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# HABs-Impacted Water Treatment in Full-Scale Practice

## *A Comprehensive Performance Evaluation Approach*

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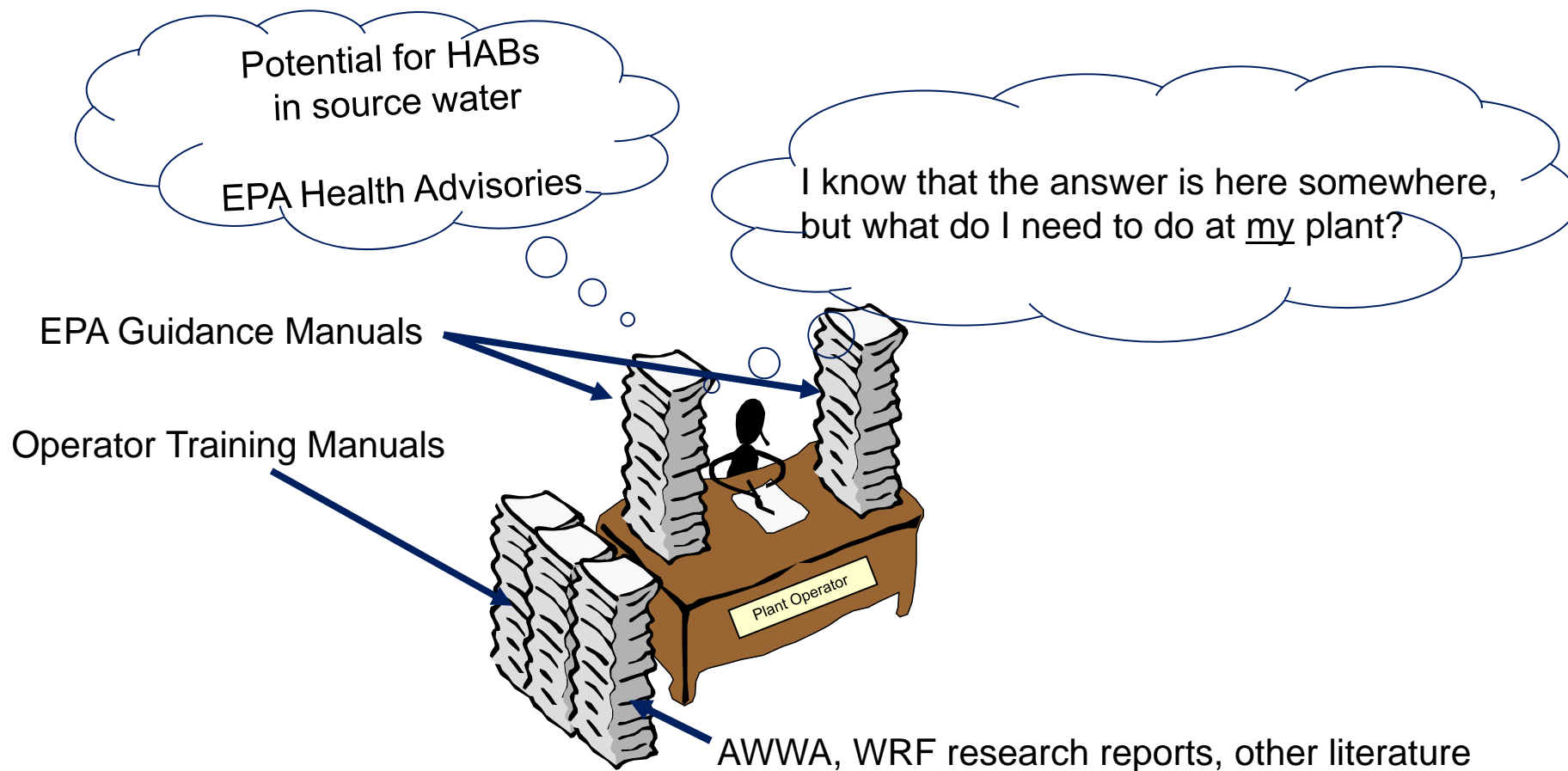
*United States Environmental Protection Agency  
Office of Groundwater and Drinking Water  
Standards and Risk Management Division  
Technical Support Center*

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# The Operator's Dilemma:





## Area-Wide Optimization Program (AWOP) solution:

- Develop approaches to assess why a treatment plant doesn't perform as desired.
- Develop knowledge/skills to help operators make changes at their treatment plants and achieve desired performance levels.
- Measurable improvements at individual plants
- Use existing facilities and enhanced process control.



