West Pasco
Water Treatment Plant

Navigating Through the Challenges of Microfiltration Startup and Testing

MAY 6, 2011

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Presentation Outline

- Overview of our two water plants and their differences
- PALL Membrane technology
- Challenges during startup and testing of the new plant
- Solutions, modifications and repairs made
- Things we've learned
- Questions?

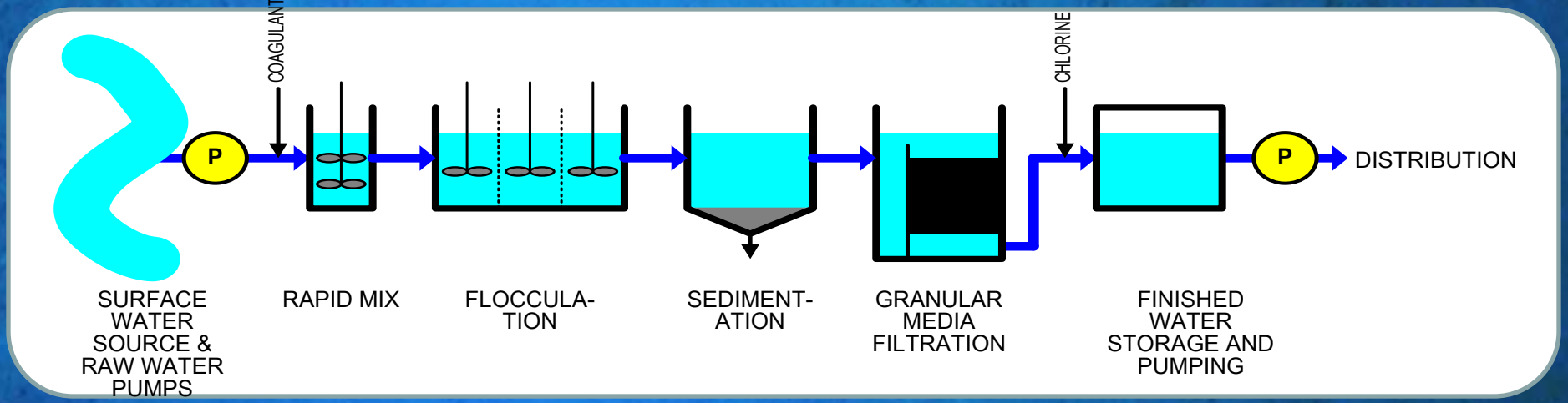
City of Pasco Washington
Water Treatment Plants
Service Population over 62,000

Butterfield Water Plant
24 MGD Conventional Filtration Plant
1933 -1955-1987-2002-2008

West Pasco Plant
6 MGD
Expandable to 18 MGD
PALL Microfiltration
2010

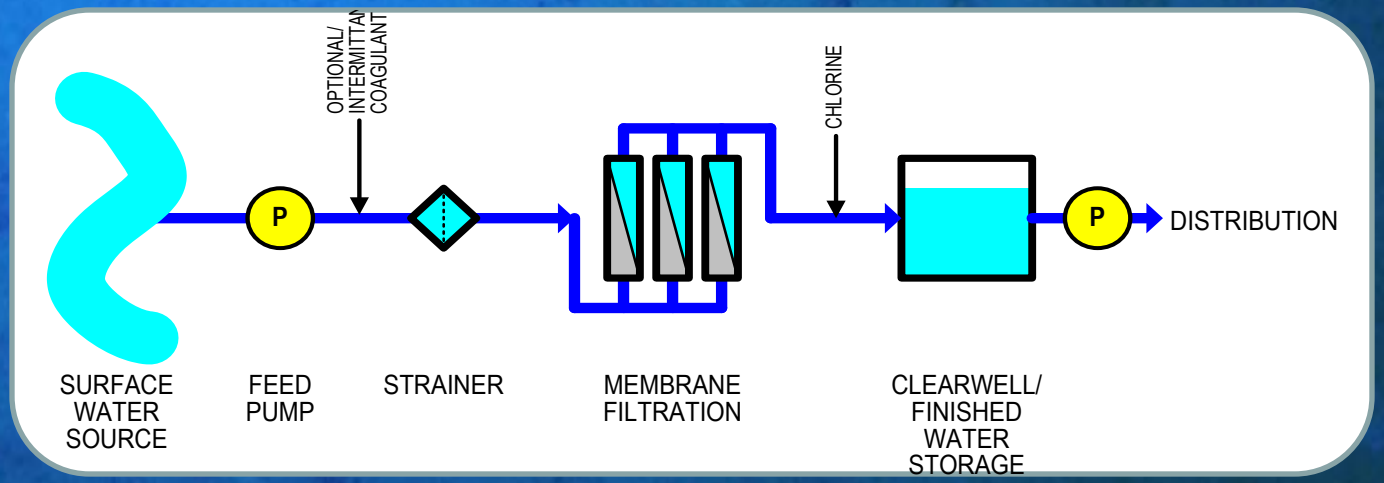
Difference Between the Two Treatment Plant's

Butterfield (*Conventional Treatment*)

