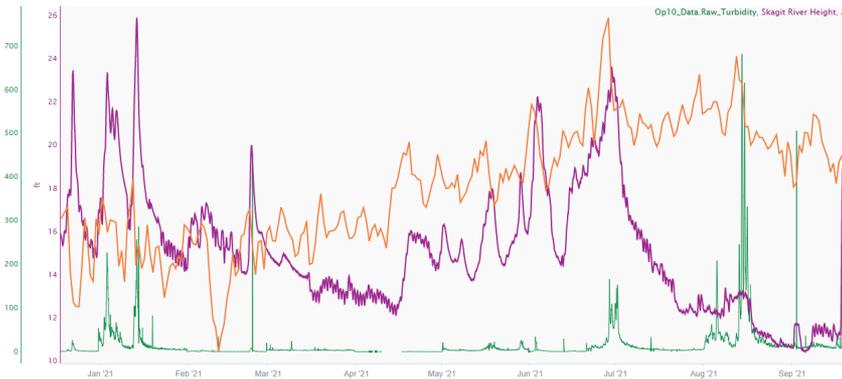


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# Water Treatment Optimization with Advanced Analytics



City of Anacortes, Washington



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# Summary

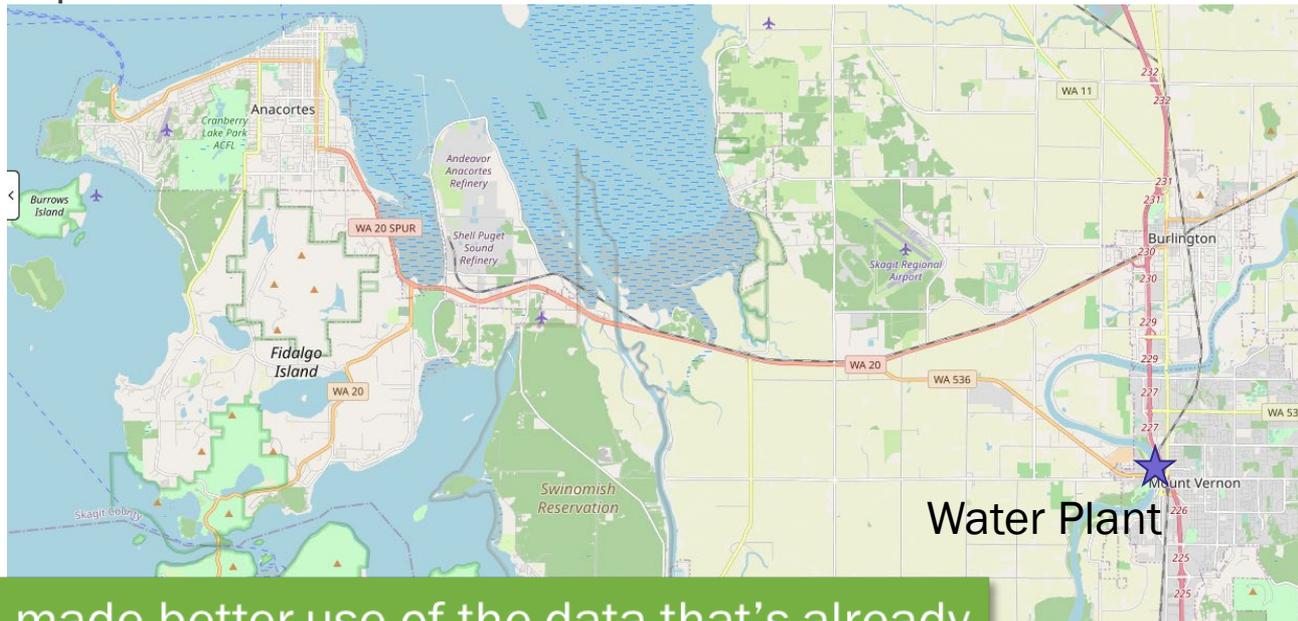
- Project inspiration and funding
- Analytics tools and methods
- Analytics use cases
  1. High service pumping
  2. Source water quality
  3. Flood response
- Next steps



# Project Motivation



- 42MGD water plant serving 56,000 customers
- Seeq trial initially requested to apply for energy efficiency project funding from Puget Sound Energy
- Chemical optimization was previously accomplished using a Zetasizer
- What other improvements can be made?

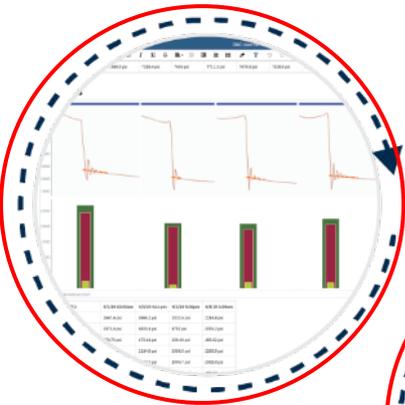


What if we made better use of the data that's already collected and saved?

# Types of Analytics

## Diagnostic

Why did it happen?

