MI-ACE 2023

85th Annual Conference & Exhibits

In The Loop:

Corrosion Control Evaluation for the City of Saginaw

FFA3

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Hazen

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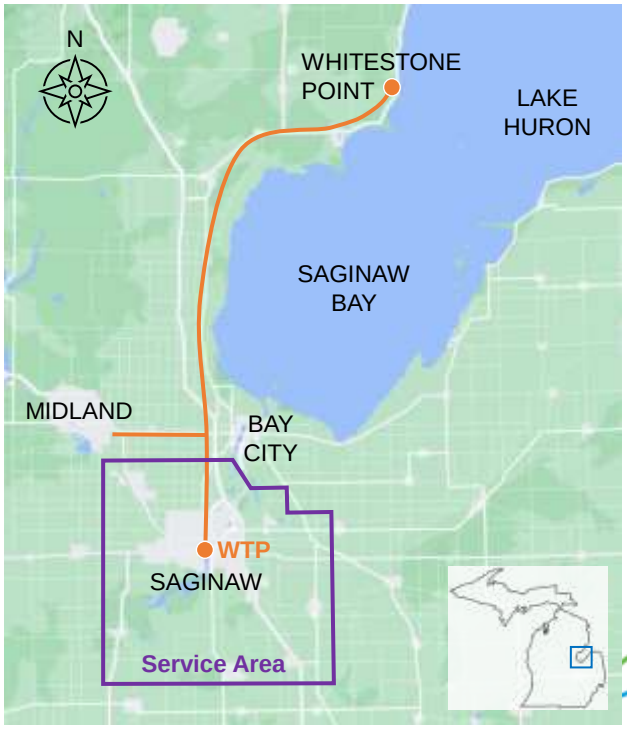
Saginaw Water Treatment Plant

- Sources water from Lake Huron
- 52 MGD capacity
- In operation since 1929
- Serves City + 20 wholesale customers



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Lead and Copper Rule Revisions

10 ppb trigger level (LCR, 2021) and 12 ppb action level (MI, 2025)

Saginaw is proactively targeting < 5 ppb and replacing any service lines with results > 8 ppb

Lime stabilization no longer recommended for corrosion control

Saginaw wants to explore orthophosphate as an option for potential future use

Infographics from MI-EGLE and Univ of MI

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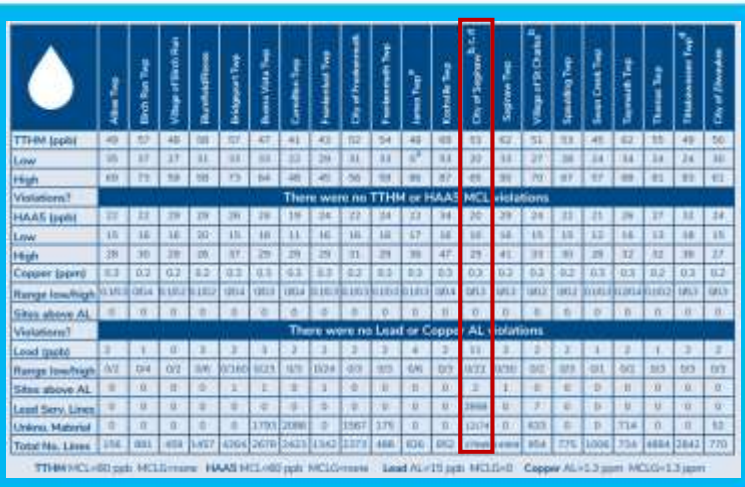
Study Objectives

Conduct an initial assessment of the impacts on lead and copper release from adjusting corrosion control treatment from alkalinity and pH control to adding orthophosphate at plant pH and low pH conditions

City of Saginaw lead service lines (LSLs):

- 2,858 known LSLs and 12,000+ unknown (potential LSLs)
- 2 sampling sites above AL



2022 Water Quality Test Results From Saginaw Region CCR

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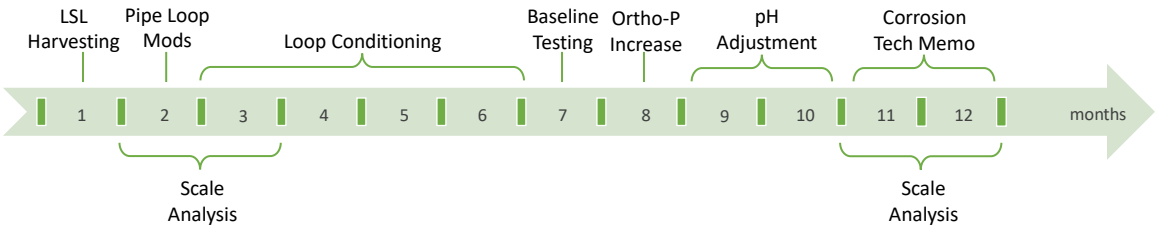
Study Schedule – 12 Month Duration



