An Experimental Technique for Protecting Wells Without Pump Systems

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Andrew Wentworth – GSI Water Solutions, Inc.
Larry Eaton – Summit Water Resources

GSI Water Solutions, Inc.

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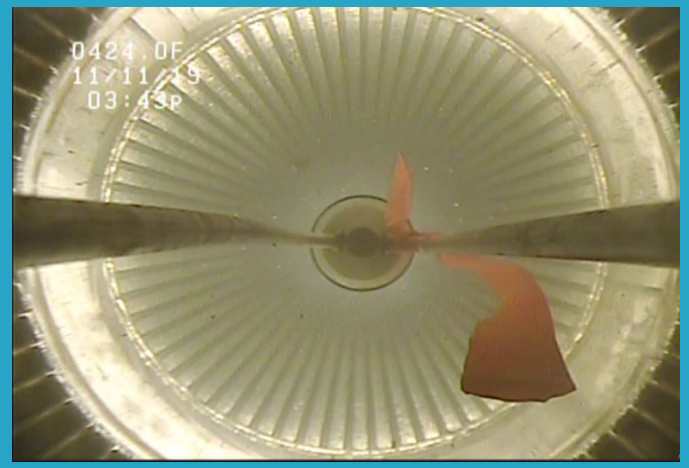
Overview

1. The Problem
2. Experiment Design
3. Results
4. Lessons Learned

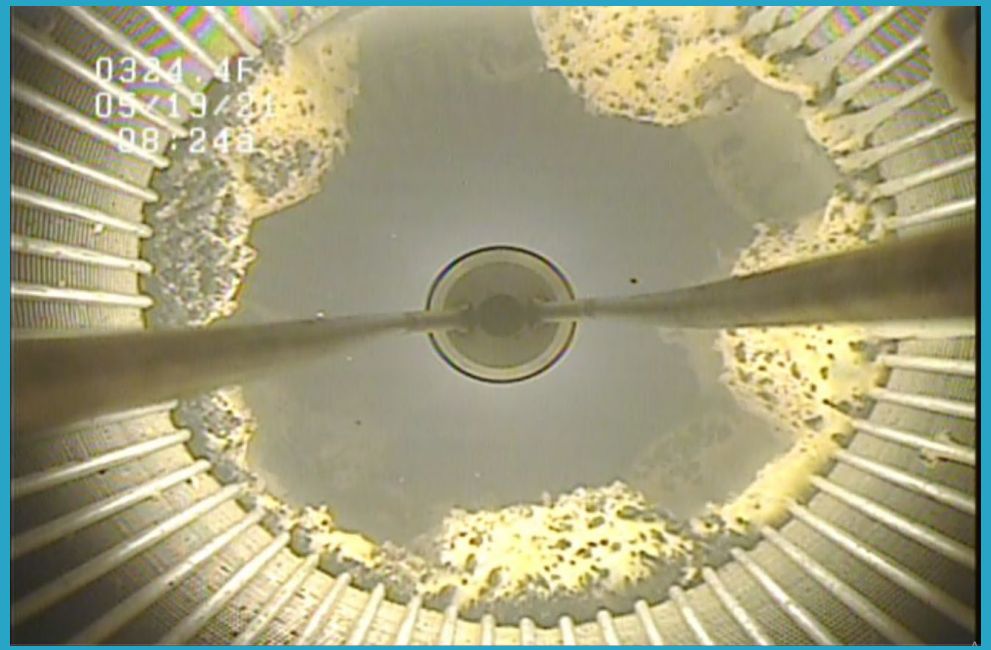
What happens when wells sit idle?

