



April 12th 2022

There's some Good in this Data, and its worth Fighting For

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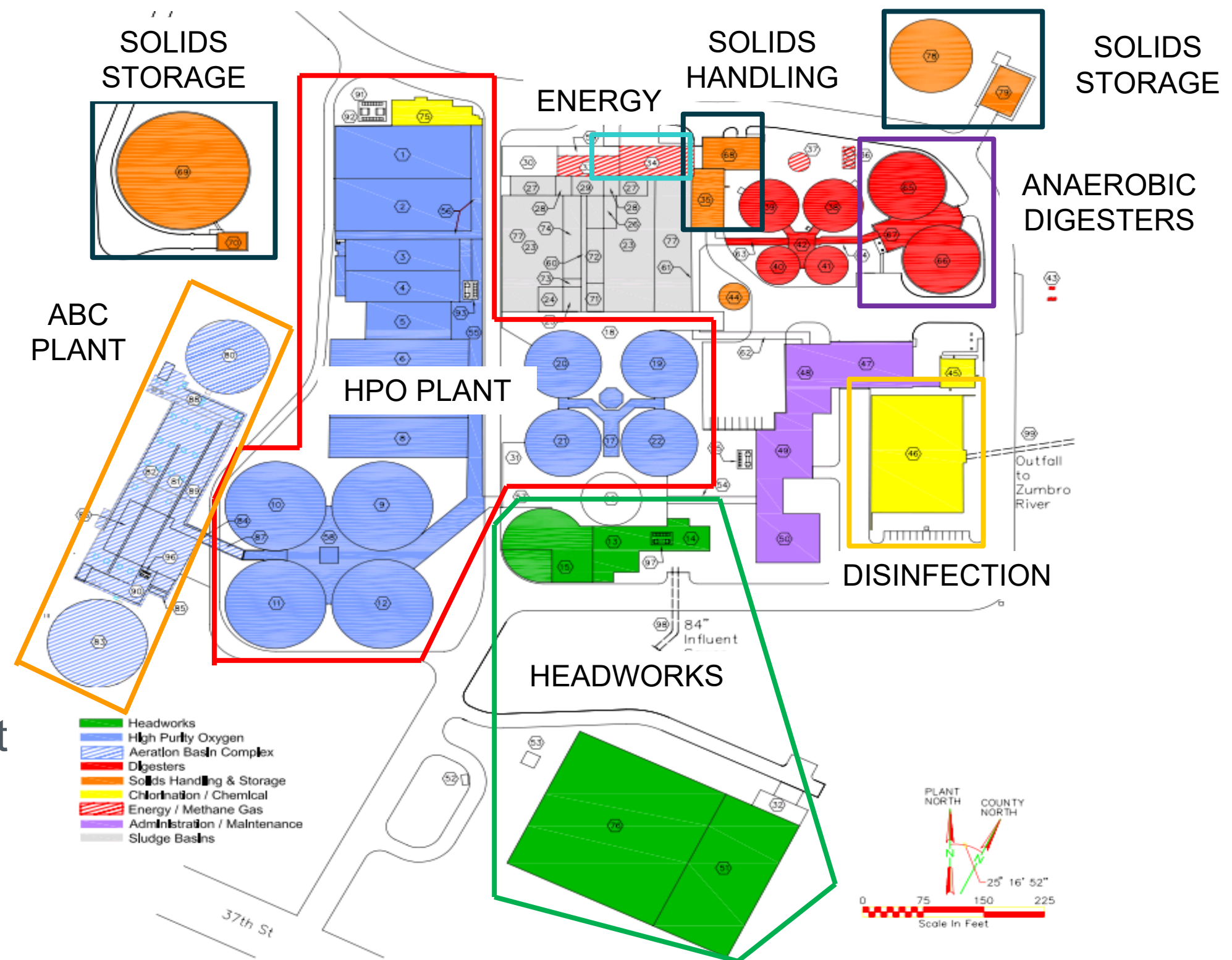
Presentation Overview

- Management of Data at WRP
- Rochester WRP Philosophy on Data
- Data Case Study 1 – Odor Study
- Data Case Study 2 – Primary Sludge and Cothickening
- Data Case Study 3 – inDense Pilot and Settling



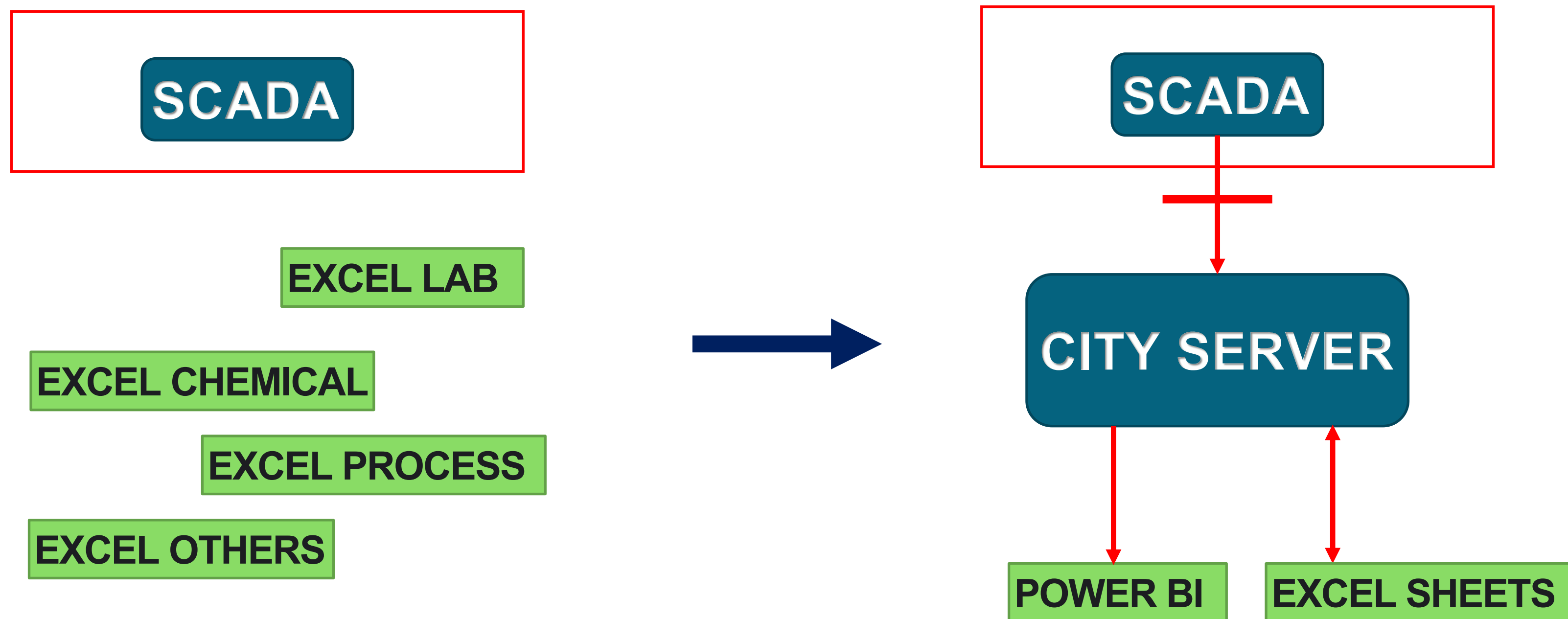
Rochester WRP Overview

- 13 MGD
- 2 Plants on site
- 3 WAS Sludge's
- Cryogenic Air Plant
- Cogeneration
- 4 temperature loops
- Anaerobic digestion
- Thickening
- Numerous tunnels/ventilation
- 7 odor scrubbers
- 500+ motorized pieces of equipment
- 2000+ monitoring tags
- Dedicated lab
- Pretreatment Program
- FOG Program



Practical Aspects to Data Management

1. 2013 – SCADA plus numerous spreadsheets
2. Expanded database – GE Historian
3. Access to information – Spreadsheets and Power BI



Power BI



Case Study 3 – inDense Pilot

- WRP Philosophy behind data collection
 - Data takes time and resources to collect/store/evaluate
1. Is technology/science well understood
 - What is the risk of failure
 - Minimal data collection for monitoring
 2. Are you trying to understand a phenomenon/new technology
 - Collect as much data as practical/financially feasible

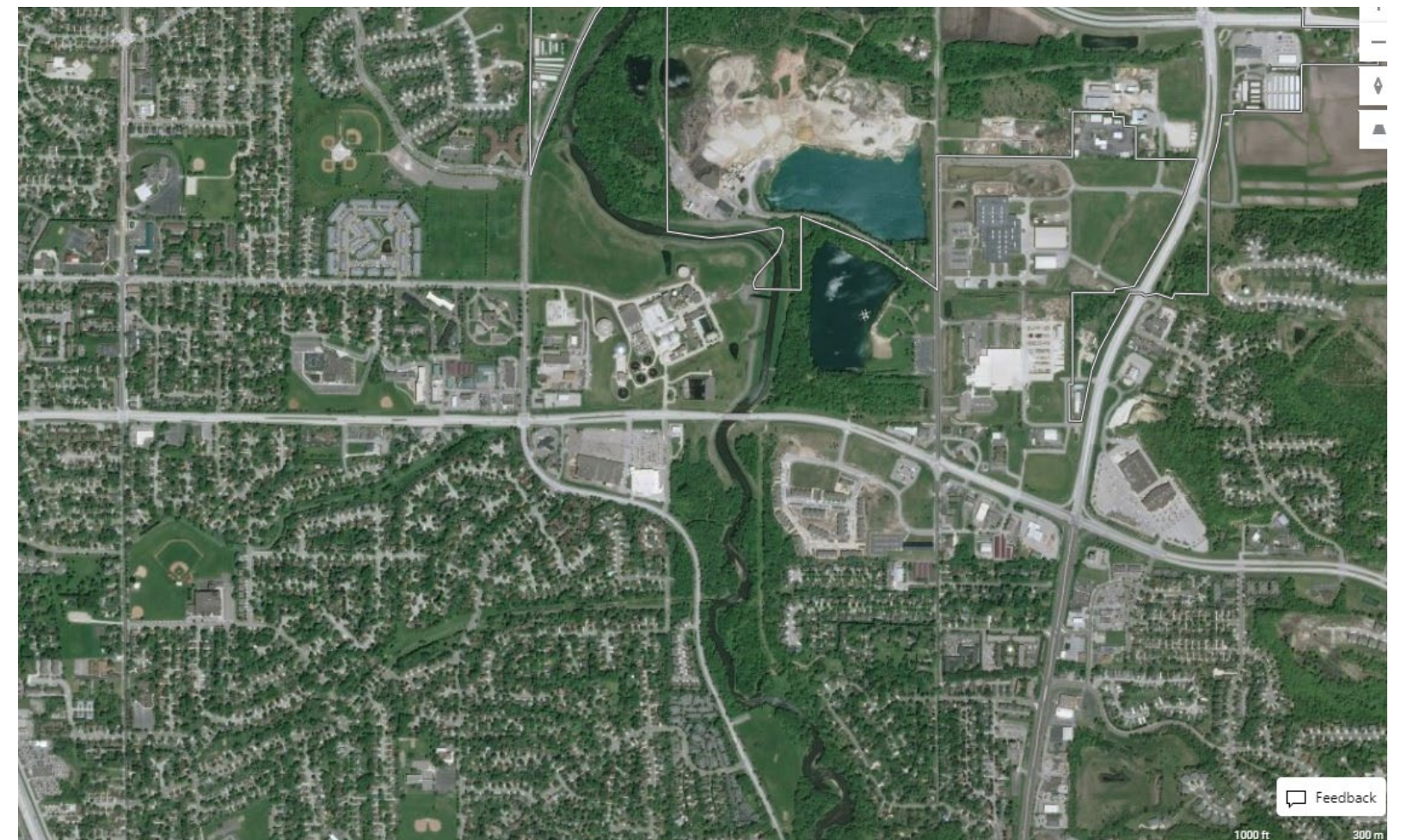


Case Study 1 – Odor Study

Issue – Odor near administration
early in the morning

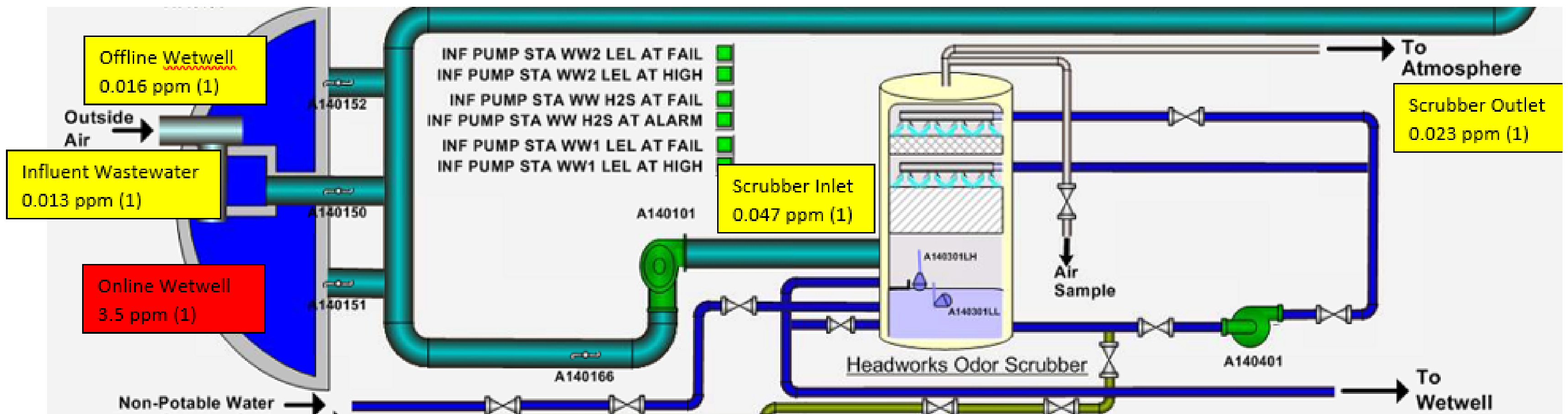
Concerned – being good
neighbors

Numerous Opinions based on
individuals – smoke testing



Case Study 1 – Odor Study

- In preparation of Project, performed odor testing (intern did work)
- Grab Samples indicated some H₂S in influent H₂S but the scrubber was showing good removal



Case Study 1 – Odor Study

- Due to limited samples and high flows, a second round sampling performed – numerous samples and continuous sampling
- First we looked at EQ

