



Cost analysis of water quality standards
Presentation to Minnesota Legislative Water Commission
June 15, 2017



Study purpose and scope

Engineering analysis to determine community costs related to compliance with current and future water quality regulations

Study purpose and scope

Request from legislature

1. Study representative sample of at least 15 communities
2. Estimate costs to upgrade infrastructure to meet current/future water quality standards
3. Estimate incremental change in water quality resulting from upgrades

Water quality standards investigated

- Total suspended solids
- Chloride
- Nutrients (phosphorus and nitrogen)
- Nitrate (future)
- Sulfate (future)
- Ammonia (current/future)*

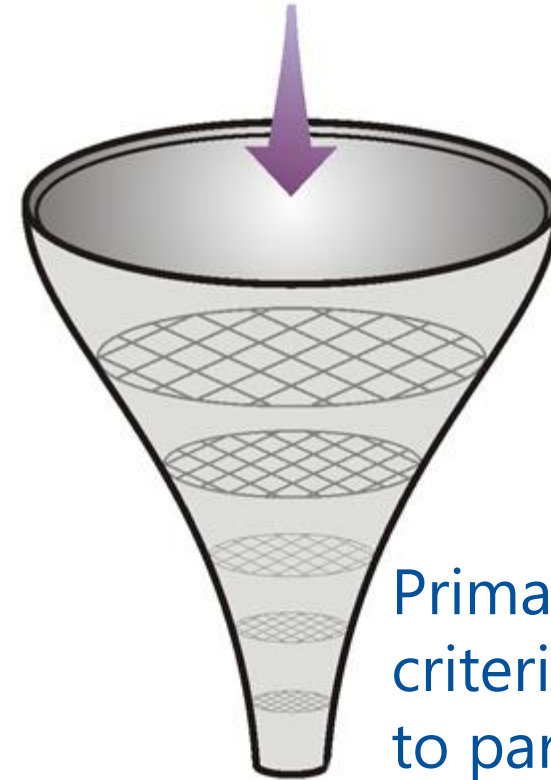
1. Study diverse, representative sample of communities



Methodology

1. Identified applicable current/future water quality standards
2. Gathered data about facilities/water bodies and calculated effluent limits
3. Evaluated which wastewater treatment technologies would be needed to meet limits
4. Estimated costs for wastewater treatment facility upgrades to meet current and proposed standards (15 facilities)

25 facilities evaluated

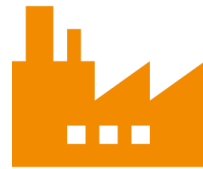


Primary selection
criteria: willingness
to participate

Cost estimates—15 facilities

Methodology (continued)

- Evaluated stormwater infrastructure and costs required to meet water quality standards
- Examined incremental downstream water quality impacts of:

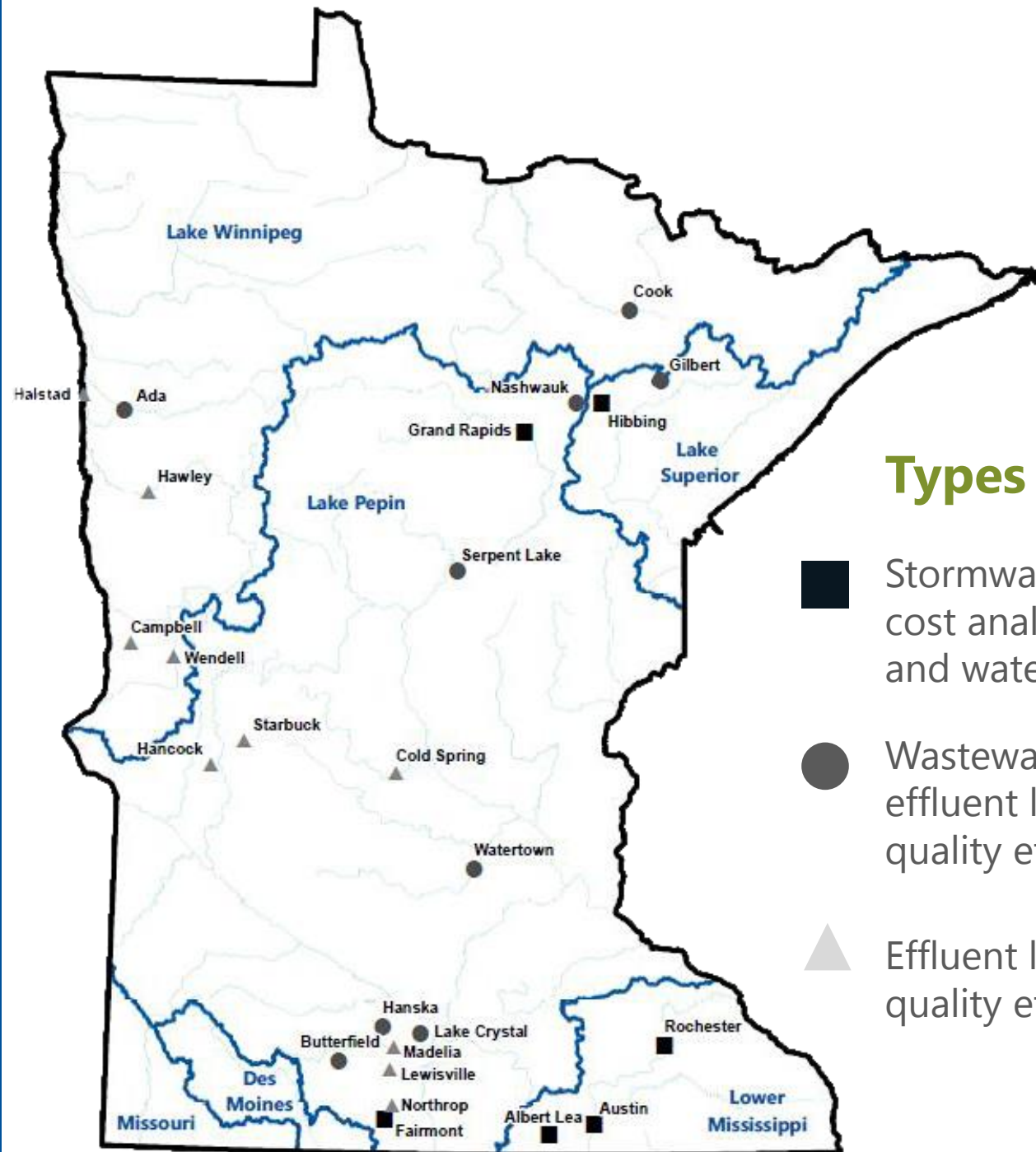


Implementing recommended wastewater infrastructure upgrades (25 facilities)



Implementing recommended stormwater infrastructure upgrades (6 cities)