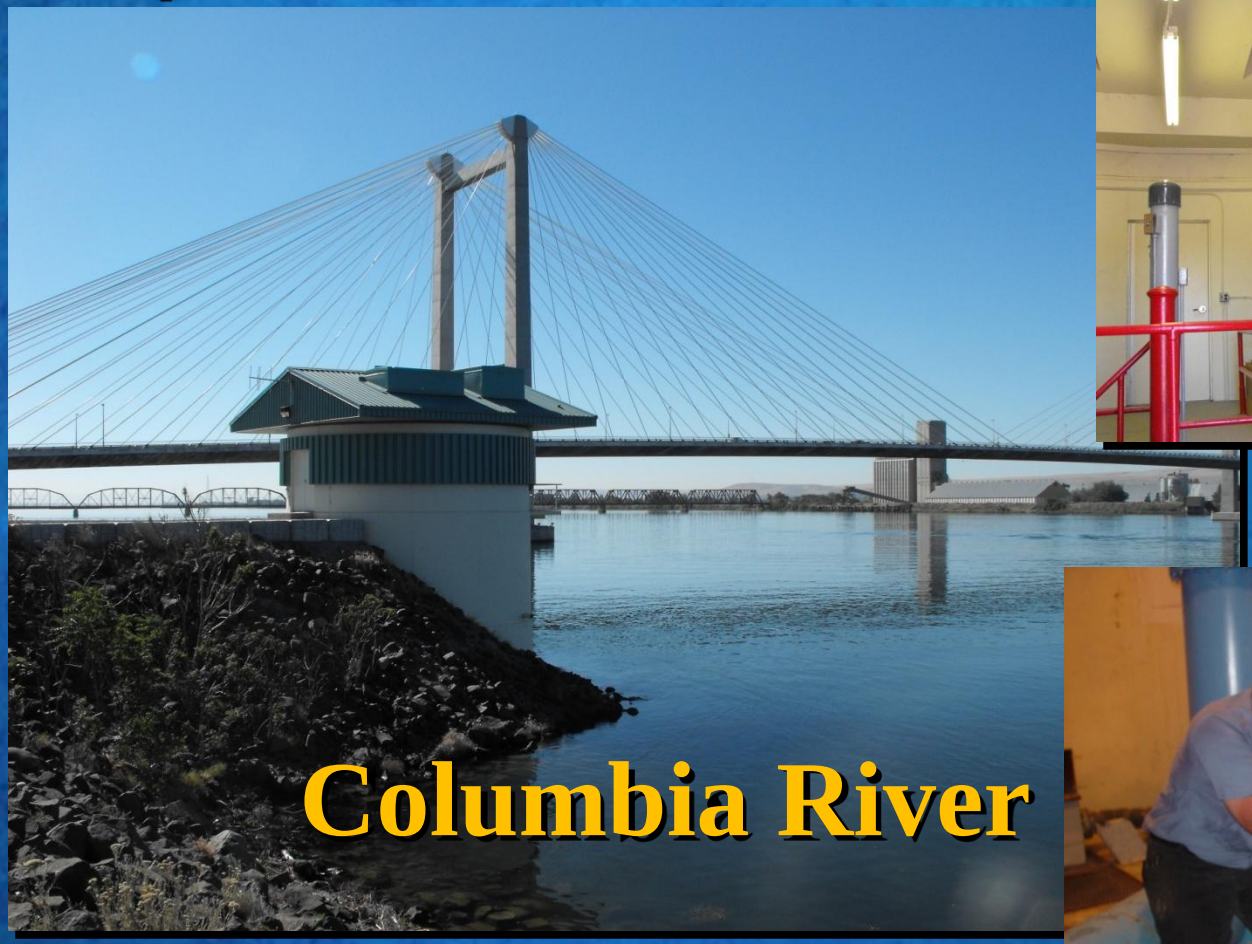


West Pasco

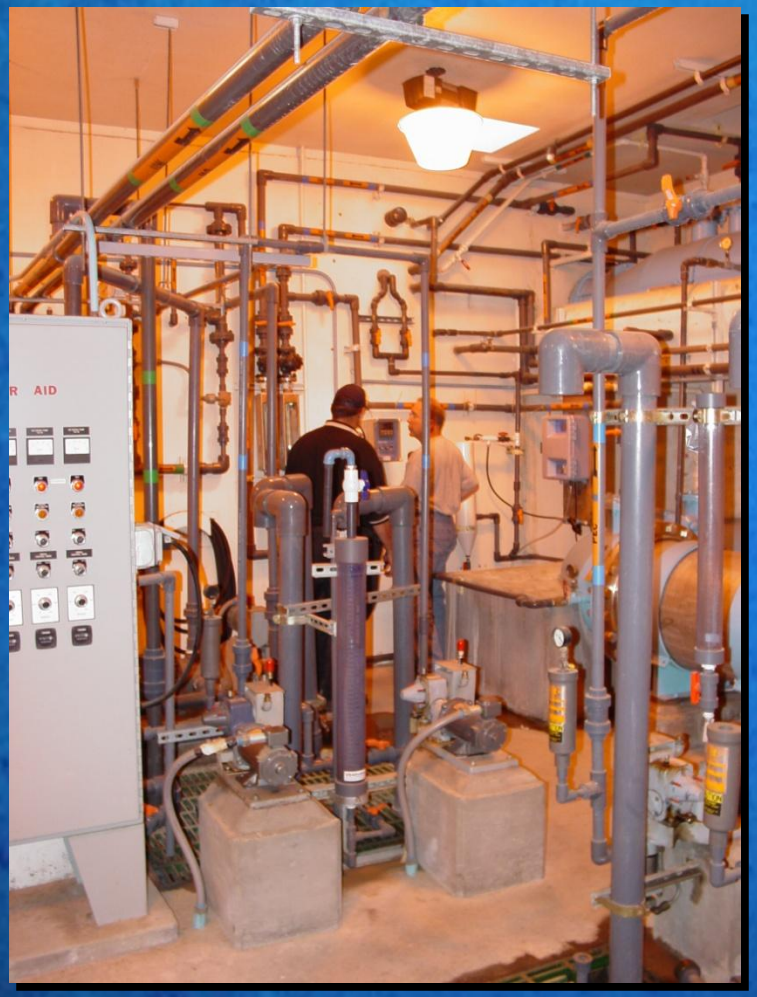
(*Membrane Filtration*)

