



Restoring Deer Creek WTP Performance

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PNWS-AWWA Conference



Agenda

- 01** Project Background
- 02** Plant Challenges
- 03** Investigation
- 04** Current Performance

Acknowledgements

Olympic View Water and Sewer District

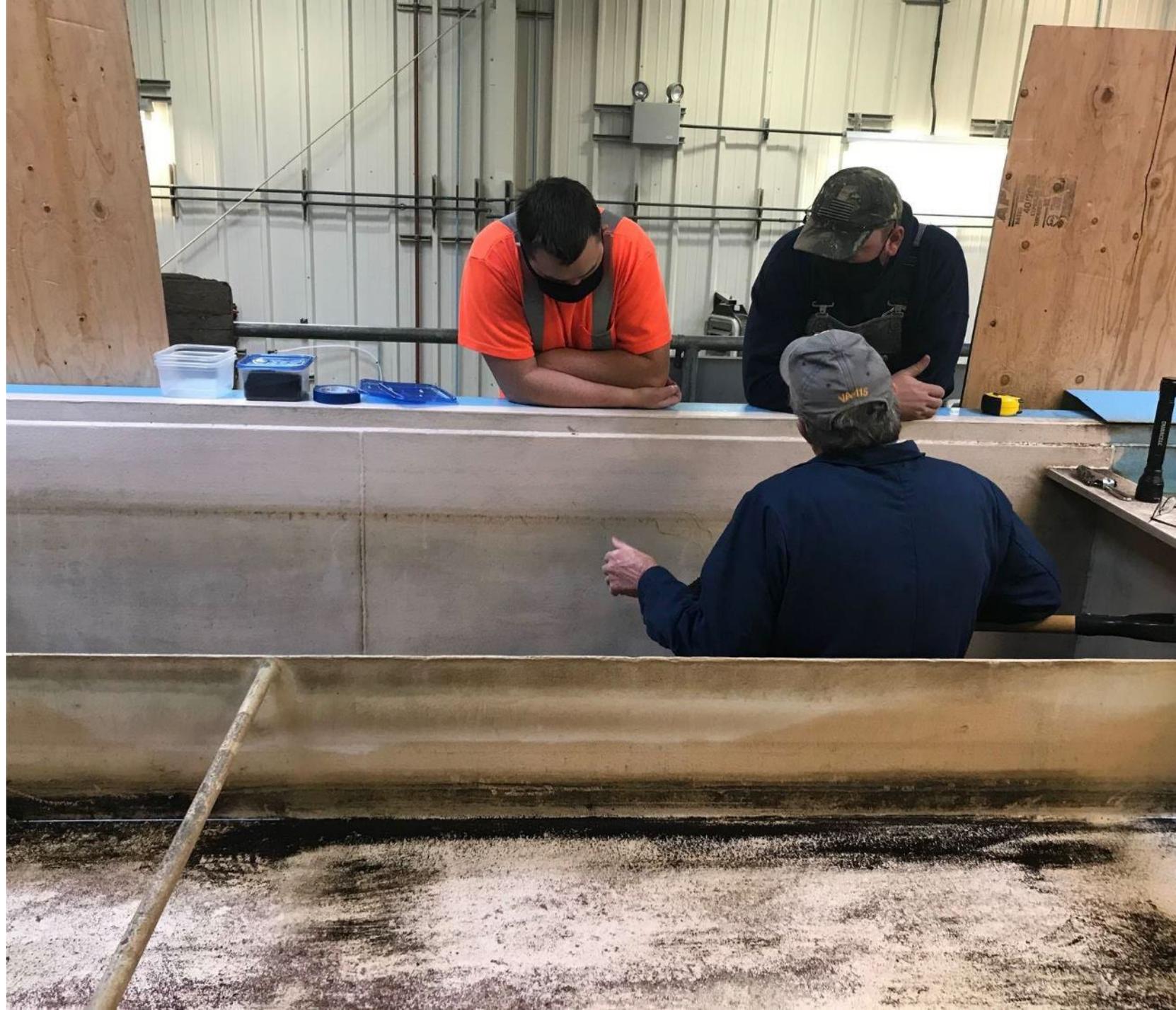


- Scott Dunn
- Marty Henninger
- Jay Prosser
- Chris Scott
- Cody Gray (former)

HDR



- Beth Mende
- John Koch
- Ed Griffenberg
- Katie Walker
- Aparna Garg





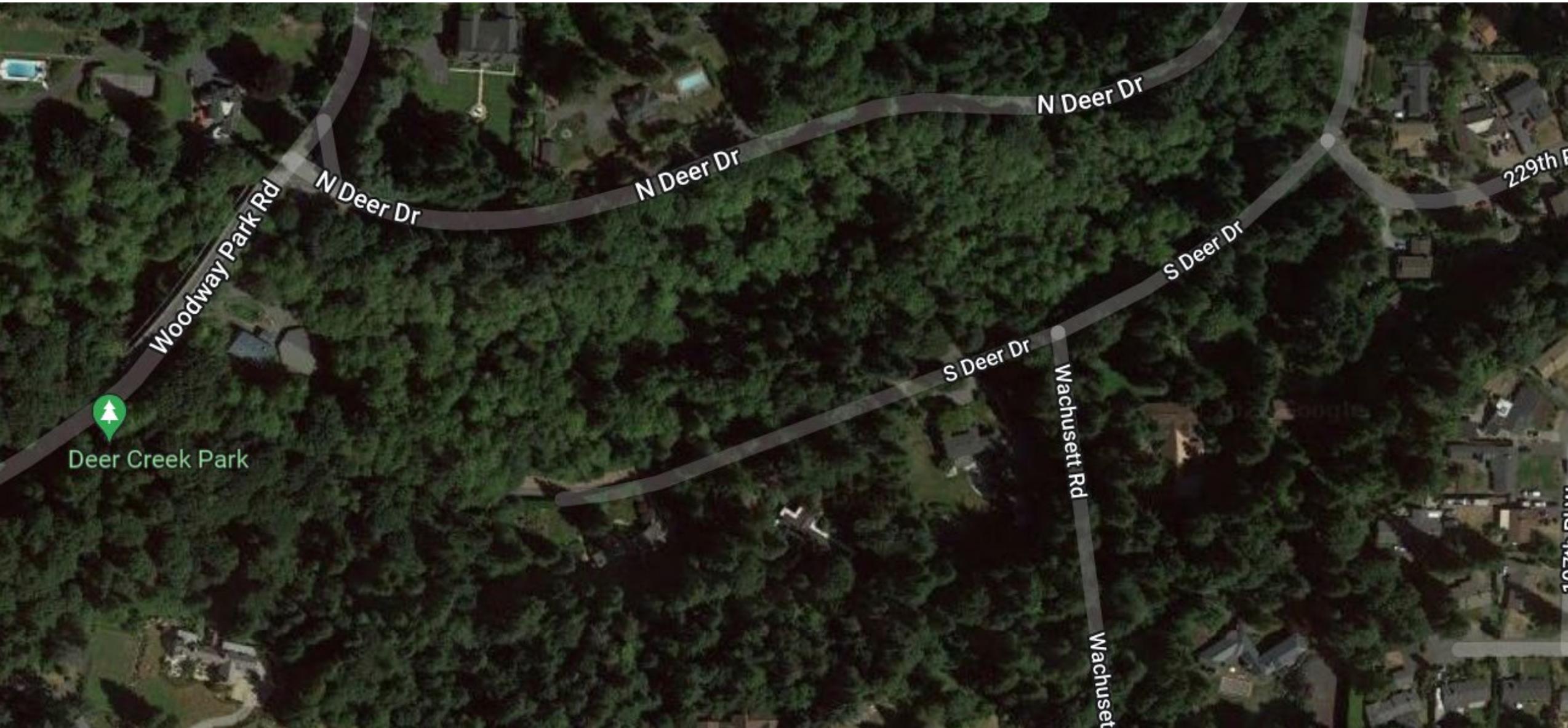
Project Background



Olympic View WSD

- Serves Edmonds, Woodway, and Southeast Snohomish County
- Deer Creek WTP used to meet base demand
- Supplemental water purchased from Seattle Public Utilities

