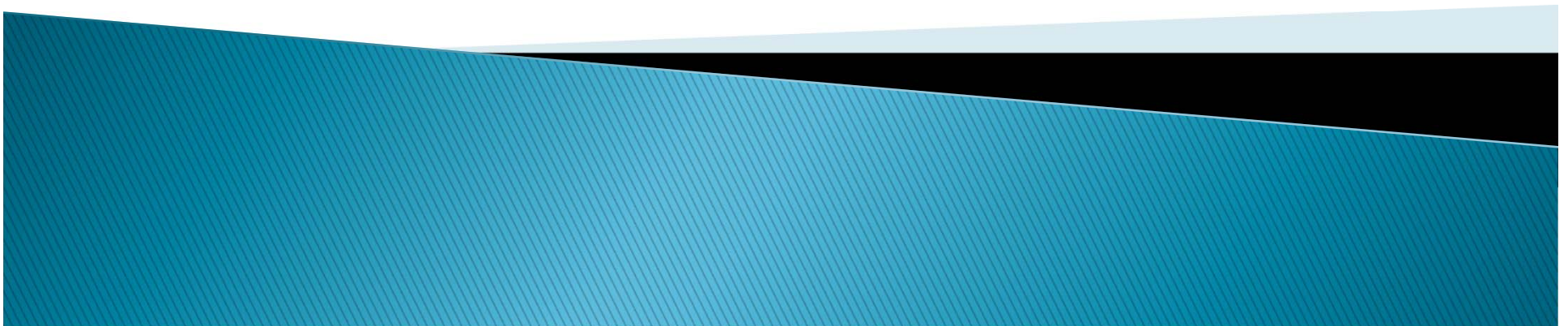


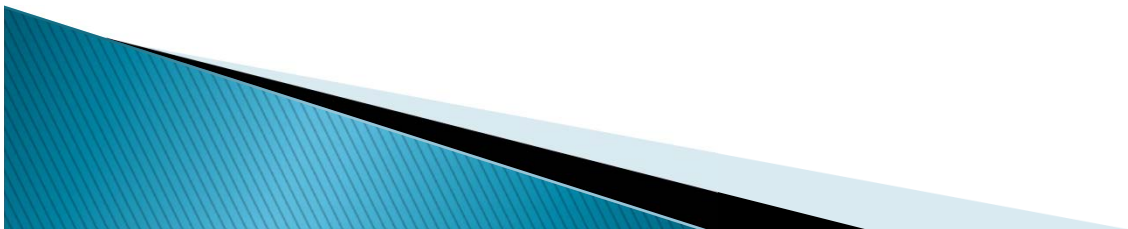
Total Nitrogen New Method for Analysis

Edward F. Askew PhD
Askew Scientific Consulting



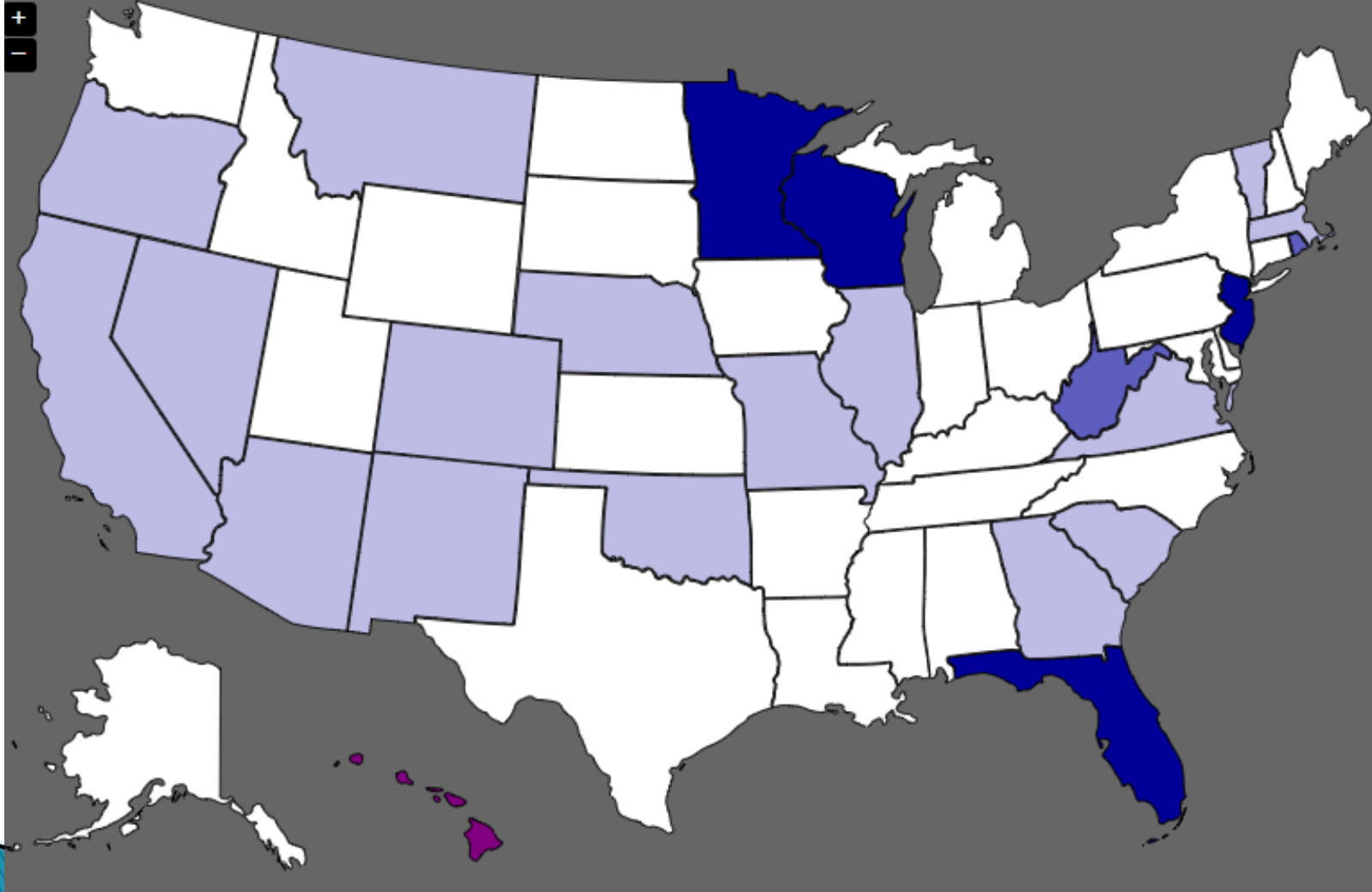
Problems

- ▶ Total Nitrogen Is NOT Defined As An Analyte in 40 CFR part 136
- ▶ Total Nitrogen and Its Removal Efficiency IS Being Defined By The States In NPDES Permits
- ▶ States Define Total Nitrogen As
 - TKN + Nitrite + Nitrate
- ▶ There are Problems With This Summation Approach
 - Each Individual Method Has Errors and Precision Problems



States with Total Nitrogen or Total Phosphorus Criteria

1998 2008 2013 2014 2015 2016 Current 2017* 2018* 2019* 2020*



Currently Available Test Methods

Summation Determination

- TKN + Nitrite + Nitrate
 - Lengthy
 - Generates substantial Waste
 - Hazardous
- Summation of values is also summation of error
 - All tests have a +/- accuracy
 - Different methods can give different results
- State of Iowa Concerned by potential for false high or low reporting

Chemiluminescence

- New to the market
- Requires additional / specialized equipment
- Requires Platinum Catalyst
- Reports ALL Mineral Species. Even those that are not detected in NORMAL WASTEWATER EFFLUENT.

