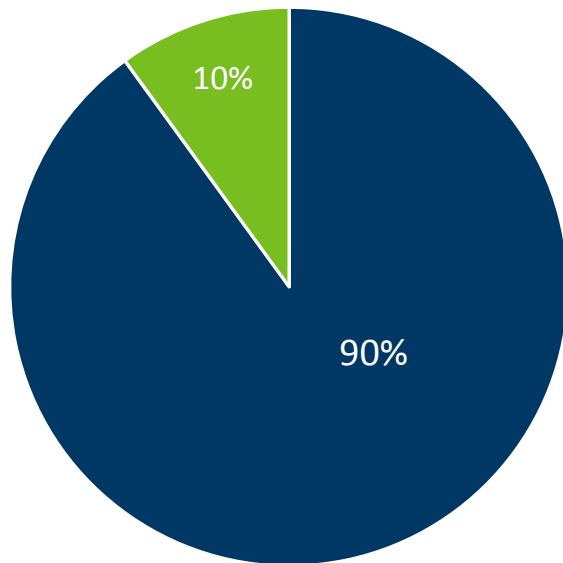
Future wastewater infrastructure needs and capital costs

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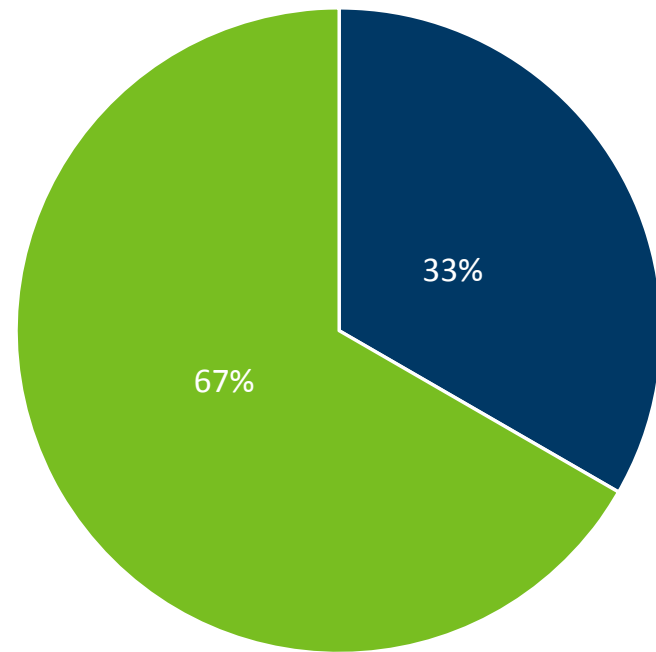
Wastewater Funding Sources Over Time

Construction and Grants Era (1987)



■ State & Federal ■ Ratepayer

Current Era (2019)

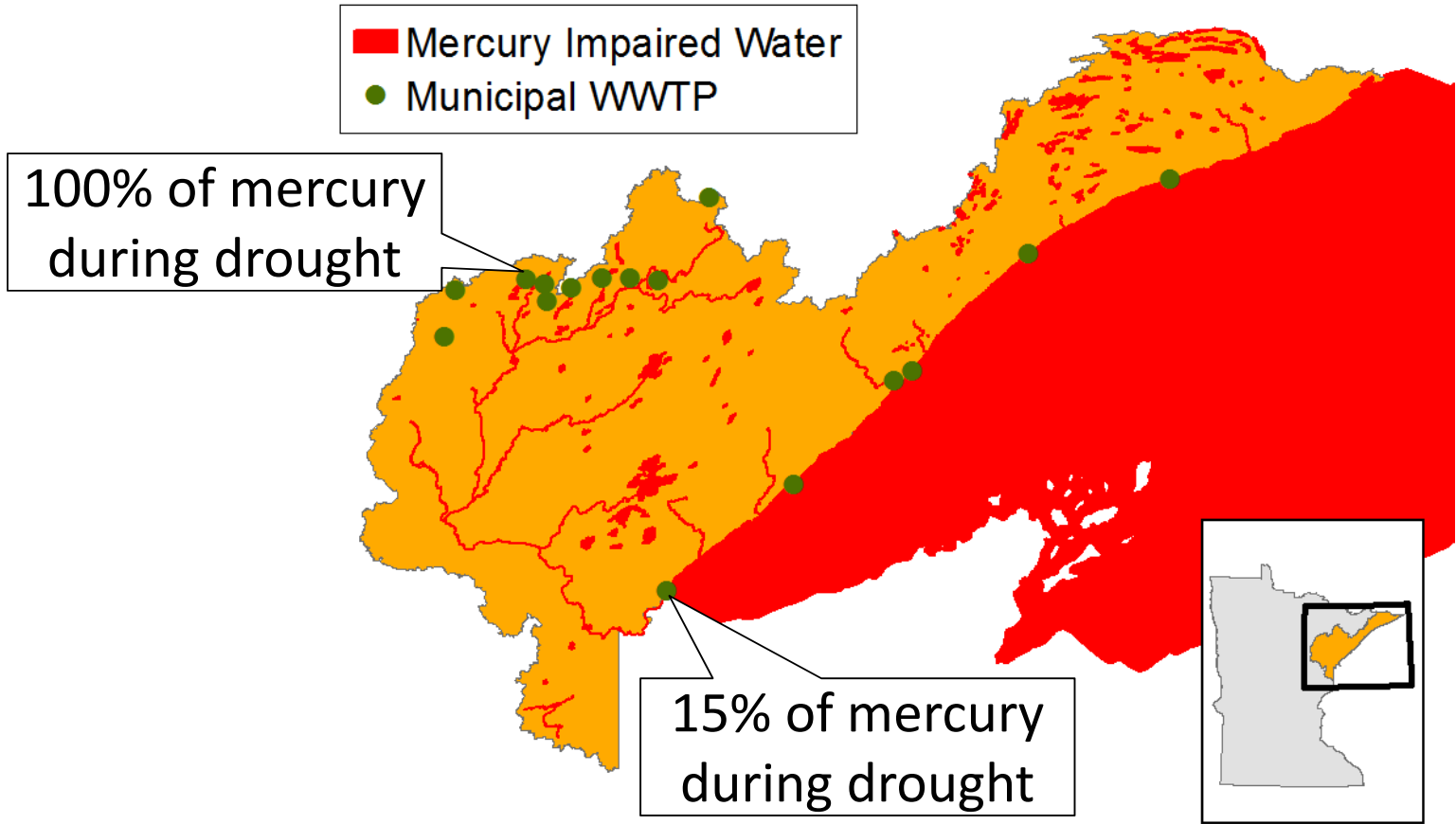


■ State & Federal ■ Ratepayer

Backdrop of Mercury Treatment in MN

MN cities have substantial wastewater funding obligations and are increasingly less able to affordably fund those obligations