Drilling/Construction

- New borehole, casing, and screen/liner



Idle Period waiting for Permanent Pump



Permanent Pump Installed

- Performance declines due to bacterial clogging
- Potential coliform development in mature bacterial ecosystems

Experiment Design

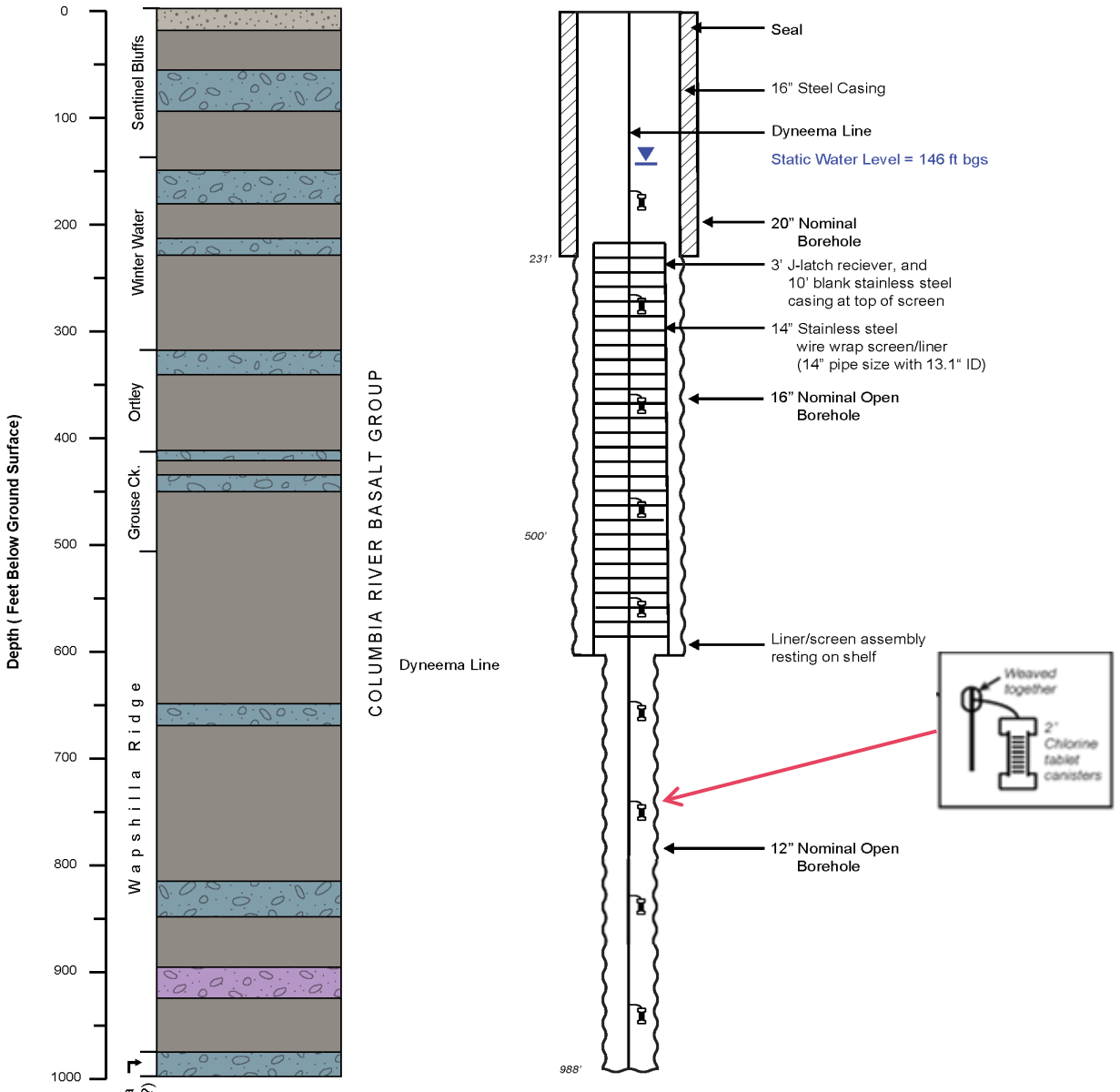
- **Goal:** Develop a low-cost method to inhibit bacterial growth while waiting for permanent pump installation

- Two designs tested
  - PVC canisters with chlorine tablets suspended in the water column
  - Low-flow injection (10 gpm) of chlorinated tap water