Solutions

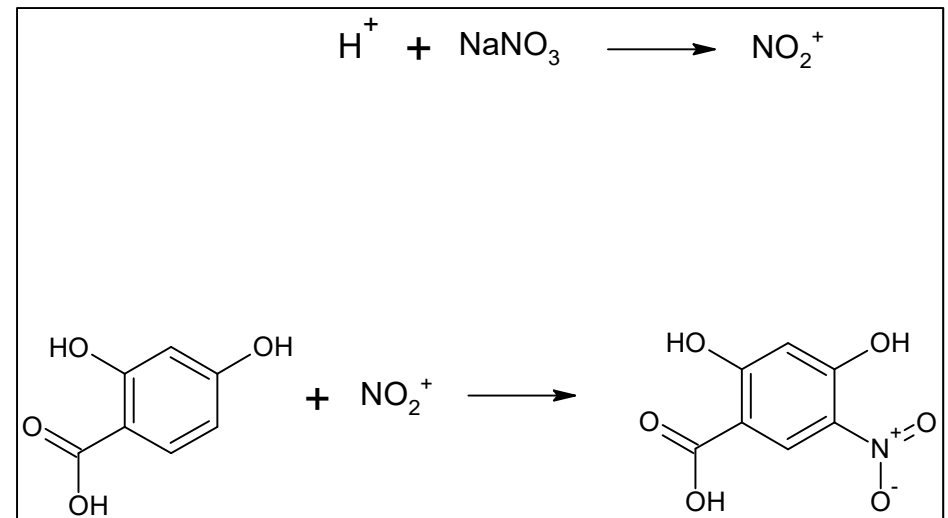
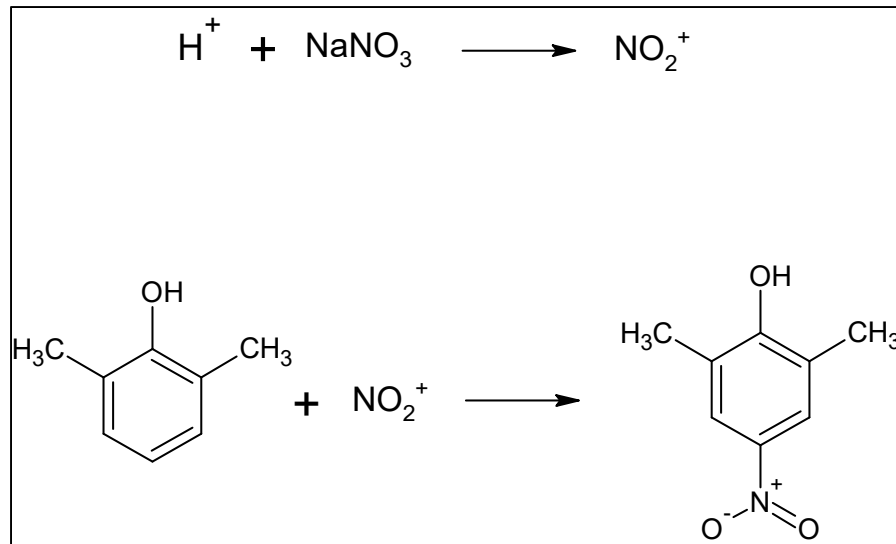
- ▶ Validated State Method (Cooperative Federalism) That Determines Total Nitrogen In A Single-Step Method
 - Validation Study Following EPA Protocols Has Been Submitted To Iowa DNR
- ▶ Utilizes
 - COD Type Digestion Tube
 - COD Type Heating Block
 - Simple Spectrophotometer



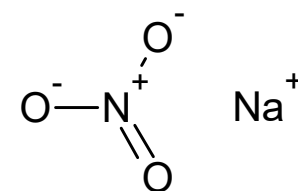
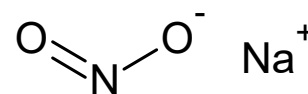
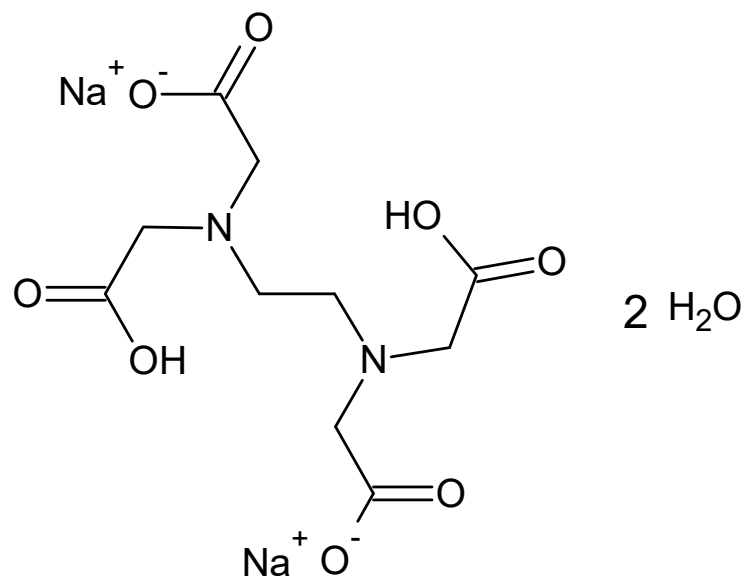
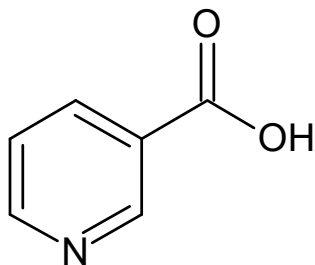
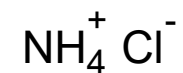
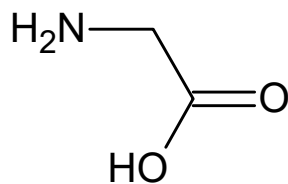
Koroleff Reaction