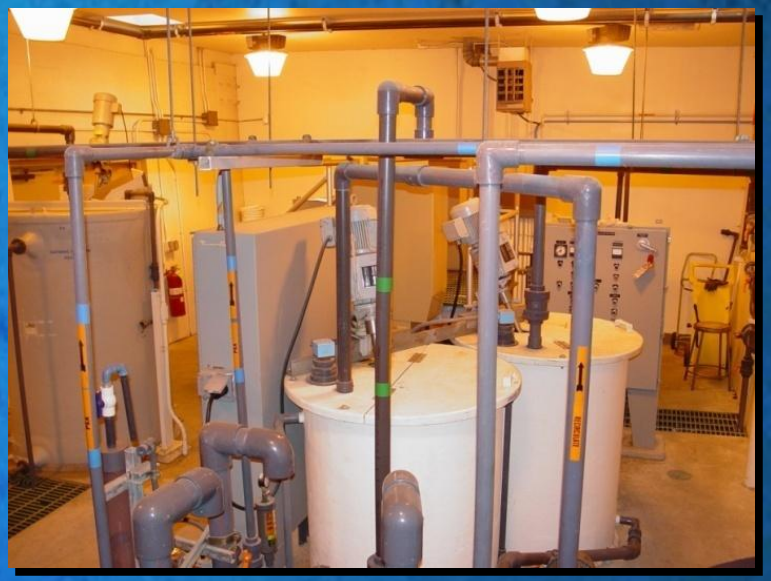


Butterfield Raw Water Pump Station



Raw Water Chemical Addition





- Alum
- Chlorine
- Potassium Permanganate

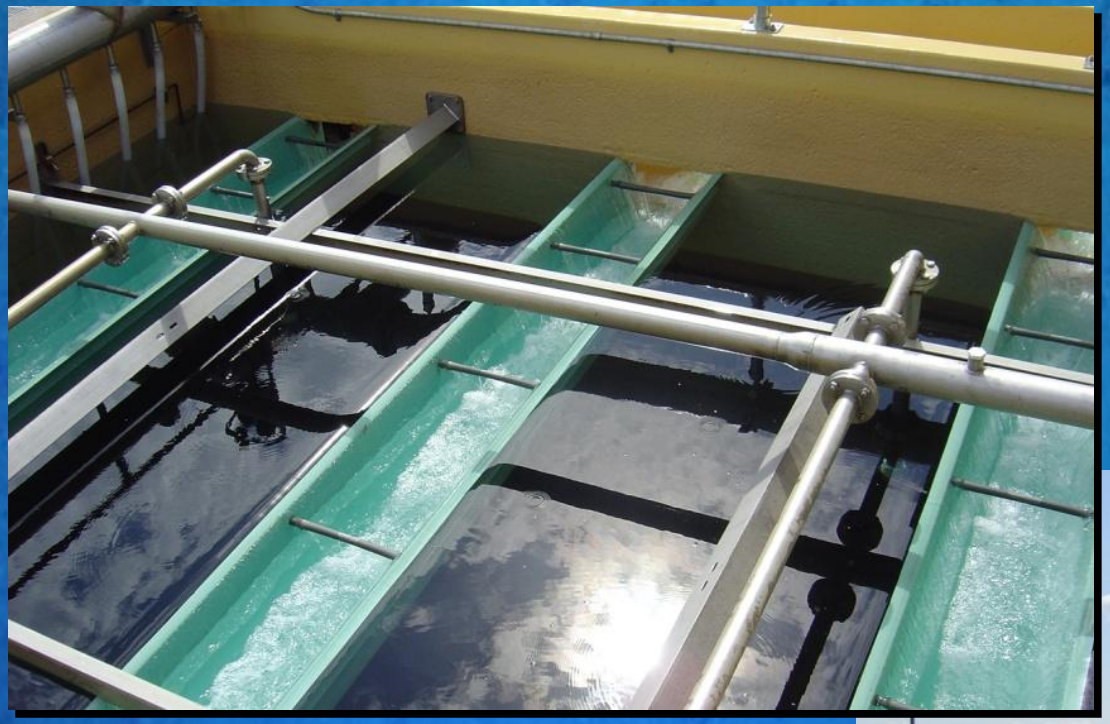
Flocculation

Paddlewheel

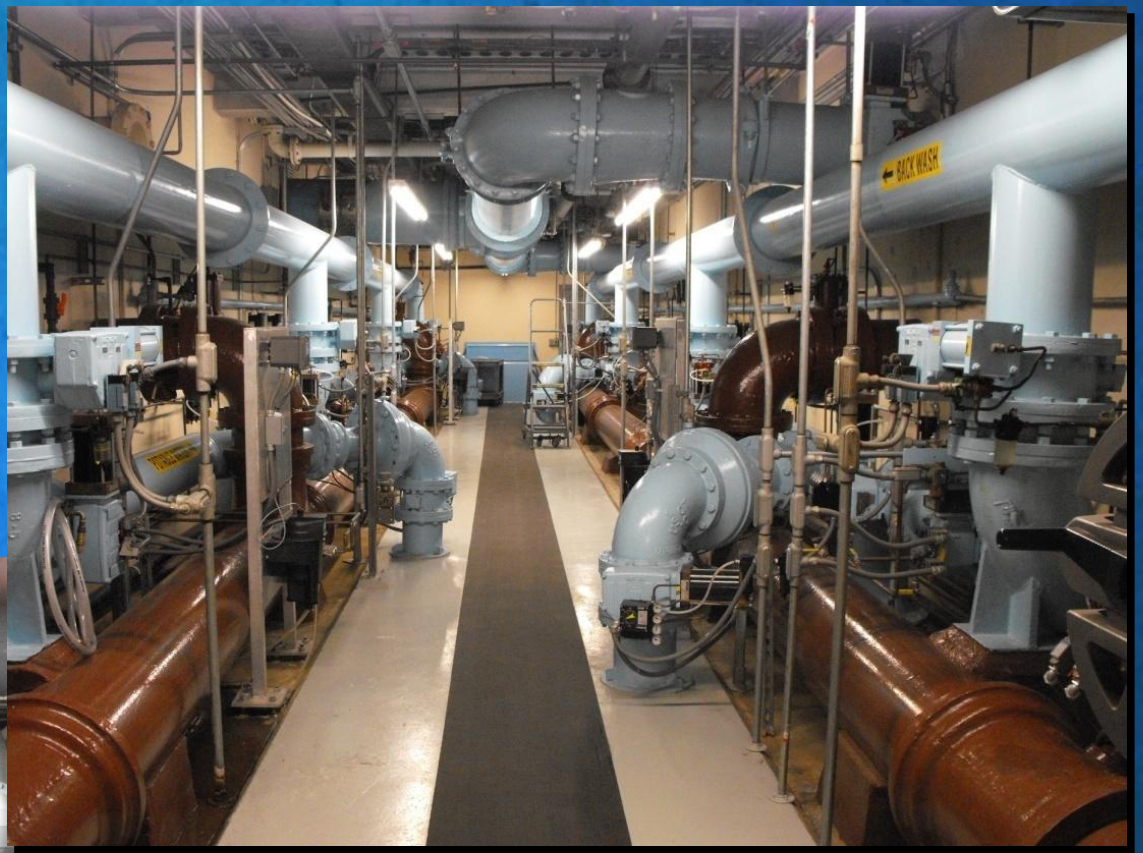
Vertical Mixers

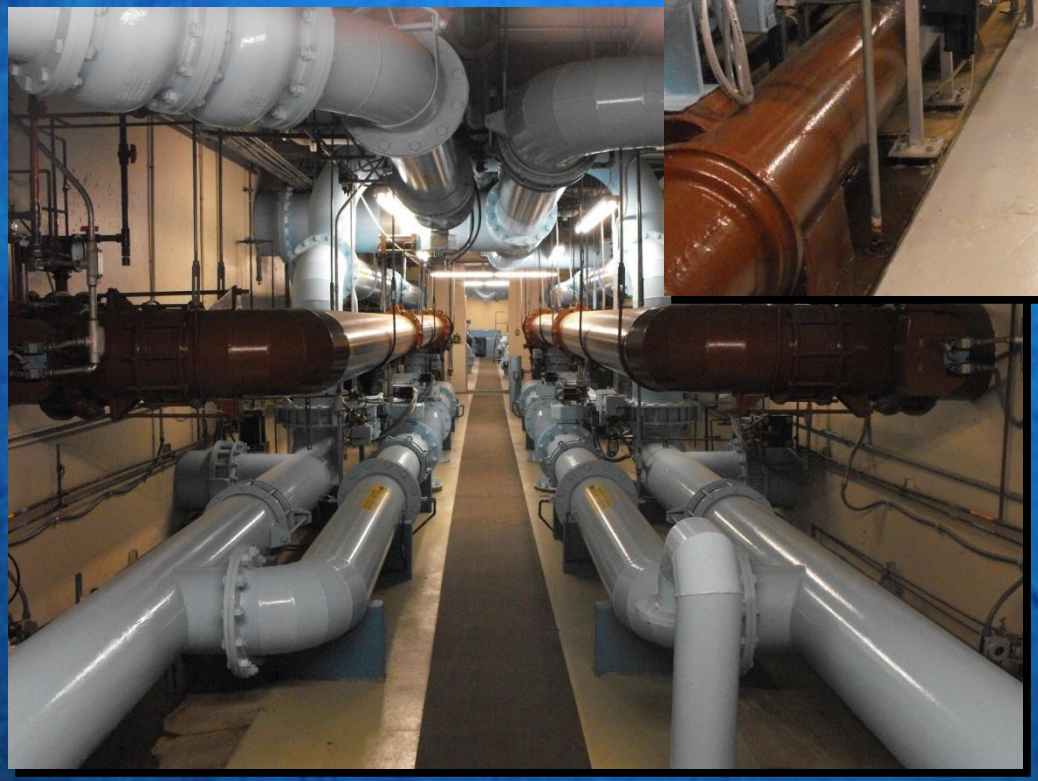
Sedimentation Basin

Anthracite Filters



Pipe Galley





572,000 gallon underground clearwell

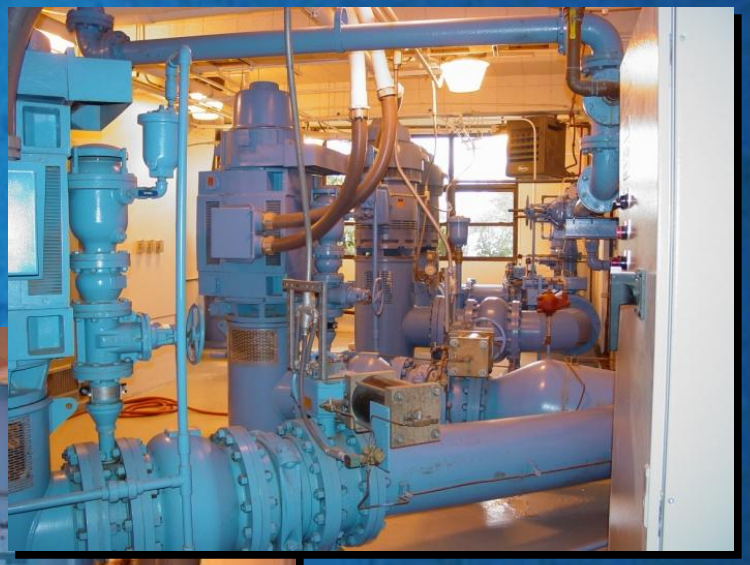
