Innovative Water Quality Monitoring Equipment at Union Water System

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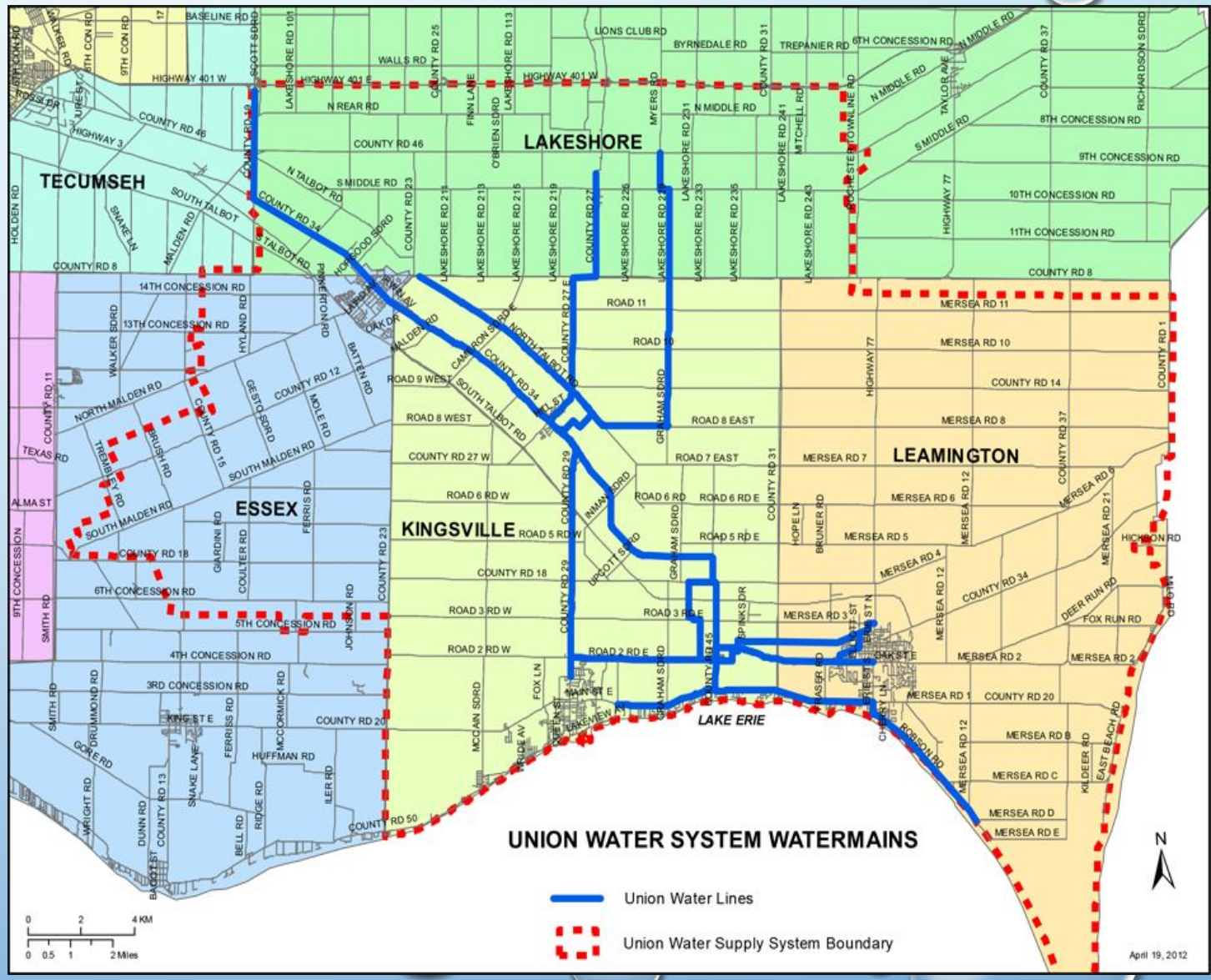
Brian Jobb, Jeff Simpson
Aquatic Life Ltd.

