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Environmental Monitoring Branch
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STANDARD OPERATING PROCEDURE
Aqua Troll 400 Multi-parameter water quality probe

KEY WORDS

Aqua Troll, water quality, measurements, sonde, probe, calibration, maintenance

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1.0 INTRODUCTION

1.1 Purpose

This document serves as a standard operating procedure (SOP) for the collection of water quality parameters using an Aqua Troll 400 device (In-Situ, Inc.).

1.2 Scope

This SOP describes procedures of connecting various components of the device, measuring and recording water quality parameters, cleaning and calibrating the sensors, and sensor storage and replacement.

1.3 Definitions

1.1.1 Probe – An object that is inserted into something to test conditions at a specific point.

1.3.1 Sonde – an instrument probe that transmits information about its surroundings from an inaccessible location, such as underground or underwater.

1.3.2 Water quality parameters – measurements that characterize the quality of water.

2.0 COMPONENTS

2.1 Equipment Needed for Field Deployment

2.1.1 Sonde

2.1.2 Storage sensor protector

2.1.3 Metal sensor protector

2.1.4 Connection cable

2.1.5 Wireless Communicator

2.1.6 Mobile phone/tablet device

2.1.7 Charging cables

2.1.8 Carrying case

2.1.9 Deionized (DI) water

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2.2   Equipment for Field Deployment Diagram

Figure 1. All components needed for the collection of water quality parameters using an Aqua Troll 400 device. Carrying case not pictured.
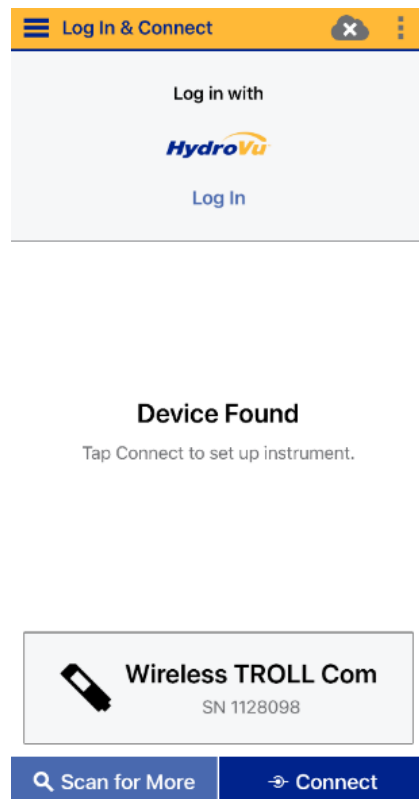
Collecting Parameters

2.3   Setting Up Device

2.3.1   During storage and travel, the sonde must have the Storage Sensor Protector securely twisted onto the device to protect the sensors and prevent them from drying out. To prepare the sonde for deployment, remove the Storage Sensor Protector and replace it with the Metal Sensor Protector. **Never** deploy a sonde without the Metal Sensor Protector securely attached.

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2.3.2   Remove the red and blue dust caps on the connection ports of the sonde, wireless communicator, and connection cable. Connect the sonde and wireless communicator using the connection cable by aligning the prongs on the ports and then twisting the metal cap into the locked position.

2.3.3   Press the [On/Off] button on the wireless communicator.

2.3.4   Open the VuSitu application using the mobile phone or tablet device.

2.3.5   Connect the mobile device you are using by selecting the serial number within the app that matches the serial number found above the charging port on the wireless communicator (Figures 2 and 3).

Figure 2. Connecting to Wireless Communicator.

Figure 3. Wireless Communicator serial number.

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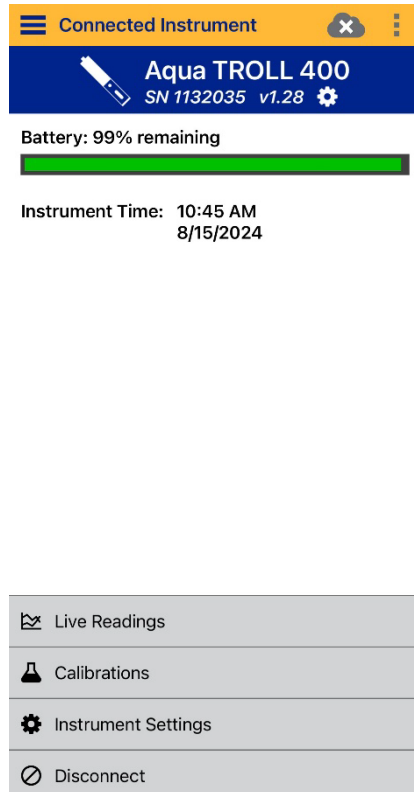**Aqua Troll 400 Multi-parameter water quality probe**

Figure 4. Instrument connected with sonde serial number.