Reducing Mercury Water Pollution Is Important

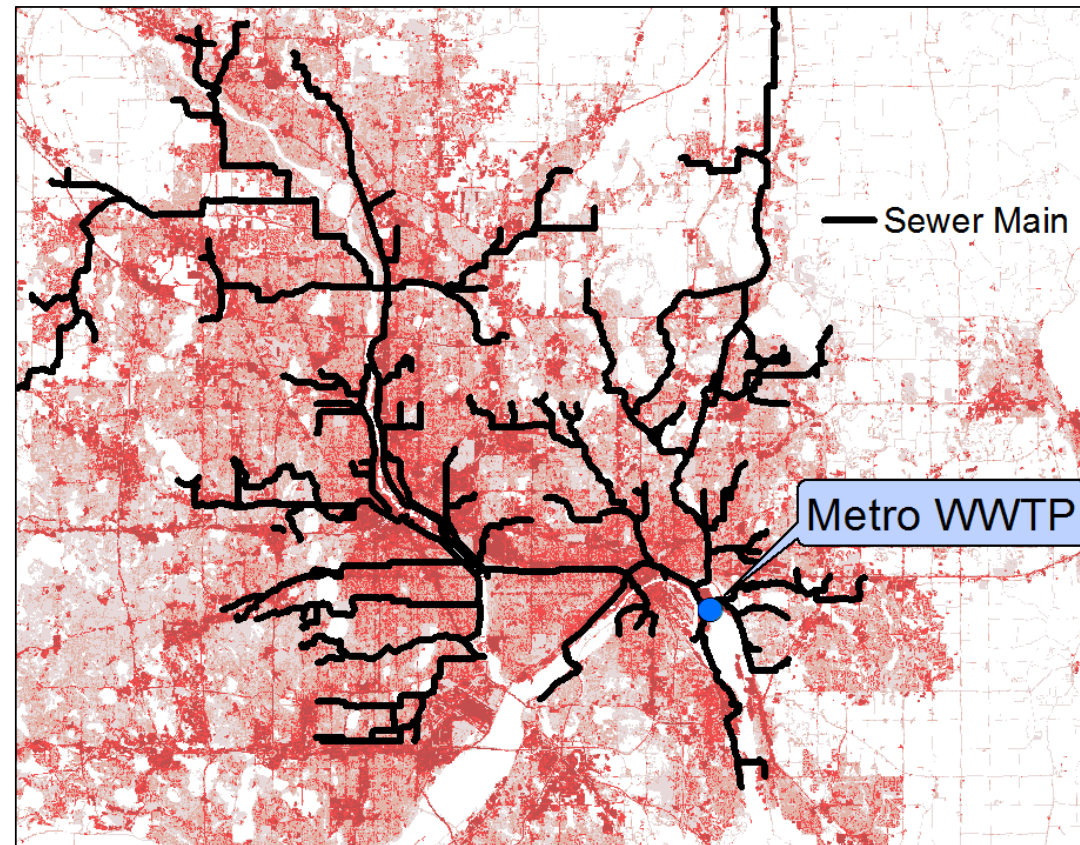


Next Steps

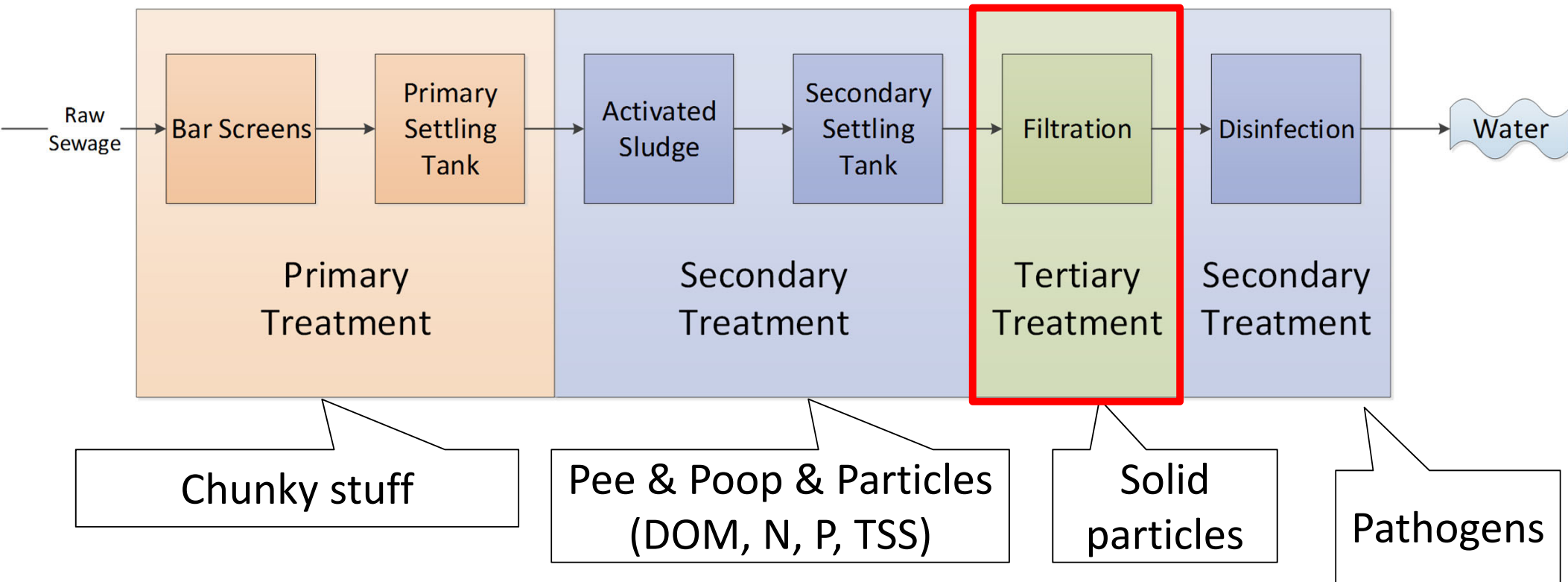
1. How do municipal WWTPs work?
2. Mercury treatment theory
3. Technologies capable of meeting low level mercury limits
4. Costs of mercury treatment technologies
5. Mercury treatment study
6. Border battle bonus bout