Case study locations



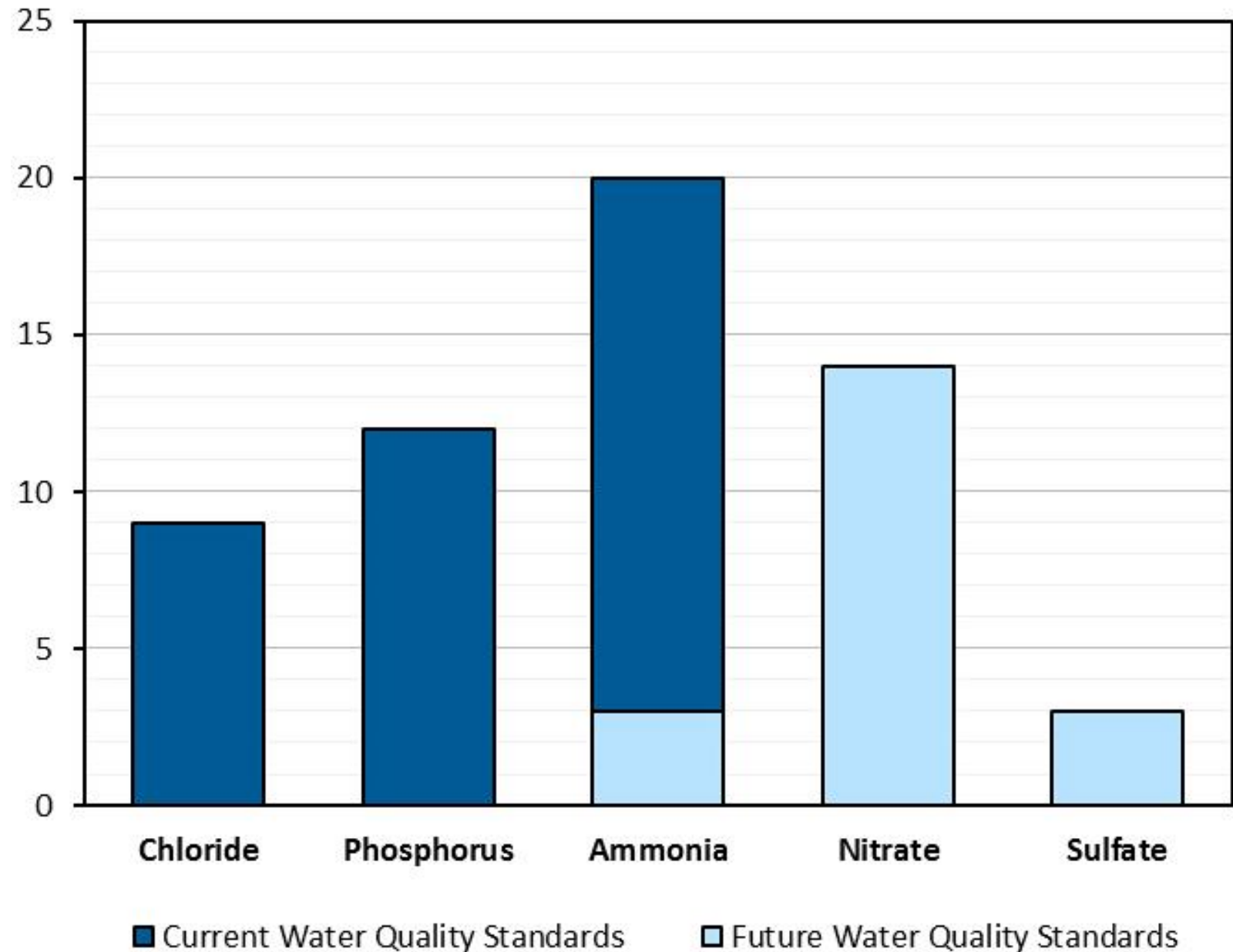
Types of analyses

- Stormwater and wastewater cost analysis, effluent limits and water quality effect
- Wastewater cost analysis, effluent limits, and water quality effect
- ▲ Effluent limits and water quality effect

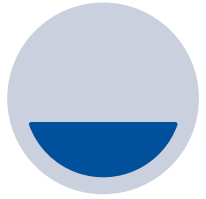
2. Estimate infrastructure upgrade costs to meet current/future water quality standards