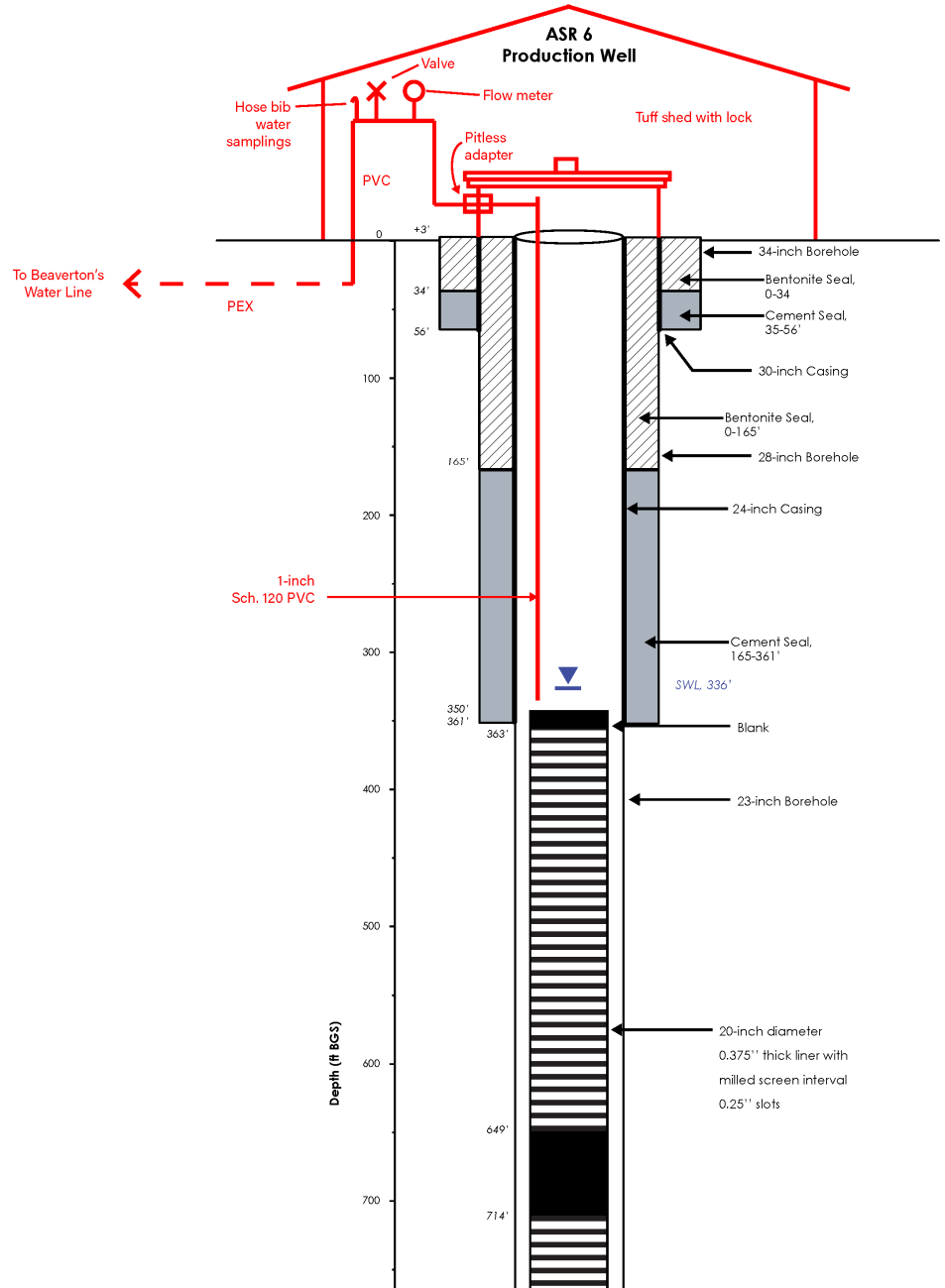
The Wells

Well Name	ASR 3 Pilot Well	ASR 7	ASR 6	ASR 5	ASR 3A
Year	2001	2012	2015	2017	2019
Construction Type	Open borehole	Open borehole	Milled Slot	Milled Slot and Perforations	Stainless Steel Wire-Wrap Screen
Chlorine System Type	Canister	Canister	Low-Flow Injection	Canister	Canister
Aquifer	Grande Ronde Basalt Formation (Columbia River Basalt Group)				