Deer Creek Springs Watershed

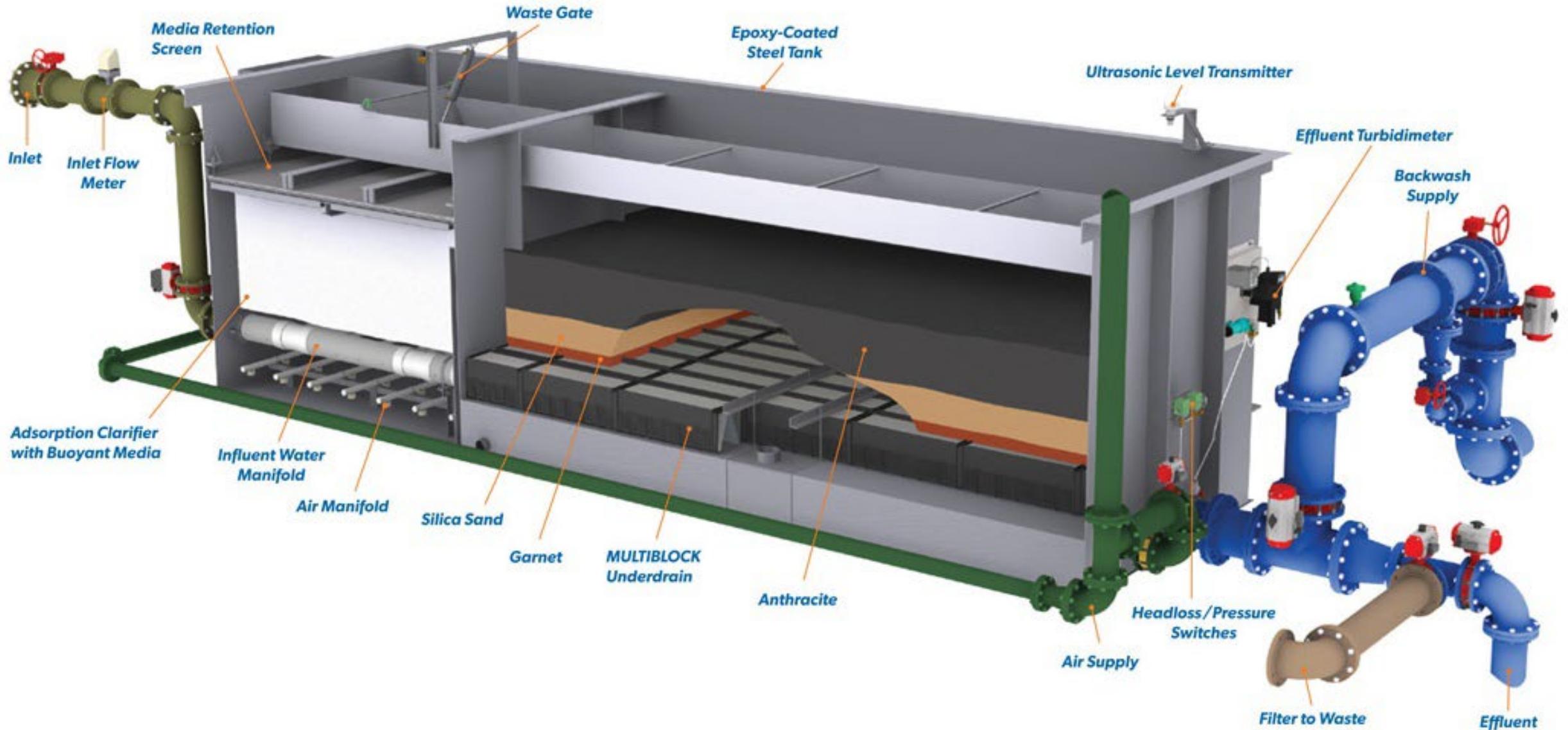


Deer Creek WTP

- Built 1998, renovated 2018
- 650,000 gpd
- Spring source affected by storms
 - Turbidity: 10 NTU to >100
 - Color: 4-5 to >50
- Trident Microfloc system
 - Alum
 - Coagulant and filter aid polymers
 - Phosphoric acid – corrosion control
 - Sodium fluoride – blend with SPU
 - Sodium hypochlorite



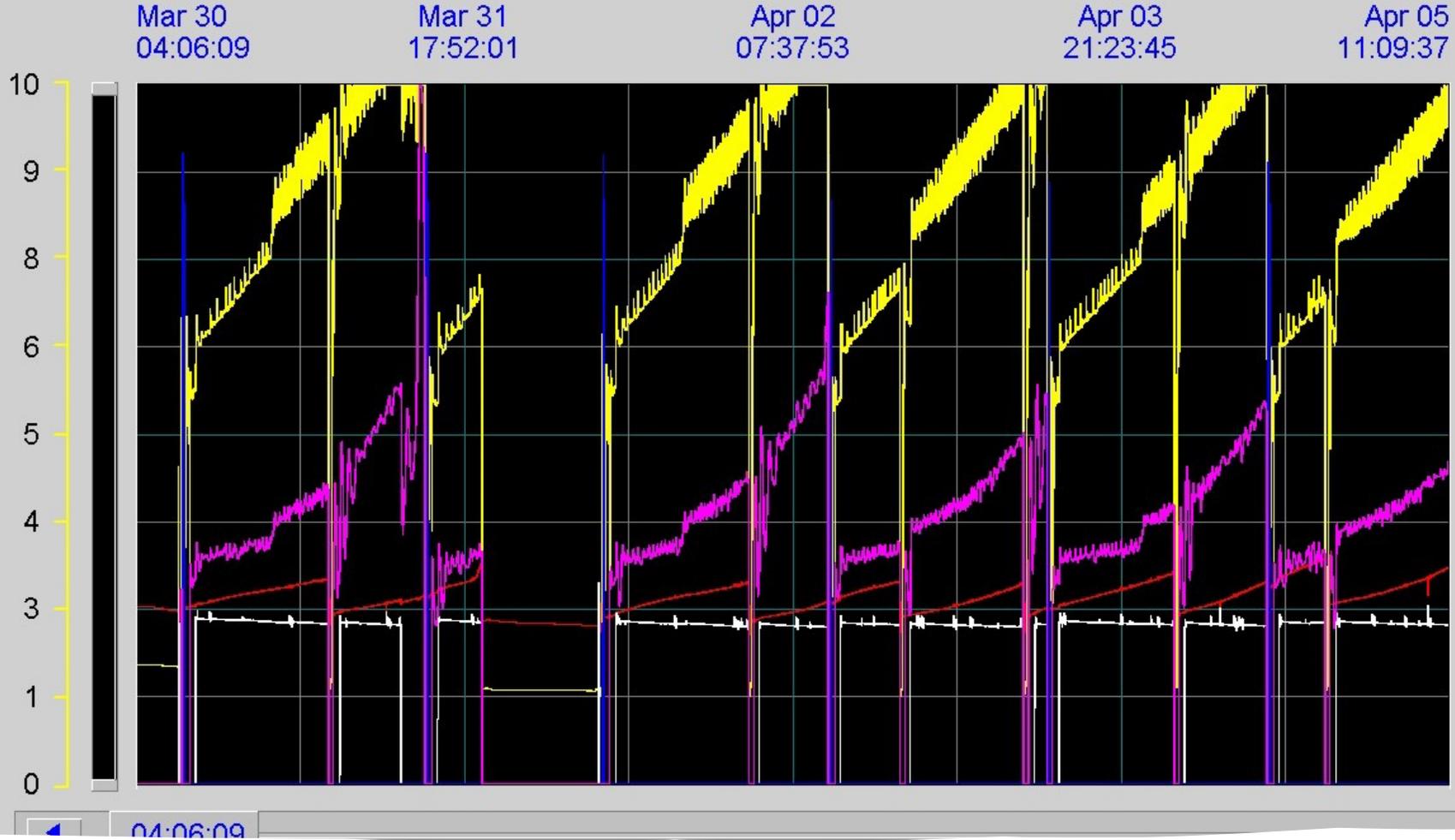
Trident Microfloc – Package System in Steel Tank



