

Statewide POTW Nutrient Removal Cost Study

Project Summary

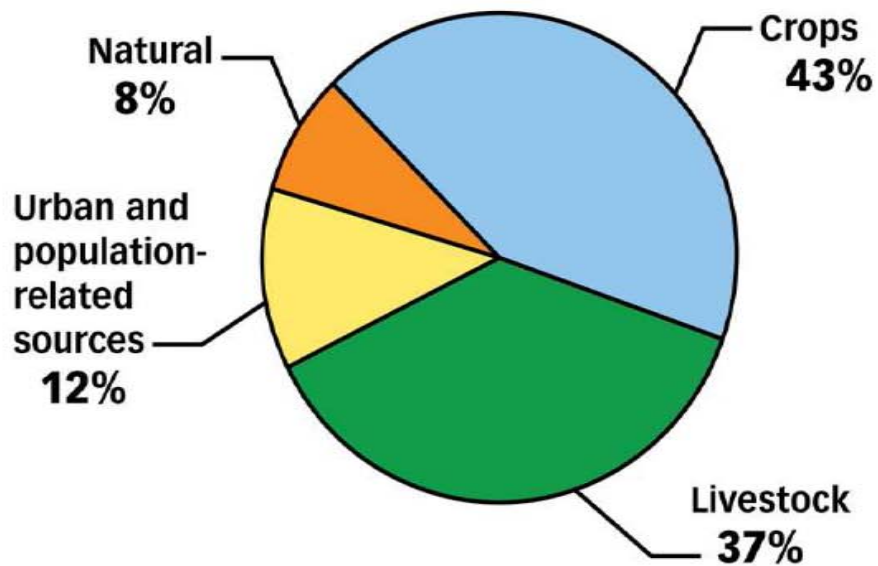
Nutrient Core Team Meeting
21 September 2011

POTW Focus

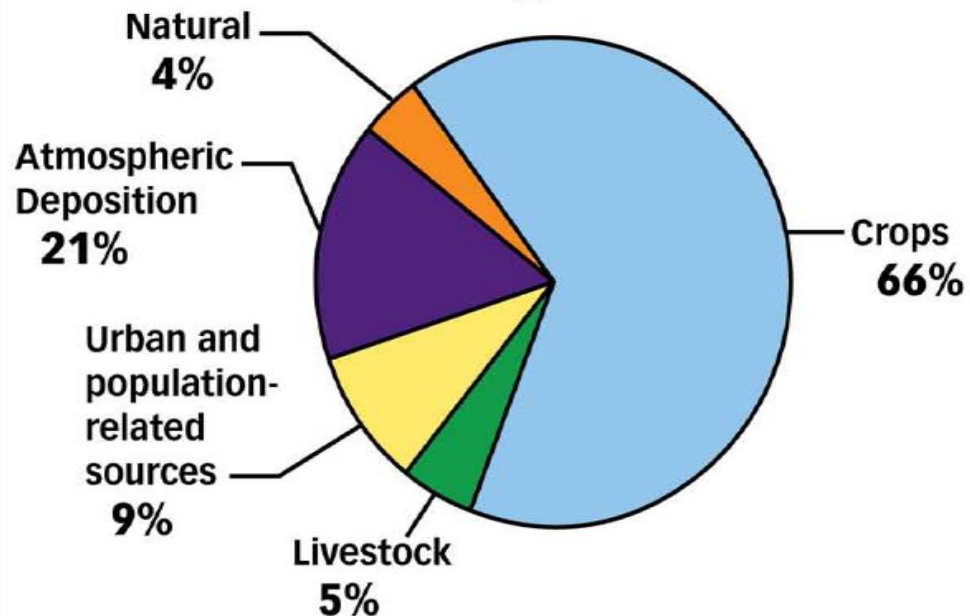
- 16,500 POTWs nationwide
- 34 billion gallons per day
- Major (urban) sources of nutrient pollution
- 65% of point source flux is from POTWs
- <10% have P limits; 4% have limits for TN
- Total discharge is expected to grow

Gulf of Mexico

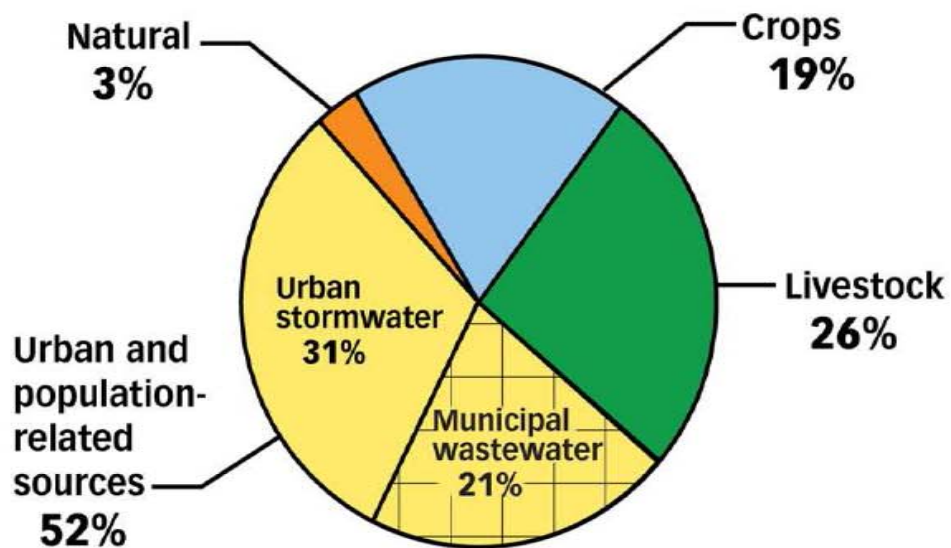
Phosphorus



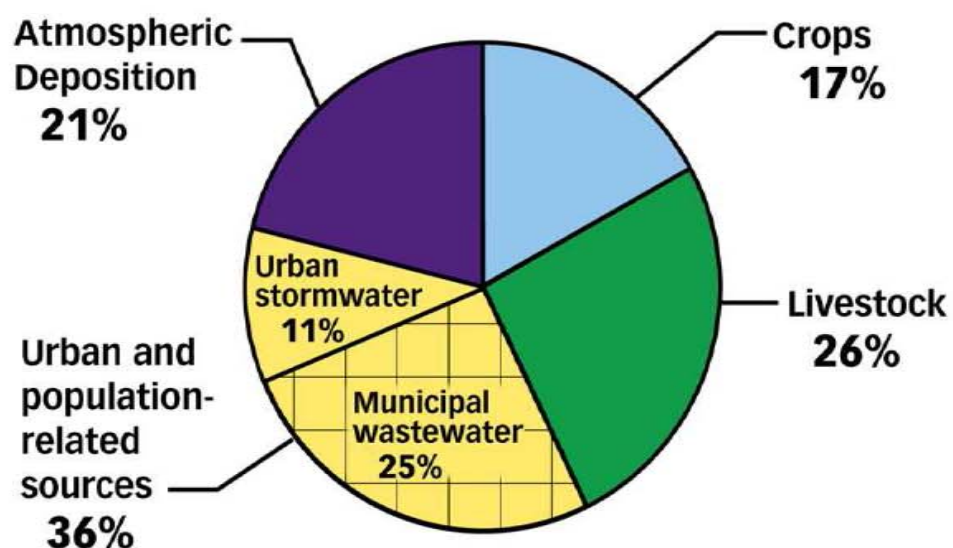
Nitrogen



Phosphorus



Nitrogen



Chesapeake Bay

Project Goals

- Establish realistic cost estimates for N & P removal in Utah's POTWs
- Quantify the water quality effects from state-wide nutrient effluent limits
- Support POTWs and the industry with facility-specific economic and technical information