ASR 3A - Canisters



ASR 6 – Low-Flow Injection

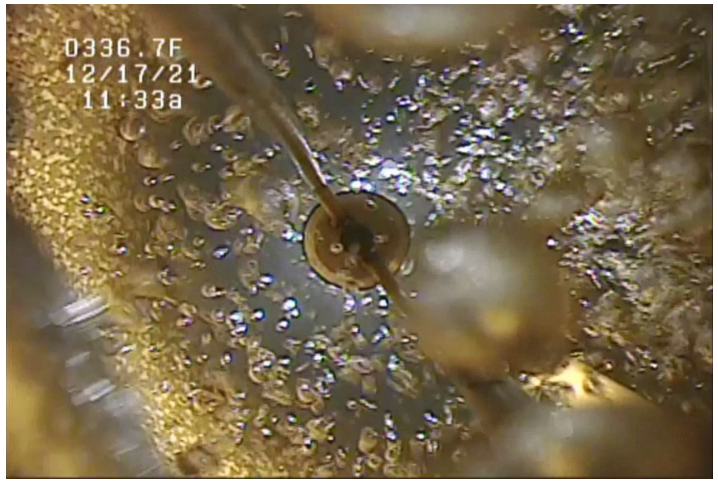


Evaluation

Video Surveys – Before and After

Water Quality – Bacterial Counts and General Geochemistry

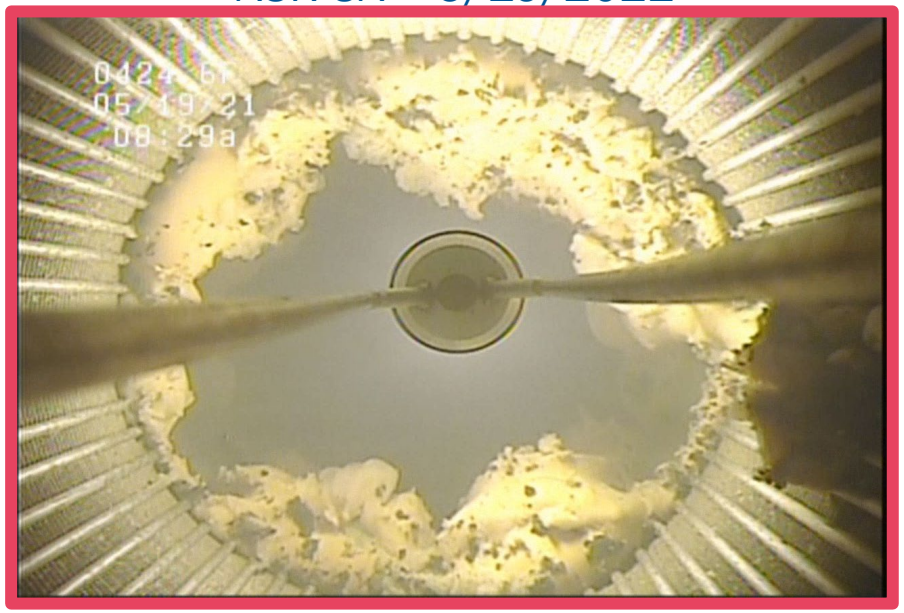
Uncertainties



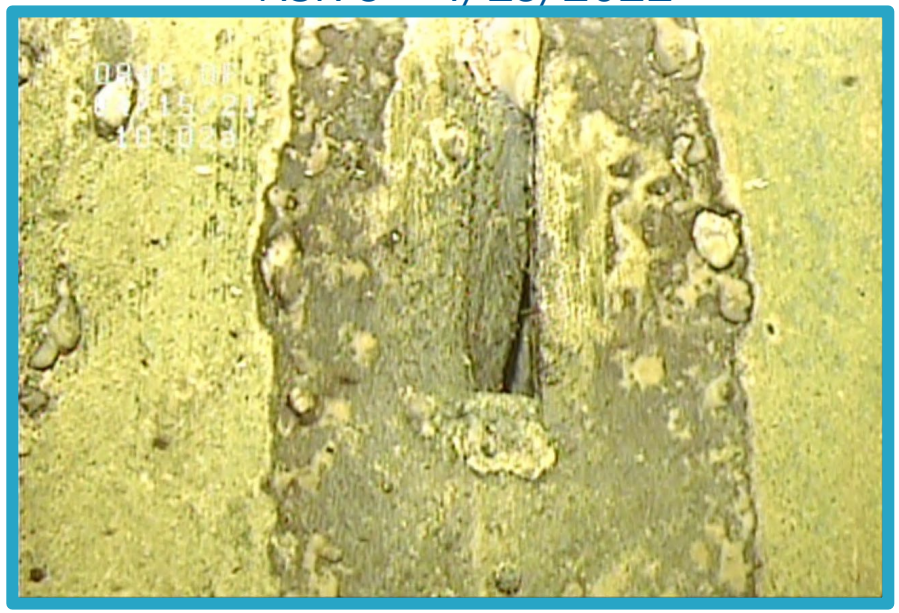
- Small sample size and limited time period
- Pumping test needed to assess actual well performance