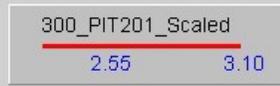
9-Month WTP Support

- Optimize physical operations
 - Performance monitoring
 - Troubleshooting
- Optimize staff operations
 - New training programs
 - Update SOPs
 - New recordkeeping procedures
 - New emergency response plans
 - Refresh maintenance program
 - New budgeting procedure

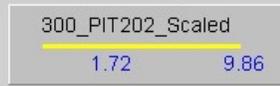




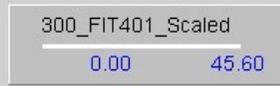
Clarifier Pressure (Headloss)



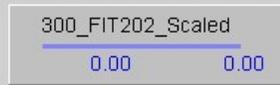
Filter Pressure (Headloss)



Backwash Recycle Flow



Backwash Flow Meter



FCV201 Effluent Control Valve Position Signal Scal



Plant Challenges

Filter Performance Degradation

Short Filter Run Time

- 36 – 40 hrs down to 12 – 24
- Increased backwashing

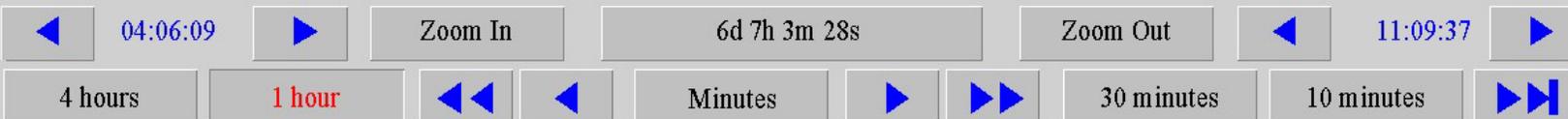
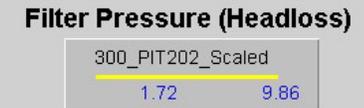
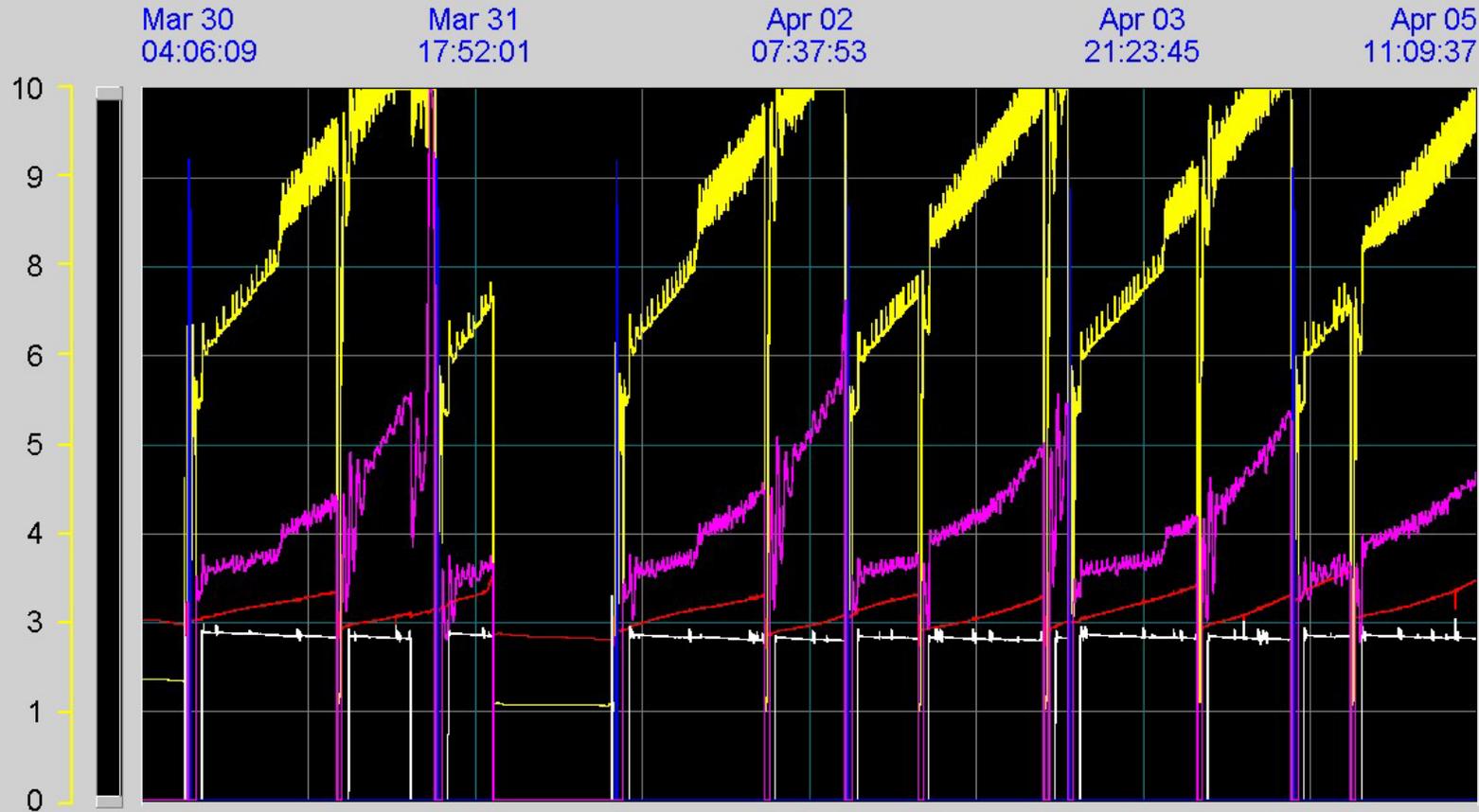
Filter Bubbling

- Air released during filter stand-by

Coagulation

- Optimize chemical dosage to reduce costs

Historian Data = An Important Tool!



