



STANDARD OPERATING PROCEDURE MAINE VOLUNTEER RIVER MONITORING PROGRAM

METHODS FOR USING THE YSI ECOSENSE EC 300A PORTABLE CONDUCTIVITY, SALINITY AND TEMPERATURE INSTRUMENT



Standard Operating Procedure YSI EcoSense 300A Portable Conductivity, Salinity and Temperature Instrument

Note: The mention of brand does not constitute recommendation of a specific company.

1. Applicability. This standard operating procedure (SOP) applies to the collection of water quality data for assessing the current state of water quality in rivers and streams. The data are used for assessing river and stream conditions to include determining water quality impacts, tracking sources of contamination, and support for watershed management plans.

2. Purpose. The purpose of this SOP is to provide standardized methods to determine specific conductance, salinity and temperature of rivers and streams as an instantaneous reading using the YSI EcoSense EC300A Portable Conductivity, Salinity and Temperature Instrument.

(Note: This instrument is also capable of measuring TDS (total dissolved solids). TDS is determined by multiplying conductivity by a TDS factor.)

3. Definitions.

A. YSI. Manufacturer of water quality monitoring meters.

B. Temperature Compensated Conductivity. Measurement of conductivity compensated to 25 °C or another specified value between 15 and 25 °C. It is expressed as $\mu\text{S}/\text{cm}$ or mS/cm with a flashing “°C”.

C. Uncompensated Conductivity. Direct measurement of conductivity, not compensated to a specific temperature. It is expressed as $\mu\text{S}/\text{cm}$ or mS/cm .

D. Specific Conductance. Specific conductance is electrical conductivity (EC) that is being expressed in microsiemens per centimeter ($\mu\text{S}/\text{cm}$) at a normalized temperature of 25 °C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in mg/L) is about 65% of the specific conductance (in microsiemens). *(Note: This relation is not constant from stream to stream, and it may vary in the same stream with changes in the composition of the water.)*

E. Salinity. Measurement of salinity, expressed in parts per thousand (ppt).

F. Total Dissolved Solids (TDS). Measurement of total dissolved solids, expressed in grams per liter (g/L).

G. Electrode. Sensing device located at the end of a cable that is attached to the meter.

H. Calibration. Set of procedures established by the manufacturer to ensure the meter is operating properly: a critical quality assurance step in meter preparation prior to use.

I. Project Manager: The project manager is a DEP employee who supervises and has the highest decision making authority. In a DEP river/stream assessment, an employee in DEA is the project manager.

J. Team Leader: Team Leaders have the highest authority within a sampling team.

4. Responsibilities.

- A. **SOP Use.** It is the responsibility of project managers to inform team leaders that this SOP must be used when collecting conductivity, salinity and temperature data with an EcoSense EC300A meter. Team leaders are responsible for assuring that the SOP is used by other team members collecting the data.
- B. **Data recording.** It is the responsibility of the team leader to assure that the data is correctly recorded on all sampling field sheets.
- C. **Data Validation.** The project manager is responsible for validating data, rejecting data and making any adjustments to the data.
- D. **Volunteer and Other Monitoring.** Data used by the DEP from volunteer monitoring groups or any other monitoring group (e.g. consultant or State agency) collected outside the DEP must follow this SOP. It is the responsibility of the monitoring group to follow this SOP.

5. Guidelines and Procedures.

A. Meter Preparation.

- 1. Before each field season, conduct a full inspection of the meter. New batteries shall be installed at the start of the sampling season and additionally, as needed. In addition, follow manufacturer's instructions for maintenance. (Refer to manual; section "Probe Maintenance").
- 2. Each meter should be equipped with:
 - Manual or copy of manual
 - Field record book/card for recording QA and repairs
 - Extra battery
 - Screw top containers for sample collection and di-ionized water
- 3. Conductivity standards should be obtained for calibration. Generally standards of 100, 500, and 1000 ($\mu\text{s}/\text{cm}$) should cover the range of streams sampled.
- 4. The meter should be kept as dry as possible. Ideally, the meter should be stored in a water resistant case with padding to protect it from damage.

B. Calibration.

- 1. Meter calibration is a necessary step that must be undertaken to assure that readings are accurate.
- 2. The EcoSense EC300A meter shall be calibrated at the beginning of the field season and then as needed. The meter should be calibrated to a known standard, preferably in the middle range of solutions that will be sampled.