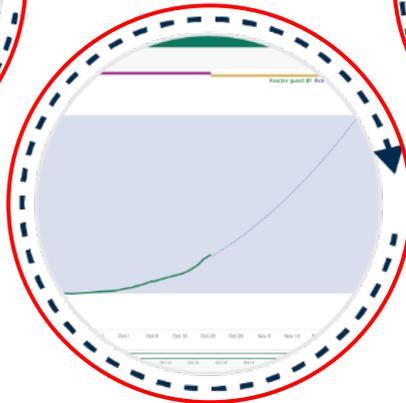


### Benefits

Root cause investigations on/of historical data sets

## Predictive

What will happen?

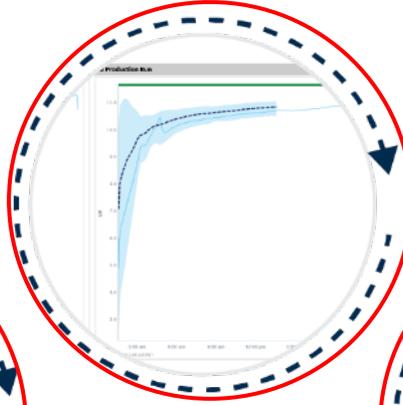


### Benefits

Increase asset availability and improve batch outcomes

## Monitoring

What is happening?



### Benefits

Advisory real-time and prediction view of process and asset status

## Prescriptive

What should happen?



### Benefits

Evaluate options to make decisions that optimize outcomes

## Descriptive

What happened?

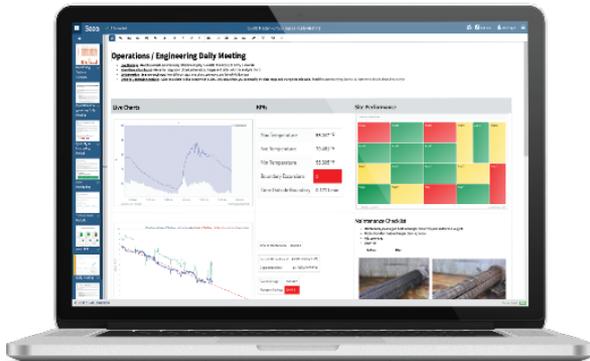


### Benefits

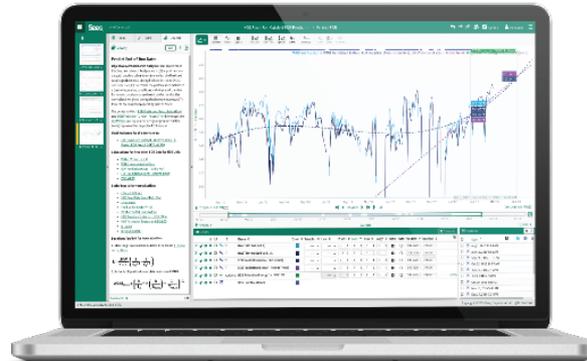
Create and share insights to inform decisions plant wide

