



Woodard
& Curran

Artificial Intelligence Program

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AI Generated Image

Presentation outline

1. Big Picture Opportunities for AI
2. Examples of AI Applications
3. What Have We Learned So Far?

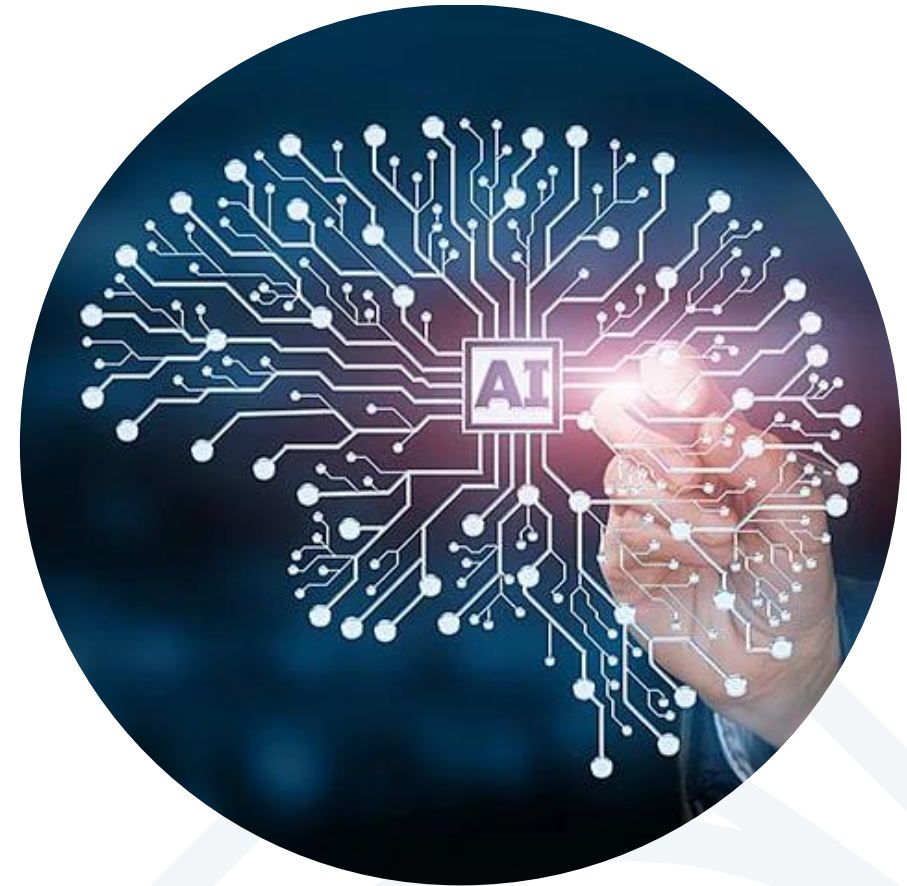


AI Generated Image

What is the potential of AI in water?

- ▶ *Fill Labor Gaps:* Offset the people "brain drain" from retirements with computers
- ▶ *Provide New Insights:* Better use of data
- ▶ *Enable Optimization:* Reduce cost pressures with real-time optimization
- ▶ *Improve Performance:* Meet increasing regulatory demands

This desire for intensification means we need to spend our time at utilities defining the beneficial applications...



What are the financial benefits of AI in water?

- ▶ The challenges facing the wastewater treatment industry:
 - increasing regulations
 - rising costs
 - the need for more efficient & sustainable operations

AI can help to address these challenges & improve the financial performance of wastewater treatment facilities by optimizing operations