Project Approach

Utah POTW Nutrient Cost Study

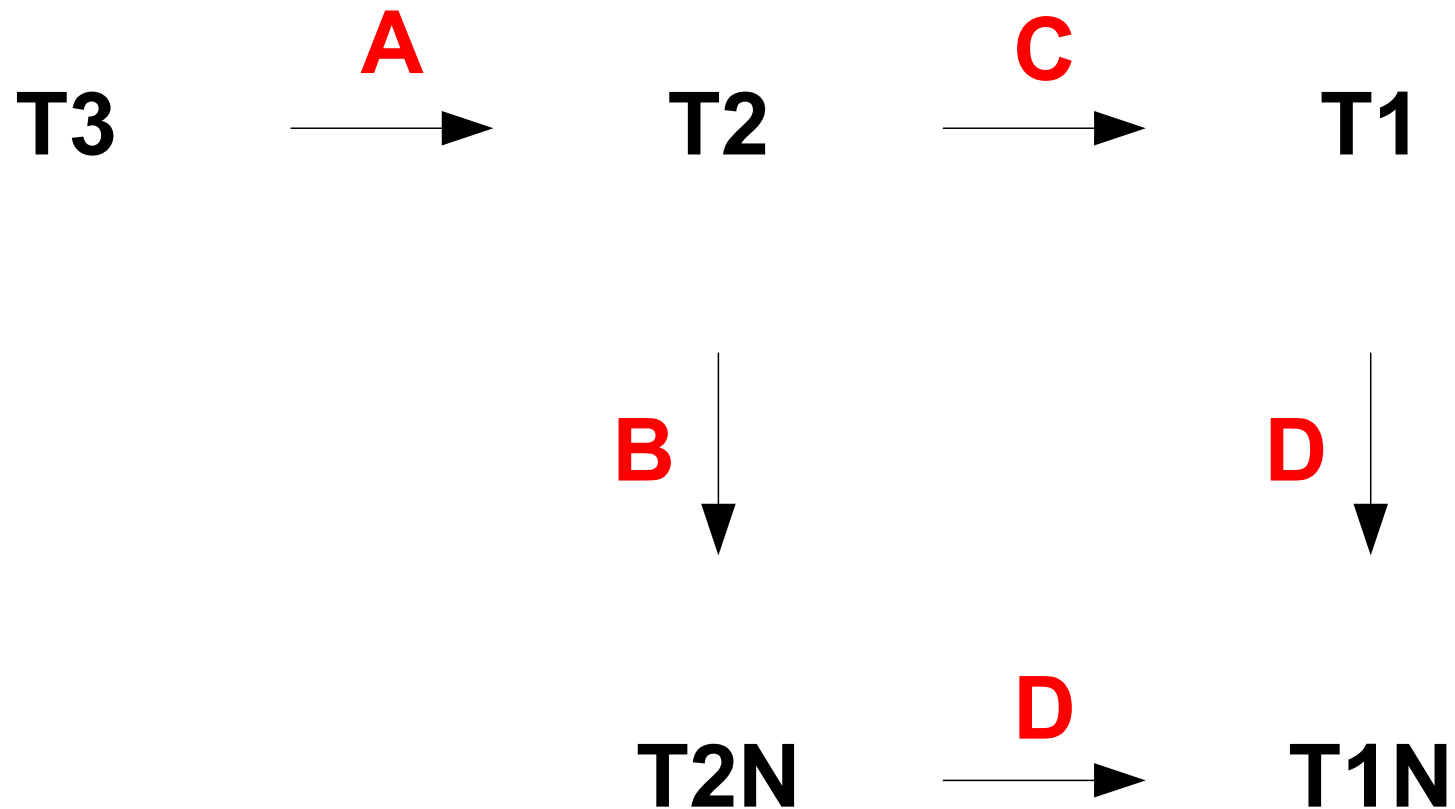
If national or state-wide effluent limits are required...

- *What are the treatment technical challenges?*
- *What are the economic ramifications?*
- *What are the water quality effects?*

Effluent Nutrient Requirement Scenarios

Tier	Total Phosphorus, mg/L	Total Nitrogen, mg/L
1N	0.1	10
1	0.1	no limit
2N	1.0	20
2	1.0	no limit
3	Base condition	Base condition

Systematic Upgrade Approach



Typical Sequence of Upgrades

- T2 – Chemical Addition
- T2N – Chemical Addition + Denitrification
- T1 – Multi-Point Chemical Addition + Filters
- T1N - Multi-Point Chemical Addition + Denitrification + Filters

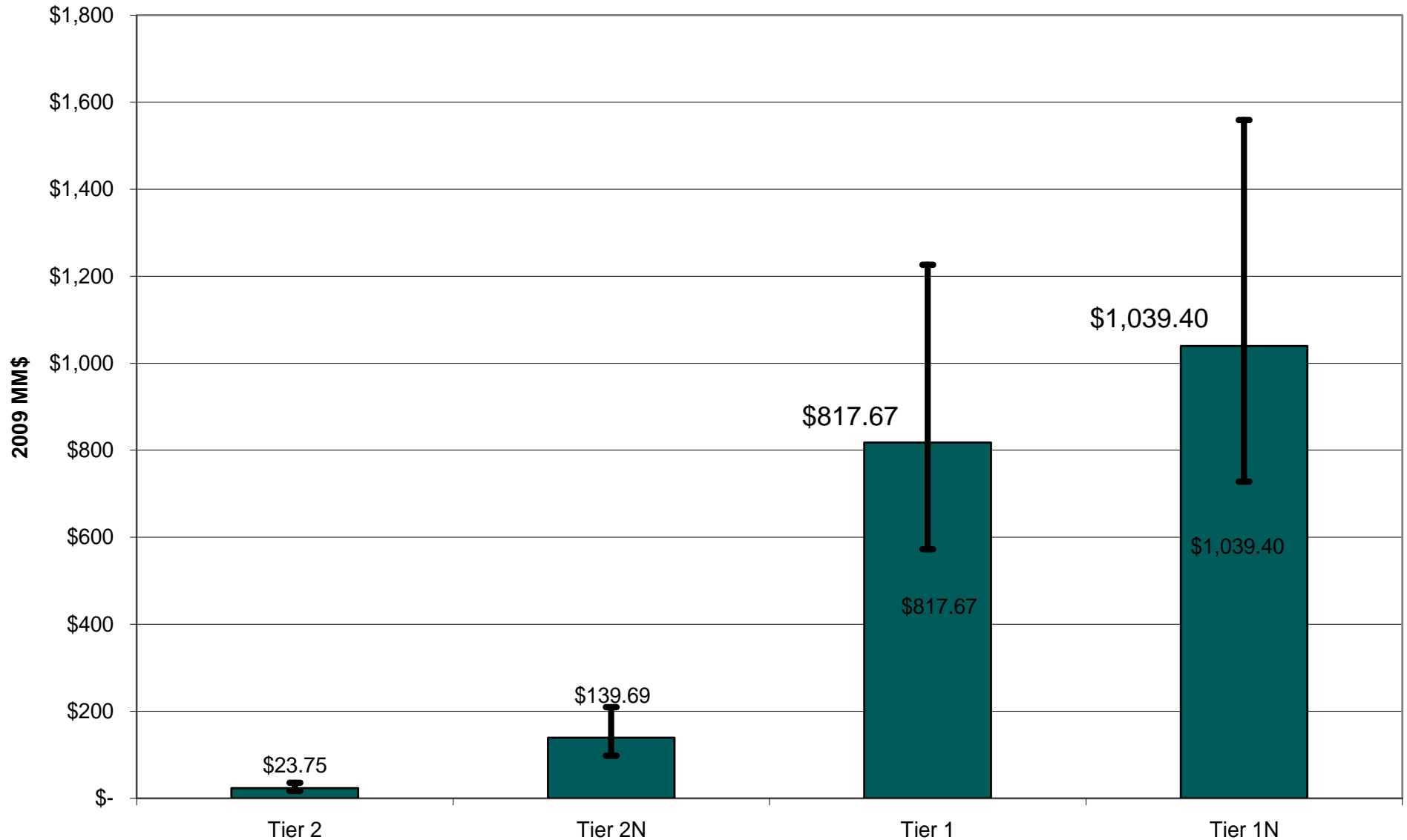
Cost Estimating Basis

- Financing Term – 20 years
- Discount Rate – 2.7 %
- Rate of Borrowing – 5.0 %
- Inflation Rate – 0 %
- Salvage Value - None