# Analytics Software

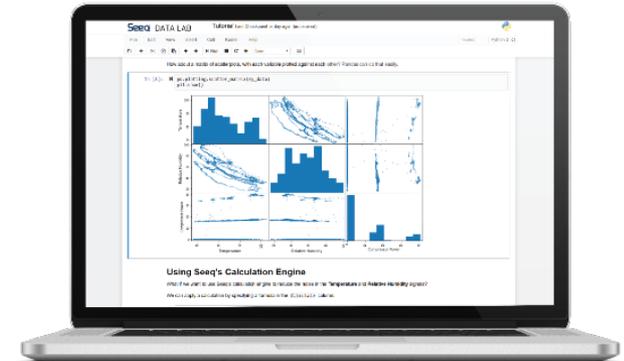
## Seeq ORGANIZER



## Seeq WORKBENCH



## Seeq DATA LAB



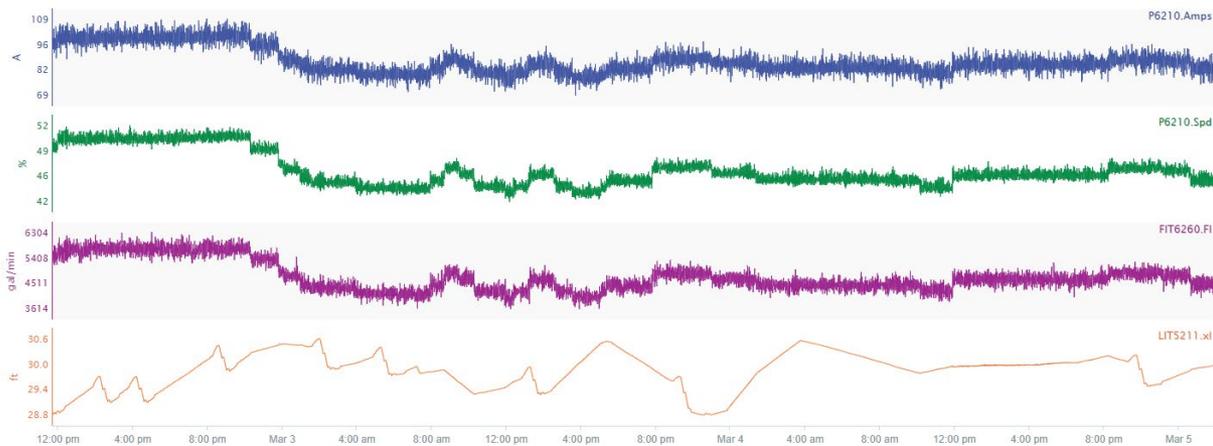
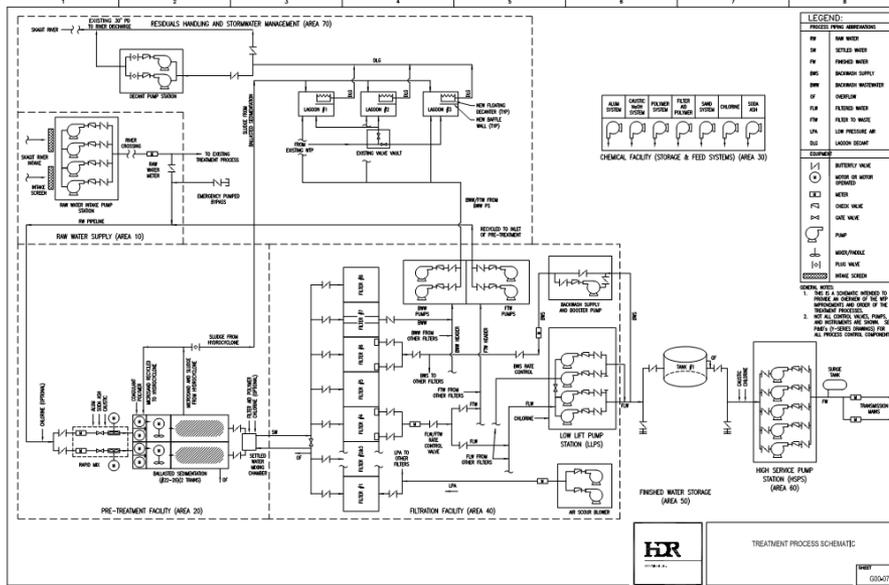
**Manufacturing Data**

See full list at: [info.seeq.com/Supported-Data-Systems](http://info.seeq.com/Supported-Data-Systems)

**SQL-Based Data**

**Custom Sources**

# Connect to SCADA Historian



»COAHISTORIAN»Public Groups  
»AWTP\_Galaxy\_2017

- 10\_RawWaterSupply
- 20\_PreTreatment
- 29thStReservoir
- 30\_ChemFacility
- 3MillionGallonReservoir
- 40\_FilterFacility
- 50\_FinishedWater
- 60\_HighServicePS
- 70\_Residuals
- 80\_PowerSystem
- AAve\_PLC
- AAvenue
- BlueHeronViewEngine
- BlueHeron\_Backplane
- BlueHeron\_ENB
- BlueHeron\_PLC
- BlueHeron\_Platform
- BlueHeron\_Viewer
- CIP\_MTU\_AOS1
- CastillejaBluff