Union Water System

- Located on north shore of Lake Erie in Southwestern Ontario
- Serves Approximately 65,000 residents in Municipalities of:
  - Essex
  - Kingsville
  - Lakeshore
  - Leamington



Union Water System

Problem at Albuna Water Tower:

- Unmaintained road difficult during bad weather
- Wastewater generated from flow-through cells
- Only free chlorine and pH monitored

Union staff were looking for a solution to:

- Reduce maintenance time and costs
- Eliminate waste stream
- Improve monitoring capabilities

Multiple-Parameter Monitoring

Devices available that:

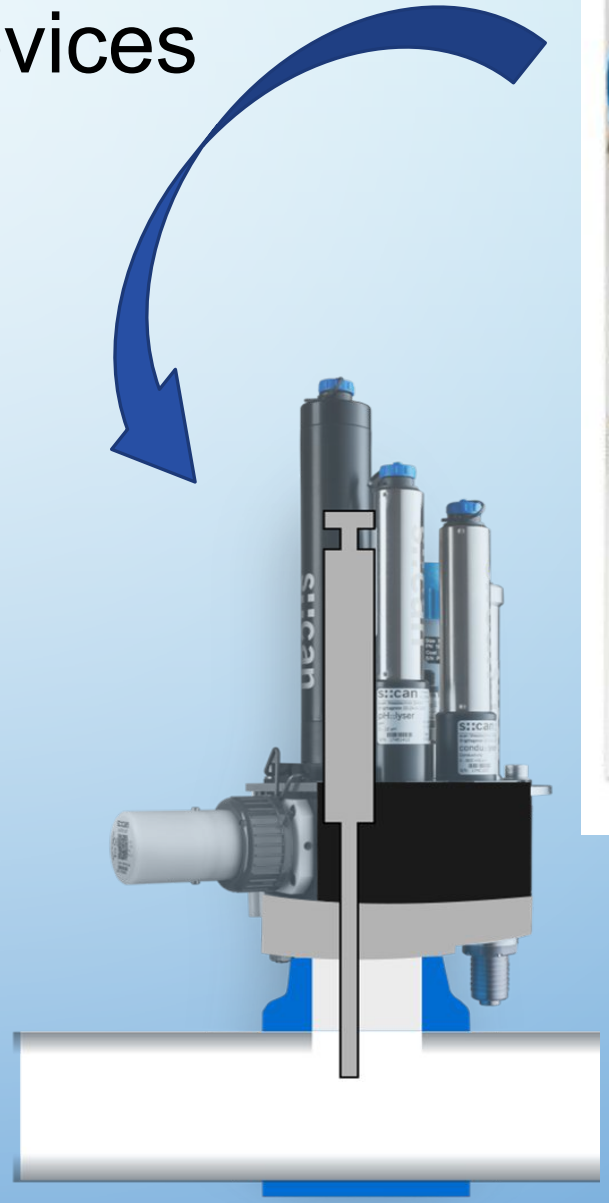
- Monitor TOC, DOC, UV254, turbidity, colour, free (or total) chlorine, pH (or ORP), conductivity, temperature, pressure
- Send data in real time to SCADA and mobile devices
- Mount directly onto pipe
- Eliminate wastewater by returning water to the pipe
- Have low maintenance requirements

Evolution of Multi-Parameter Devices

Original Configuration:

- Conventional wall-mounted panel
- Multiple sensors possible
- Hard to install on pressurized pipes
- Requires sample lines and flow-through cells