How does wastewater treatment work?

Wastewater
treatment
plants collect
and treat
wastewater



Degrees of Municipal Wastewater Treatment



Meeting Low Level Mercury Limits

Treating to < 6.9 ng/L

- Possible with 'conventional' 1970's solid control technologies
- Does not require advanced filtration
- Rarely requires new capital investments
- Often WWTPs can't meet limits when WWTP is past its prime

Treating to < 1.3 ng/L

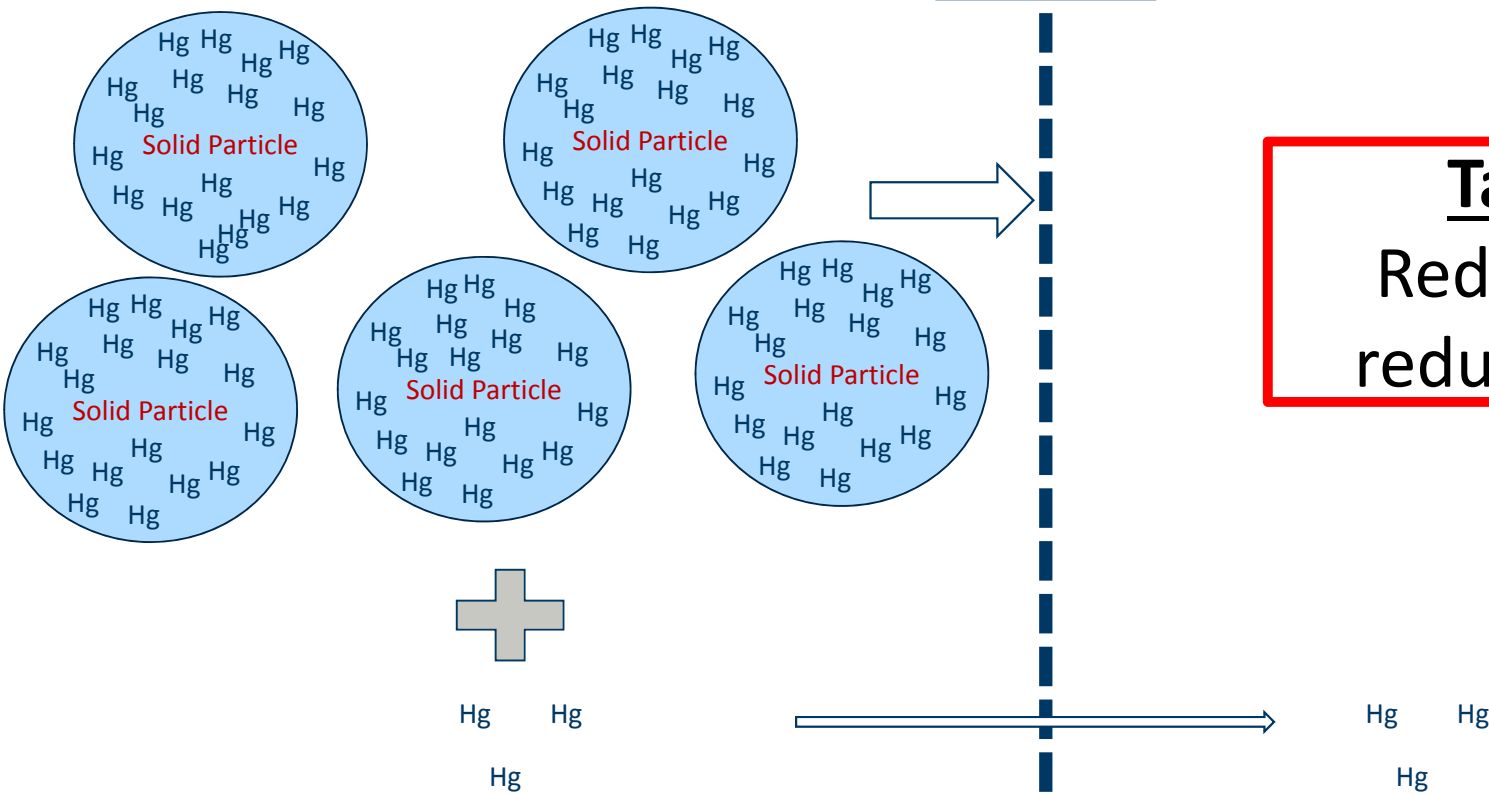
- Not possible with 'conventional' 1970's solid control technologies
- Requires advanced filtration
- Always requires new capital investments (i.e. \$\$\$)
- Every facility in NE MN will receive limits