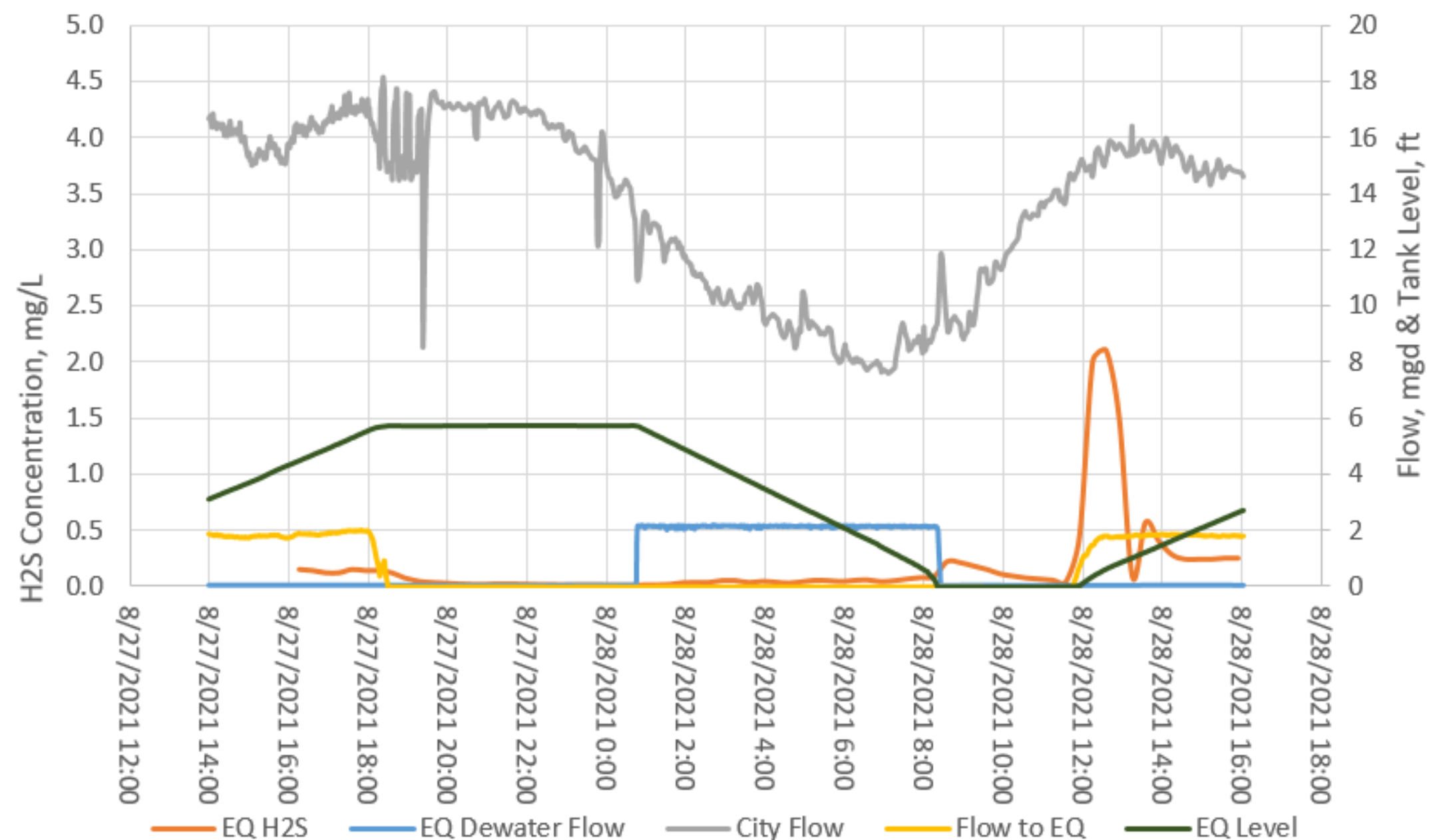


Figure 10: Flows and H2S Concentration around Equalization on August 27th and 28th 2021



Case Study 1 – Odor Study

Considered influent Wet Well

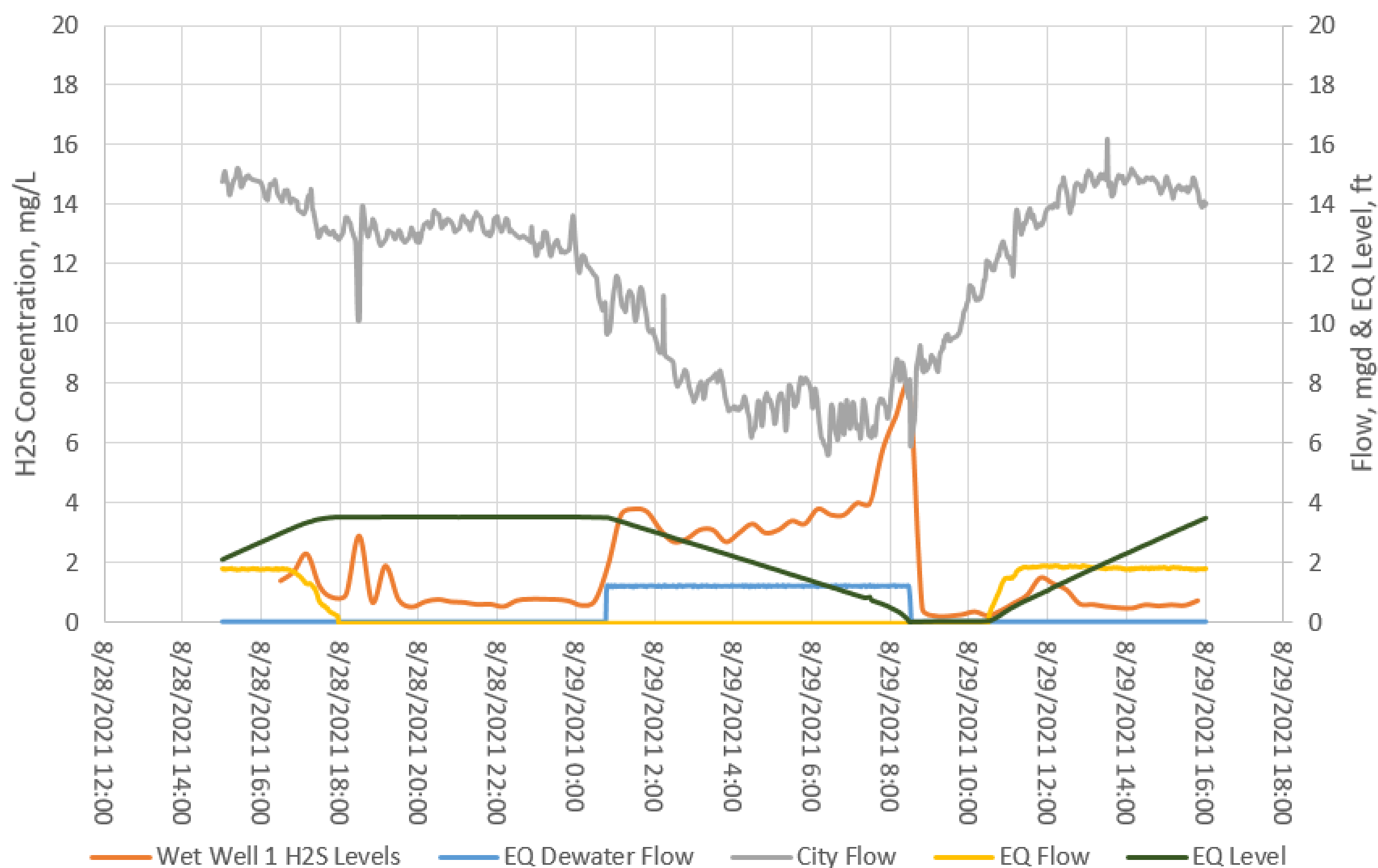
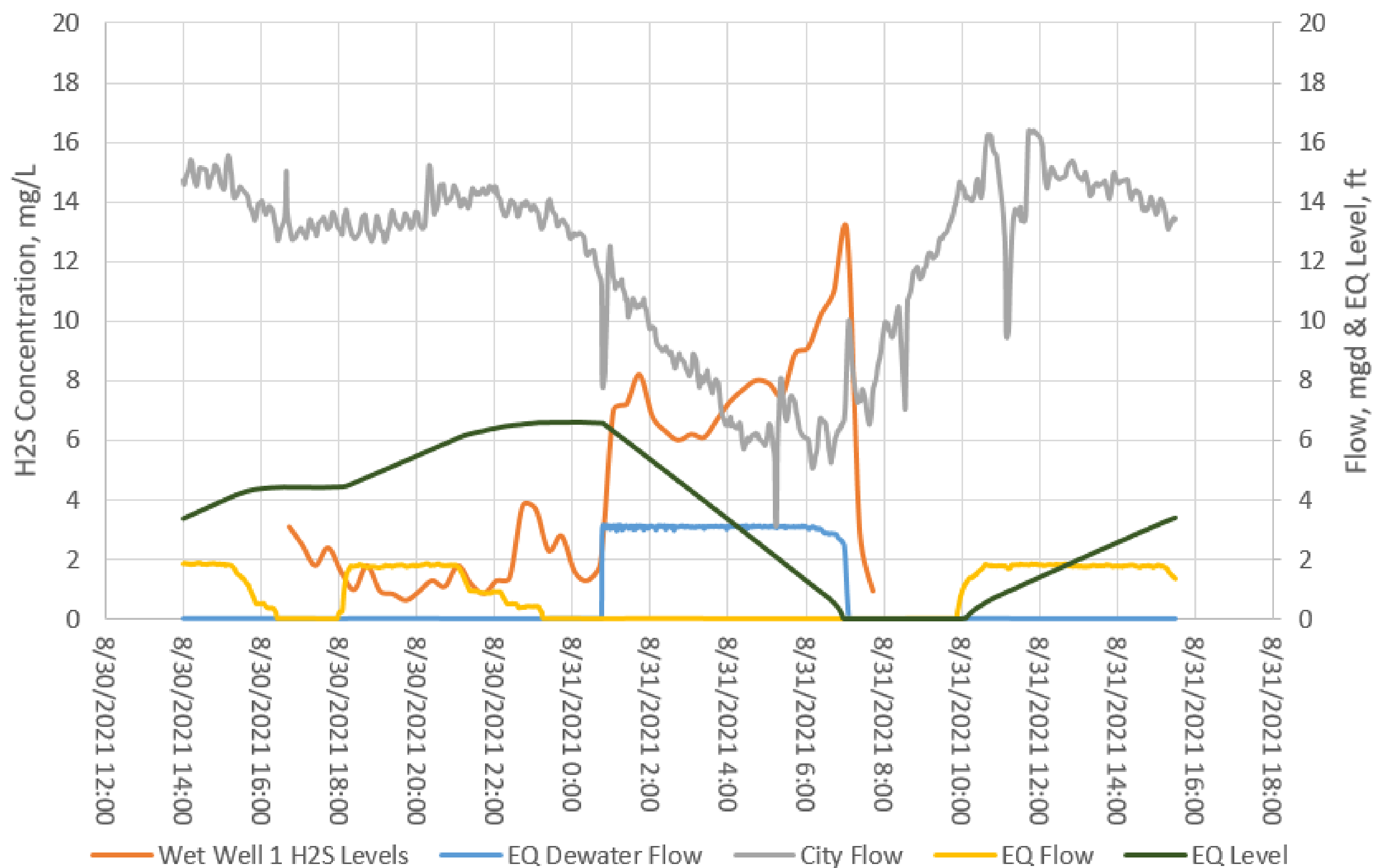


Figure 2: Flows and H2S Concentration for Wet Well 1 on August 28th and 29th 2021



Case Study 1 – Odor Study

Considered influent Wet Well – Changed Operation



Case Study 1 – Odor Study

- EQ was engine for generating H₂S but was not released until discharged into Wet Well
- Found this slug of H₂S appears in other areas of the plant
- Modifications planned to Scrubbers, Ventilation rates



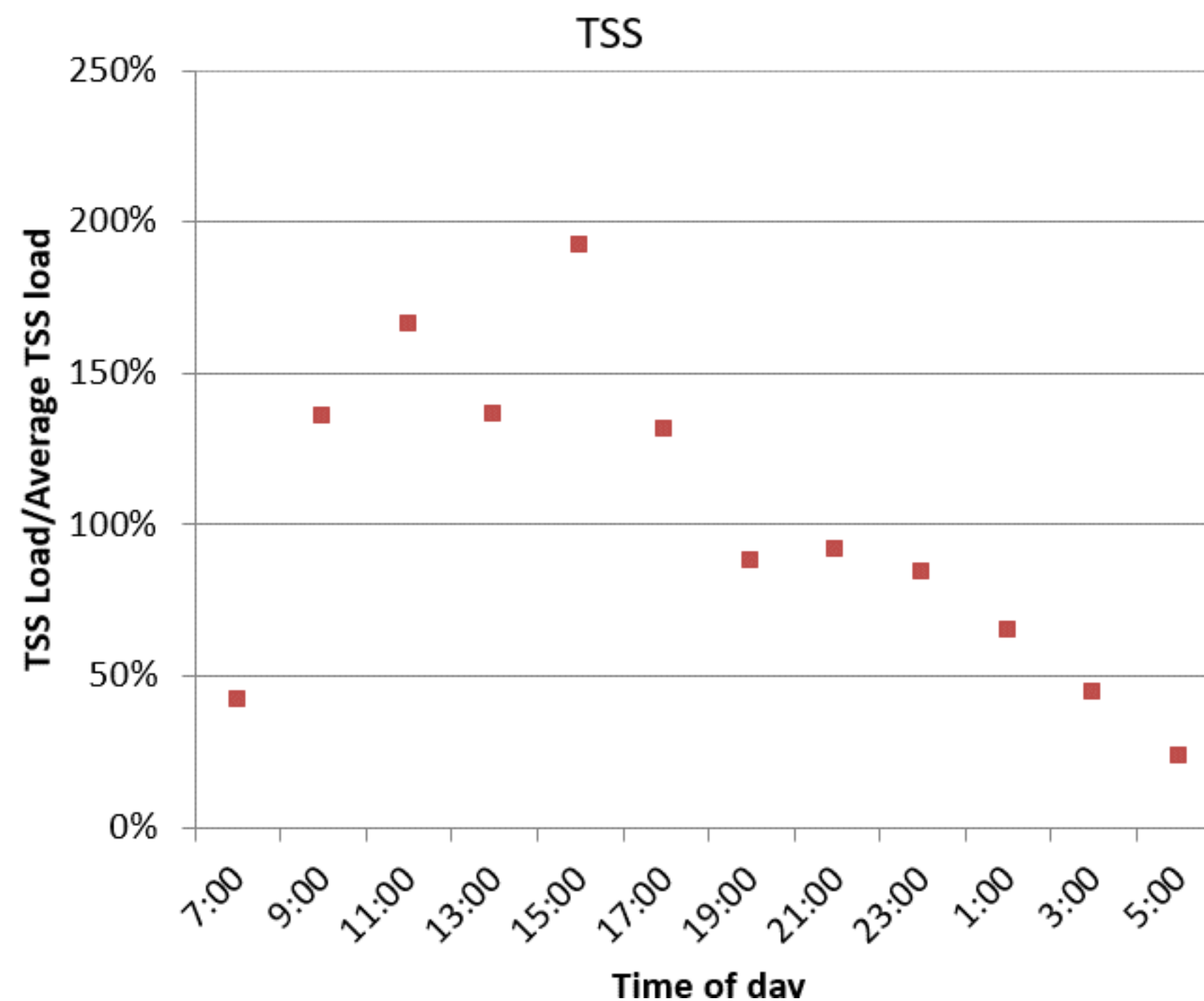
Case Study 2 – Co-thickening on GBT

- Facility plan identified limited Digester Capacity
- Recommended Primary Gravity Thickener
- Tested co-thickening of primary sludge & WAS



