

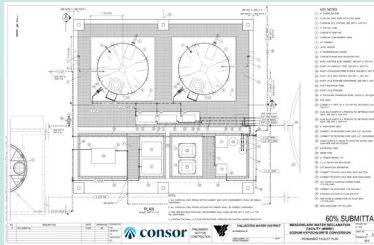


Converting from Chlorine Gas to Sodium Hypochlorite Meadowlark Water Reclamation Facility

Presentation Overview



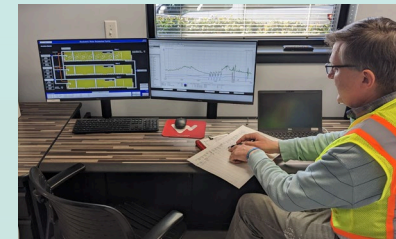
Background & Design



Bench -Scale & Full -Scale Testing



Next Steps



Background

Meadowlark Water Reclamation Facility

Vallecitos Water District Carlsbad, CA

- Tertiary Wastewater
- Future Expansion
- Site Challenges

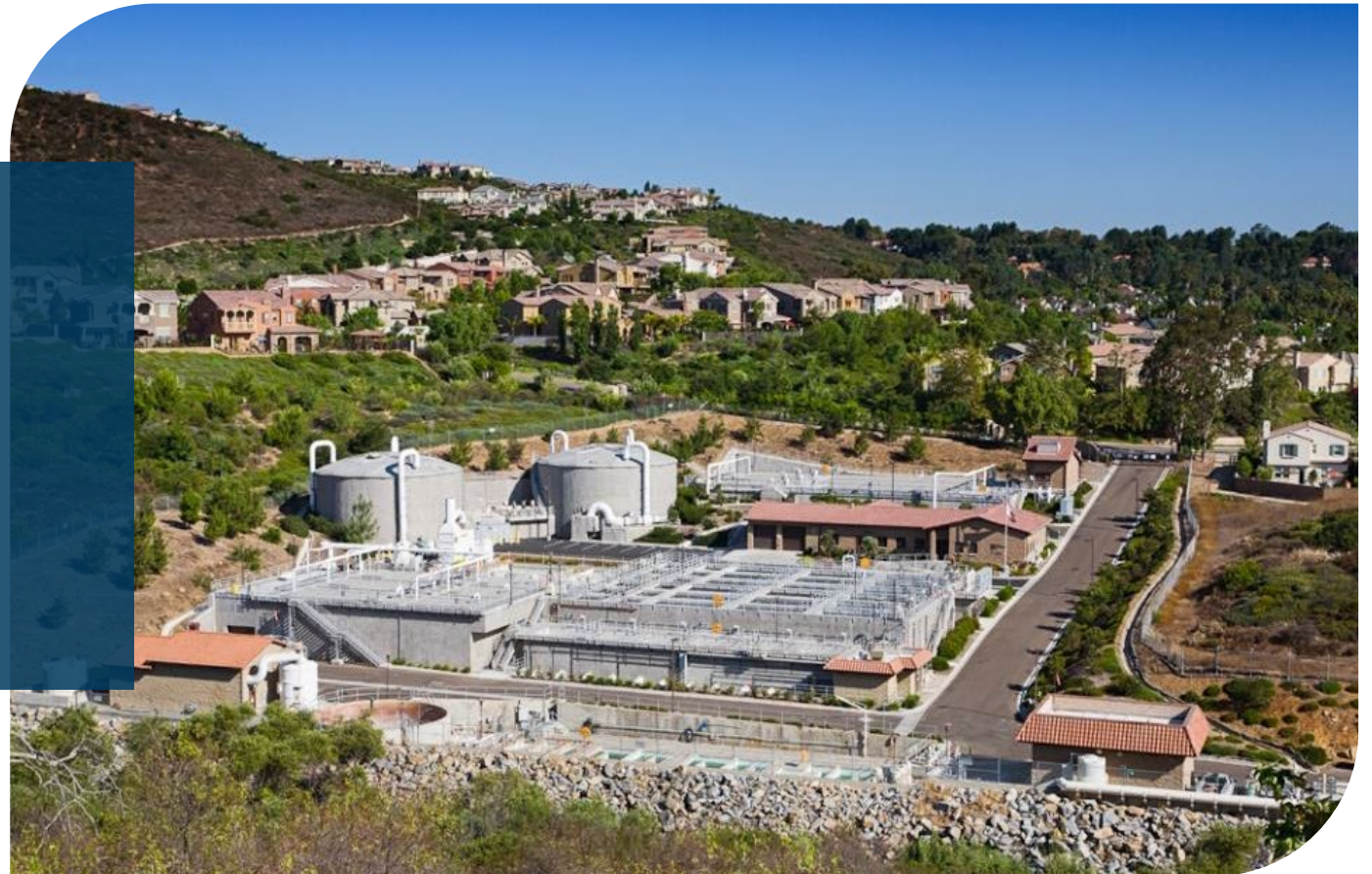


Photo: [Meadowlark Water Reclamation Facility | Vallecitos Water District \(vwd.org\)](https://www.vwd.org)