Finished Water Chemical Addition

Fluoride

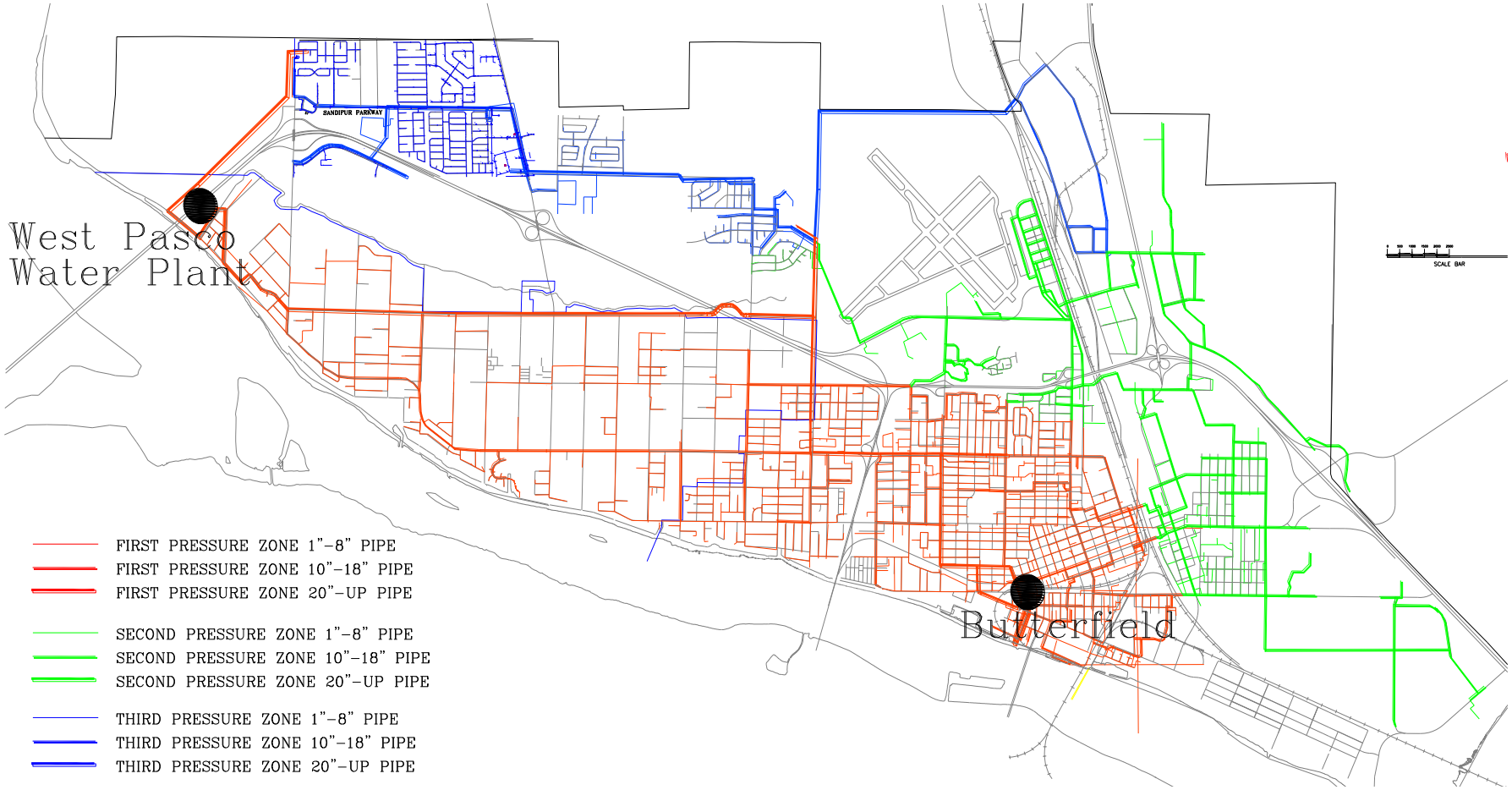
1 Ton Chlorine containers

Caustic Soda

High Service Pumps



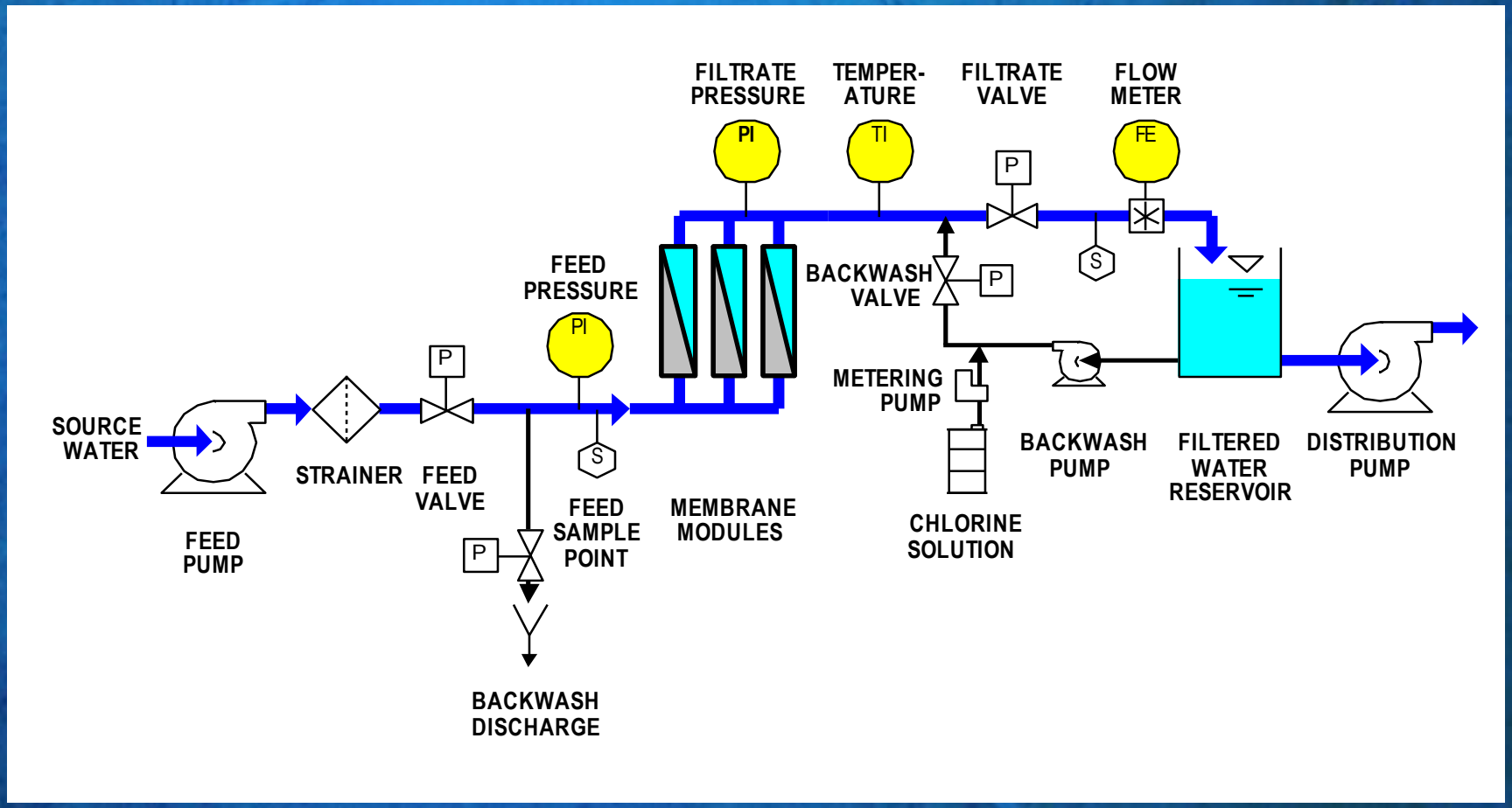
WATER DISTRIBUTION SYSTEM HAS THREE PRESSURE ZONES



West Pasco Water Filtration Plant
PALL Microfiltration

- June 2009 Started Construction
- June 2010 Substantial Completion
- June 2010 - April 2011 Solved Problems
- April 2011 Functional Testing