# HAB CPE Development Pilot Project

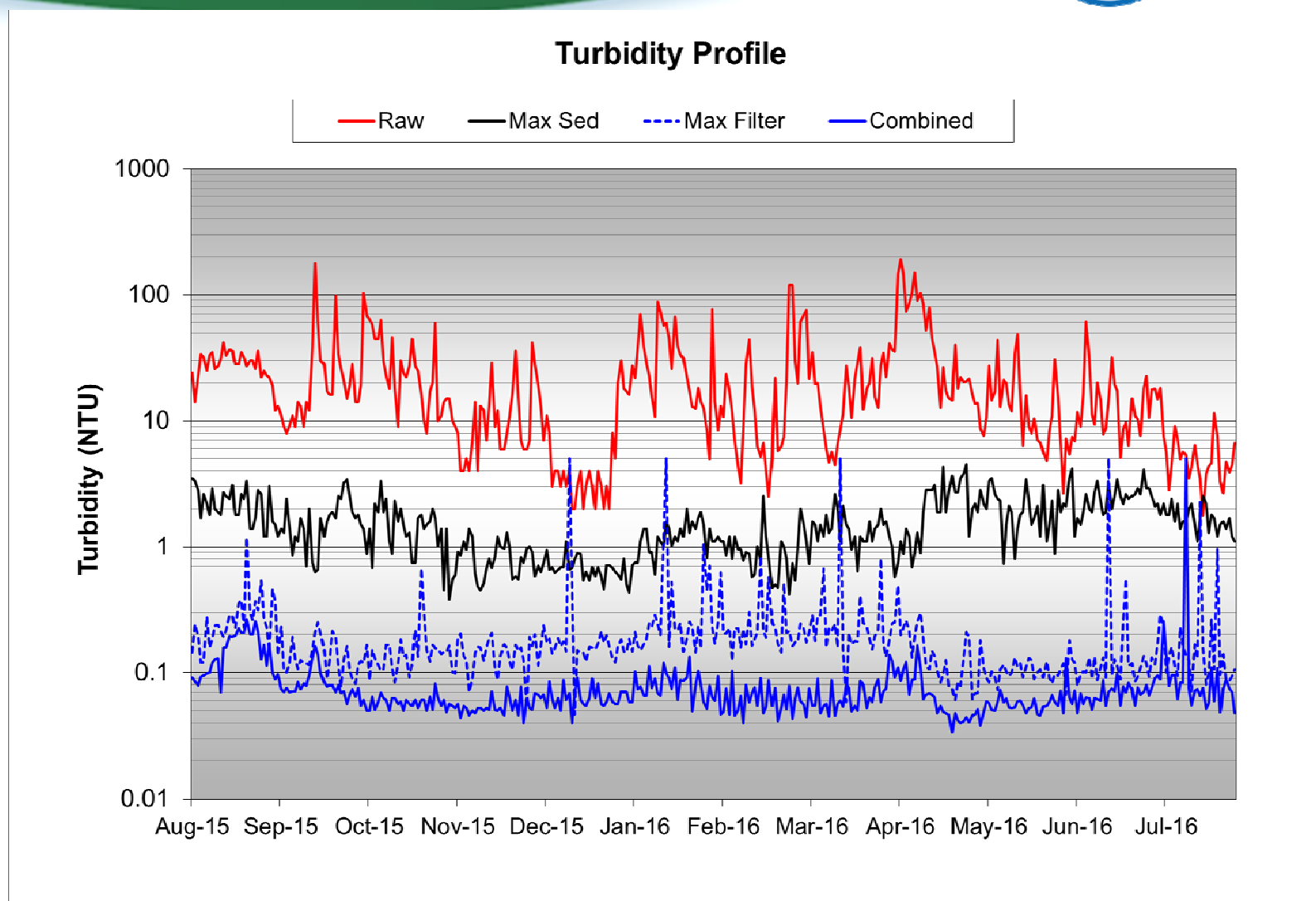
- Partnering with Ohio EPA
- Series of 4 pilot HAB CPEs at Ohio WTPs
- Develop protocol for conducting a HAB CPE by modifying the existing microbial CPE framework
- Transfer capability to conduct CPEs to Ohio EPA staff, and other states (long-term)
- Ohio EPA HAB water treatment experience at plant level



