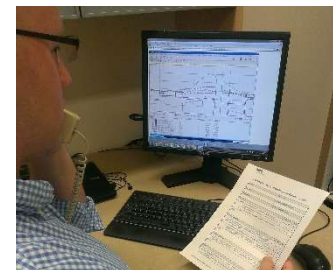
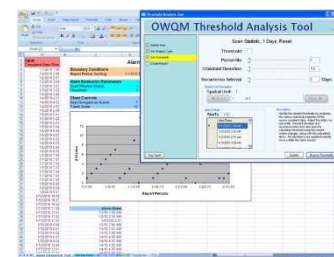


Approaches and Benefits to Online Water Quality Monitoring

Matt Umberg, U.S. EPA

**National Environmental Monitoring Conference
Orange County, CA; August 11, 2016**





Outline

Topic 1: What is Online Water Quality Monitoring (OWQM)?

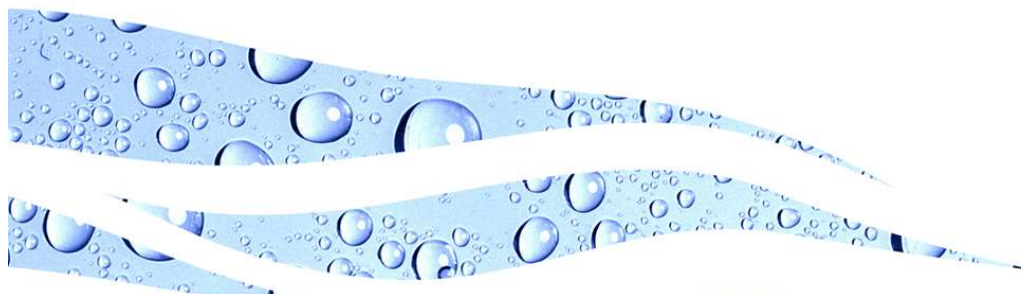
Topic 2: What approaches have been used to implement OWQM?

Topic 3: What benefits have been realized from OWQM?

Topic 4: Conclusions



Topic 1: What is OWQM?





