

Multifaceted Approach to Copper Reduction

Scituate Wastewater Treatment Facility



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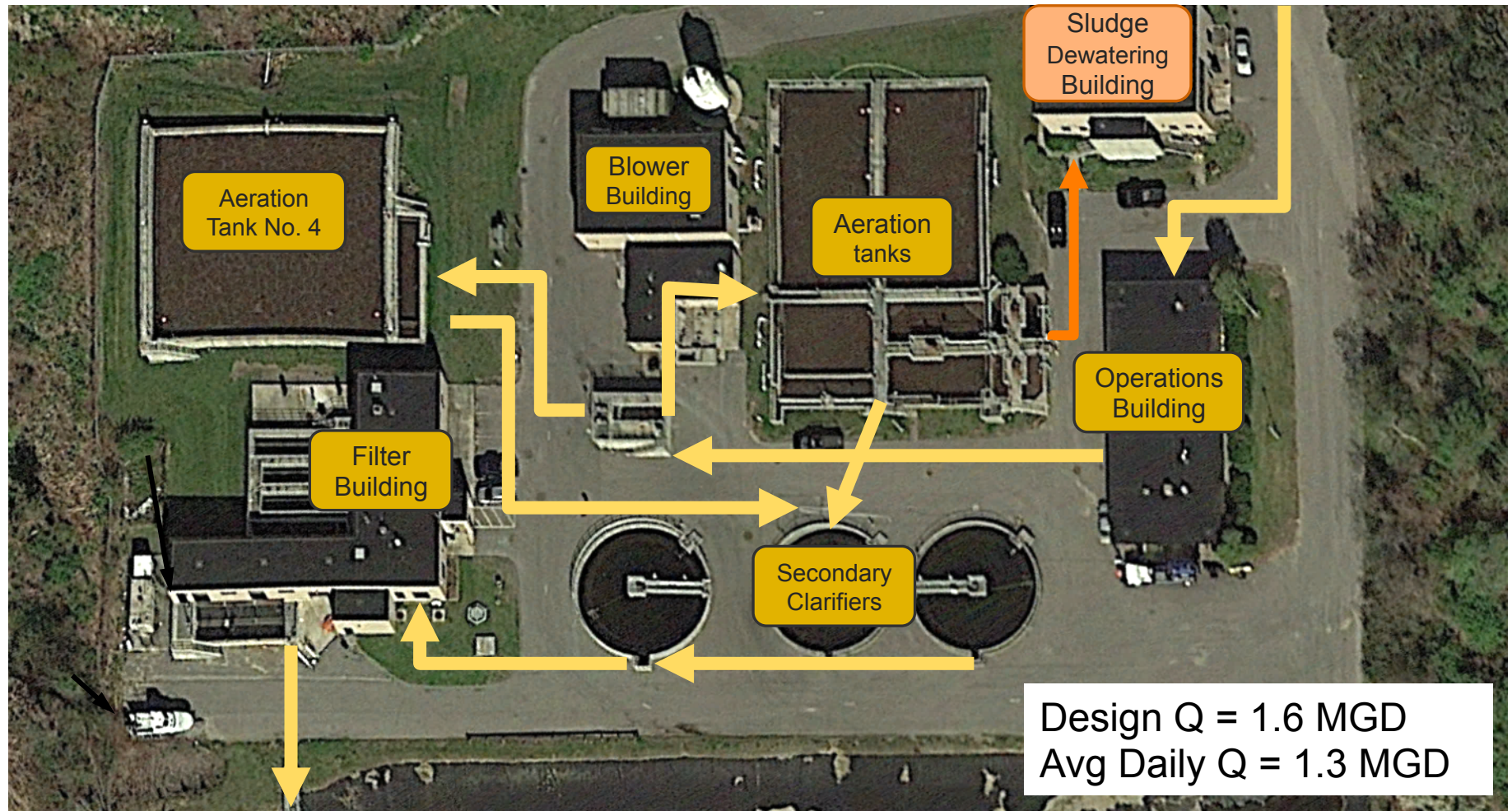
NEWEA Annual Conference 2018

Overview

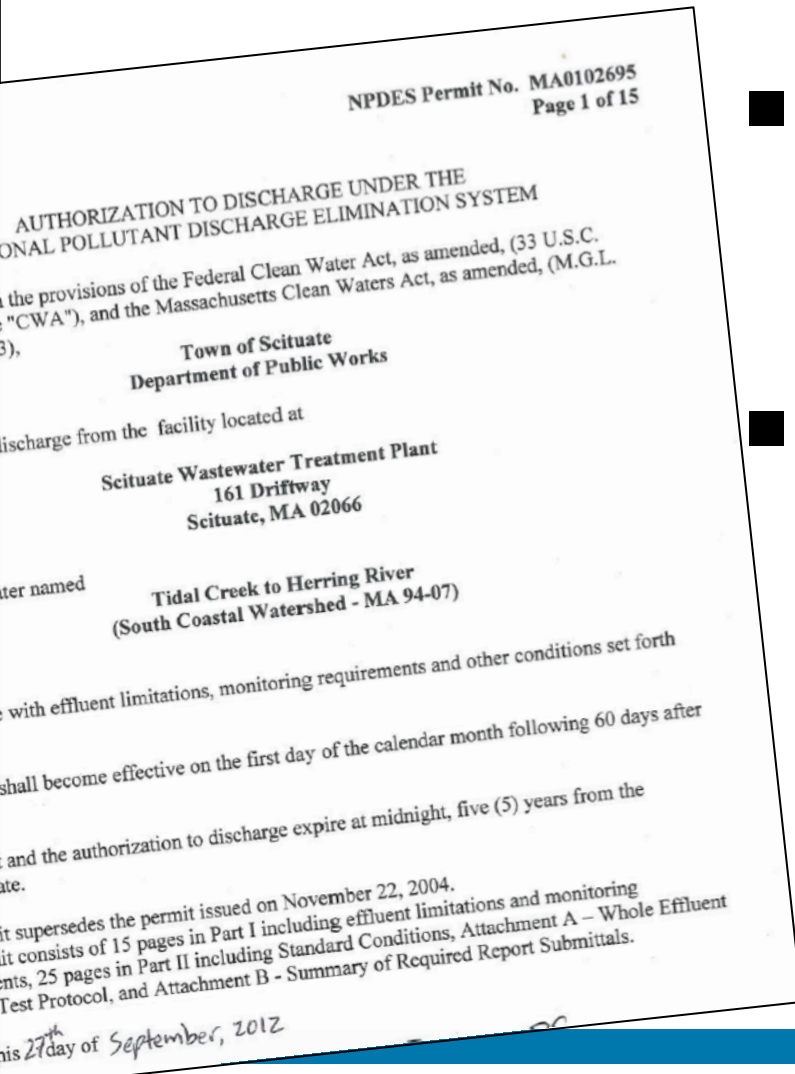
- **WWTF Background**
- **Regulatory Drivers**
- **Alternatives Evaluation**
- **Pilot Testing**