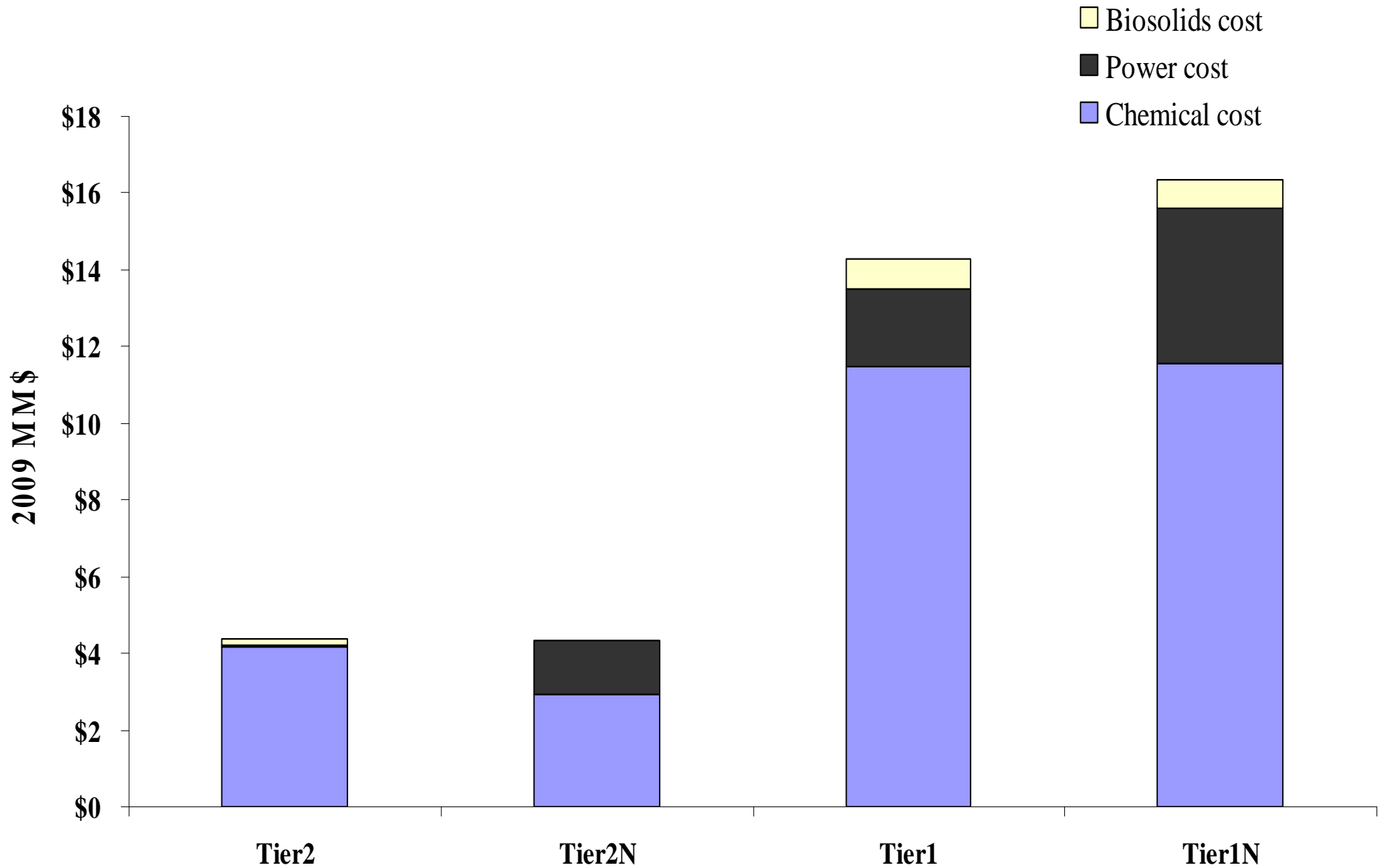
Project Summary Results

Capital Costs - Statewide

Utah Statewide Nutrient Removal Cost Impact Study CAPEX Comparison

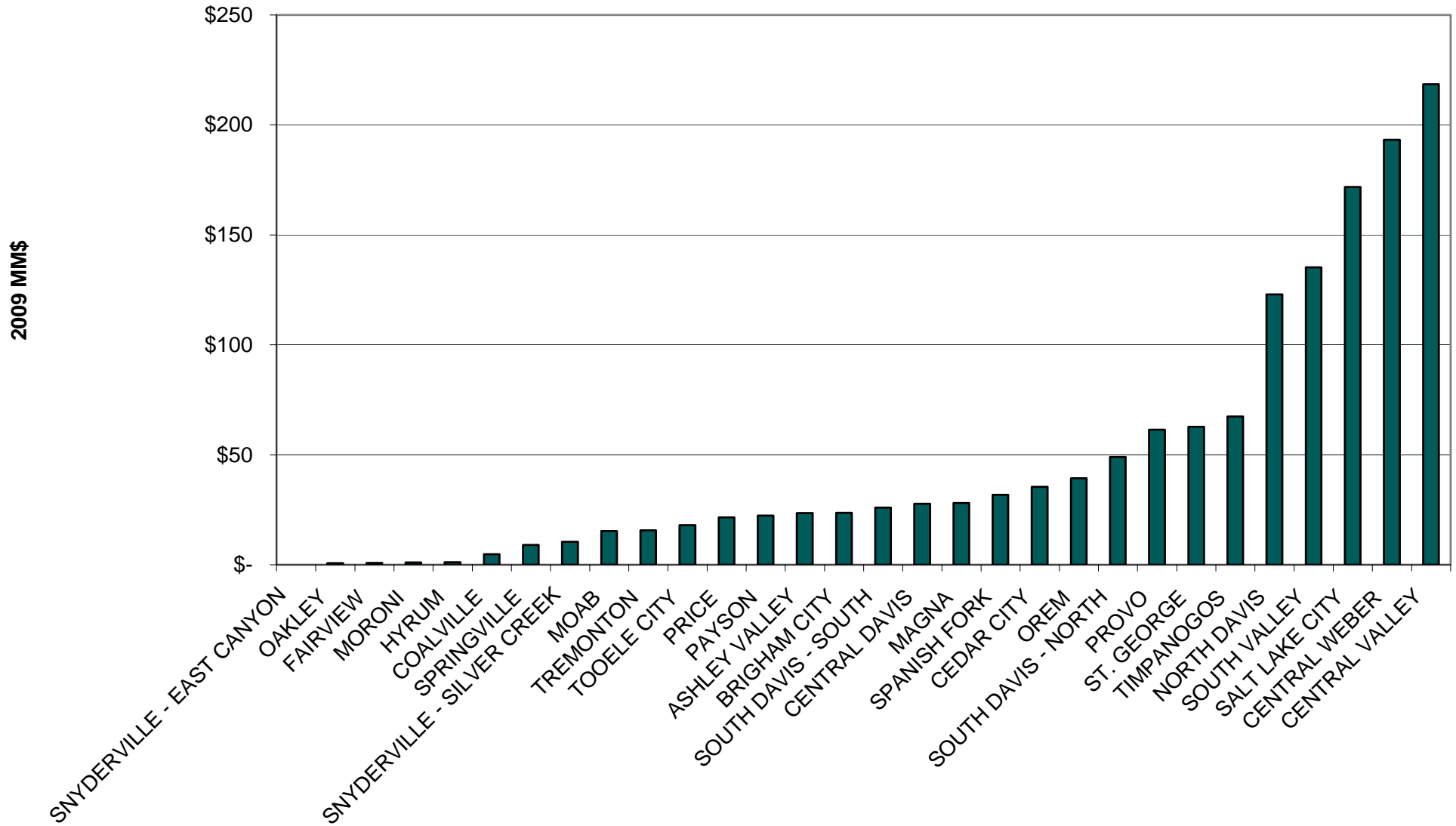


Annual Operating Costs - Statewide

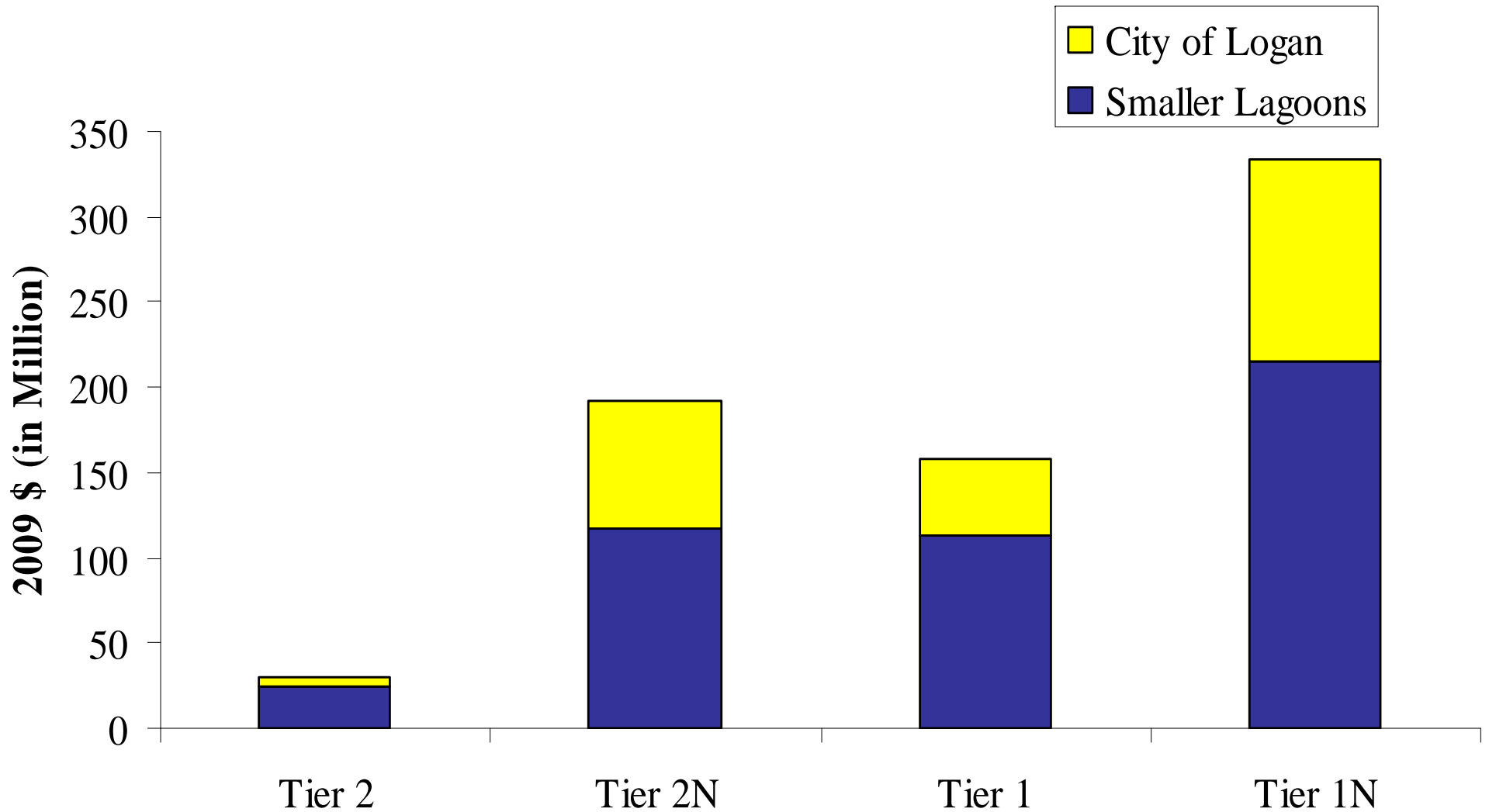


T1N – 20 Years Total Costs

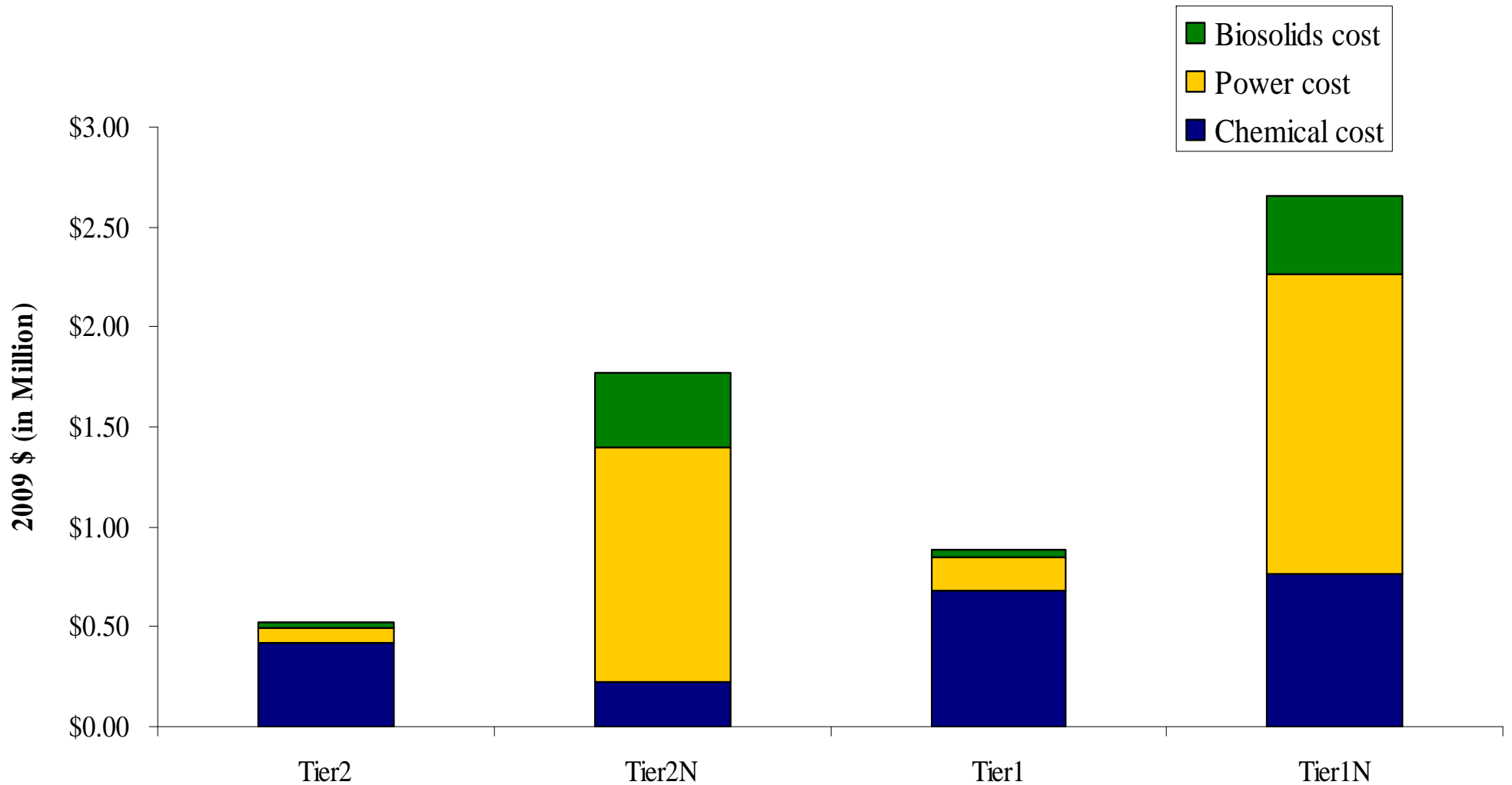
Utah Statewide Nutrient Removal Cost Impact Study