Canister System - Video Survey Comparisons

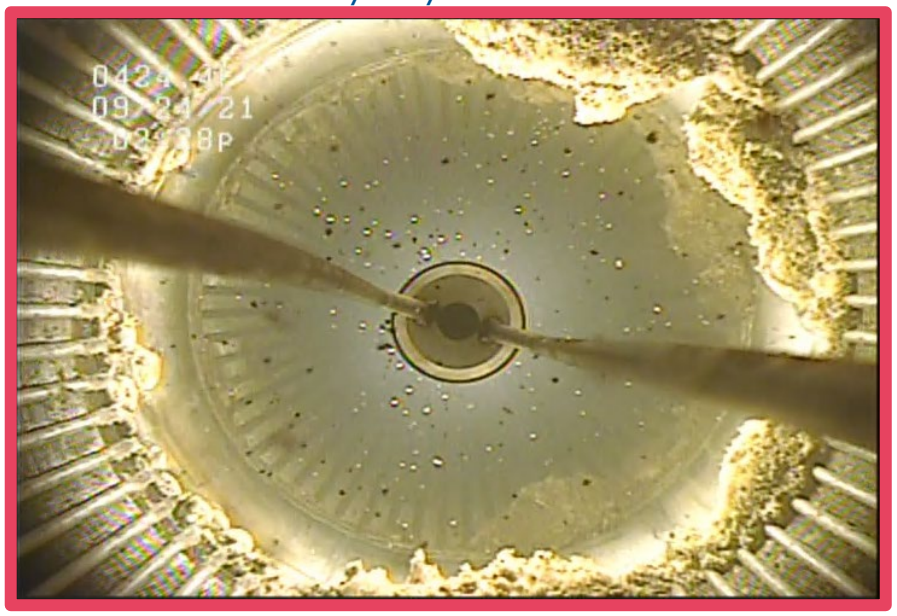
ASR 3A – 5/19/2021



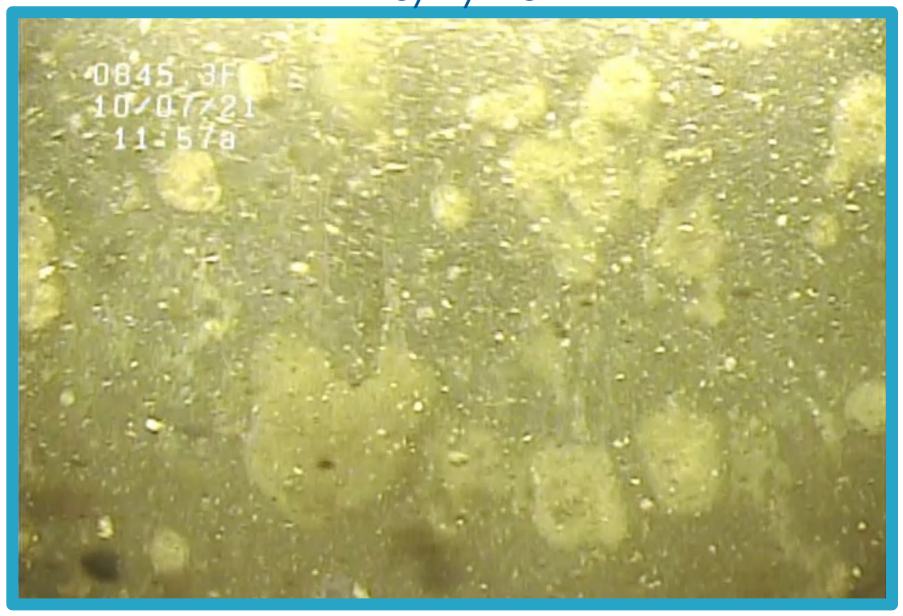
ASR 5 – 4/15/2021



