Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedures for Hydrolab® DataSonde® and MiniSonde® Multiprobes.

Version 1.0

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Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

Revision Date	Rev number	Summary of changes	Sections	Reviser(s)

Environmental Assessment Program

Standard Operating Procedures for Hydrolab® DataSonde® and MiniSonde® Multiprobes.

Introduction

DataSondes® and MiniSondes® are water quality multiprobes used by the Environmental Assessment Program (EAP) to measure pH, dissolved oxygen (D.O.), D.O. percent saturation, conductivity, temperature, depth, rhodamine dye concentration, and total dissolved gas (TDG) data. They can be used for short term spot-sampling as the user moves from site to site throughout the course of a day, depth profiling, or long-term unattended monitoring at specified time intervals. Currently, EAP does not use Hydrolab sondes to gather turbidity, ammonium, chloride, nitrite, or redox data, but these nonstandard sensors are available through Hach/Hydrolab if necessary.

Reservations for all Hydrolab equipment must be made on Ecology's Y: drive. Required Hydrolab training covers how to do this properly. Equipment information and specifications are also on the Y: drive. Go to Y:\SHARED Files\WES Section\Hydrolab to find both of these folders.

1.0 Purpose and Scope

1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for using Hydrolab® DataSondes® and MiniSondes®.

1.2 The information hereafter should be used for quick reference and additional information and is not a substitute for the Hydrolab user's manuals or the Electronic Data Solutions Hydrolab Maintenance and Calibration Workshop Training Manual. Consult the appropriate manual for a complete guide of the proper use, calibration, maintenance, storage, deployment, and troubleshooting of Hydrolab sondes. For information on using rhodamine, TDG and other nonstandard sensors, please consult the appropriate Hydrolab manual or Hach's website at http://www.hydrolab.com/ or contact a Hydrolab custodian.

2.0 Applicability

2.1 This SOP must be followed when using Hydrolab sondes. Hydrolab equipment is expensive and must be treated and maintained carefully. Anyone not following proper procedures is subject to losing rights to future use.

3.0 Definitions

3.1 Calibration: To standardize or correct sensors after determining, by measurement or comparison with a standard, the correct value.

3.2 Conductivity: A measure of the ability of water to pass an electrical current. This parameter indicates the amount of dissolved substances (salts) present in the water.

3.3 D.O.: Dissolved oxygen in water, measured in mg per liter.

3.4 D.O.%: The percent saturation of dissolved oxygen in water.

3.5 Multiprobe: The combination of several sensors, probes, or probe assemblies into a complete, stand-alone piece of equipment which simultaneously measures several parameters for profiling, spot-checking, or logging readings and data. A multiprobe is a multiparameter instrument.

3.6 pH: A measure of the hydronium ion concentration of a solution. Solutions with a pH less than 7 are considered acidic, while those with a pH greater than 7 are considered basic. The pH is the negative logarithm of the hydronium ion concentration in solution. For example, if the hydronium ion concentration is 10^{-7}, the pH is 7.

3.7 Post-calibration: Assessing the performance of a sensor - after use - by noting the variation from a standard, to ascertain necessary correction factors.

3.8 Profiling: Lowering a multiprobe through a water column to measure changes in values with depth.

3.9 Rhodamine: Rhodamine is a synthetic red to pink dye having brilliant fluorescent qualities. It is often used as a tracer in water to determine the rate and direction of flow and transport. Rhodamine dyes fluoresce and can thus be measured easily and inexpensively with fluorometers or with a Hydrolab rhodamine probe.

3.10 Sonde: Generic term for a water quality multiprobe.

3.11 Total dissolved gas (TDG): The total pressure of gaseous compounds dissolved in water, measured directly in units of mmHg, and also expressed as percent of saturation (ratio of dissolved gas pressure to ambient barometric pressure).

4.0 Personnel Qualifications/Responsibilities

4.1 You must be on EAP's list of approved Hydrolab users and properly trained to use any Hydrolab equipment. A Hydrolab custodian or company representative can help fulfill the training requirement. See your supervisor for further details.

