

Standard Operating Procedure (SOP) #10

Quality Control When Changing Labs

Version 1.0 (February 26, 2021)

Change History

New Version #	Revision Date	Author	Changes Made	Reasons for Change	Previous Version #

Only changes in this specific SOP will be logged here. Version numbers increase incrementally by hundredths (e.g., version 1.01, version 1.02) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0). Record the previous version number, date of revision, author of the revision, changes made, and reason for the change along with the new version number.

Purpose

This SOP outlines quality control studies to be undertaken when a new analytical lab is contracted to analyze water quality samples for nutrients. Note that the bias test requires samples to be split and sent to both the old and new labs.

Shipping Test

If samples must be shipped to be delivered to a new lab, the shipping method must be tested to ensure samples remain below temperatures required to prevent biological activity from occurring in bottles. Generally shipping times should always be minimized to prevent samples from thawing, and shipping containers should be high quality insulated coolers.

1. Freeze tap water in standard sample bottles to create dummy samples.
2. Pack cooler with dummy samples in the same way regular samples are to be shipped.
3. Ship dummy samples using the same method regular samples are to be shipped.
4. Ideally all samples should arrive frozen. It is acceptable if most of the samples arrive frozen with some partially thawed with ice in bottles. A small number of thawed samples is acceptable if they remain at or below 4°C.
5. If samples do not arrive under 4°C the shipping method must be modified and tested until samples arrive under 4°C.

Accuracy and Precision Test

For the purposes of this SOP, accuracy is the degree to which the analytical measurement reflects the actual nutrient concentration and precision is consistency between values measured in replicates. After the shipping method has been tested and found to be acceptable, a test of the lab's analytical method and precision must be conducted before field samples are sent to the new lab. The test will consist of sending standard solutions of known nutrient concentrations and salinities. Both nitrogen and phosphorus should be tested.

1. Purchase standard solutions from a different lab made up with the following nutrient species, concentrations (N and P in the same solution) × 0 ppt, 15 ppt, and 30 ppt saline, for a total of 15 solutions:
 - a. 10 µg/L P and 50 µg/L N
 - b. 25 µg/L P and 100 µg/L N
 - c. 50 µg/L P and 500 µg/L N
 - d. 100 µg/L P and 1000 µg/L N
 - e. 200 µg/L P and 2000 µg/L N
2. Create three replicate test samples of each standard solution using standard samples bottles, label and freeze them. Label bottles with a code so as to not notify the lab of nutrient concentrations. Do not include concentrations in the chain of custody form but keep a record of the concentrations.
3. Send three replicate test samples of each concentration and salinity to the lab for analysis using the shipping method determined to be acceptable.

Accuracy of the results produced by the new lab should be within $\pm 10\%$ of the known concentrations of standard solutions for each nutrient (see table 5 in Raikow and Kozar 2020). Precision of the results produced by the new lab should be such that replicates are within $\pm 10\%$ of each other (Raikow and Kozar 2020). If results of analyses by the new lab are not within these accuracy and precision guidelines the new lab must correct methodology to produce such results before field samples can be sent for analysis. Additional analytical tests with standard solutions may be necessary.

Bias Test

Bias is a consistent difference between two analytical methods. Once accuracy and precision by the new lab are demonstrated bias between the old and new lab must be evaluated. Samples may be sent to the old lab prior to contract termination or analyzed as small individual purchases:

1. Collect a set of ten samples at double standard volume from a variety of ecosystems and conditions, e.g. streams at low flow, streams at high flow, marine, and anchialine pools. The intention is to create a wide range of nutrient concentrations.
2. Split each sample into two equal subsamples.
3. Send one set of subsamples to each lab.
4. Compare results between labs.

The test should either show that results from the new lab are on average the same as results from the old lab or demonstrate a consistent bias. If a bias is present, results from the new lab must be corrected to compensate. Correction for bias can occur within the database by applying a correction rate to results in queries. Corrected values should be used for all analyses including trends.

Literature Cited

Raikow, D.F., Kozar, K. 2020. Quality Assurance Plan for Water Quality Monitoring in the Pacific Island Network. Natural Resource Report NPS/PACN/NRR—2020/XXX. National Park Service, Fort Collins, Colorado.