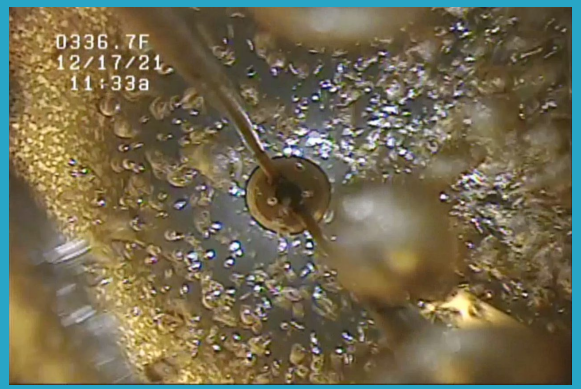
9/24/2021



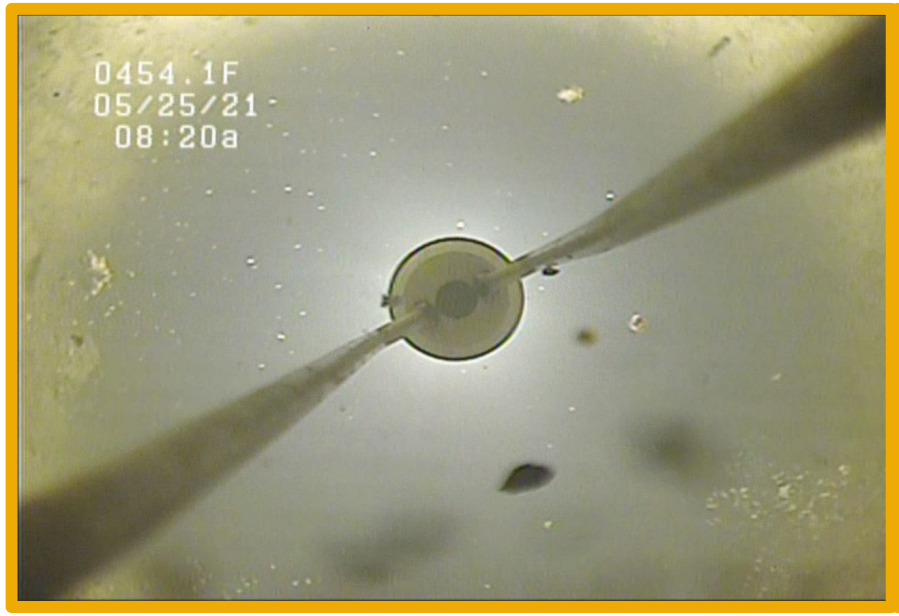
10/7/2021



ASR 6 Low-Flow Injection - Video Survey Comparisons