Figure 5. Serial number located on sonde.

2.3.6 Once connected, you will see the sonde serial number at the top of the screen matching the serial number on the side of the sonde. If so, the instrument is ready for deployment (Figures 4 and 5).

2.4 Recording Live Parameters

2.4.1 While securely holding the wireless communicator and ensuring it stays dry, submerge the sonde into the body of water. If grab samples are being collected simultaneously, submerge the sonde downstream of ongoing sample collection to prevent sediment disturbance.

2.4.2 Once submerged, return to the VuSitu app and select [Live Readings] (Figure 4).

2.4.3 The VuSitu app will display the water quality parameters with a refresh rate of 2 seconds. Since the unit does not provide "auto stabilized" results; wait until the parameters are relatively stable before recording.

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2.4.4   If you do not see the target parameters available on the screen, check to make sure the parameter has been selected with a blue check on the left-hand side of the parameter row. If it is greyed out, check the box to have the parameter included within the reading (Figure 6).
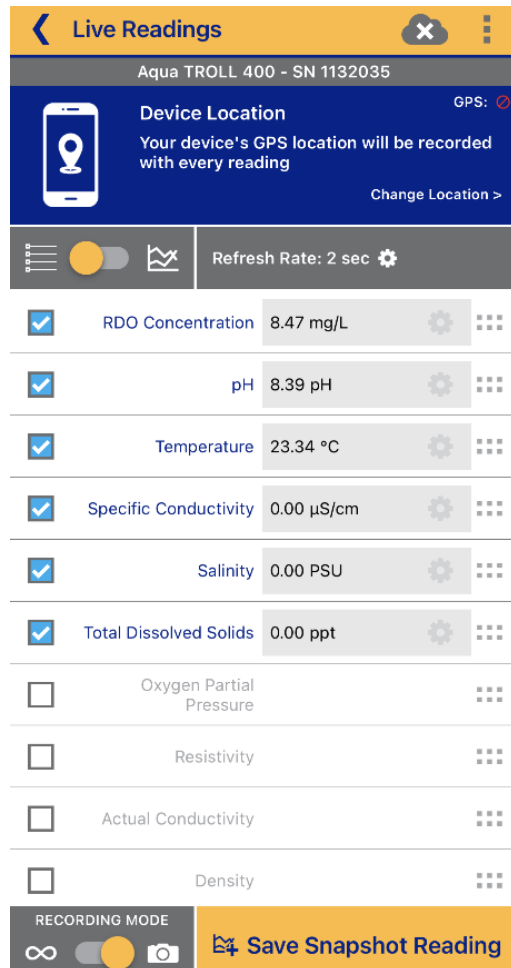

Figure 6. Live parameter reading.

2.4.5   The parameters can be recorded by hand onto physical field data sheets or electronically stored within the mobile phone or tablet device and accessed later.

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2.4.6   To store the parameters on the mobile phone or tablet device, tap the [camera] button at the bottom left of the screen and then press [Save Snapshot Reading] (Figure 6). This feature can be helpful during storm sampling when conditions are too wet for recording on physical field data sheets. Be sure to record the time and date of sampling at each site, as this ensures that the parameters are assigned to the correct sampling location.

2.4.7   To access the stored data files, return to the main screen in VuSitu, select the Menu [≡] button on the top left-hand side of the screen, and select [Data Files] (Figure 7).

2.4.8   Select the data file corresponding to the date of sampling (Figure 8). Each recording will be listed in time order.
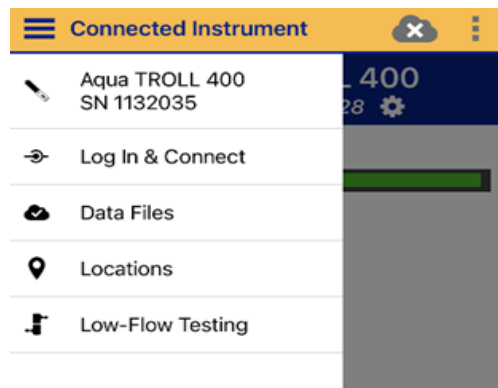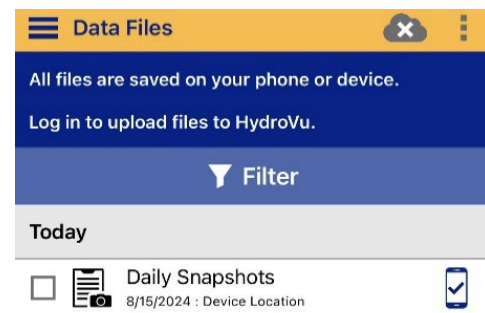

Figure 7. VuSitu main menu.