## Case Study #1: Western Lake Erie System

- Conventional treatment (coagulation, flocculation, sedimentation)
- PAC
- $\text{NaMnO}_4$  pre-oxidation
- Sodium hypochlorite disinfection





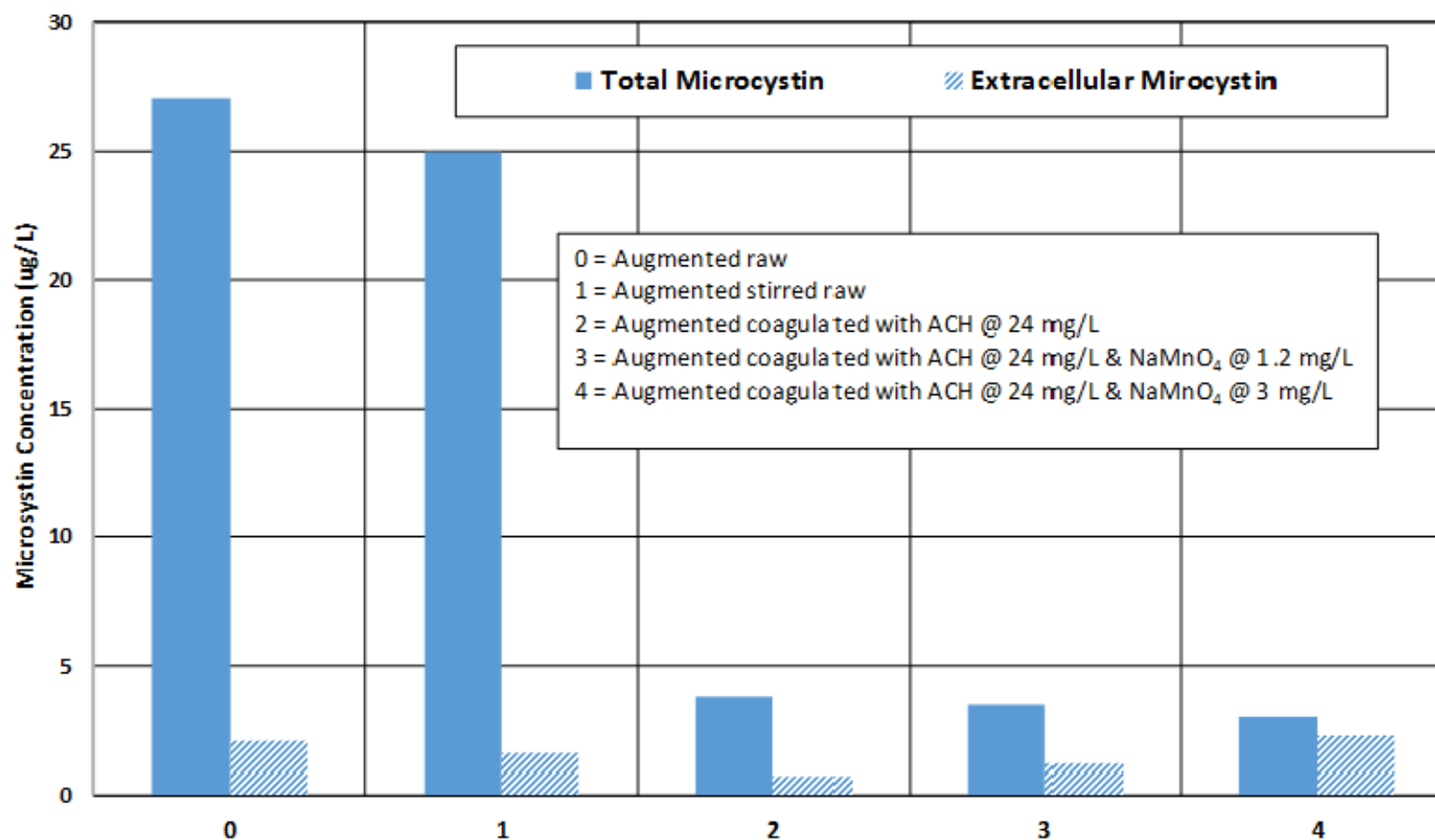
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**Microcystin Data**  
Jar test conducted on August 3, 2016