5/25/2021



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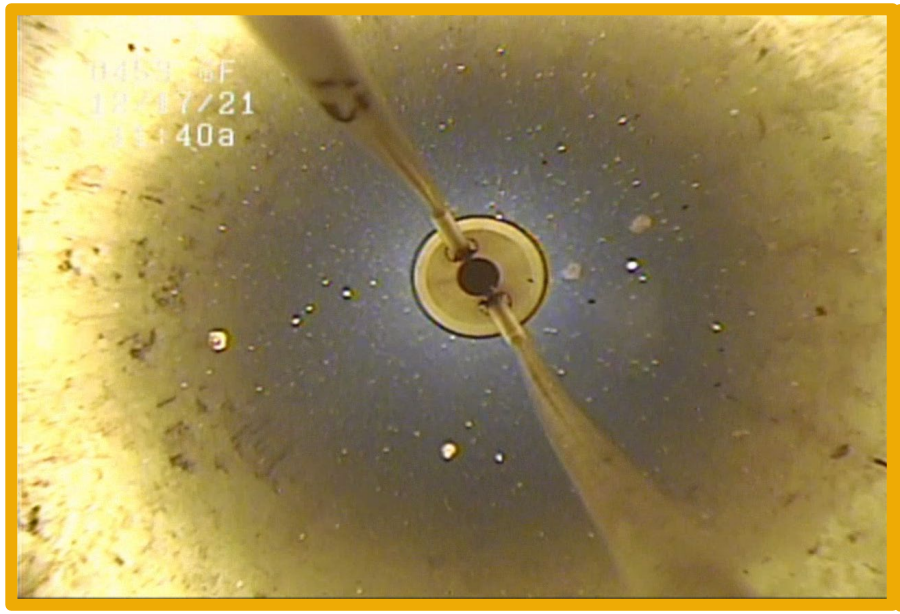
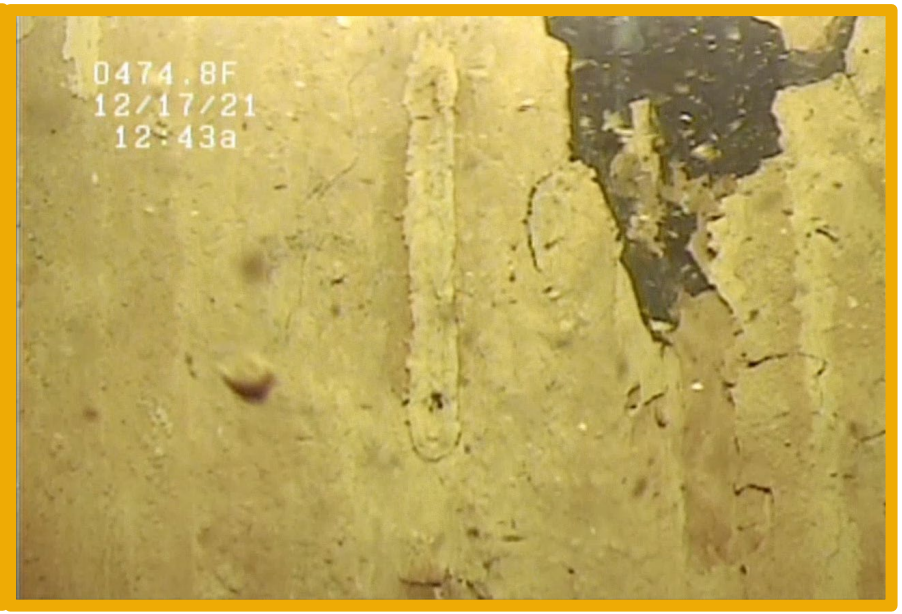