Design

Project Drivers

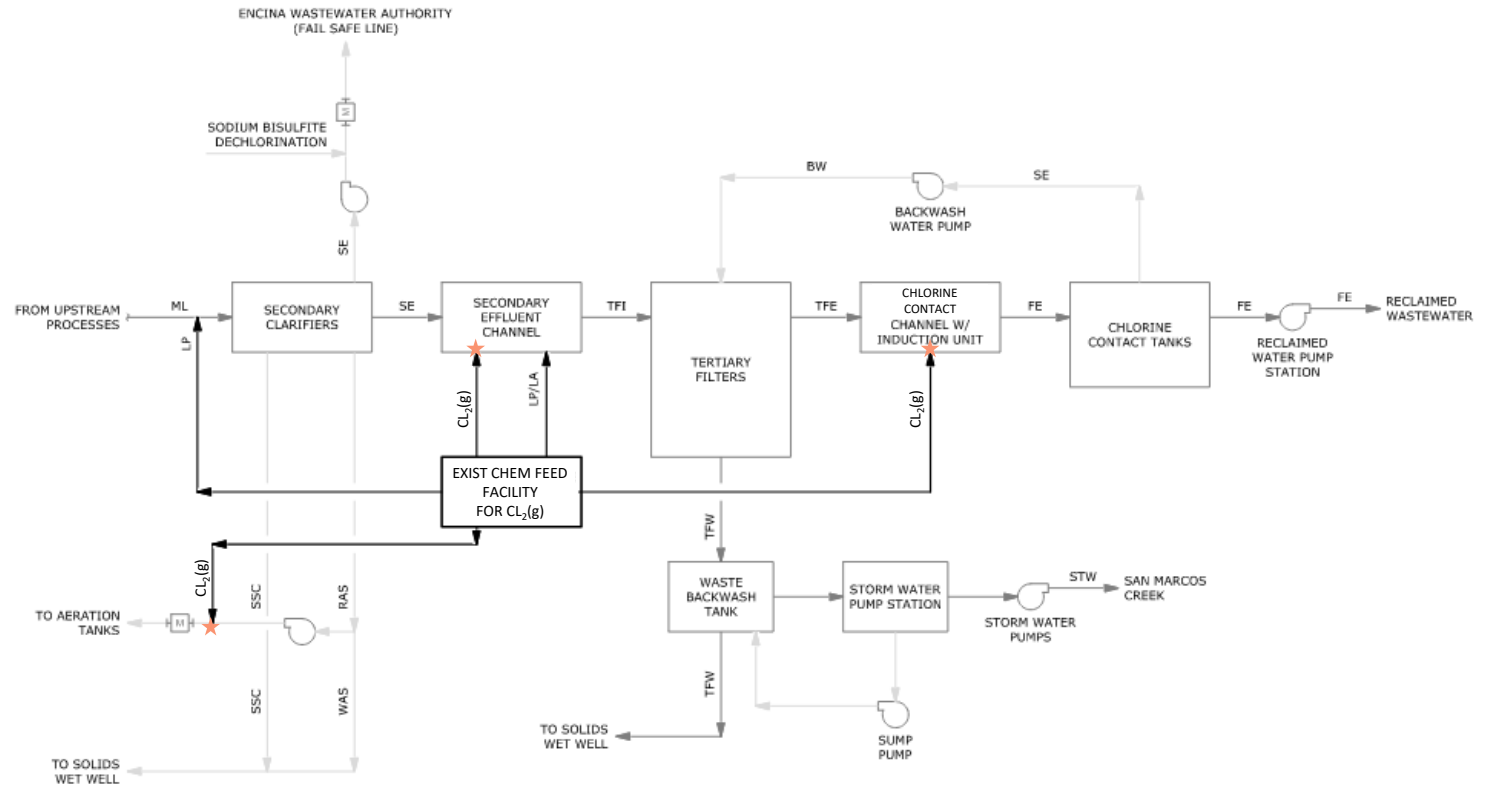
- Safety
- Dosing Optimization
- Cost



Design

Existing Treatment

- Headworks
- Primary Sedimentation
- Roughing Filters
- Aeration Basins (2022 Improvements)
- Secondary Clarifiers
- Tertiary Filters
- Chlorine Contact Tanks



★ = Chlorine Injection



Design

Existing Treatment

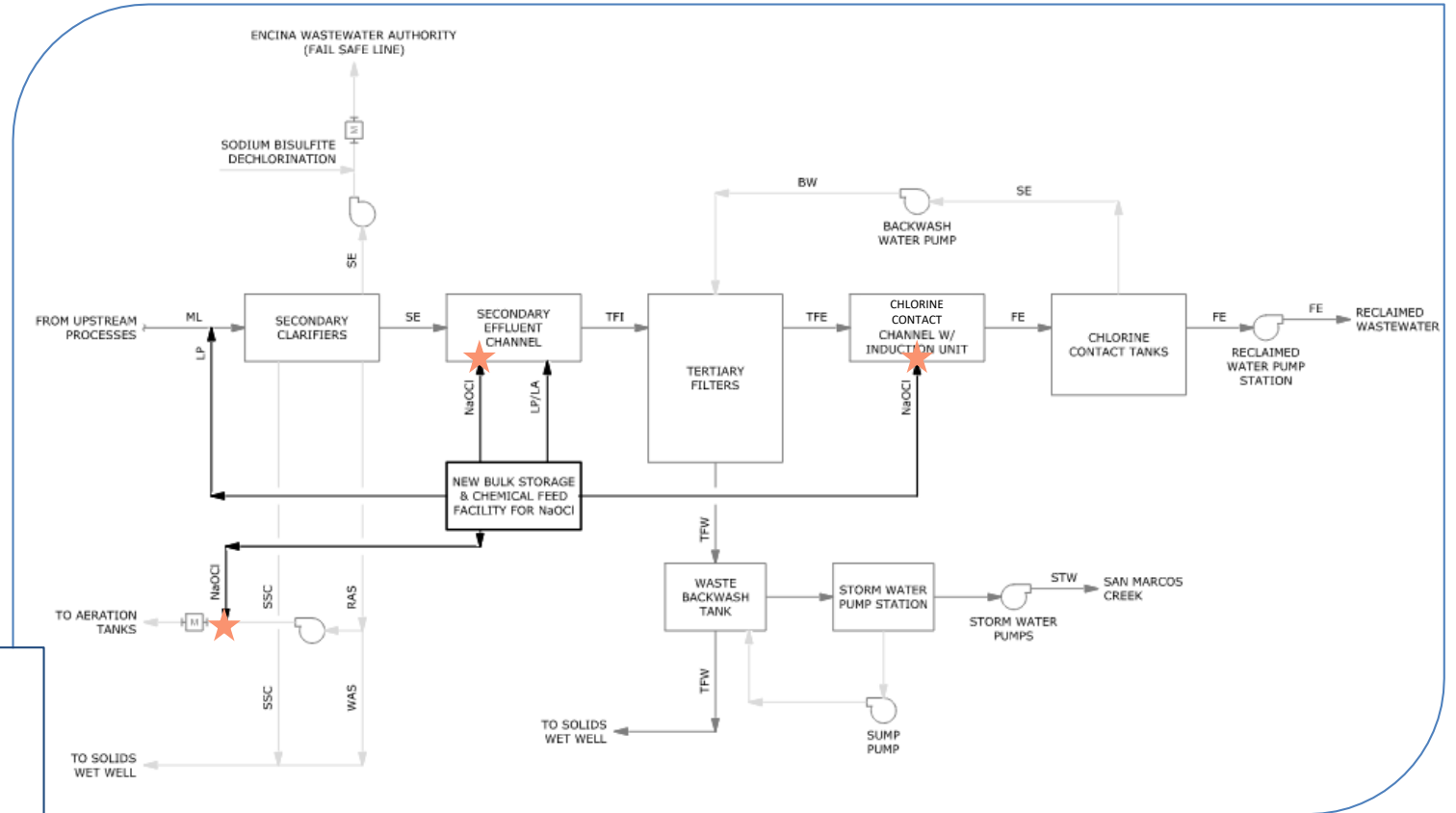
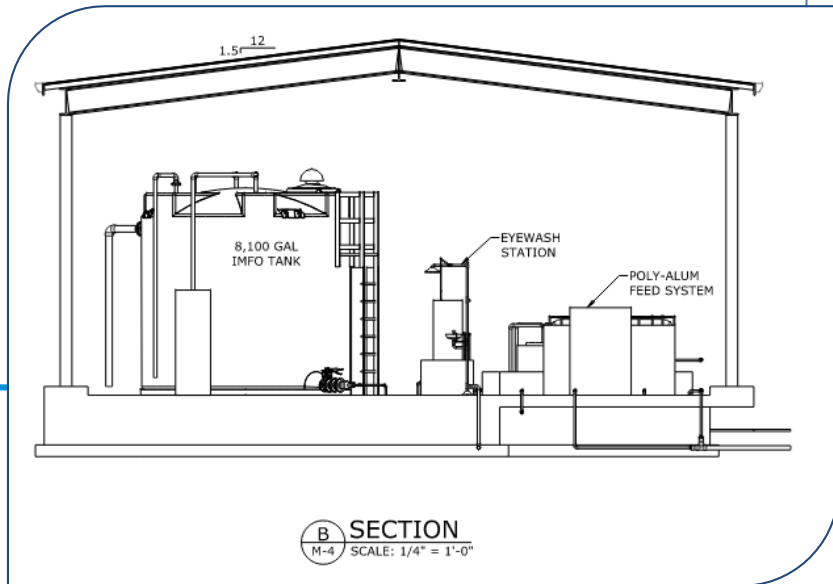
Venturi & "Harrington Screen"
Exist Chlorine Injection



