

Best Practices for Continuous Water Quality Monitoring

Presented by: Kerry Caslow



water
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Top 5 Tips

1. Stay Up-to-date
2. Maintain Power
3. Clean & Replace Parts
4. Check Calibration
5. Deploy Properly

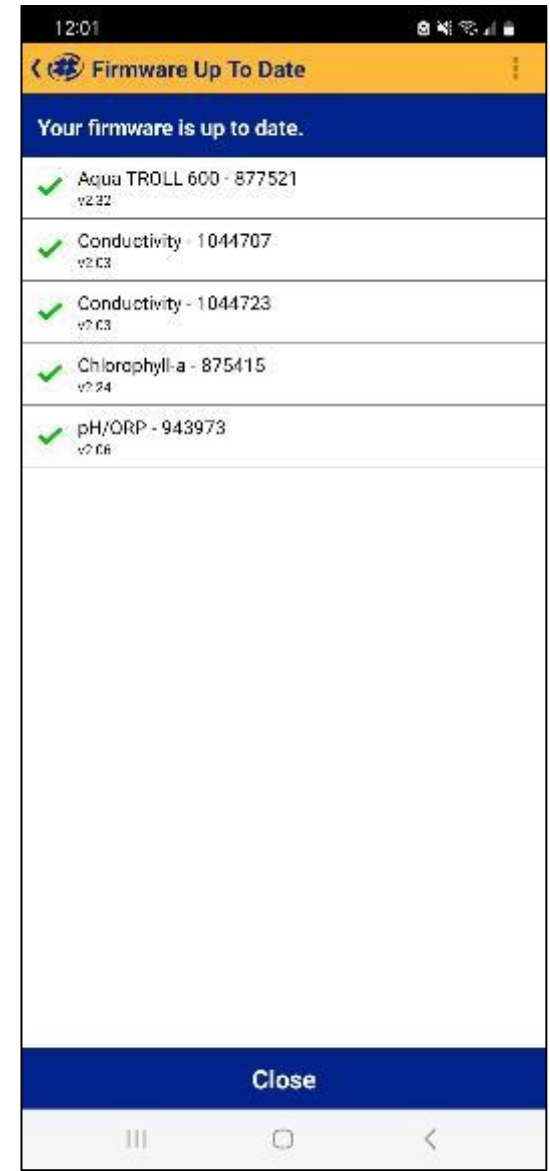
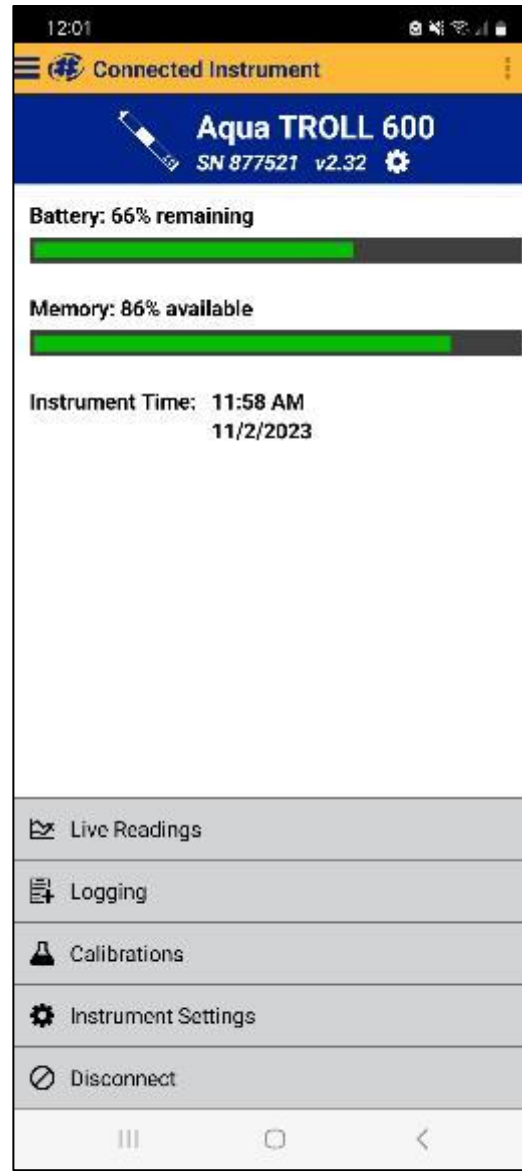




1. Stay Up-to-date

Phone & Computer

- Software updates periodically
 - New features
 - Bug fixes
 - Firmware updates
- Information found on websites or on mobile device application store
- Recommendation: Check Monthly (or set to automatic updates)