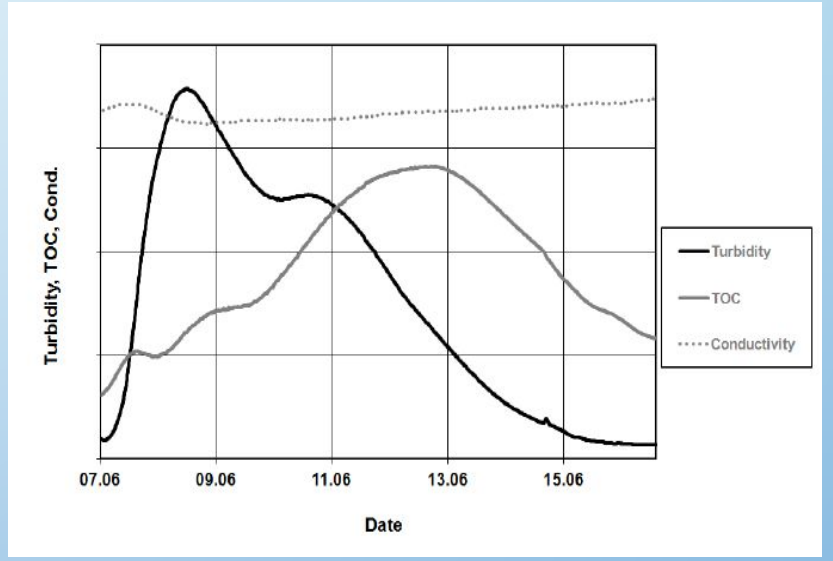
- **All-in-one, pipe-mounted monitoring station was developed (pipe::scan)**



Why Monitor Multiple Parameters?

Multiple sensors give a more complete picture:

- TOC/DOC, colour, turbidity, UVT, UV254
  - Sensitive to small changes in water quality
  - Detects contamination and operational problems
- **Other chemical, physical sensors may help to identify problems, for example:**
  - Low chlorine, pressure drop
  - TOC increase, pH increase