Clean Bed Headloss Increased from 3 psi to 6 psi

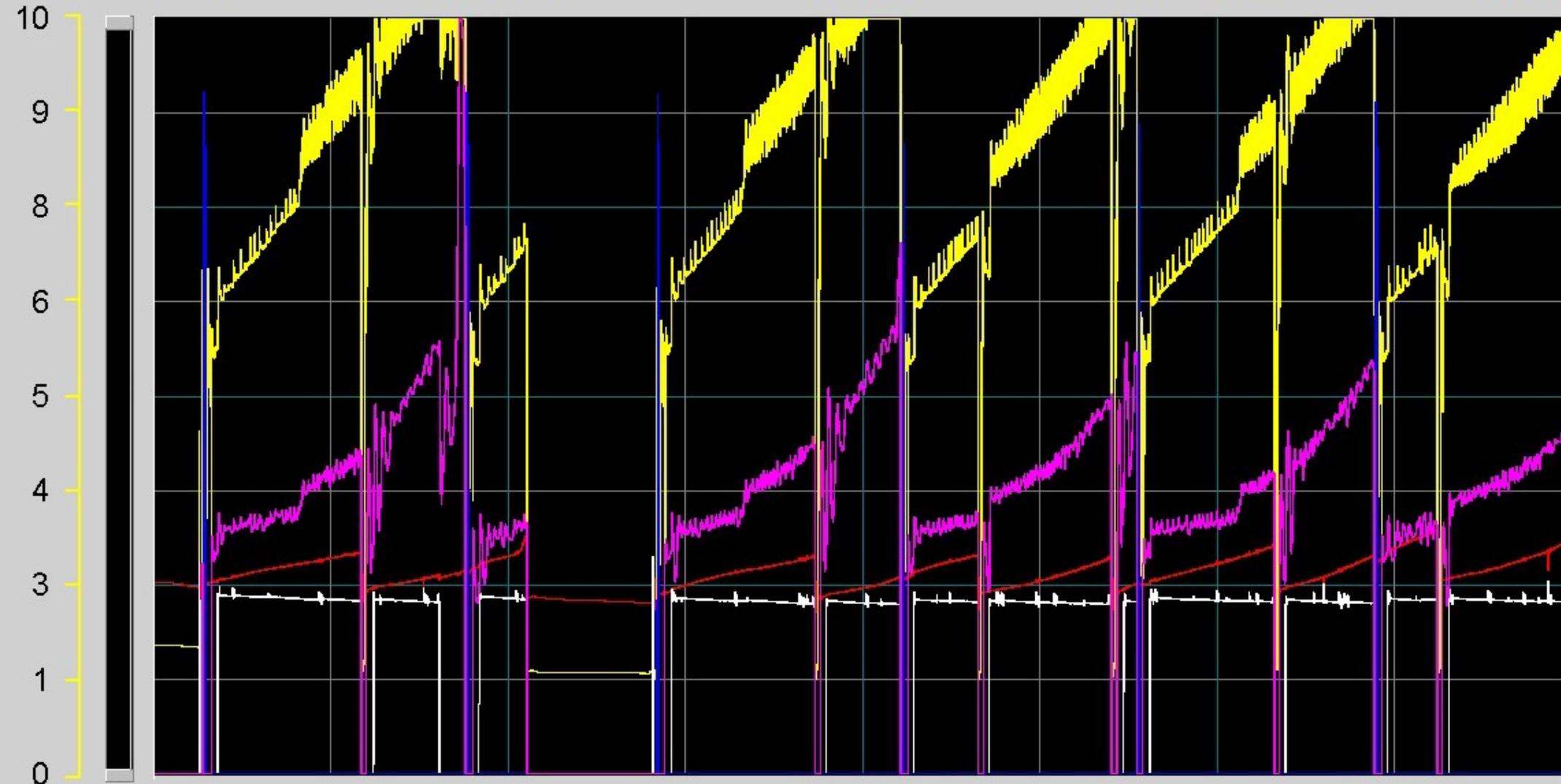
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Apr 03
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Apr 05
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Initial Low Noise

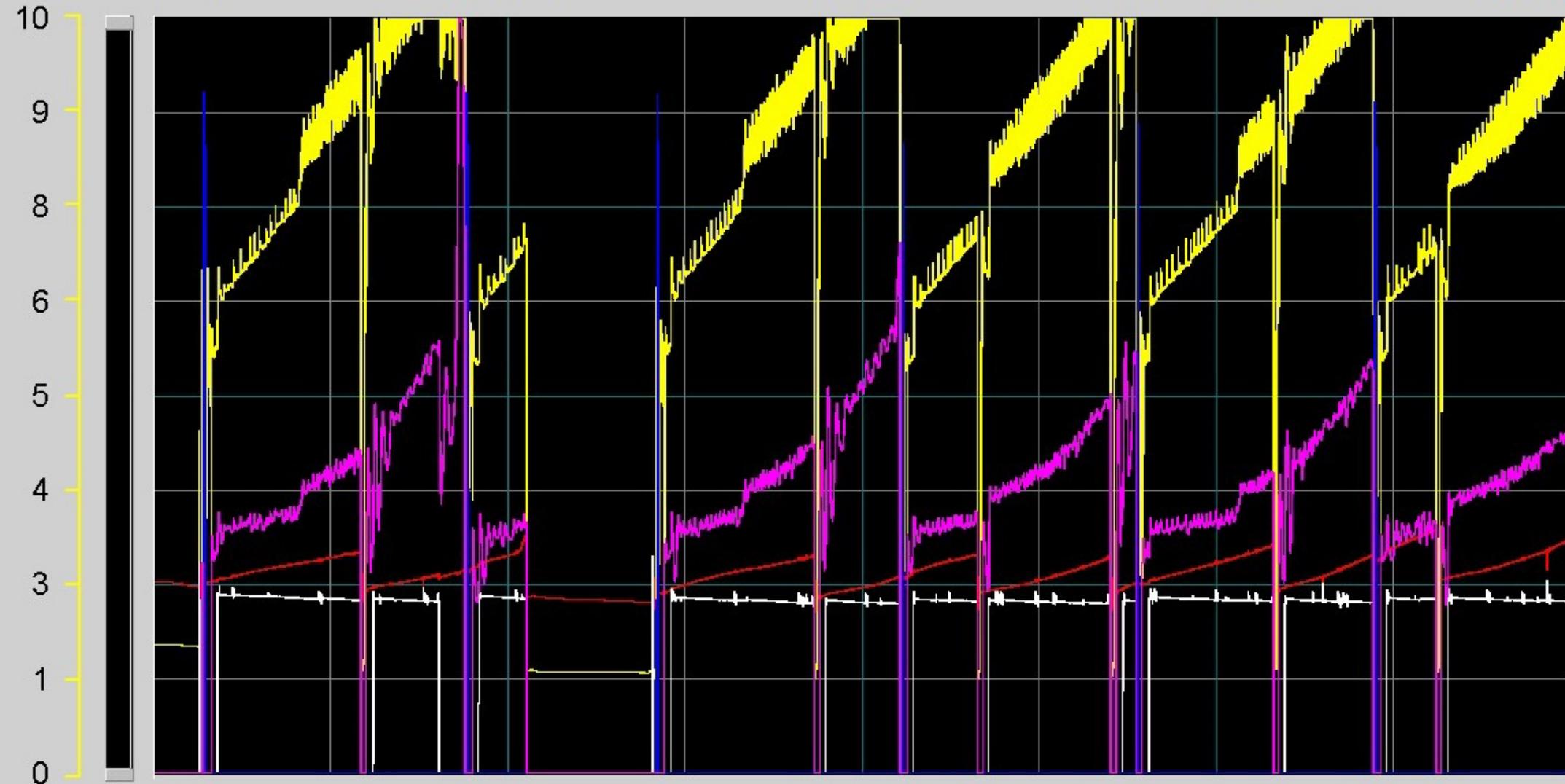
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1 psi Pressure Jump Right at ~6 hours