Scituate WWTF



Regulatory History



■ NPDES Permit

- Effective Date: 12/1/2012
- Effluent Copper Limit: 4.0 µg/L

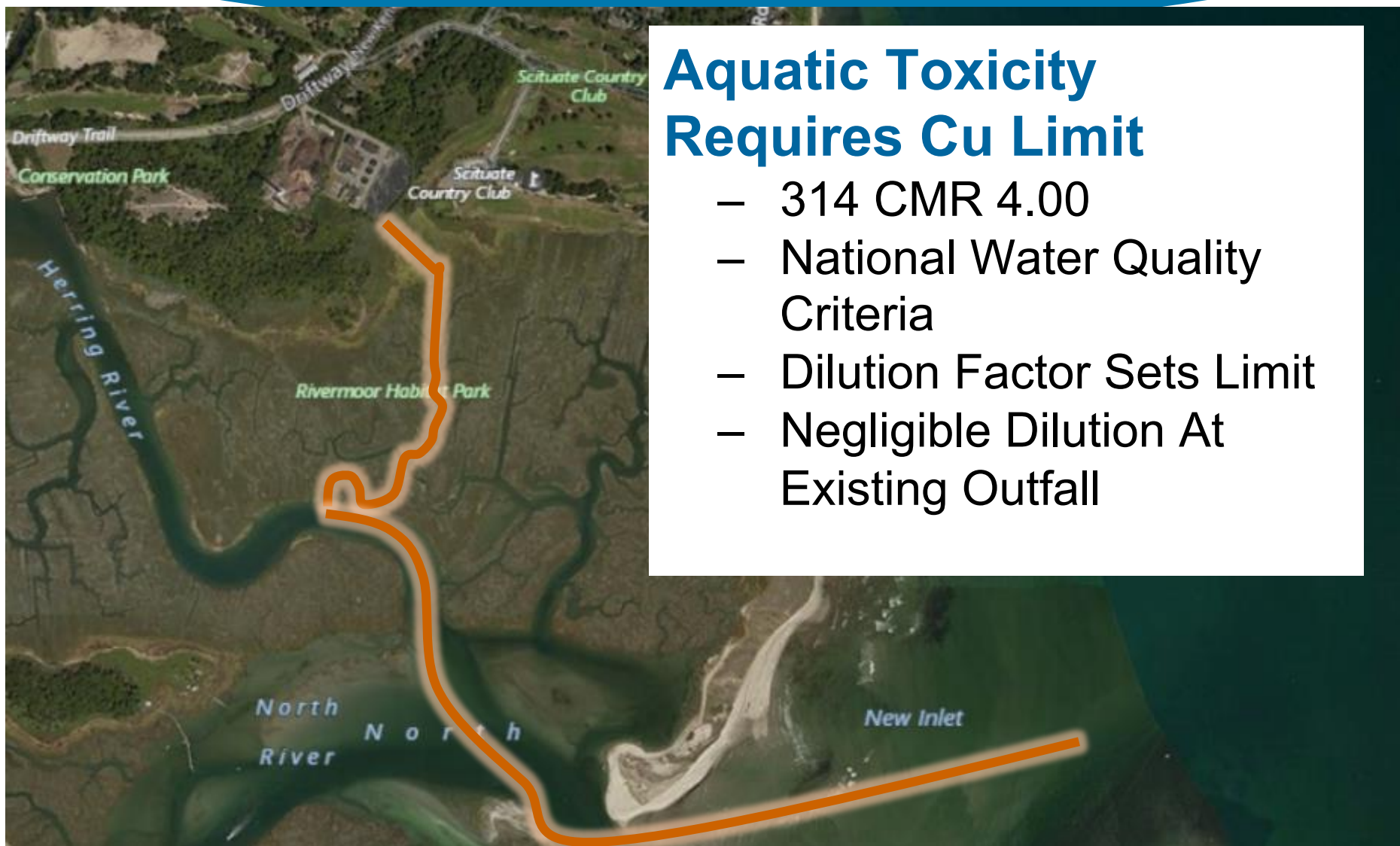
■ EPA Order of Compliance

- Issued March 2013
- Interim Cu Limit = 20 µg/L
- Establishes Compliance Schedule
- Requires Annual Reporting

Regulatory History

Aquatic Toxicity Requires Cu Limit

- 314 CMR 4.00
- National Water Quality Criteria
- Dilution Factor Sets Limit
- Negligible Dilution At Existing Outfall