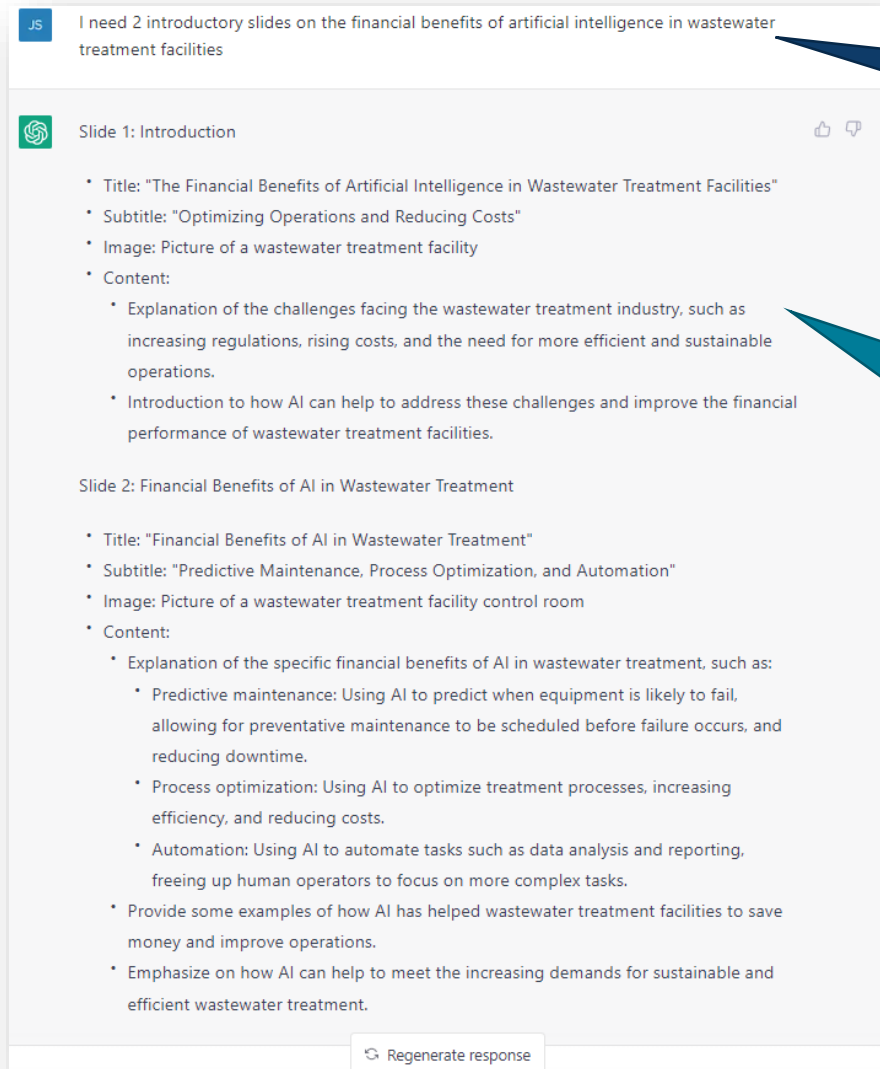
Specific financial benefits of AI in water



- ▶ Predictive maintenance
 - Use AI to predict when equipment is likely to fail, allowing for preventative maintenance to be scheduled before failure occurs, and reducing downtime
- ▶ Process optimization
 - Use AI to optimize treatment processes, increasing efficiency, and reducing costs
- ▶ Automation
 - Use AI to automate tasks such as data analysis and reporting, freeing up human operators to focus on more complex tasks

AI can help meet the increasing demands for sustainable and efficient wastewater treatment

AI can save us time! *The last two slides were generated by AI...*



JS I need 2 introductory slides on the financial benefits of artificial intelligence in wastewater treatment facilities

Slide 1: Introduction

- Title: "The Financial Benefits of Artificial Intelligence in Wastewater Treatment Facilities"
- Subtitle: "Optimizing Operations and Reducing Costs"
- Image: Picture of a wastewater treatment facility
- Content:
 - Explanation of the challenges facing the wastewater treatment industry, such as increasing regulations, rising costs, and the need for more efficient and sustainable operations.
 - Introduction to how AI can help to address these challenges and improve the financial performance of wastewater treatment facilities.

Slide 2: Financial Benefits of AI in Wastewater Treatment

- Title: "Financial Benefits of AI in Wastewater Treatment"
- Subtitle: "Predictive Maintenance, Process Optimization, and Automation"
- Image: Picture of a wastewater treatment facility control room
- Content:
 - Explanation of the specific financial benefits of AI in wastewater treatment, such as:
 - Predictive maintenance: Using AI to predict when equipment is likely to fail, allowing for preventative maintenance to be scheduled before failure occurs, and reducing downtime.
 - Process optimization: Using AI to optimize treatment processes, increasing efficiency, and reducing costs.
 - Automation: Using AI to automate tasks such as data analysis and reporting, freeing up human operators to focus on more complex tasks.
 - Provide some examples of how AI has helped wastewater treatment facilities to save money and improve operations.
 - Emphasize on how AI can help to meet the increasing demands for sustainable and efficient wastewater treatment.