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Lead Service Line Selection Criteria

- ✓ On service line inventory list for upcoming lead replacements
- ✓ Undergoing regular daily use by household
- ✓ Length is greater than 8 ft (for loop apparatus) + 2 ft segments (for scale analysis)
- ✓ Homeowners will allow significant digging on property

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Lead Service Line Harvesting Protocol

1. Cut pipe with PVC cutter
2. Drain water from pipe
3. Insert damp sponges into ends
4. Seal ends with duct tape
5. Wrap pipe in bubble wrap

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Scale Analysis Methods

Analysis conducted at Washington University of St. Louis

SEM/EDS Scanning electron microscopy with energy dispersive X-ray spectroscopy

XRD X-ray powder diffraction

ICP-MS Inductively coupled plasma mass spectrometry

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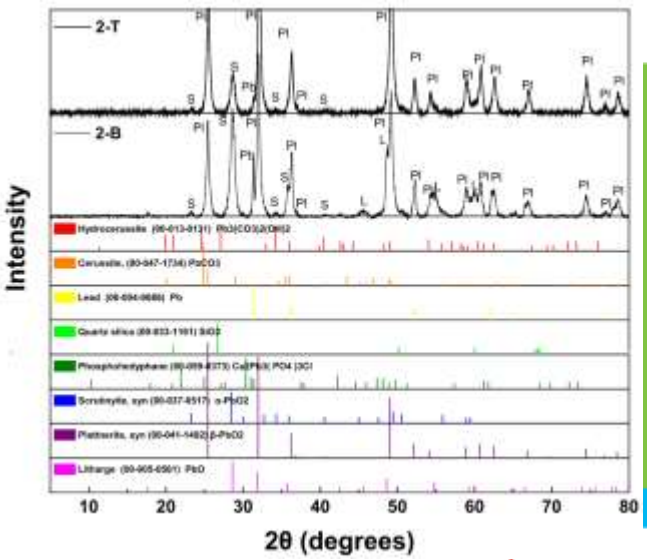
Scale Analysis Results

Predominantly composed of lead(IV) oxides:

- Plattnerite, Scrutinyite, Litharge

To preserve Pb(IV) scale stability and reduce lead release:

- Maintain chlorine residual
- Keep pH high



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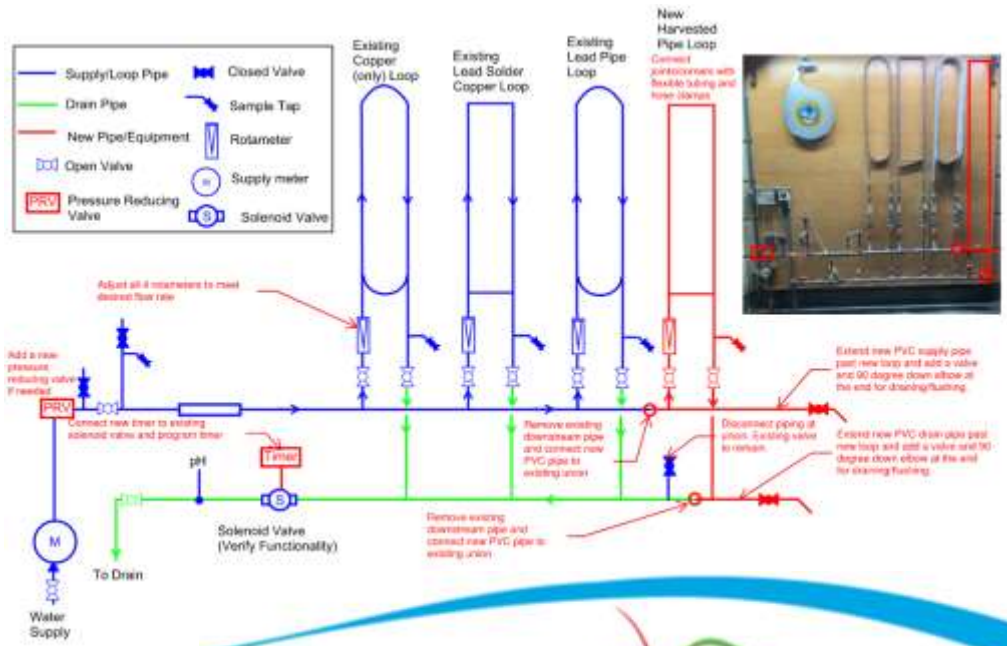
Pipe Loop Setup