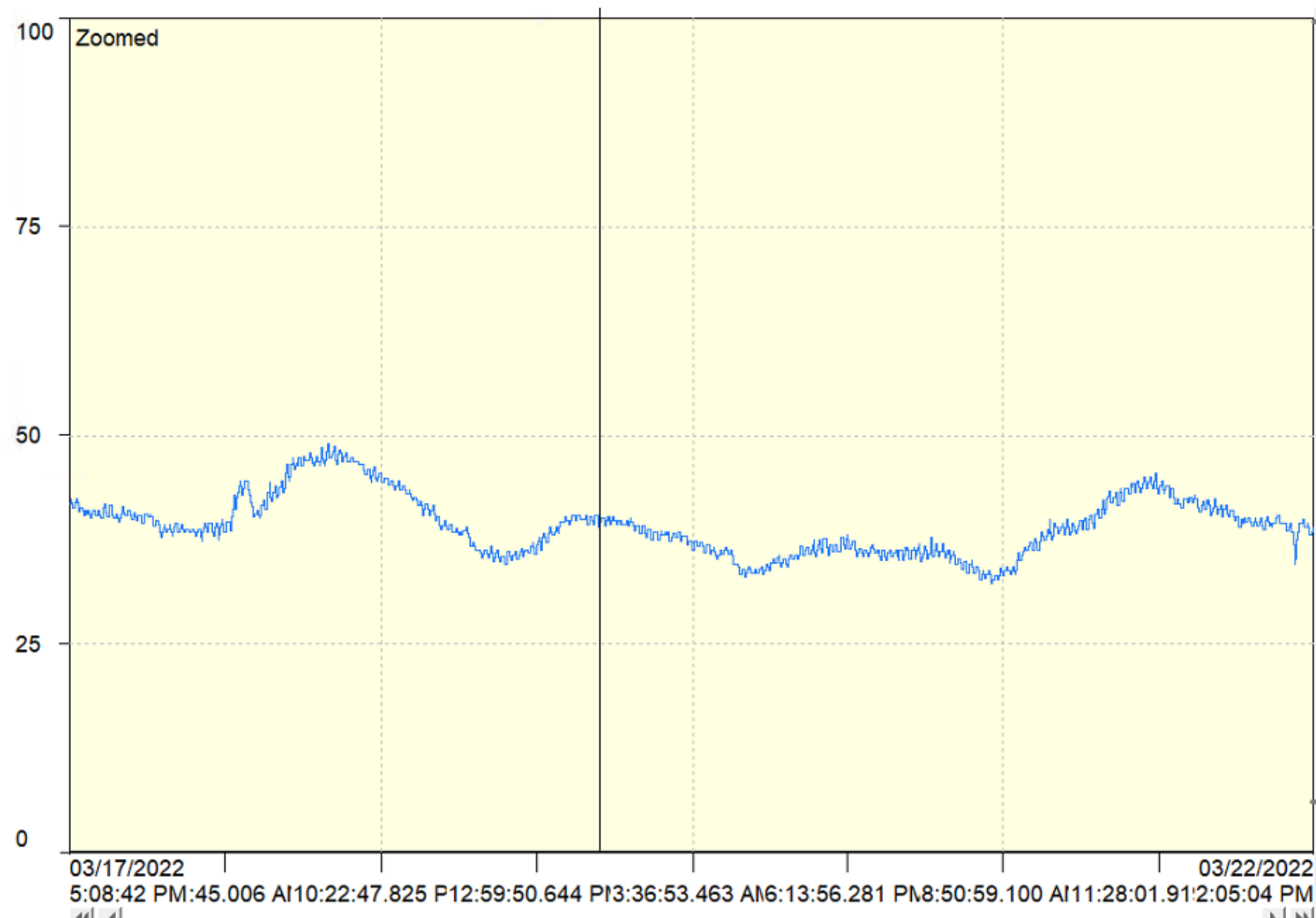
Case Study 2 – Co-thickening on GBT

- Generally worked but flooding out issues
- Looked at diurnal loading
- Checked primary sumps – valve timing and bridge travel



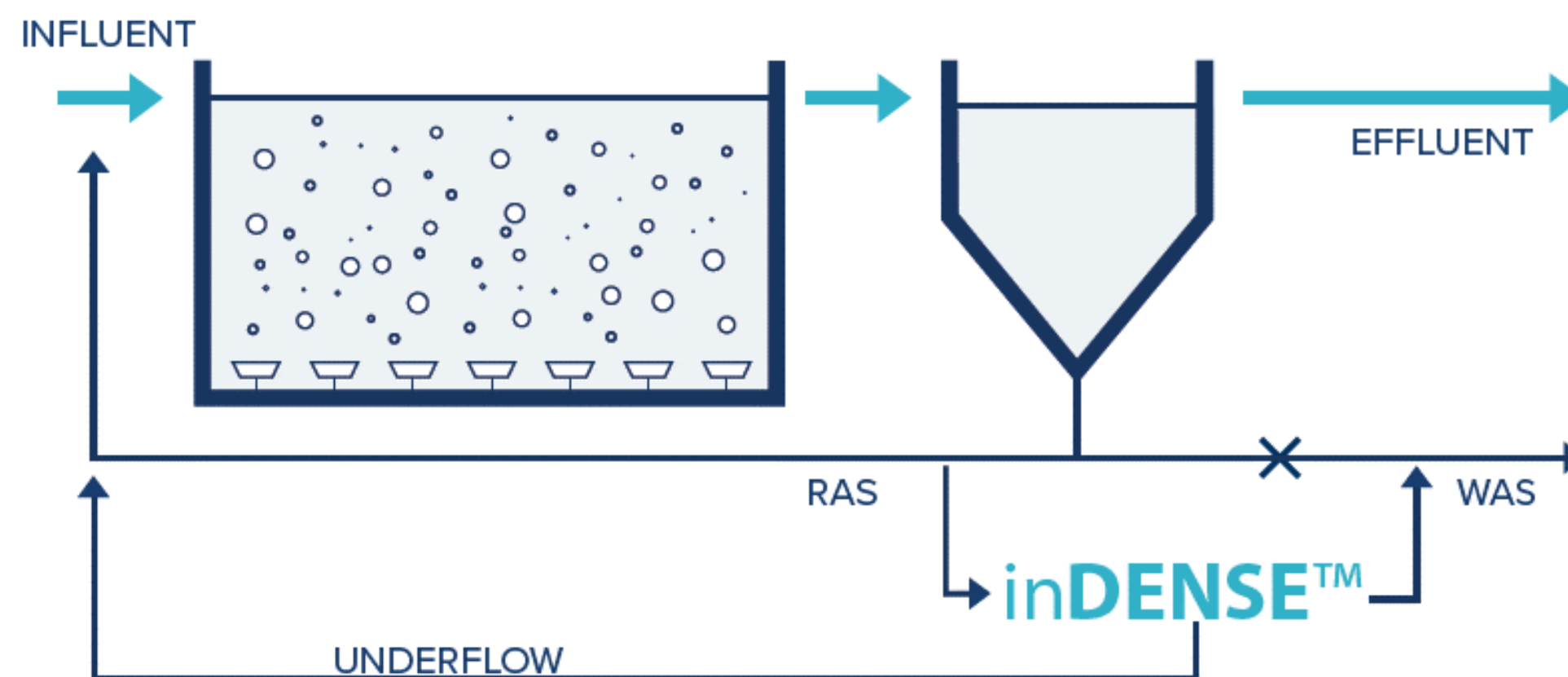
Case Study 2 – Co-thickening on GBT

- Purchased Solids Analyzer
- Random slug loads – from industries???
- Polymer Dose tied to solids analyzer



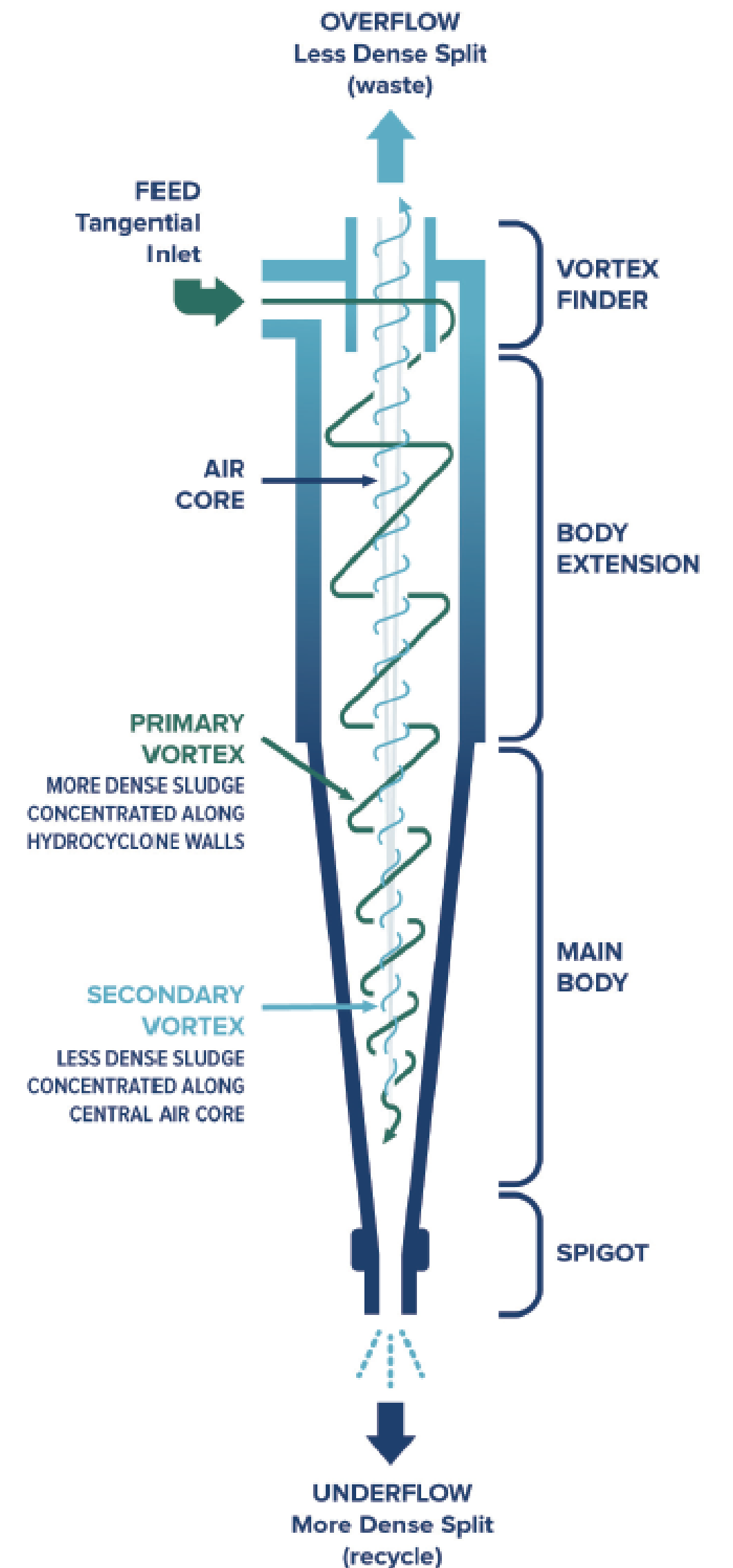
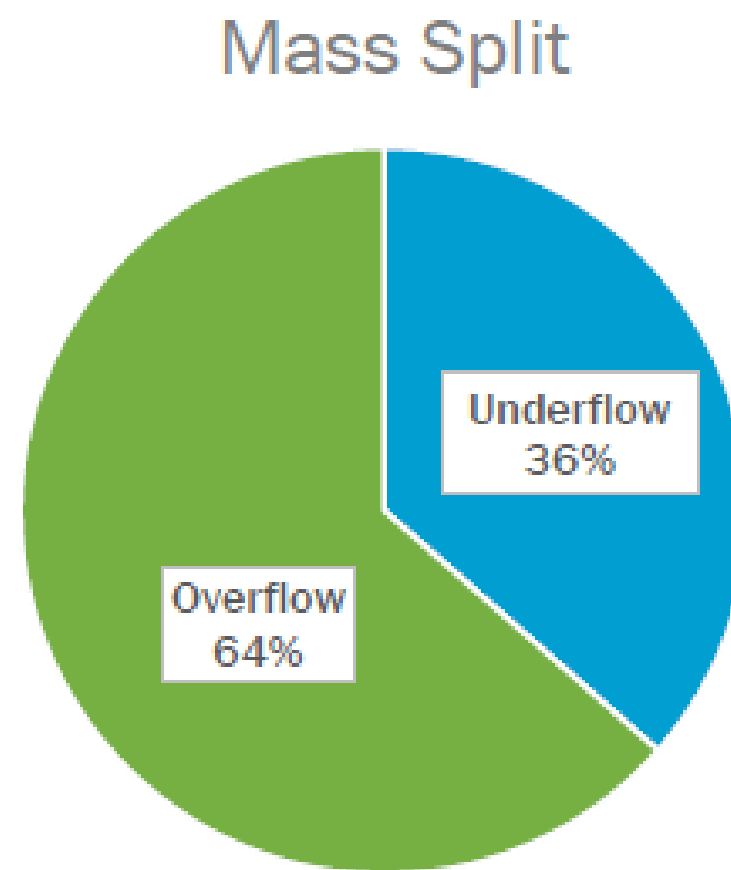
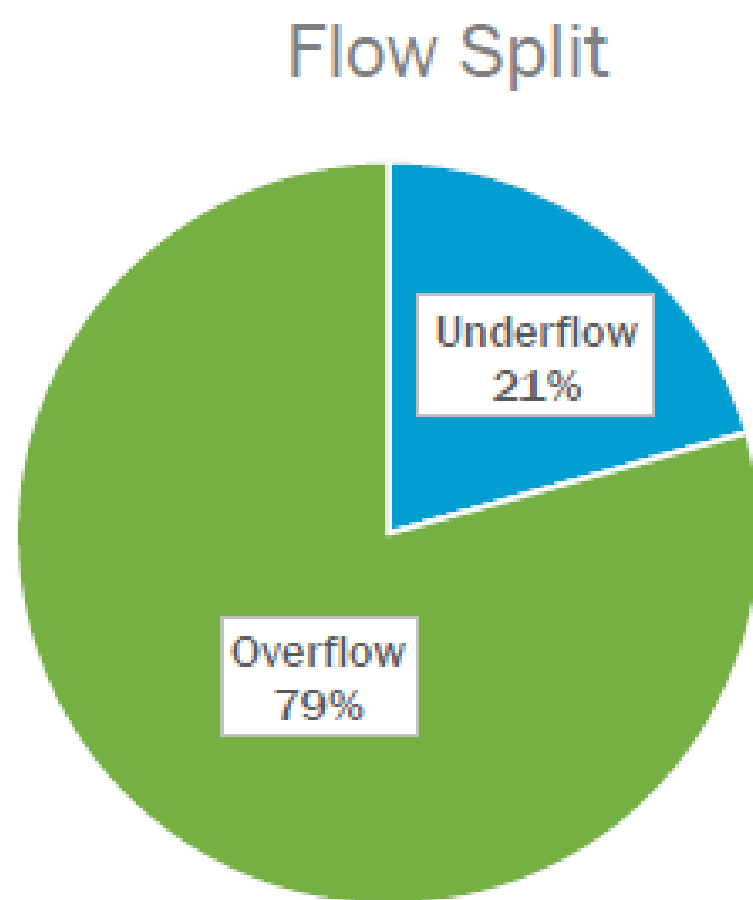
Case Study 3 – inDense Pilot

- Identified in Facility Planning – 3 goals to understand
 - Reduce Energy with low DO while maintaining nitrification
 - Simultaneous nitrification denitrification
 - Maintain or improved settling characteristics