Health Canada Suggested Parameters

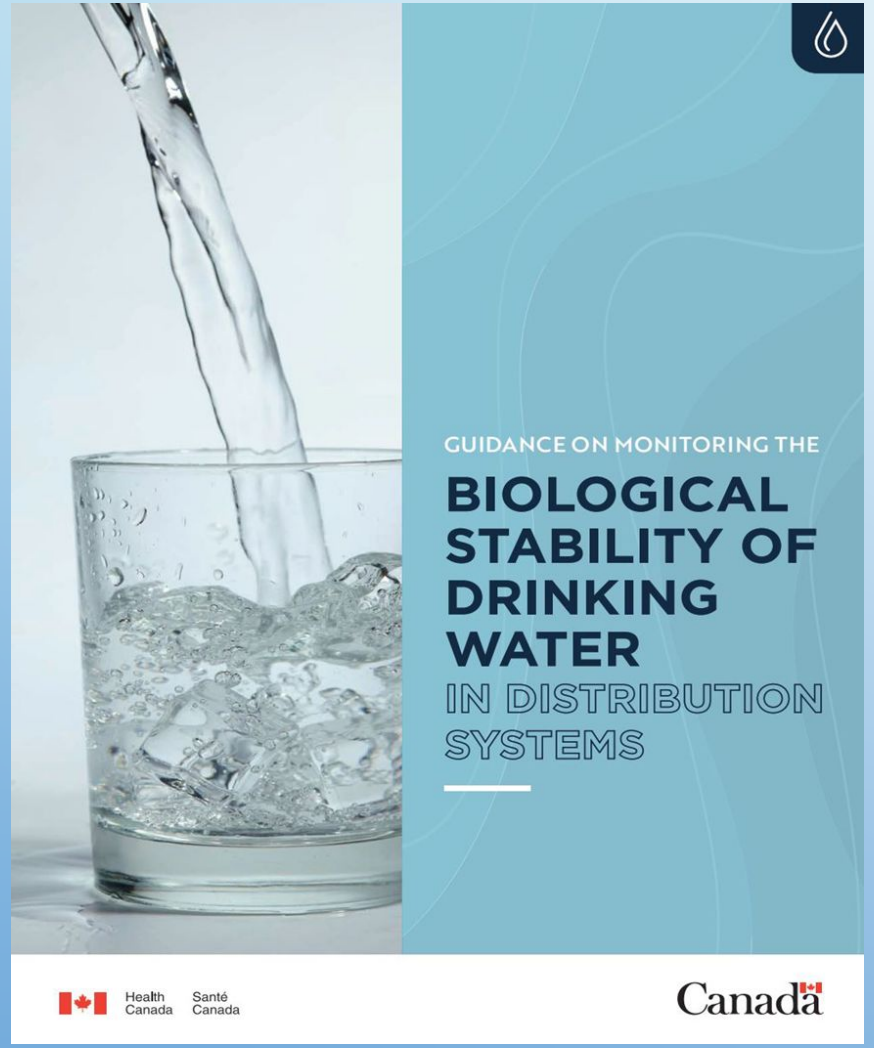


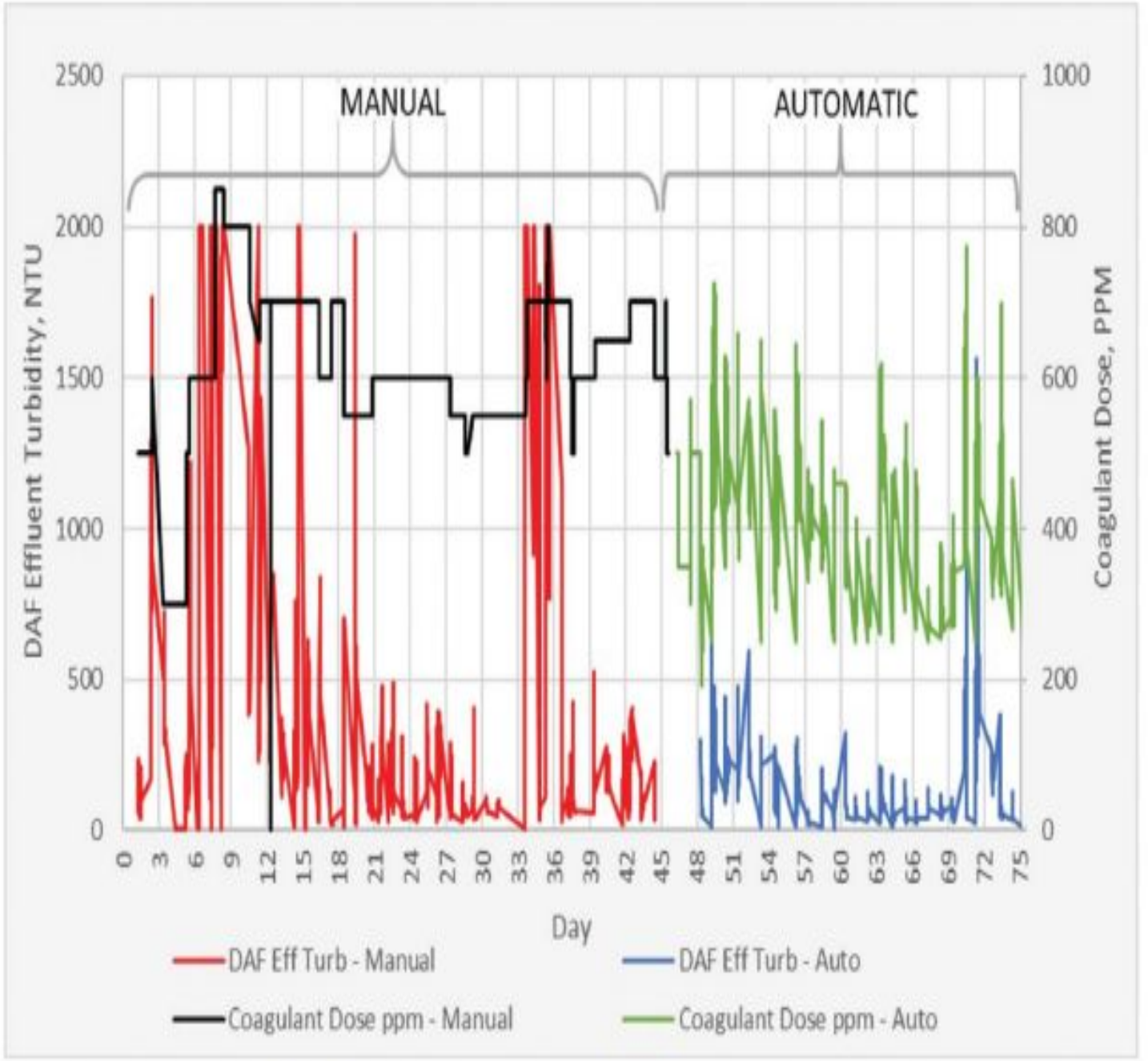
Table 2. Suggested parameters/methods to assess the biological stability of drinking water in the distribution system.