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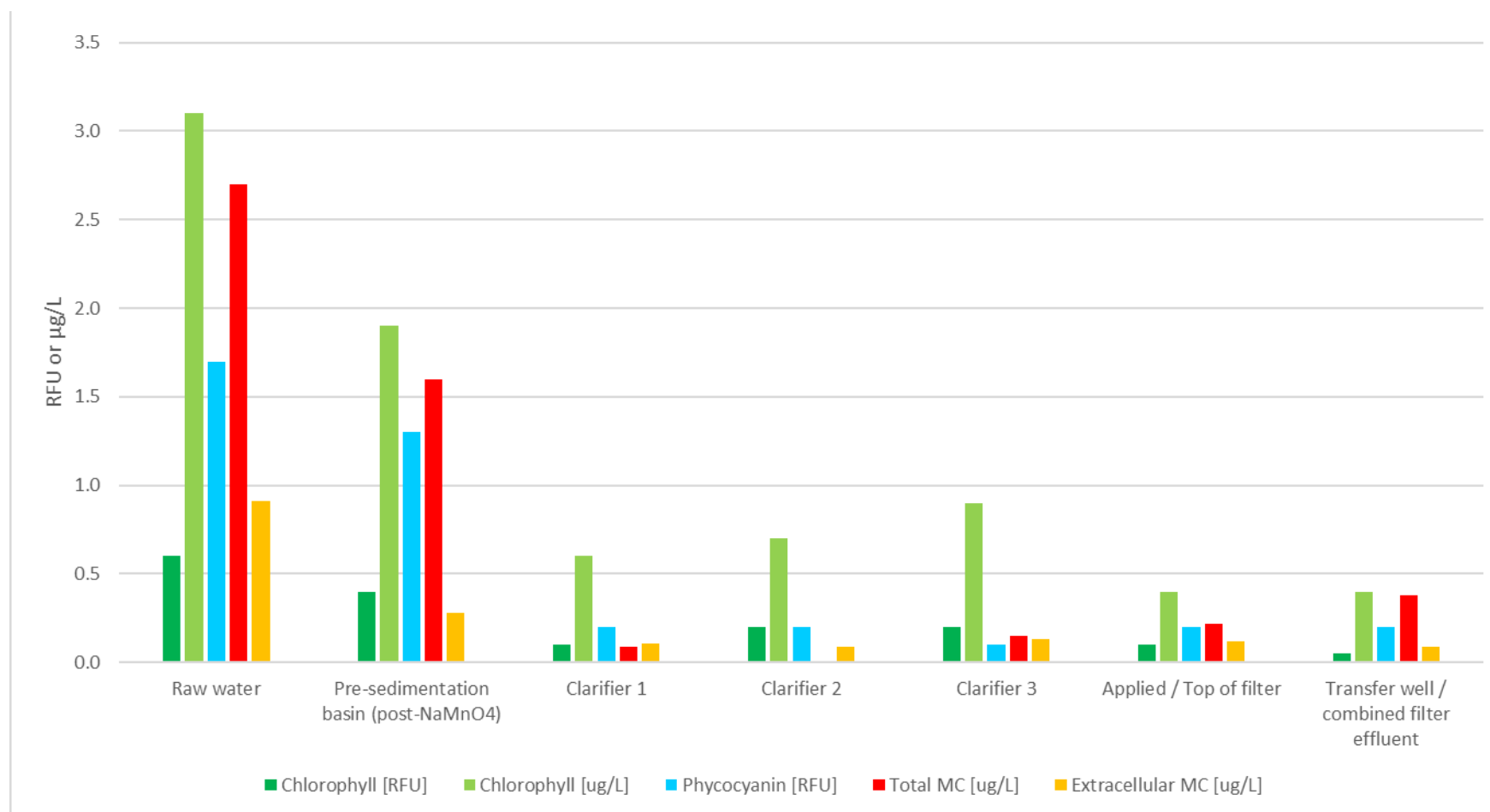
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## Plant profile sampling