Hydrocyclones

- Dense sludge exits the bottom and lighter solids overflow out of the top
- Different mass and flow split



www.worldwaterworks.com



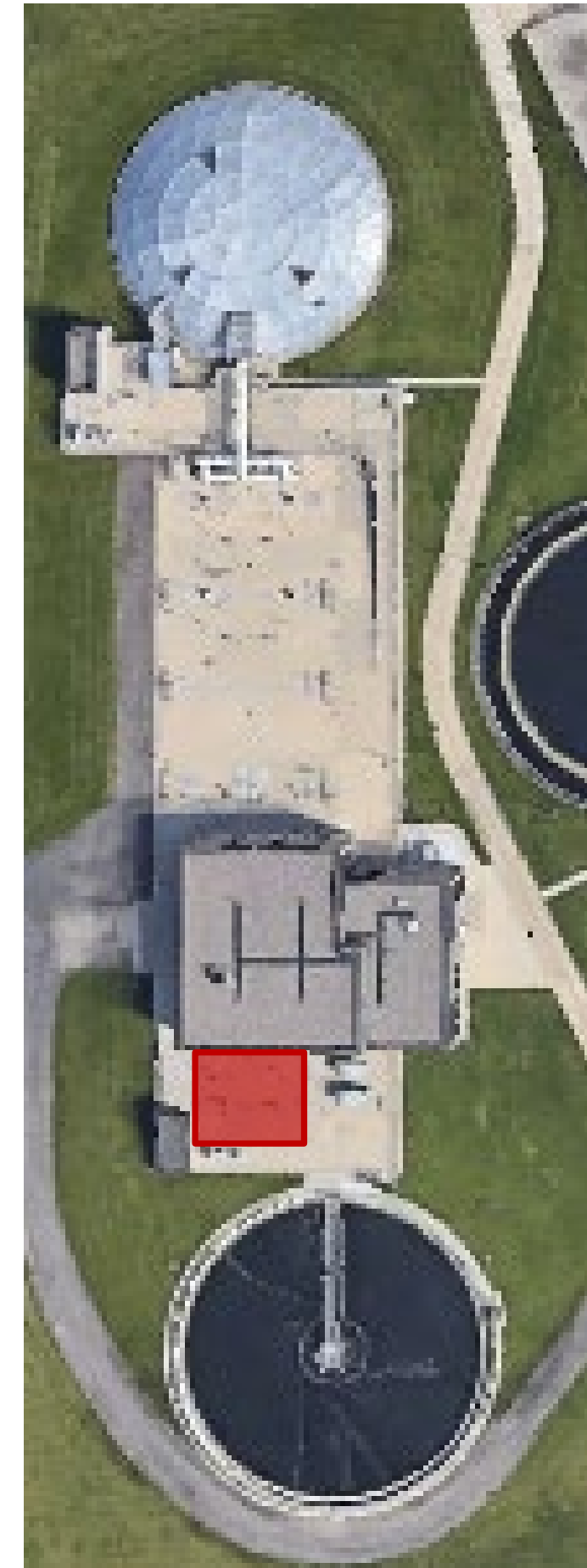
inDense low DO Settleability

- Consistently selection for denser material



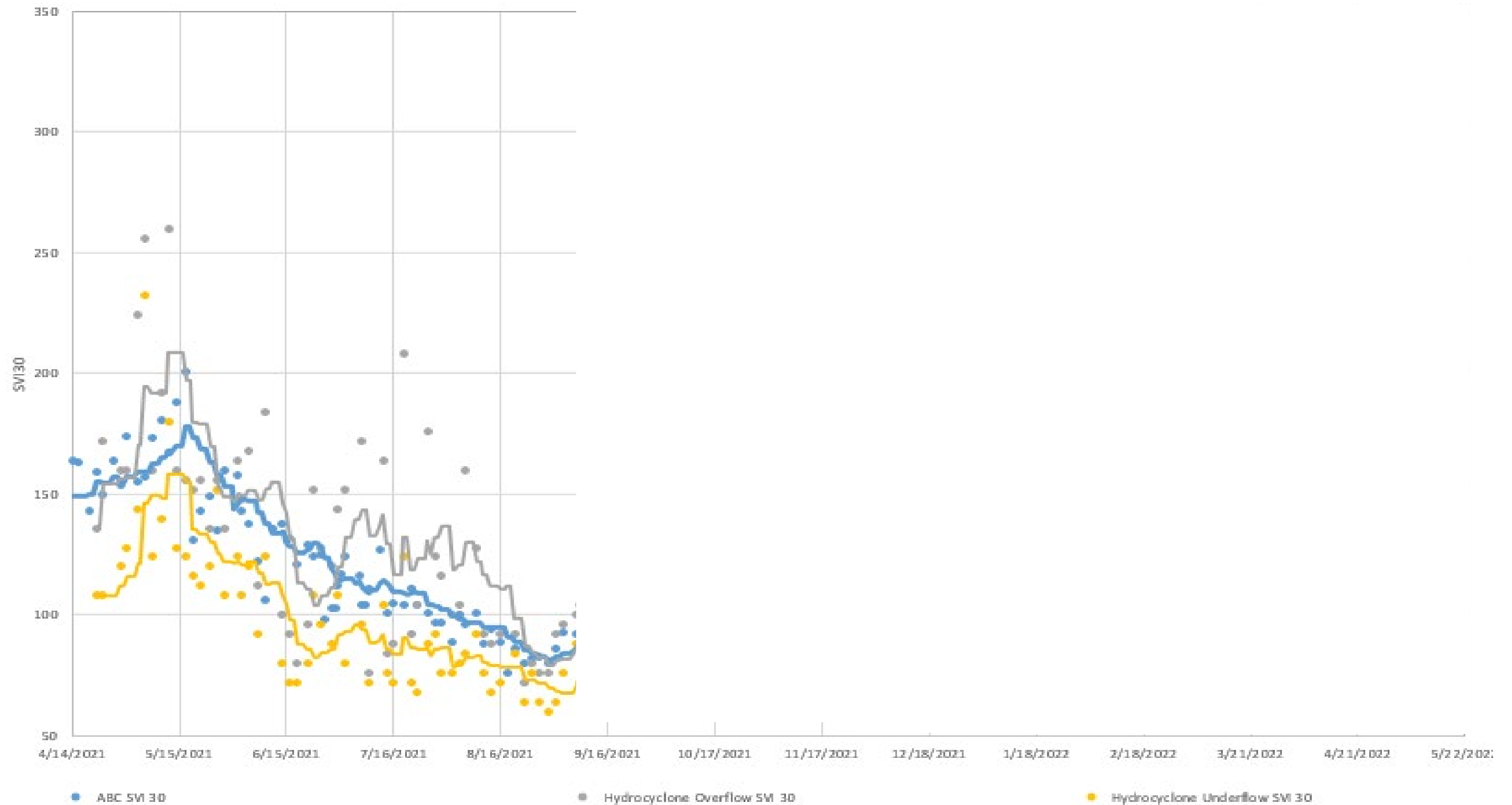
Rochester inDense Pilot

- Weekly profiles and additional composite testing
- Biology monitoring
- Settling tests on feed, overflow and underflow
- Nitrification Uptake Rate Tests
 - Cold Wastewater Temps in April
 - Nitrification inhibition
- Oxygen Uptake Rate Test
- sTOC coming out of Anaerobic Zone
- Modeling update based on data collection
 - (Brown and Caldwell)



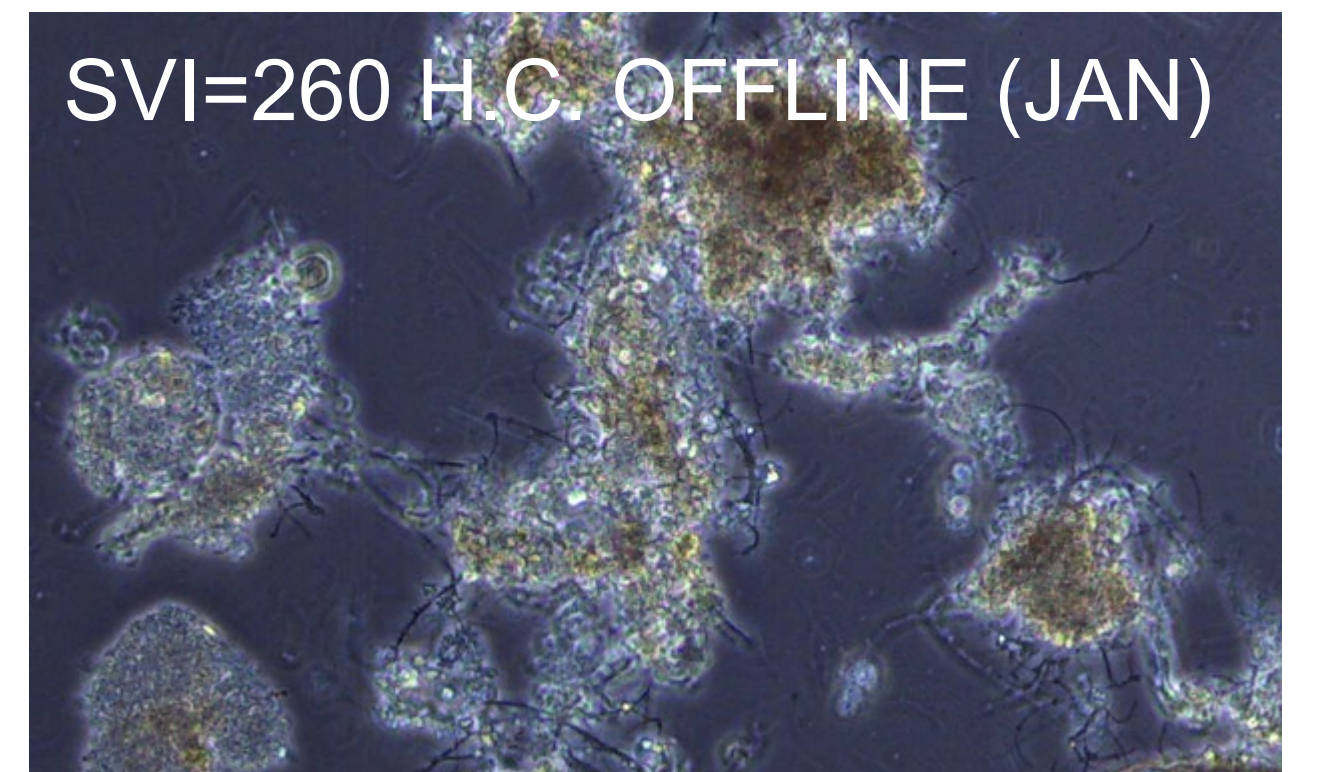
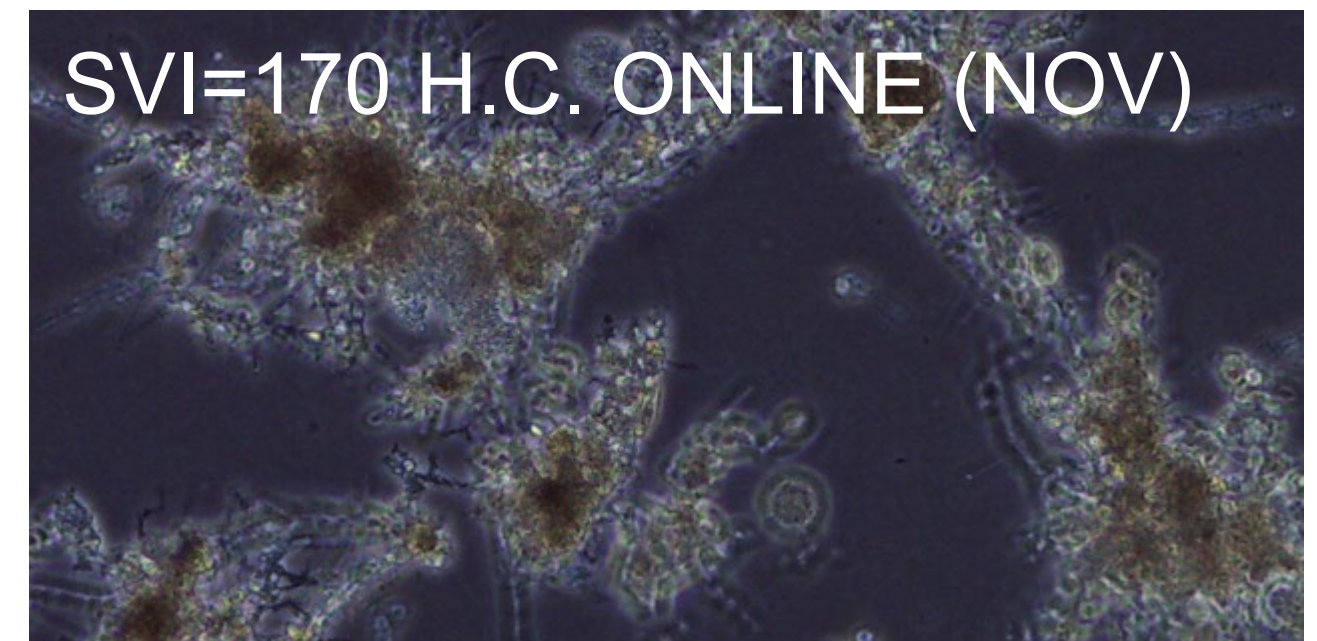
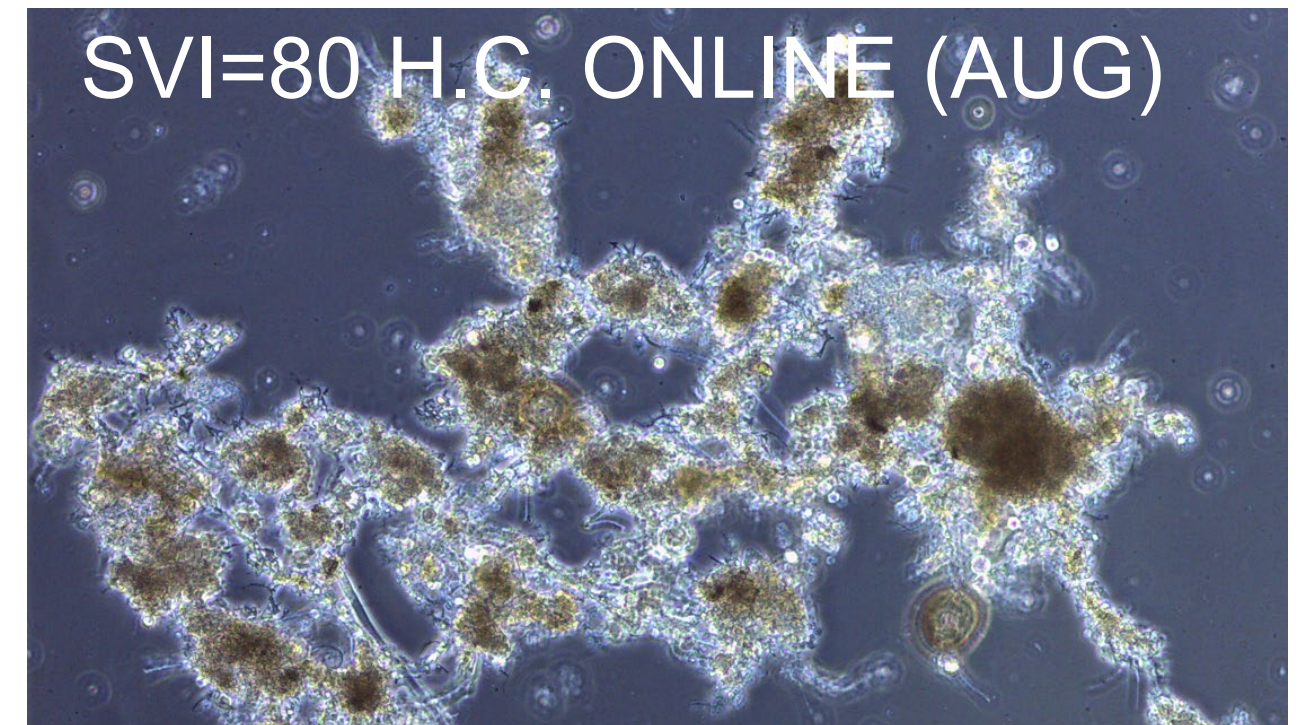
inDense low DO Settleability