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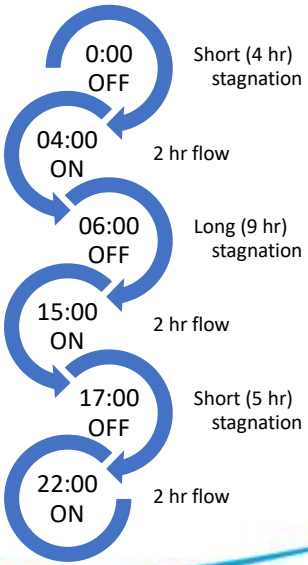
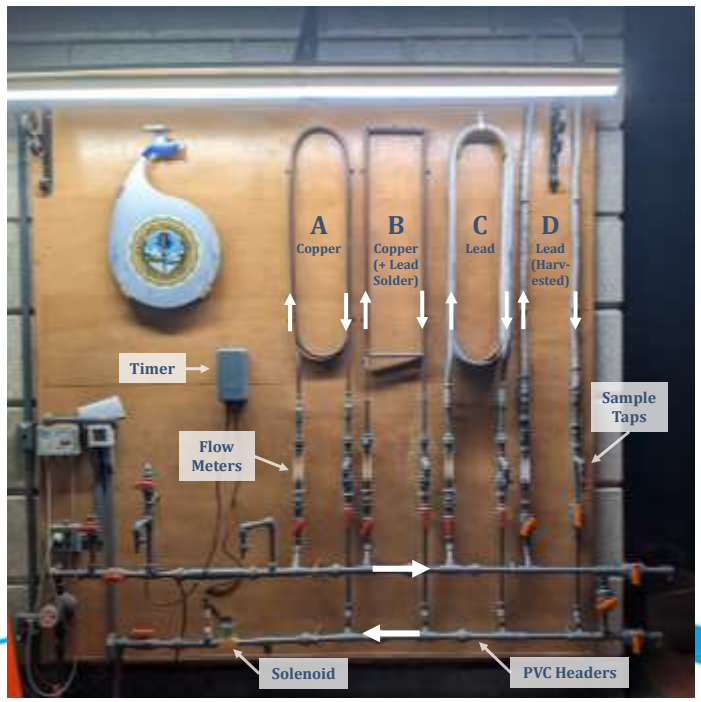
Conditioning





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Sampling Protocol

Before Sampling

- Close effluent valve
- Discard first 50 mL of water from each sample tap

Sampling

- Fill 500 mL sample bottle from each loop

After Sampling

- Open effluent valve and solenoid
- Check flow rate (1.5 gpm) on each loop
- Send samples to lab for analysis

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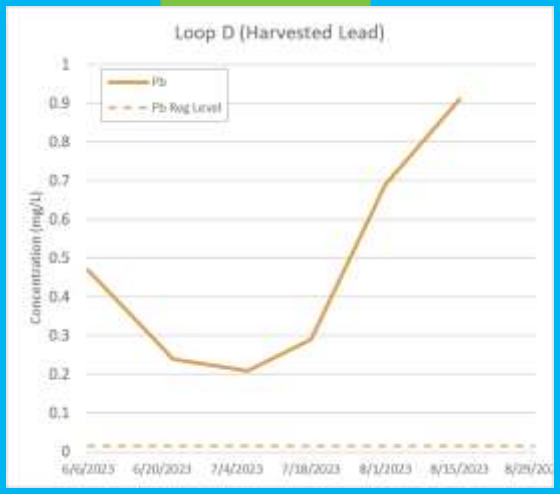
Preliminary Conditioning Results

Possible reasons for Pb level variability:

- Has not stabilized over only 2 months
- Variability in finished water quality
- Air in pipes affecting flow rate
- Interruptions in stagnation cycle



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Pipe Loop Testing

Chemical Conditions	
Orthophosphate Concentration	mg/L as PO4
Gradual Increase	0.5 to 1
Sudden Increase	1 to 3
pH Level Adjustment	
Gradual Decrease	8.8 to 7.8

Operating Conditions (per Loop)	
Daily Flow/Stagnate Cycles	3
Operating Flow Rate	1-2 gpm
Water Volume per Cycle	200 gal
Stagnation Period Between Cycles	5-6 hrs
Stagnation Before Sampling	8 hrs

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Questions?

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