Design

Future Treatment

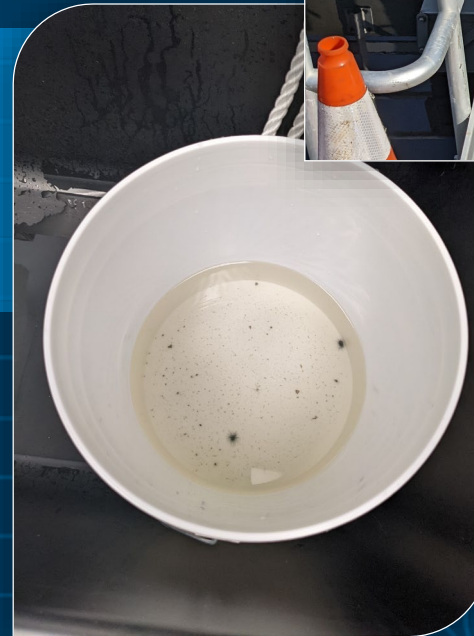
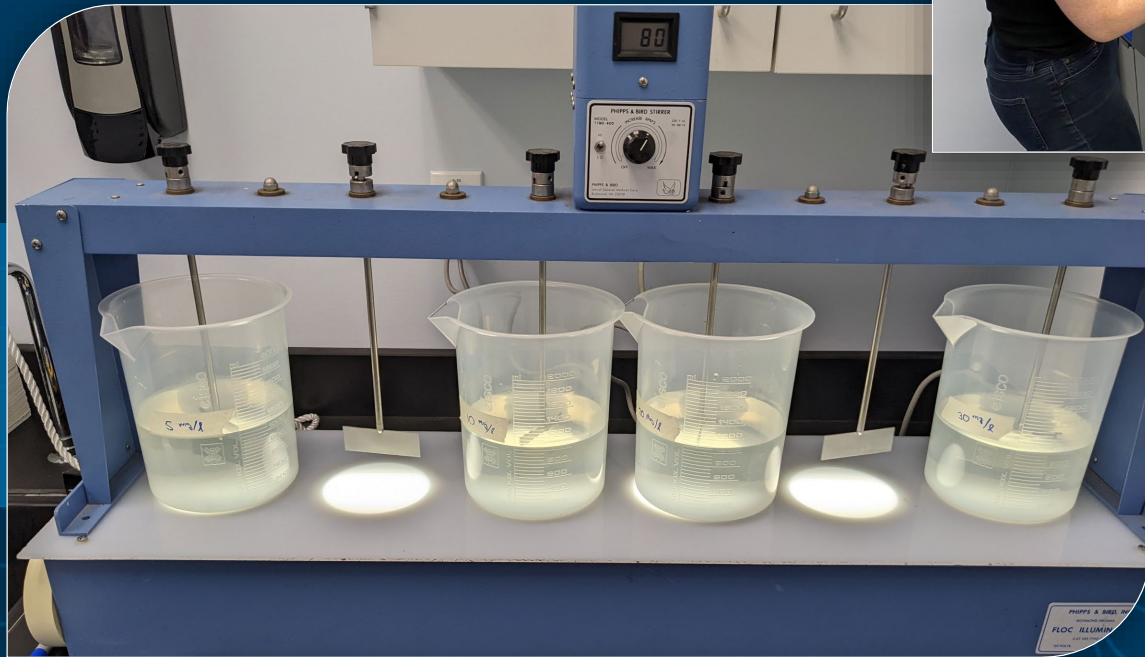
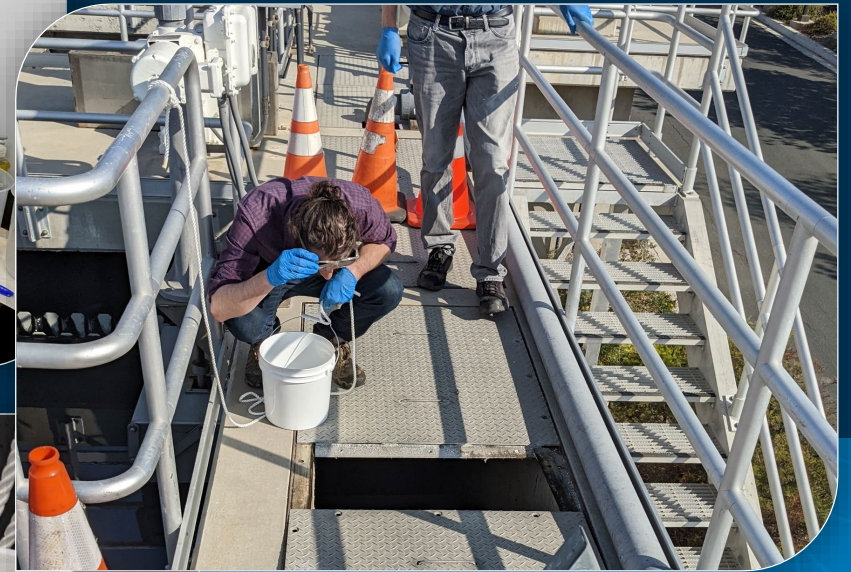
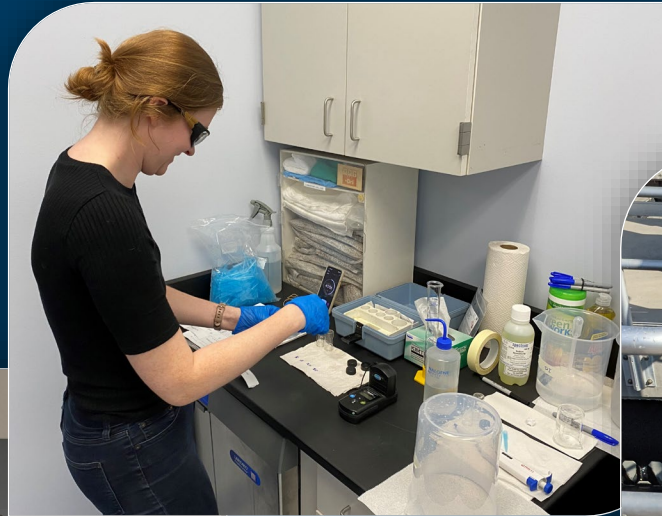
- Maintain Injection Locations
- NaOCl Facility & Conversion
- Optimize Dose
- Save \$\$