Schematic of Pressure-Driven Hollow-Fiber System



West Pasco Raw Water Pump Station

Chemical Addition

300 micron Strainers

ACH

Chlorine

Membrane Influent

1.6 MG Clearwell

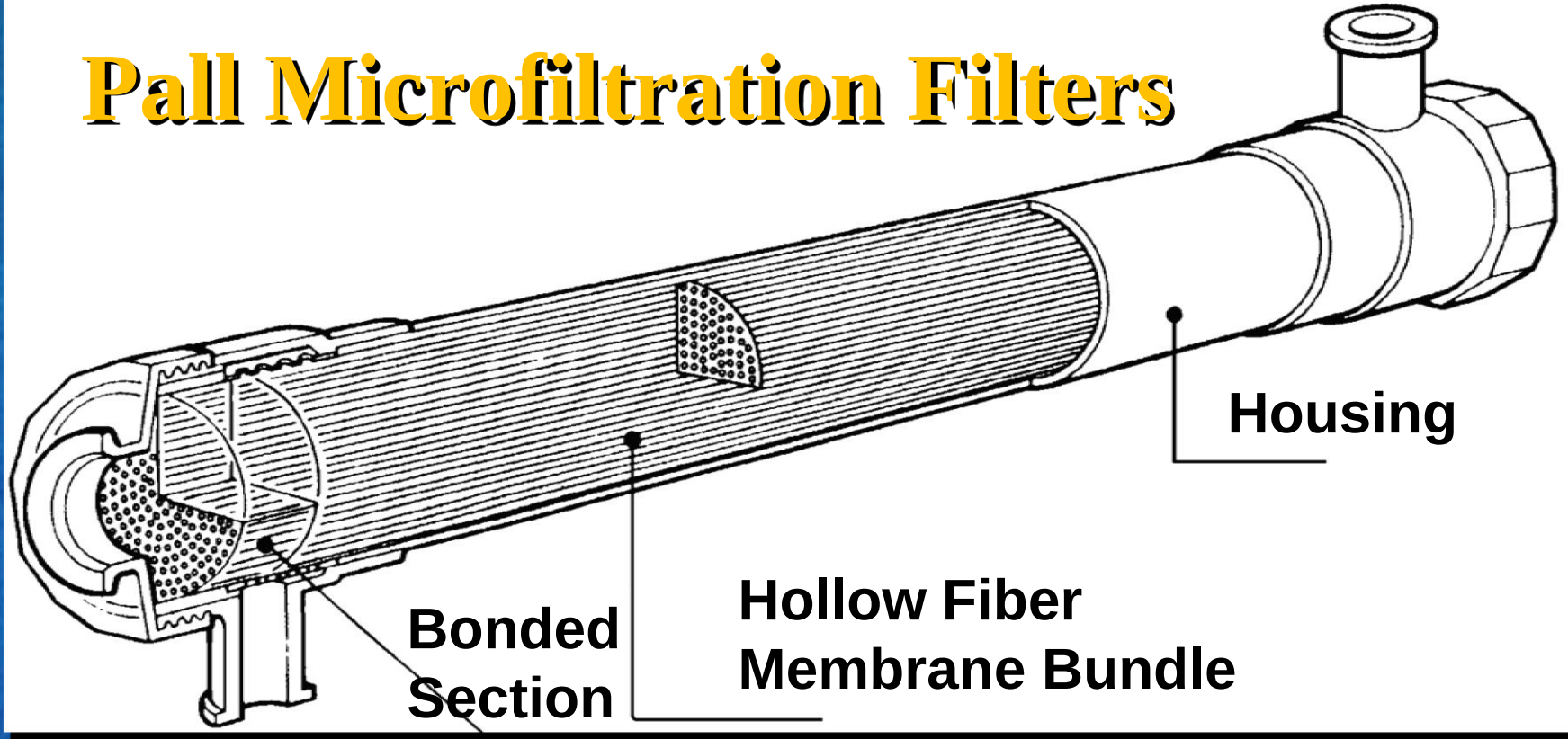
DYK pre-stressed concrete tank

High service pump's

116 Filters per rack = 3 MGD
We have 2 racks of filters = 6 MGD

Expandable to 18 MGD

Pall Microfiltration Filters

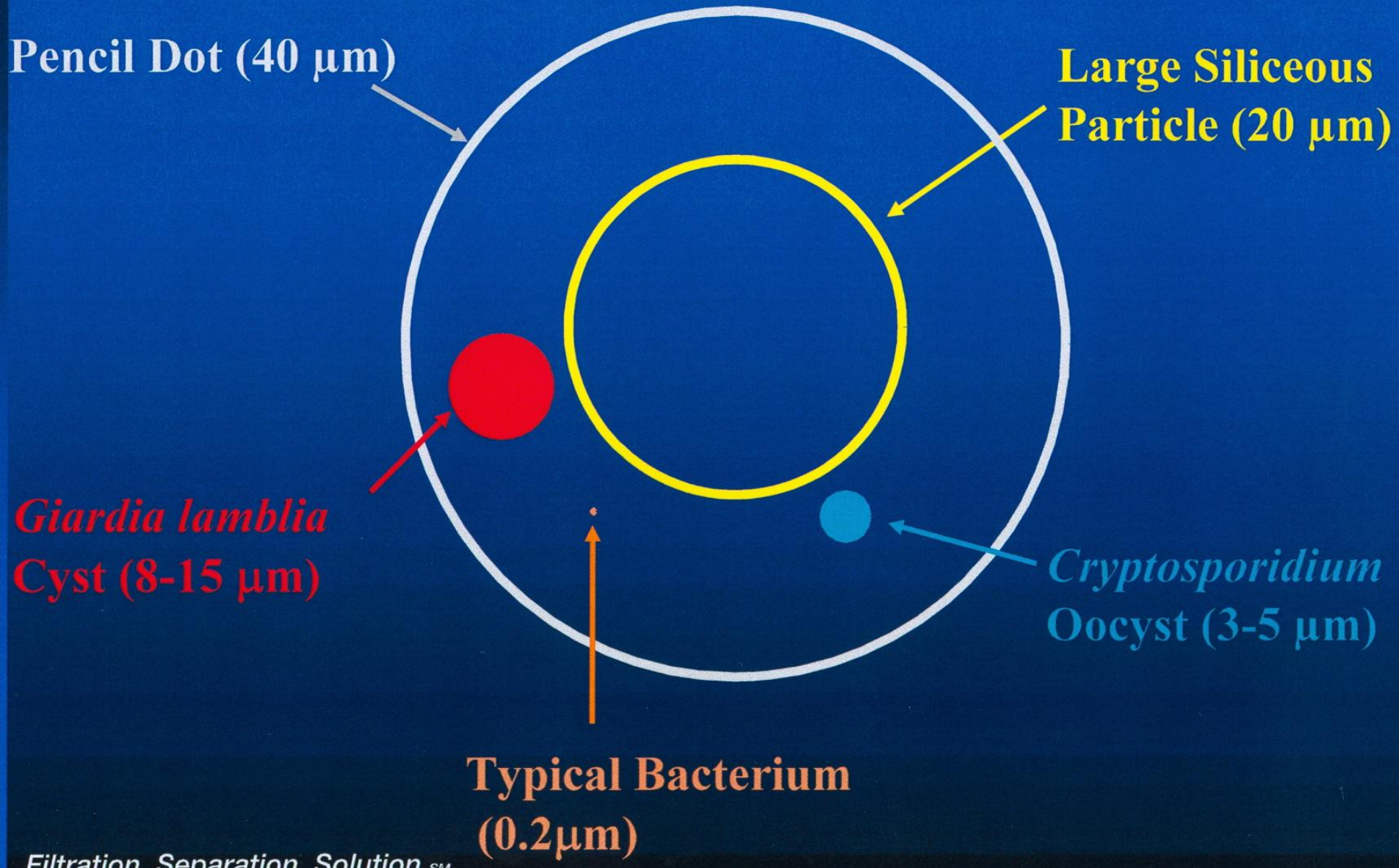


- 6350 Fibers per filter module
- Fibers are made of PVDF
  (Polyvinylene Difuoride)
- Each module flows around 18 GPM

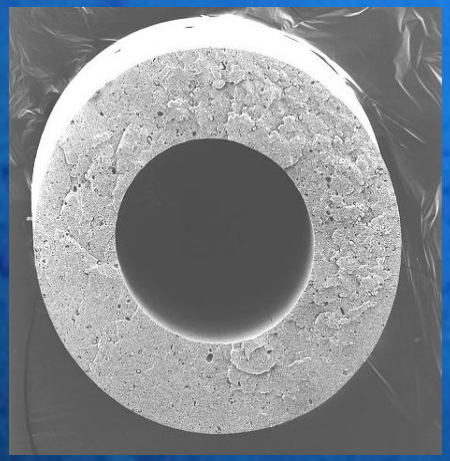
A Micrometer (µm) Is:

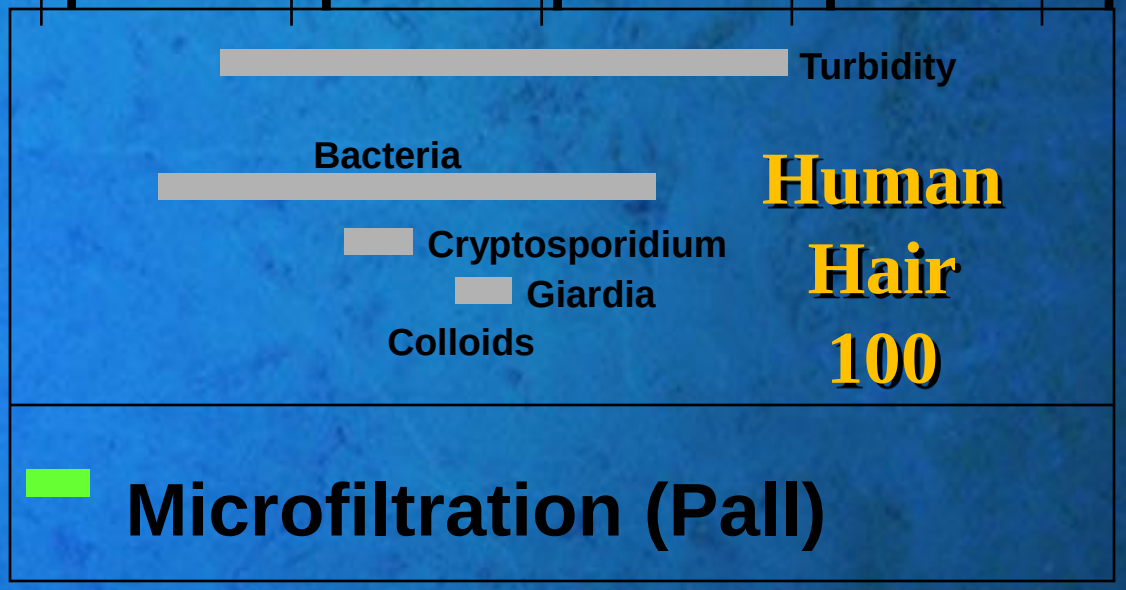
- One millionth of a meter
- One thousandth of a millimeter
- Also know as a “micron”
- 39 millionths of an inch (0.000039 in)