3. Ideally, the calibration should be undertaken in the lab prior to going out to sample as the meter and conductivity solutions will be close to 25 °C.
4. Calibrate the meter according to manufacturer's instructions. (Refer to manual: Section "Calibration").
5. If possible, periodically cross check the meter with other Division of Environmental Assessment meters.
6. Record calibration checks on the field record book/card.

C. Conductivity, Salinity and Temperature Measurements.

1. The team leader shall familiarize themselves with the basic operation, keypad and readouts of the meter. Refer to manual: Section "Key Functions of the Model EC300A" through "Measurement Modes" and Section "Conductivity Measurements".
2. When taking measurements, ensure that the probe is submerged and temperature has stabilized before recording the measurement.
3. Measurements may either be made in directly in the stream or a clean sample container. "Clean" means that the sample container has been rinsed 3 times with stream water at the site.
4. Relevant information such as weather, samplers, meter #, date/time, GPS location should be recorded on the sampling sheet in addition to the conductivity, salinity, temperature measurements.
5. If the sampling location has an overall depth of less than 1 meter, sampling is taken at mid-depth. If depth is greater than 1 meter in depth, sample at mid-depth if known or ½ foot below surface.

6. Equipment Care.

A. Start of field season.

1. Follow manufacturer's directions for preparation of a new electrode at the start of the field season.
2. Use new batteries at start of each sampling season. An extra set of appropriate size batteries (1 9V batteries) should be included in the meter carrying case.

B. Field Season.

1. Always keep the sensor electrodes clean. Rinse the electrode with de-ionized water and wipe it dry with a clean cloth before storing with protective cap.
2. Ideally the meter should be in water-resistant case with padding to protect it from damage.
3. Allow the case and contents to air-dry at end of each day. This may be accomplished by simply propping lid open. When contents are very wet, remove the contents and spread out to facilitate drying.

4. Do not store the meter in extreme environments (eg. car over hot summer periods).
5. Replace battery if low battery indicated.
6. The instrument is waterproof, However if it is submerged without the cap connected, follow manufacturer’s instructions immediately. See manual: Section “The Instrument”.

C. End of field season.

1. Completely dry meter, case, and all items in the case before storing.
2. Remove battery.
3. Soak electrode in alcohol for a 10-15 minutes to remove oils (not sure about this?)
4. Cover top of electrode with electrode cap to keep dust and dirt out for winter.
5. Keep meter dry and in a heated storage space to prevent corrosion of electronic parts.
6. Record winterization date and equipment repairs in Equipment Log.
7. Label the meter and case as ‘WINTERIZED’ in an obvious manner (so users will know the current status of the unit).
8. Send the meter for repair if needed.

D. Miscellaneous. Refer to Manual, “Troubleshooting”, if instrument fails to calibrate or displays “OvEr/Undr”.

7. Specifications

Display	Range	Accuracy	Resolution
Conductivity, Auto-ranging	0.0 to 499.9 μ S/cm	$\pm 1\%$ of reading plus 2 μ S/cm	0.01 μ S/cm
	500 to 4999 μ S/cm	$\pm 1\%$ of reading plus 5 μ S/cm	1 μ S/cm
	5.00 to 49.99 mS/cm	$\pm 1\%$ of reading plus 0.05 mS/cm	0.01 mS/cm
	50.0 to 200.0 mS/cm	$\pm 2.5\%$ of reading plus 0.5 mS/cm	0.1 mS/cm
Salinity	0.0 to 70.0 ppt	0.2% Full Scale	0.1 ppt
Temperature	-10.0 to 90 $^{\circ}$ C	± 0.2 $^{\circ}$ C or $\pm 0.4\%$ Full Scale whichever is greater	0.1 $^{\circ}$ C

8. References.

A. Operations Manual EcoSense EC300A: Portable Conductivity, Salinity, and Temperature Instrument. Revision A: July 2012 [For latest version of this manual, go to www.yei.com]

B. DEP Standard Operating Procedures:

- Document number #:DEPLW-0890: Dissolved Oxygen and Temperature, Instantaneous Measurement using Electronic Meters
- Document number#: DEPLW-0984: Methods for Using the Oakton Waterproof ECTestr for Measuring Specific Conductance in Rivers and Streams