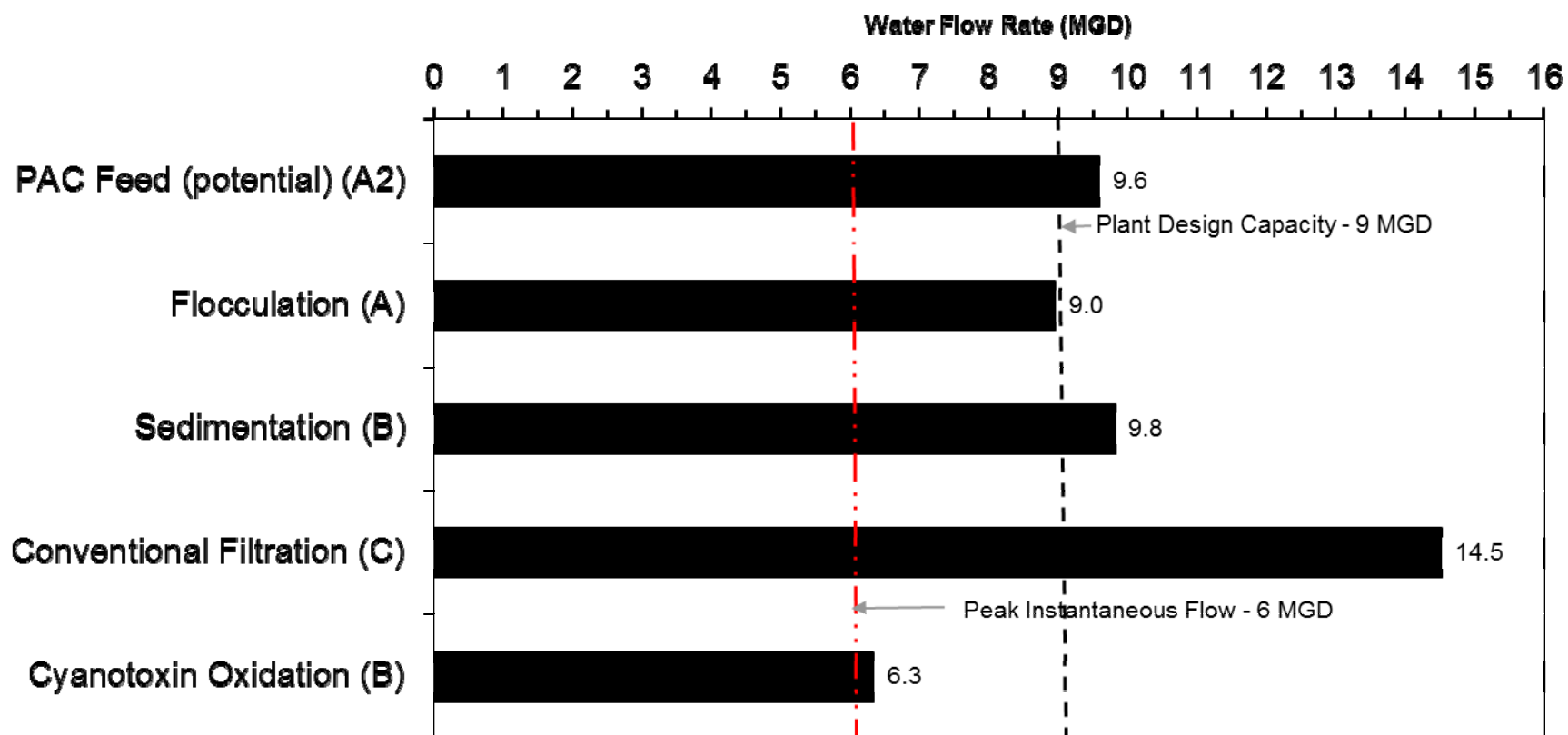
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## Major Unit Process Evaluation