Figure 8. List of available data snapshot recordings.

2.4.9   After water quality parameters have been recorded, remove the sonde from the water and rinse with DI water before returning to the storage carrying case.

2.4.10   If the sonde will not be used again for 30+ minutes, remove the metal sensor protector, remove any debris or foliage, rinse the sensors with DI water, and securely attach the storage sensor protector.

3.0 MAINTENANCE

3.1   Storage

3.1.1   **Short term storage (< 1 month between uses)**

3.1.1.1   Rinse the sensors with DI water.

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3.1.1.2   Ensure the sponge within the storage sensor protector is damp but not fully saturated. This will prevent the sensors from becoming dry.

3.1.1.3   Securely attach the storage sensor protector and place the sonde in the holder on the designated Aqua Troll shelf in the digestion lab at Bradshaw Regional Office.

3.1.2   **For long-term storage (>1 month between uses)**

3.1.2.1   Remove the pH/oxidation-reduction potential (ORP) (Diagram 1) sensor and place the orange pH plug into the empty pH/ORP port to prevent any humidity from entering the probe.

3.1.2.2   Locate the sensor storage bottle in which the pH sensor was originally shipped. This is kept in the pH maintenance kit in the Aqua Troll supplies drawer.

3.1.2.3   Open the bottle and remove the O-ring.

3.1.2.4   Add enough pH storage solution or pH 4 solution to cover the sensor bulb (about 10 mL).

3.1.2.5   Slide the O-ring onto the sensor body, then slide the bottle cap over the sensor. (Figure 9)

3.1.2.6   Place the sensor tip in the buffer and tighten the cap to prevent the glass bulb from drying.

Figure 9. pH/ORP sensor long-term storage

3.2   Cleaning

The nature in which SWPP uses the Aqua Troll 400 devices should not require extensive cleaning of the sensors. The following cleaning procedures should only occur when residues are visibly present on the sensors and not easily removed by rinsing with DI water.

3.2.1   **pH/ORP Sensor**

If cleaning is required after rinsing the sensor with DI water, consider the nature of the debris to determine the appropriate method. Do not touch or wipe the glass bulb on the sensor. After performing any of the following cleaning methods, rinse the sensor with DI water and then soak overnight in pH 4 buffer.

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3.2.1.1   Oily or Greasy Residue

3.2.1.1.1   Clean the sensor with warm water and mild soap, such as Liquinox.

3.2.1.1.2   Methanol or isopropyl alcohol may be used for short soaking periods, up to 1 hour.

3.2.1.1.3   Do not soak the sensor in strong solvents, such as chlorinated solvents, ethers, or ketones, including acetone.

3.2.1.2   Slimy Film

3.2.1.2.1   Clean the sensor with warm water and mild soap, such as Liquinox.

3.2.1.2.2   Soak the sensor in 0.1M HCl solution for 10 minutes and then rinse with DI water.

3.2.1.3   Crystalline Deposits

3.2.1.3.1   Clean the sensor with warm water and mild soap, such as Liquinox.

3.2.1.3.2   Soak the sensor in 5% HCl solution for 10 to 30 minutes.

3.2.1.3.3   If deposits persist, alternate soaking in 5% HCl and 5% NaOH solutions.

3.2.2   **Rugged Dissolved Oxygen (RDO) Sensor**

3.2.2.1   Leave the cap on the sensor throughout the cleaning process.

3.2.2.2   Rinse the sensor with DI water from a squirt bottle.

3.2.2.3   Gently wipe with a soft cloth or brush if debris is present.

3.2.2.4   If debris is still present, soak the RDO Cap end in household vinegar for 15 minutes.

3.2.2.5   Soak in DI water for 15 minutes.

3.2.2.6   After cleaning the sensor cap, perform a 2-point calibration.

3.3   Calibration

In-Situ recommends inserting the instrument into a known calibration standard to check the accuracy of a sensor prior to performing any user calibration. In-Situ **does not** recommend calibrating for conductivity as most commercially available standards can introduce a larger potential measurement error than the sensor's initial factory calibration.

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3.3.1 **pH (every 4-6 weeks)**

3.3.1.1   From the main menu in VuSitu, select [Calibrations]

3.3.1.2   From the Calibration menu select [pH].

3.3.1.3   Select [2-Point Calibration]

3.3.1.4   Pour 7-pH buffer solution into the calibration cup until it reaches the fill line.

3.3.1.5   Insert the Aqua Troll 400 sonde into the solution.

3.3.1.6   VuSitu will automatically detect the pH of your buffer solution. If the wrong pH is chosen, click on [pH Buffer] to input the correct pH of the current calibration buffer.

3.3.1.7   Allow several seconds for stabilization. Once you see "Stabilized" in the green box at the bottom of the screen, click [Accept].