POTW 20Y Total Cost Comparison for T1N



Capital Costs – Statewide Discharging Lagoons



Statewide Lagoon O&M Cost



Projected Monthly Rate Increases

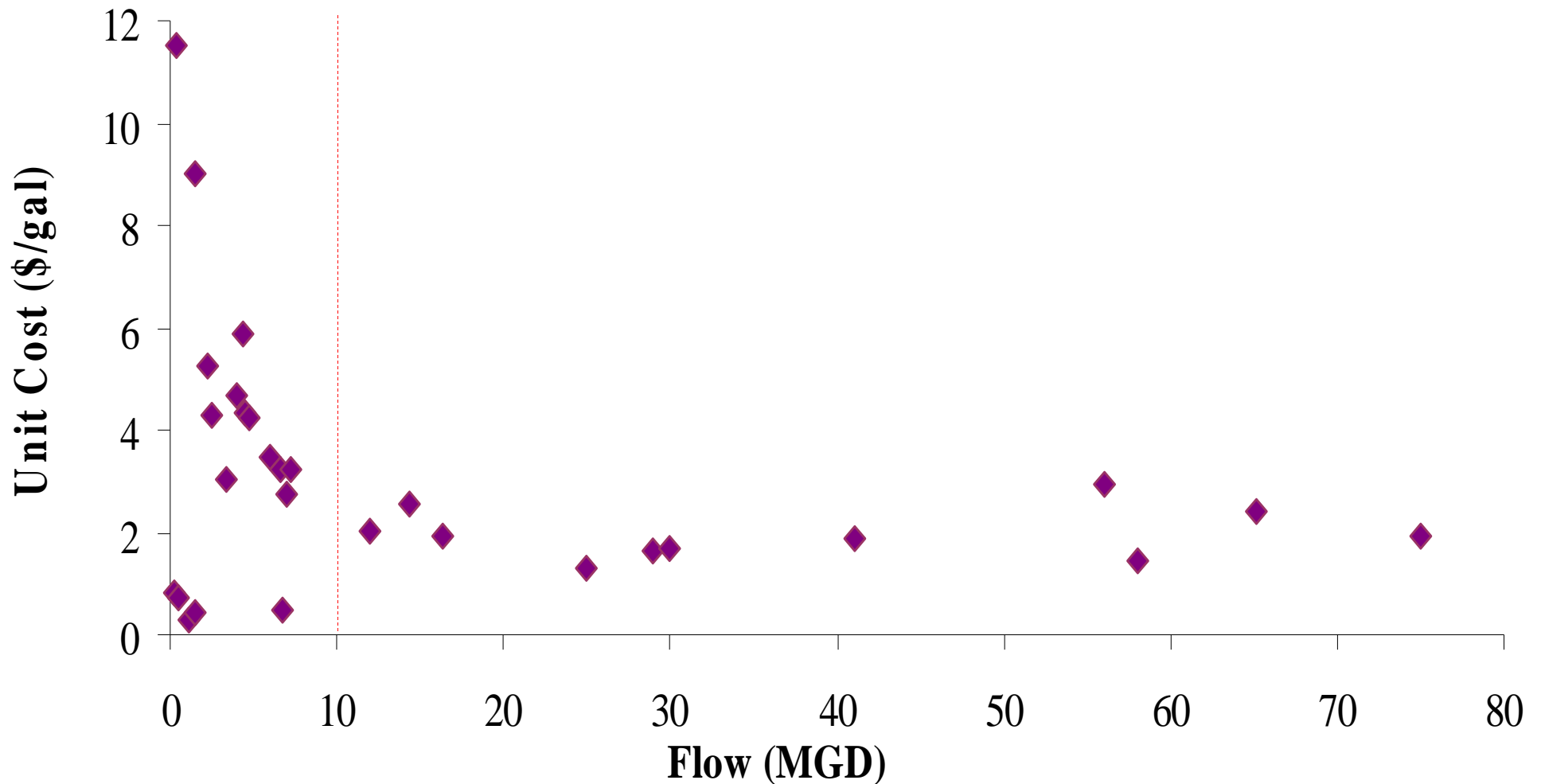
- Tier 2: \$0 - \$3.75 median = \$0.95
- Tier 2N: \$0 - \$15.30 median = \$1.65
- Tier 1: \$0 - \$33.35 median = \$8.45
- Tier 1N: \$0 - \$33.35 median = \$9.40