Regenerate response

My input:

I need 2 introductory slides on the financial benefits of artificial intelligence in wastewater treatment facilities

Chat GPT's Output:

Title: "The Financial Benefits of Artificial Intelligence in Wastewater"

Subtitle: "Optimizing Operations and Reducing Costs"

Image: Picture of a wastewater treatment facility

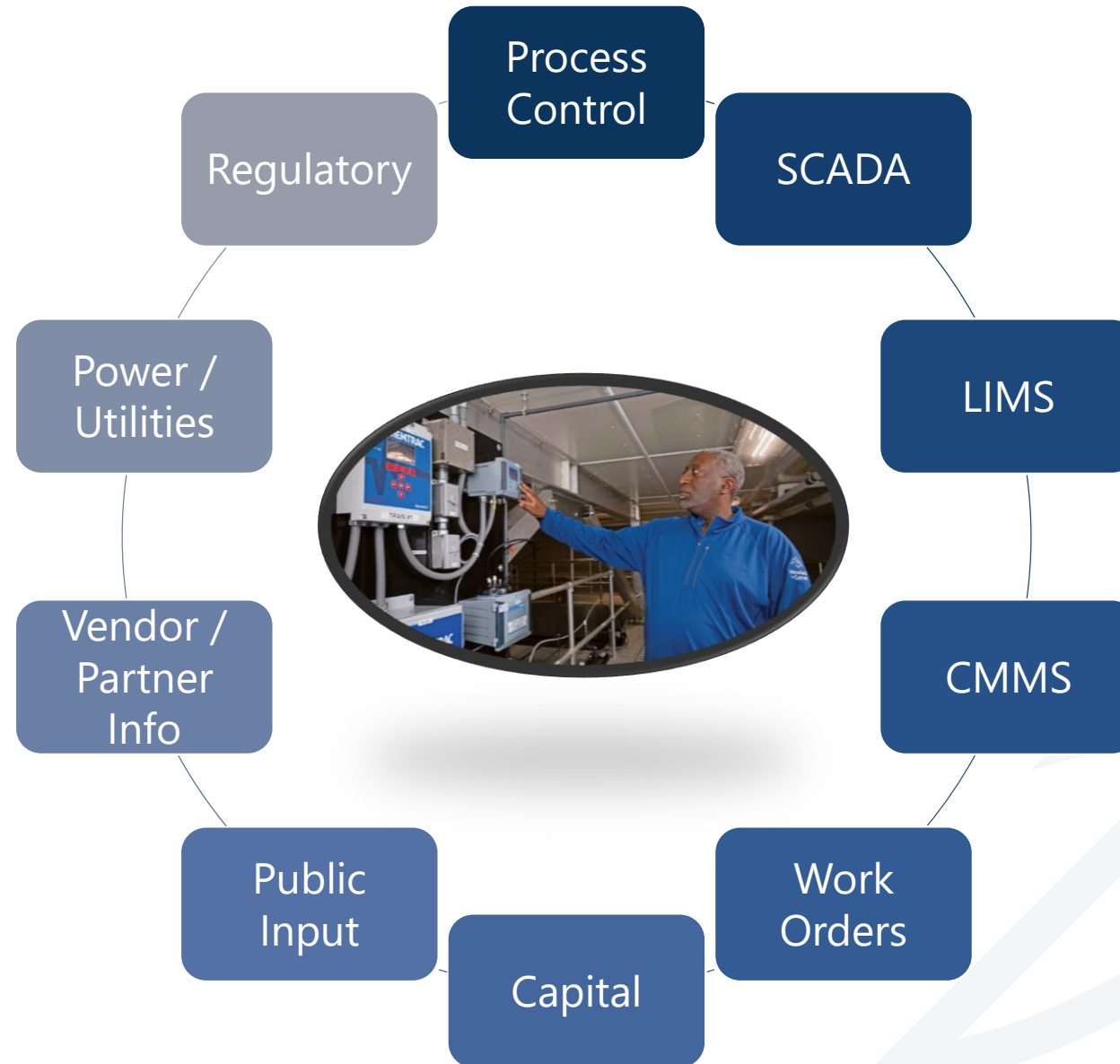
Content: Explanation of challenges...increasing regulation, rising costs, and the need for more efficient and sustainable operations....