5.0 Equipment, Reagents, and Supplies

5.1 pH buffer solution (low or normal ionic strength)
5.2 Conductivity standard solution
5.3 Tap and deionized water
5.4 DataSonde or MiniSonde multiprobe
5.5 Surveyor (deck unit) and 5 meter cable
5.6 Profiling communication cable (longer than 5 meters)
5.7 Sonde calibration cup, other communication cables, charger, probe protection cage

5.8 Toolbox containing: extra parts (o-rings, screws, calibration cups, etc.), soft wipes, cotton swabs, silicone grease, pH reference solution, ethyl alcohol, D.O. probe electrolyte and membranes, small scissors, Phillips and flathead screwdrivers, toothbrush, pliers, crescent wrench, tweezers, electrical tape, "AA" and "C" batteries, Allen wrenches for outer case and battery compartment, and other miscellaneous supplies.

5.9 TDG calibration kit (pressure gage, custom fittings and calibration cup, spare membranes, and tools)

5.10 Laptop and HyperTerminal if applicable

5.11 Hydrolab manuals

6.0 Summary of Procedure

6.1 Calibration

6.1.1 Note: TDG calibration procedures are discussed in detail in a separate SOP (Pickett, 2006).

6.1.2 Make sure the sonde stirrer is turned off and the calibration cup is attached. Rinse the probes a minimum of three times with deionized water, then at least once with a small amount of the standard you are using. Discard and shake out. Clamp the sonde to the support stand and slowly pour the calibration standard over the probes. Make sure the standard covers every probe on the sonde because they make references to each other.

6.1.3 Always discard used conductivity standard after each use. It goes bad very quickly, especially the 100 µS standard. Opened conductivity standard bottles should not be kept longer than two weeks. pH 9.15 (low ionic strength solution) fouls quickly as well, so check it against a new bottle if you've used it several times, or if it's been opened and stored longer than one month. Other standards should be carefully checked for expiration dates and possible fouling before each use.

6.1.4 Recommended Calibration Order

6.1.4.1 Conductivity (0, then your standard; bracket expected field readings if possible)

6.1.4.2 pH (7, then 10 or 4; bracket expected field readings if possible)

6.1.4.3 D.O.

6.1.4.4 Depth (if necessary)

6.1.4.5 Temperature is factory-calibrated.

6.1.4.6 TDG (if needed)

6.1.5 Calibration Procedures

6.1.5.1 Start by cleaning the sonde (see section 6.3).

6.1.5.1.1 Conductivity: Dry off and buff the conductivity probe with a cotton swab or paper towel to remove any oil or dirt. If you're calibrating a DataSonde 4a® or higher, first calibrate the dry probe to 0.0 µS. Then cover all probes and calibrate using your standard (100, 1000, 10,000 µS or other; bracket expected field readings). If you're using a DataSonde 3®, skip the dry calibration and calibrate only once, using a standard in the range of your expected field readings.

6.1.5.1.2 pH: A two point calibration is most common. Cover all probes with the pH standard. Always start with pH 7 standard, then 4 or 10; bracket expected field readings. If you're doing a three point calibration, start with pH 7 standard, then 10, then 4.

6.1.5.1.3 D.O.: D.O. can be calibrated using air or a saturated water bath.

6.1.5.1.3.1 *Air Calibration:* Fill the sonde cup with tap water to just under the D.O. probe o-ring, gently dry off the D.O. membrane with a cotton swab or soft cloth if necessary, and set the cap on top – don't screw it on. Wait about five minutes for equilibration, then calibrate the D.O.% saturation to 100.0 by entering the current barometric pressure. If you are calibrating in a location more that several hundred feet above sea level, make sure you are using the true local barometric pressure and not barometric pressure at sea level.

6.1.5.1.3.2 *Water bath calibration:* Place the sonde in a water bath which has had a bubbler running for at least 24 hours. Turn on the sonde and allow the D.O. sensor to equilibrate. Take two water samples from the bath and run Winkler titrations. Calibrate the sonde to the average of the two Winkler values.

6.1.5.1.4 Depth: Make sure nothing is blocking the depth port and calibrate to zero prior to use.

6.1.5.1.5 Temperature is already factory-calibrated and cannot be recalibrated.

6.2 Field Use

6.2.1 Methods for profiling, spot-sampling, or long-term deployment vary and will be discussed during training. Basic methods are described in the Hydrolab user's manual. Tips for collecting more precise and accurate data while in the field are located at Y:\SHARED Files\WES Section\Hydrolab.