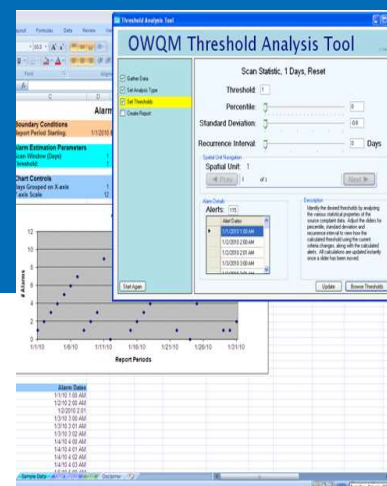
OWQM Overview



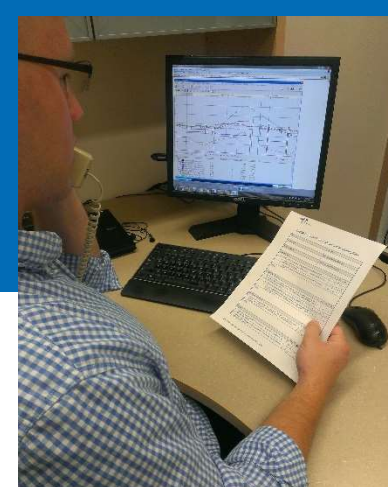
**Step 1:
Data
Generation**



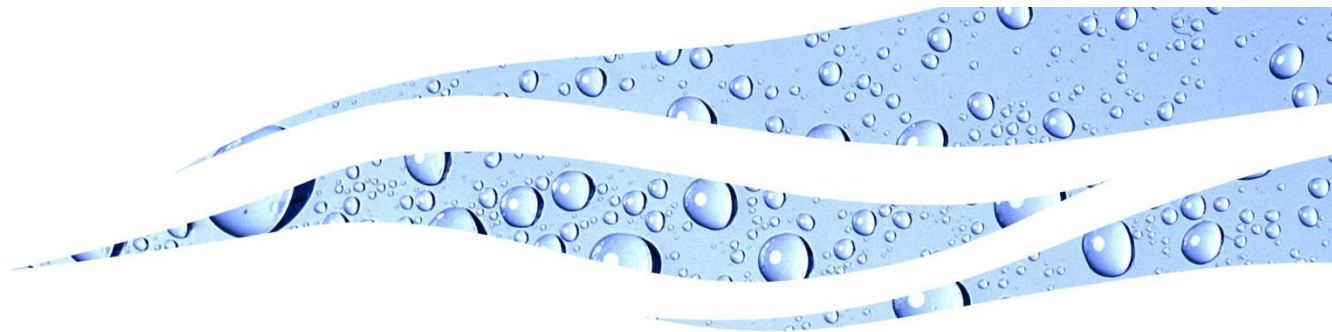
**Step 2:
Data
Communication**



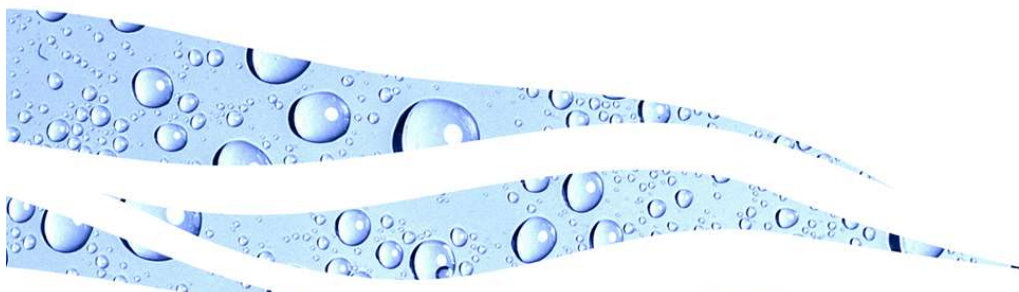
**Step 3:
Information
Management &
Analysis**



**Step 4:
Alert
Investigation**



Topic 2: What approaches have been used to implement OWQM?





Data Generation

Potential Monitoring Locations

Utility facilities

- Storage tanks
- Pump stations



City/town facilities

- Fire stations
- Police stations



Large water users

- Hotels
- Bottling plants



Stand-alone installations

- Public right-of-way





Data Generation

Parameters and Instrumentation

Utility ID	Customers	CL ₂	pH	Turbidity	SC	Spectral	TOC	NH ₃
Utility 1	700,000	☒	☒	☒	☒		☒	
Utility 2	600,000	☒	☒	☒	☒			
Utility 3	600,000	☒						
Utility 4	400,000	☒	☒		☒	☒		☒
Utility 5	400,000	☒	☒		☒			
Utility 6	< 200,000	☒	☒	☒		☒		
Utility 7	< 200,000	☒	☒		☒			
Utility 8	< 200,000	☒	☒	☒				
Utility 9	< 200,000	☒	☒	☒				

CL₂: Chlorine residual

Spectral: Multi-spectrum UV absorbance

NH₃: Ammonia

SC: Specific conductance

TOC: Total organic carbon

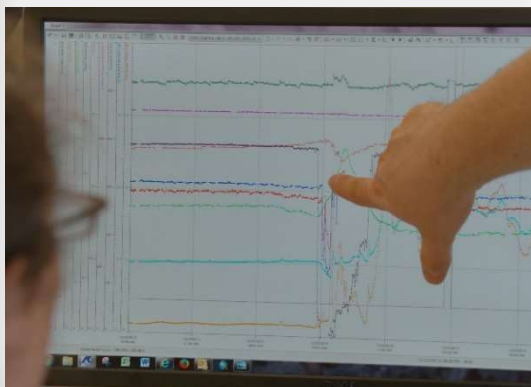




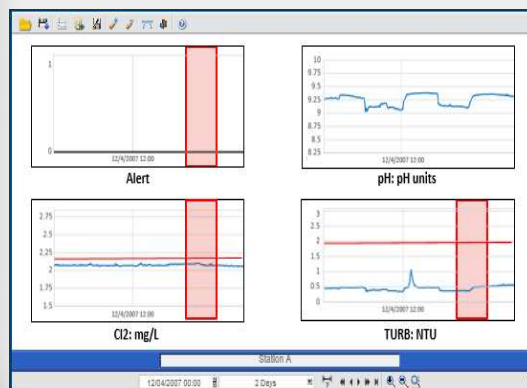
Information Management & Analysis

Data Analysis

Utility personnel have manually reviewed data to identify anomalies.



Thresholds have been set to automatically generate alerts.



Software-based algorithms have automatically generated alerts.