- Measured SVI through Pilot Period



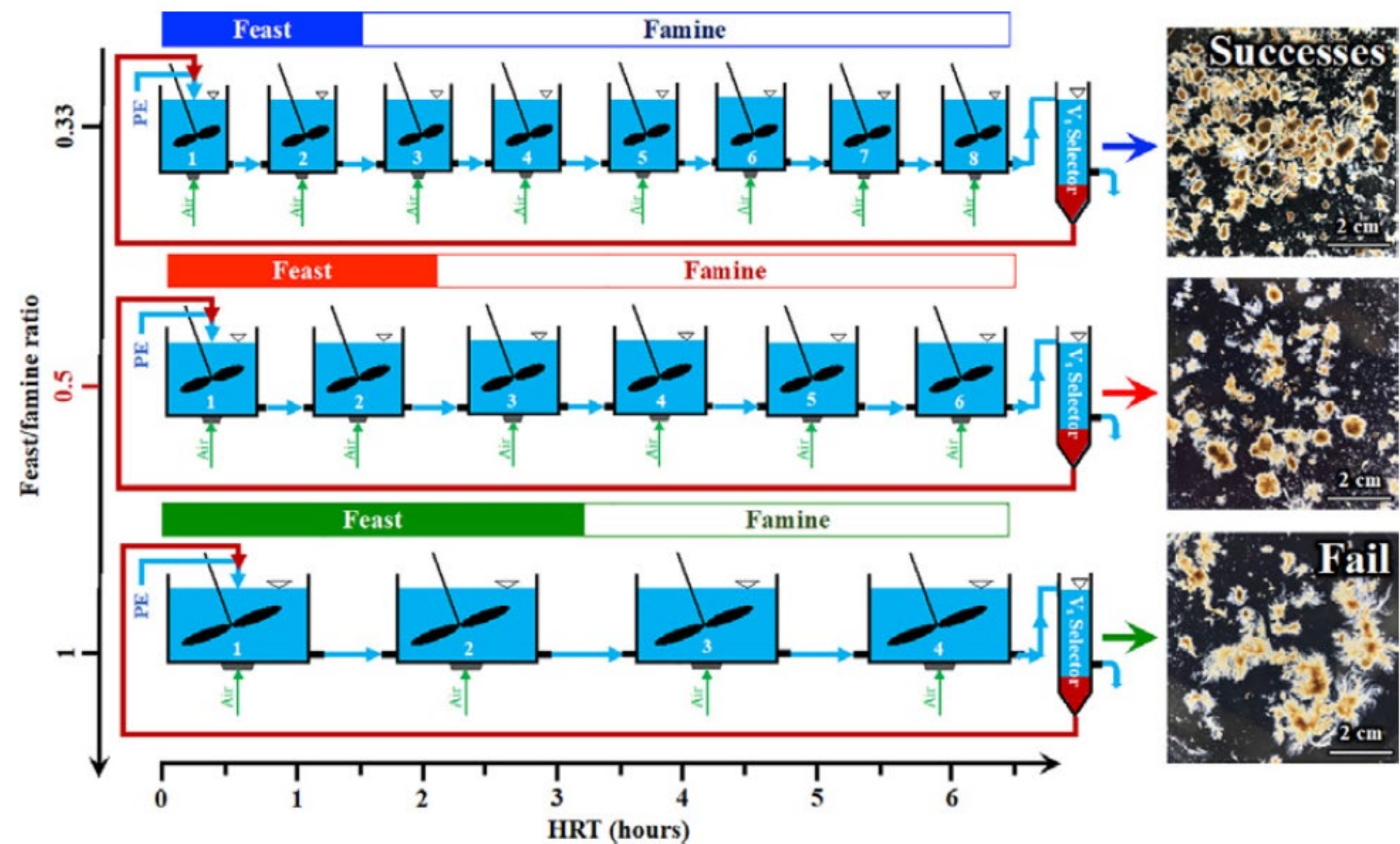
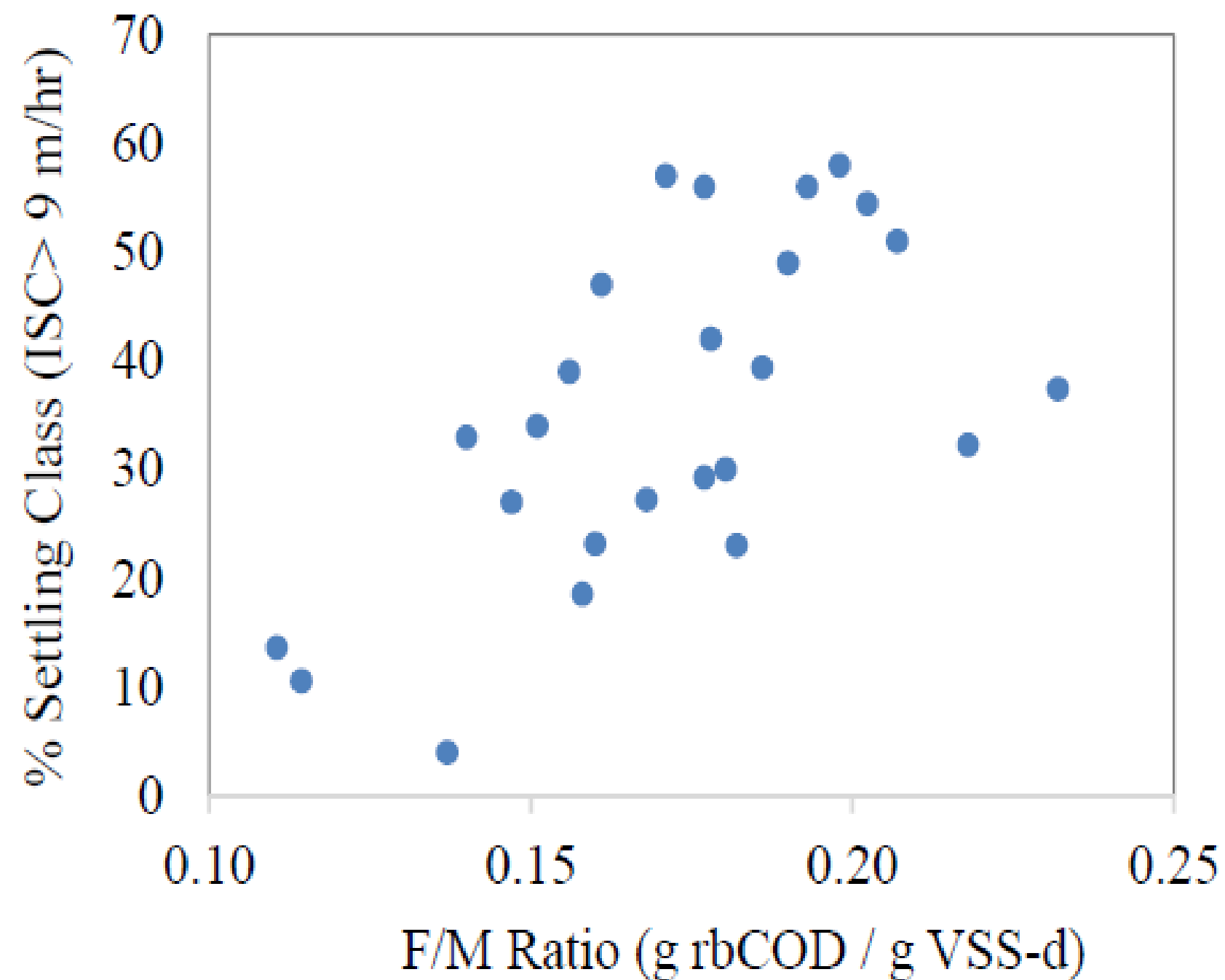
Rochester inDense Pilot

- Settling changes not driven by filaments
- Hydrocyclone was turned off in Early November
- Microthrix appeared in December (usually appears in March)
- Hydrocyclone turned back on reduced presence of microthrix



Substrate Gradient also Important

- Create right F/M
- Create of Feast / Famine Profile within the basin



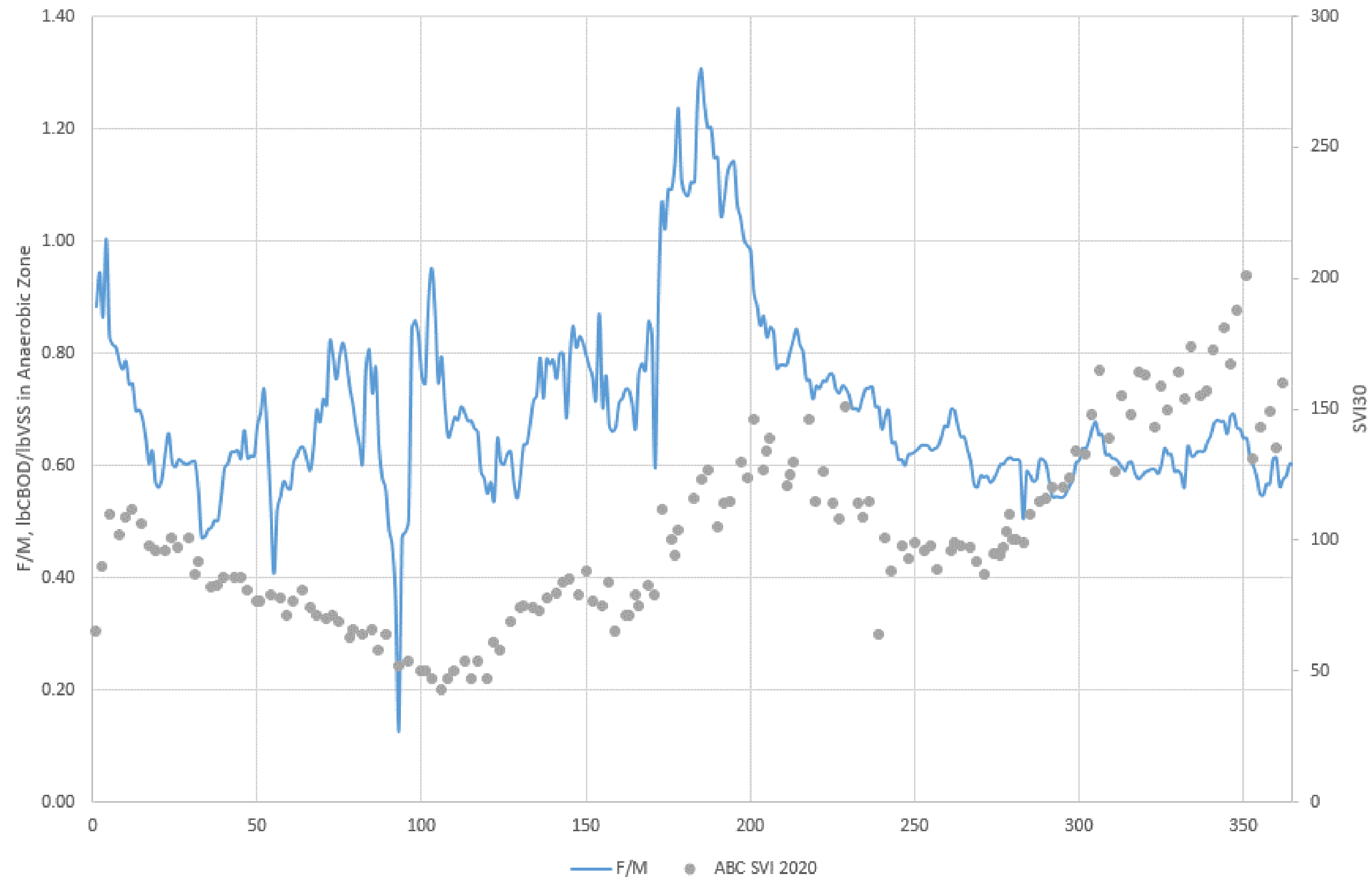
Water Research Foundation, Balancing Flocs and Granules for Activated Sludge Process Intensification in Plug Flow Configurations, 2020

Yewei Sun, Bob Angelotti, Matt Brooks, Zhi-Wu Wang. Feast/famine ratio determined continuous flow aerobic granulation. 2021 Science of the Total Environment