Nitrate Determination By Spectroscopy

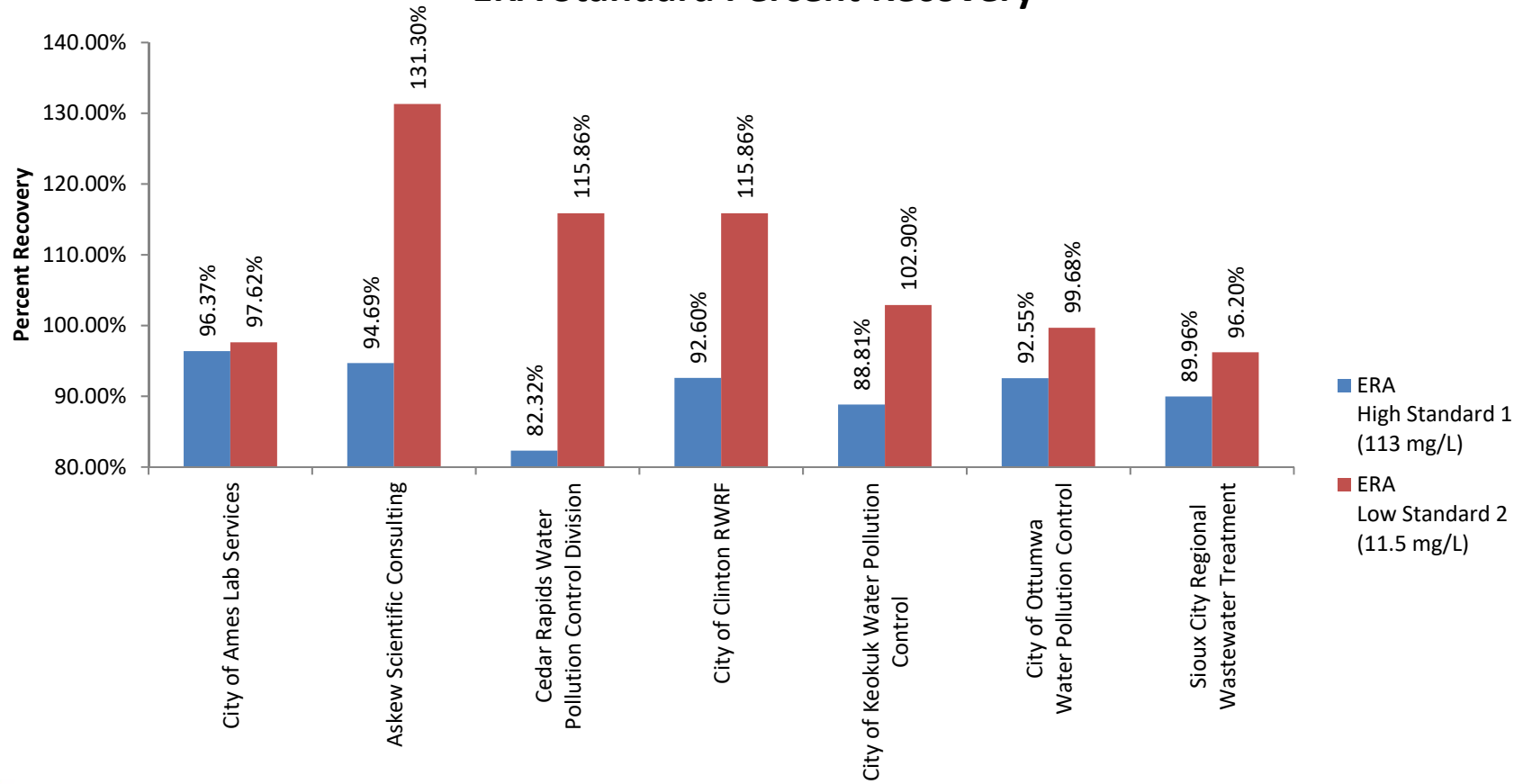


Compounds In Mixed Standard



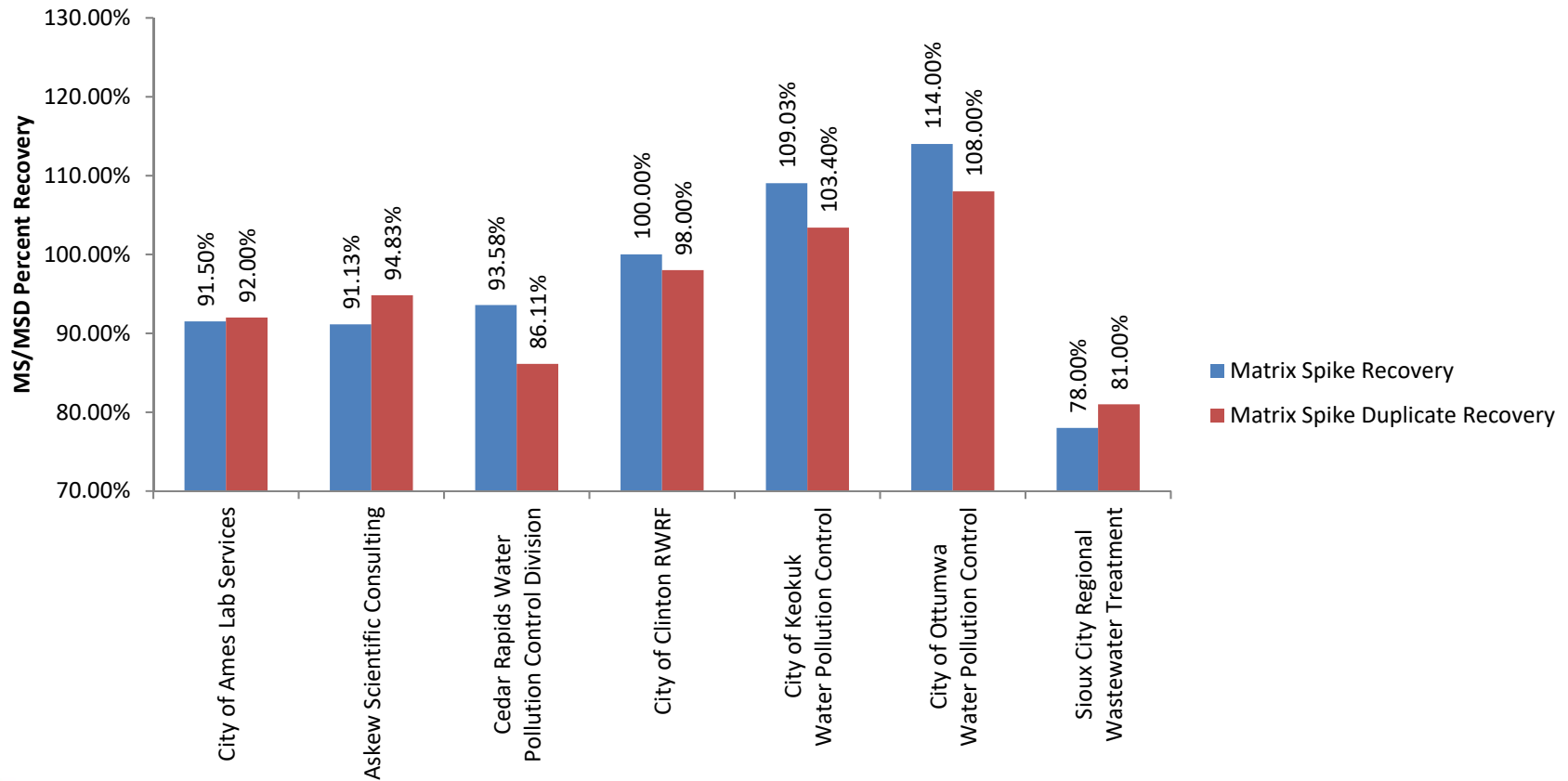
ERA Blind Checks

ERA Standard Percent Recovery



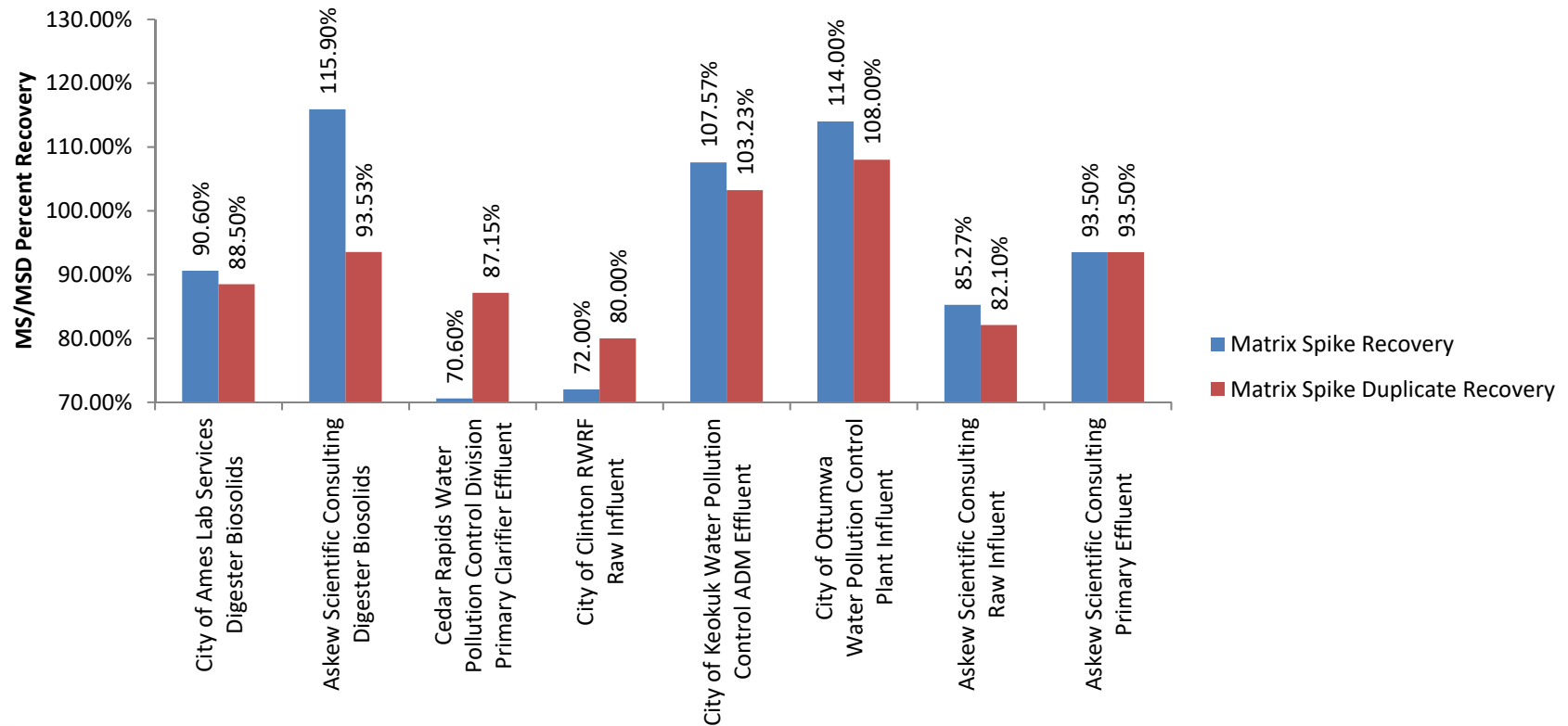