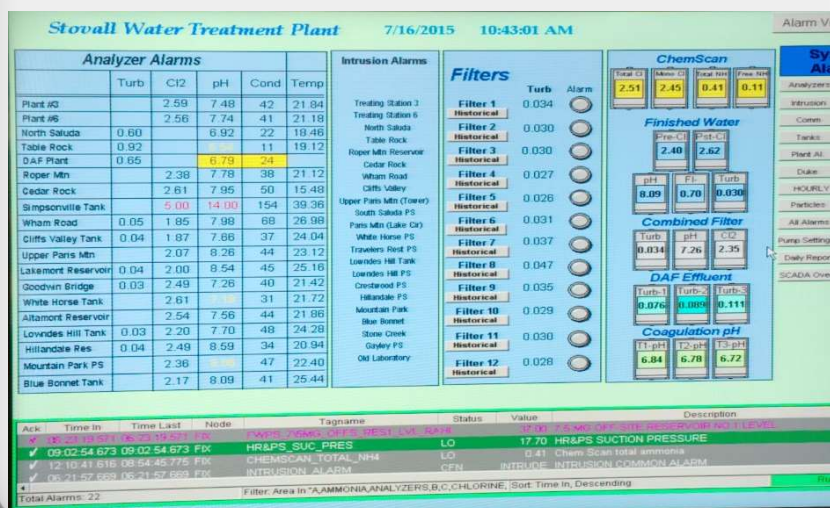




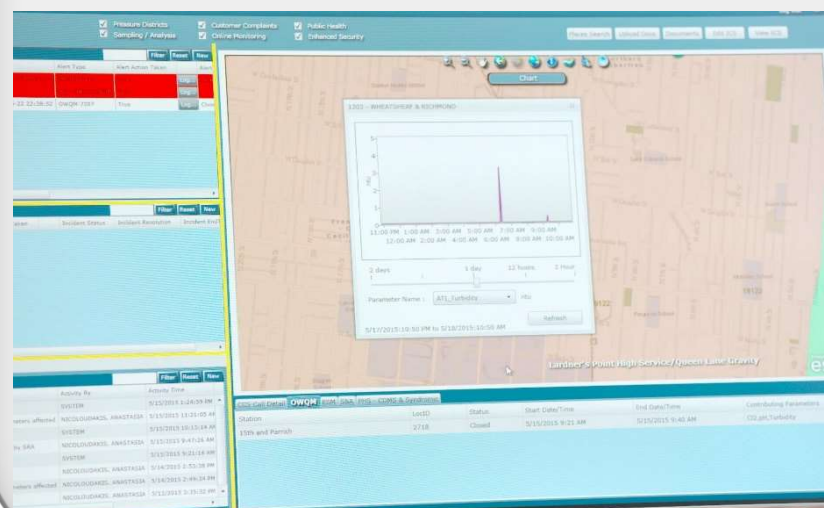
Information Management & Analysis

Data Visualization

Data has been incorporated into existing SCADA displays.



Data dashboards have displayed data spatially and graphically.



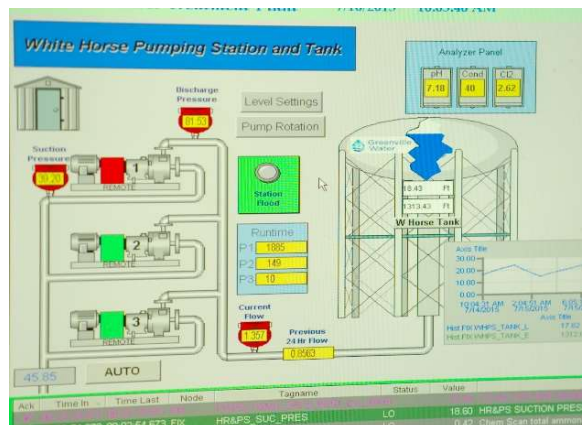
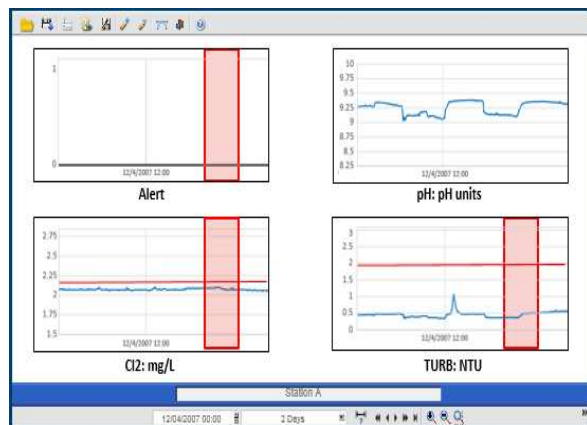