Type	Suggested parameters/methods
Basic	Bacterial indicators (total coliforms and *E. coli*)
	Disinfectant residual
	Turbidity
	Conductivity
	Pressure
Operational	Temperature
	Microbiological activity—heterotrophic plate count and/or adenosine triphosphate
	pH
	Oxidation-reduction potential
	Colour (apparent and true)
	Nutrient concentrations
	Metals (dissolved and particulate)
	Biofilm formation rate
	Corrosion rate
Advanced	Flow cytometry
	Molecular methods
	Pipe autopsies and characterization of accumulated material
	Water distribution system models

Automated Chemical Feed

Several parameters used:

- pH, Temp, DOC, Turbidity
- Algorithms for chemical feed
- Continuous dosage optimization
- Good for variable source water
- Potential cost reduction



Source: Watson, L. SUEZ 2022

Full spectrum UV-VIS spectrometer

- Monitors numerous parameters
- Detects many contaminants in real time
- Extensive parameter sets and research applicability
  - Hydrocarbons (BTX)
  - Disinfection by-product research
- Spectral alarms for unknown contaminants

TSS
Turbidity
Colour TCU, ACU
TOC / DOC
BOD / COD
NO_3
Chloramine
H_2S
O_3
Chlorophyll-A
BTX
UV 254
UV 436
Temperature
Full spectrum UV

Full spectrum UV-VIS spectrometer

Applications

- Advanced plant & source monitoring
- Event detection
- Disinfectant residual monitoring (ozone, chloramine)
- Drinking water, wastewater and other industries (breweries, food processing)
- Alarms for potential contamination events
- Programmable for other compounds