Number of cities with new or more stringent limits



Three types of treatment

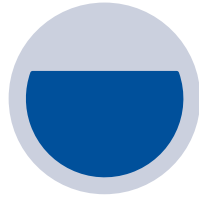


Pond System

Total suspended solids

Some phosphorus

Some ammonia



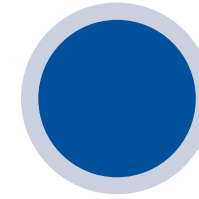
Secondary Treatment

Total suspended solids

Phosphorus

Ammonia

Nitrate



Membrane Filtration

Total suspended solids

Phosphorus

Ammonia

Nitrate

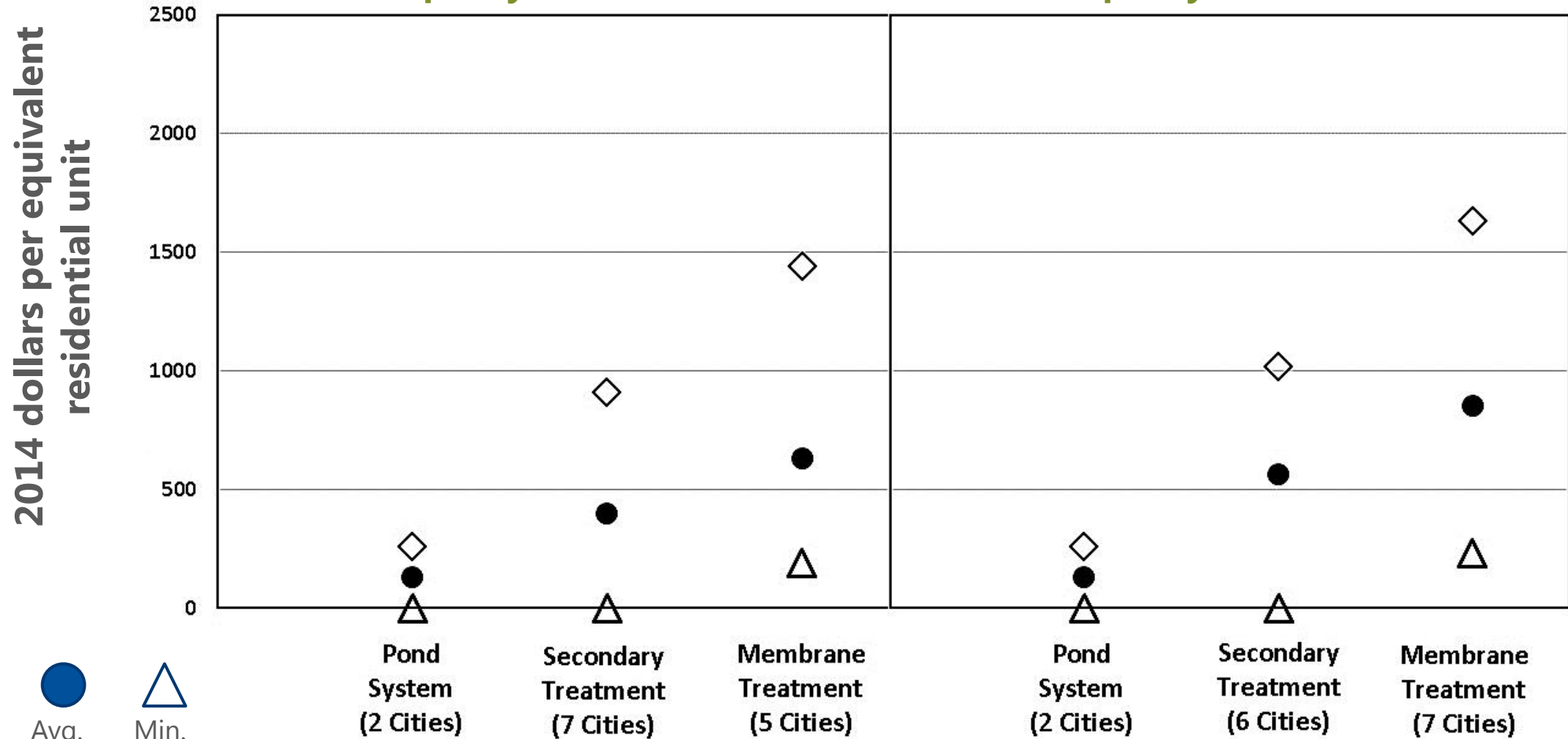
Chloride

Sulfate

Annual increases in user costs for upgrades

Upgrades to meet current water quality standards

Upgrades to meet proposed water quality standards

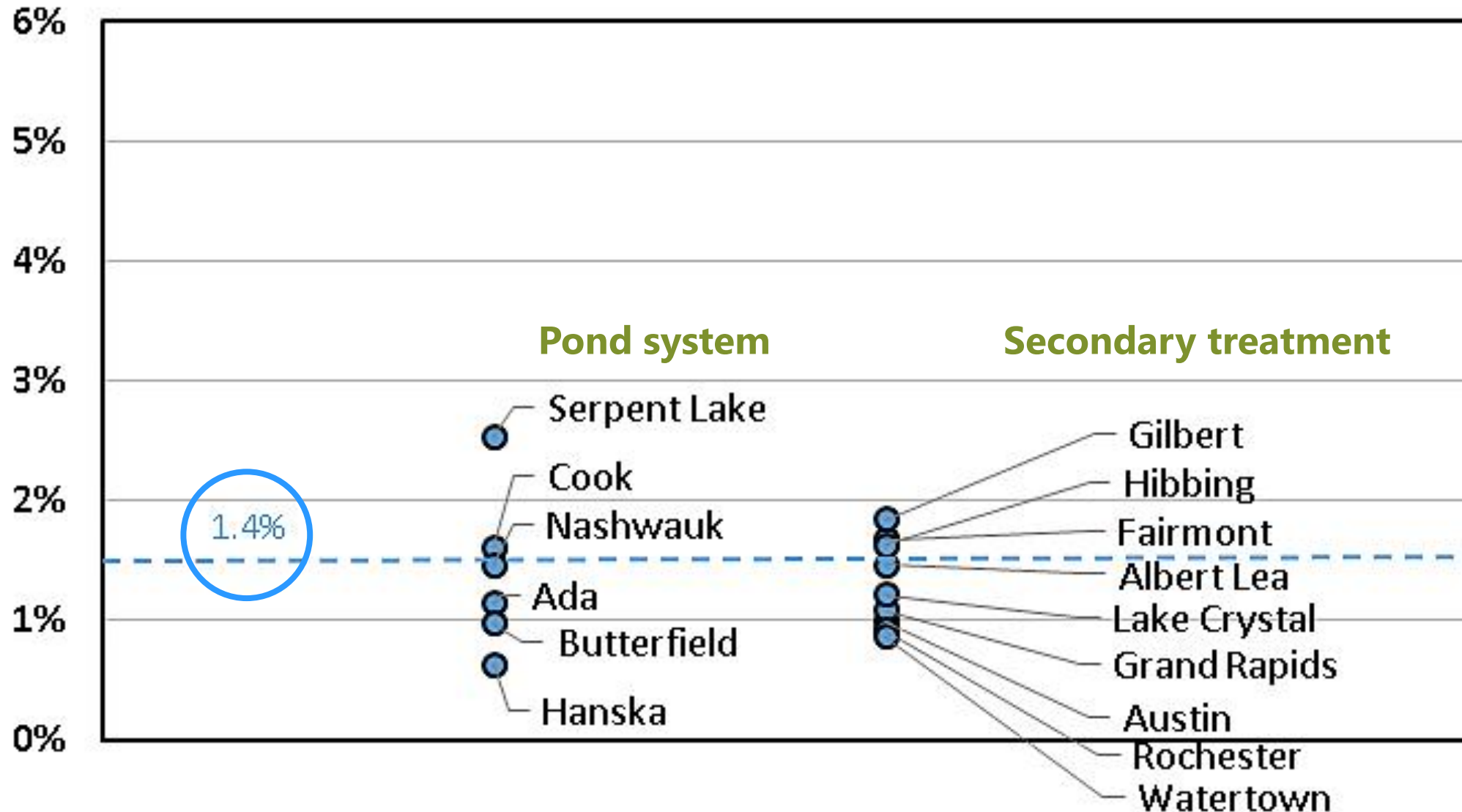


Affordability index

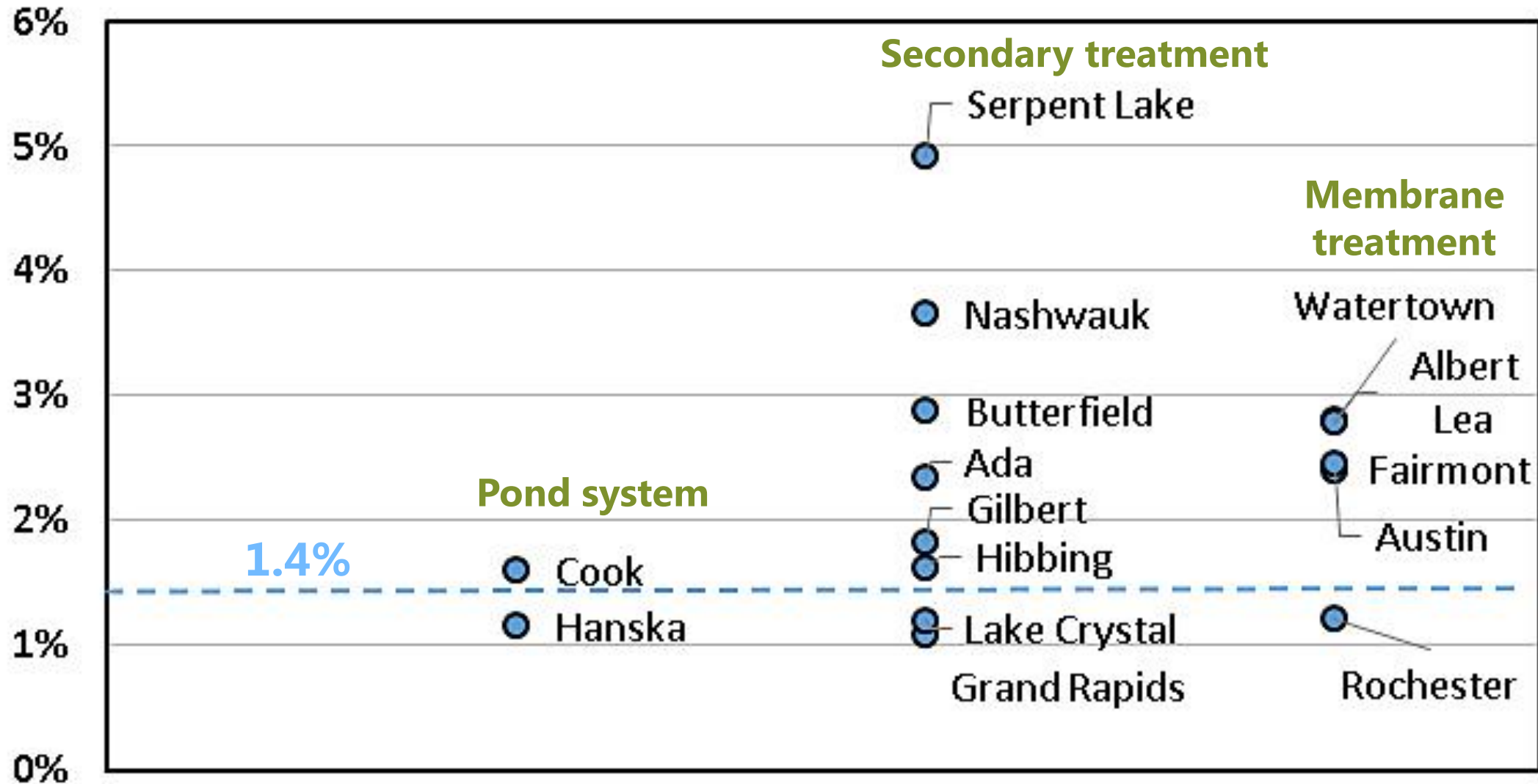