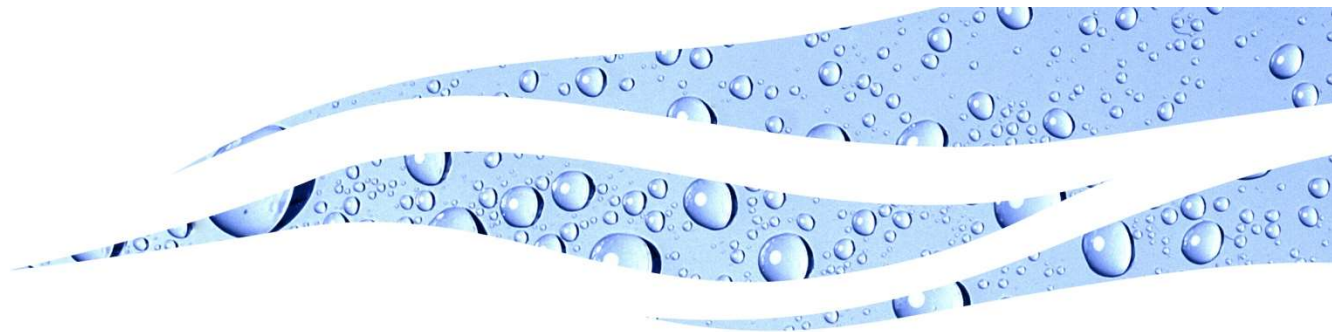
Alert Investigation

Review data from alerting station to determine if alert is valid

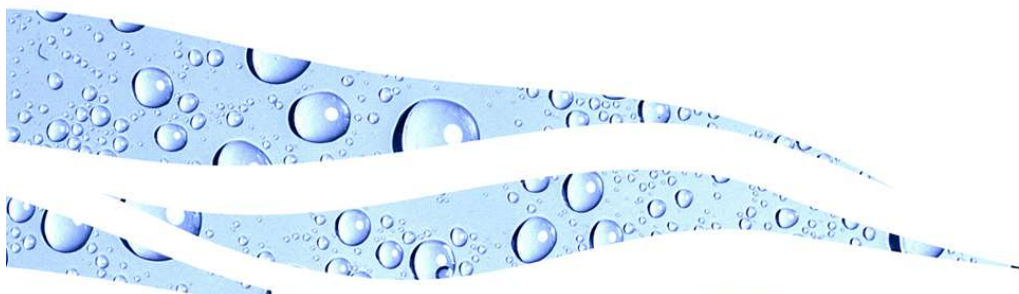
Review additional resources to determine cause of water quality change

Visit station to verify instrument performance





Topic 3: What benefits have been realized from OWQM?





Examples of OWQM Benefits

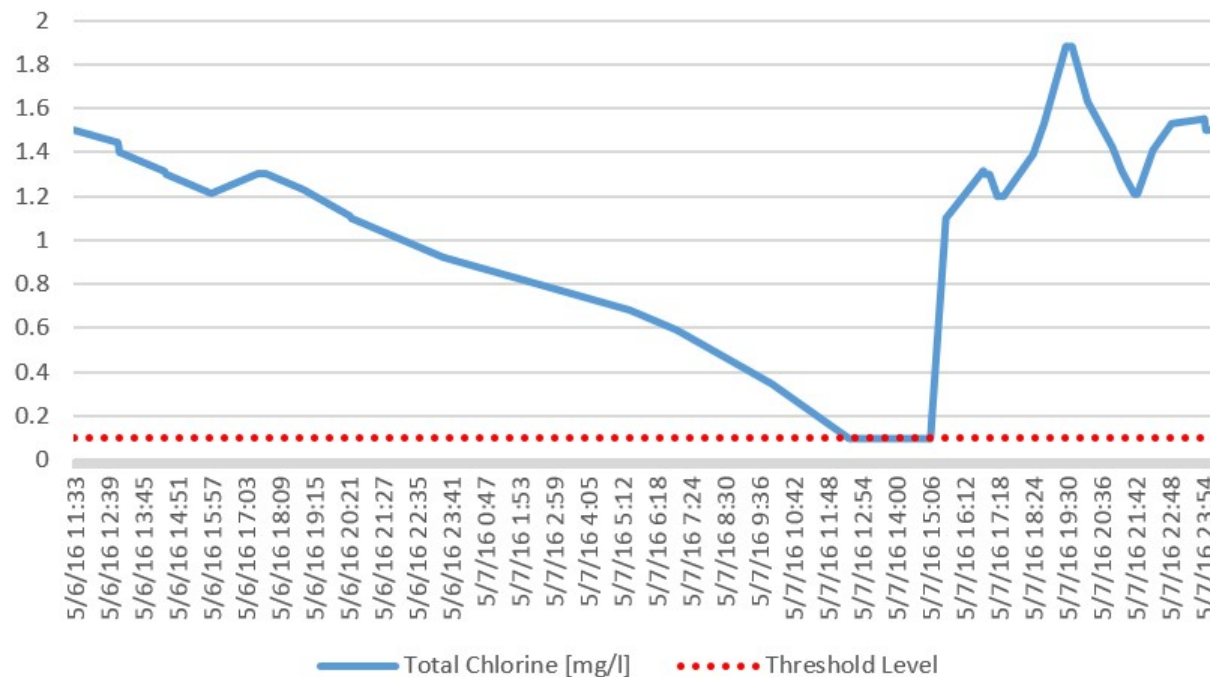
- Support regulatory compliance
 - Revised Total Coliform Rule
 - Disinfectants and Disinfection Byproducts Rules
 - Lead and Copper Rule
 - Ground Water Rule
- Detect distribution system events
 - Nitrification
 - Equipment failure
 - Treatment process upsets
 - Pipeline breaks/scouring
 - Red water/particulate matter events
- Optimize system operations
 - Chemical dosing rates
 - Storage tank operation
 - Unidirectional flushing
 - Aquifer storage recovery processes
- Detect system contamination
- Learn about system
 - Determine water quality trends
 - Determine WTP reach and blending characteristics
 - Update system models