Treating mercury by treating solids

Total Hg

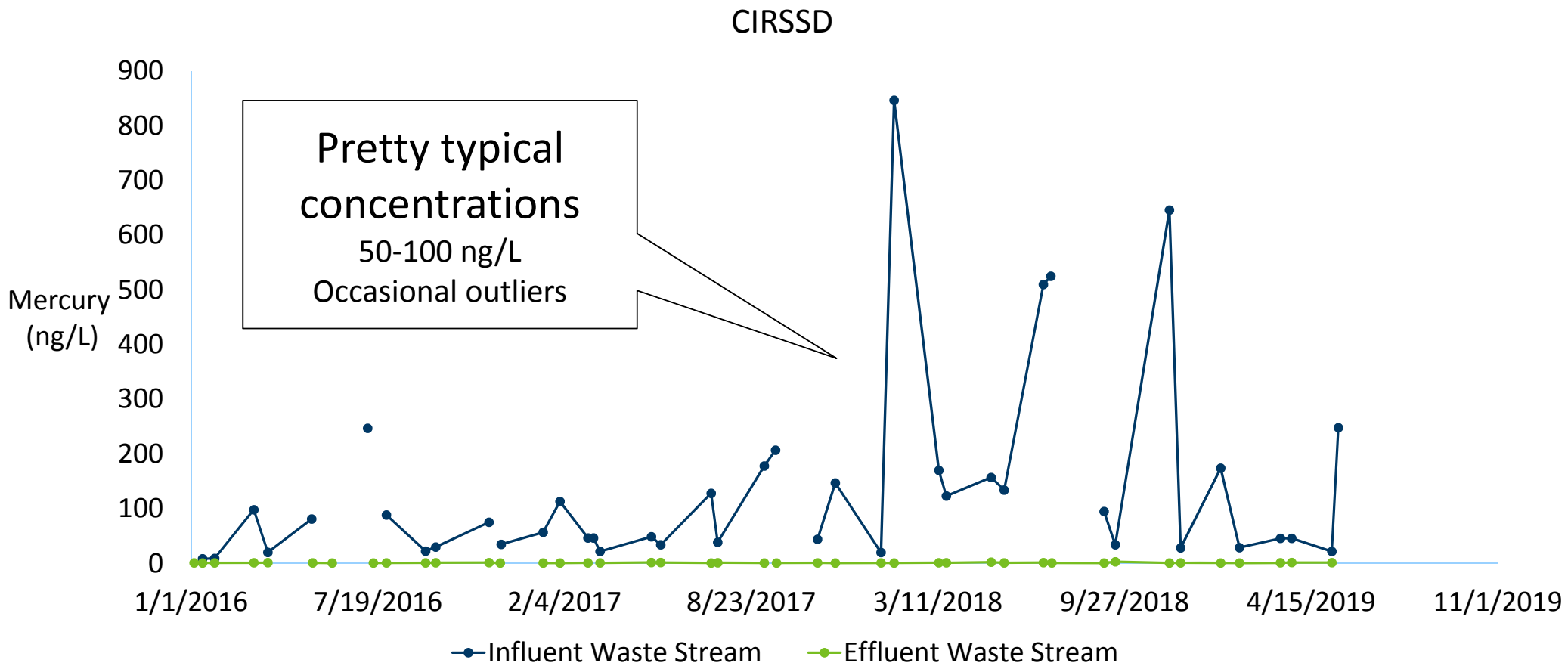
Dissolved Hg

Treatment



Takeaway:
Reducing solids
reduces mercury

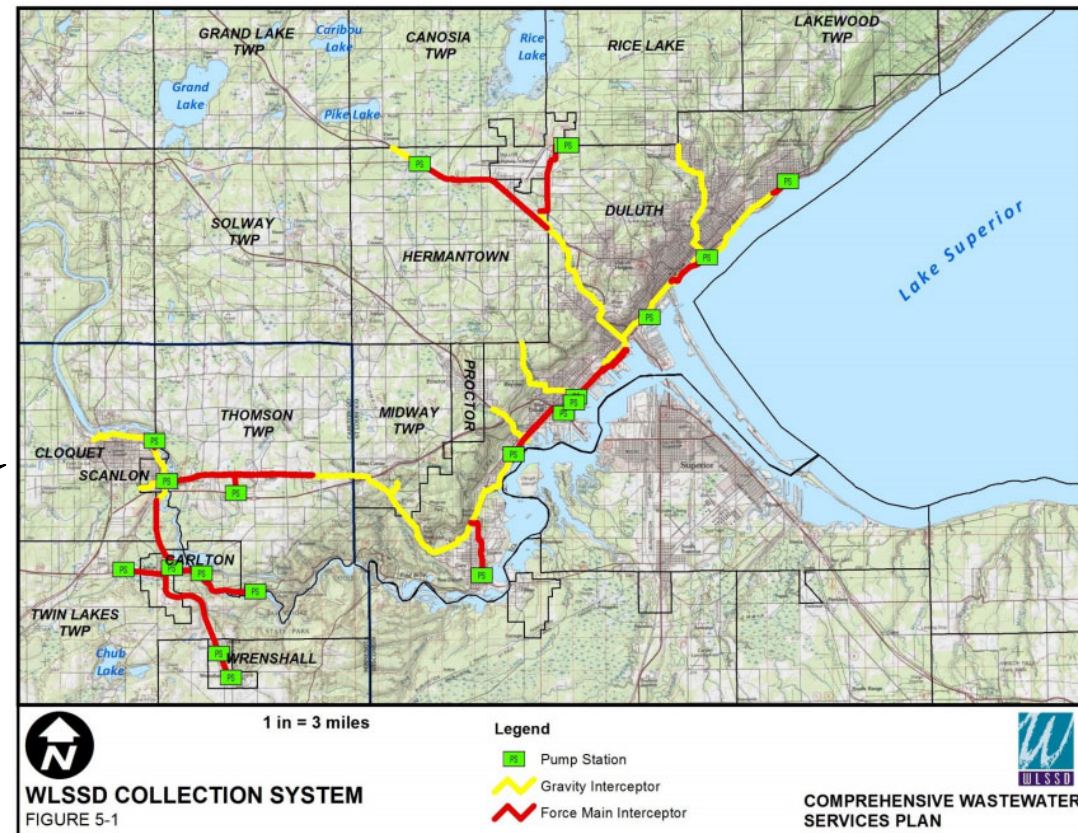
How much mercury do WWTPs remove?