AFFORDABILITY: Annual sewer cost \leq 1.4% of median household income

The Minnesota Public Facilities Authority offers grants for wastewater projects when the annual sewer cost to each household exceeds 1.4% of median household income. The Minnesota Pollution Control Agency refers to this value as the **“affordability index.”**

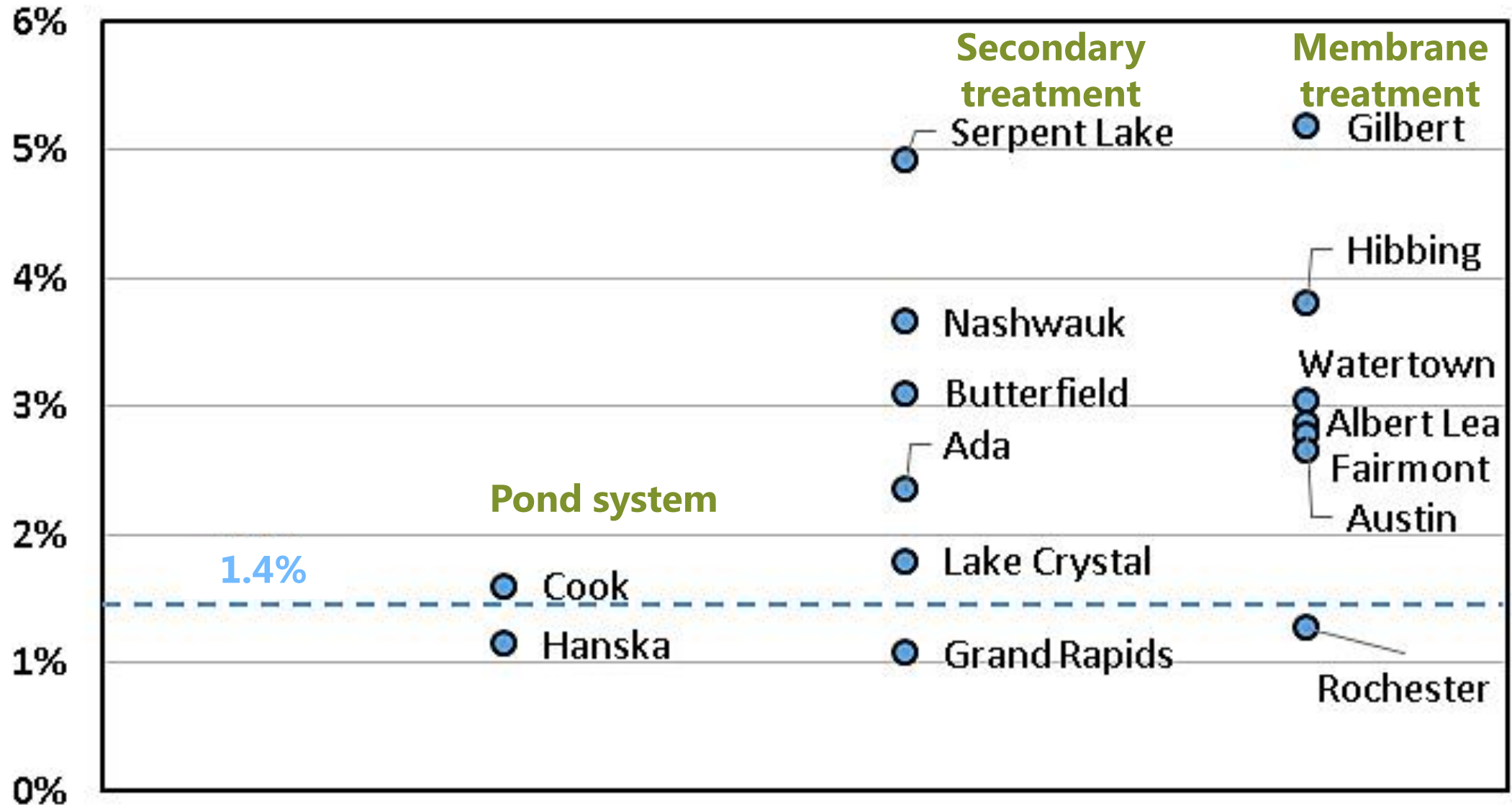
Existing sewer rates as percentage of median household income



Estimated sewer rates with upgrades to meet current water quality standards (percentage of median household income)



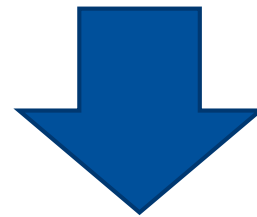
Estimated sewer rates with upgrades to meet future water quality standards (percentage of median household income)