Support Regulatory Compliance

Revised Total Coliform Rule

- Chlorine residual data and Heterotrophic Plate Count (HPC) testing has been used to identify possible contamination.





Support Regulatory Compliance

Disinfectants and Disinfection Byproducts Rules

- Bromide, chlorine residual, pH, temperature, and TOC data has been used with models to predict DBP formation potential.
- Chlorine residual and temperature data has been used to optimize storage tank operation and minimize travel time.

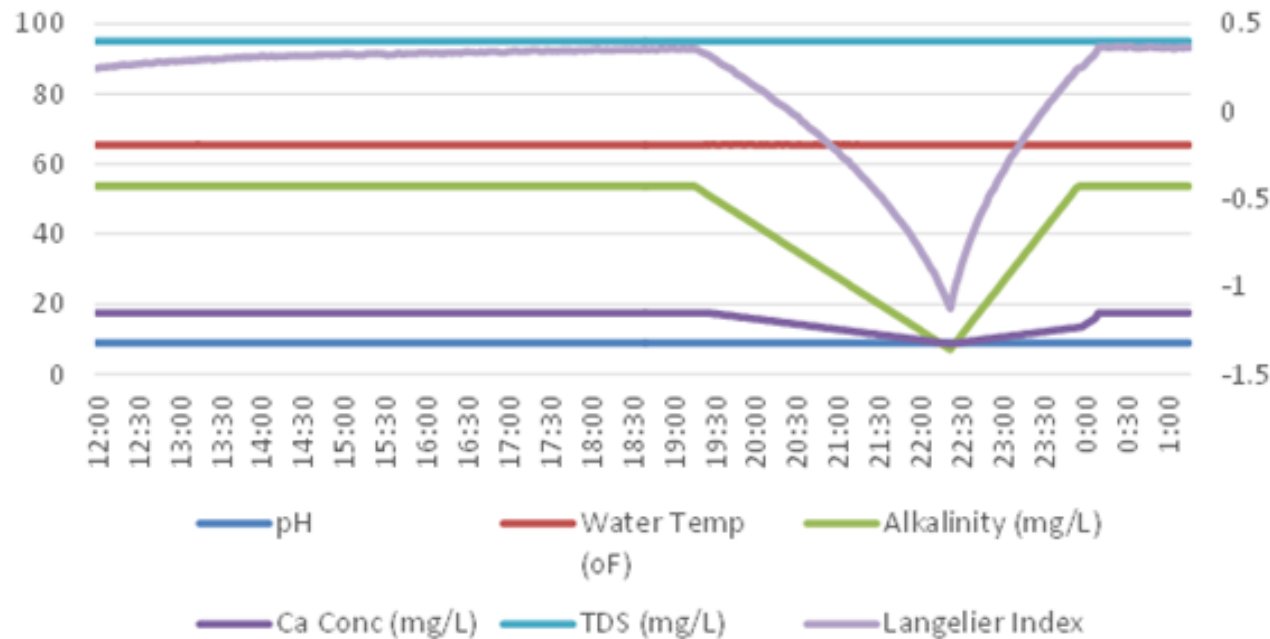
A DBP model allowed a utility to eradicate a chronic THM issue and save over \$500,000 in GAC regeneration costs during the first year it was used.