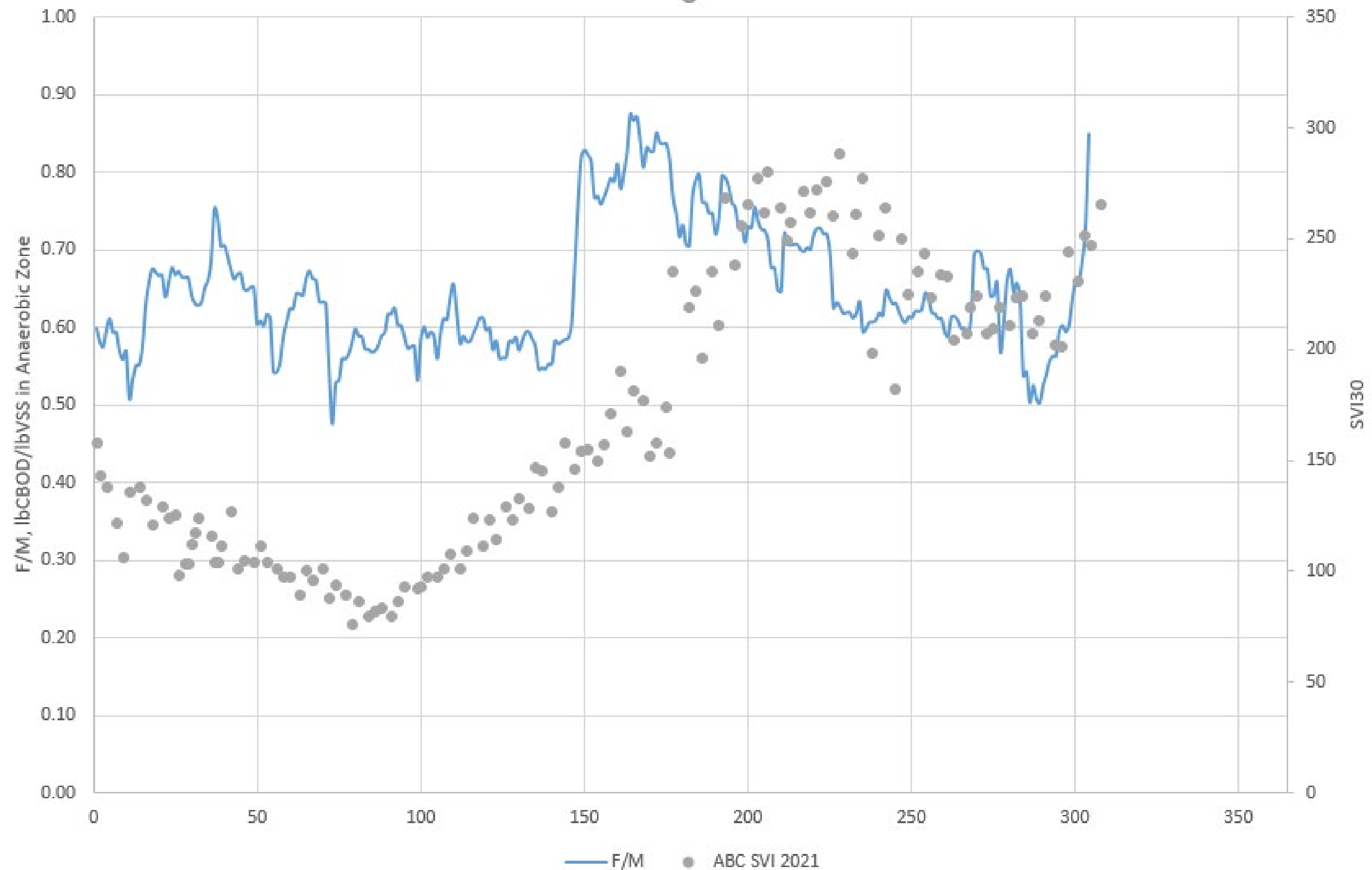
inDense low DO Settleability

- Comparing the SVI of the two previous years – Without Hydrocyclone



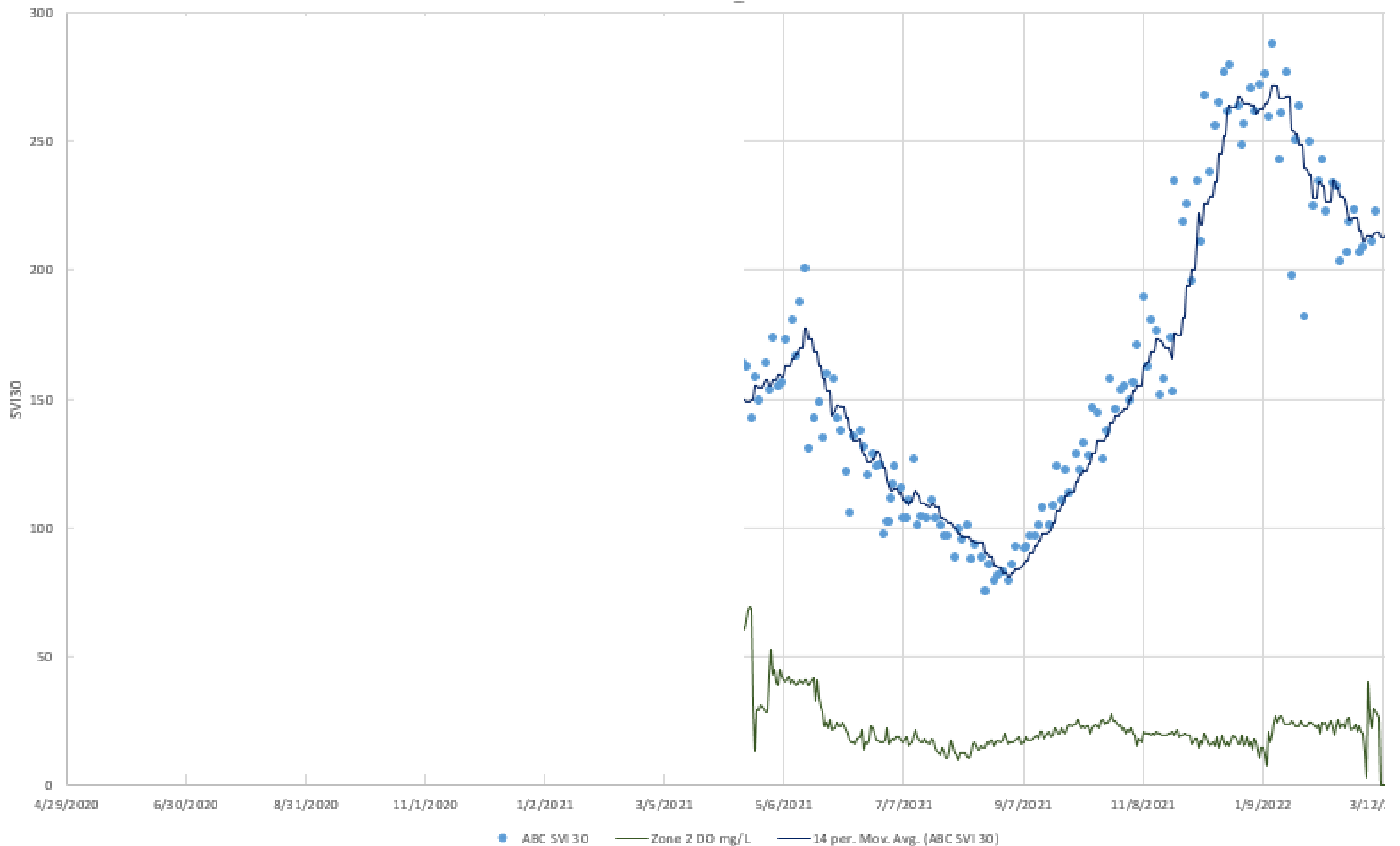
inDense low DO Settleability

- Comparing the SVI of the two previous years – With Hydrocyclone



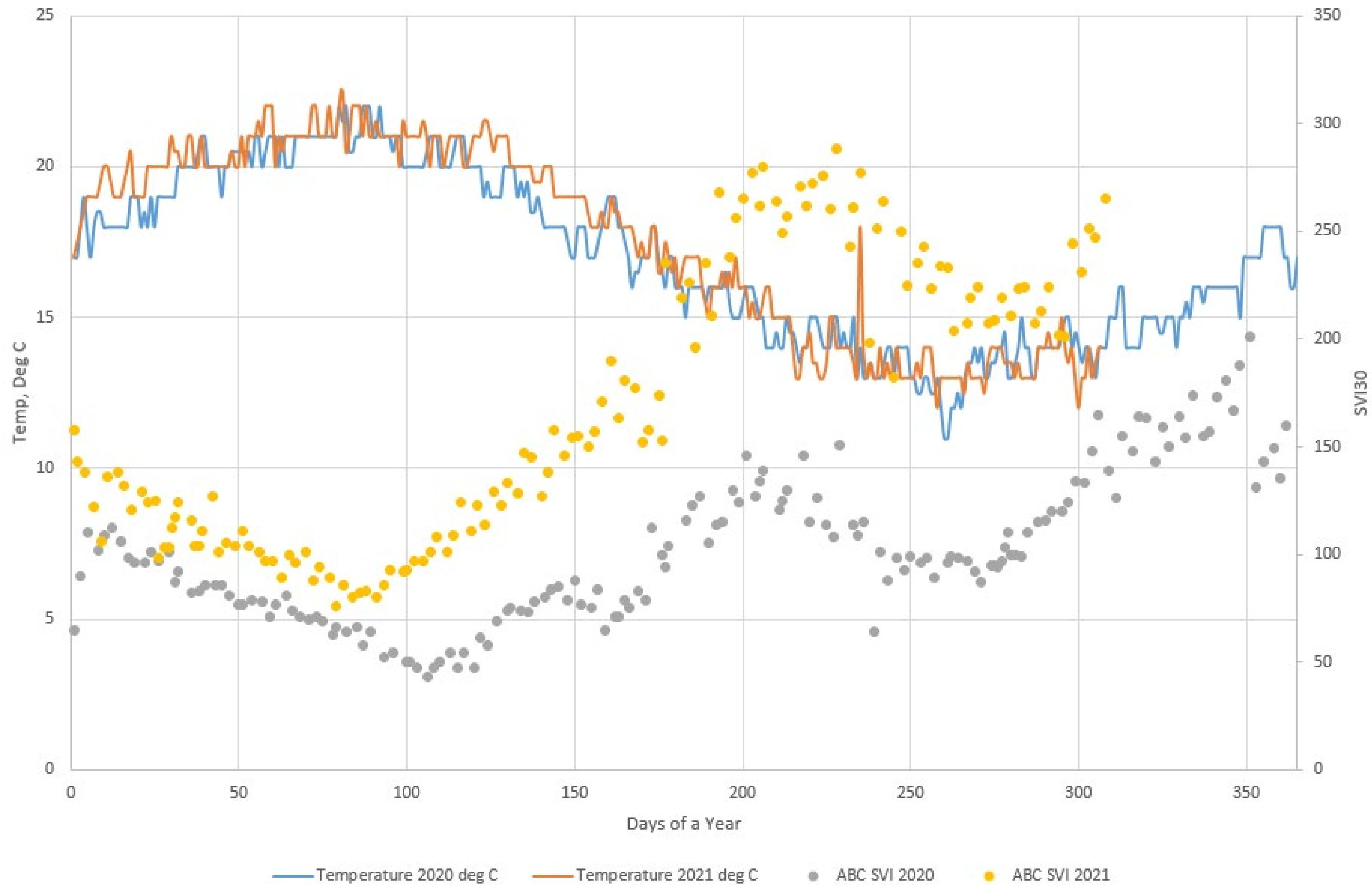
inDense low DO Settleability

- Looked at previous year



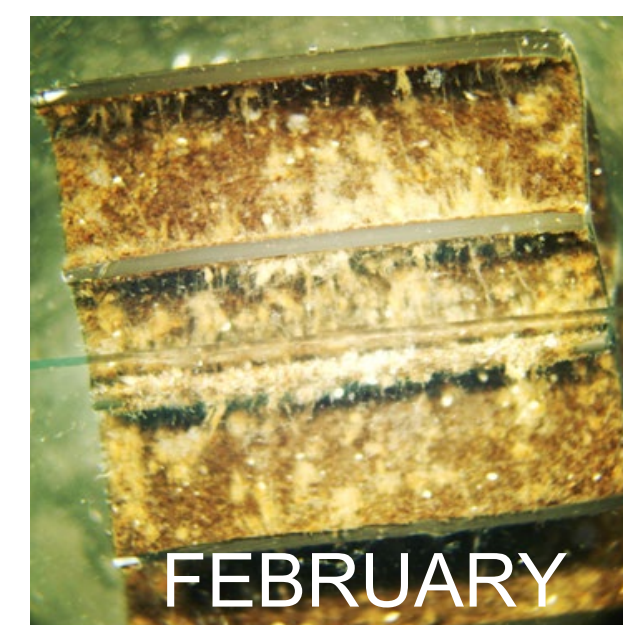
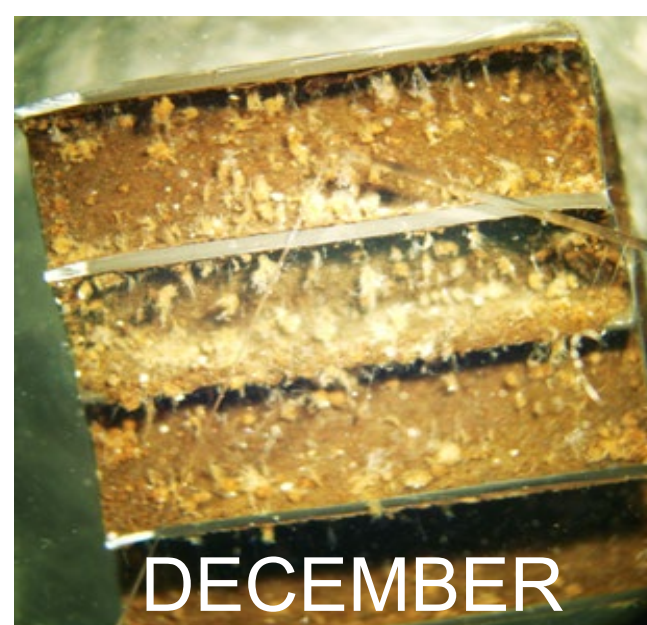
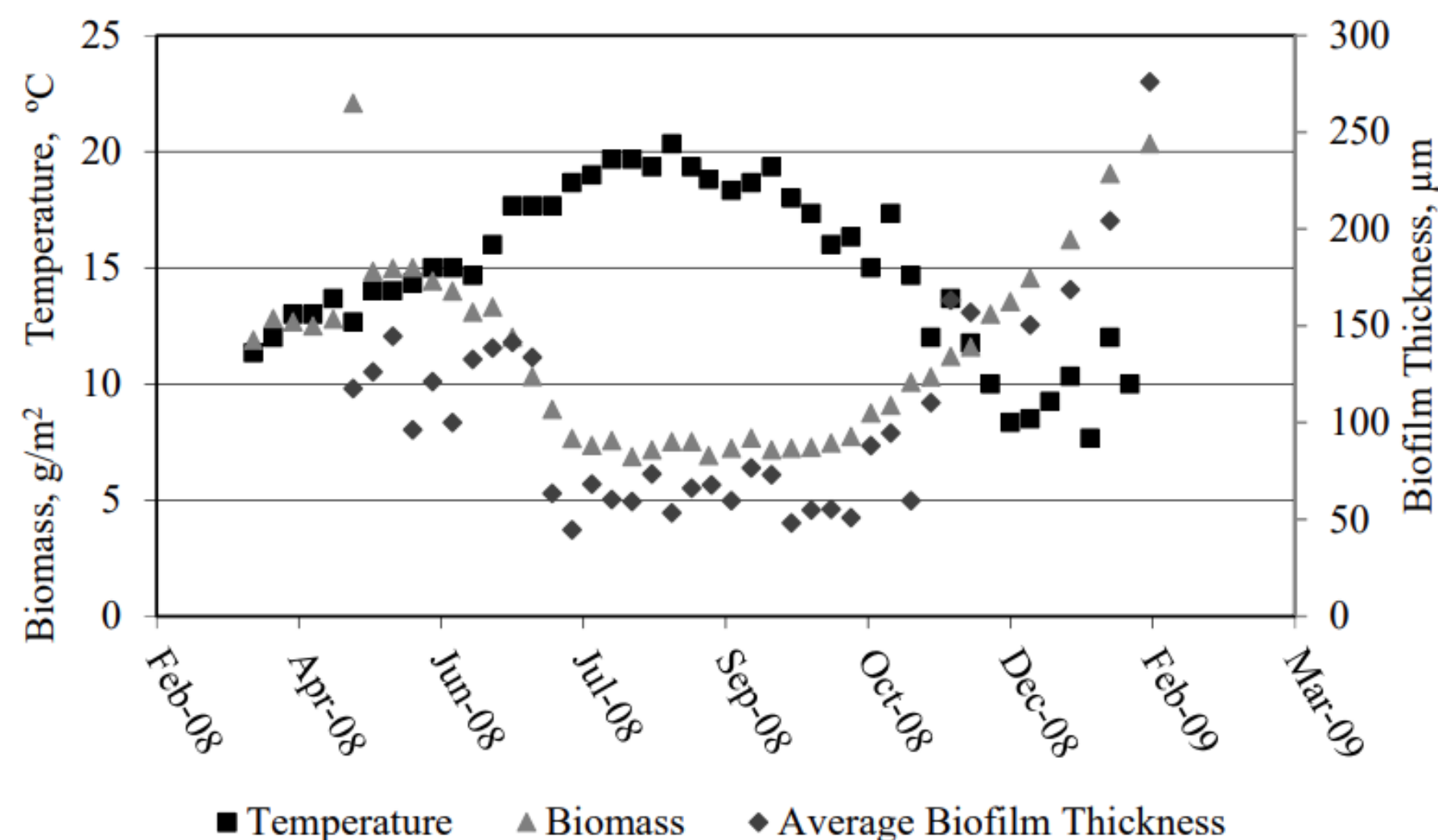
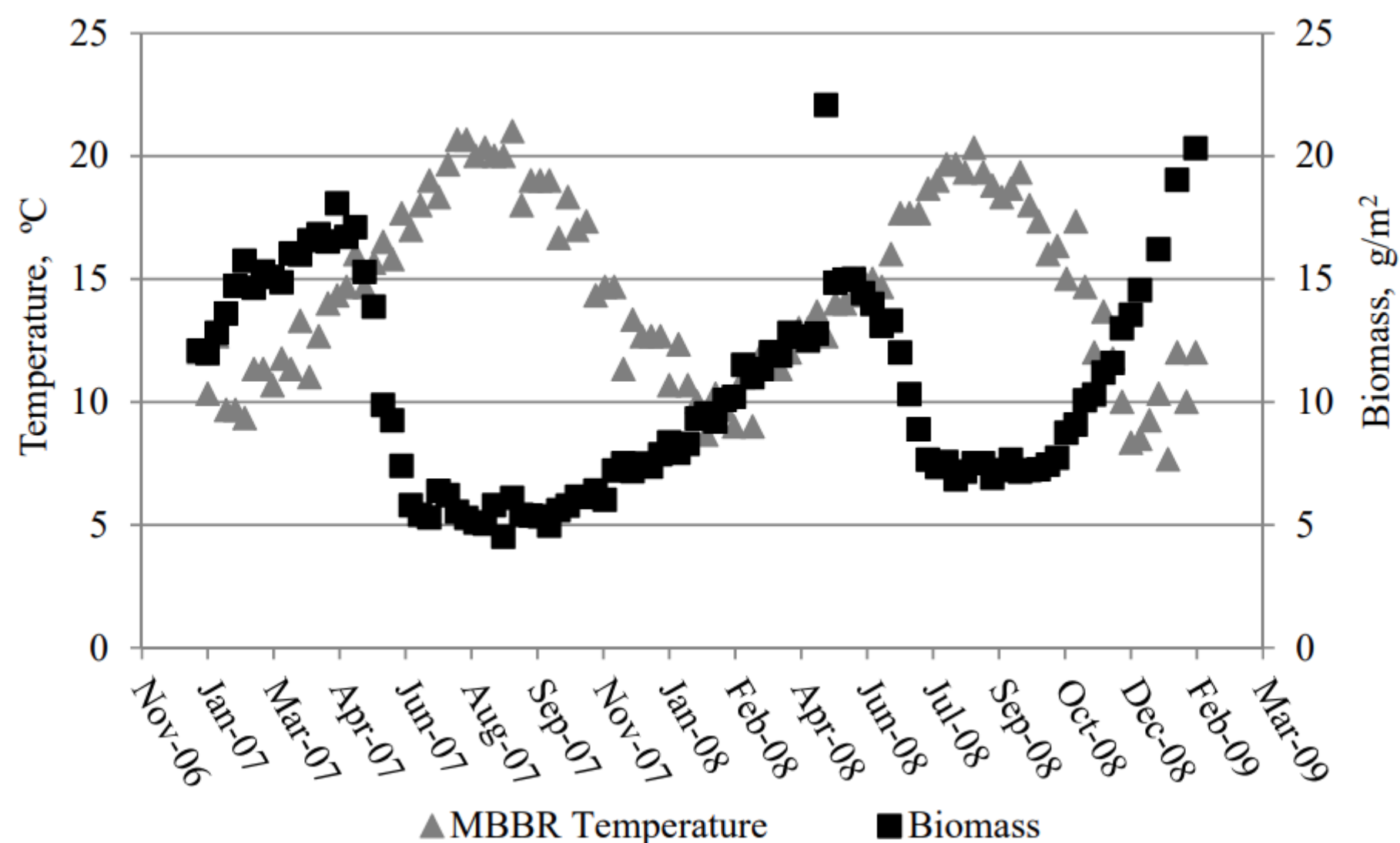
inDense low DO Settleability