★ = Chlorine Injection



Jar Testing



Jar Testing

Overview

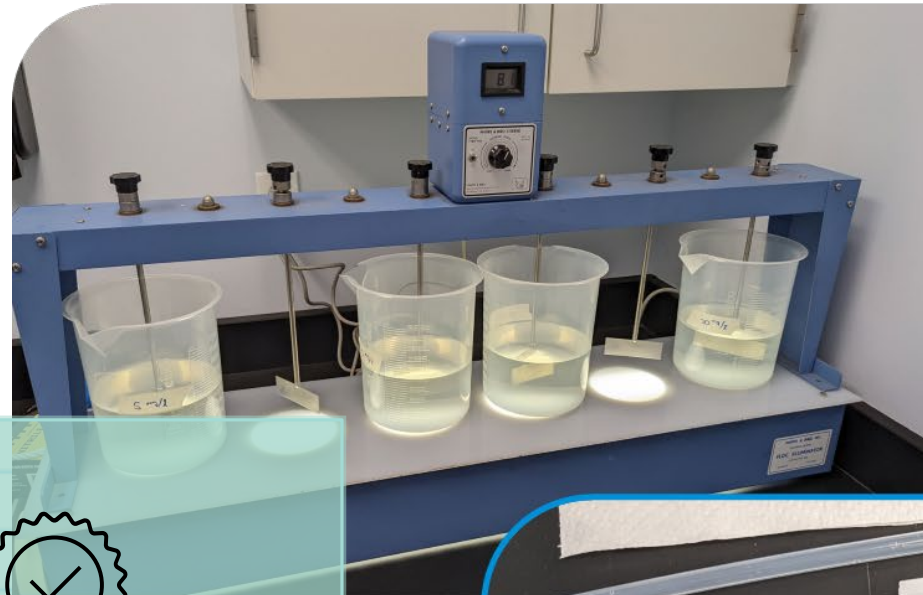
Vallecitos WRF


Jar Testing – Needs

- Documentation
- Testing Equipment
- Consumables
- Space



Jar Testing Process



JAR TESTING DATA REPORTING SHEET 

PROJECT: Meadowlark WRF S. Hypochlorite Conversion Prepared By: PMD, HB
 PHASE: Jar Testing Date: 24 Aug
 Page: 1 of 2 Project No. 21-3276

Run 1 Date: 24 Aug Time: _____

Sample 1	Turbidity (NTU)	pH	Temperature (°C)	Total coliform (/100mL)
	4.4	7.2	24.3	

Chlorine Dose (mg/L) Chlorine residual (2 mins) (mg/L) Chlorine residual (90 mins) (mg/L) pH (90 mins) Temperature (°C, 90 mins) Total coliform (90 mins) (/100mL)

5	0.75	0.62	7.7	24.9	3.75
10	1.46	1.16	7.8	24.7	3.64 NTU
20	2.2	2.17	7.82	24.5	4.61 NTU
30	2.2	2.2	7.91	24.4	4.60 NTU

Bottom of meniscus @ 2 min

Run 2 Date: _____ Time: _____

Sample 2	Turbidity (NTU)	pH	Temperature (°C)	Total coliform (/100mL)
	6.1	7.3	27.5	

Turb @ 90 min

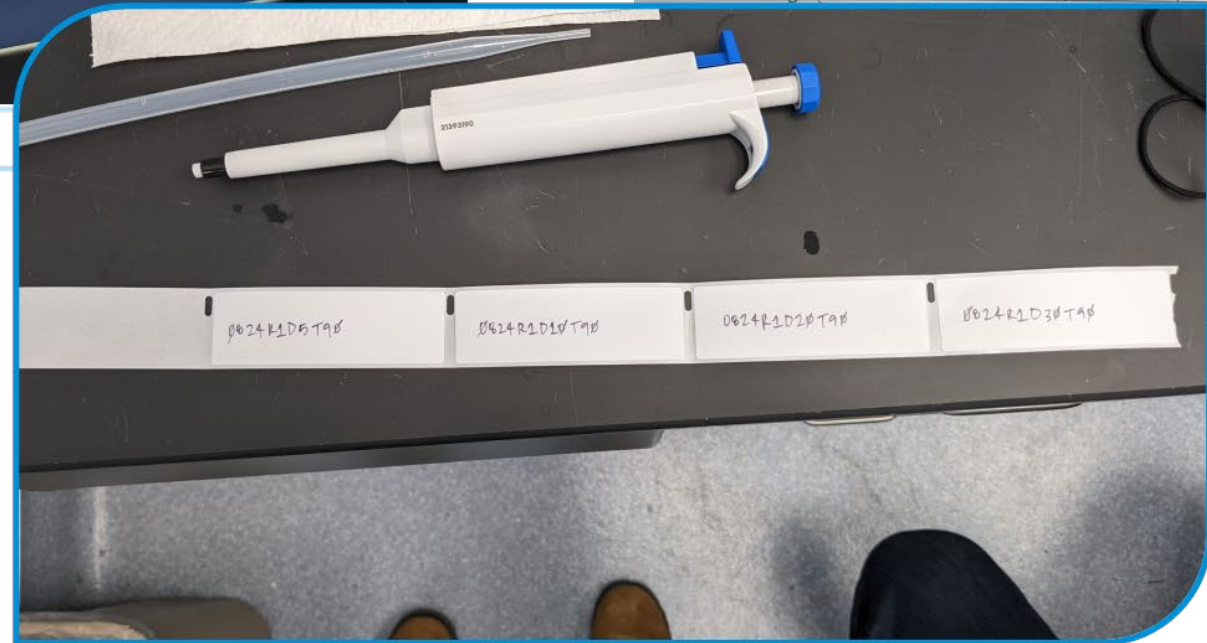
coliform (90 s) (/100mL)

	5.94 NTU
	5.99 NTU
	5.61 NTU
	6.14 NTU



Setting up for Success

The solution, the means, and the methods



Jar Testing

Analysis

Key Markers

- Cl Dose and Total Coliform
- Cl Residual and Total Coliform
- Cl Dose and Residual