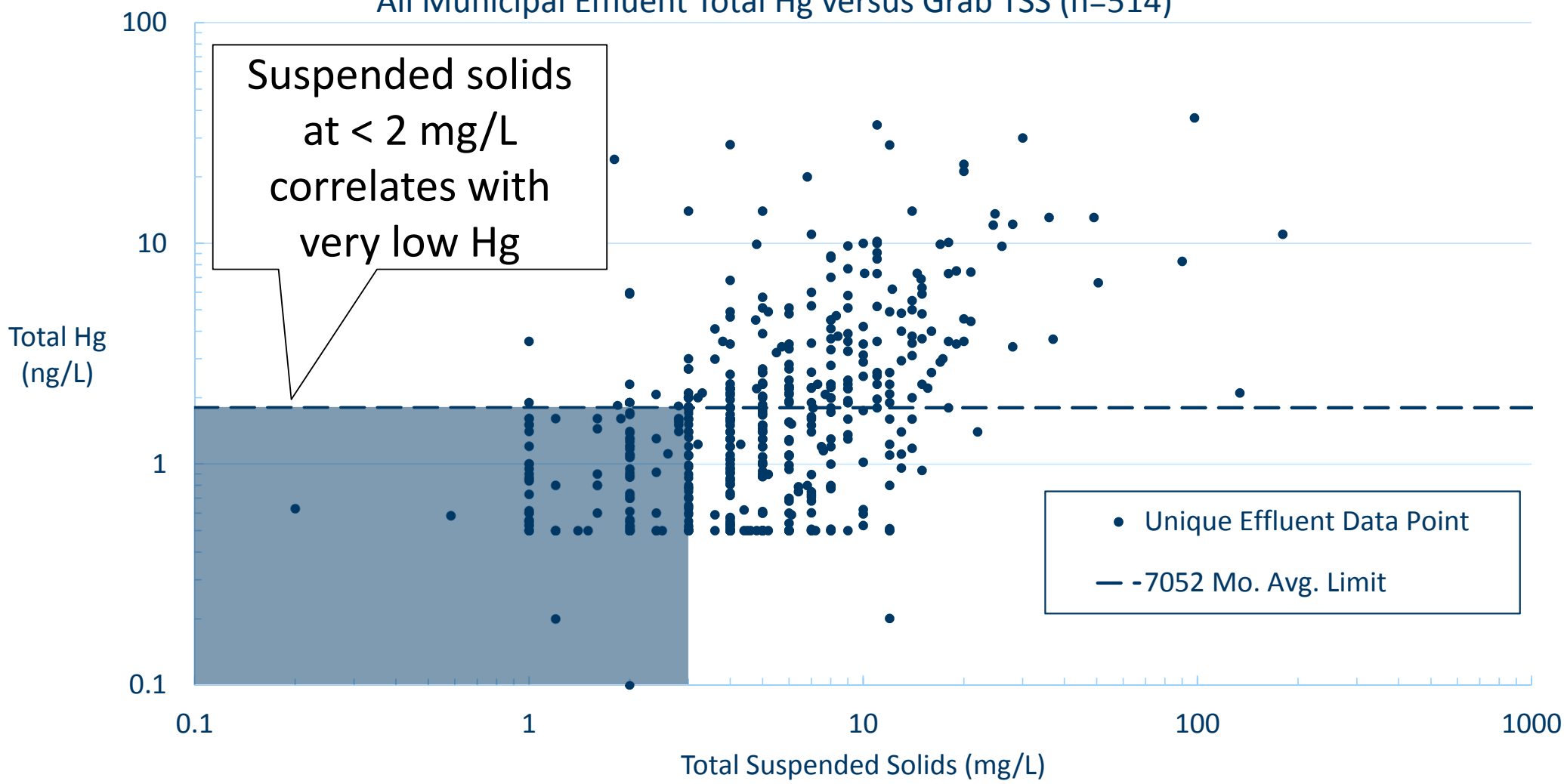
Where does the mercury come from?

1. Significant industrial users
2. Regular human waste disposal

WLSSD is not typical
(Sappi Paper)