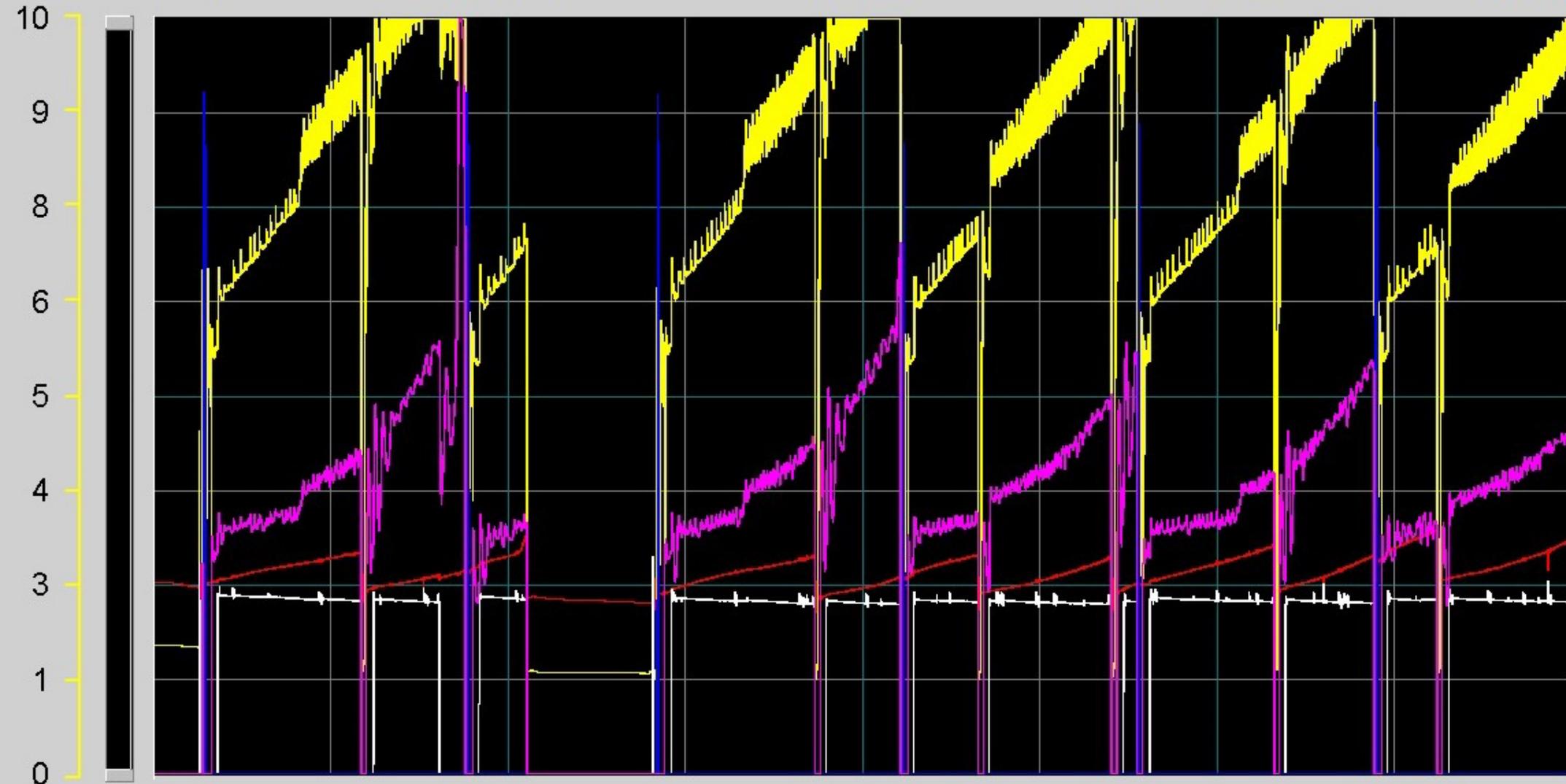
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High Signal Noise

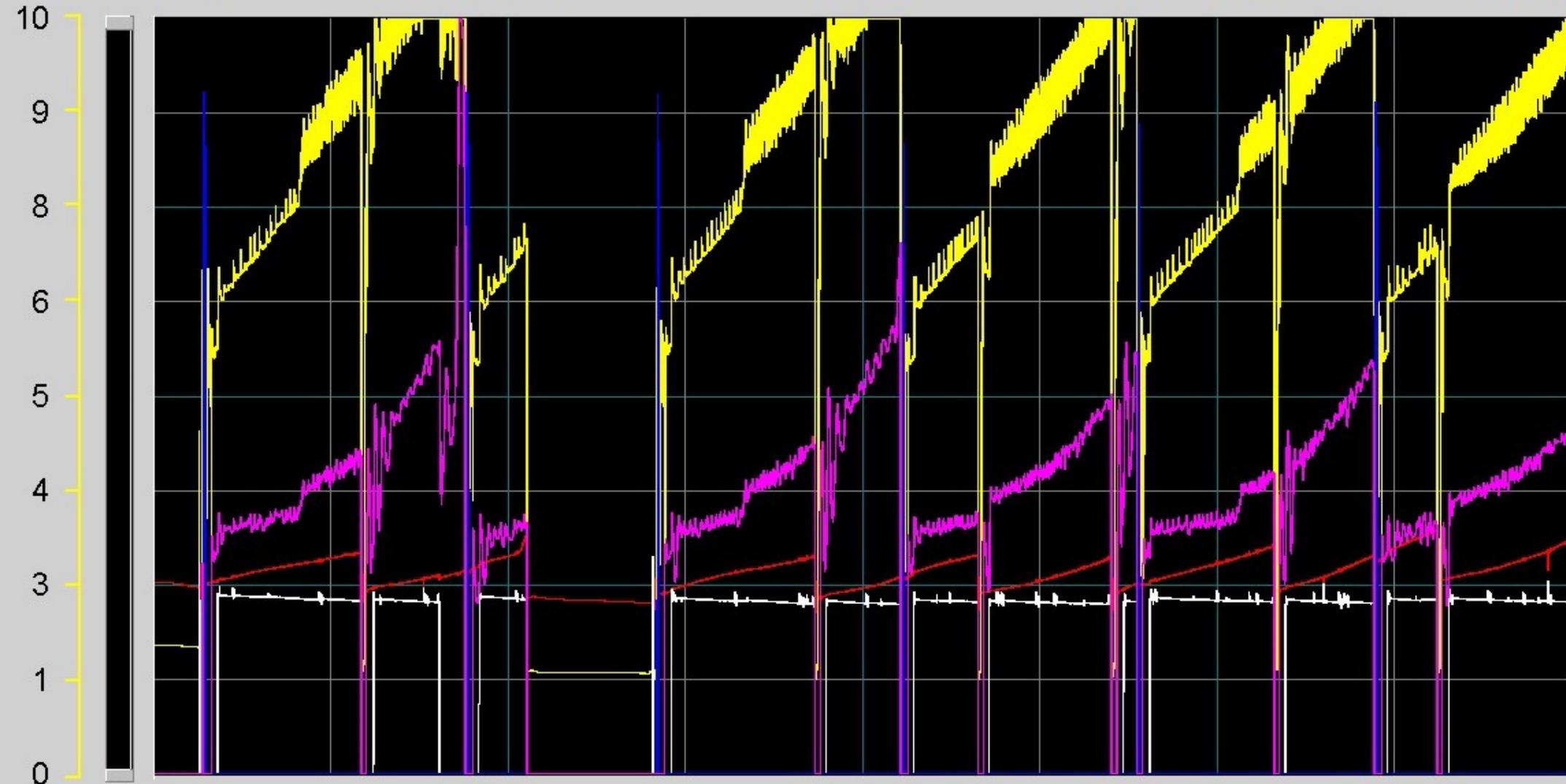
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Hit 10 psi Terminal Headloss Too Soon