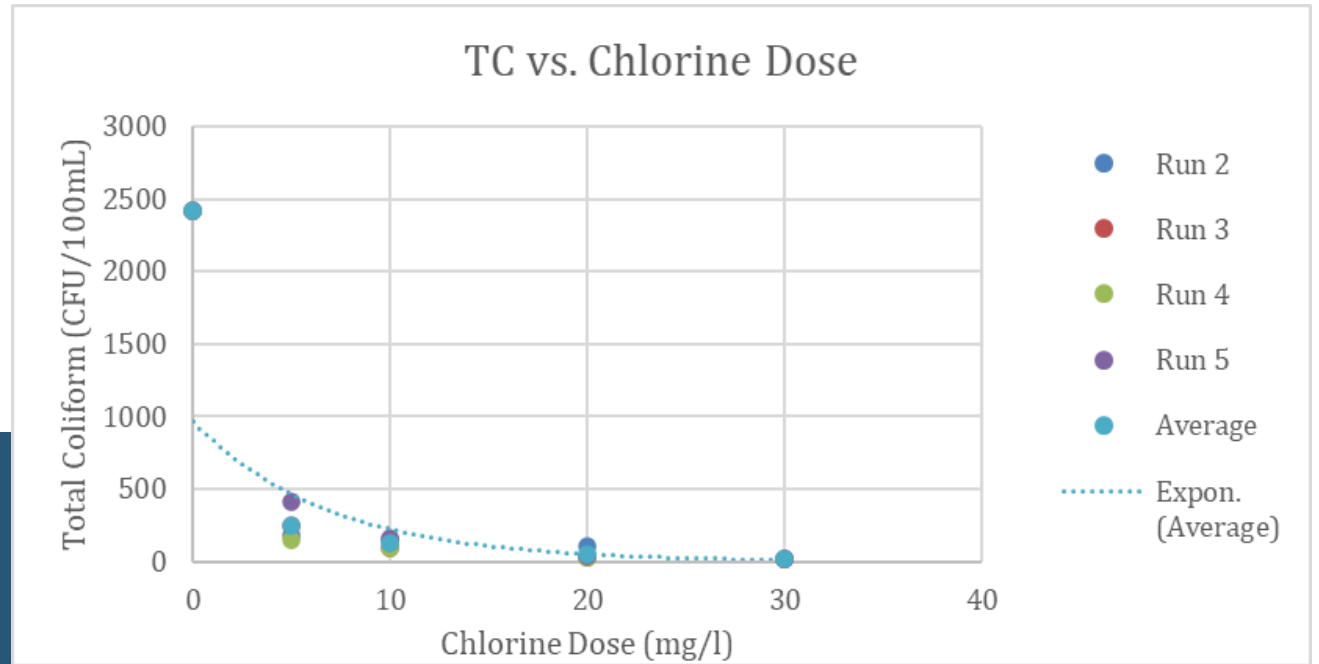


Jar Testing

Analysis

Key Markers

- Cl Dose and Total Coliform
- Cl Residual and Total Coliform
- Cl Dose and Residual

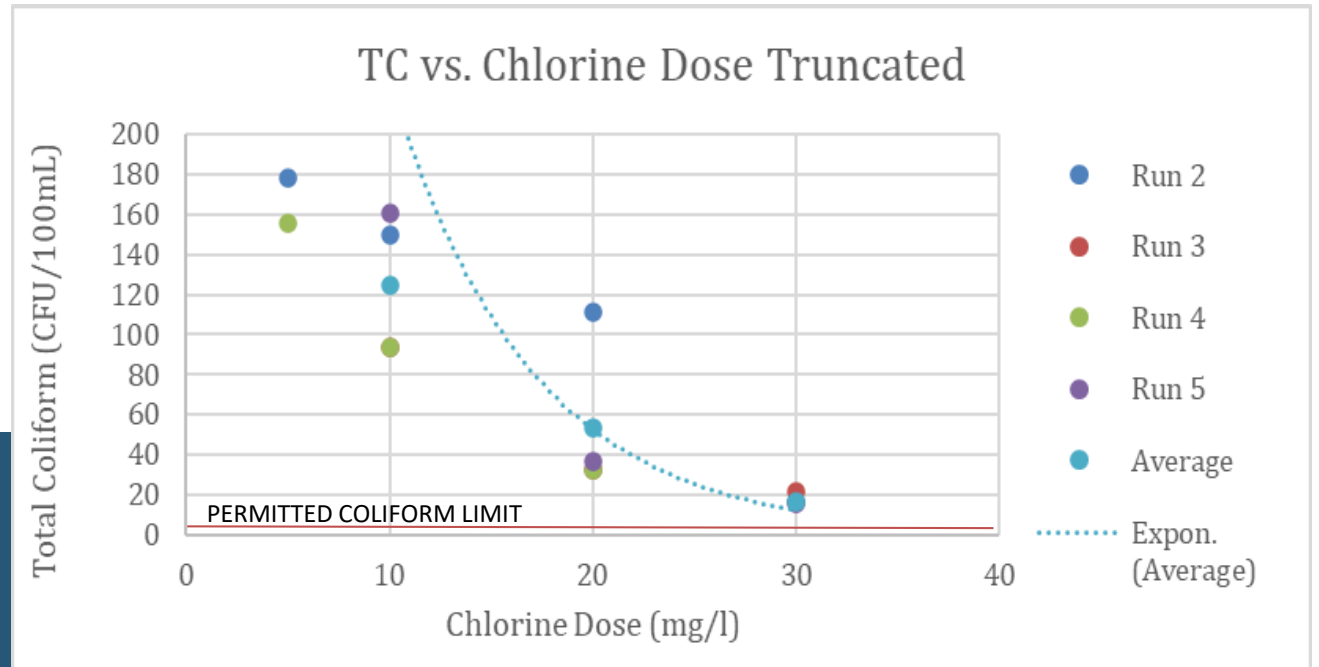


Jar Testing

Analysis

Key Markers

- Cl Dose and Total Coliform
- Cl Residual and Total Coliform
- Cl Dose and Residual