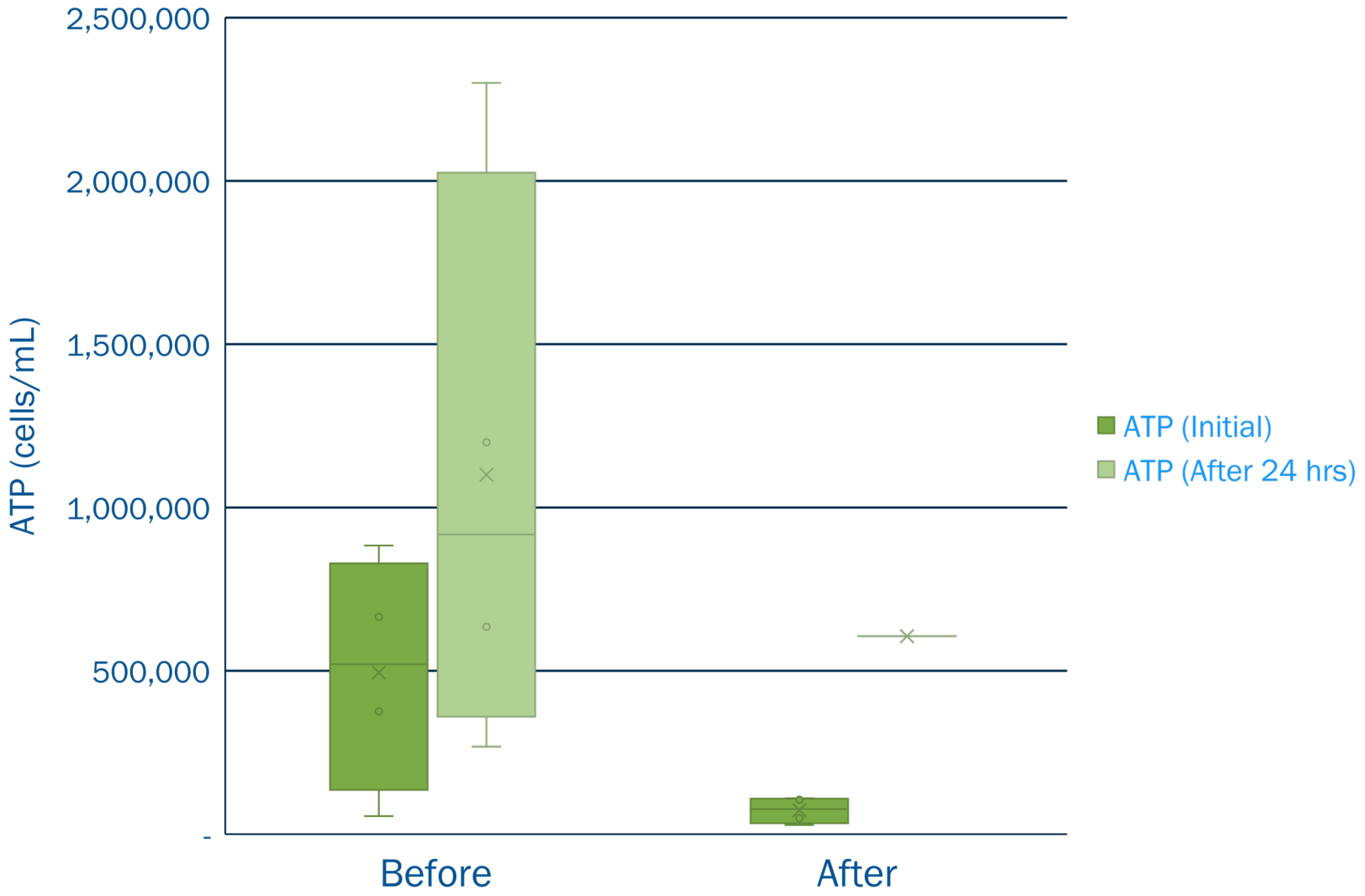


Water Quality Analysis

Well Name	ASR 3 Pilot Well	ASR 3A	ASR 5	ASR 6	ASR 7
ATP Before (cell/mL)	665,000	55,000	884,000	376,000	Chlorine too high for lab test*
ATP After (cell/mL)	Chlorine too high for lab test	28,000	110,000	37,000	49,000
Percent Change	—	- 46%	- 88%	- 90%	—
Chlorine (mg/L)	33.75	0.55	ND	0.27	ND

*Baseline ASR 7 value could not be measured because the chlorine residual leftover from over-reaming 5 months earlier was too high

Water Quality Analysis



Lessons Learned

- Chlorine treatment appears to have reduced ATP concentration
- Canister slots clogged and slowed dissolution of chlorine tablets

Future research

- Explore using a small temporary pump to purge water from the well
- Periodically disinfect with liquid chlorine and agitate with a nylon brush
- Effect of change in water chemistry on casing/screen corrosion

Questions?