Projected Bill Affordability

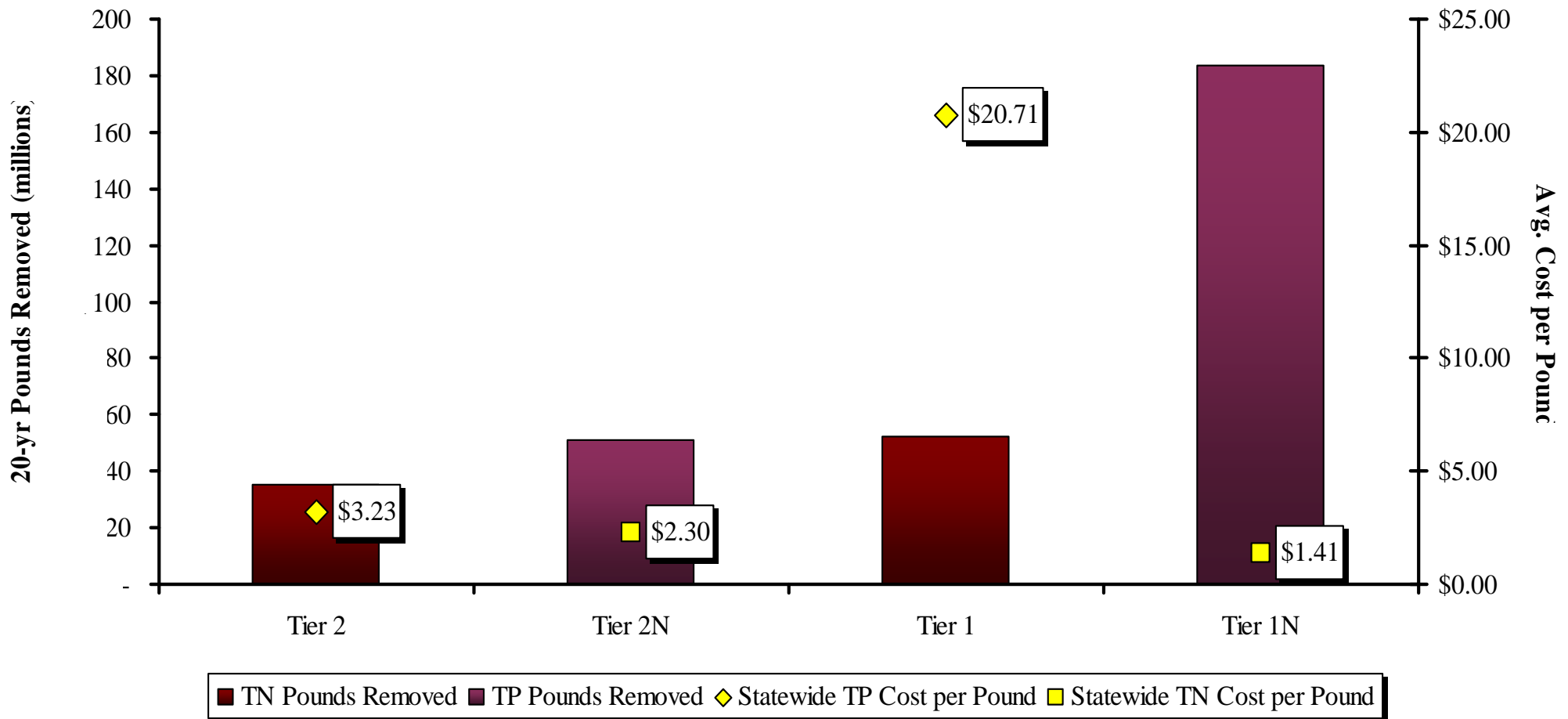
as Percent of 1.4% MAGHI Criterion

- Tier 2: 15 – 95 % median = 45 %
- Tier 2N: 20 – 100 % median = 50 %
- Tier 1: 25 – 115 % median = 60 %
- Tier 1N: 30 – 125 % median = 65 %