Support Regulatory Compliance

Lead and Copper Rule

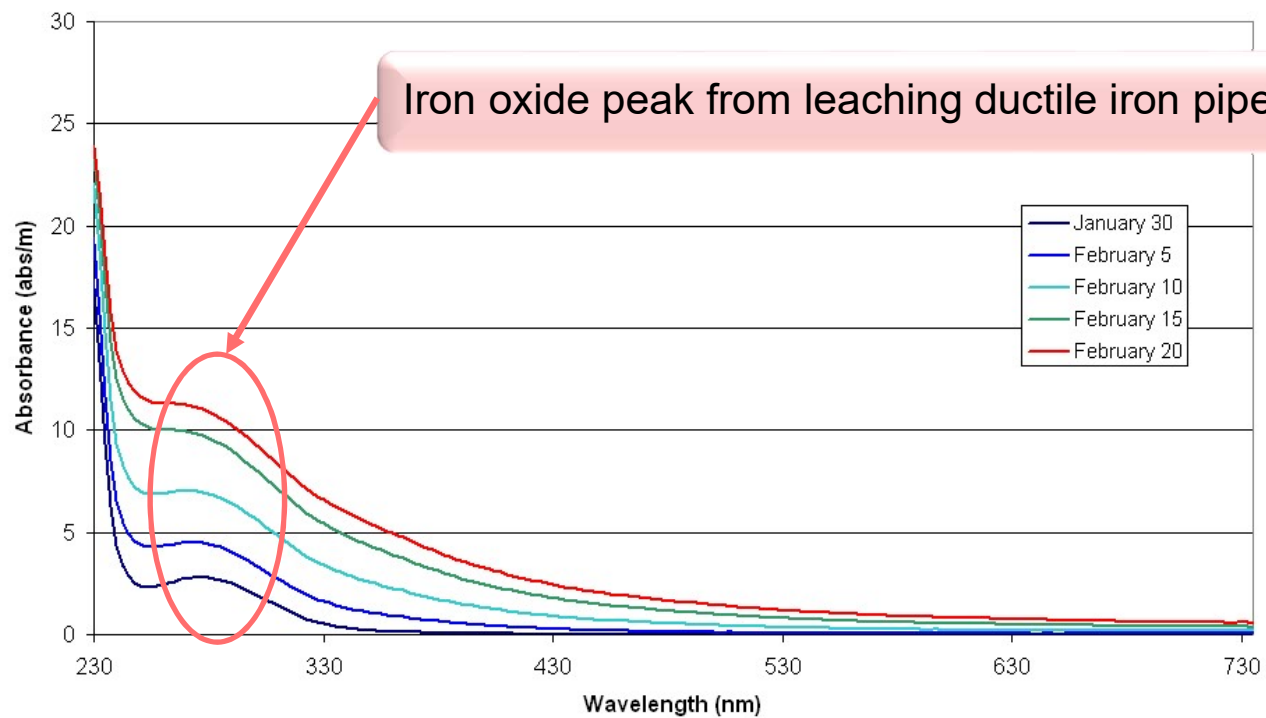
- Data can be used to calculate Langelier Index values to provide an indication of the corrosivity of water.