- Comparing the SVI of the two previous years with Temperature



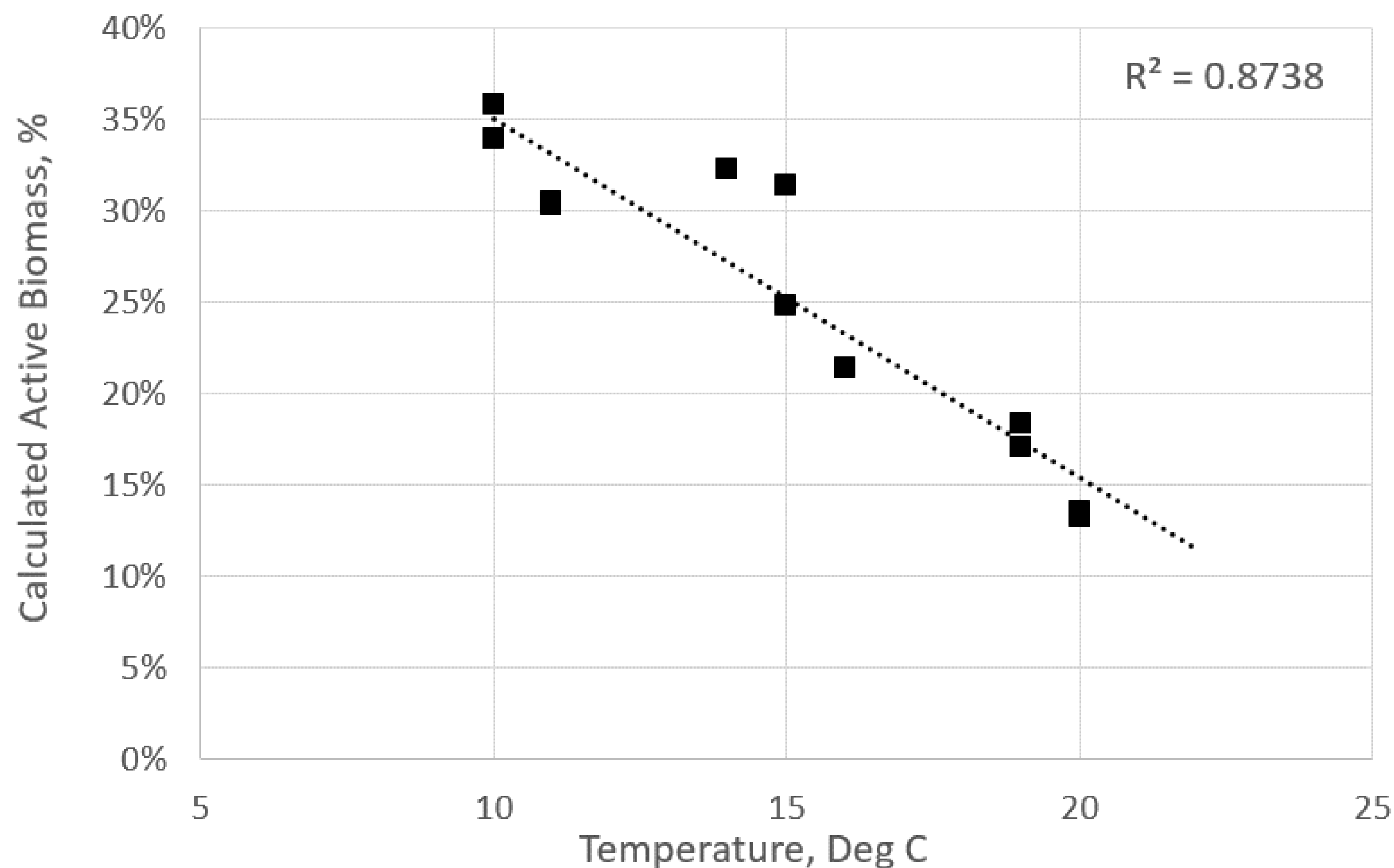
Case Study 3 – inDense Pilot

- Moving Bed Biofilm Research Work – Moorhead MN



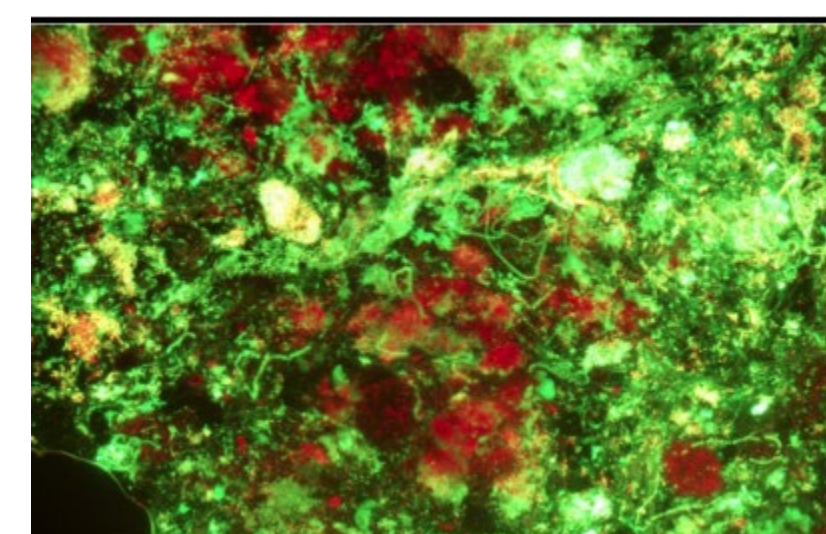
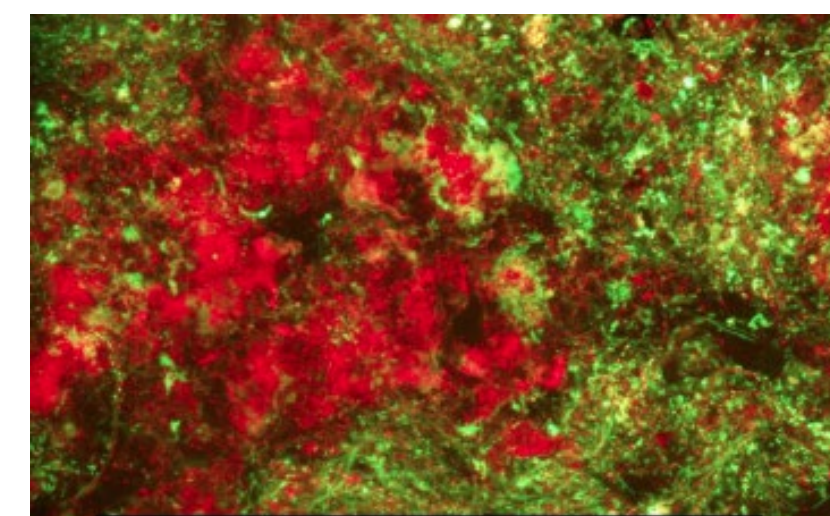
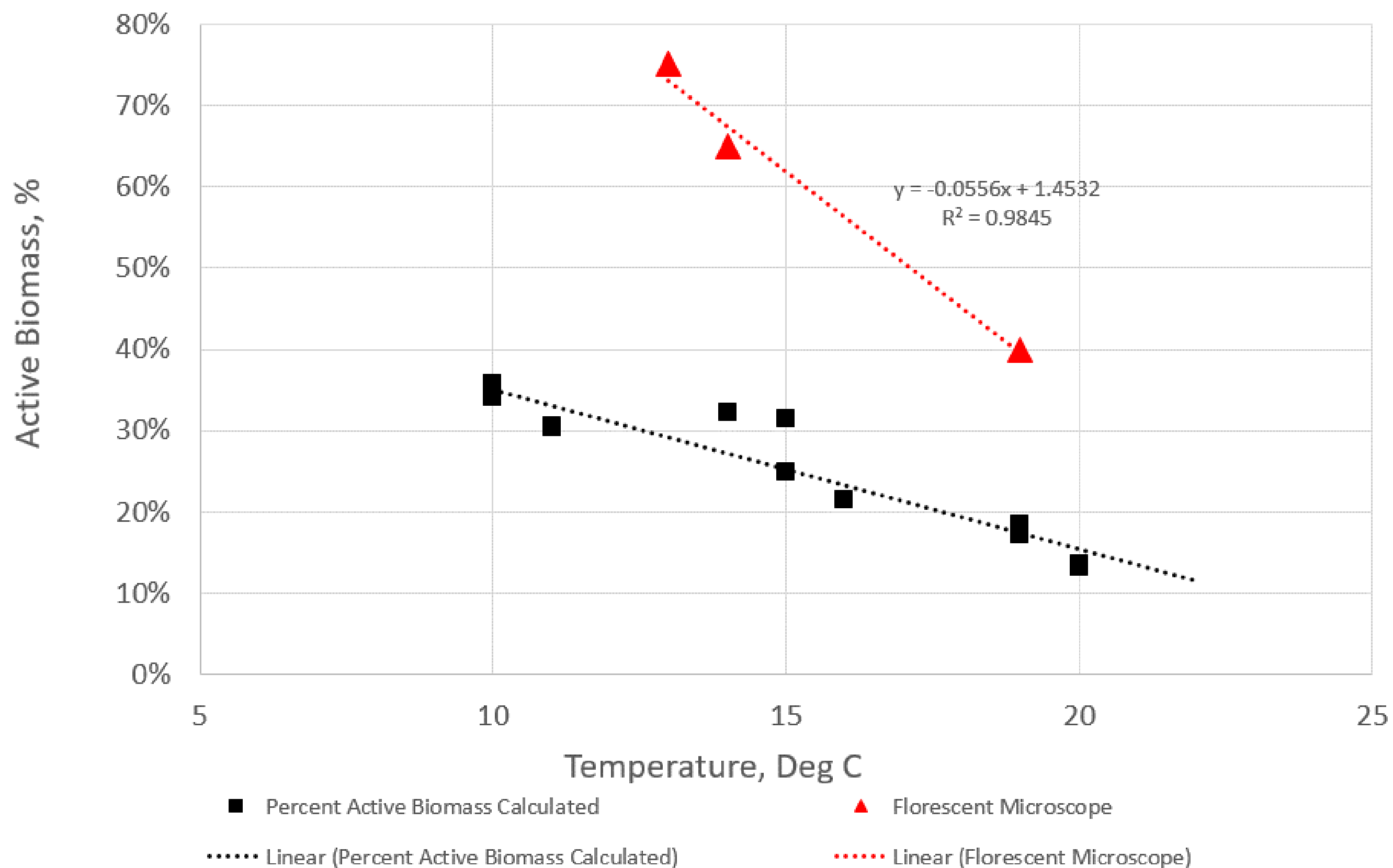
Case Study 3 – inDense Pilot

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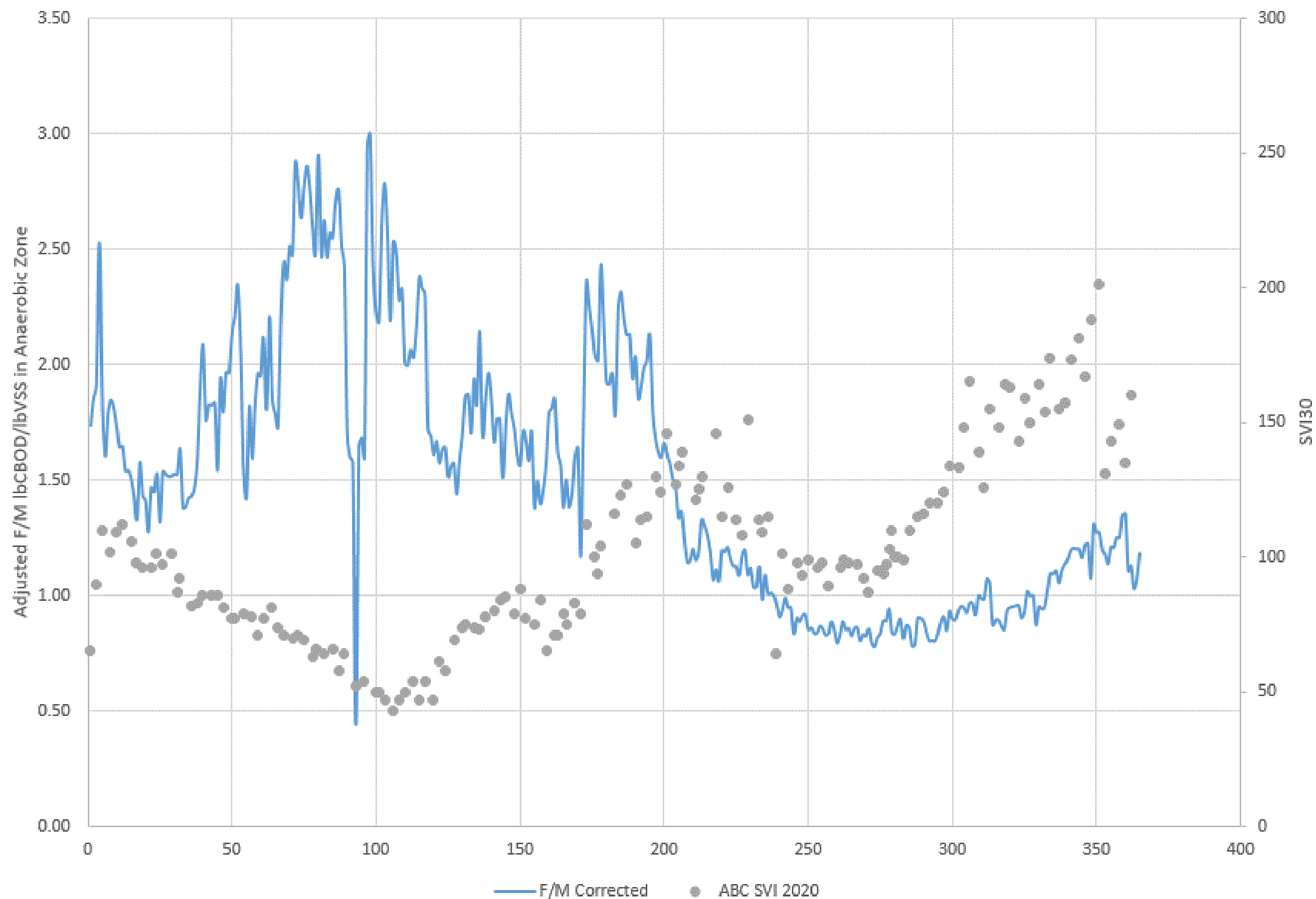
Case Study 3 – inDense Pilot