Relative Sizes of Particles



Fiber Membrane Size



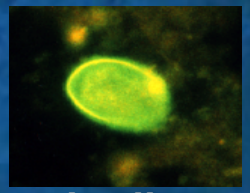


Bacteria

E.coli

0.5-2 µm

Protozoa



Giardia

3-15 µm

Filter Cleaning

Flux Maintenance Procedures

- FM

–Air Scrub (AS)

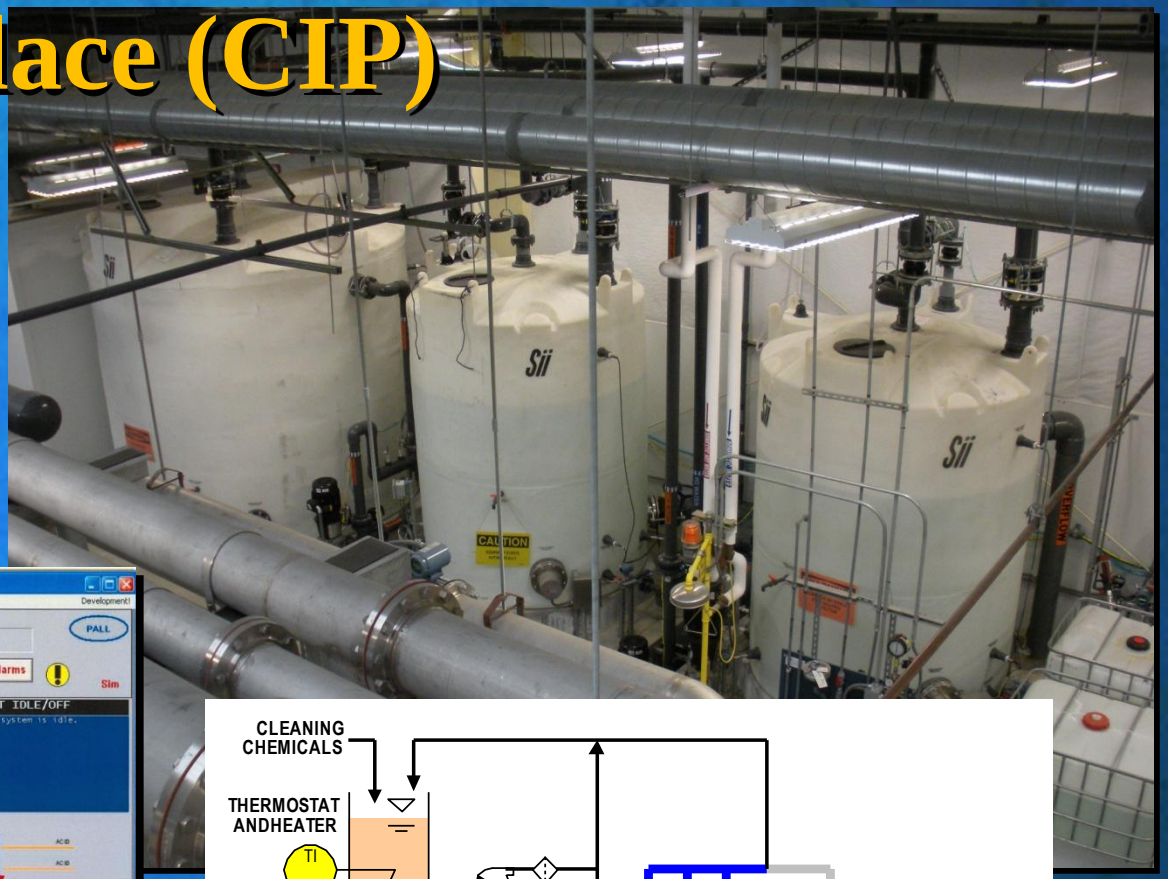
– Reverse Filtration (RF)

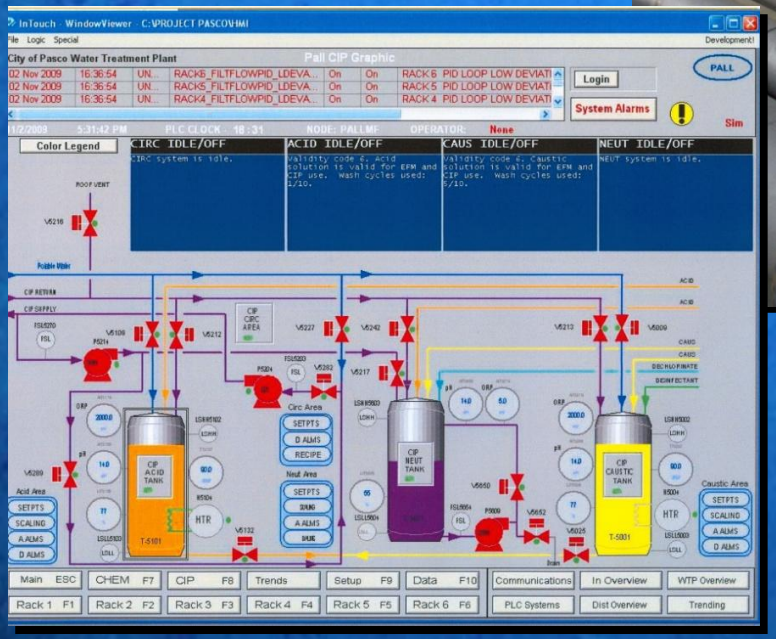
– Feed Flush (FL)

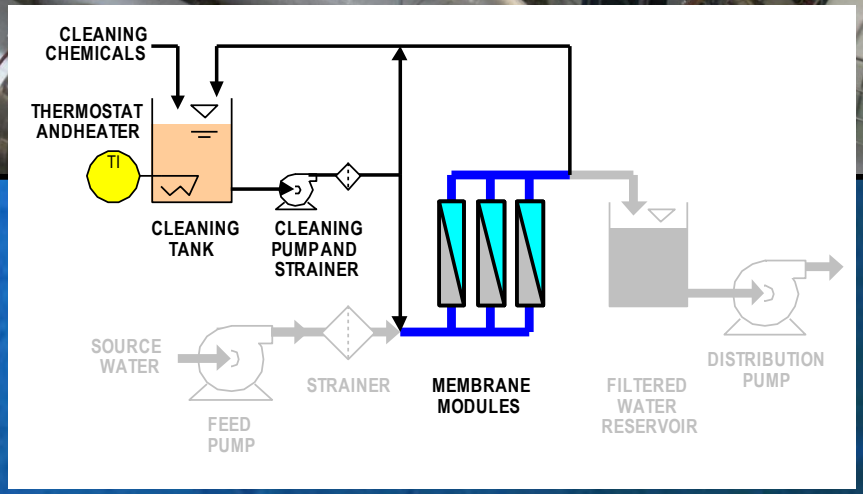
- Enhanced Flux Maintenance (EFM)
- Clean In Place (CIP)

Chemicals:

- Caustic
- Chlorine
- Citric Acid







Backwash Basin's

Challenges during startup and testing

1. Rapid filling of clearwell lead to disruptions in distribution system and secondary cleaning of clearwell.
2. Floor drains not sized nor plumbed in correctly.
3. Major air and water release into process area when air scrub would happened.
4. Amiad strainers were not able to maintain desired flow of 5000 gpm . Strainers would backwash too often tripping the motor overload and shut the plant down.
5. Water pressure to low to operate the water softener system.
6. Chemical feed tubes were incompatible with solution being carried through them.

No Drain Installed In Clearwell

Inadequate Floor Drains

Major Air and Water Release

Scaling on the PLC was wrong for the blower's

AMIAD Strainer

Problems with AMIAD strainer led to 2 failures that took 6 months to fix.