## Case Study #1 Lessons-Learned:

- Value of plant profile in understanding capability of each unit process
- Difficulty in estimating PAC capacity – isotherms underreport due to competing organics in actual raw water
- Performance-limiting factors identified were not necessarily tied to HABs and have a more continuous impact on plant operations



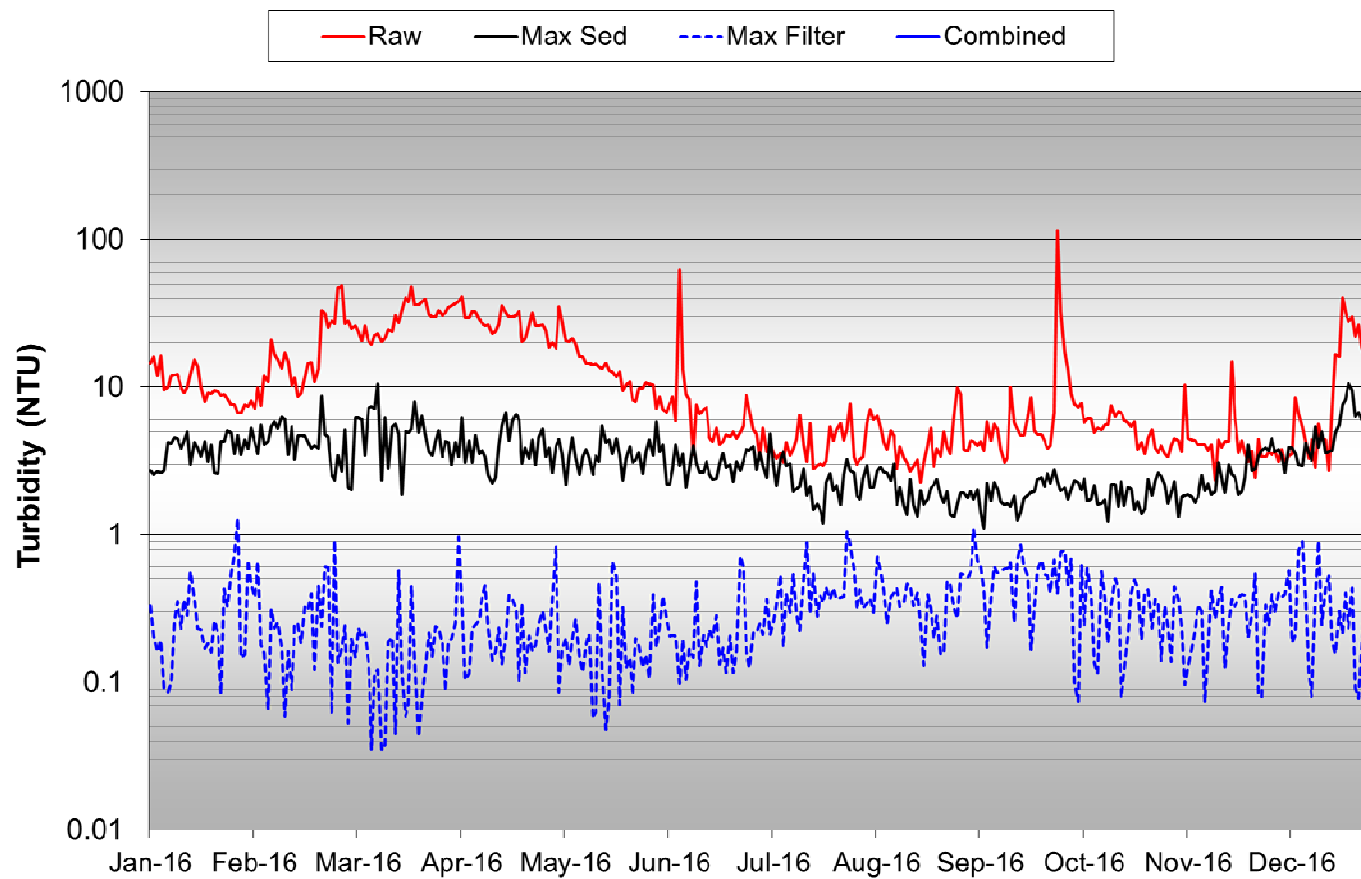


## Case Study #2: Inland Lake System

- In-stream reservoir
- Conventional treatment with softening (lime and soda ash)
- PAC addition at raw water intake
- Chlorine gas disinfection