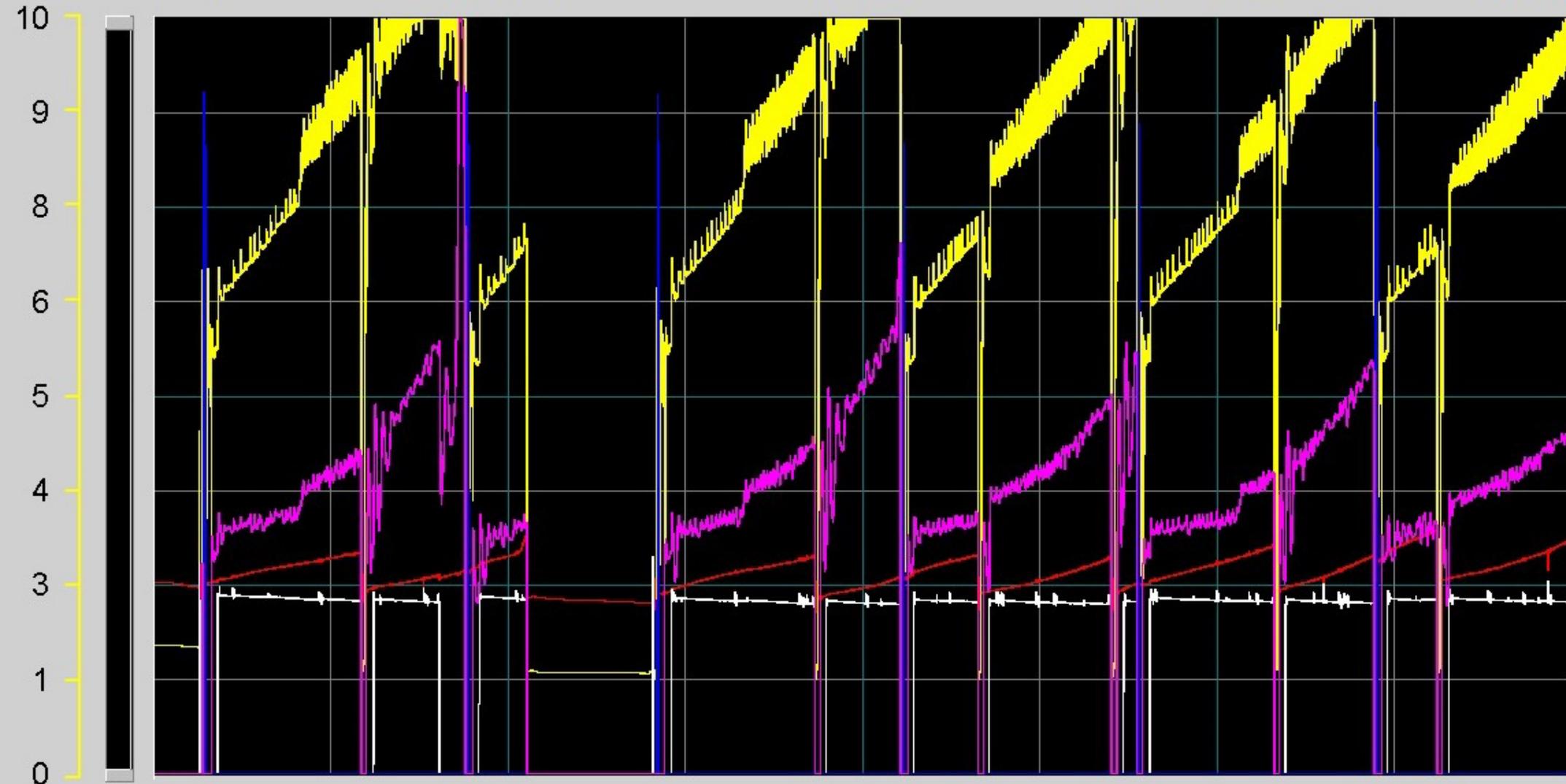
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Bubbly Filter

- Bubbles coming up from filter bed
- During entire filter run
- All across filter bed
- Worse when filter was resting





Performance Investigation

Operational Support

- Filter investigation
 - Changed filter setpoints
 - Media investigation
 - Leak testing
 - Pulled and verified every single instrument
- Jar testing for chemical optimization



Filter Investigation

- Filter media:
 - Anthracite
 - Silica sand
 - Garnet
- Sand and anthracite at top of filter
- Indicated that media may be intermixing
- Created headloss issues and impacting filter run times?





Excessive Polymer Usage Causing Mudballs?

- Plant polymer usage has been inconsistent and sometimes high.
- Coagulant aid polymer sometimes dosed up 1.0 mg/L

Free Chlorine Soak

- Added 8 gallons of 12.5% sodium hypochlorite directly to filter.
- Used blower to mix hypochlorite throughout bed.
- 24-hour soak, more chlorine when residual <0.5 mg/L.
- Backwashed at the end.
- Mudballs eliminated!



Media Investigation

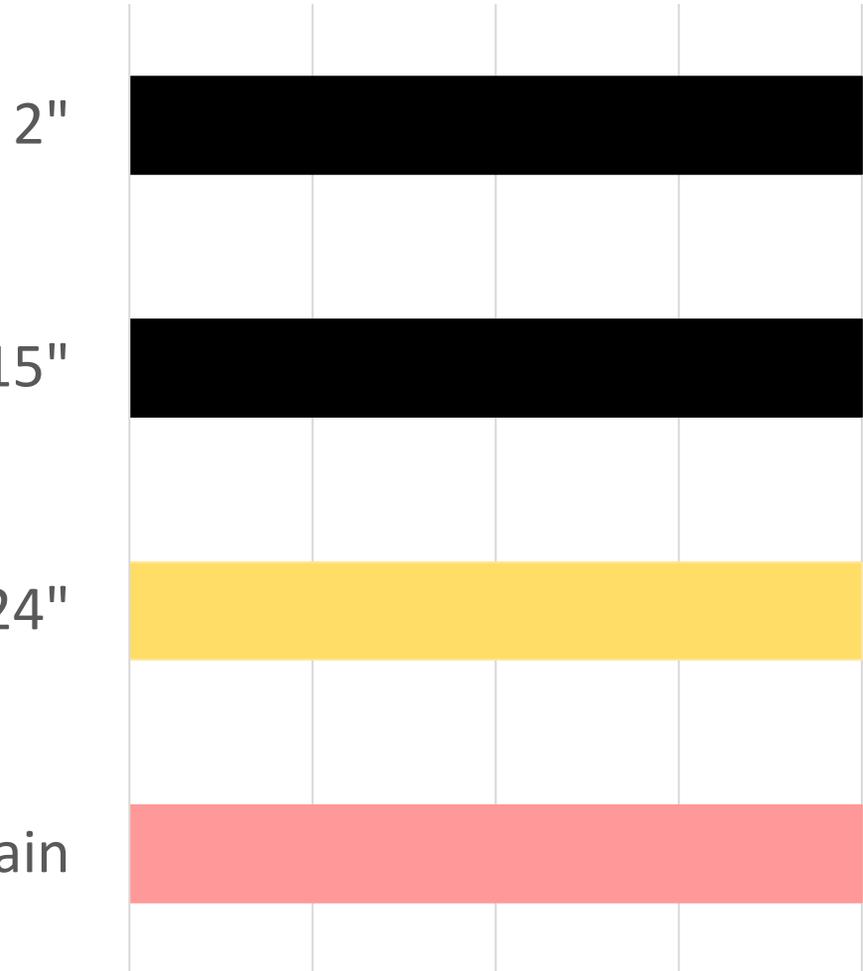
- Cored filter to get media profile
- Dug up media down to the underdrains
- Pulled samples from various depths for analysis
- Media was consistent with specifications
- Media mixing was discovered throughout entire bed