Detect Distribution System Events

Aggressive Water Event

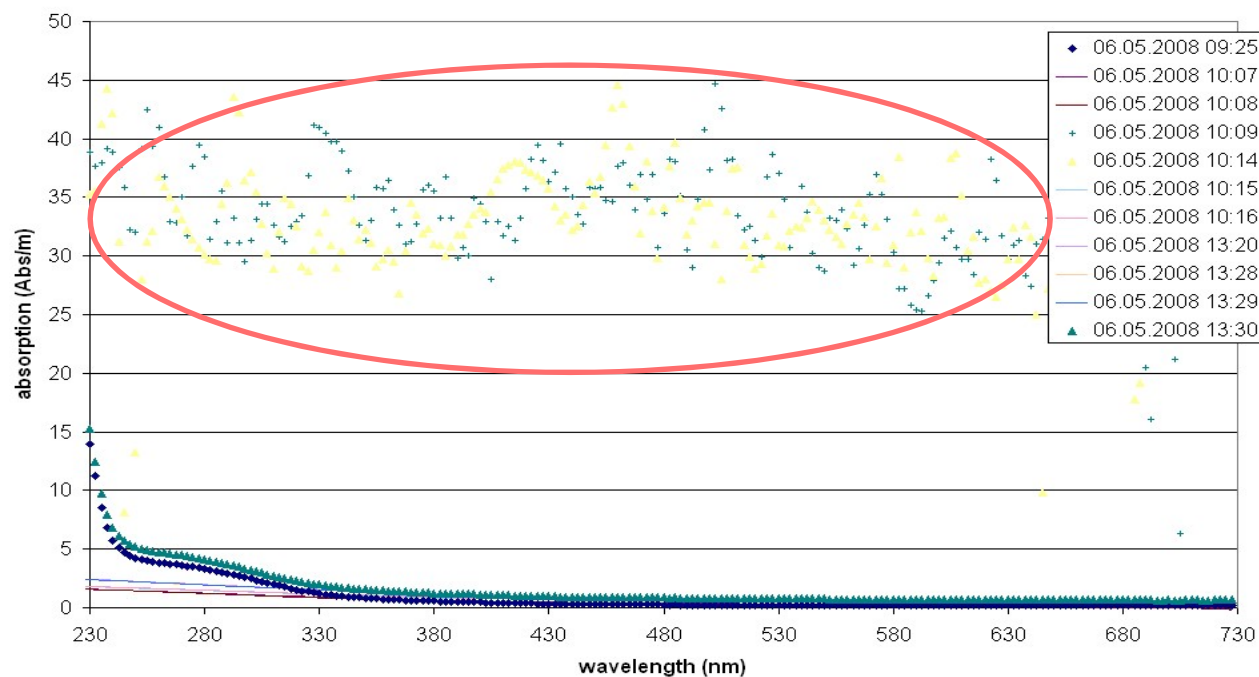


Identifying an aggressive water event saved a utility \$20M in early pipe replacement costs.



Detect Distribution System Events

Plant PLC Failure

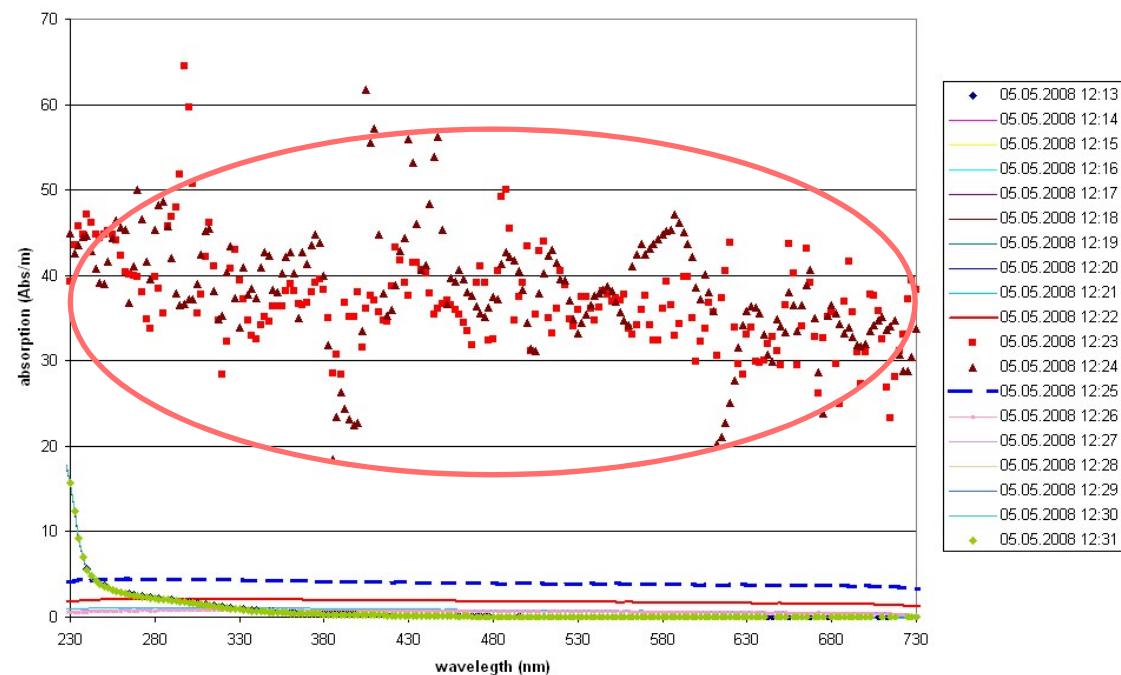


A PLC failure, which impacted a pilot ion exchange process, was discovered before major damage was done or contaminated water was consumed.