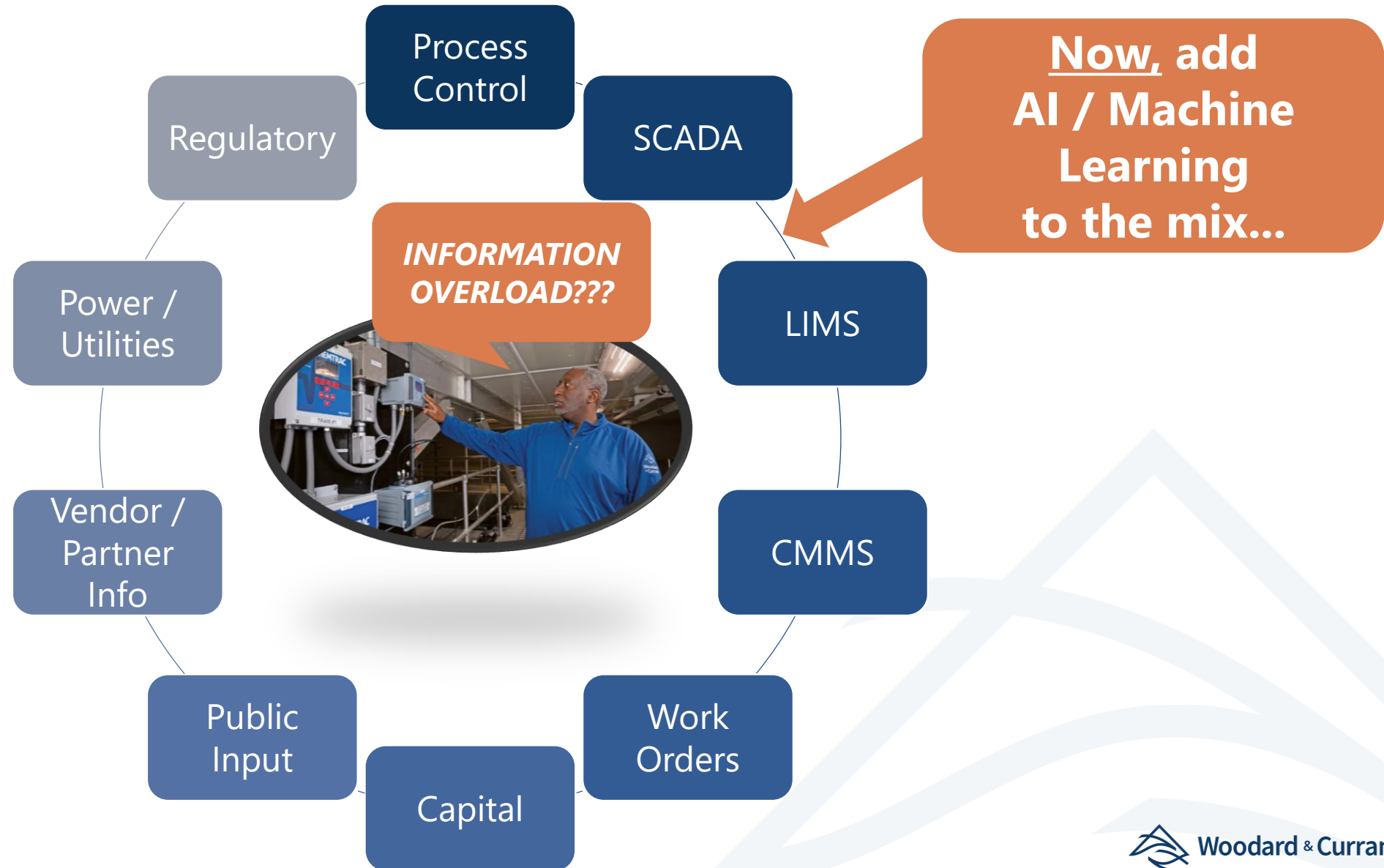
Enough with the theoretical...

...What can we do to get practical?

We collect lots of data...



How can AI help us use this information?



W&C AI Pilot #1:

Leverage grant funding for experimentation

Goal: Use AI to flag operational issues & recommend actions to increase operational efficiency

▶ Hull, MA Municipal Wastewater Treatment Plant

- 3.1 MGD capacity
- 7 pump stations
- 44 miles gravity sewer
- Ocean outfall

▶ 2019 MassCEC Grant (~ \$140K)

- Implement AquaSight APOLLO artificial intelligence platform
- Connected to WWTP unit processes and collection system pump stations



