STANDARD OPERATING PROCEDURE FOR SECCHI DISK DEPTH MEASUREMENTS

State of Utah
Department of Environmental Quality
Division of Water Quality

Revision 0
Effective May 1, 2014

Utah Division of Water Quality (DWQ) Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. This document is intended primarily for internal DWQ use. This SOP should not replace any official published methods.

Any reference within this document to specific equipment, manufacturers, or supplies is only for descriptive purposes and does not constitute an endorsement of a particular product or service by the author or by DWQ. Additionally, any distribution of this SOP does not constitute an endorsement of a particular procedure or method.

Although DWQ will follow this SOP in most instances, there may be instances in which DWQ will use an alternative methodology, procedure, or process.[1]

[1] *Disclaimer language above adapted from Washington State Department of Ecology SOPs.*

REVISION PAGE

Date	Revision #	Summary of Changes	Sections	Other Comments
6/1/12	1	not applicable	not applicable	Previous version was put into new standardized format, began document control/revision tracking
5/1/14	0	Changed revision number, minor formatting	not applicable	First version should have been revision 0

TABLE OF CONTENTS

1.0 SCOPE AND APPLICABILITY

This document presents the Utah Division of Water Quality's (DWQ) Standard Operating Procedure (SOP) for performing Secchi disk measurements (also referred to as Secchi readings or Secchi depths) in lakes, reservoirs, and wetlands. This SOP applies to all DWQ field staff, non-DWQ cooperators, and citizen volunteers.

Secchi disk readings are essentially a measure of transparency and give an indication of water clarity. The DWQ uses this data in several ways. As an important indicator for lake water quality assessment, Secchi readings can allude to algae and/or suspended sediment concentrations. Secchi depth values are one component used to calculate the Carlson Trophic State Index, a measure of the degree of eutrophication in a lake/reservoir. The depth of the Secchi reading is also used to determine the depth at which surface water samples are to be collected (See DWQ's lake sampling SOP).

There is no one standard technique for performing Secchi readings and there is ongoing debate in the scientific community regarding whether Secchi readings should be taken in the shade vs. sun, with the naked eye vs. a viewing box, at the point of disk disappearance vs. reappearance vs. an average of the two, with an all white disk vs. a black and white disk, etc. (Smith, 2000). Therefore the best way to make data comparable for a monitoring project/program is to choose one procedure and have all data collectors use that procedure consistently. The procedure below was chosen by DWQ with a goal of reducing variability due to glare and degree of cloud cover.

2.0 SUMMARY OF METHOD

The Secchi disk is lowered into the water until it disappears from view. The depth at which the Secchi disk reappears after vanishing is the recorded Secchi reading. The sampler takes the reading on the shady side of the boat without wearing sunglasses.

3.0 HEALTH AND SAFETY WARNINGS

Field personnel should take appropriate precautions when operating watercraft and working on, in, or around water. All boats should be equipped with safety equipment such as personal flotation devices (PFD's), oars, air horn, etc. Utah's Boating Laws and Rules shall be followed by all field personnel.

Field personnel should be aware that hazardous conditions potentially exist at every waterbody. If unfavorable conditions are present at the time of sampling, the sample visit is recommended to be rescheduled. If hazardous weather conditions arise during sampling, such as lightning or high winds, personnel should cease sampling and move to a safe location.

4.0 CAUTIONS

Watercraft must be stationary while performing Secchi readings. A moving watercraft will produce invalid readings because the Secchi disk will not be aligned vertically in the water column. An additional anchor may be needed to further secure watercraft. Extreme wave action may also produce invalid readings. In these cases, round the Secchi reading to the nearest 0.1 meter as best as possible, making sure to note the field conditions on a field sheet or in a field notebook.

5.0 INTERFERENCES

Several factors may affect the Secchi reading. Since the eyesight of samplers may vary, all readings on the same waterbody ideally should come from the same person. Weather conditions and site conditions (e.g. overcast skies, water surface scum, dark-colored water, etc.) should be recorded so that outlier readings may be explained.