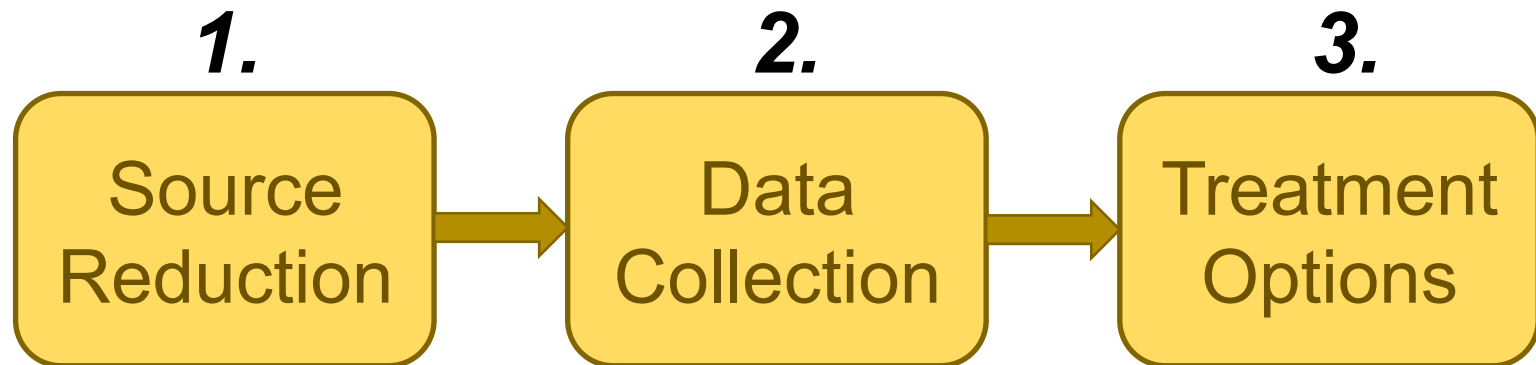


Compliance Alternatives Evaluation

Relocate Outfall

- Improve Dilution Increases Cu Limit
- Several Layouts Considered

Copper Reduction at Treatment Facility



Outfall Relocation Alternative 1

■ Ocean Outfalls

- Two Layouts
- Effluent Pump Station
- Ample Dilution
- Challenging Permitting & Construction