Sondes & Sensors

- Firmware updates periodically
- Information found on websites
- Recommendation: Check Quarterly



Telemetry System

- Firmware updates periodically
- Information found on websites or on mobile device application store
- Some updates performed over-the-air
- Recommendation: Check Monthly (or set to automatic updates)





2. Maintain Power

Traditional Setup

- Typically includes:
 - Solar panel(s)
 - Marine grade battery(-ies)
 - Regulator
 - Wiring
- Solar panels need proper placement for maximum solar exposure
- Solar panels need cleaning
- Batteries need replaced and recharged



VuLink Setup

- Operates on 3 D-cell batteries
- Replacement time dependent on:
 - Number of parameters
 - Transmit interval
 - Weather
- Transmit battery level
- Alarms for low-voltage



Phone & Computer

- Make sure to charge before going to the field
- Have in-vehicle charging options
- Portable charging devices helpful





3. Clean and Replace Parts

Build a Field Kit

- Typically includes:
 - Soft brushes
 - Cotton swabs
 - Lint-free cloths
 - Sponges
 - Canned air
 - Mild soap
 - Water
 - Batteries
 - Chargers
- Follow manufacturer's instructions for cleaning and maintaining equipment!



Replace O-Rings

- Know where they are!
- Check for nicks, cuts, breaks, etc.
- Replace periodically even if ok
- Use grease recommended by manufacturer to lubricate
- Only takes a small amount of grease
- Do not stretch when installing. Simply roll or press them into position.



Sensor Maintenance

- Items needing attention:
 - pH/ISE solution or module
 - DO lens cap or membrane
 - Wiper brush head
 - Desiccant packets/cartridges
- Check equipment manual for complete instructions



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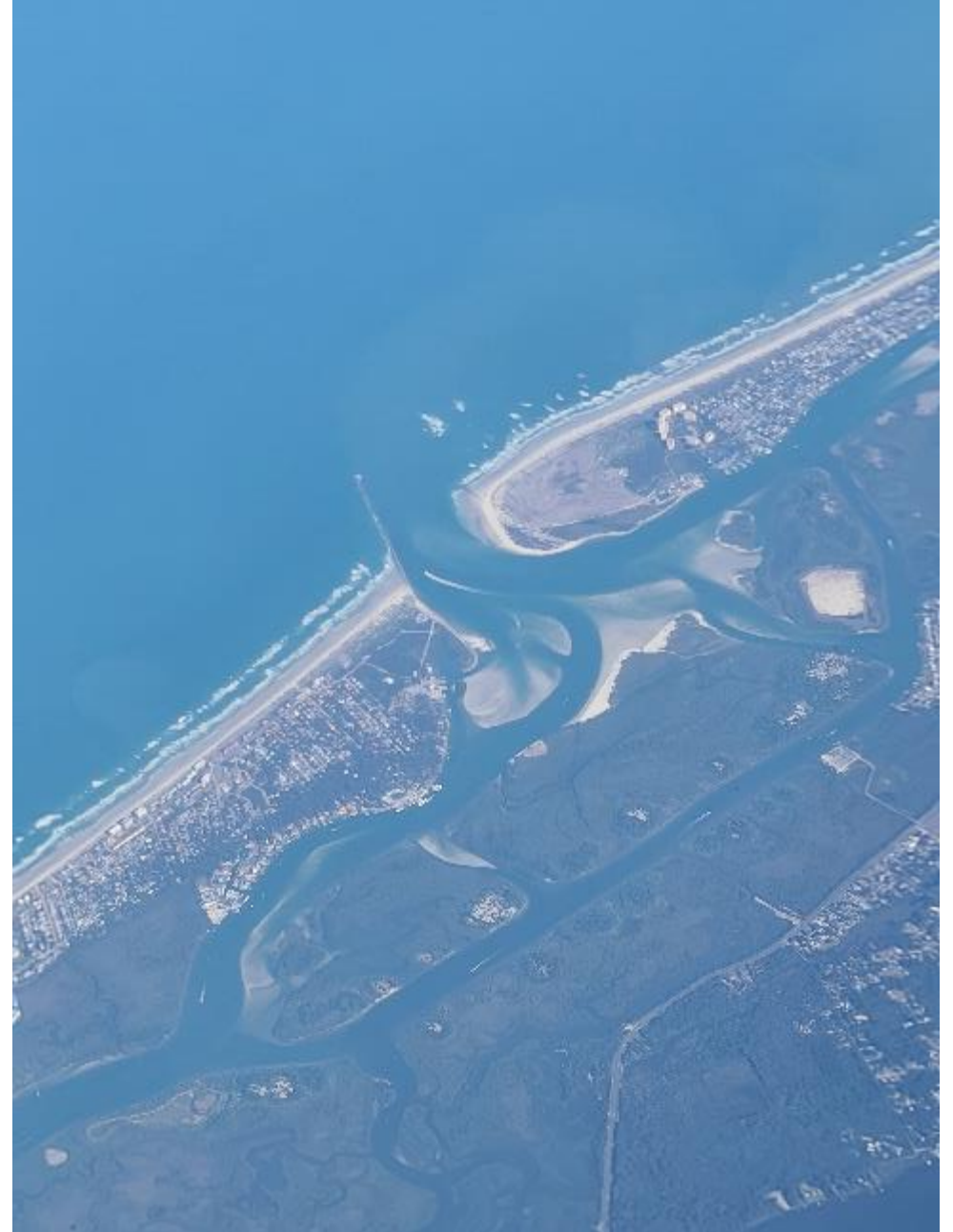
Frequency of Calibration