Final Effluent Matrix Recovery

Final Effluent Matrix Spike and Matrix Spike Duplicate Recovery



Other Matrixes Recoveries

Individual Laboratory Other Matrix Spike and Matrix Spike Duplicate Recovery



Total Nitrogen Removal Efficiency

▶ City of Muscatine POTW

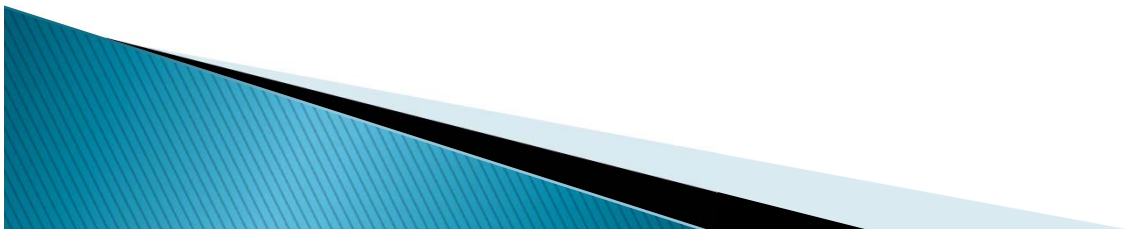
- Influent 28.98 mg/L TN-N
- Primary Effluent 23.17 mg/L TN-N
- Final Effluent 8.04 mg/L TN-N

▶ Total Nitrogen Removal

- $28.98 - 8.04 = 20.94$ mg/L TN-N

- 72.3 % Removal

- ~ 8 % Needed To Reach 80% Removal



Questions ???

