



## Environmental Quality

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### QUALITY CONTROL/QUALITY ASSURANCE DOCUMENTATION

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## **ACKNOWLEDGEMENTS**

(Place to acknowledge peer reviewer)



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TABLE OF CONTENTS

1.0 SCOPE AND APPLICABILITY .....2

2.0 SUMMARY OF METHOD .....2

3.0 HEALTH AND SAFETY WARNING .....2

4.0 CAUTIONS.....3

5.0 INTERFERENCES .....3

6.0 FIELD PERSONNEL QUALIFICAITONS/RESPONSIBILITIES.....3

7.0 EQUIPMENT AND SUPPLIES .....3

8.0 PROCEDURE .....3

9.0 DATA AND RECORD MANAGEMENT .....4

10.0 QUALITY ASSURANCE AND QUALITY CONTROL .....4

11.00 REFERENCES.....4

APPENDIX A. Field Reporting Form

APPENDIX B. SOP Acknowledgement and Training Form



## **1.0 SCOPE AND APPLICABILITY**

This document presents the North Dakota Department of Environmental Quality, 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 can also be used to determine the depth at which surface water samples are to be collected. 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 WARNING**

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. North Dakota'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 B). 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 field form (Appendix A). Once personnel reach the office, data recorded on the field form are entered into the DWQ Sample Identification Database (SID). 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 forms and 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 duplicate 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 SOPs**

Standard Operating Procedures for the Measurement of Temperature and Dissolved Oxygen Profiles in Lake and Reservoirs

Standard Operating Procedures for the Collection of Lake Water Quality Samples



**APPENDIX A**  
Field Reporting Form



[illegible]

09/22/2020

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_







**APPENDIX B**  
SOP Acknowledgement and Training Form



# 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:	Measuring Secchi Disk Transparency
Document Version Number:	1.1
Document Version Date:	02/08/2024

Please sign below in accordance with the following statement:

“I have read and understand 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.”

[illegible]



## SOP Acknowledgement and Training Form (con't)

**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 training is competent to perform the procedures described within.

[illegible]