Capital Cost = \$15 mil



Outfall Relocation Alternative 2

■ Herring Creek Outfall

- Effluent Pump Station
- Tidal Dilution
- Challenging Permitting & Construction

Capital Cost = \$5 mil



Source Reduction

- **Point Sources Contamination**
 - Reviewed Major Water Users



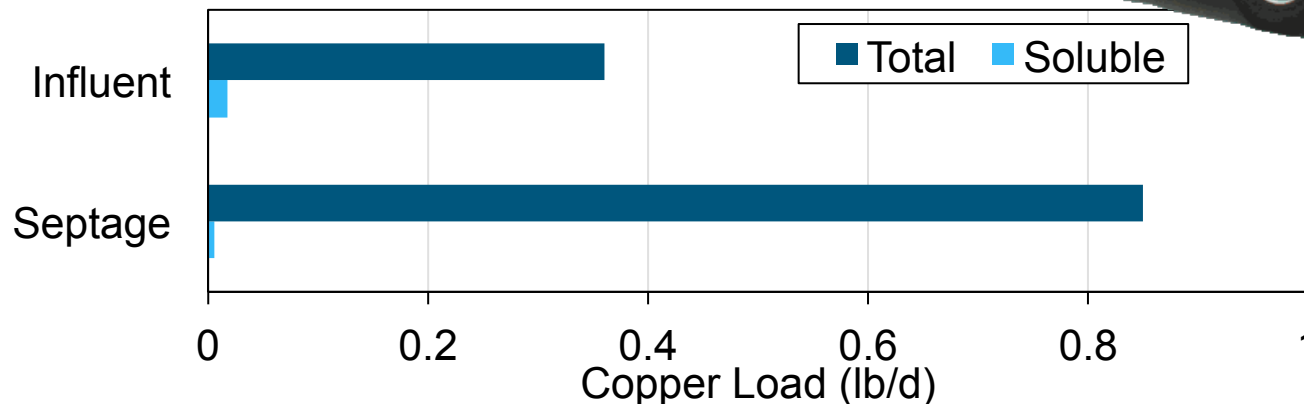
Source Reduction

■ Point Sources Contamination

- Reviewed Major Water Users

■ Septage Intake

- High Concentrations
- Variability



Source Reduction

■ Point Sources Contamination

- Reviewed Major Water Users

■ Septage Intake

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■ Drinking Water

- Source Water
- Pipe Corrosion



Drinking Water Mass Balance

SOURCES

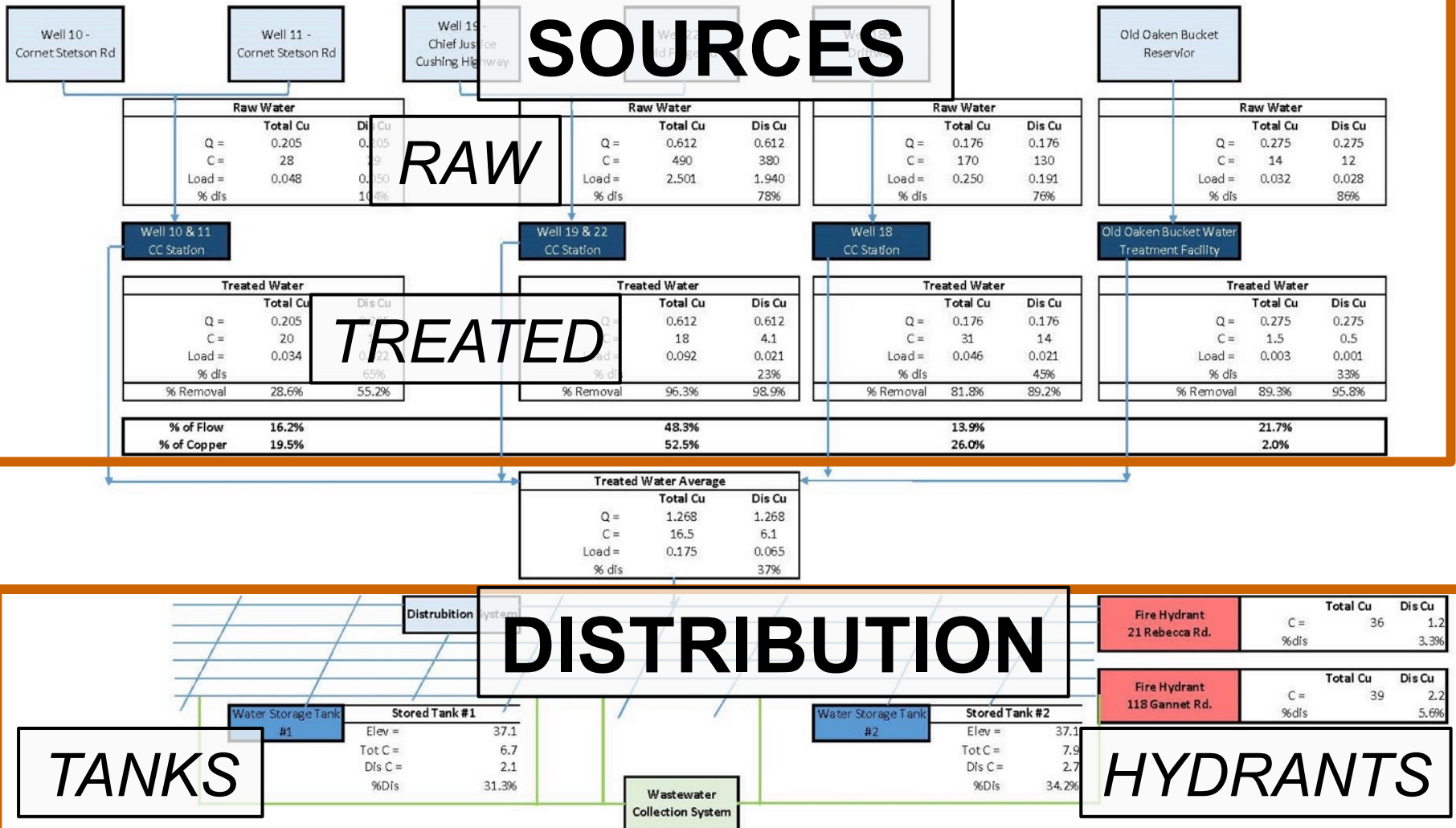
RAW

TREATED

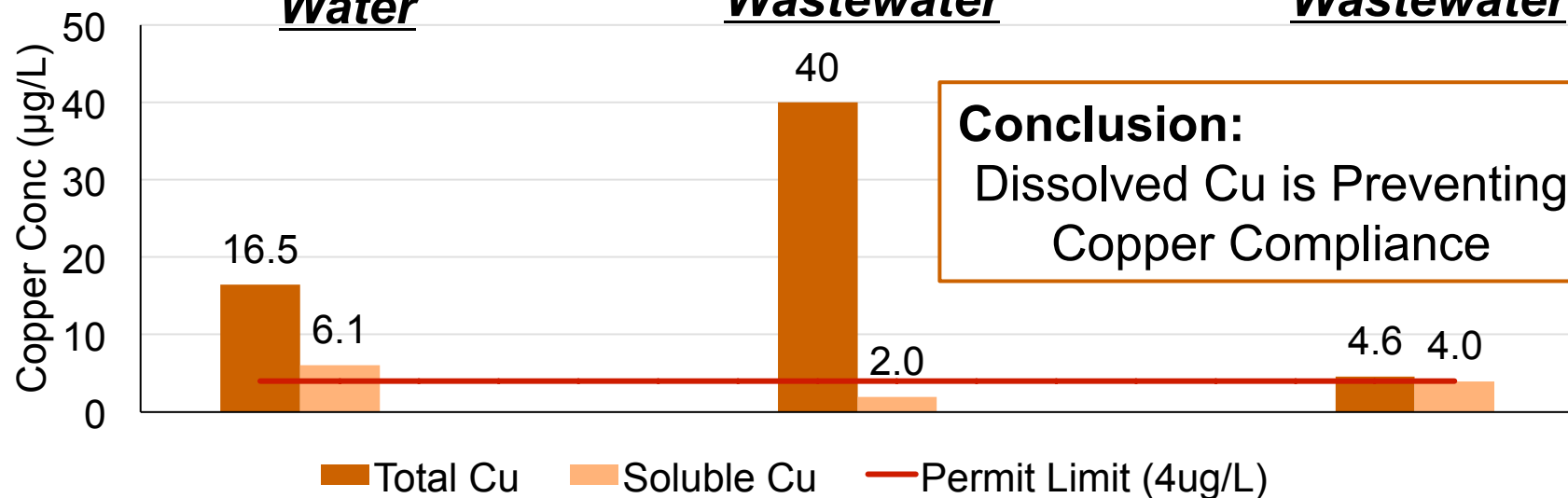
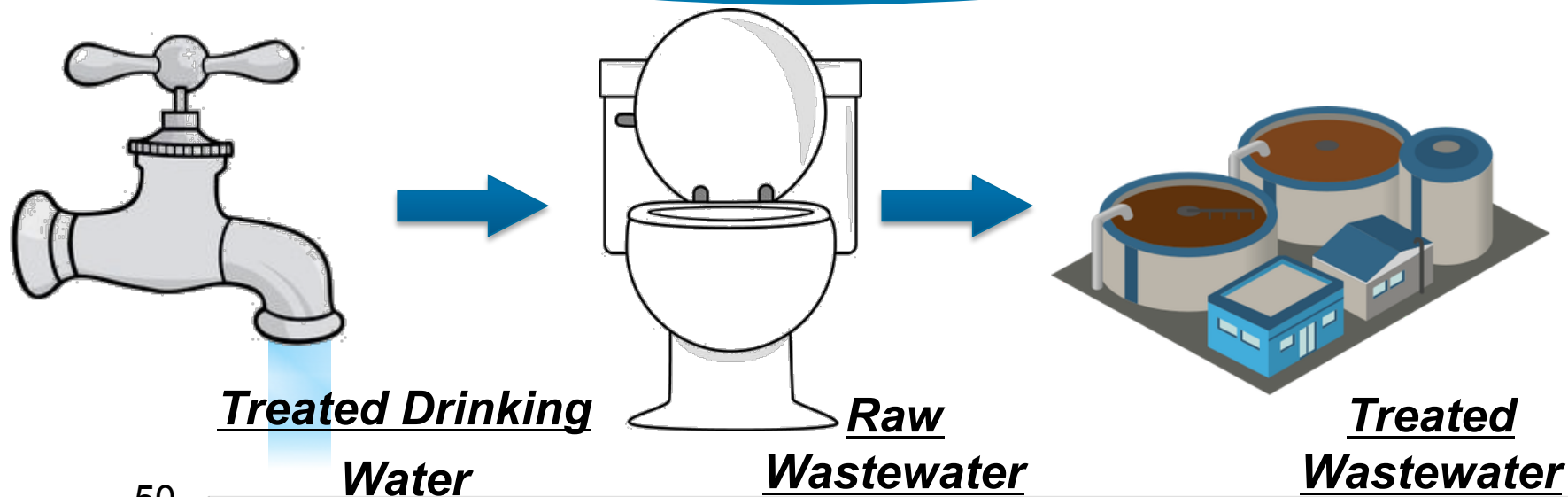
DISTRIBUTION