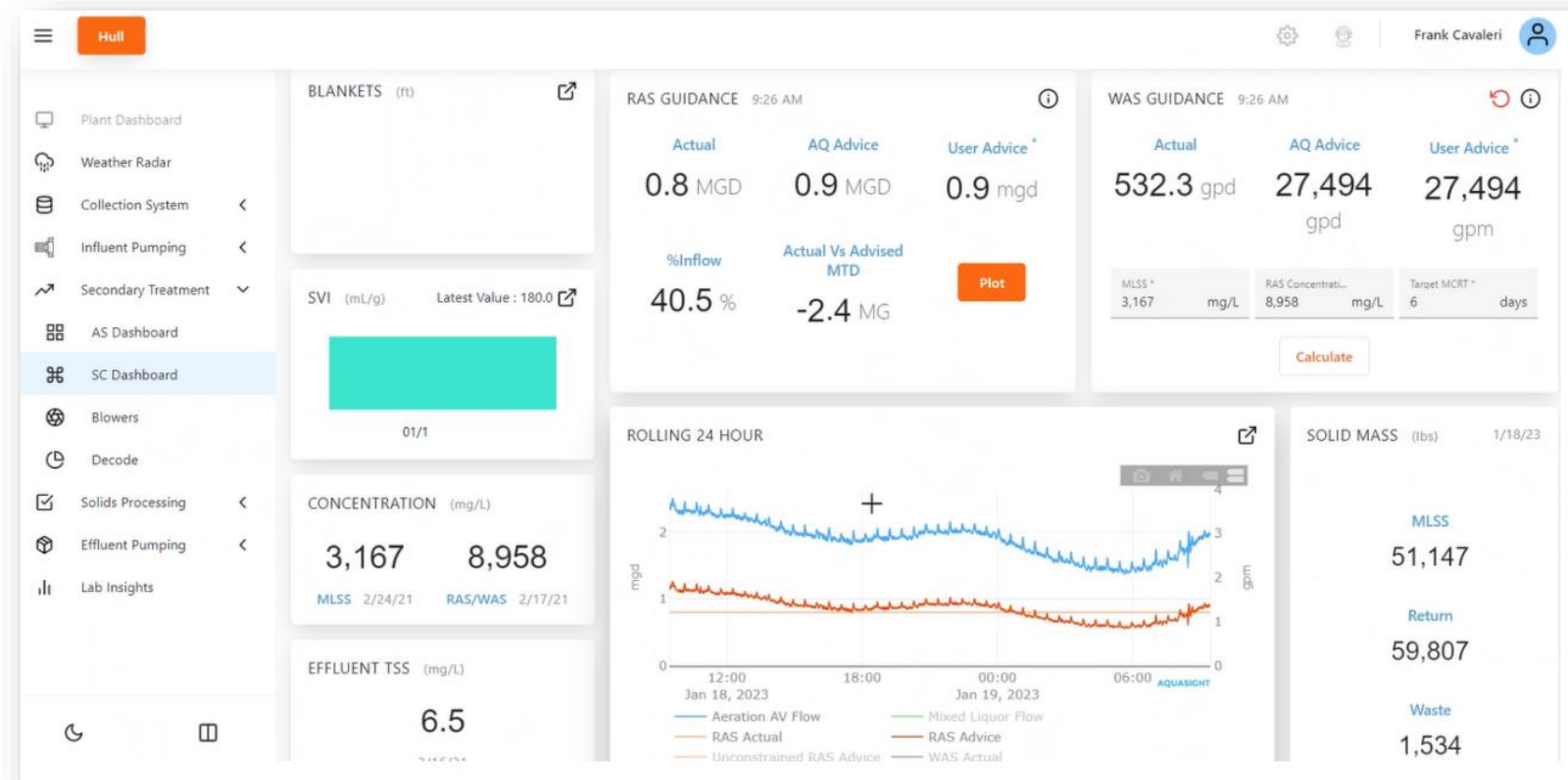
W&C AI Pilot #1: Lessons learned

► Positives

- AI partnership with Aquasight was effective
- Costs finished within budget
- Real-time dashboard with good information

► Challenges

- Slow operator adoption
- AI effectiveness varies between systems



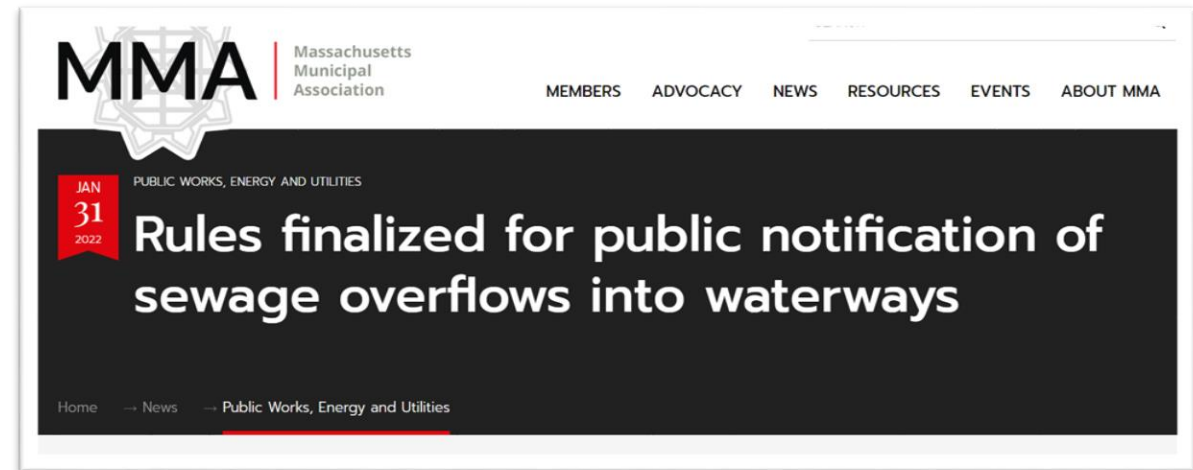
Aquasight Secondary Clarifier Dashboard
at the Hull WWTP

W&C AI Pilot #2:

Automation to support new regulatory requirement

Goal: Automate CSO notification

- ▶ Municipal CSO Facility
 - In 2022, MassDEP required two-hour notification of CSO activation
- ▶ Current notification process is operator-intensive
 - Operators confirm multiple conditions are met by reviewing multiple data sets including SCADA & weather
 - Operator calls HQ
 - HQ posts info on website & notifies MassDEP
- ▶ Used existing Aquasight ATLAS program as the platform for the automated system



W&C AI Pilot #2: Lessons learned

► Positives

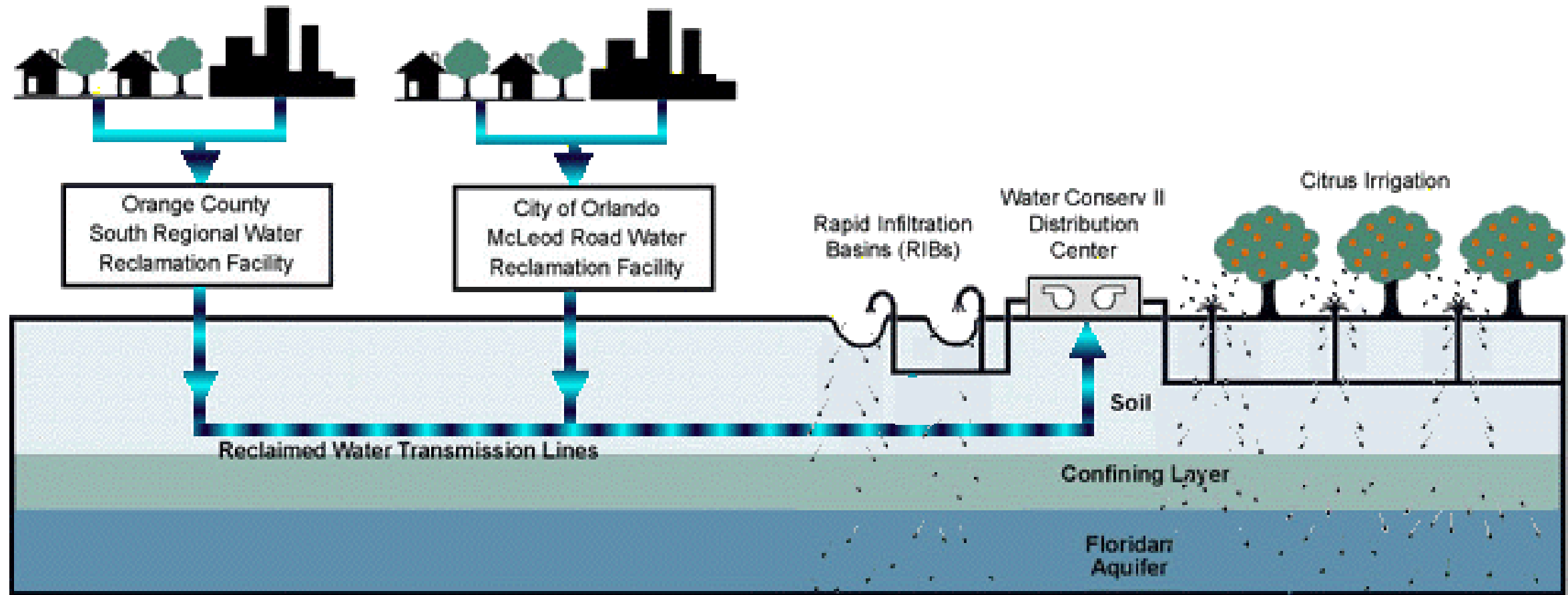
- AI partner effectively collaborated with the operators to define the process
- Software was able to provide real-time notifications

► Challenges

- Needed additional instrumentation
 - Current system did not have all measurement tools/probes
- **Not ready to rely on automation for regulatory compliance (yet)**



W&C AI Pilot #3: Water Conserv II, Orange County, FL



W&C AI Pilot #3: Water Conserv II System Design & Operation



- ▶ System Design
 - Designed for average flow of 50 MGD and can handle peak flows up to 75 MGD
- ▶ Operation
 - Monitor weather conditions
 - Monitor groundwater elevations in groundwater wells
 - Utilize SCADA system to control distribution of recycle water in system

W&C AI Pilot #3:

Maximize operational efficiency at Water Conserv II

- ▶ Project Objectives
 - Mitigate the brain drain
 - Use data to inform operational decisions
 - Maintain permit compliance
- ▶ Key Question
 - **How do you determine which RIBs to put/keep in service?**
- ▶ Project Approach
 - Build an AI model to predict groundwater levels
 - Combine data sources including weather, hydrogeologic and operations