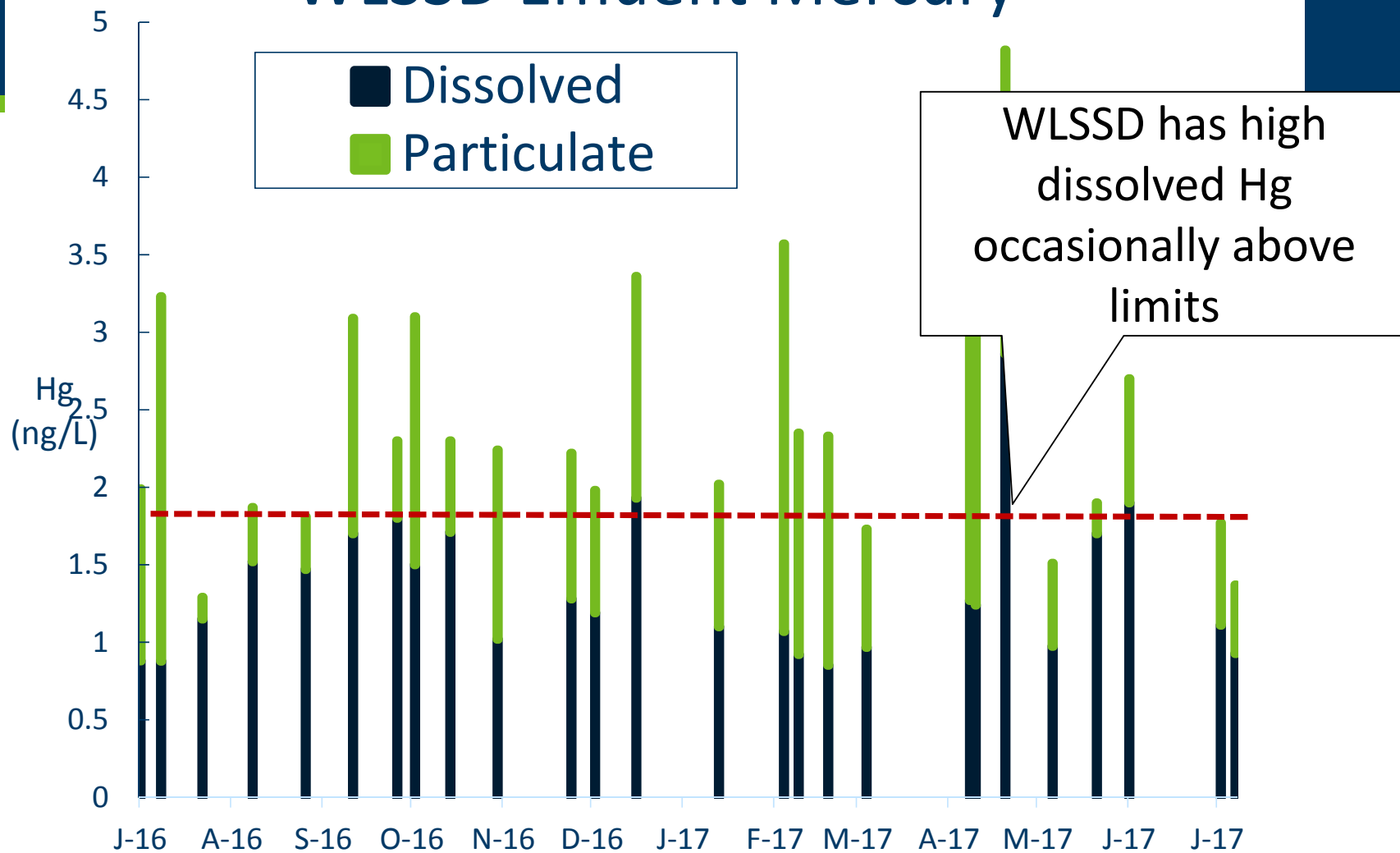
All Municipal Effluent Total Hg versus Grab TSS (n=514)

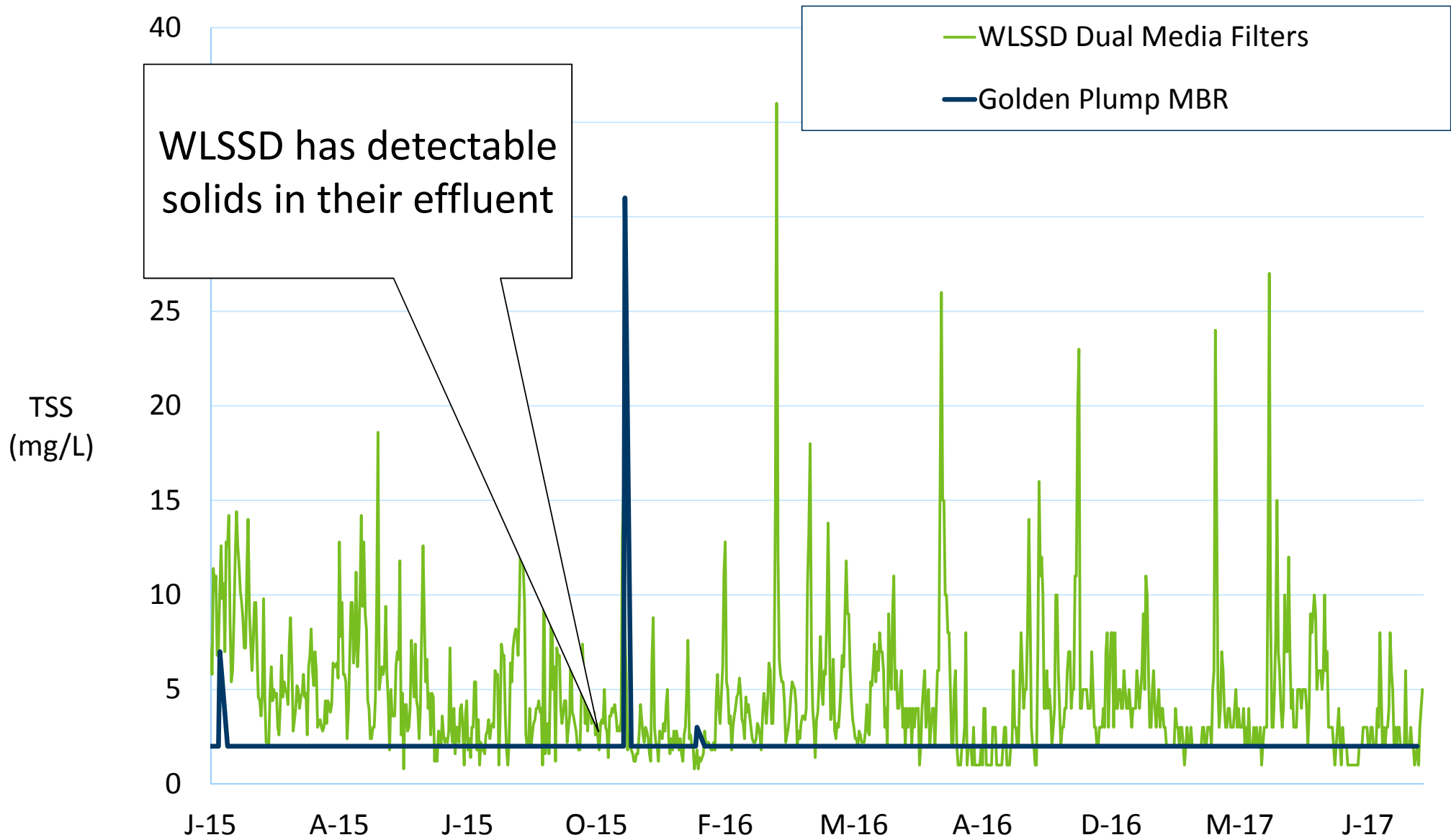


Suspended solids
at < 2 mg/L
correlates with
very low Hg

• Unique Effluent Data Point
— -7052 Mo. Avg. Limit

WLSSD Effluent Mercury





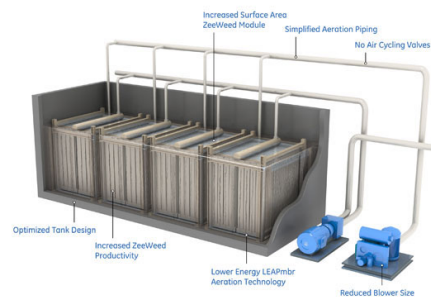
What current treatment system treat mercury to low levels?