Metrics – Unit Upgrade Cost per Gallon Capacity at Tier 1N



Metrics – Unit Cost per Pound Nutrient Removed



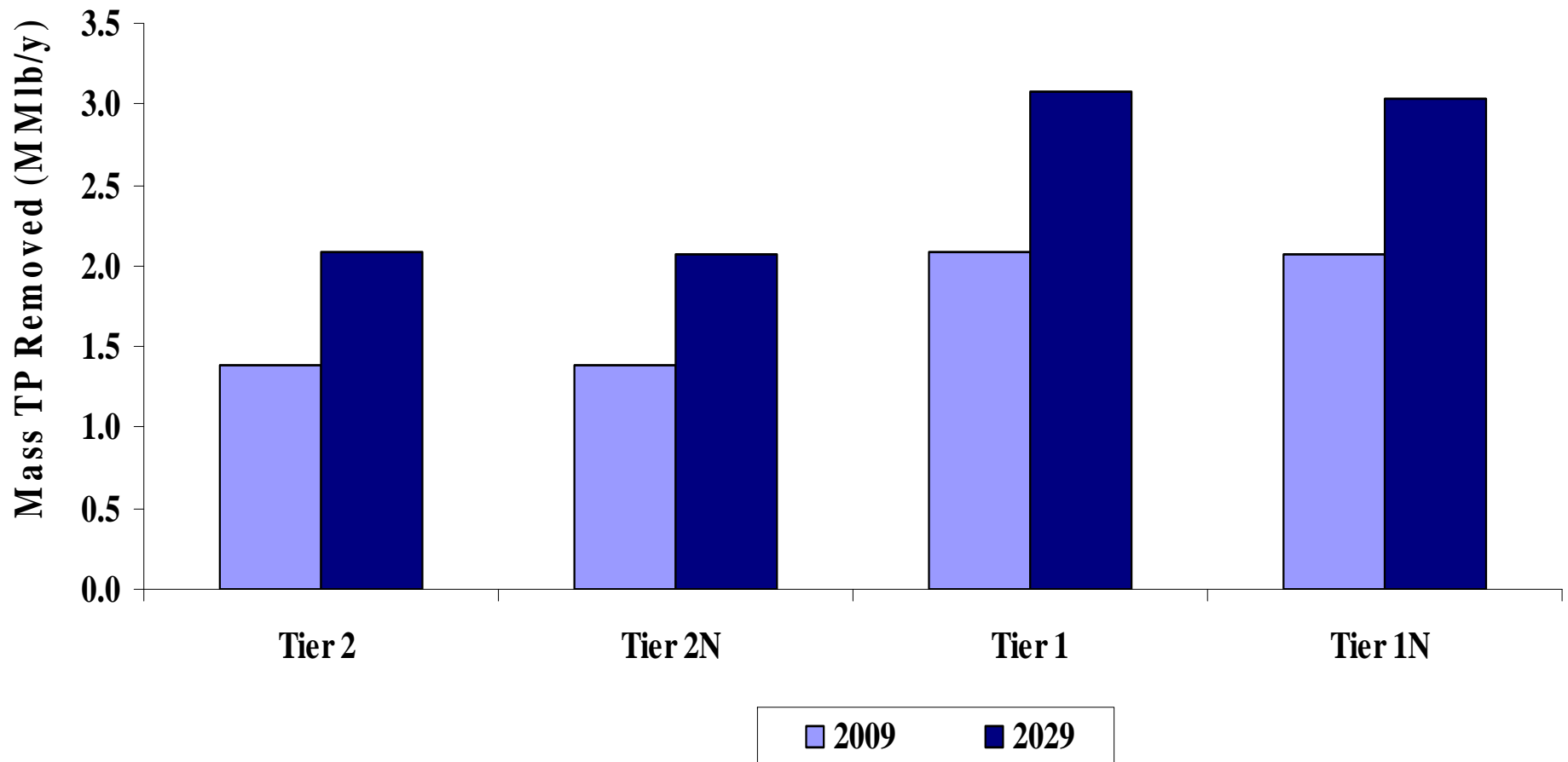
Environmental Impacts

- Load reductions
- Stream Load reductions realized

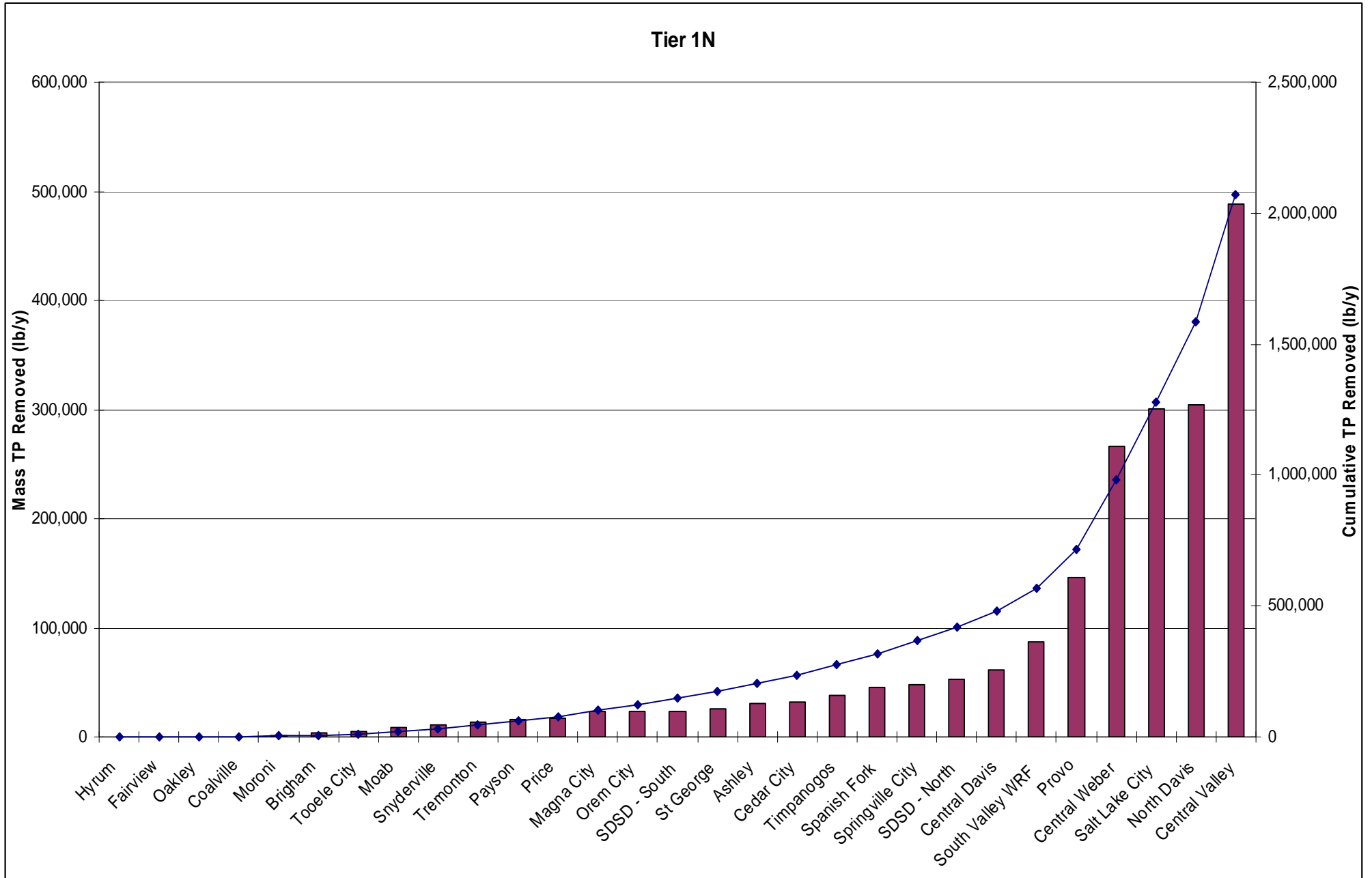
How relate to WQS? – Florida & Montana comparison

Mass Phosphorus Removed

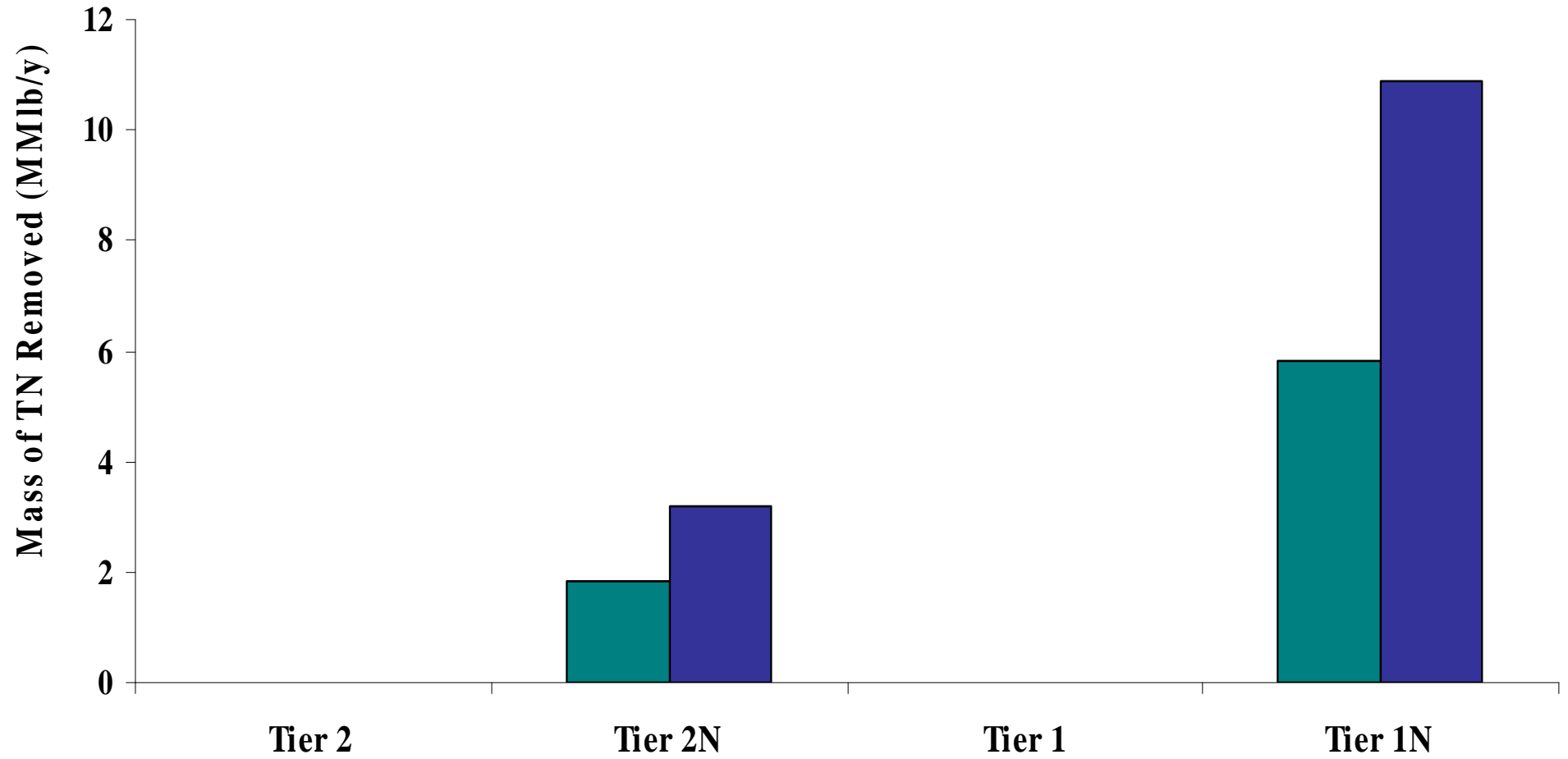
Utah Statewide Nutrient Removal Cost Impact Study
Pounds of TP Removed