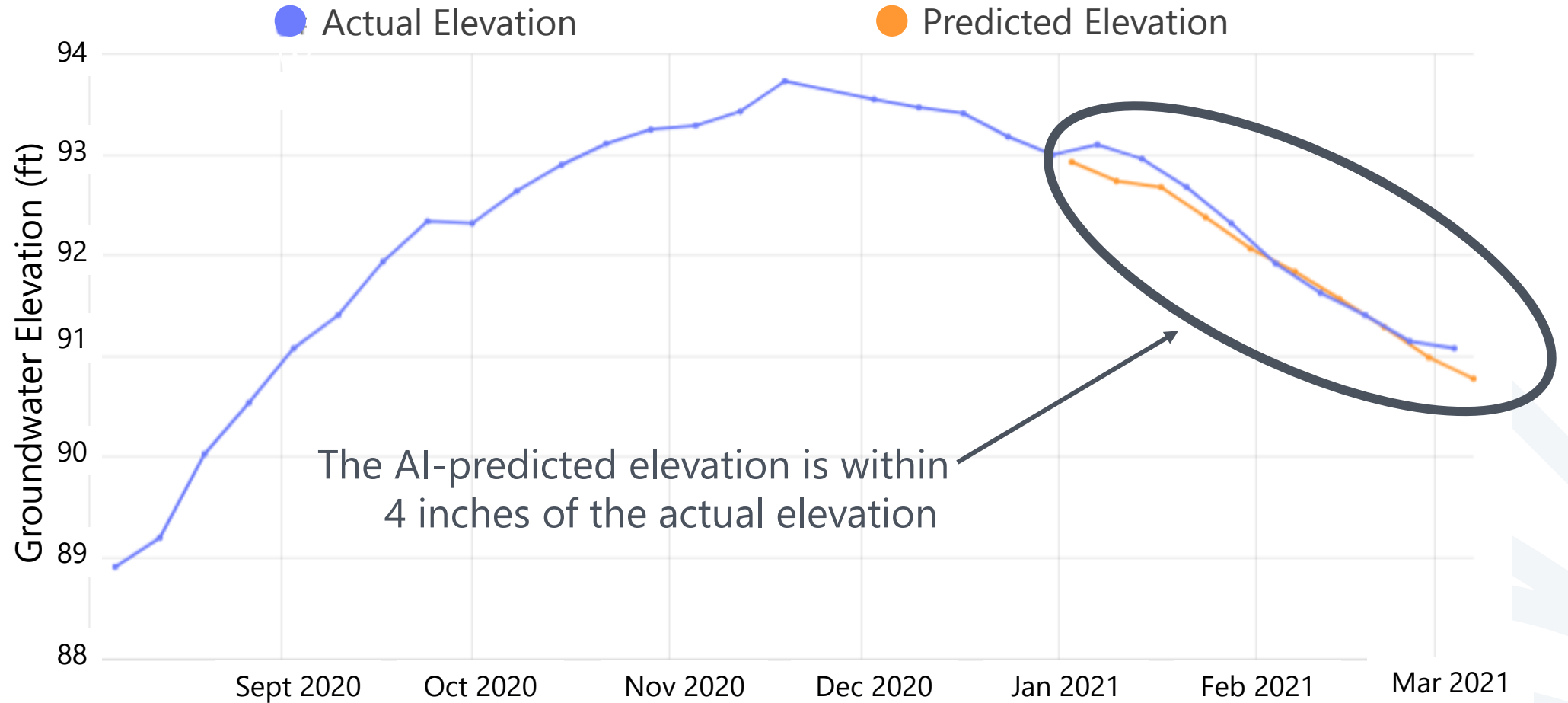
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W&C AI Pilot #3: Obtained good preliminary results

