



DEPARTMENT OF
ECOLOGY
State of Washington

Standard Operating Procedure EAP053, Version 1.0

Marine Water Salinity Sample Analysis

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Purpose of this Document

The Washington State Department of Ecology develops Standard Operating Procedures (SOPs) to document agency practices related to sampling, field and laboratory analysis, and other aspects of the agency's technical operations.

Publication Information

This SOP is available on the Department of Ecology's website at <https://apps.ecology.wa.gov/publications/SummaryPages/2203201.html>.

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The Washington State Department of Ecology’s (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.

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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	Revision History	Summary of Changes	Sections	Reviser(s)
12/29/2021	1.0	new SOP	All	Arati Kaza

1.0 Purpose and Scope

- 1.2 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for the analysis of bottle salinity samples collected concurrently with total alkalinity and dissolved inorganic carbon (TA/DIC) samples at our long-term marine monitoring stations in the Salish Sea and Coastal Bays.
- 1.3 The Marine Waters group collects salinity samples in 125mL brown Nalgene bottles at long term monitoring stations where we collect total alkalinity and dissolved inorganic carbon (TA/DIC). We analyze these samples at our lab using a benchtop conductivity cell electrical probe that we calibrate using an international certified reference material, IAPSO seawater salinity standard. The resulting salinity data are used in the analysis of TA/DIC samples and in the calculation of carbonate system parameters for ocean acidification monitoring

2.0 Applicability

- 2.1 We follow this SOP once a month after marine monitoring fieldwork and sample collection are complete.

3.0 Definitions

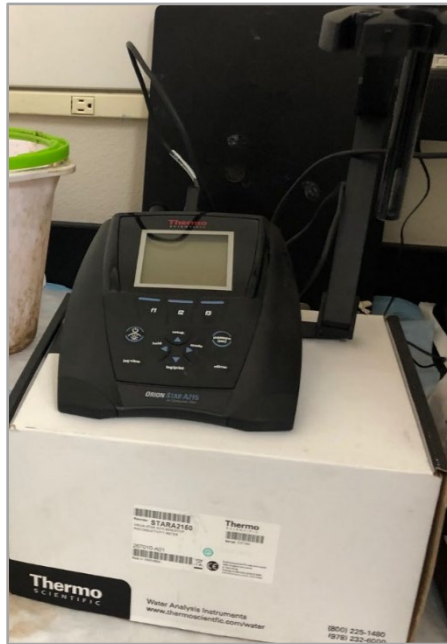
- 3.1 PSU - Practical Salinity Units
- 3.2 DI - deionized water
- 3.3 mL - milliliters
- 3.4 IAPSO - International Association for Physical Sciences of the Ocean

4.0 Personnel Qualifications/Responsibilities

- 4.1 Any staff carrying out this analysis are first trained on the SOP by the NRS2 Ocean Acidification Scientist who will conduct side-by-side analysis to compare results and ensure any new analyst produces data that do not differ from senior analyst or certified standard measurement by more than 0.05 PSU.
- 4.2 Job classes include NRS1 – NRS4. NRS2 Ocean Acidification Scientist, NRS2 Field Lead, or NRS1 Marine Field Technician carries out Benchtop salinity analysis.

5.0 Equipment, Reagents, and Supplies

- 5.1 Thermofisher Scientific Orion Star A215 4-electrode conductivity cell is a benchtop probe that can be dipped directly into a bottle sample of seawater to measure conductivity. To calibrate this instrument, IAPSO certified standard concentration seawater with a final concentration of 34.994 PSU is used in conjunction with DI water to determine the accuracy of the instrument across a large scale of salinities. Standards should be replaced every month.



- 6.1 **Probe Storage:** If more than 30 days passes between use the probe should be stored dry. If less than 30 days pass between analysis dates, the probe should be stored in a vial of DI water.
- 6.2 **48 hours prior to analysis,** all seawater bottles to be analyzed should be placed in the same, confined water bath with ambient tap water to minimize the differences in temperature of the samples.
- 6.3 After pressing the probe’s “on” button, the screen should read “sal 0.000 PSU.” If it doesn’t, use “mode” button to change between *cond* and *sal*.

6.4 This instrument should be calibrated at the start of each analysis day using the IAPSO standard (34.994 PSU) and DI water (0.00 PSU) to verify accuracy at high and low salinities.

6.4.1 At the beginning of calibration, press the F1 button under the screen to the left. Next, lower the dry probe into a glass vial of IAPSO standard seawater so that the entire gap at the bottom of the probe is submerged. After the probe has been lowered into the vial, hit “next.”



6.4.2 The screen should show “P1-xxx PSU” at the top with a large blinking “ready” until a numeric reading appears (e.g. “P1-34.990 PSU”). If the reading matches the known concentration (34.994 PSU) exactly, hit “accept” and then “next.” If the reading does not match, hit “edit” and manually enter the known concentration before hitting “next.” After this High standard step is complete hit “cal done,” rinse probe with DI water, and dry with a KimWipe.

6.4.3 Next, lower probe into a glass vial of DI water so that the entire gap at the bottom of the probe is submerged and hit “measure.” Wait until PSU reading stabilizes; the blinking light above the numeric display will go from “stabilizing” to “ready.” The reading for DI water must not exceed 0.05 PSU. If the reading for DI water exceeds 0.05 PSU, fill a fresh glass vial with new DI water and rinse probe with DI water until 0.05 PSU can be achieved. Dry the probe with a Kimwipe, and move on to sample bottles.

- 6.5 Remove a salinity sample bottle from water bath, shake, remove lid, and lower bottom 4 cm of probe directly into the sample. Then press “measure” button and wait until PSU reading stabilizes; the blinking light above the numeric display will go from “stabilizing” to “ready.” Record reading, date, temperature, and sample number in tracking sheet (salinity_sample_template.xlsx) from the Marine Waters folder on the EAP shared directory. Remove probe, rinse with DI water, dry with Kim Wipe and repeat process with remaining samples.



- 6.5.1 After every 10 sample measurements, take another reading of the IAPSO standard seawater and of DI water. Use “measure” button to read the 34.994 PSU standard and 0 PSU DI water sequentially and record values in the tracking sheet to see if there is drift in PSU or temperature reading over the sampling period. If either reading differs from the known value by more than 0.05 PSU, then5, recalibrate the instrument following steps 6.3.1 to 6.3.3.
- 6.5.2 When all of the salinity samples have been measured, finish by measuring the 34.994 PSU standard and DI water again.
- 6.5.3 Storage: store the probe in glass vial full of DI water until next monthly sampling period or store dry if next sampling period is >30 days.

7.0 Records Management

Use the tracking sheet template (salinity_sample_template.xlsx) from the Marine Waters folder on the EAP shared directory.

- 7.1 Lab result logs will be stored on a network drive in annual data folders. Data will be entered into an agency database, EAPMW, for further QC and analysis.
- 7.2 Lot numbers for IAPSO standards will be photographed and stored in annual data folders.

8.0 Quality Control and Quality Assurance

- 8.1 Data collected without calibration of the instrument will be rejected. Any data collected on days where the instrument calibration cannot be maintained within 0.05 PSU of the 34.994 PSU standard will be rejected.

9.0 Safety

- 9.1 No reagents pose a safety hazard but be careful to ensure electrical plug components do not come into contact with water to avoid electric shock.