T1 Phosphorus Removed

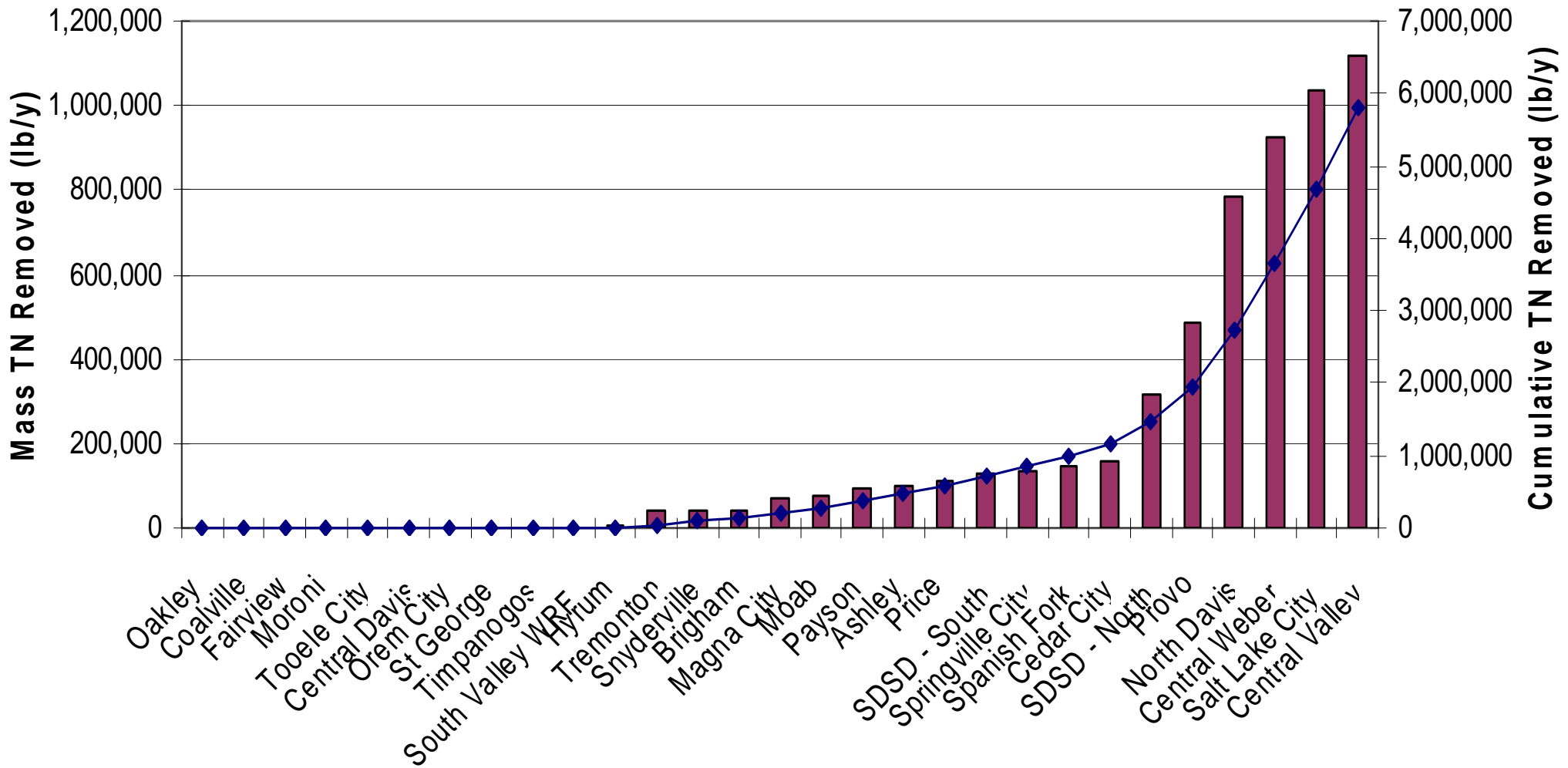


Utah Statewide Nutrient Removal Cost Impact Study
Pounds of TN Removed

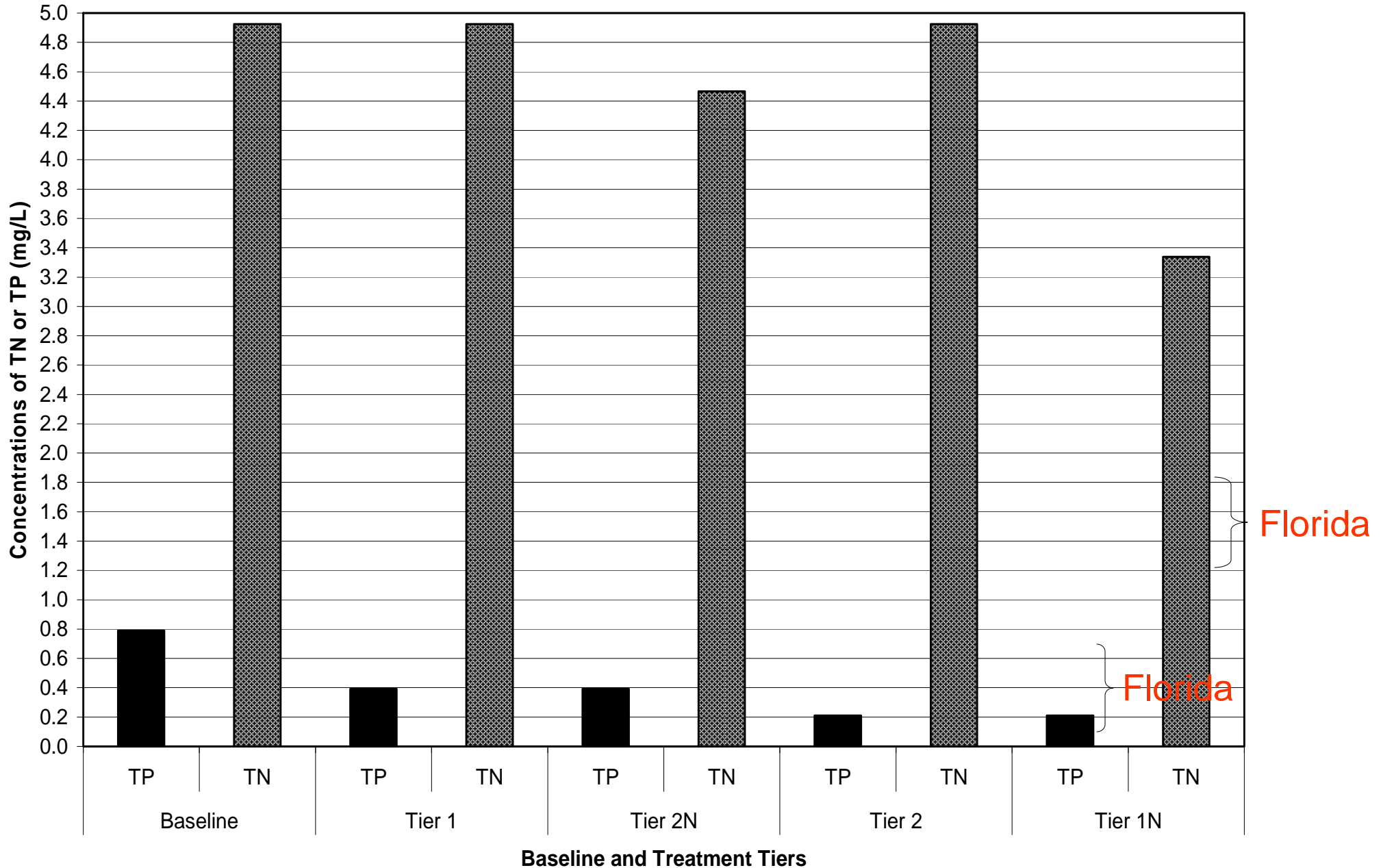


T1N Nitrogen Removed

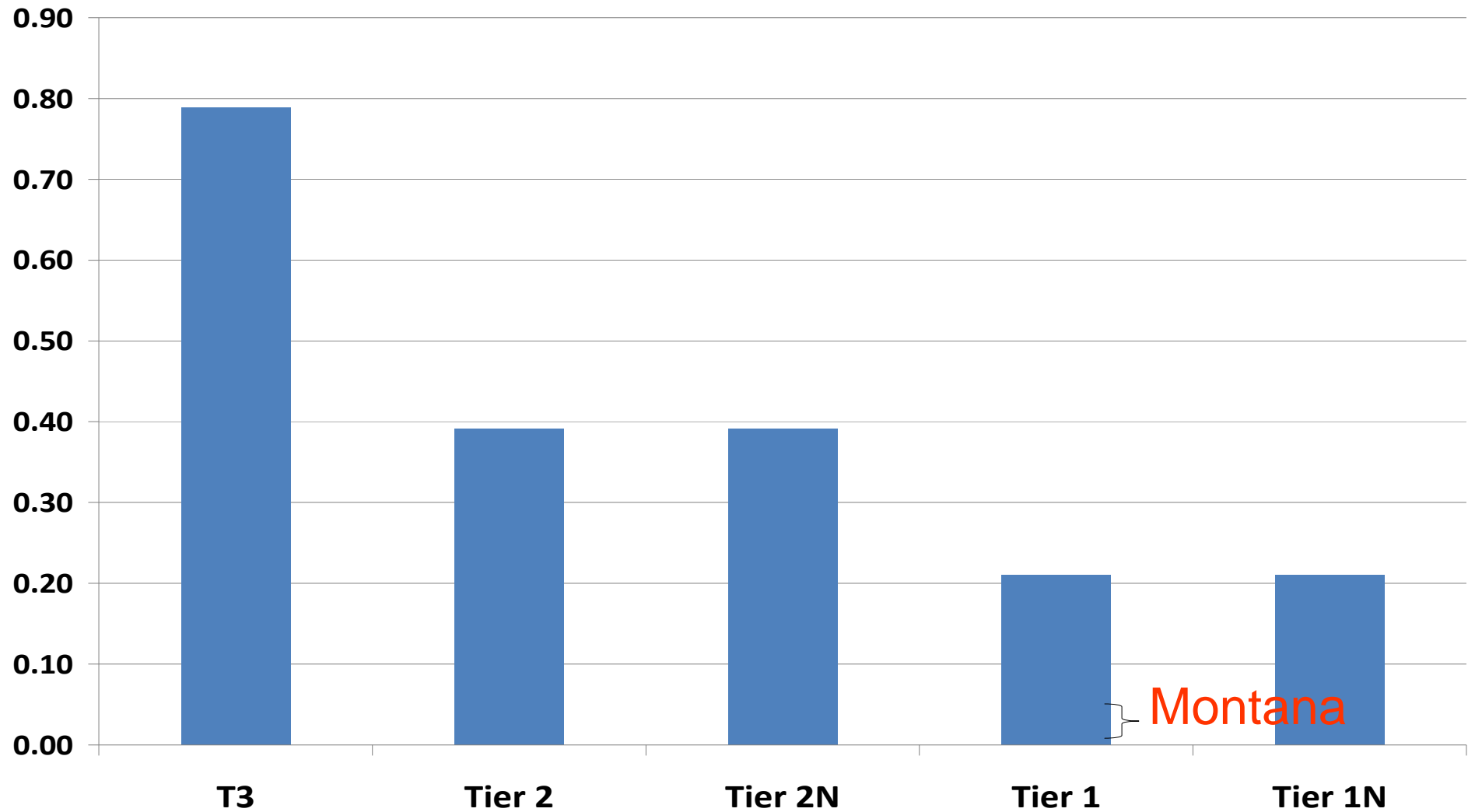
Tier 1N



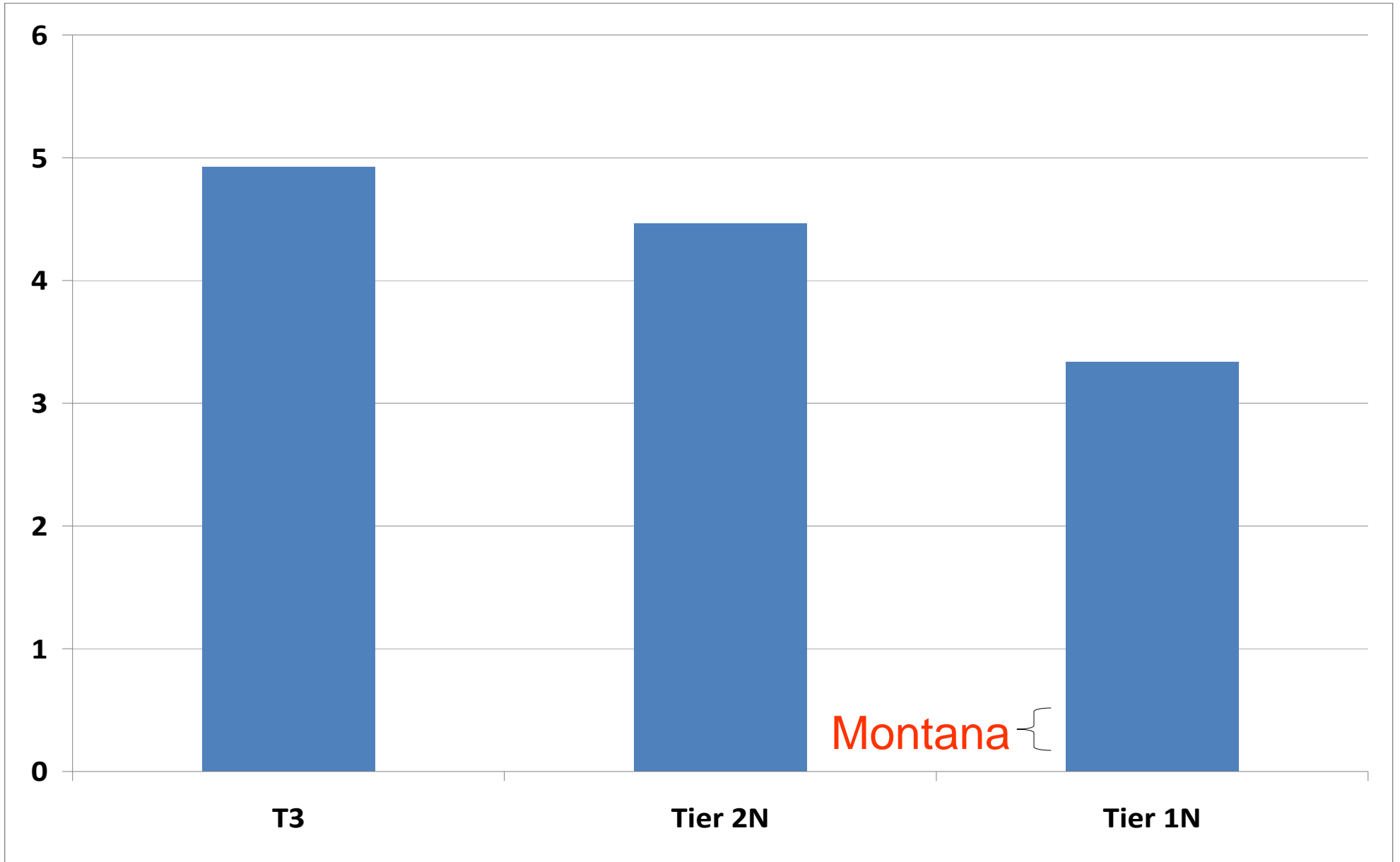
Average Concentrations in Downstream Receiving Waters



Average TP in Downstream Receiving Waters



Average TN in Downstream Receiving Waters



What We Learned

- Good estimate of statewide cost of POTW nutrient limits
- Good cost metrics for nutrient control upgrade analysis
- Good treatment adaptability at most POTWs
- Broad range of “affordable” upgrade options for most Utah POTWs

What We Learned

- Significant nutrient load reductions from POTW controls, but...
- Limits to end-of-pipe solutions for nutrient total nutrient management
- Significant cost impacts to some communities, particularly discharging lagoons & other small plants

Questions?

