

# Resampling Guidance for District Water Quality Sampling

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## **Resampling Guidance for District Water Quality Sampling**

### **Introduction**

A small number of South Florida Water Management District (SFWMD) water quality monitoring projects provide data for compliance with water quality standards and tests. Some of these tests are sensitive to the loss of data caused by sampling or laboratory issues that result in compromised samples. This document provides guidance on what those compliance tests are, what stations are involved, what parameters and cofactors are of concern, and what thresholds should or should not trigger resampling.

### **How Samples are Compromised**

On rare occasions, field sampling and laboratory failures occur that result in compromised samples (including both environmental and quality assurance samples). These failures include, but are not limited to:

- Uncollected samples
- Lost samples
- Damaged bottles
- Improperly preserved samples, and
- Improperly handled samples

In the case of both the field and laboratory, these issues are subject to routine audits and process improvements. For example, the laboratory is currently developing a strategy to rapidly notify field staff if it detects issues during the sample receiving process.

### **Factors Influencing Resampling**

The majority of water quality monitoring samples are subject only to compliance with Class III water quality standards based on annual data sets. These compliance tests are typically not very sensitive to the number of samples collected and can therefore tolerate the occasional loss of samples and data. For these stations, resampling of compromised samples is under the purview of the field supervisor and the field project manager.

However, there are several tests that are sensitive to loss of samples and data including the Settlement Agreement Discharge Limits for Shark River Slough and Taylor Slough (Discharge Tests), the Settlement Agreement Long-Term Marsh Concentration Levels for the LNWR (LNWR Marsh Test), and the State of Florida's Phosphorus Standards for the Everglades Protection Area (TP Rule Test). In each of these tests, the only parameter of concern is total phosphorus; it therefore seems logical to build a resampling policy around this parameter.

Additionally, each test has cofactors that influence the sampling and compliance test, and may influence the decision to resample. The Discharge Tests (Settlement Agreement Appendix A) are based around 12-month flow-weighted mean concentrations, and therefore flow is obviously a cofactor. However, because some interpolation between flow events may be needed, even events that have no flow may become critical. Given

these factors, resampling for the Discharge Tests should be carried out regardless of flow conditions.

The LNWR Marsh Test (Settlement Agreement Appendix B) is influenced by stage and water depth and these parameters play a role in the decision to resample. The LNWR Marsh Test is only applicable if the average stage of three specified stations is above 15.42 feet NGVD. However, using stage as a cofactor becomes a logistical issue since the lag in reporting data from the three gauges is generally longer than thirty days. Additionally, because stage is a component of the test itself, the differences in stage between the original event and any resampling needs to be minimized. Under this constraint, to avoid uncertainties associated with changes in marsh depth, any required resampling should be carried out as soon as possible. The second cofactor for this test is water depth, which sets a sampling depth of  $\geq 10$  cm for individual stations.

Unlike the LNWR Marsh Test, the TP Rule Test is not subject to stage, but instead is subject to a minimum sampling frequency of monthly. Thus, if samples for this test are compromised, they need only be resampled within the same month. The TP Rule Test is also subject to a minimum water depth, which sets a sampling depth of  $\geq 10$  cm.

Finally, all resampling is subject to the universal logistical concerns including the availability of qualified staff and transportation, including flight resources to conduct resampling.

### **Resampling Guidance for Discharge Tests**

The Discharge Tests are complex and require data from several structures including:

- Weekly if flowing otherwise monthly
  - S12A
  - S333
  - S334-S356
  - S332D
  - S18C
- Weekly if flowing
  - S12B
  - S12C
  - S12D

This set of structures is based on current operational infrastructure; if infrastructure in the area is modified, corresponding changes to the structures used in the test may be required.

If TP grab samples from structures associated with this compliance test are compromised, the affected stations should be resampled for TP only regardless of flow conditions. However, as a logistical consideration, the compromised samples must be detected within 72 hours of the original sample time and shall be resampled within the same week (Monday through Friday) as the original sample. To do otherwise would result in significant overlap with the sampling scheduled for the next week. If the compromised

stations cannot be resampled within the same week, a grab sample is required at the next routine weekly sampling regardless of flow conditions.

**General Guidance for Resampling for Marsh Tests**

Marsh sampling presents a greater logistical challenge and therefore greater financial investment than sampling structures. Consequently, while complete sampling of all stations with no quality assurance issues is the goal, some allowances for compromised samples must be made. For the purposes of this document, a resampling trigger level of 25 percent is suggested. Specifically, for any given marsh test, if 25 percent of the sampling stations are compromised, then resampling is automatically required. Furthermore, because water depths in marshes vary from station to station, some stations in the compliance test may be below 10 cm while others may be at or above this lower limit of sampling, thus the 25 percent trigger should be calculated from the number of “wet” stations rather than the total number of stations in the test (Table 1).

**Table 1.** Resampling triggers based on the number of “wet” stations.

<b>Number of Wet Stations</b>	<b>25% Resampling Trigger</b>
21-24	6
17-20	5
13-16	4
9-12	3
5-8	2
1-4	1

**Guidance for Resampling for LNWR Marsh Test**

The LNWR Marsh Test is comprised of 14 marsh stations when the average stage is above 15.42 ft NGVD. If 25 percent of the TP samples or total water depth measurements associated with this compliance test are compromised and stage is greater than 15.42 feet NGVD, the affected stations must be resampled for all parameters. Since data from the stage gauges have a significant lag (i.e., >30 days), it will be assumed that stage is greater than 15.42 feet NGVD unless current data are made available. However, as a logistical consideration to avoid potential changes in stage, the compromised samples must be detected within 48 hours of the original sampling event and must be resampled within 72 hours of the original sampling event.

Additionally, historically when there are fewer than five “wet” stations, average stage has always been less than 15.42 feet NGVD and the compliance test has not applied. Therefore if four or fewer stations are collected, no resampling should be initiated even if some samples are compromised.

**Guidance for Resampling for TP Rule Test**

The TP Rule Test requires monthly samples be collected from 24, 16, and 18 marsh stations in WCA-1, WCA-2A, and WCA-3, respectively. If 25 percent of the TP samples or total water depth measurements associated with this compliance test are compromised, the affected stations shall be resampled for TP only. However, as a logistical

consideration to avoid changes in stage, the compromised samples must be detected within 48 hours of the original sample event and must be resampled within the same month as the original sampling.

**Impact of this Guidance on Sampling Requirements**

This document provides guidance to SFWMD monitoring staff on how to determine if a particular compromised sample is of concern and how to respond. This document also provides the Technical Oversight Committee (TOC) and Florida Department of Environmental Protection (FDEP) with assurances that SFWMD monitoring staff has guidance that should result in a consistent response to compromised samples. It is not the intent of this guidance to effectively reduce the number of samples required for each of the varying compliance tests. Complete sampling of all stations with no quality assurance issues remains the goal. Staff is reminded that compromised samples should be a rare occurrence and the resampling guidance should be invoked infrequently. If a pattern of use emerges, field supervisors, field project managers, auditors, agency managers, FDEP, and the TOC all have options that can be exercised in response.