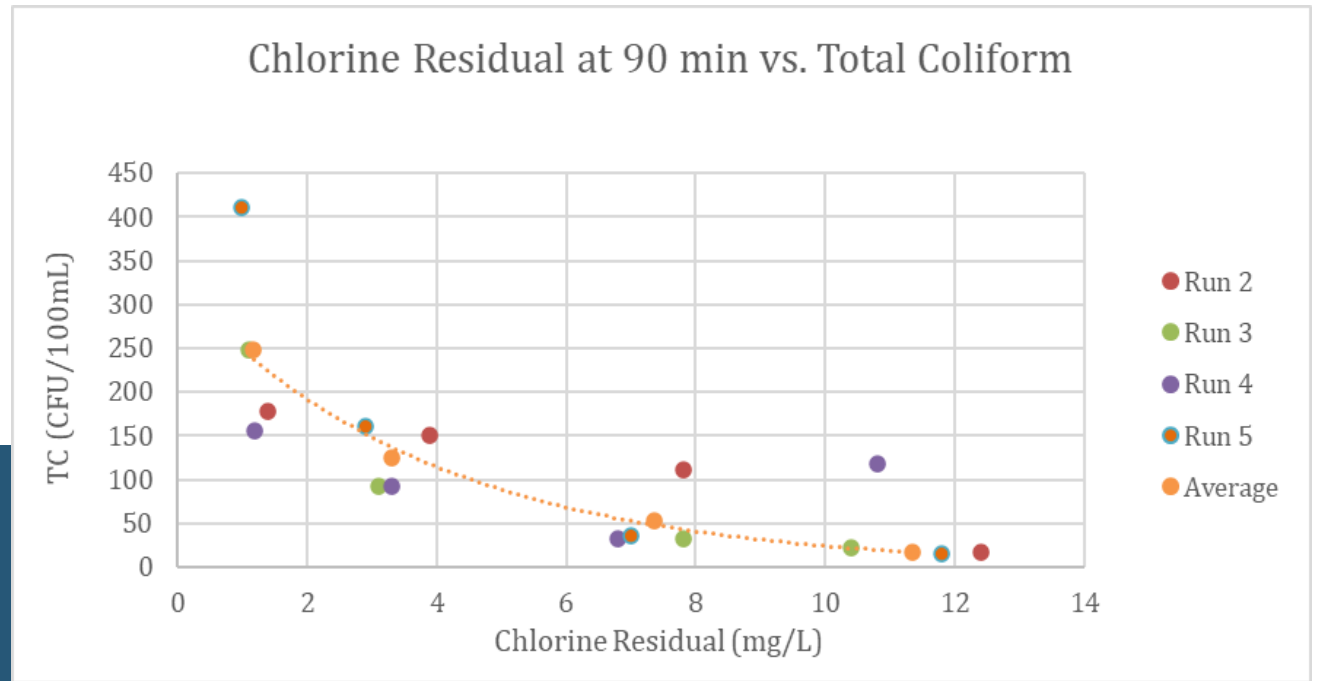


Jar Testing

Analysis

Key Markers

- Cl Dose and Total Coliform
- Cl Residual and Total Coliform
- Cl Dose and Residual

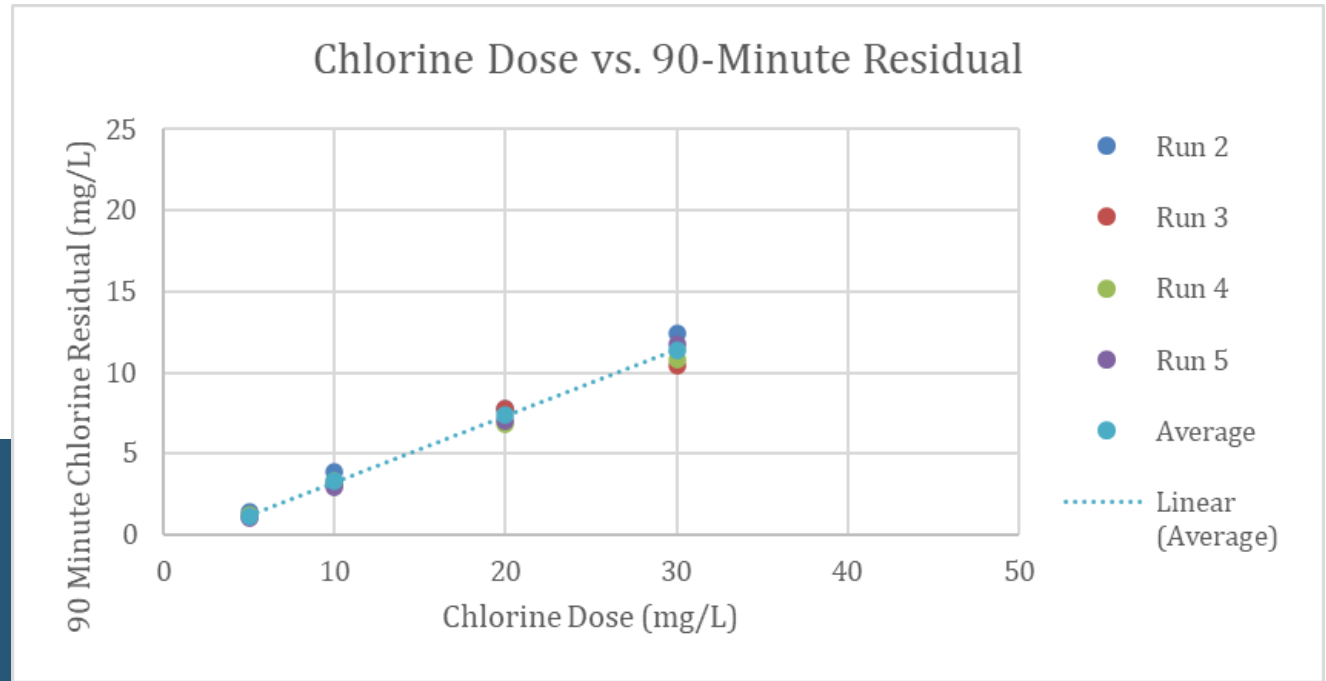


Jar Testing

Analysis

Key Markers

- Cl Dose and Total Coliform
- Cl Residual and Total Coliform
- Cl Dose and Residual



Jar Testing Results

- Broad Confirmation of Concept
- Ideal Dosing Between 40 mg/l – 50 mg/l
- Minimal Impacts from Turbidity



PROJECT: Meadowlark WRF S. Hypochlorite Conversion Prepared By: PMD, HB
 PHASE: Jar Testing Date: 24 Aug
 Page: 1 of 2 Project No. 21-3276

Run 1 Date: 24 Aug Time:

Sample 1	Turbidity (NTU)	pH	Temperature (°F)	Total coliform (/100mL)
	4.41	7.2	28.3 °C	

Chlorine Dose (mg/L)	Chlorine residual (2 mins)(mg/L)	Chlorine residual (90 mins) (mg/L)	pH (90 mins)	Temperature (°F, 90 mins)	Total coliform (90 mins) (/100mL)
x10 5	0.78	0.62	7.71	24.9	3.73
x10 10	1.46	1.16	7.81	24.7 °C	3.64 NTU
x10 20	2.2	2.19	7.82	24.5 °C	4.61 NTU
x10 30	2.2	2.2	7.91	24.4 °C	4.60 NTU

Turb@90min

Before residual @ 10 min

Run 2 Date: Time:

Sample 2	Turbidity (NTU)	pH	Temperature (°F)	Total coliform (/100mL)
	6.11	7.31	27.5 °C	

Chlorine Dose (mg/L)	Chlorine residual (2 mins)(mg/L)	Chlorine residual (90 mins) (mg/L)	pH (90 mins)	Temperature (°F, 90 mins)	Total coliform (90 mins) (/100mL)
x10 5	0.21		7.78	24.7 °C	5.94 NTU
x10 10	0.55		7.86	24.4 °C	5.99 NTU
x20 20	0.53		7.84	24.5 °C	5.61 NTU
x20 30	0.82		7.89	24.2 °C	6.14 NTU