Anticipated sewer rates

Affordability index = $\leq 1.4\%$ of median household income

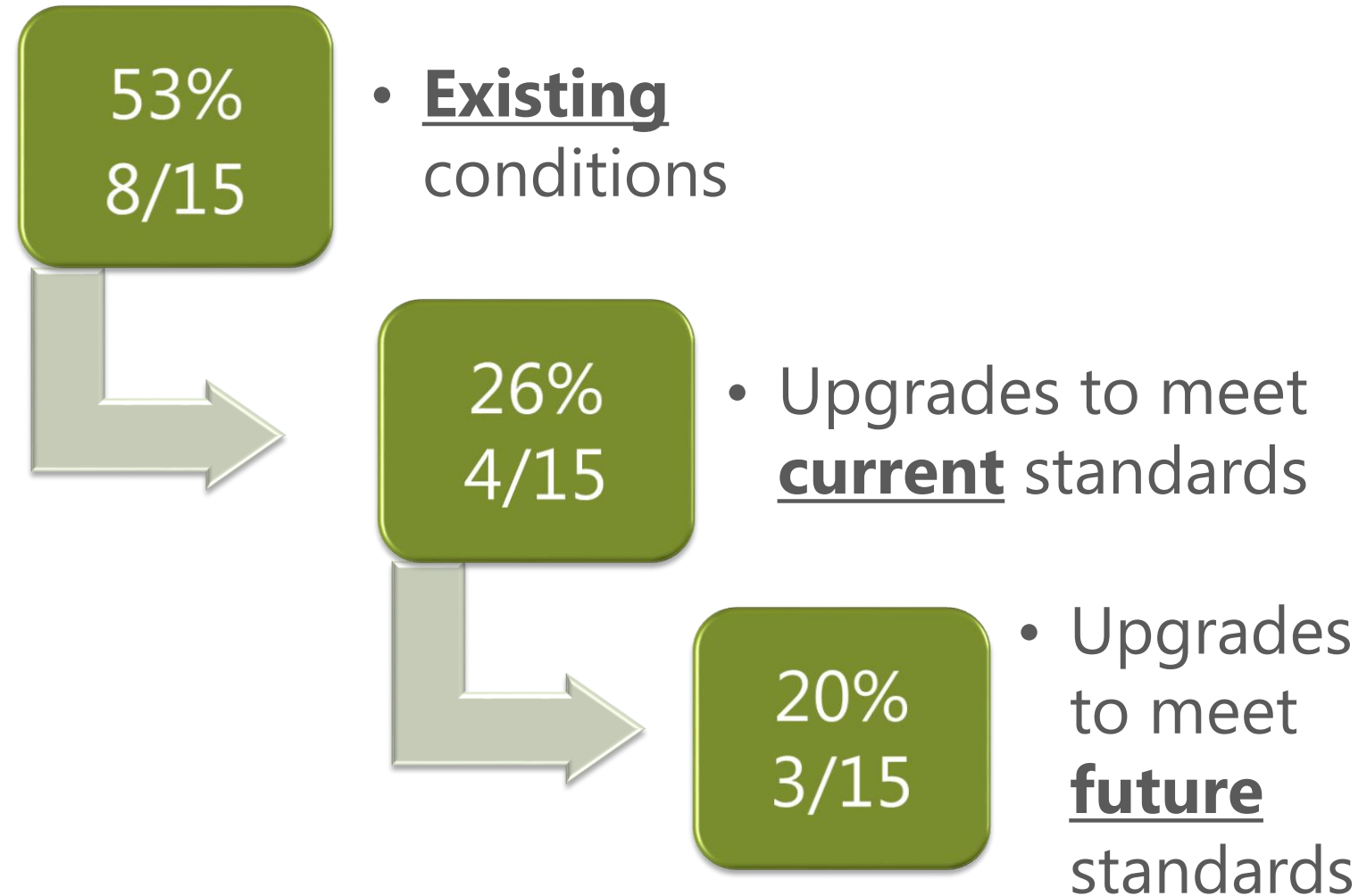
- **Existing** rates in 15 cities studied: **0.6–2.6%** of median household income
- Rates following upgrades to meet **current** water quality standards: **1.1–4.9%**
- Sewer rates following upgrades to meet **future** water quality standards: **1.1–5.2%**



Increased pressure on funding sources

Wastewater
project
affordability
for cities
evaluated

Percentage of cities meeting affordability index of 1.4% of median household income



3. Stormwater costs and estimate incremental change in water quality resulting from wastewater treatment and stormwater upgrades

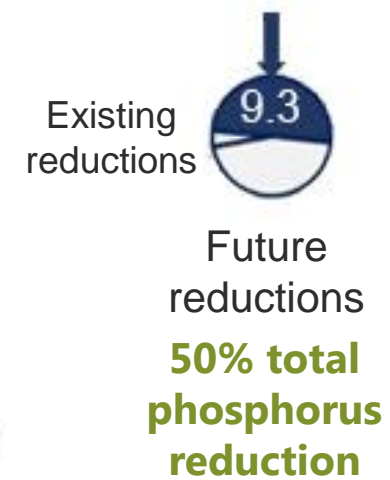


Stormwater costs and pollutant load reductions

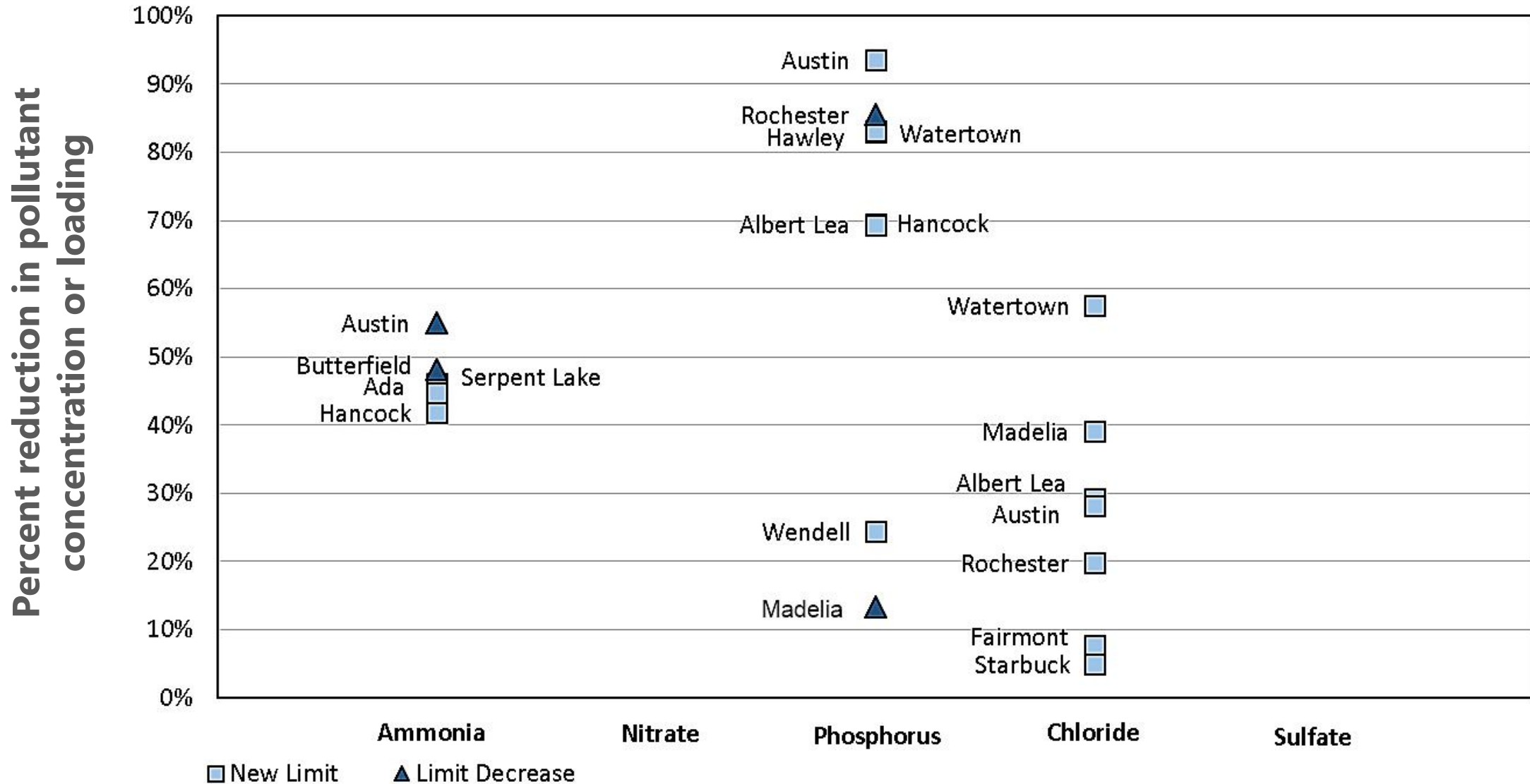
Existing pollutant loads (metric tons per year)