3.3.1.8   Repeat steps 4.3.1.1 through 4.3.1.6 again with 10-pH buffer solution.

3.3.2 **Rugged Dissolved Oxygen Sensor calibration (every 12 months)**

3.3.2.1   From the main menu in VuSitu, select [Calibrations]

3.3.2.2   From the Calibration menu select [RDO Saturation]

3.3.2.3   Place the vented cap on the calibration cup.

3.3.2.4   Insert a water saturated sponge in the bottom of the calibration cup.

3.3.2.5   Insert the probe into the calibration cup and select [100% Saturation].

3.3.2.6   After the calibration is stable, select [Accept].

3.4 Sensor Replacement

The dissolved oxygen, conductivity, pressure, and temperature sensors are integrated into the instrument and cannot be serviced in house. The pH/ORP sensor and the RDO Sensor Cap have a typical lifetime of 15 months. However, sensor replacement is only necessary if the sensors require calibration at a greater frequency than what is recommended for the sensor and/or the sensors repeatedly read known standards incorrectly despite calibration. See diagram 1 below for sensor locations.

3.4.1 **RDO Sensor Cap Replacement**

3.4.1.1   Without twisting, pull the used sensor cap off the RDO sensor.
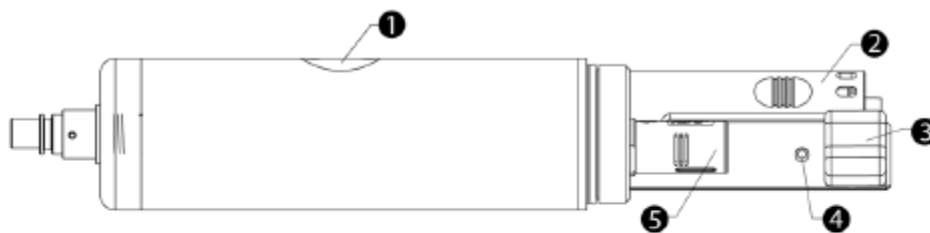
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3.4.1.2   Remove the existing O-rings from the sensor.

3.4.1.3   Using the lint free cloth provided with the RDO replacement kit, remove any moisture from the sensor body.

3.4.1.4   Use your finger to apply a thin layer of lubricant around the O-ring grooves. Replace the O-rings onto the sensor.

3.4.1.5   Remove the new cap from its sealed package.

3.4.1.6   Align the arrow on the cap with the index mark on the sensor and press it firmly, without twisting, until it seals over the probe body.

3.4.1.7   Ensure the O-rings are not pinched or rolled between the cap and the sensor.

3.4.2   **pH/ORP Sensor Replacement**

3.4.2.1   Unpack the sensor from the pH/ORP replacement kit. The electrode is shipped in a long-term storage bottle.

3.4.2.2   Unscrew the cap on the long-term storage bottle and gently remove the O-ring from the electrode.

3.4.2.3   Locate the pH/ORP sensor and, without twisting the sonde, pull the old sensor out.

3.4.2.4   Firmly insert the new sensor to the pH/ORP port.

Diagram 1 Sensor locations

1	Pressure sensor 76 m (250 ft)
2	pH/ORP sensor
3	Conductivity sensor
4	Temperature sensor
5	RDO Sensor

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3.5   O-ring Replacement

The Aqua Troll 400 has several serviceable O-rings (Diagram 2) on the device that should be monitored for wear and replaced as necessary to prevent moisture from damaging the internal electronics. Locate the correct size, remove the old O-ring and replace with a new one. A very small amount of silicone lubricant should be applied to the newly installed O-ring using a polyurethane foam swab included within the O-ring kit.

Diagram 2 Serviceable O-ring Replacements
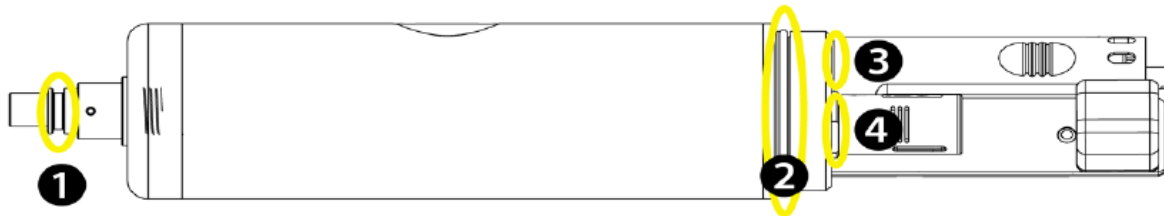
4.0 REFERENCES

In-Situ. (2019). *Aqua TROLL 400 Instrument Operator's Manual*