Turb@90min

x10
x10
x20
x20



0.5 ml into sample jar + 9.5 ml DI water

Jar Testing Lessons Learned

Costs vs. Benefits



**More Data –
Not Less**

Ensure all constituents
are accounted for



**A little bit of
redundancy
goes a long way**

Avoid Mishaps.
Have Backups

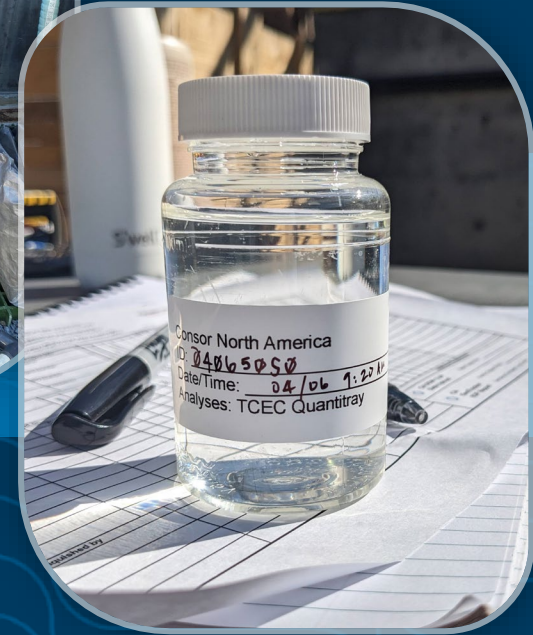


**Forward thinking
here and now**

Procurement woes



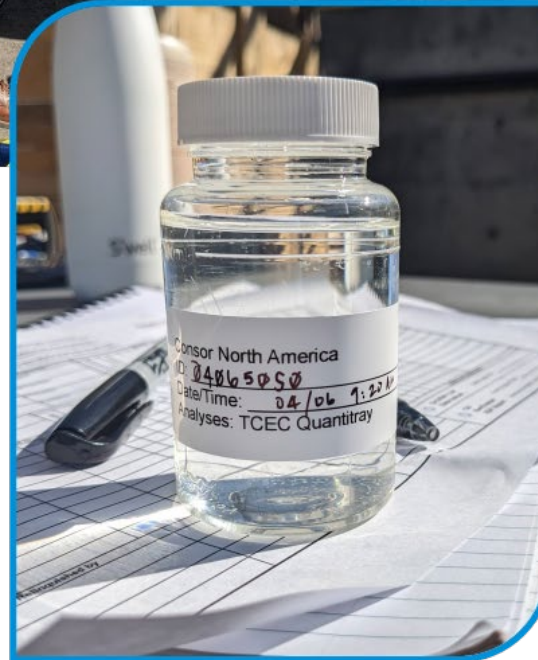
Proof of Concept Testing



Proof of Concept

Execution

- 2 days, 8 – 9 hours/day
- Adjust Pumps 1x/15 minutes
- Changing Doses
- Sample Collection



Proof of Concept

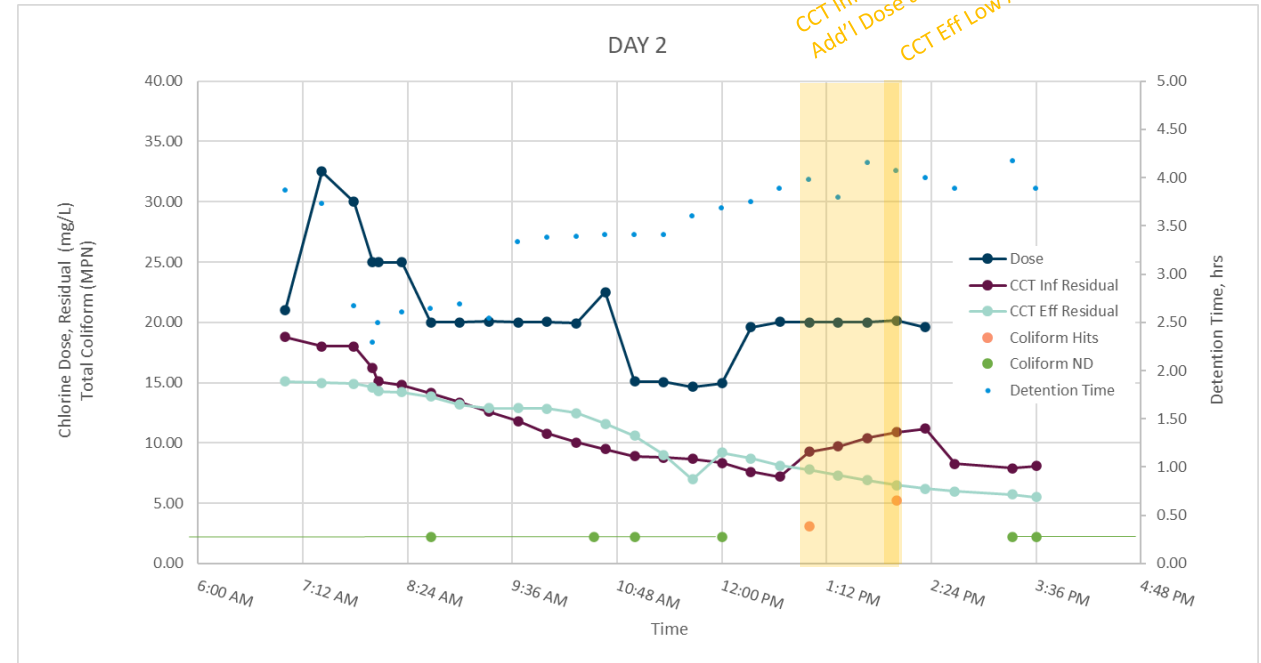
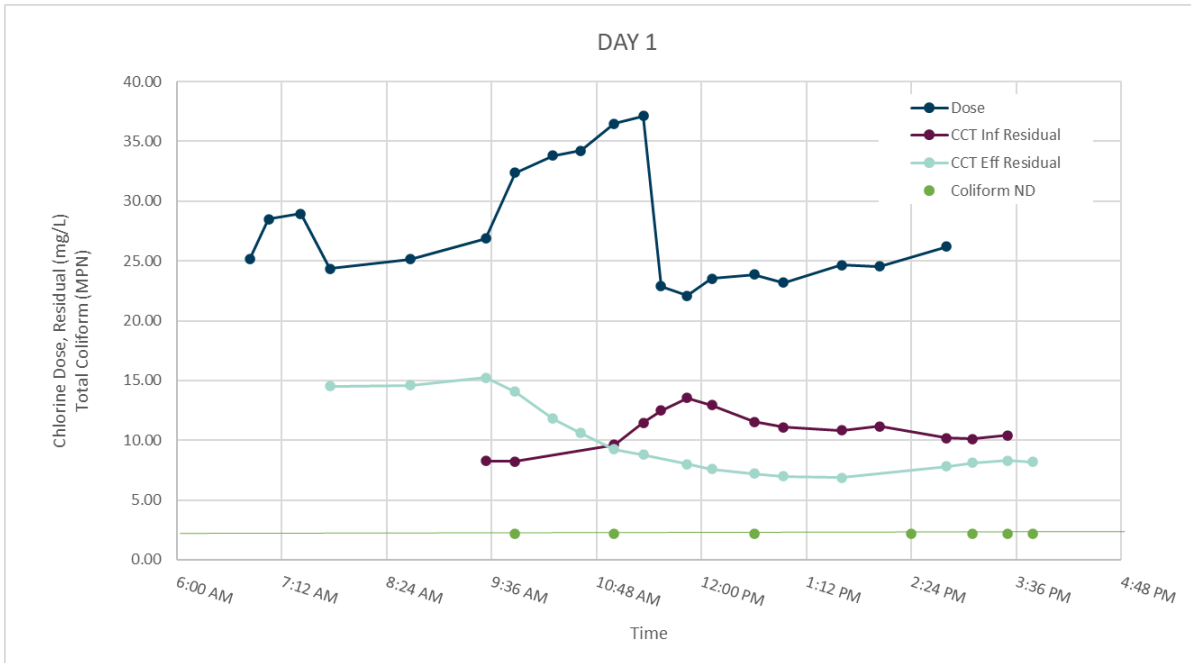
Troubleshooting