6.3 Cleaning

6.3.1 Clean all probes before and after each use.

6.3.1.1 Gently wipe the D.O. membrane with a cotton swab to remove any residue or oily build-up.

6.3.1.2 Gently wipe the glass pH probe. If it's really dirty, a soft toothbrush may be used. Do not use alcohol.

6.3.1.3 There is no need to clean the white reference probe unless it's visibly dirty. Do not use alcohol.

6.3.1.4 Firmly wipe the conductivity electrodes with a cotton swab. Alcohol may be used if necessary.

6.3.1.5 Remove all iron shavings from in and around the stirrer.

6.3.1.6 Wipe down and rinse everything else and make sure there are no problems for the next user.

6.3.1.7 If you run into problems or something doesn't work properly, consult the troubleshooting section of a Hydrolab manual, call Hydrolab's technicians directly, or consult an experienced Hydrolab user within EAP.

6.4 Short-term Storage (one day to three months)

6.4.1 Clean the sonde. Keep a minimal amount of tap water (about ½ inch) in the plastic sonde cap when not in use. Do not use distilled or deionized water unless it's the only water available. If the sonde is equipped with a low ionic strength pH reference probe, fill the rubber cap with pH reference solution and place it securely over the probe.

6.5 Long-term Storage (over three months)

6.5.1 Follow the short-term instructions. In addition, remove the D.O. membrane and electrolyte, rinse with distilled or deionized water and add a new membrane without refilling the D.O. reservoir with electrolyte. Remove external batteries, but do not remove the lithium battery which powers the sonde's internal time clock.

6.6 Troubleshooting

6.6.1 Consult the appropriate manual. Hydrolab and Electronic Data Solutions manuals have a lot of useful information not covered in this SOP and are easy to use. Manuals are found on the Hydrolab equipment shelves in the electronic storage room at the Operations Center (OC), in the drawers in the wet lab at the OC, or at the desks of field leads who frequently use Hydrolab equipment. Manuals can also be downloaded from the Hydrolab website at http://www.hydrolab.com/.

6.6.2 Call a Hydrolab custodian or a Hydrolab technician if problems arise that the manuals can't help you with. Hach's technical support line for Hydrolabs: 1-800-949-3766.

6.7 Equipment Repair

6.7.1 Every sonde will need probe replacement or repair at some time. Follow these instructions for sending in sondes to Hach/Hydrolab for repairs, performance tests and evaluations (PT and E), probe replacements, or any other unsolvable problems you or an OC technician cannot solve. *Note: The following process may change without notice. If you are unfamiliar with repairing and shipping Hydrolabs, see a Hydrolab custodian or OC technician.*

6.7.1.1 Go to Hach's Hydrolab website and print off the SERVICE MEMORANDUM.

6.7.1.2 Fill it out as directed and then call 1-800-949-3766. Ask for someone to help you get a SERVICE JOB number.

6.7.1.3 Put the SERVICE JOB number on the SERVICE MEMO and the DATE you will ship the equipment and fax the SERVICE MEMO to 970-461-3924.

6.7.1.4 Hydrolab will fax you a label to put on the box(s) you ship to Hydrolab (they'll do this right after you get off the phone with them). It will include the SERVICE JOB number(s) on it.

6.7.1.5 Include the SERVICE MEMO in each box and write "carton # of #" on each box. Make sure the SERVICE JOB number is showing. Cover up any other labels still on the box so as not to confuse the shippers.

6.7.1.6 When you get an estimate from Hydrolab (should take around two weeks) submit a Preliminary Purchase Request to Ecology for that amount.

6.7.1.7 When you get the Purchase Order number from Ecology (this is the part that takes the most time), fax it to Hydrolab and they will then return the equipment with a summary of what was done.