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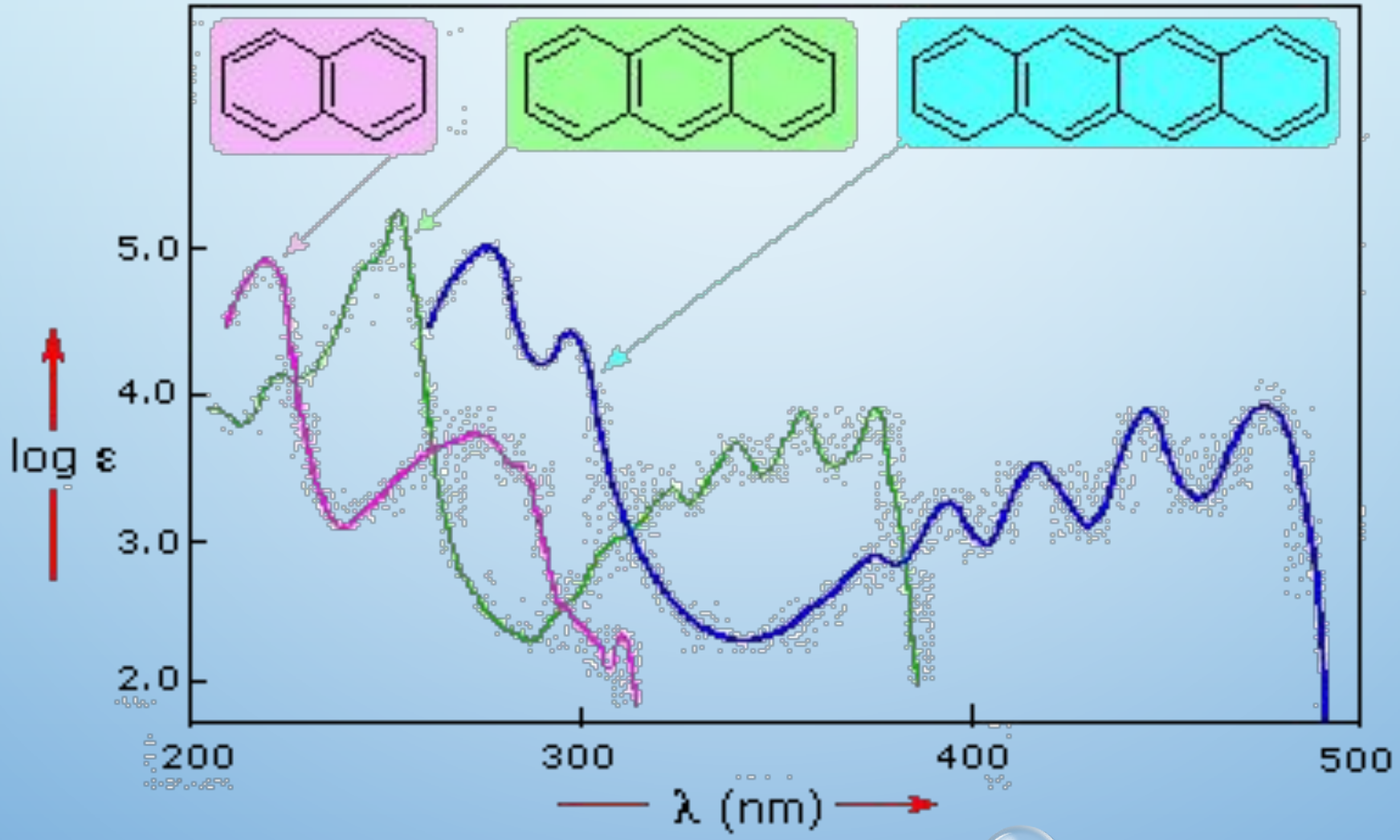
UV Absorbance "Fingerprint"



Applications

Full spectrum UV-VIS spectrometer

- Used for event detection in Dallas, New York City, Zurich, Vienna
- Remote First Nations communities in Alberta
- Super Bowl venues for US Homeland Security
- Hydrocarbon detection in Iqaluit and Fort McMurray

Applications - Union Water System

Pipe-mounted devices installed at Albuna tower and Cottam reservoir

- No waste stream – saves 1.34 ML/yr ($900 at $0.70 per m^3)
- Maintenance / calibration reduced from monthly to quarterly
- Eight additional parameters beyond the chlorine and pH analyzers previously in use

Full spectrum UV-VIS spectrometer also installed at Union water plant for DAF process monitoring & control