TANKS

HYDRANTS



Copper Mass Balance: Overview



Copper Mass Balance: Conclusions

■ Recycle Stream Impacts

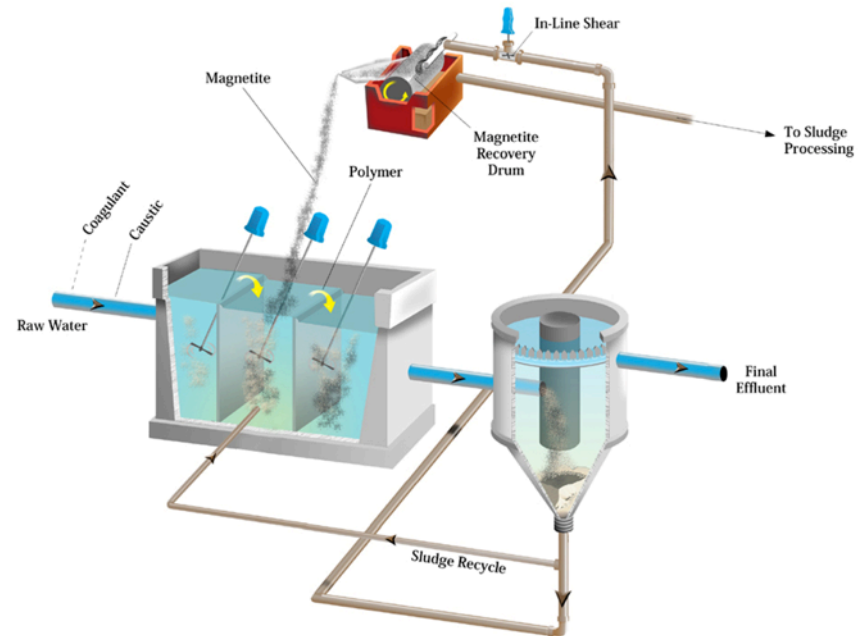
Recycle Stream	Total Copper	Dissolved Copper
Filter Backwash	2%	2%
Digester Decant	12%	27%
Belt Filter Press Filtrate	4%	2%

Treatment Alternative

Numerous Technologies Considered

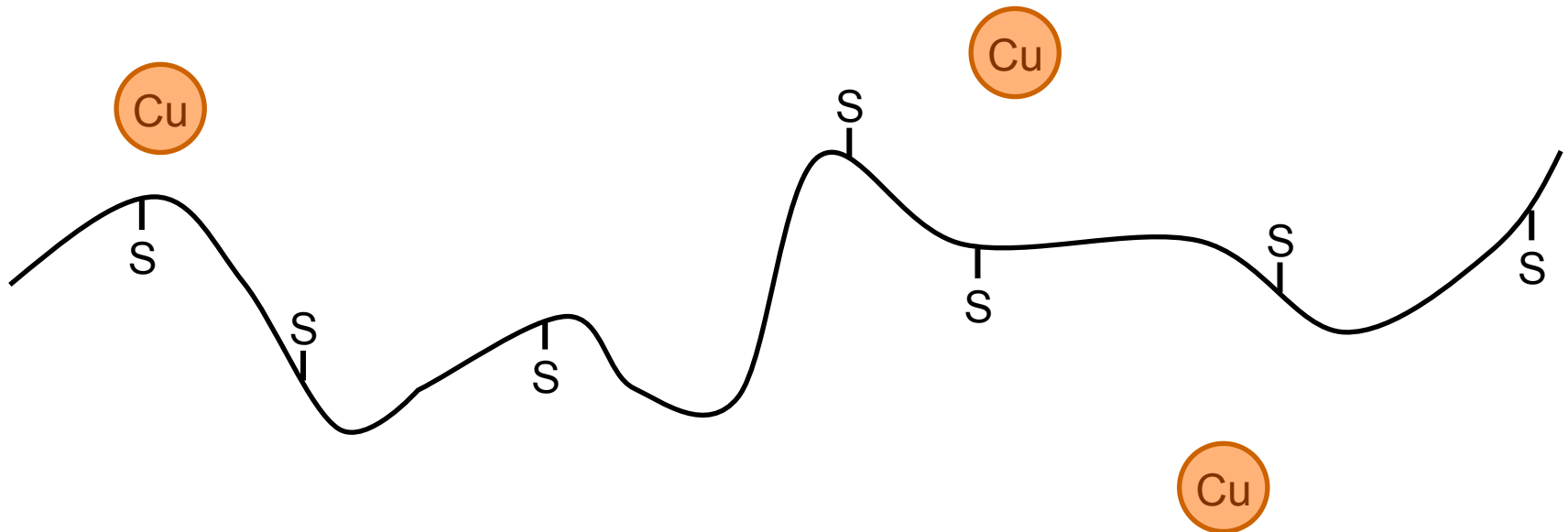
- Several Capable of Meeting Limit
- Most Costly & Energy Intensive

Best Options Optimize Existing System



MetClear Polymer

- Manufactured by Suez (formerly GE Water)
- Organo-sulfur polymer
- Binds dissolved metals and precipitates out of solution