- Dictated by YOUR standard operating procedure
- Manufacturer's sometimes offer recommendations of frequency:
 - Check equipment manual
 - Examples:
 - pH: 10-12 weeks
 - DO: 1 year
 - ISE: 1 month



Bracket Conditions

- Each water body is unique
- Standards for calibration and checks should represent expected conditions
 - Example:
 - SC: Freshwater vs Brackish
 - pH: Ocean vs Mine drainage
 - DO: Top vs Bottom of lake
 - TBY: Mountain vs urban area



Standard Expiration Dates

- Yes, they do expire!
- They expire faster when opened
- Avoid expired standards:
 - Solution may have changed
 - Legal reasons
- Label bottles with the date opened
- All standards should have solution expiry information available for unopened and opened bottles

<i>Solutions</i>		
Solution	Shelf Life - Unopened	Shelf Life - Opened
Quick Cal	4 months. Store in a cool, dark place. Shake before use.	7 to 21 days (± 10 mV, ± 0.05 pH, ± 50 μ S/cm)
ZoBell's	9 months. Store in a cool, dark place.	3 to 6 months
Low Conductivity (147 μ S/cm)	12 months	Hours (± 1 μ S/cm, check before use)
Other Conductivity	12 months	3 to 6 months
pH Calibration Buffers	24 months	3 to 6 months
Sensor Reference Filling Solution	24 months	12 months
pH Storage Solution	24 months	12 months
Sodium Sulfite	12 months	3 to 6 months
Turbidity	12 months	12 months from expiration date
Deionized Water	24 months	Hours, check before use for calibration
Ammonium	12 months	3 to 6 months
Chloride	12 months	3 to 6 months
Nitrate	12 months	3 to 6 months



The Basic Process

- Five simple steps:
 1. Clean everything
 2. Rinse 3 times
 - Ideally all with standard to be used
 3. Fill the calibration cup with standard
 4. Wait for stabilization
 5. Accept calibration
- Videos often available for help
- Sometimes can batch calibrate

Quality Assurance Information

- Calibration reports include:
 - Pre- and Post-calibration info
 - Slope or Gain
 - Offset
 - Constants
- Need to watch QA parameter changes over time. They indicate:
 - Errors in procedure
 - Sensor malfunction
 - Sensor maintenance time

Sensor	pH/ORP
Serial Number	574714
Last Calibrated	1/25/2019
<i>Calibration Details</i>	
<i>Calibration Point 1</i>	
pH of Buffer	4.00 pH
pH mV	155.9 mV
Temperature	26.58 °C
<i>Pre Measurement</i>	
pH	4.20 pH
pH mV	155.9 mV
<i>Post Measurement</i>	
pH	4.00 pH
pH mV	156.8 mV
<i>Calibration Point 2</i>	
pH of Buffer	7.00 pH
pH mV	-8.9 mV
Temperature	26.52 °C
<i>Pre Measurement</i>	
<i>Calibration Point 3</i>	
pH of Buffer	10.00 pH
pH mV	-187.5 mV
Temperature	26.74 °C
<i>Pre Measurement</i>	
pH	9.97 pH
pH mV	-187.6 mV
<i>Post Measurement</i>	
pH	10.00 pH
pH mV	-188.6 mV
<i>Slope and Offset 1</i>	
Slope	-54.94 mV/pH
Offset	-8.9 mV
<i>Slope and Offset 2</i>	
Slope	-59.53 mV/pH
Offset	-8.9 mV
<i>ORP</i>	
ORP Solution	Quick-Cal
Offset	7.4 mV
Temperature	22.37 °C