Ideal Filter Media Distribution by Depth

0% 25% 50% 75% 100%

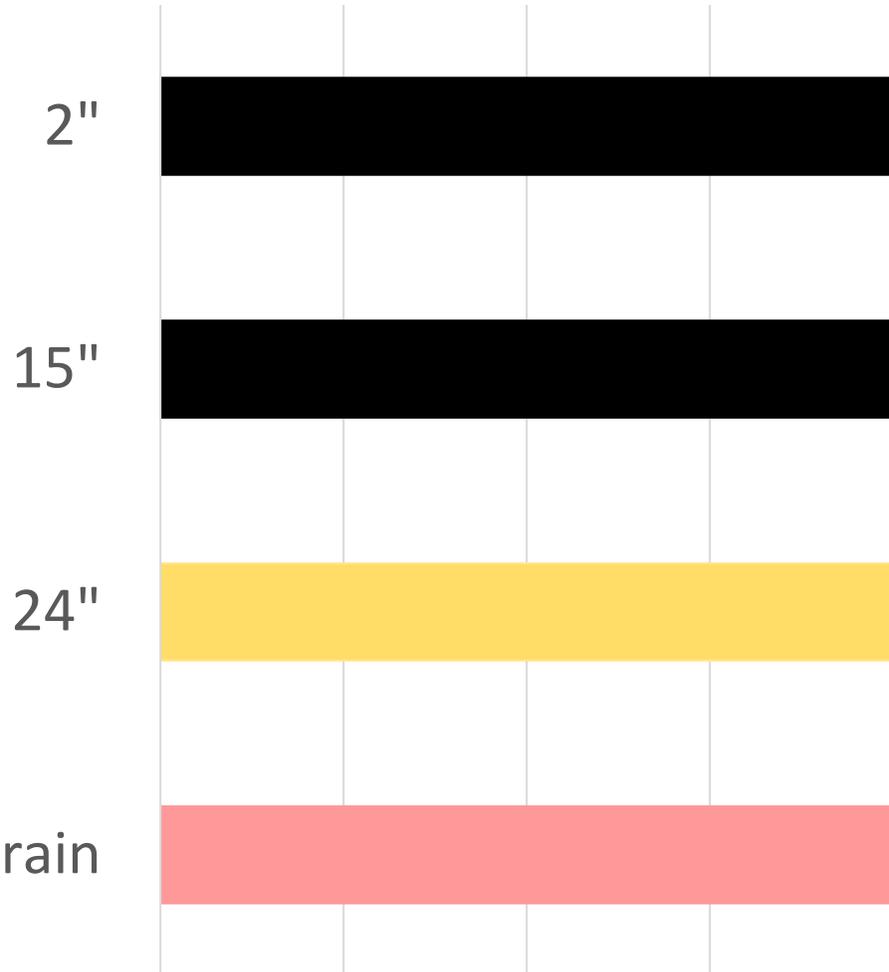


Underdrain



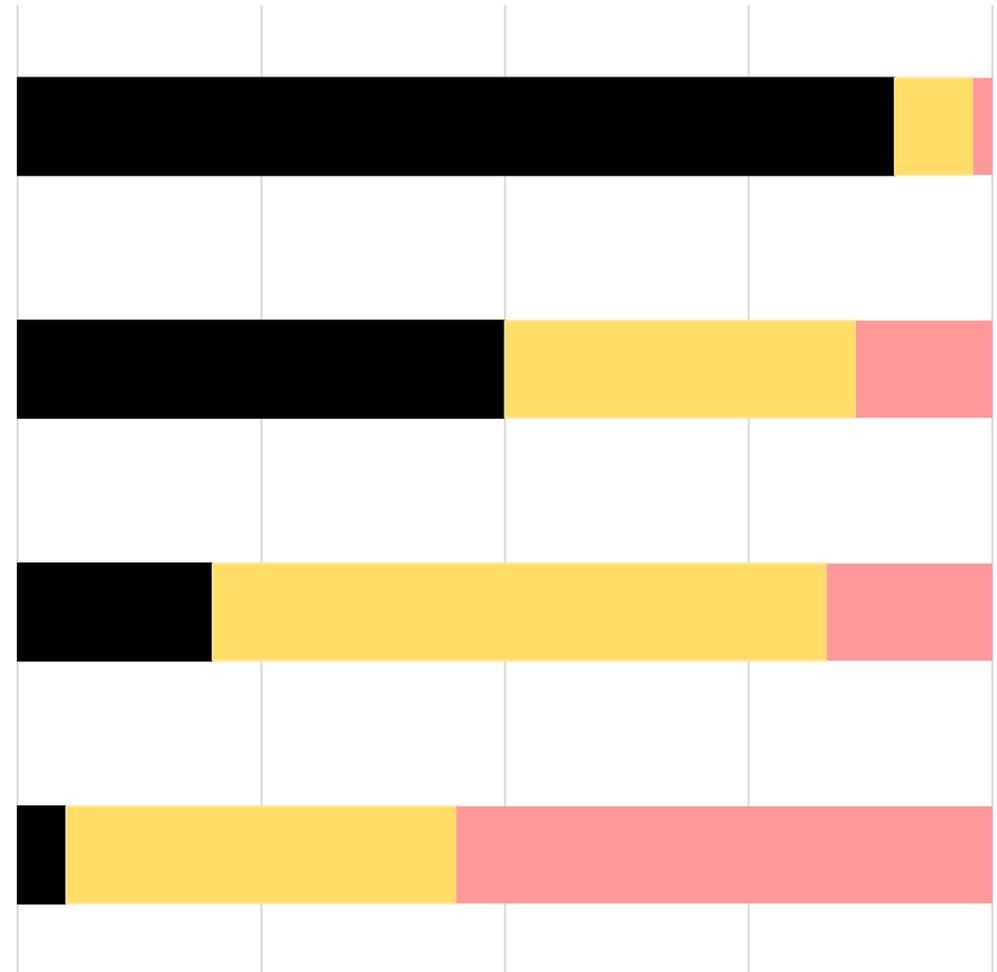
Ideal Filter Media Distribution by Depth