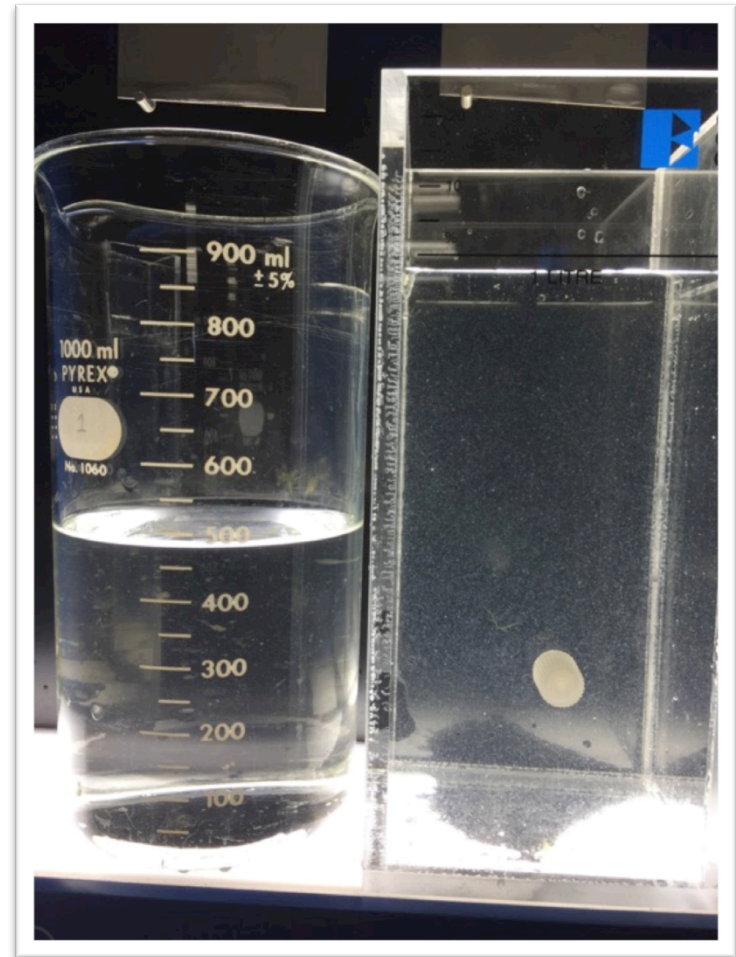
Jar Testing: MetClear Polymer

■ Testing Plan

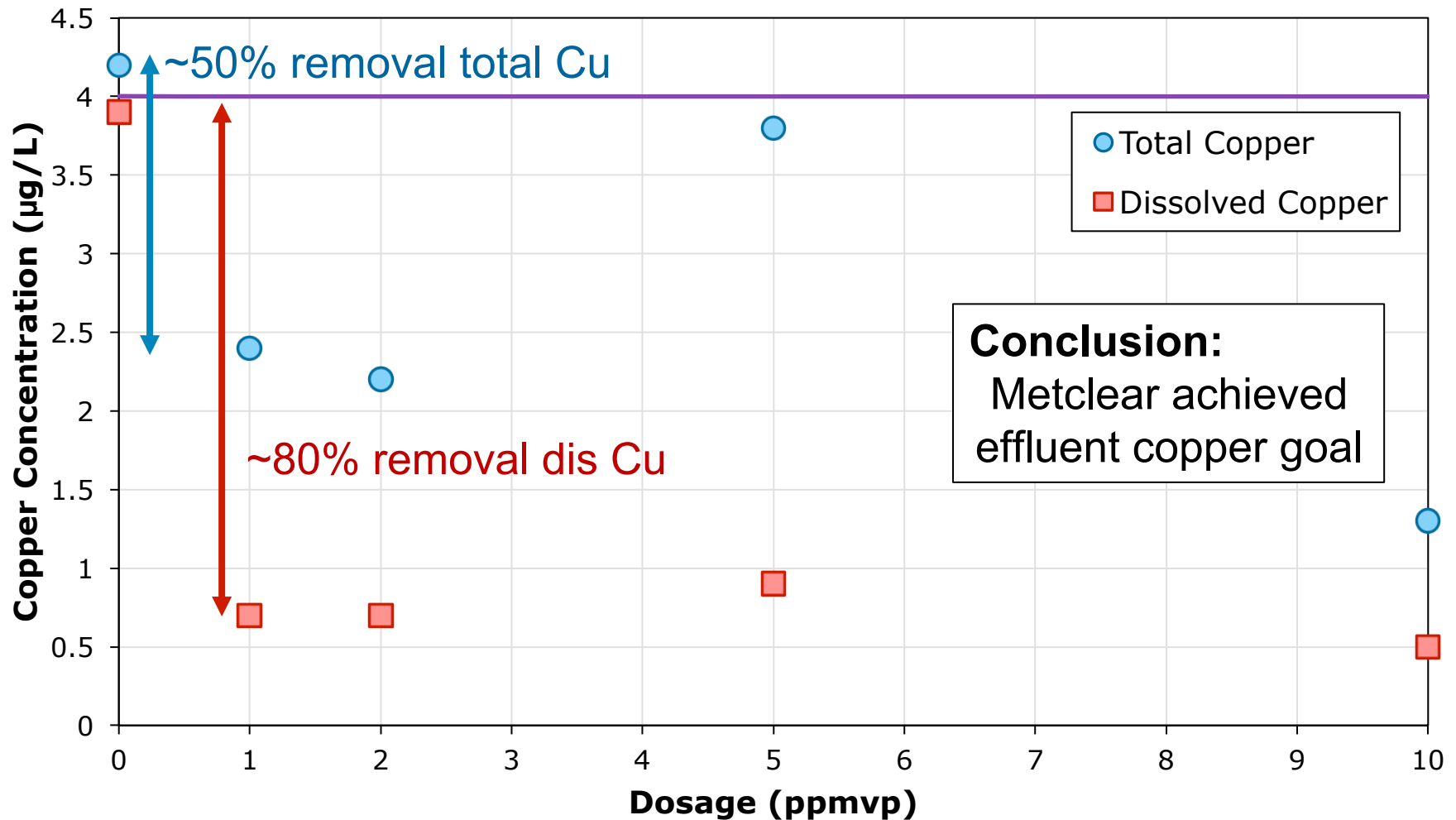
- 3 chemicals at 4 different dosages each