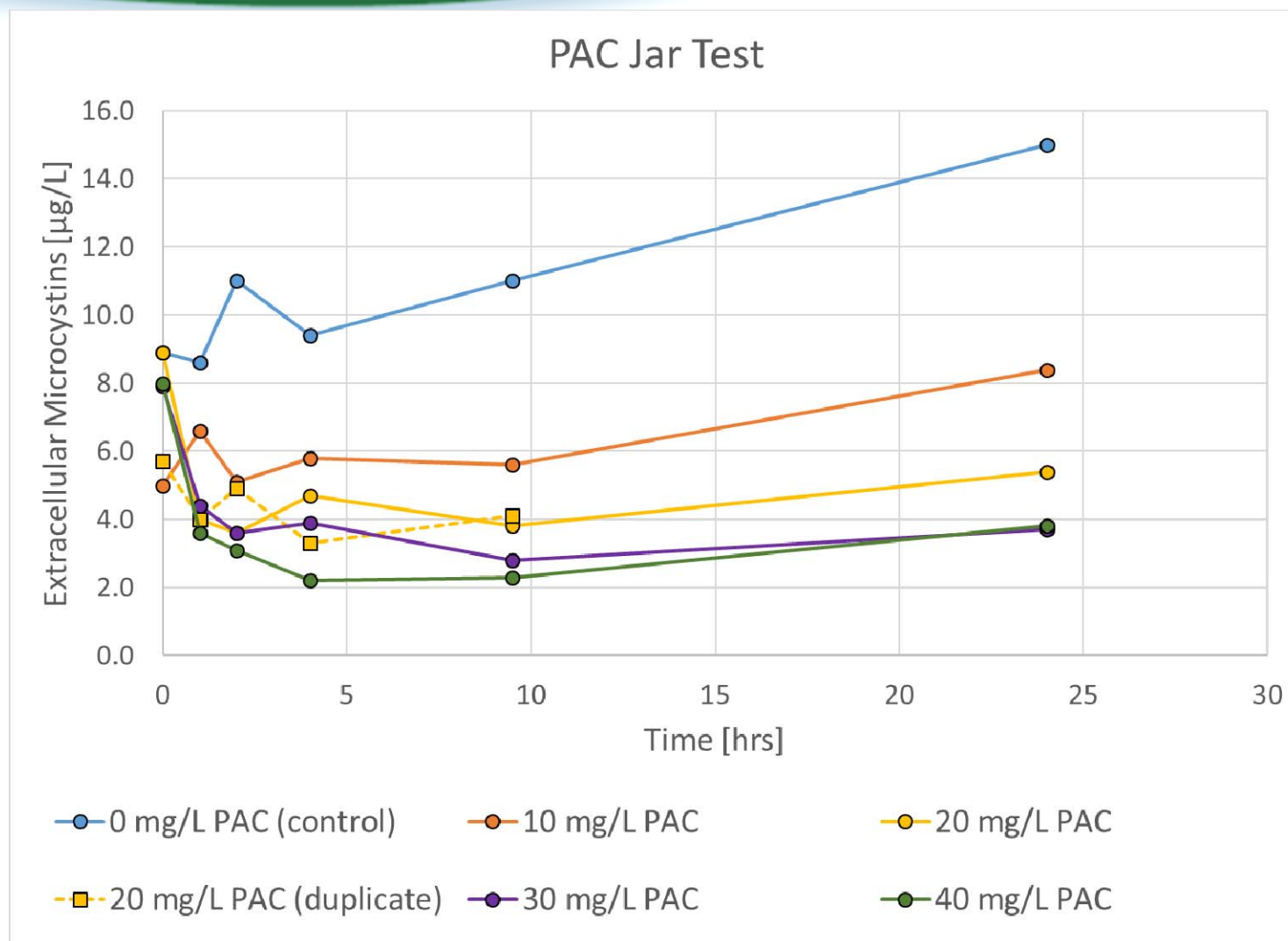
# Turbidity Profile



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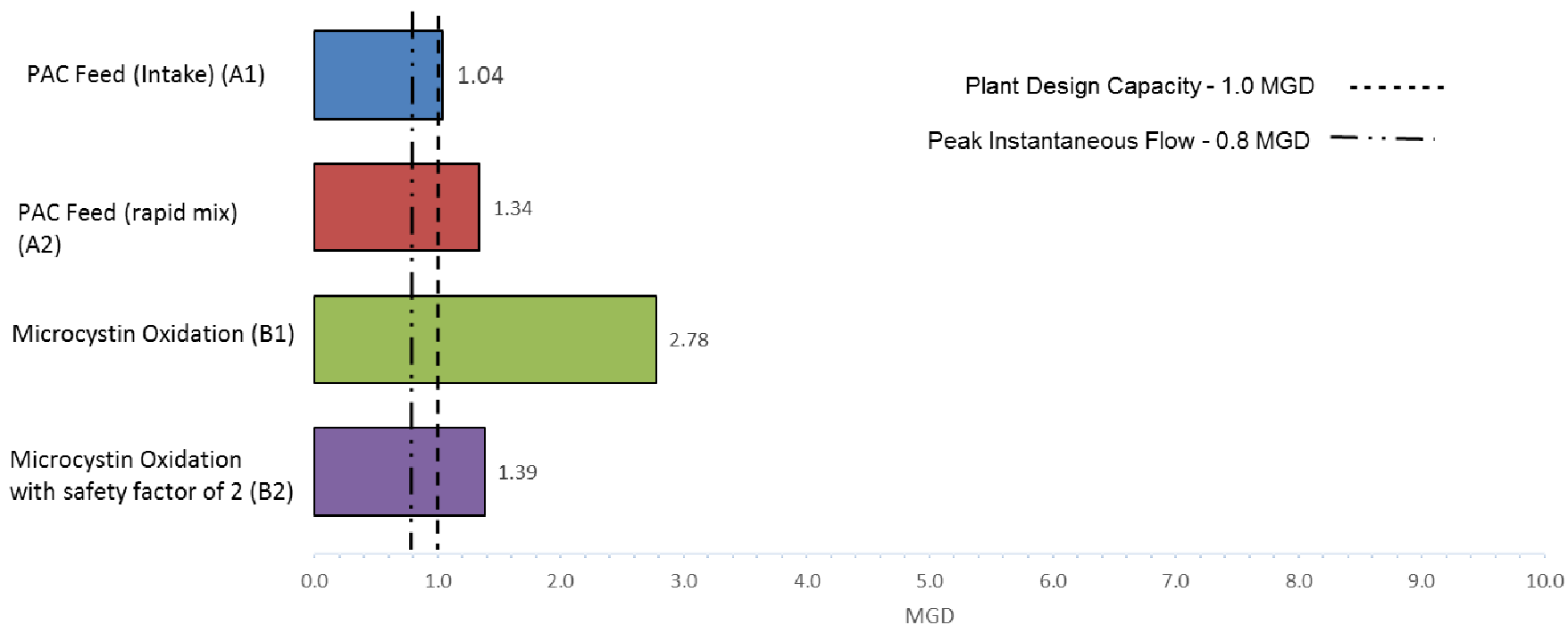
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# Major unit process evaluation

## Microcystins Adsorption & Destruction







## Case Study #2 Lessons-Learned

- Performance-limiting factors identified were not necessarily tied to HABs and have a more continuous impact on plant operations
- Difficulty in estimating PAC capacity
  - Jar testing protocol to help with MUP evaluation
  - Further studies at EPA research lab





Thank You!

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