Weekly Groundwater Elevation

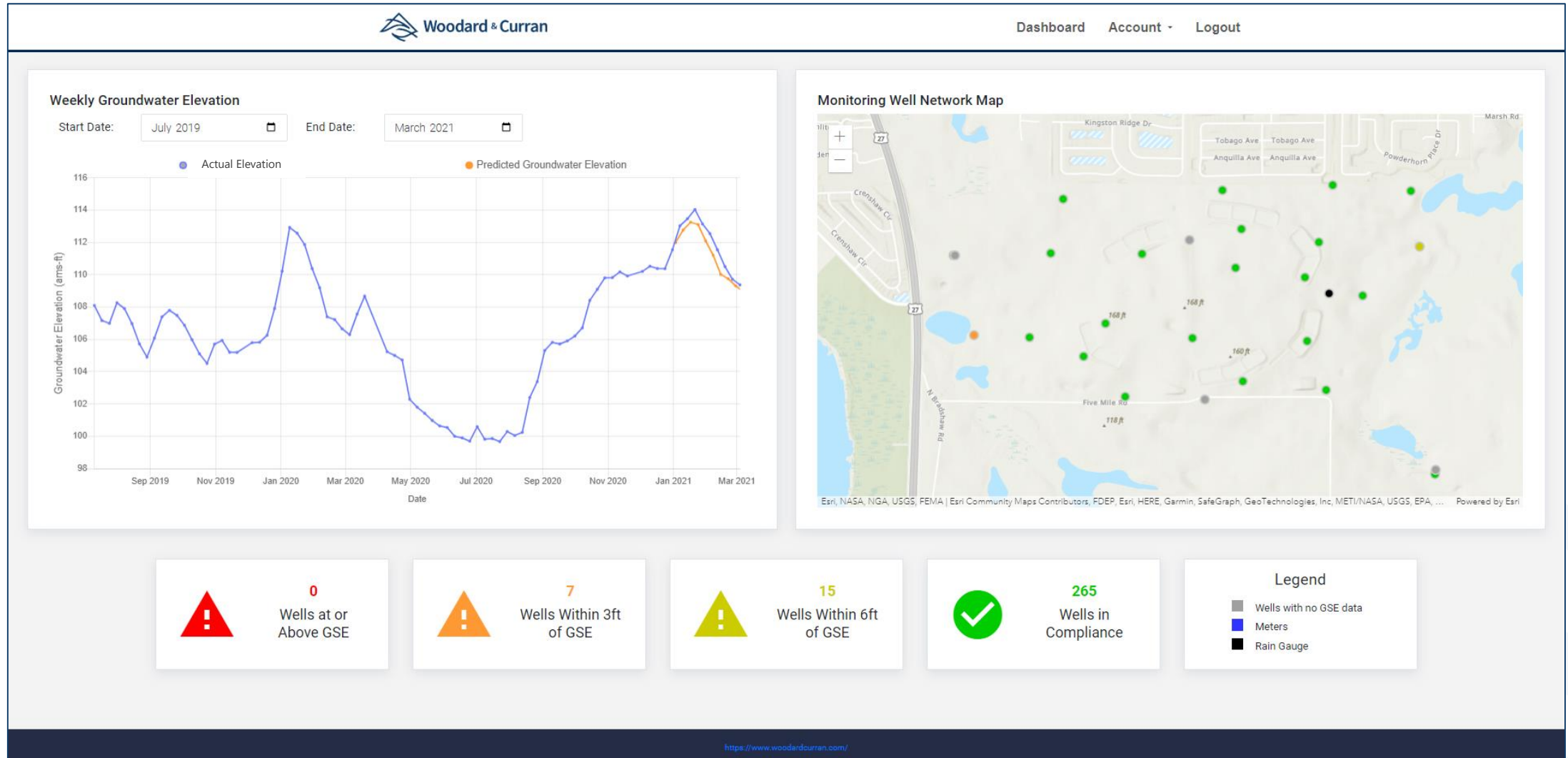
Start Date: August 2020

End Date: March 2021



The AI-predicted elevation is within 4 inches of the actual elevation

W&C AI Pilot #3: Dashboard Displays Visual & Actionable Data



<https://www.woodardcurran.com/>

W&C AI Pilot #3: Lessons learned

Positives:

- Extensive, organized, high-quality data available
- Clear vision of desired outcome
- Internal multi-disciplinary expertise to drive approach and results
- Demo dashboard displays alerts to aid in operational decision making



Challenges:

- Custom solution & approach developed from scratch
- Required merging expertise in groundwater systems & machine learning
- Need to drive operator adoption





Next steps on the journey...
...what do we do now?

W&C AI Pilot #4:

Clarify how to measure AI effectiveness

- ▶ Create a framework to assess AI applications
 - Evaluate the return on investment (ROI)
 - Assess vendor capabilities and advantages for in-house implementation
- ▶ Leverage experience from academia (Roux Institute at Northeastern)
- ▶ Use framework & continue to experiment with data-driven decisions in real applications
 - Municipal drinking water treatment facility
 - Municipal wastewater treatment facility
 - Industrial treatment facility



The Roux Institute
Northeastern University

Key Takeaways from our AI Trials



Developing a framework for evaluating ROI is important

Define the key questions that need to be answered
Define how to measure the results



Must have a robust integrated data management strategy

Identify and collect the data that is needed to answer the questions
Data quality is imperative before AI can be applied



Subject matter expertise matters

Effective collaboration between process experts and data experts is imperative – you need both to be successful
Capitalize on expertise from the vendors



At the end of the day, it's all about the people

Engagement at all levels and departments of the organization is critical to adoption
If AI isn't easily integrated into the standard operating procedures, then adoption will be low

W&C Artificial Intelligence Program

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