Detect Distribution System Events

Plant PLC Failure

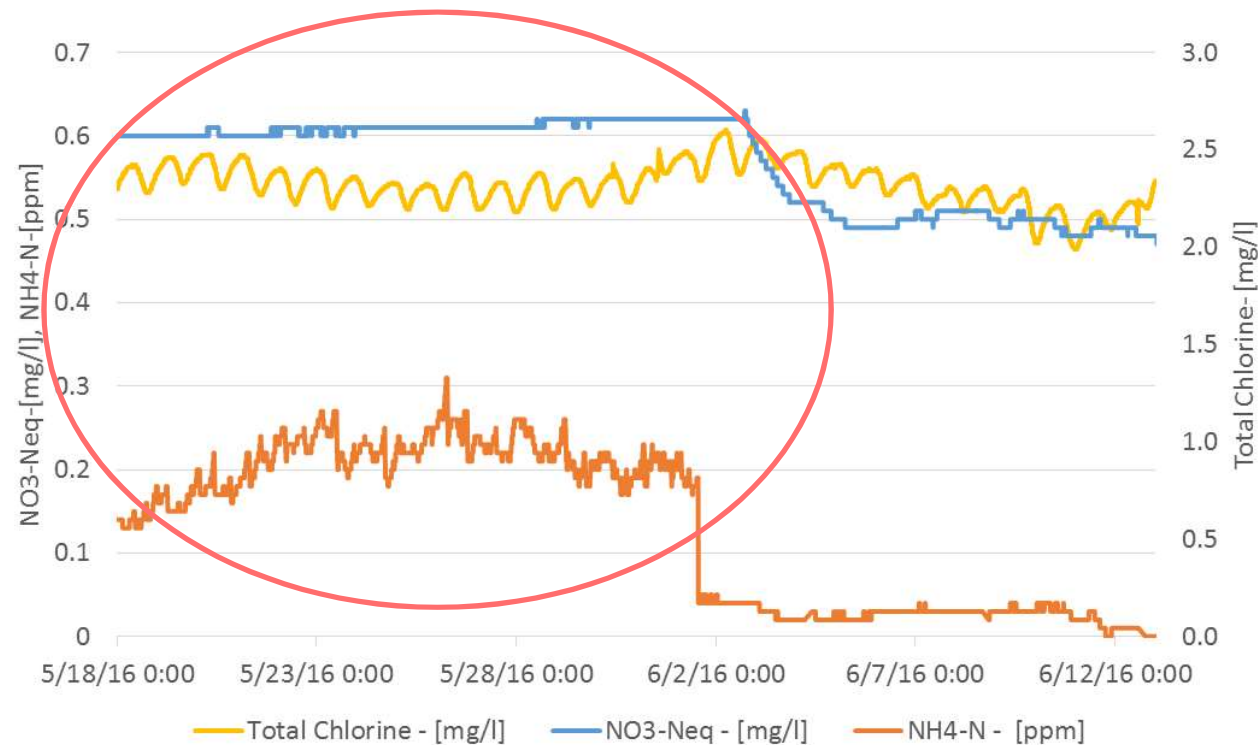


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Detect Distribution System Events

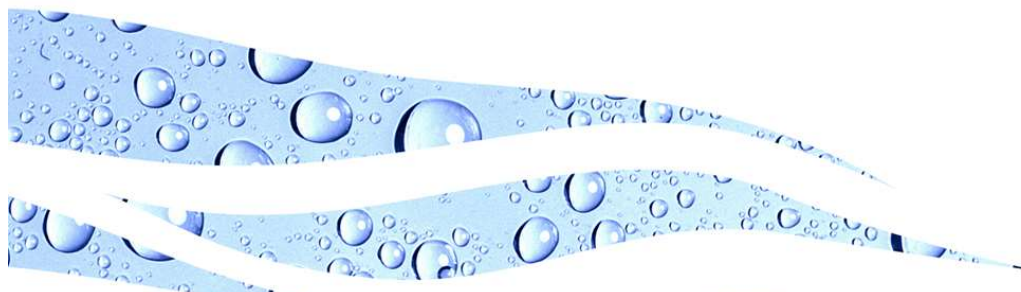
Nitrification Event



Detecting the onset of nitrification allows personnel to isolate and flush the affected areas of a system.



Topic 5: Conclusions





Conclusions

- Utilities have used a variety of approaches to successfully implement OWQM.
- Utilities have realized a wide range of benefits, including supporting regulatory compliance, as a result of using OWQM data.
- Allowing utilities to use OWQM data for compliance monitoring could reduce the burden of collecting grab samples for regulations such as the Total Coliform Rule and Surface Water Treatment Rule.
- If OWQM data is to be used for compliance monitoring, water quality instruments must be properly maintained and generating quality data. A proper data management plan must also be in place.



For More Information:

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Relevant Links

<https://www.epa.gov/waterqualitysurveillance>