- React, filter, & analyze



Jar Testing Data



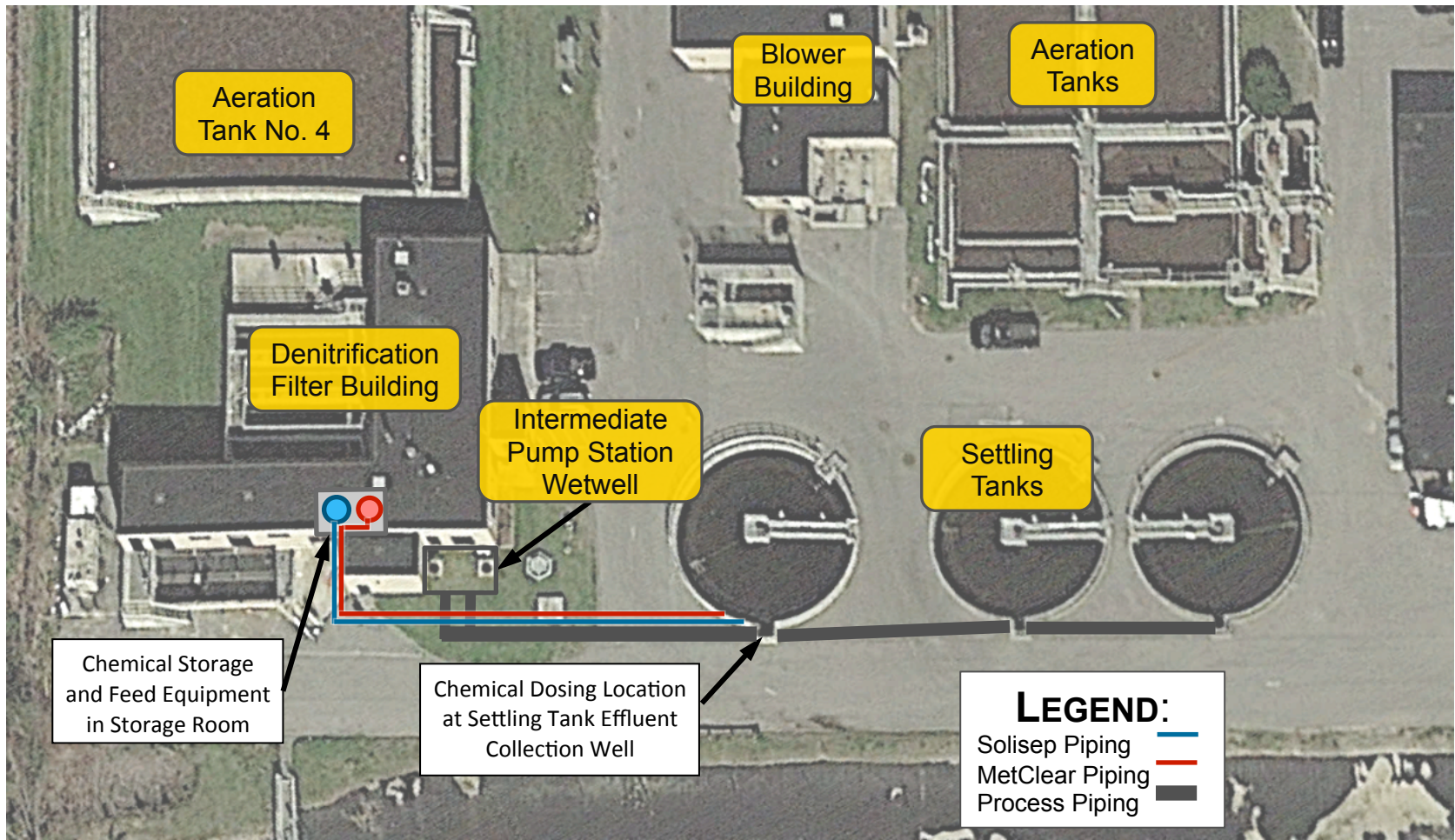
Alternative Capital Cost Comparison

Alternative	Project Capital Cost
Outfall 1A	\$ 14,640,000
Outfall 1B	\$ 14,990,000
Outfall 2	\$ 5,040,000
Chemical Addition	\$ 600,000

Conclusion:

- Proceed with Chemical Treatment Approach
- Develop & Implement Full Scale Pilot

Temporary Pilot Test Layout



Pilot Test: Sampling Plan

Parameter	Sample Location		
	INF	Sec. EFF	EFF
Cu, total	✓	✓	✓
Cu, dissolved	✓	✓	✓
pH	✓	✓	✓
Alkalinity	✓	✓	✓
TN		✓	✓

- Sampling 3 times per week
- Changing dosages weekly
- Overlap 1 quarterly toxicity test



Temporary Pilot Test Considerations

- **Chemical Storage and Feed Systems**
- **Temporary Utilities**
 - Power
 - Flow Signal
- **Operator Safety**
- **Sampling Equipment and Lab Services**
- **Freezing Concerns**
- **Transition to Permanent Installation**