Full spectrum UV-VIS spectrometer

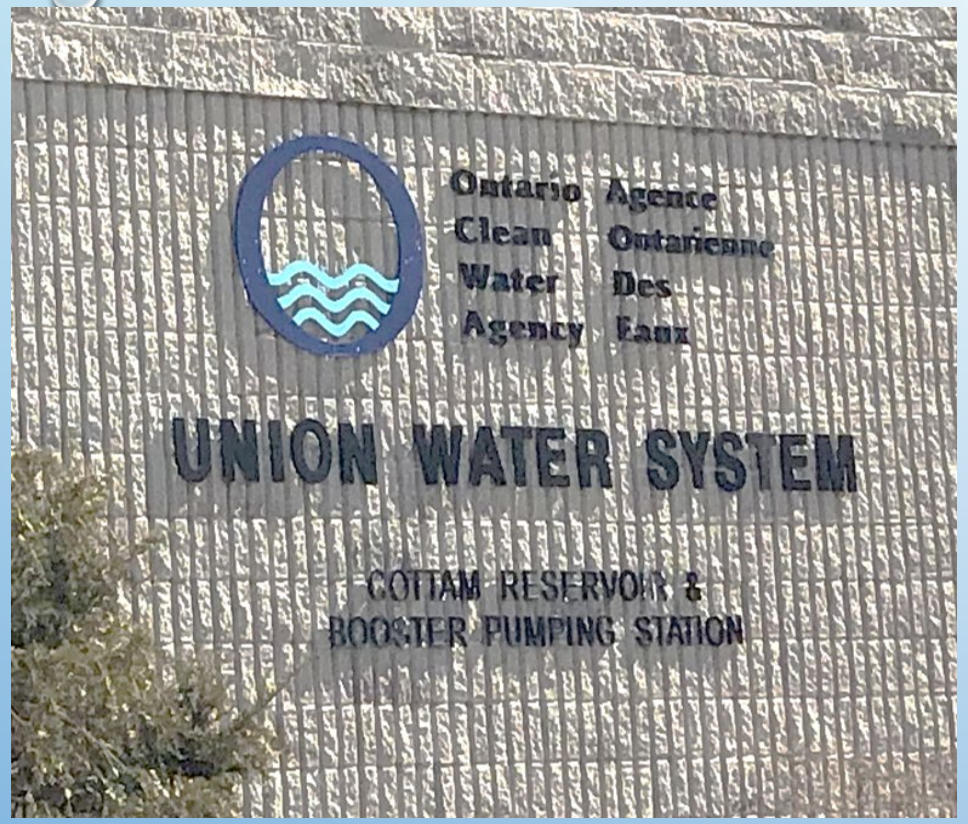
- Installed at Union Water System to optimize DAF
- Monitors Turbidity, TOC, DOC, Chlorophyl a, UV254, Colour, UVT
- Raw water, DAF clarifier effluent and finished water are being monitored
- Goal is to optimize coagulant dosage – study is currently underway