# High Service Pump Station

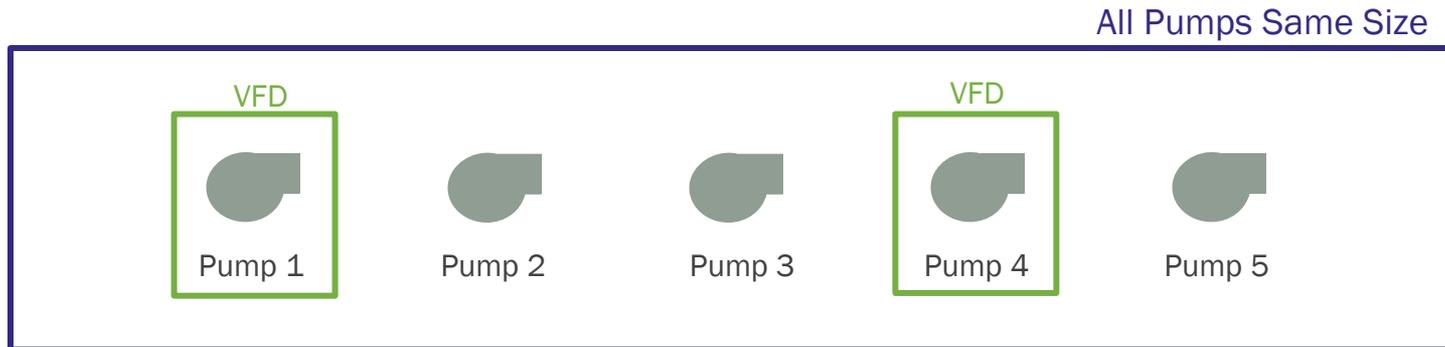
# High Service Pumping



Wholesale and industrial users account for ~70% of the total finished flow

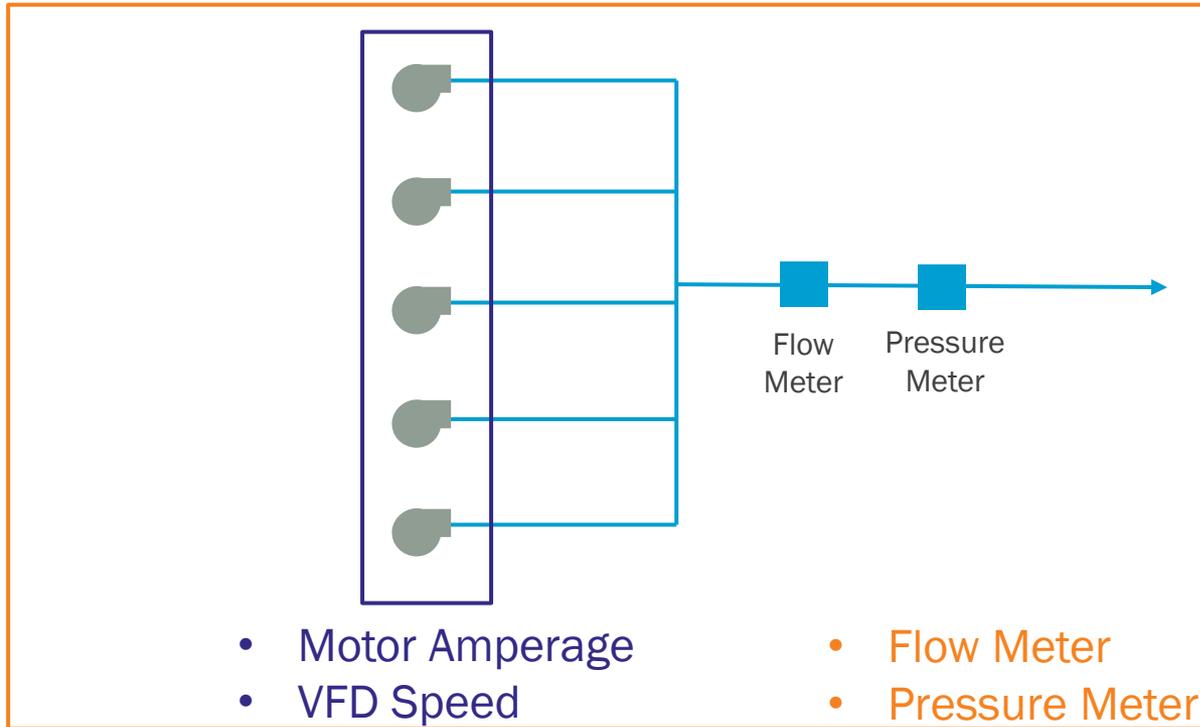
# High Service Pumping

- 5 vertical turbine pumps with space for a sixth
- Uses approximately half of the total power at the facility

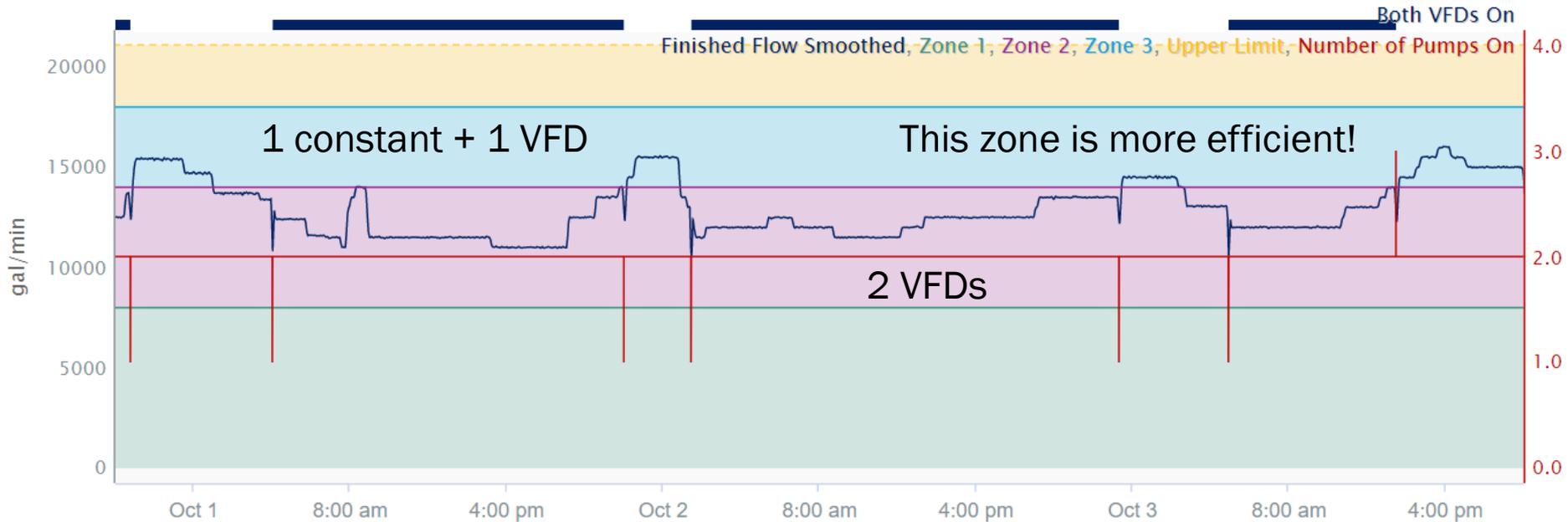


- Challenges
  - Fluctuating demands of industrial users
  - Flow meters integrated in SCADA for industrial users are not fully encompassing of their flow
    - AMI will be integrated into SCADA later this year