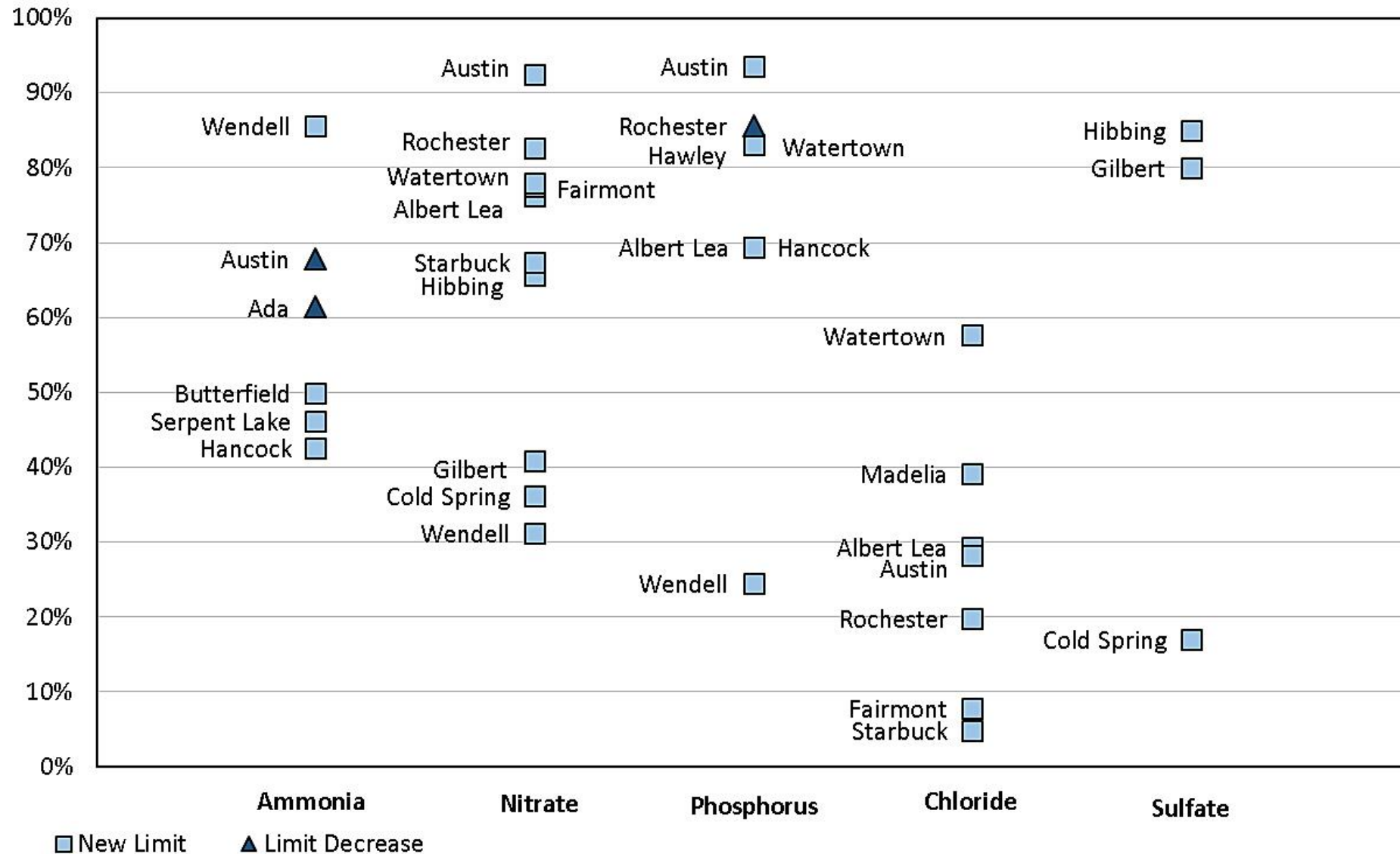
Wet detention ponds
\$15 million annualized total cost for six municipal separate storm sewers



Pollutant reduction in wastewater treatment facility discharge resulting from upgrades to meet effluent limits from current water quality standards

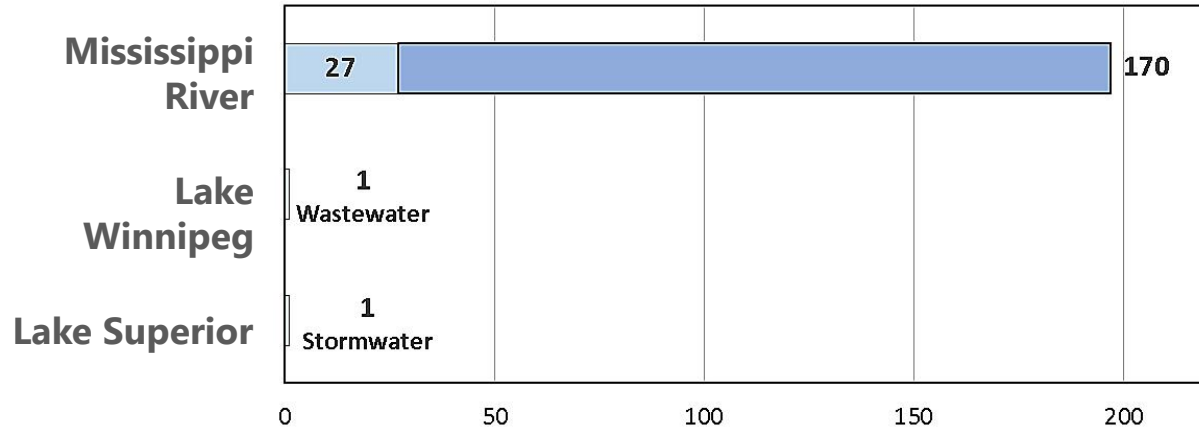


Pollutant reduction in wastewater treatment facility discharge resulting from upgrades to meet effluent limits from future water quality standards