- Maintaining Permit & Disinfection



Proof of Concept

Results & Trends



Conclusions:

- Day 1, 25 – 35 mg/L OK
- Day 2, 20 – 25 mg/L OK
- 15 – 20 mg/L too low for long periods



Proof of Concept

More Questions

- Ammonia and Nitrite vs. Chlorine Demand
- TSS vs. Coliform Kill
- Dosing at CCT Influent

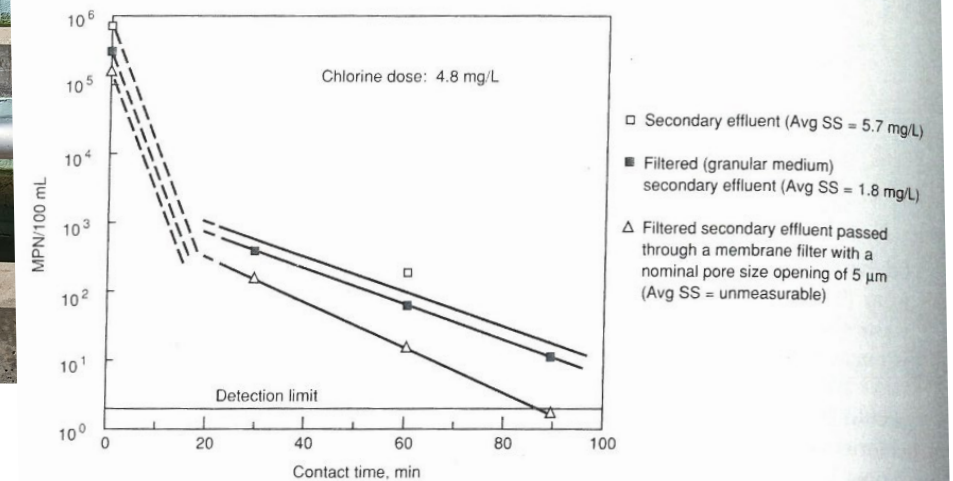
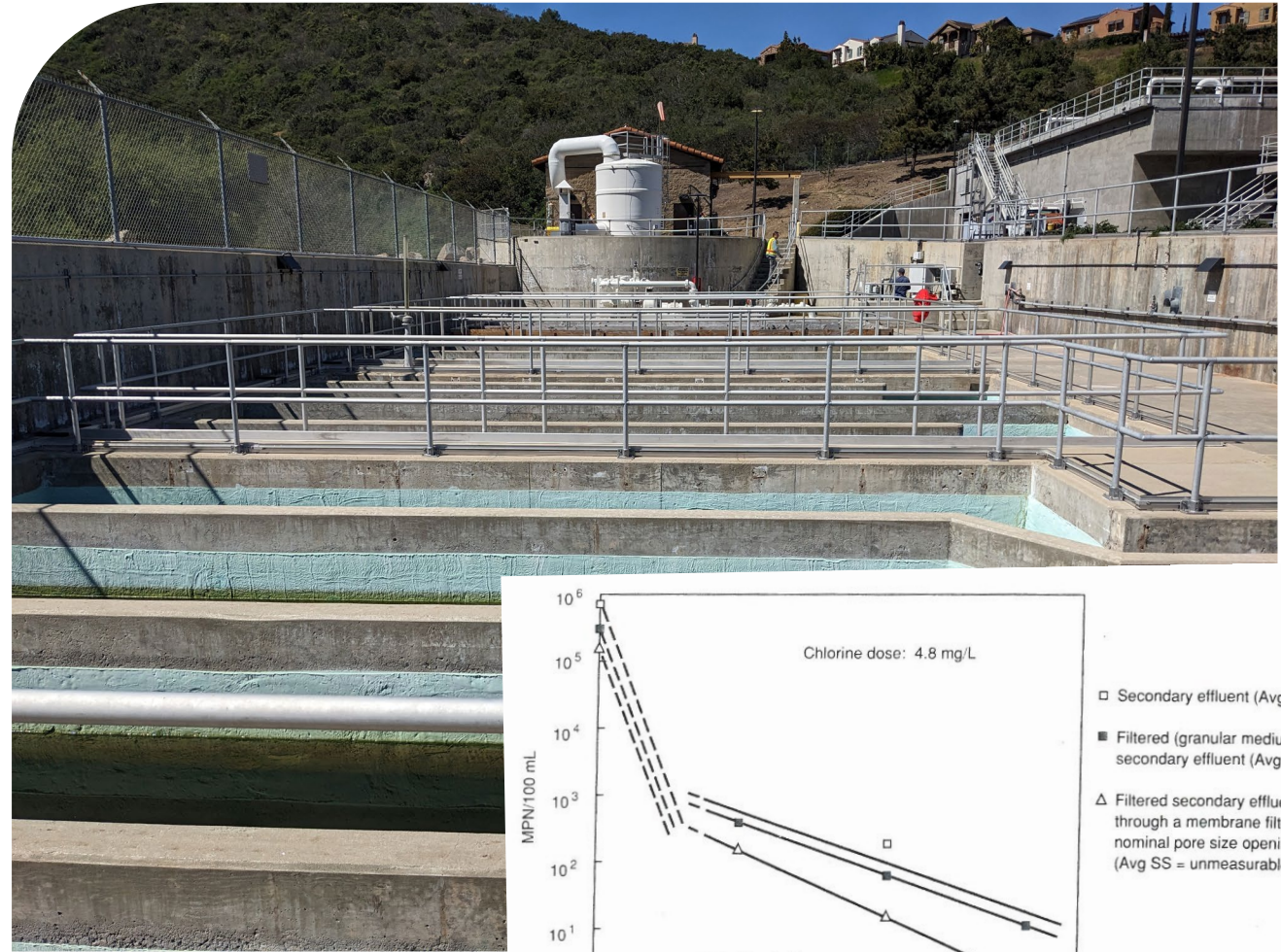


FIGURE 7-17

Typical disinfection results obtained when suspended solids are present [8].

Photo: Metcalf & Eddy Inc., Tchobanoglous, G., Burton, F. L., Tsuchihashi, R., & Stensel, H. D. (2013). Wastewater engineering: Treatment and resource recovery (5th ed.). McGraw-Hill Professional



Next Steps

Next Steps

More Testing!
Final Design, Bid, Construction
Continued Adjustments



Questions

& Thanks!

Vallecitos Water District

Ryan Morgan

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Marc Smith

Dale Austin

Alison Fretwell

Consort

John Thayer

Andy Szakowski

Miaomiao Zhang