# Challenges with Limited Metering



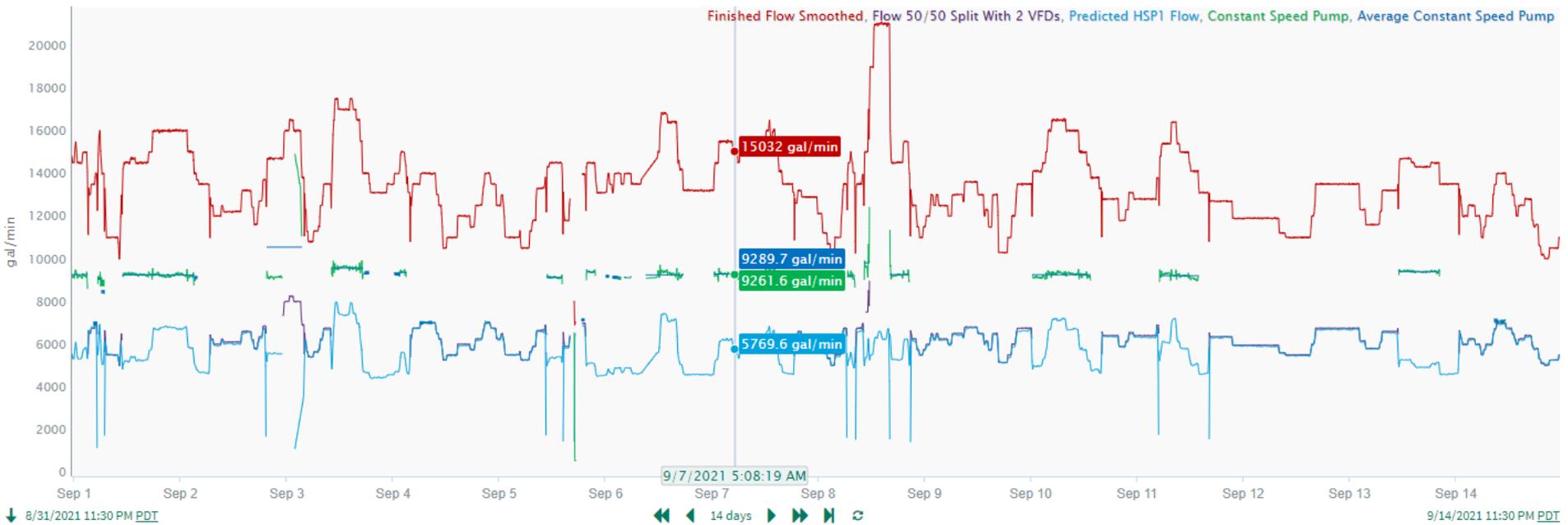
# High Service Pumping



 Both VFDs are programmed to operate at the same speed

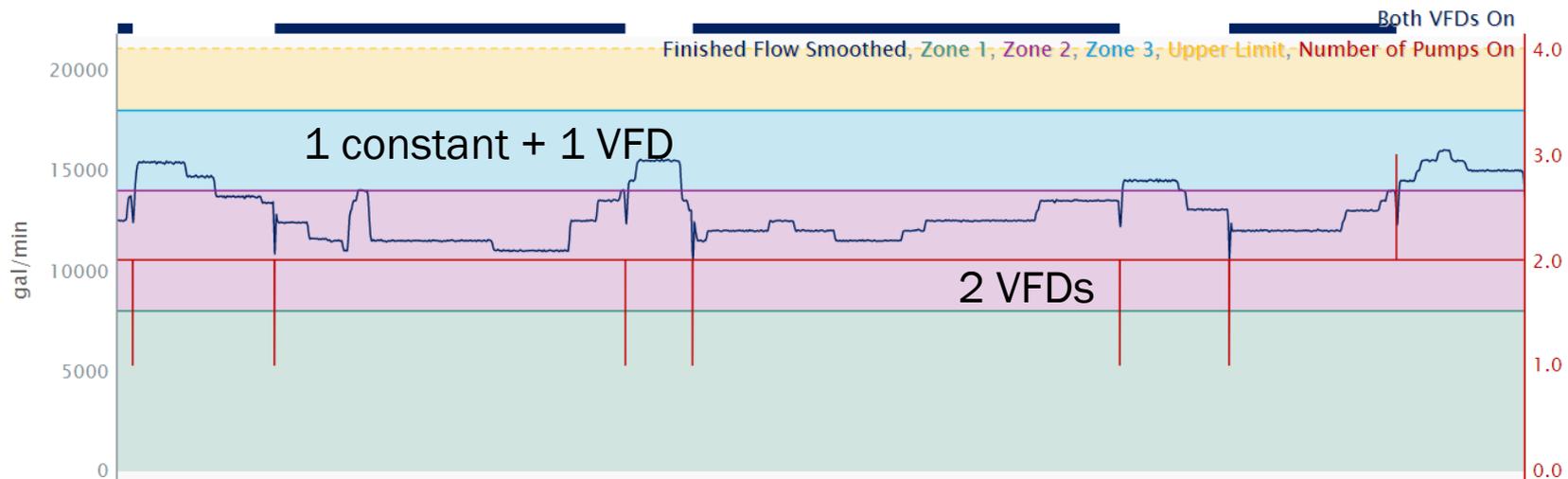
# Real Time Pump Functionality

- Calibrate the VFD speed with flow
- Create conditions to estimate constant speed pump flow
- Compute real time TDH



# Pumps are Oversized

	Design	Actual
Head (ft)	453	280-320
Flow (gpm)	7300	8900-9300



Conclusion:

What can you find in the data you have already collected using analytics tools and techniques?