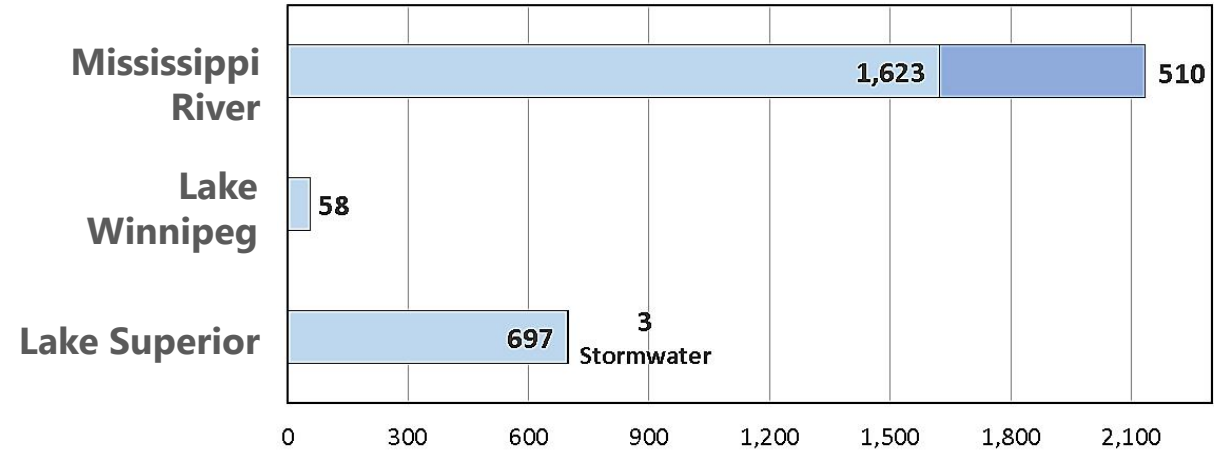


Total pollutant load reductions by major river basin (metric tons per year)

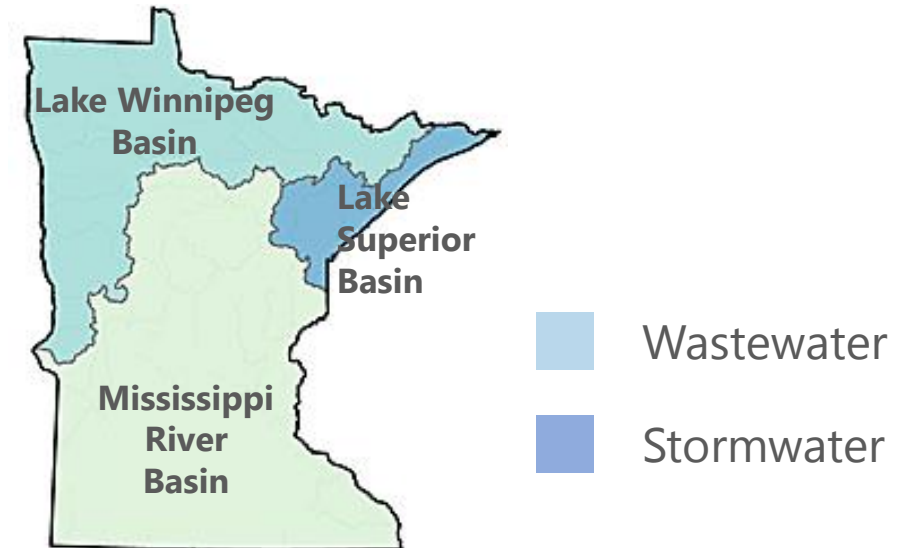
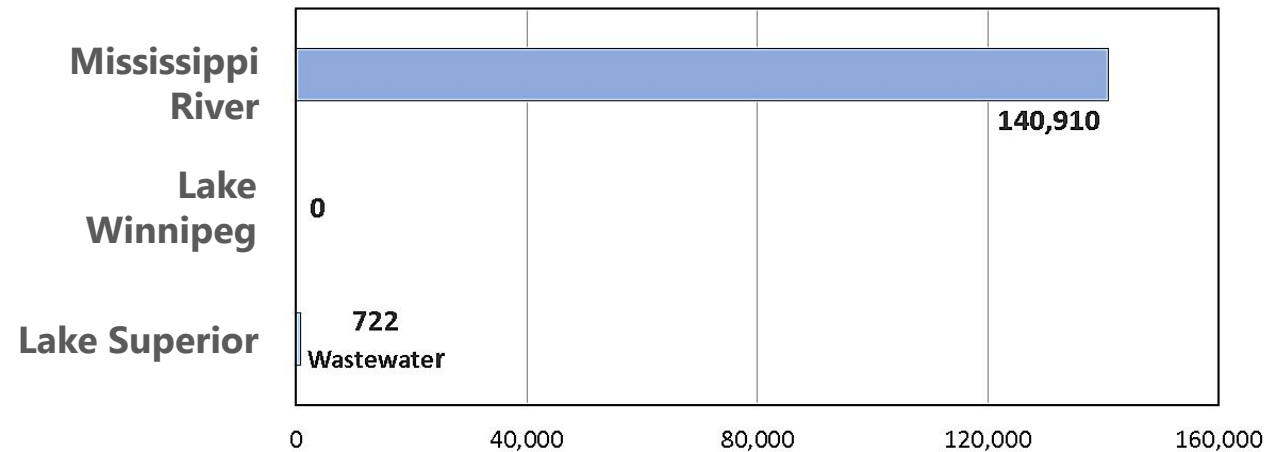
Total Phosphorus