6.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

All personnel taking Secchi readings must read this SOP annually and acknowledge they have done so via a signature page (see **Appendix**). New field personnel must also demonstrate successful performance of the method. The signature page will be signed by both trainee and trainer to confirm that training was successfully completed and that the new monitor is competent in carrying out this SOP. The signature page will be kept on-file at DWQ along with the official hard copy of this SOP.

7.0 EQUIPMENT AND SUPPLIES

A Secchi disk is made out of a 20-cm-diameter Plexiglass disk painted with four alternating black and white quadrants. This disk is attached to a metered tape by a series of nuts and bolts. The tape is marked off in meters (subdivided by tenths of meters). Before use, make sure the markings on the tape are still clearly visible.

_____Copy of this SOP

_____Secchi disk and metered tape

_____Field forms, pencils or pens

8.0 PROCEDURE

Upon arrival to the sample site, establish which sampler is going to perform the Secchi reading(s).

1) Retrieve the Secchi disk from storage.

2) Move to the shady side of the boat and wait for the boat to be as stationary as possible before lowering the Secchi disk.

3) With sunglasses off, lower the disk slowly; make sure the tape is straight up and down.

4) Lower the Secchi disk to the point of vanishing and slowly raise it back up until it reappears. Move the disk up and down until the exact vanishing/reappearing point is found. At this point, read the tape where it is entering the water; this is the Secchi reading. One can visually read the tape or use your hand to mark the tape where it meets the water's surface.

5) Pull the disk out of the water and record the tape measurement to the nearest 0.1 meter.

9.0 DATA AND RECORDS MANAGEMENT

Secchi readings will be recorded on the lab sheet and trip sheet. If Hydrolab readings are also being taken, record Secchi reading in the annotation (see DWQ's lake hydrolab SOP). Once personnel reach the laboratory to drop off samples, all lab and trip sheets will be scanned and saved into the DWQ Monitoring Section shared folder titled "lake sampling trip data". These lab sheets hold important information that will be kept with the sampling trip data including sample depths, Secchi readings, sampling time, etc. Data management staff will review these sheets on a biweekly basis.

Field notes should be used to record any quality control activity performed such as measurements taken by more than one sampler, or to record any sampling conditions that may have interfered with the reading such as high winds/wave action. Field notes should be stored in the appropriate project folder at DWQ.

10.0 QUALITY ASSURANCE AND QUALITY CONTROL

There are limited Quality Assurance and Quality Control (QA/QC) procedures for Secchi readings. Duplicate readings may be performed at sites where duplicates samples are to be collected or two readings may be averaged by the sampler, if desired. For quality control, Secchi readings should ideally be taken by one person for an entire sampling trip. For long-term monitoring stations, all readings at the same location should ideally be taken by one person. A project-specific Sampling and Analysis Plan (SAP) may require additional quality control activities, for example having two samplers each record Secchi readings in order to measure variability between samplers.

11.0 REFERENCES

Smith, D.G. 2000. Standardization of secchi disk measurements, including use of a viewer box. Proceedings of the National Water Quality Monitoring Conference 2000: Monitoring for the Millennium, Austin, TX. National Water Quality Monitoring Council.

Related DWQ's SOPs:

Standard Operating Procedure for Collection of Lake Water Samples

Standard Operating Procedure for Hydrolab Data Collection in Lakes

12.0 APPENDIX

SOP Acknowledgement and Training Form

This SOP must be read and this form signed annually. This form must be kept with the latest version of the SOP.

Document Title:	
Document Revision Number:	
Document Revision Date:	

Please sign below in accordance with the following statement: "I have read and understood the above referenced document. I agree to perform the procedures described in this SOP in accordance with the document until such time that it is superseded by a more recent approved revision."

Printed Name	Signature	Date

SOP Acknowledgement and Training Form (continued)

Trainee: Sign below to acknowledge that training on this SOP was received, understood, and all questions/concerns were addressed by the trainer.

Trainer: Sign below to acknowledge that training on this SOP was completed for the individual listed and that trainee is competent to perform the procedures described within.

Date of Training	Trainee Printed Name	Trainee Signature	Trainer Printed Name	Trainer Signature