# Source Water Quality

# Source Water Quality

- Skagit River is source water
- Variable high influent turbidity
- Data Analytics
  - Combine various data signals into a single location
  - Create models to predict outcomes



SCADA



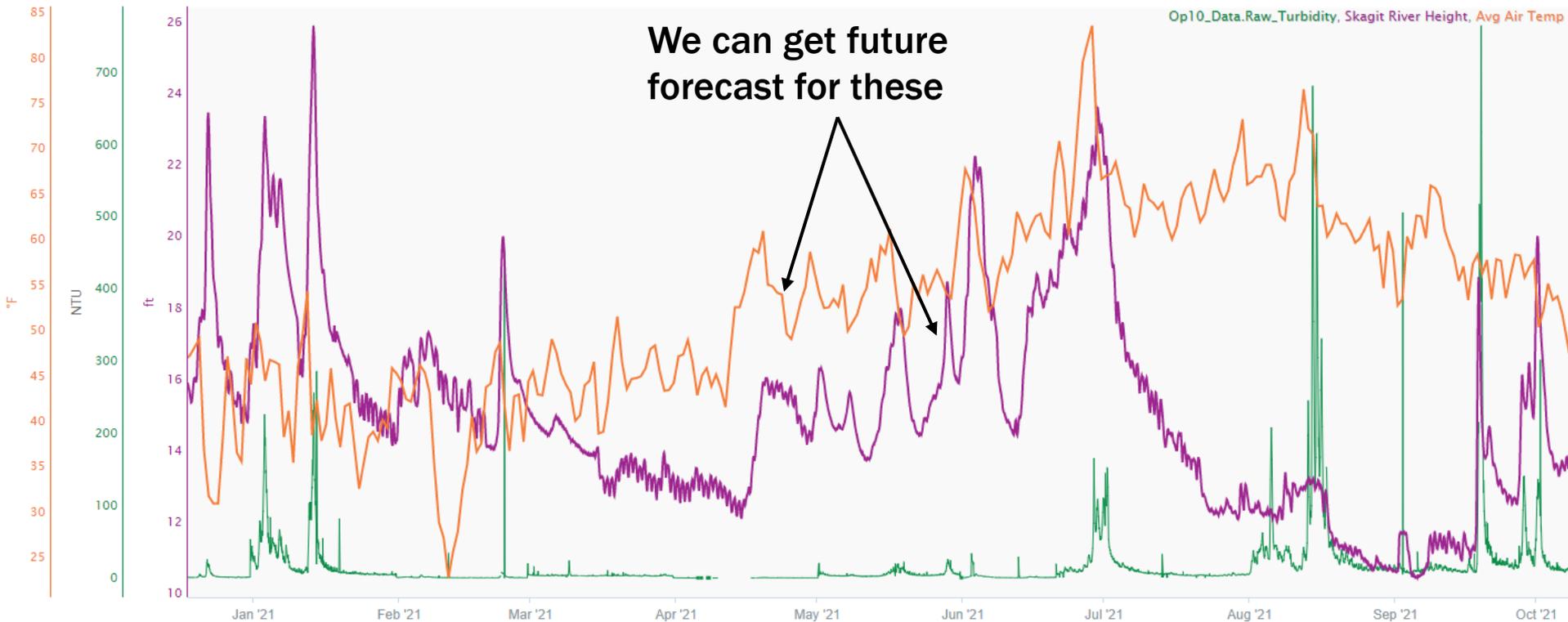