No
published
treatment
references

Cloth Disk Filter



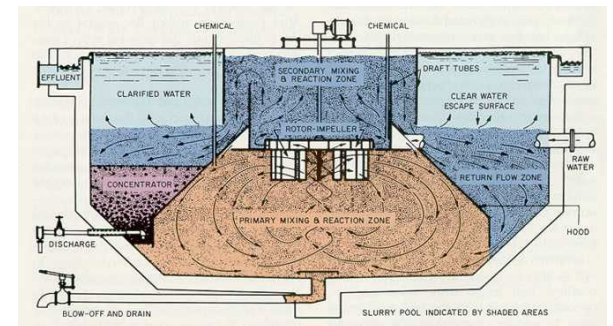
Membrane Reactor



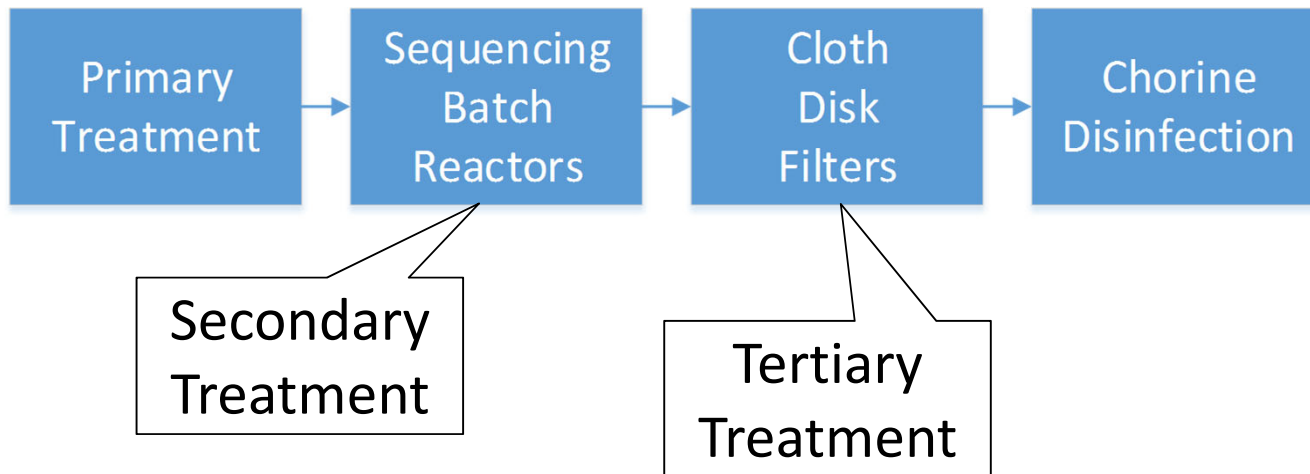
Dual Media Filter



Contact Clarifier

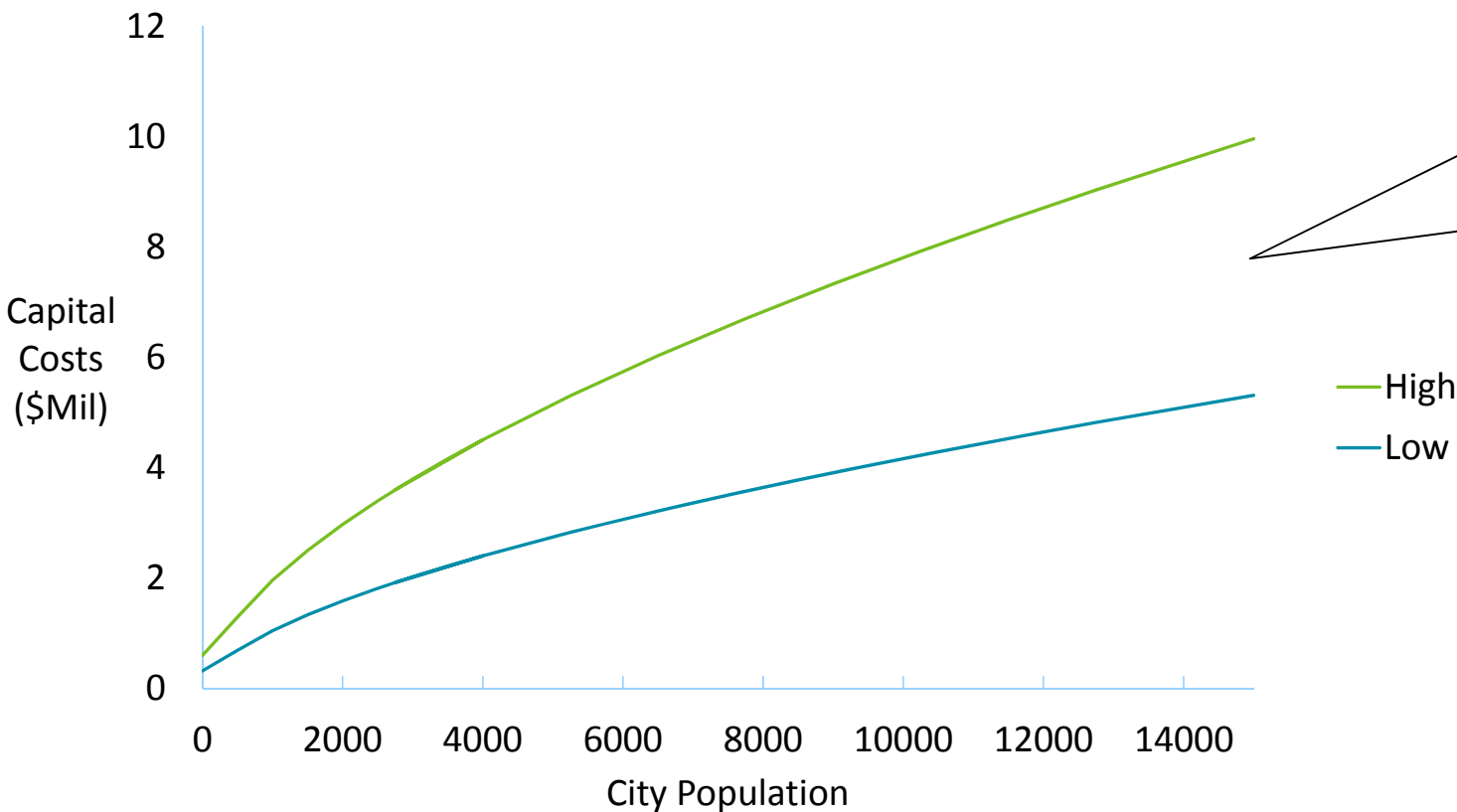


CIRSSD built a new WWTP that meets low level Hg limits



How much does mercury treatment cost?

Cost Estimates of Installing Cloth Disk Filters



In the WWTP world these costs are 'low' but can still be unaffordable for many cities

What does affordable wastewater mean?

Expensive

Affordable

Wastewater
requires
massive
amounts of
capital!

Wastewater
Treatment

Financing tools
make rates
affordable!

Economic Variance Summary



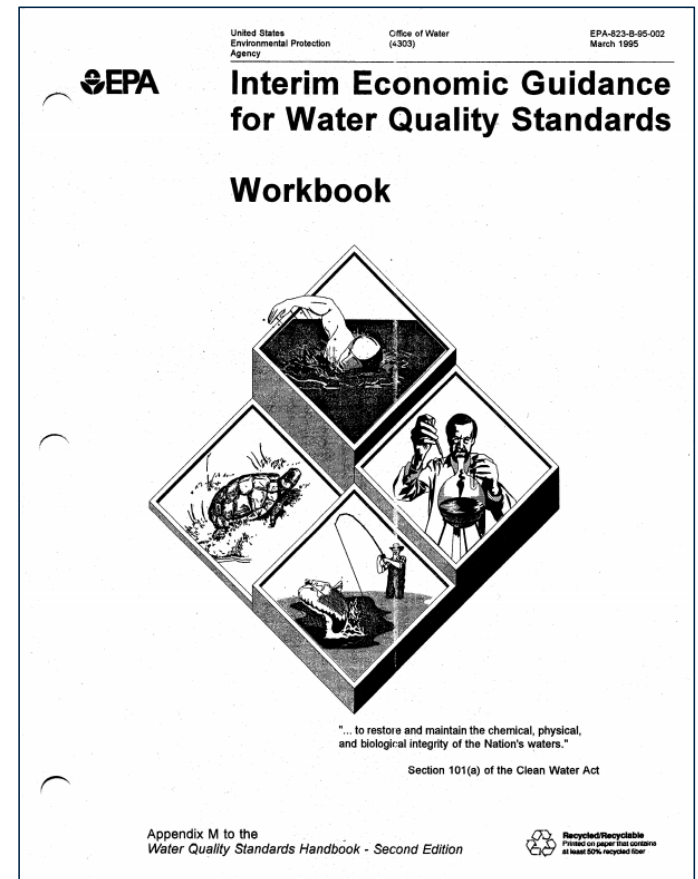
EPA Municipal Wastewater Affordability Index

Primary Affordability Measure

$$\frac{\text{Annual Wastewater Cost per Household}}{\text{Median Annual Household Income}} \leq 2\%$$

Secondary Measures

- Municipal economic health
- Widespread social and economic impacts in surrounding communities



EPA Industrial Wastewater Affordability Index

- **Primary Affordability Measure**

- **Profitability** with and without pollution control

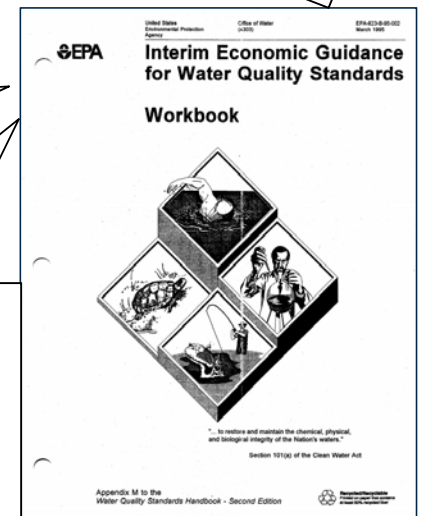
- **Secondary Affordability Considerations**

- Level of industry competition
- Possibility of plant shutdown
- Likelihood of competitors facing similar pollution control costs
- Willingness of consumers to pay more for the product
- Widespread social and economic hardship in the surrounding communities

“as long as the applicant maintains positive earnings, it can afford to pay for the pollution control”

“If the discharger is already not profitable, it may not claim that substantial (negative) impacts would occur due to compliance with water quality standards”

“The structure, size, and financial health of the parent firm should also be considered”



Mercury Treatment Study

- Working with UMD Civil
- \$250,000 Study funded by LCCMR
- Two grad students
- Complete in 2022
- Publications?

Goal: Identify mercury treatment technologies and make info accessible to public



Dr. Nate Johnson



Dr. Adrian Hanson

Summary

1. In general, WWTPs are doing a good job complying with the statewide TMDL
2. WWTPs in NE MN face lower limits that require capital investments
3. It is possible to use solid control technologies to meet low level Hg limits
4. Some NE MN cities are 'affordably' complying with their Hg limits
5. Some NE MN will not be able to afford to comply with their Hg limits
6. We've got a study going to document Hg compliance strategies and advance the understanding of mercury treatment

Questions