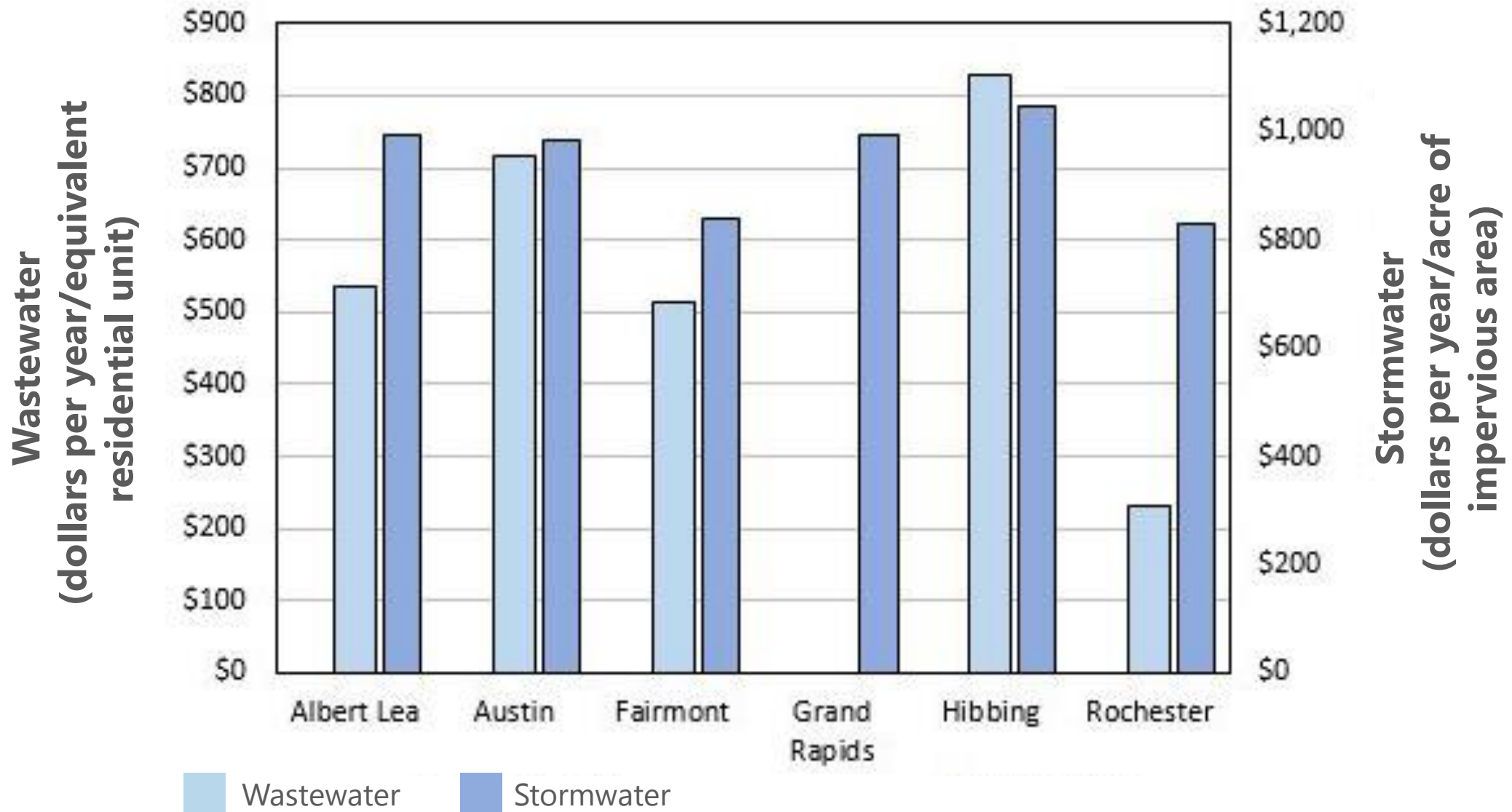
Total Nitrogen



Solids



Overall cost for wastewater/stormwater system upgrades



Questions?

Engineering Cost Analysis of Current and Recently Adopted, Proposed, and Anticipated Changes to Water Quality Standards and Rules for Municipal Stormwater and Wastewater Systems in Minnesota

Prepared for Minnesota Management and Budget

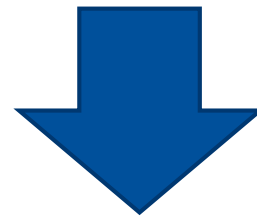
<https://mn.gov/mmb-stat/documents/budget/barr-engineering-cost-of-water-quality-standards-report.pdf>



Anticipated sewer rates

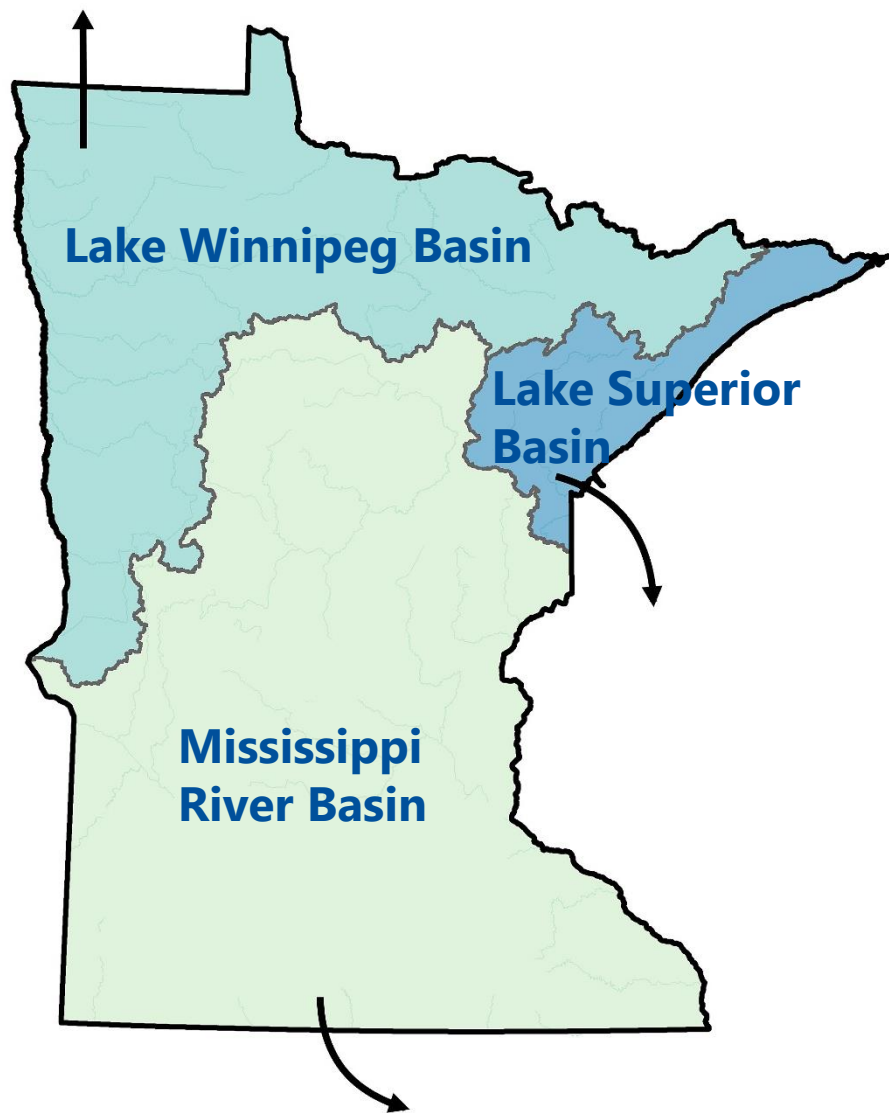
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Increased pressure on funding sources

Nitrogen and phosphorus loading reductions to major basins due to current/future wastewater treatment facility effluent limits



Standards	Percent Reduction	Mass Reduction (Metric Tons/Year)
Lake Superior Basin Loading Summary		
Total nitrogen—current	0.0%	0
Total nitrogen —proposed	14.4%	697
Total phosphorus—current	0.0%	0
Lake Winnipeg Basin Loading Summary		
Total nitrogen—current	0.8%	45
Total nitrogen —proposed	1.0%	58
Total phosphorus—current	0.8%	1.2
Mississippi River Basin Loading Summary		
Total nitrogen—current	0.1%	122
Total nitrogen—proposed	1.2%	1,623
Total phosphorus—current	1.2%	27