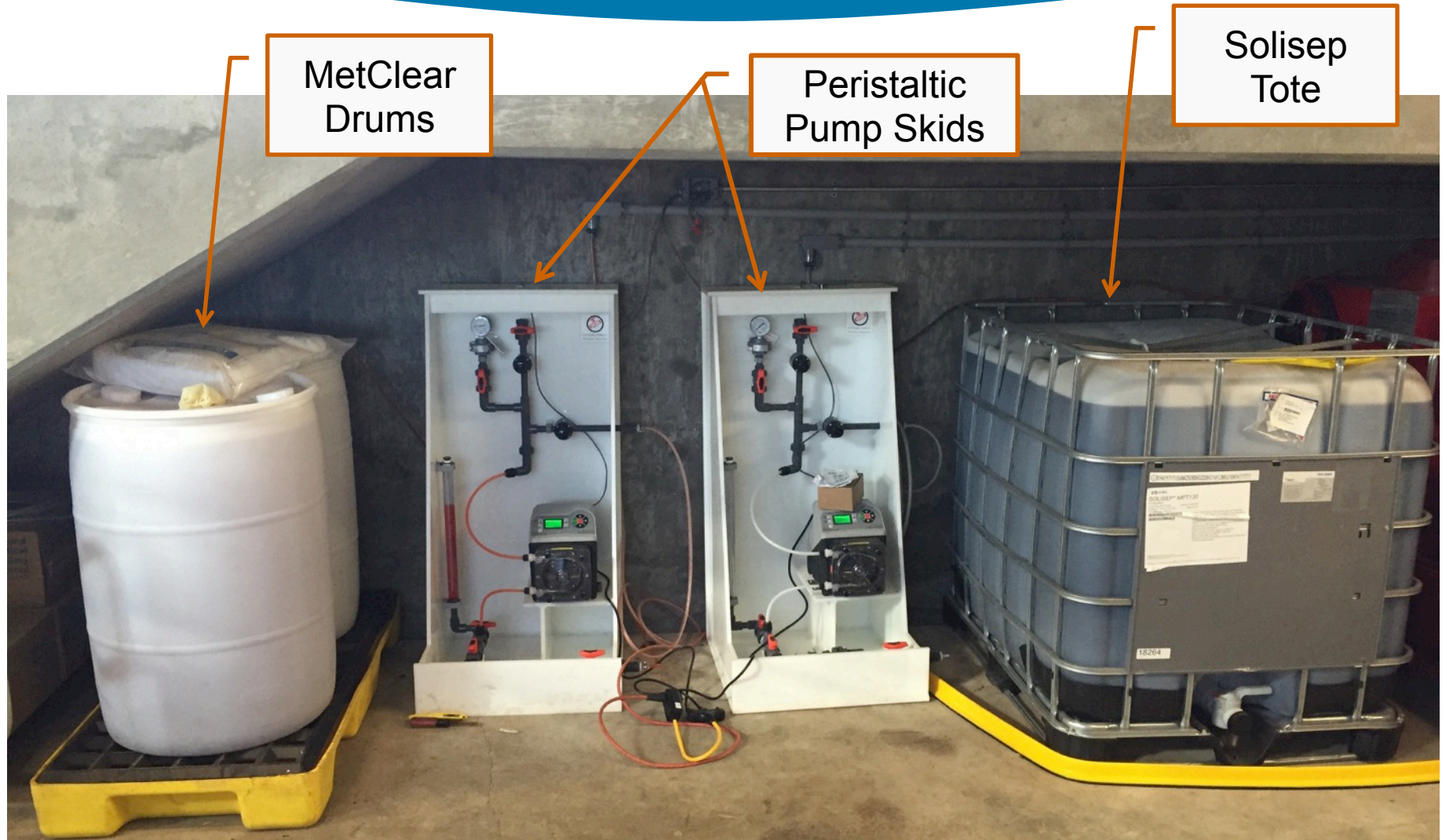
Pilot Test In Action



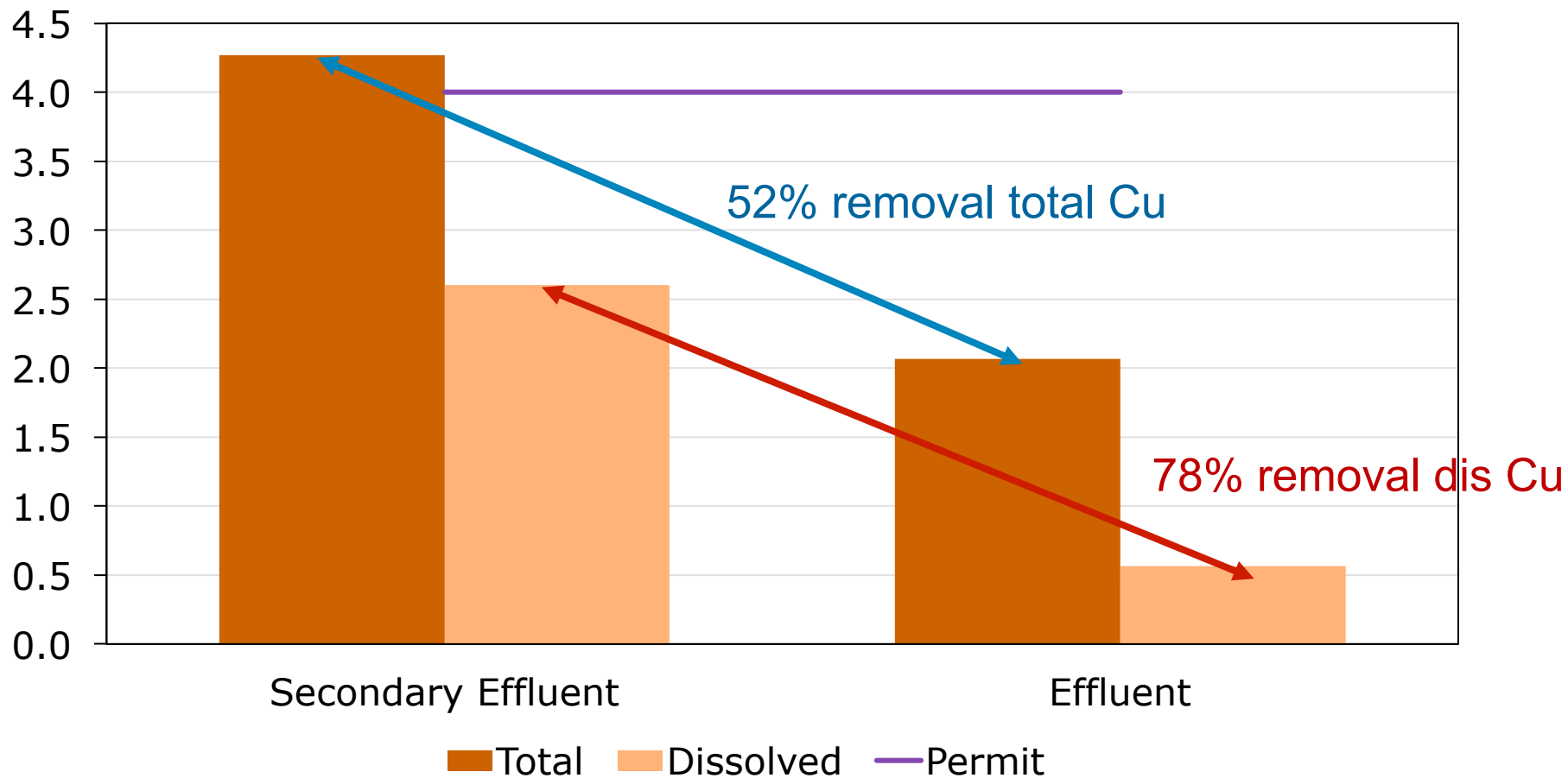
Pilot Test in Action



Pilot Test In Action



Preliminary Pilot Results



Conclusions

- **Strategies for metals removal are plant-specific**
- **Source reduction can be effective**
- **Data collection useful to select treatment strategy**
- **Chemical treatment pursued as cost-effective alternative to achieve permit compliance**

Closing

■ Discussion & Questions

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Dose (ppmvp)	MetClear			Solisep		
	1	2	5	5	10	20
Annual Cost (Drum)	\$20,240	\$40,479	\$101,198	\$73,666	\$147,332	\$294,664
Annual Cost (Totes)	\$21,780	\$43,559	\$108,898	\$46,036	\$92,072	\$184,144