Influent Water  
Quality Model

Working/Operational  
Knowledge



Institutional  
Knowledge

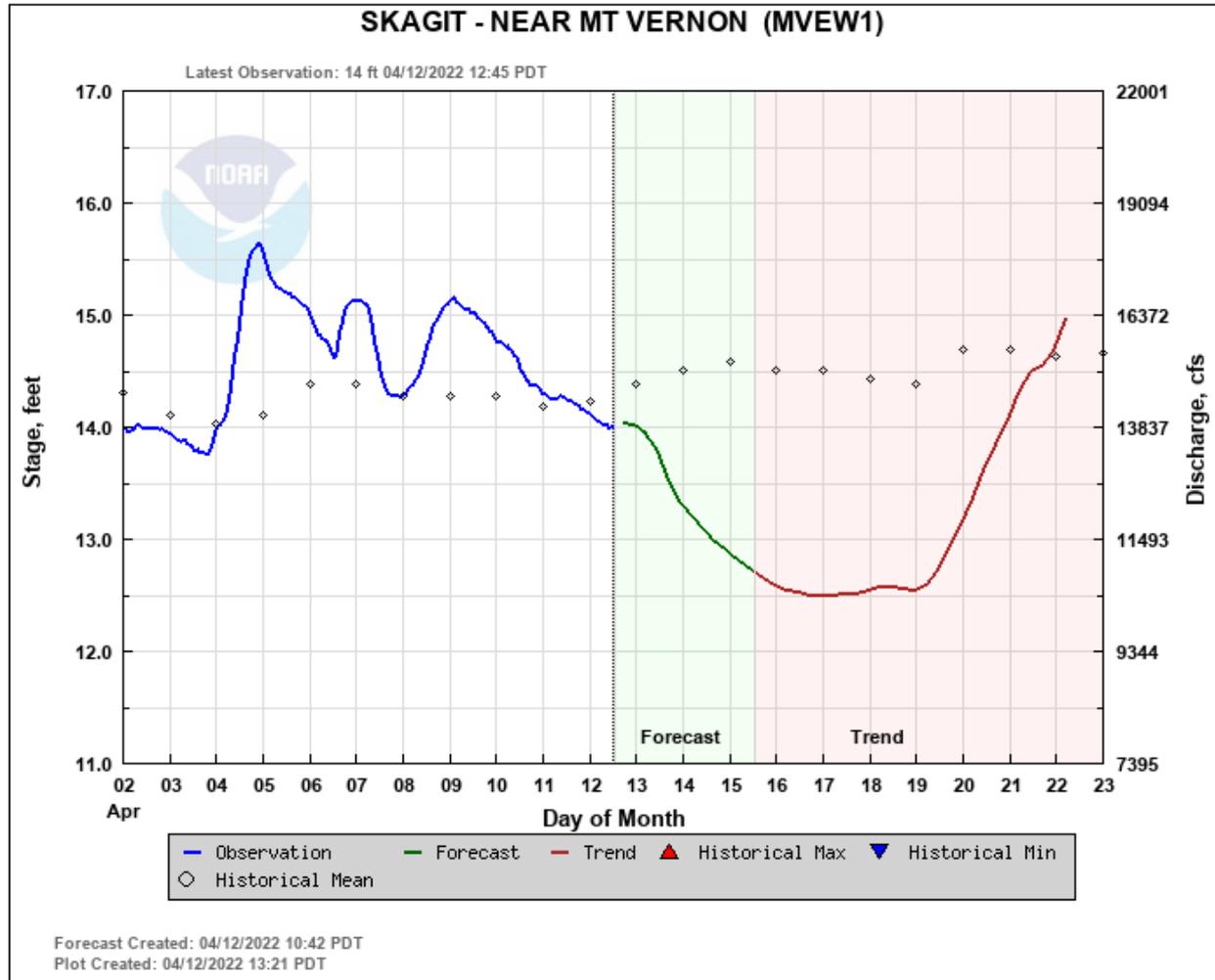
# Source Water Quality



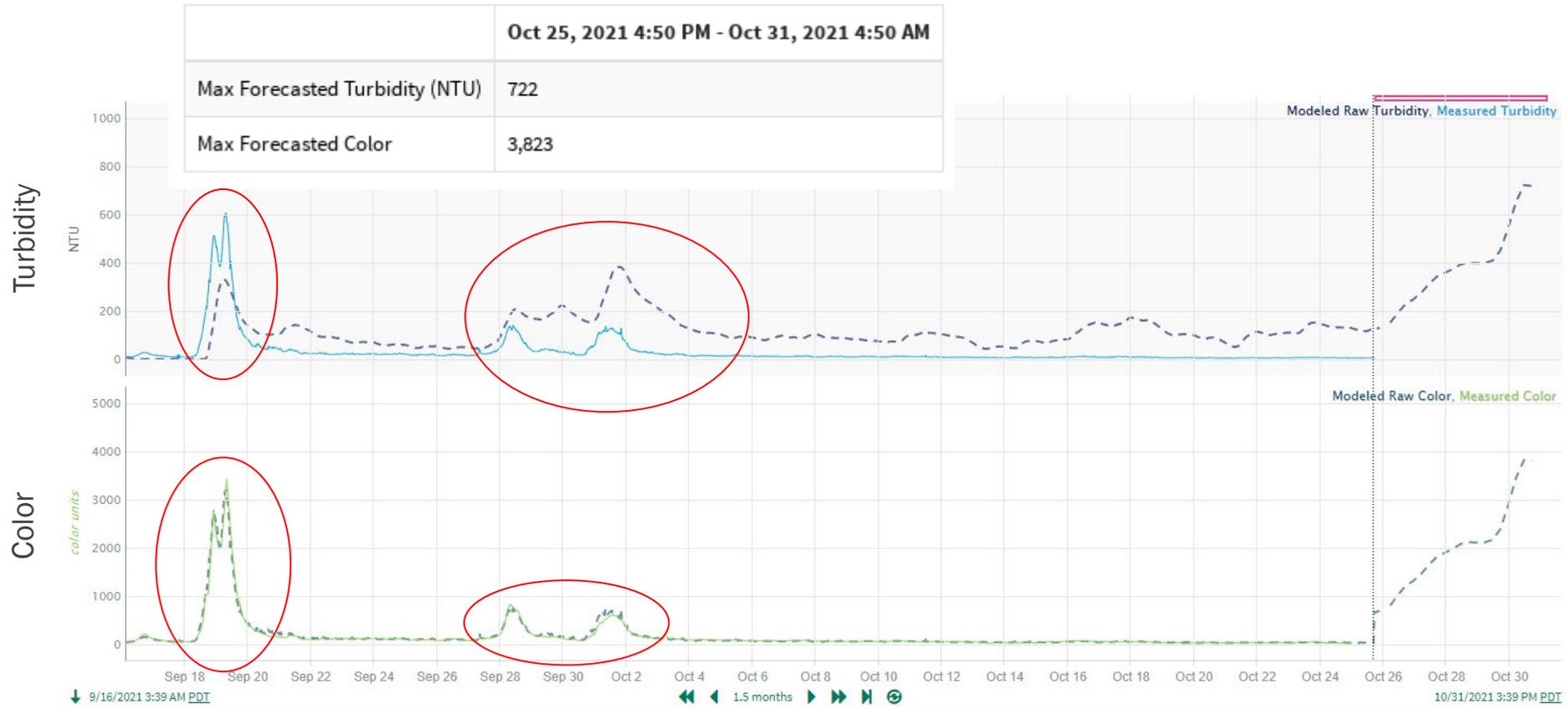
- Skagit River Height
- Raw Turbidity
- Air Temperature