- Biological Monitoring of Hydrocylone



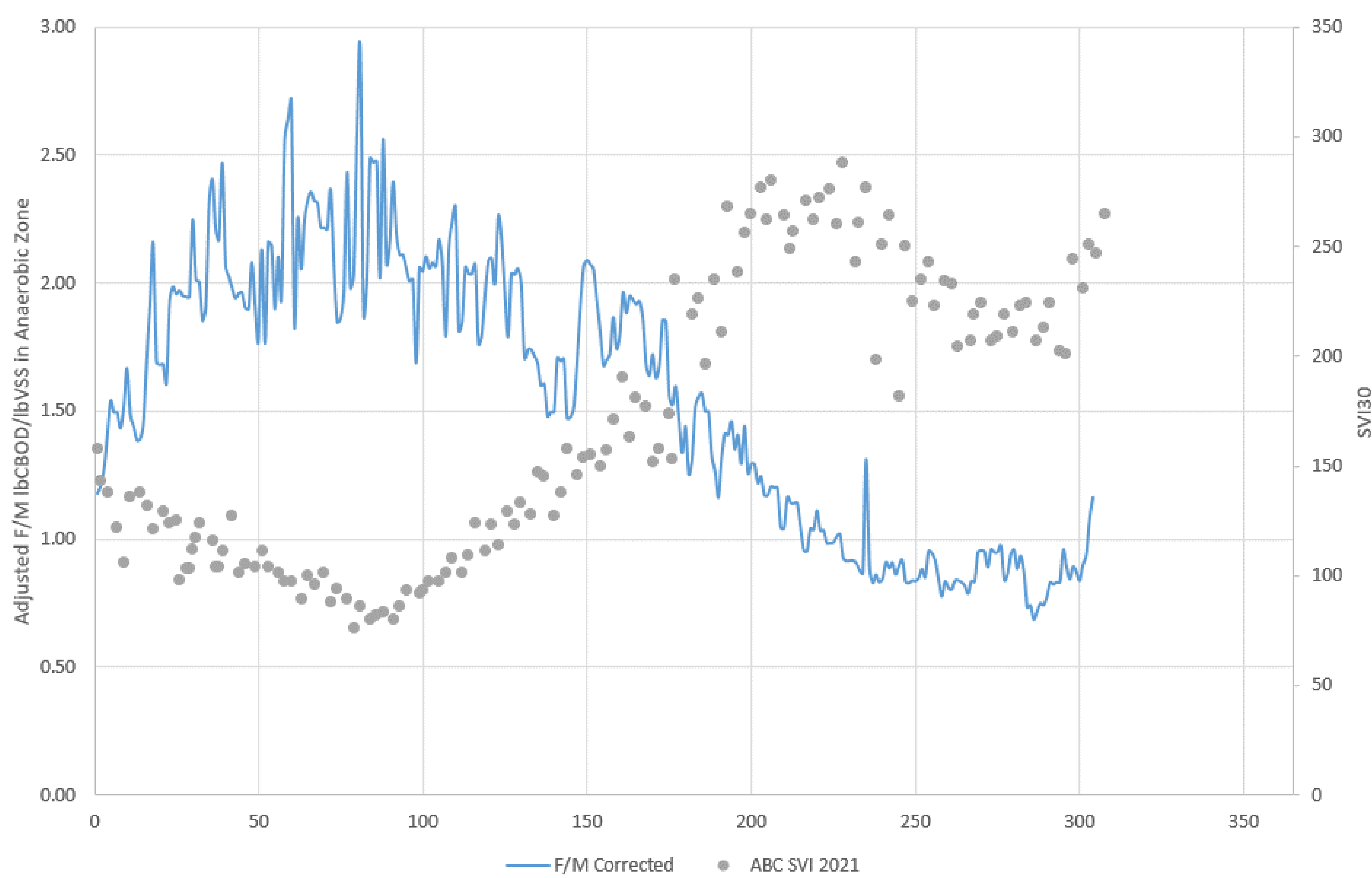
Case Study 3 – inDense Pilot

- Adjusted the Mass in F/M – without Hydrocyclone



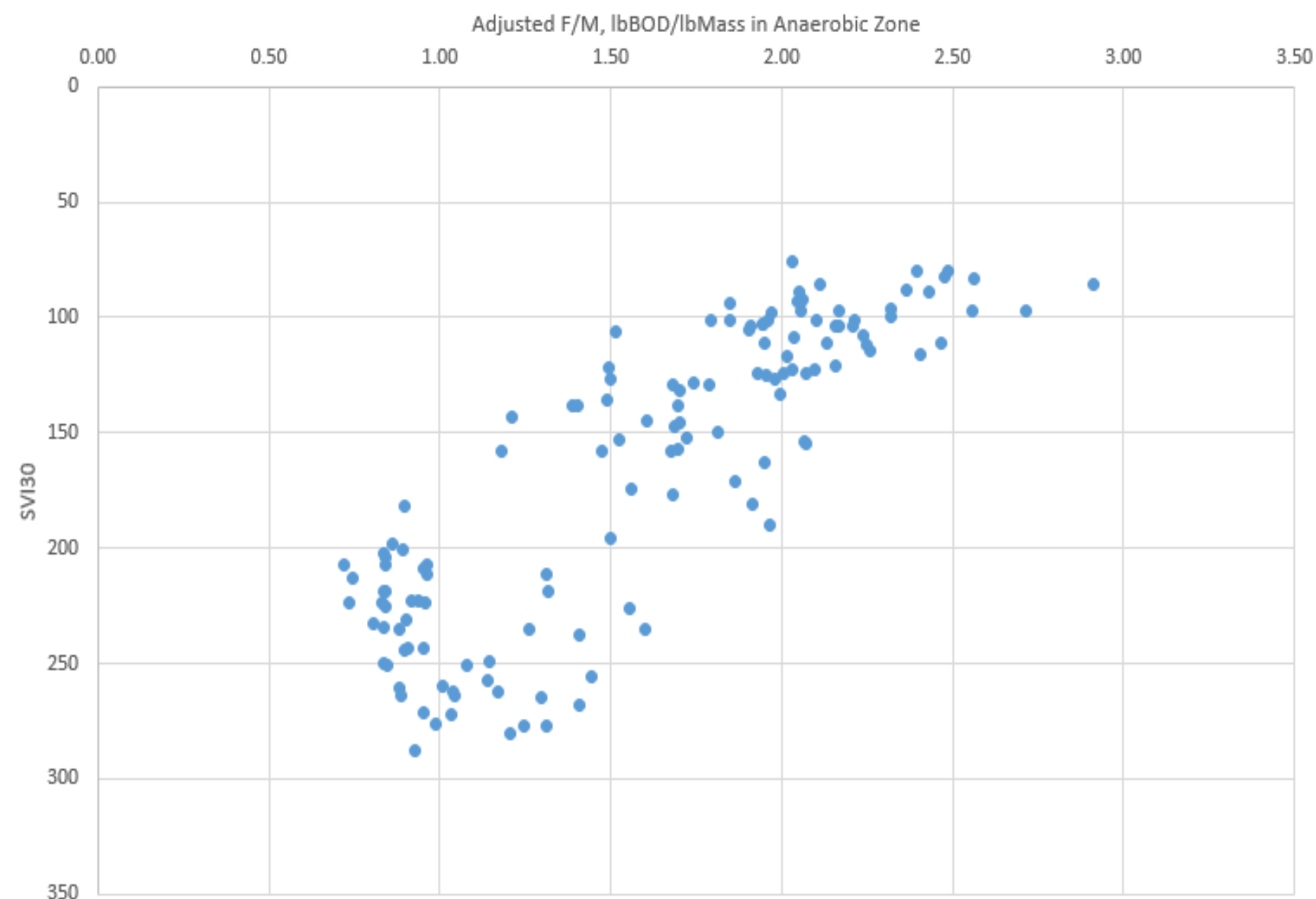
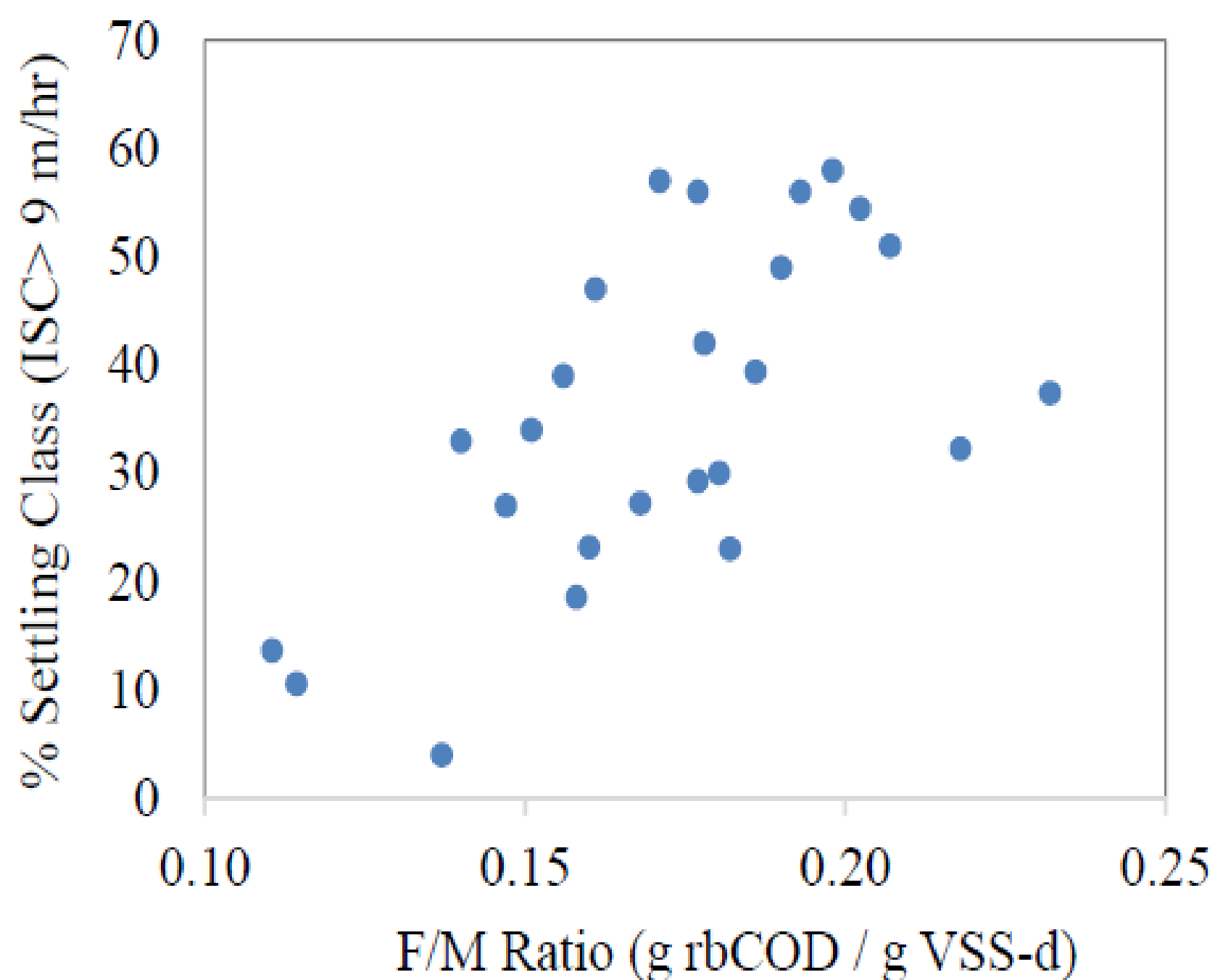
Case Study 3 – inDense Pilot

- Adjusted the Mass in F/M – with Hydrocyclone



Case Study 3 – inDense Pilot

- Comparison to Previous Studies

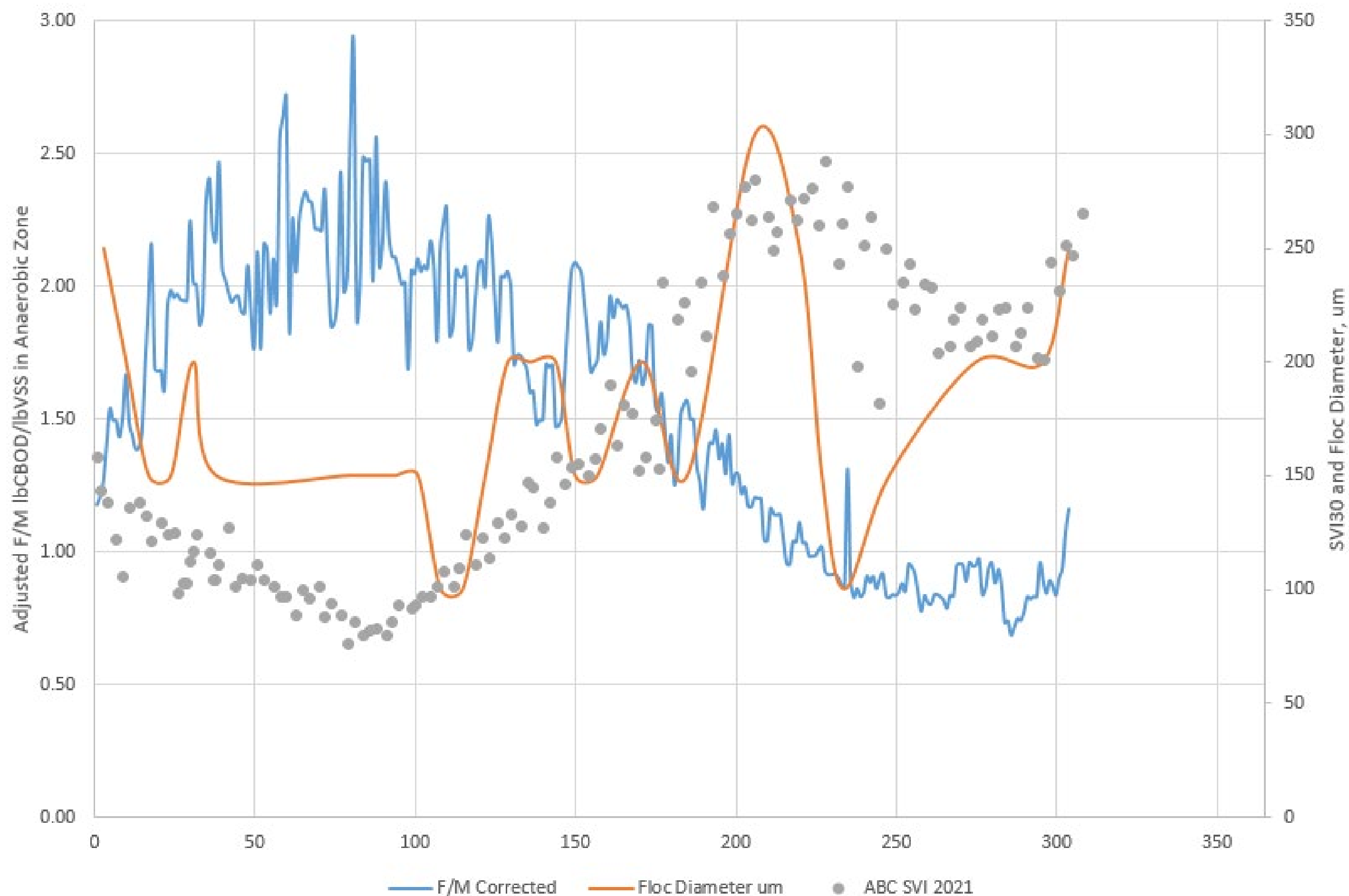


Water Research Foundation, Balancing Floccs and Granules for Activated Sludge Process Intensification in Plug Flow Configurations, 2020



Case Study 3 – inDense Pilot

- Adjusted the Mass in F/M – Floc Diameter



Case Study 3 – inDense Pilot

- By no means conclusive or defensible – but interesting...
- Created numerous questions...
- Further analysis of data required...
- Image Analysis of Biology??? Look at Density...
- Any input is welcome...



Thank you to:

- Rochester WRP Staff for setup, operation & sampling
- World Water Works – Jason Kucavich, Dan Dair
- Great Northern Environmental – Kyle Fritze
- Brown & Caldwell – Don Esping, Mark Miller, Varun Srinivasan, Jose Jimenez
- Ryan Hennessy Wastewater Microbiology



Questions