6.7.1.8 Make sure to read the summary of work done in case the manufacturer forgot to do any of the repairs.

6.7.1.9 Pack the equipment tightly with a small amount of water in the cap (about ¼").

6.7.1.10 Note that your shipping address and billing address may be different. At Headquarters the address is:

Shipping:

WA State Dept. of Ecology
300 Desmond Drive
Olympia, WA 98504

Billing (P.O. box):

WA State Dept. of Ecology
300 Desmond Drive
P.O. Box 47612
Olym pia, WA 98504

6.8 Setting up HyperTerminal for Hydrolab Communications

6.8.1 Attach appropriate cable from sonde to laptop.

6.8.2 Open HyperTerminal: (Start/Program/Accessories/Communications/HyperTerminal)

6.8.3 Box Opens: “Connection Description”. Type in a name (your choice) and pick an icon.

6.8.4 Box opens: “Connect To”. Under “Connect using”, pull down menu and pick “COM1”. Click OK. (This should be the serial port you connect the Hydrolab cable to. If you do everything that follows and this doesn’t seem to work, try a different COM).

6.8.5 Box Opens: “COM1 Properties”. “Bits per second” = 19200. “Data bits” = 8. “Parity” = NONE. “Stop bits” = 1. “Flow Control” = Xon/Xoff.

6.8.6 You will now be connected. At the bottom of the window it might say “Connected 0:00:xx” with a clock counting. Disconnect (click the “phone off the hook” button or menu “Call/Disconnect”.)

6.8.7 Click menu “File/Properties”. The “Connect To” tab has the same box as Item 3 above. The “Configure” button will give you the same box as Item 4 above.

6.8.8 In the Properties box click the “Settings” tab. Under “Emulation” select “ANSI.”

6.8.9 You should now be able to connect and talk to the Hydrolab.

6.9 File Handling

6.9.1 Please see any of the Hydrolab manuals mentioned in section 1.0 for detailed instructions on how to create, transfer, download, and delete data files.

7.0 Records Management

7.1 Reservations for all Hydrolab equipment are made at Y:\SHARED Files\WES Section\Hydrolab. Training will cover how to do this properly.

8.0 Quality Control and Quality Assurance Section

8.1 Sondes should be calibrated before each use and post-calibrated using standards afterward.

8.2 When traveling from site to site, make sure the sonde’s probes are kept moist so they don’t dry out and become inaccurate.

8.3 Although Hydrolab equipment is robust and made for heavy field use, it should be handled carefully at all times.

8.4 Further quality control and quality assurance procedures will be addressed thoroughly on a project-by-project basis in the Quality Assurance Project Plan for the project.

9.0 Safety

9.1 Conductivity and pH standards are nontoxic, but can irritate eyes and other sensitive areas because of their high salt content.

9.2 Wash hands thoroughly after calibration or after use in contaminated waters.

9.3 When using a sonde in the field, be aware of your surroundings. Select an area in which you feel safe and secure from water and land hazards.

9.4 For further field health and safety measures, please refer to the EAP safety manual.

10.0 Theft

10.1 Hydrolab sondes deployed in small creeks and clear rivers are easily seen. To avoid problems with theft and vandalism, hide them carefully. Deploy sondes upstream or downstream of public access areas, private property, or places where boaters and swimmers can see them. Under overhanging vegetation, or behind instream rocks and fallen tress are often good places to hide them, as long as water circulation is not limited.

10.2 Do not use large floats or anchors in smaller streams; they attract attention. Instead, note where the sonde is and cover it as much as possible. Small cement blocks work well as anchors. If the sonde is deployed in a large river, floats, line, and larger anchors may be necessary. See an experienced Hydrolab user for further details.

10.3 If you cannot find a sonde and suspect theft is the cause, visit the local police station and fill out a report. Ecology has also located lost equipment by running ads in local papers.

11.0 References

11.1 Electronic Data Solutions, 2002. Hydrolab Maintenance and Calibration Workshop Training Manual. Electronic Data Solutions. Jerome, Idaho.

11.2 Environmental Assessment Program, 2006. Environmental Assessment Program Safety Manual. March 2006. Washington State Department of Ecology. Olympia, WA.

11.3 Hach Environmental. 2007. Hydrolab Homepage. http://www.hydrolab.com/. Viewed March 27, 2007.

11.4 Pickett, Paul. 2006. Standard Operating Procedures for Monitoring Total Dissolved Gas in Freshwater. Environmental Assessment Program, Washington Department of Ecology. Olympia, WA.