Turbidity spikes can cause treatment upsets  
Requires chemical dosing adjustments

# Source Water Quality



# Source Water Quality Model



- Solid Line: Measured
- - - Dashed Line: Predicted

I am an operator and I want to know when a color/turbidity spike is coming, how long it will last, and how high it's predicted to be.

# Flood Response

# Flood Response

- Historic flooding event threatened the City's water plant
- Skagit River rising above the plant's riverside elevation
- The City was part of an Emergency Operations Center (EOC) for the region

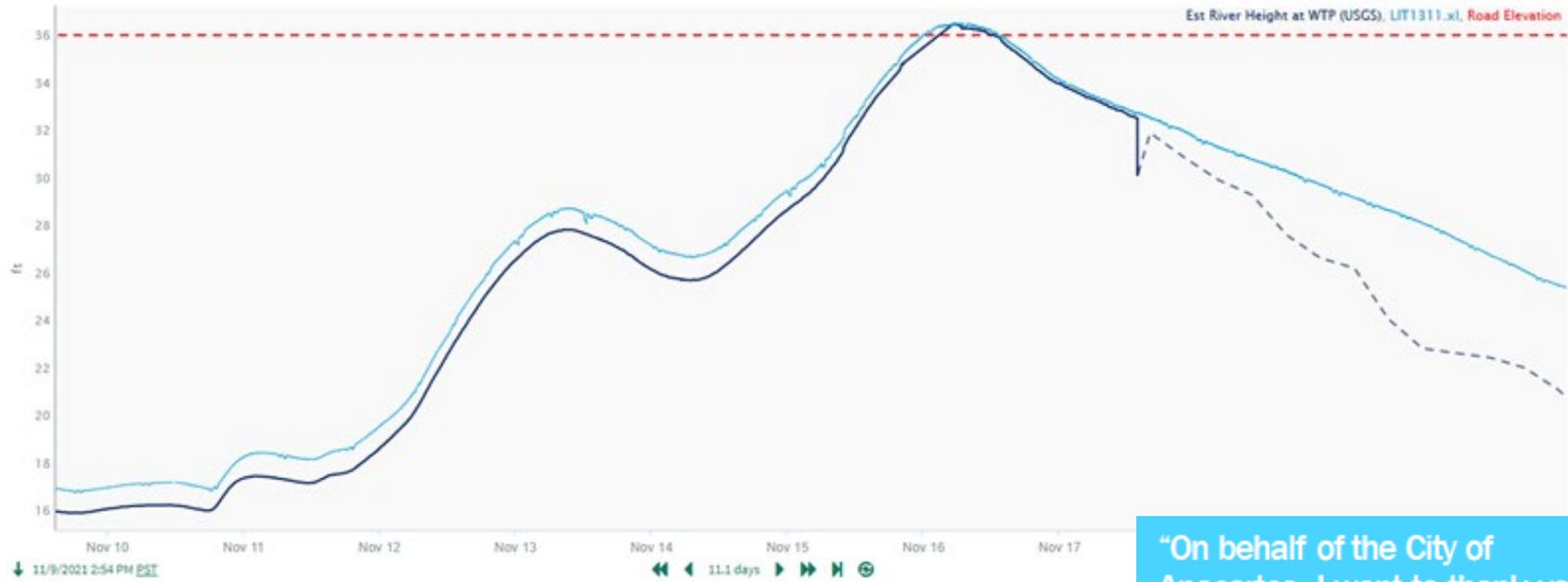


# Flood Response

- USGS gage was inundated during the flood
- Real-time water level information was lost just as the river was about to overtop the road
- Seeq platform was used to quickly calibrate an additional level sensor in the river, providing critical real time data to entire region
- Safer alternative to field repair of the USGS gage



# River Height Quantification



- USGS Gage
- Plant Level Sensor

Data that was not routinely used became easily accessible and could be easily manipulated to make informed decisions in a crisis

“On behalf of the City of Anacortes, I want to thank you for your help during our flood response. Your team helped pull together quick modifications to the Seeq platform that resulted in providing critical information to base our decisions on during the event. I cannot thank you enough.”

Brian McDaniel, Water System Manager

# Conclusions and Future

- High Service Pumping:
  - Industrial user predictions with AMI
  - Mechanical evaluations and recommendations for the pump station
- Continuing with the analytics trial, working on adoption

Two critical ways analytics can be useful:

- 1) Takes qualitative knowledge and makes it quantitative information
- 2) Use data that is already being collected to its full potential





# Questions

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