Sensor	Conductivity
Serial Number	599067
Last Calibrated	1/25/2019
<i>Calibration Details</i>	
TDS Conversion Factor (ppm)	0.65
Cell Constant	0.952
Reference Temperature	25.00 °C
<i>Pre Measurement</i>	
Actual Conductivity	13,485 µS/cm
Specific Conductivity	13,157 µS/cm
<i>Post Measurement</i>	
Actual Conductivity	13,211 µS/cm
Specific Conductivity	12,890 µS/cm

Sensor	RDO
Serial Number	596662
Last Calibrated	10/19/2018
<i>Calibration Details</i>	
Slope	1.063145
Offset	0.00 mg/L
<i>Calibration point 100%</i>	
Concentration	7.41 mg/L
Pre Measurement	103.53 %Sat
Post Measurement	100.00 %Sat
Temperature	27.67 °C
Barometric Pressure	1,013.5 mbar

Extras to Check

- Compare sensor reading to NIST-certified thermistor
- Check conductivity sensor reading in air
- Verify barometer is reading correctly and calibrate, if possible



Tech Support

- If anything goes wrong, always make Technical Support your #1 call!





5. Deploy Properly

Cross-Sections

- Important for verifying that a location is well-mixed
- Well-mixed ensures that sampling or monitoring anywhere will be representative of entire water body



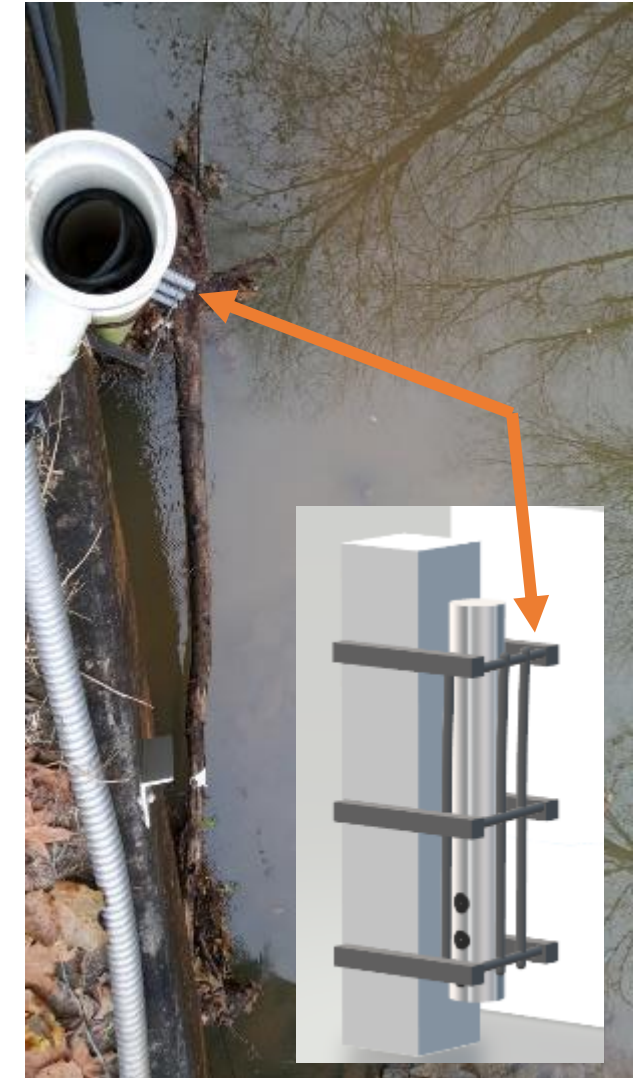
Discrete Sampling

- Collect data in a consistent location
- -or- Collect data where you collect samples for laboratory analysis
- Stand downstream of the sonde
- Ensure all sensors are in water
- Keep sensors off streambed
- Look at graphs for stability



Continuous Monitoring

- Monitoring location should be representative of water body
 - Compare deployment location readings to cross-section data
 - Do not deploy in an eddy
- Deployment pipe should have holes to ensure proper flow across sensors
 - For long pipes and those with heavy sediment, put holes down entire pipe
- The more vertical, the better
- Angle pipe downstream to deflect some debris and sediment
- Ensure sonde is safely accessible at all flows



A woman with long blonde hair, wearing a dark blazer, is shown in profile, looking towards the left. She is standing in front of a wall covered with numerous colorful sticky notes (yellow, pink, orange). The background is slightly blurred, emphasizing the woman and the sticky notes. The overall mood is professional and focused.

Quick Recap

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2. Maintain Power
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