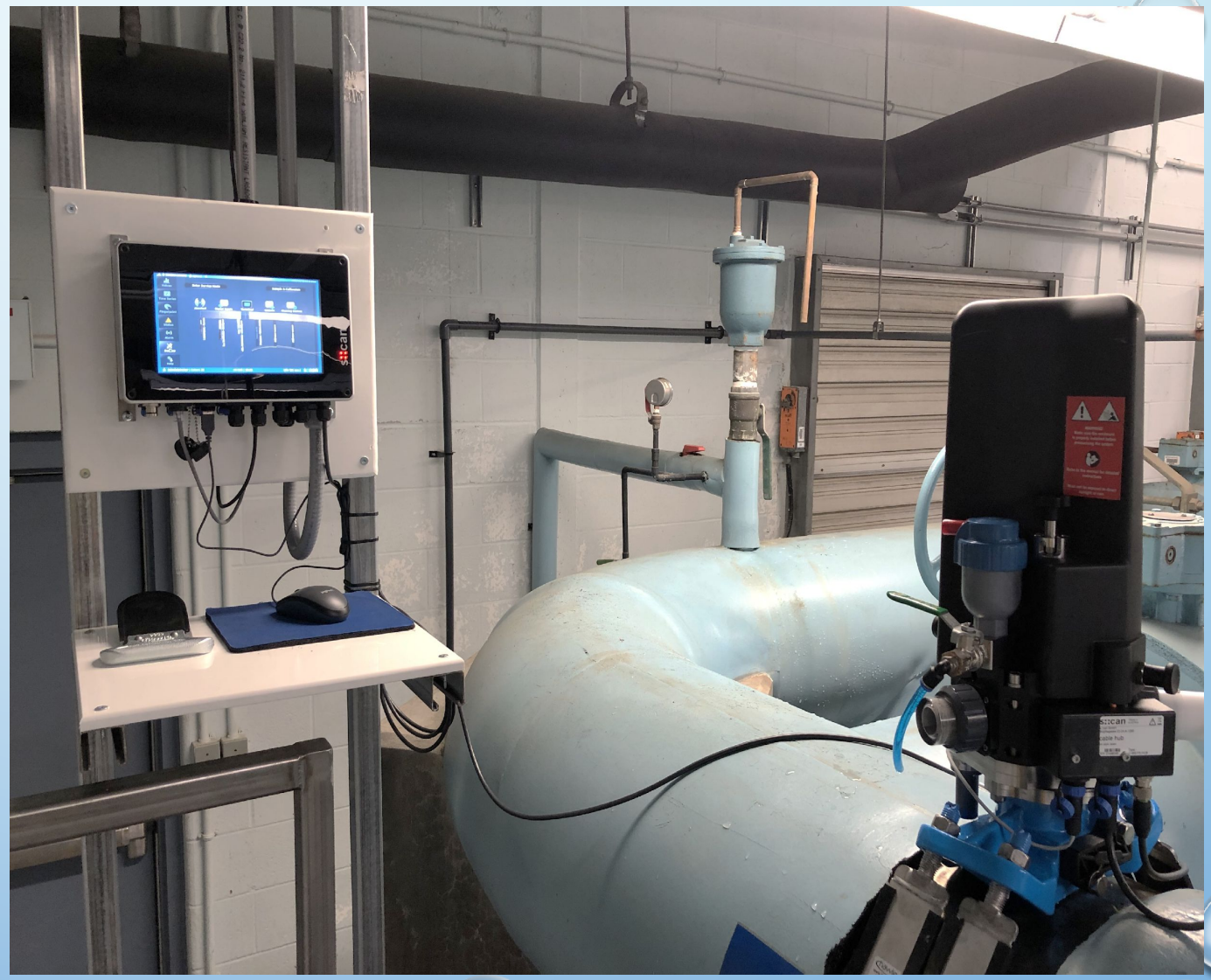
TSS
Turbidity
Colour TCU, ACU
TOC / DOC
BOD / COD
NO_3
Chloramine
H_2S
O_3
Chlorophyll-A
BTX
UV 254
UV 436
Temperature
Full spectrum UV

Albuna Tower Finished Installation

April 28, 2022

Cottam Reservoir/Booster Station





Finished Installation March 9, 2023

Benefits for Union Water System

- Wastewater stream eliminated (1.34 ML/year)
- Reduced maintenance (monthly to quarterly)
- No reagents, minimal consumables / disposable components
- Monitoring of multiple parameters (disinfection, organics, pressure, etc)
- Improved monitoring of unit processes for optimization
- Remote operation and control
- Easy data transfer

UNION WATER SUPPLY SYSTEM

Benefits for Union Water System

- Results comparable to laboratory equipment
- Device approved by ANSI/NSF (Std 61 and 372)
- Meets USEPA standards for regulatory reporting
- Meets ISO and European regulatory standards
- Recommended by the USEPA for event detection
- Statement of “no objection to use” from Ontario Ministry of Environment Conservation and Parks
- Comparatively low capital and minimal operations costs

Thank You!

Questions?

Aquatic Life Ltd. 1(800) 409-8378
Jeff Simpson – jsimpson@aquaticlife.ca
Brian Jobb – brianjobb@rogers.com