0% 25% 50% 75% 100%



Estimated Media Distribution by Depth

0% 25% 50% 75% 100%

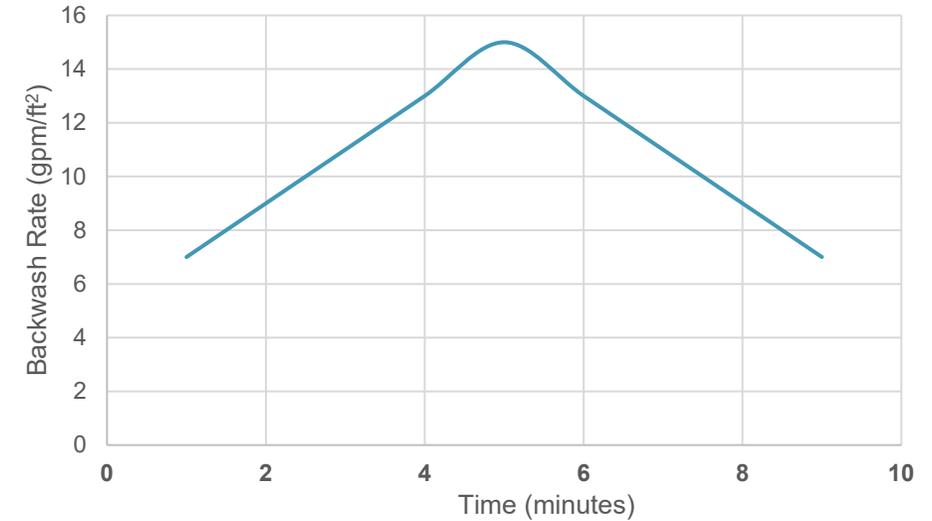




S.E.
Before

Media Restratification

- Backwashing rate overshoots backwashing setpoint
- Could cause media to mix and 'boil'
- Restratify media using an extended backwash
- Media was successfully restratified
- Added 4 – 6 hours to filter run times.
- Still not back to normal.



Plant Instruments?

- Tested every level element
- Found **both** level elements were off.
- Feedwater level sensor had faulty transmitter and had to be replaced
- Backwash sensor needed to be re-scaled

- Clean bed headloss dropped from 6 psi to 4 psi.



Filter Bubbling

- Smoke tested entire backwash air system
- Removed and inspected air check valves
- Plant smelled like incense for days
- Couldn't find a leak



Found the Source!

- Air release valve on backwash waste line
- Meant to purge air with line is filled with backwash
- Wasn't seating and sucking air into pipe during filtration
- Air slowly built up in underdrains



High Signal Noise

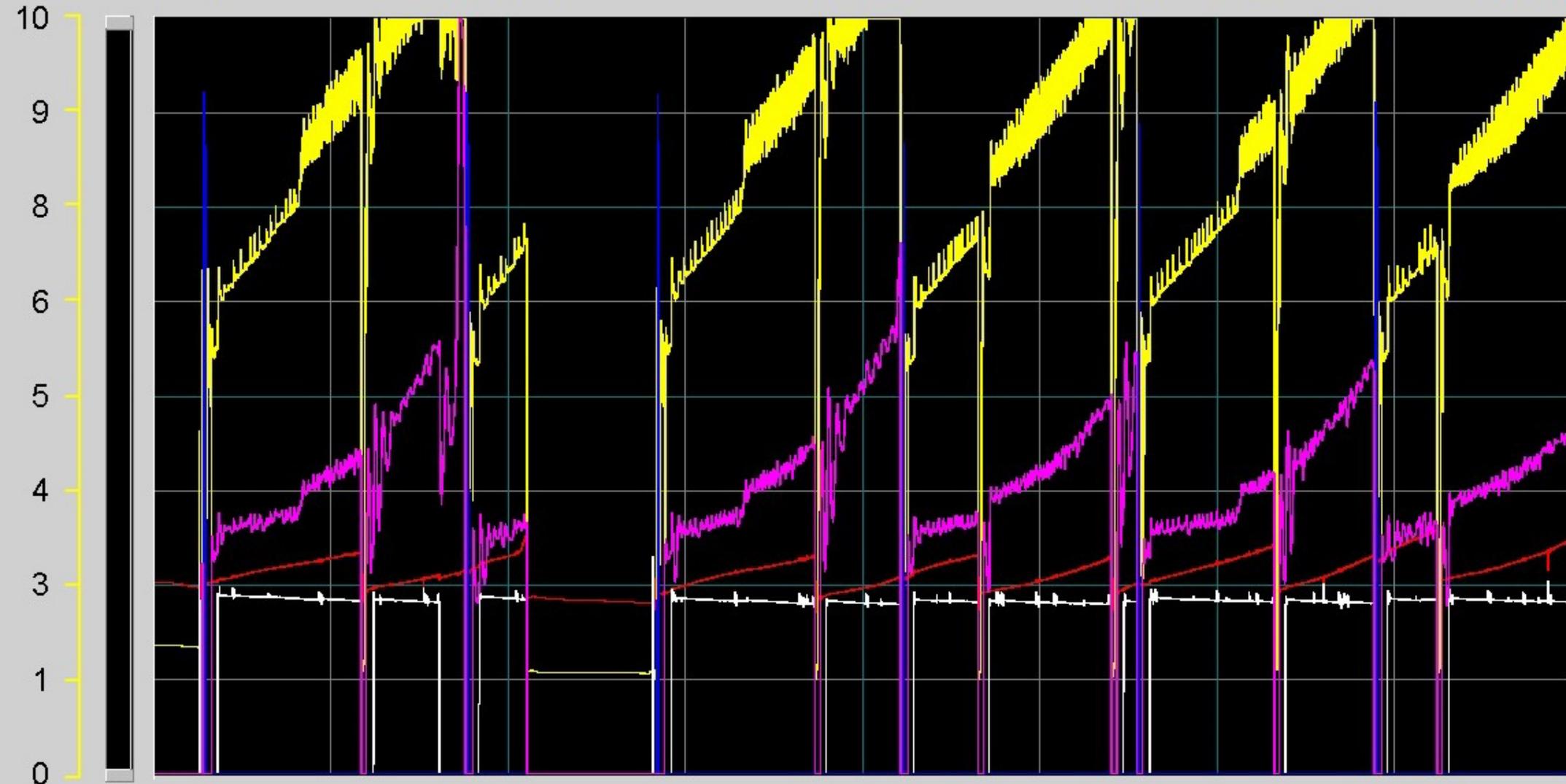
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Filter Issues

- Mudballs
- Destratified filter bed
- Bad sensors
- Leaking air valve

- 30+ hour filter run times
- Never got back to 3 psi clean filter bed headloss
- Damaged underdrains?



Jar Testing

- Primary goal
 - Educate new plant staff on coagulant chemistry
- Secondary goals
 - Lengthen filter run times
 - Minimize the amount of backwash waste generated
 - Reduce chemical costs





Teamwork + Knowledge = High Performance Staff



Current Operations

How is the District/WTP Doing Today?

Current:

- Happier, more educated staff
- Filter run times are back to 36 hours
- Backwash waste down 80%
- Faster, better responses in WQ changes

Next Steps

- No change in treatment systems
- More money in training / less in re-engineering
- Replace underdrains later this year



Restoring Deer Creek WTP Performance

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