Paint Failure

Installed Flushing Valves

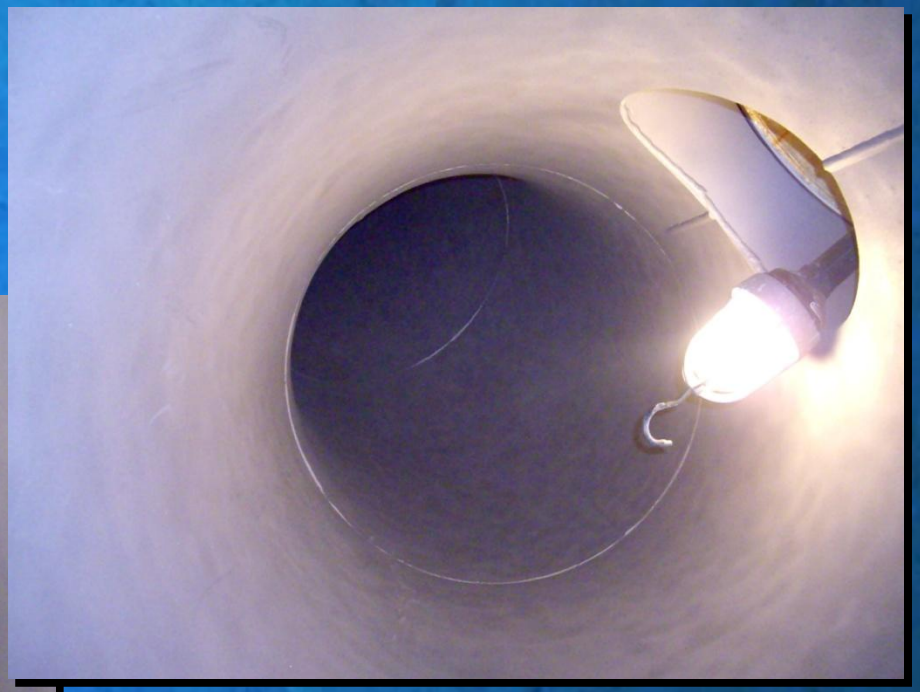
Piping Under Building

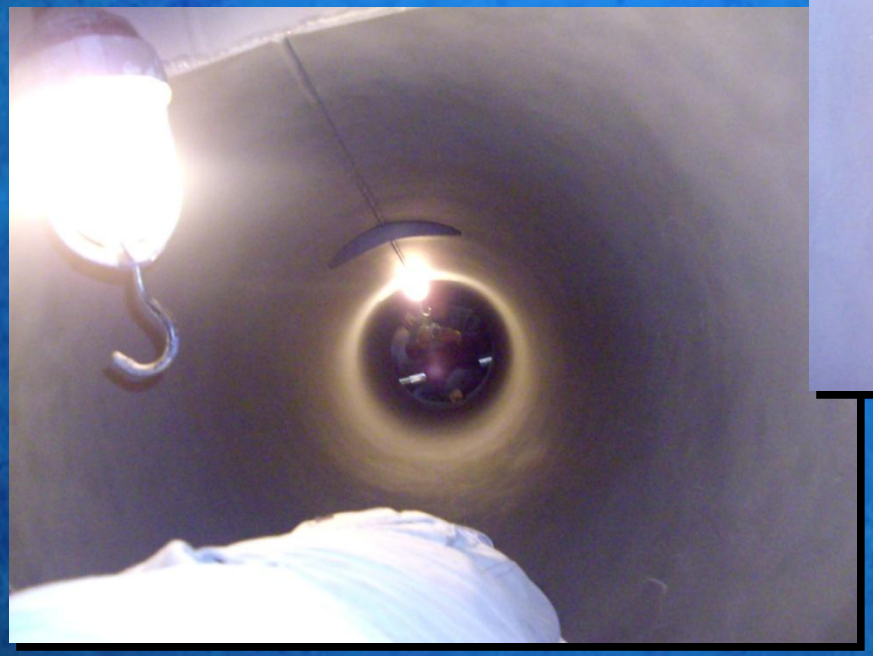
Cut Floor To Access Pipe

Pipe Paint Failure

Pipe Paint Failure

30 Inch Pipe Recoated

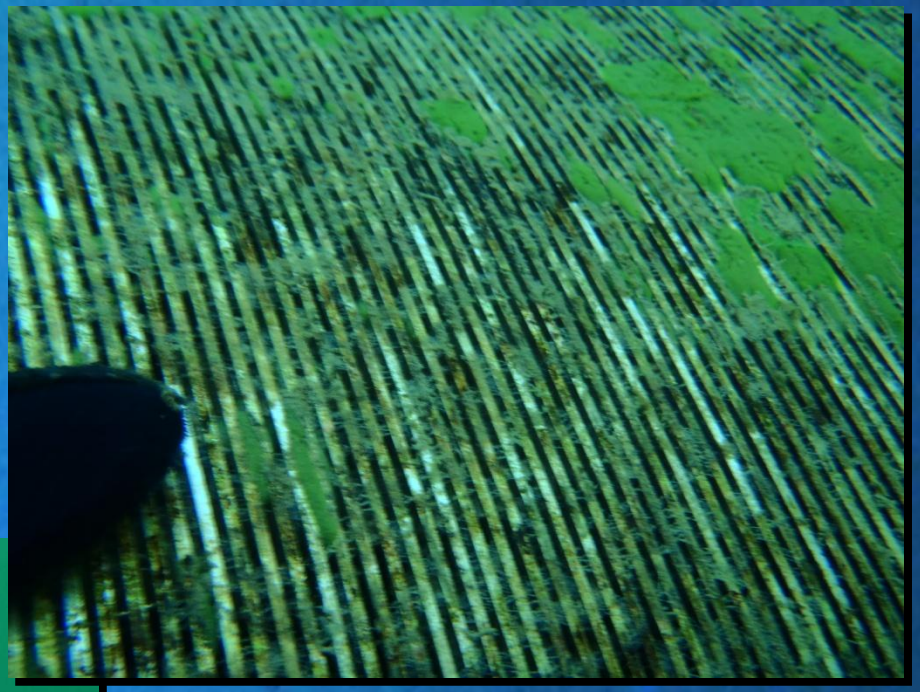




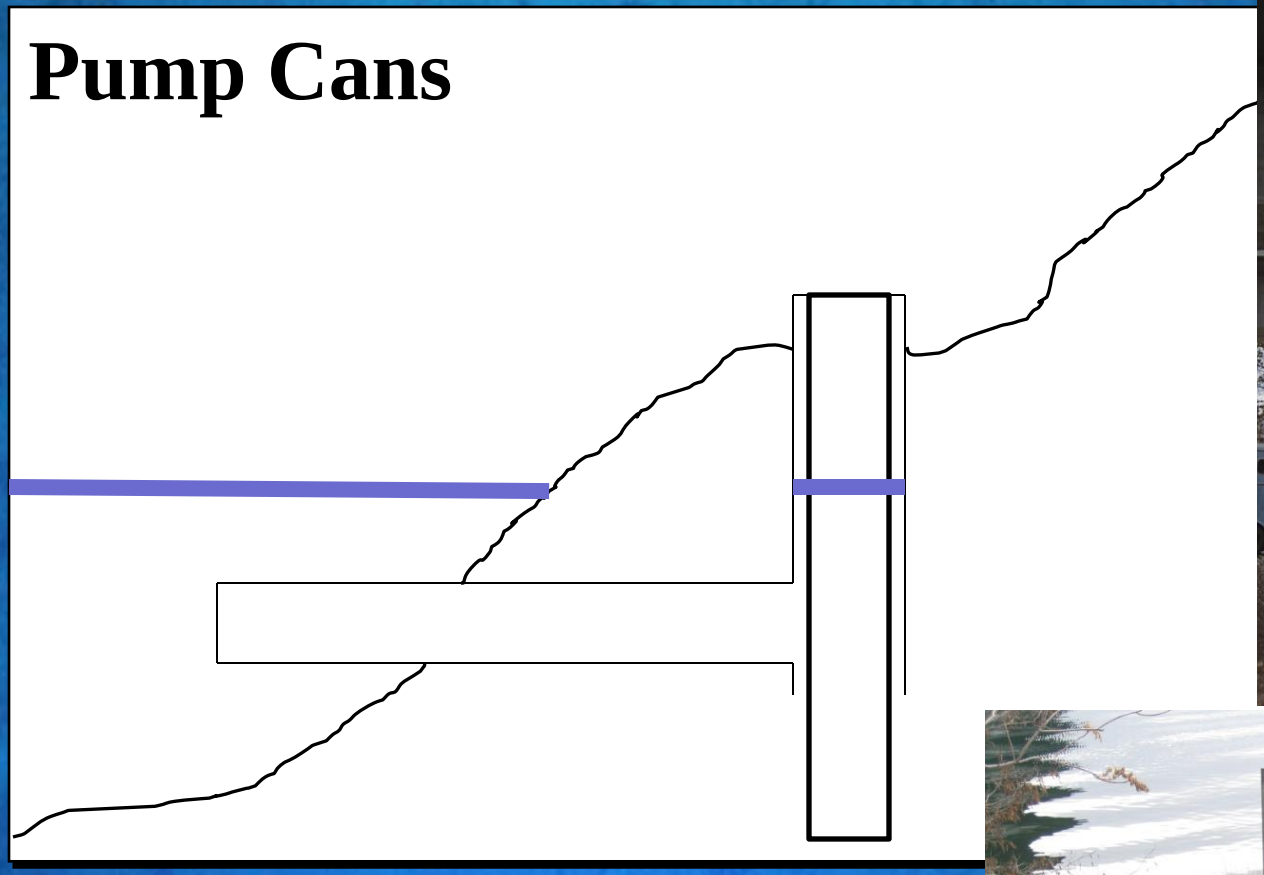
Patch Floor

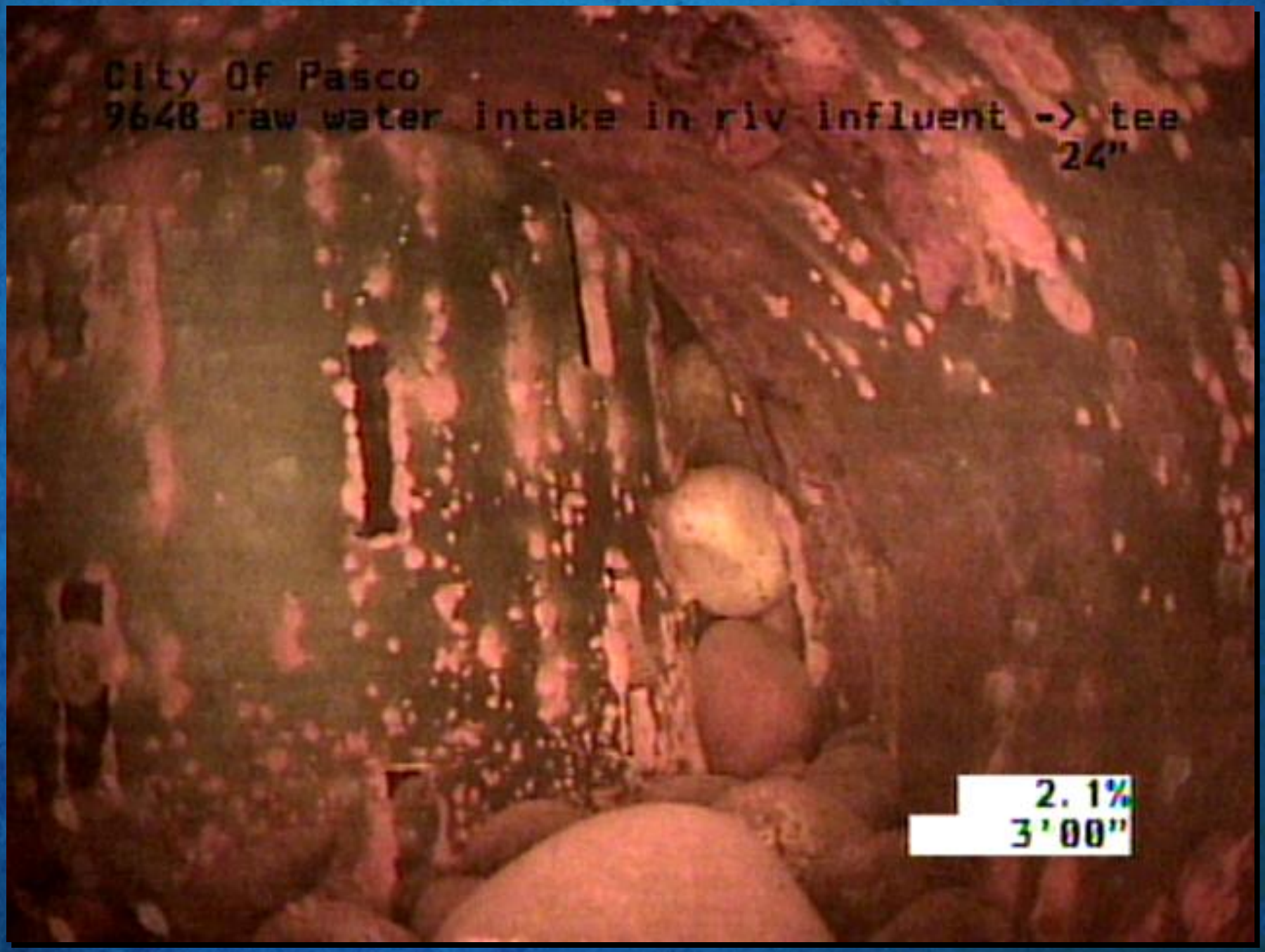
Sand In Influent Line

River Inlet Screens

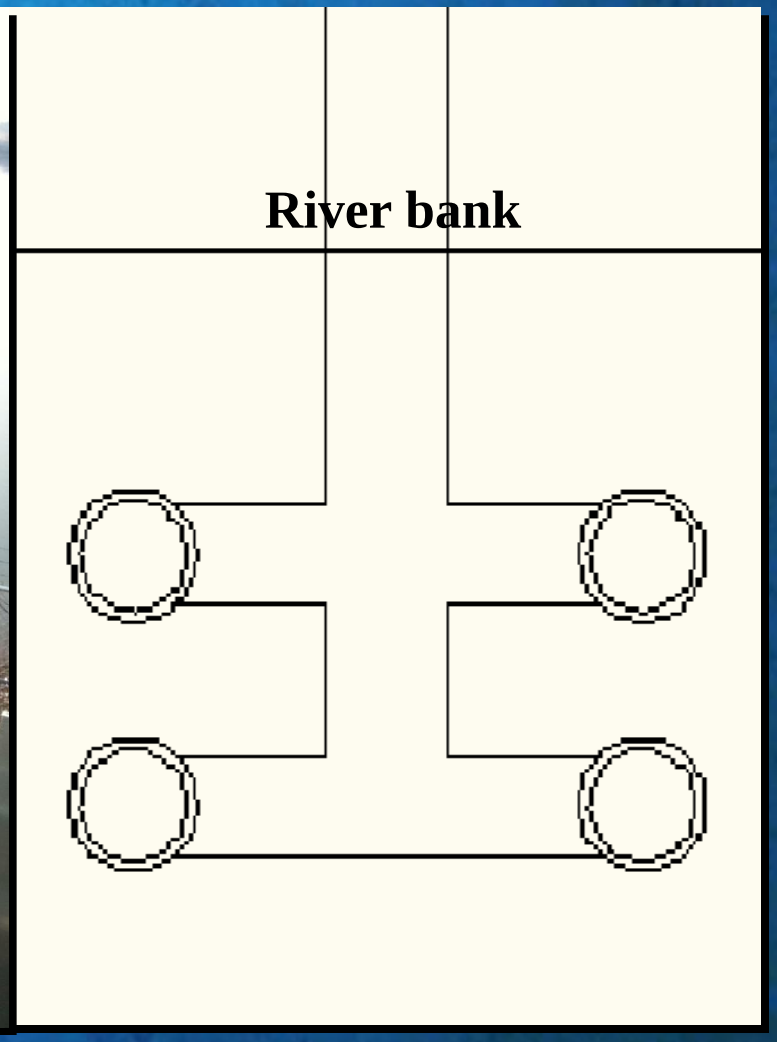


Pump Cans




City Of Pasco
9648 raw water intake in riv influent -> tee
24"
2.1%
3'00"

Pulled Pumps and Rebuilt Cut Holes In Pipe



HVAC

Lessons Learned

1. Do a good review of all drawings before construction begins.
2. Have a qualified third party do the inspection.
3. Do a thorough inspection of critical areas.
4. Require that all instrumentation and control integrators are certified in the software that you are using.
5. Recommendation from the operators “Don’t Skimp On Floor Drains” you never have too many.
6. Listen to the plant operator’s concerns and ideas.
7. Keep all regulatory agencies informed through the design and construction process.
8. By trying to complete things fast, you don’t always save time and money

Training Room

QUESTIONS ?