Standard Operation Procedures for Statewide Lake Assessment

South Dakota Department of Agriculture and Natural Resources

Watershed Protection Program

April 2022

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Sampling station overview.

All lakes have a total of 5 stations (Figure 1). The primary station on the lake will have a Station ID that starts with SWLAZZZ, then includes a 4-digit lake ID. For example, SWLAZZZ9702. Water chemistry and algae ID/enumeration results from the composite sample, the average of the Secchi disk results and the average of the surface measurements (0.5 meters) from the vertical profile are associated with this station in the SD DANR NR92 Water Quality Database.

Three additional stations have A, B, or C at the end of the Station ID and are the locations where water is collected for the composite sample and the Secchi disk and vertical profiles are measured. Examples of these stations are SWLAZZZ9702A, SWLAZZZ9702B, and SWLAZZZ9702C.

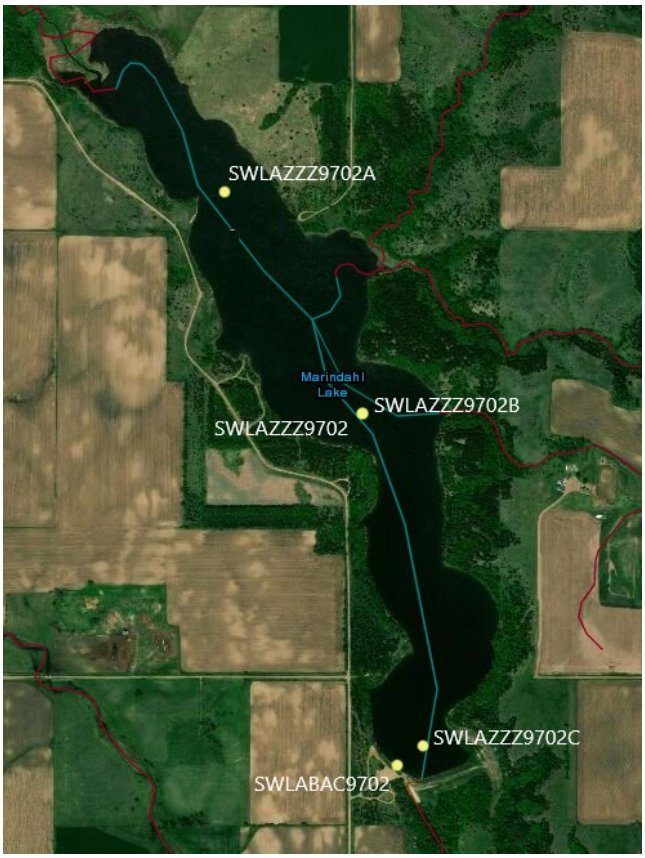

Figure 1. Lake data collection station example.

Finally, a station along the shoreline where the C bottle (*E. coli*) is collected will have a Station ID such as SWLABAC9702, where BAC replaces the ZZZ portion of the Station ID to indicate that bacteria samples are collected at this location. The bacteria collection stations are located either on a swimming beach or boat ramp so that the sample is collected where people frequently enter the water.

Before performing sampling, verify the lake location, boat ramp location and public access. When visiting the lake, to accurately locate sampling sites enter them into a GPS unit or create maps with imagery of the lake and sampling locations so you may use landmarks to determine your location relative to the data collection stations. In most cases the SWLA Coordinator will provide you with these resources before field season begins.

AIS Decontamination

The composite sample container should be rinsed on shore with distilled or deionized water before sampling begins. Also take any other necessary precautions to prevent the spread of AIS.

Lake Composite Sampling

A composite sample is a mix of water collected from three locations (A, B, and C stations) evenly distributed throughout a lake. The purpose of composite sampling is to provide a sample that is more representative of the entire lake than a single grab sample collected in the middle of the lake. Water chemistry may vary across a lake, and composite sampling evens out the results of any spatial variability

in lake water chemistry. Visiting three locations on the lake also allows for the collection of 3 sets of Secchi measurements and vertical profiles, further enriching the dataset used for 303(d) assessments to determine whether lakes are meeting water quality standards.

Equipment List

- Boat/motor or other watercraft
- Anchor
- Life jackets for all samplers
- Lake maps and/or GPS with station locations
- Integrated depth sampler
- Cooler(s) for holding and shipping samples
- Distilled/deionized water
- Composite sample container (>3 gallons)
- Secchi disk
- Sulfuric acid for B bottle
- Pipettes for acid
- Bottles (A, B, chlorophyll-a)
- Supplemental bottles (cyanotoxin, algae ID/enumeration)
- Nitrile Gloves
- Ice
- Fine-tip Sharpie markers or pencils
- Preprinted labels and SD DANR Field Data Collection sheets (datasheets)
- Multi-meter sonde and handheld with depth sensor and logging capability
- Conductivity calibration standard
- pH calibration standard 7

Multi-meter Calibration and Logging Set-up

Note: Only for crews using a multi-meter.

Tutorial video part 1: https://youtu.be/SD-5ievw8zY Part 2: https://youtu.be/4KQzBN9--qE

At the beginning of each day, calibrate specific conductivity in micro-siemens (µS), pH, dissolved oxygen (percent), and depth (meters). Record the results on the multi-meter calibration sheet (Appendix). Include the pH millivolts, conductivity cell constant, and results of the dissolved oxygen calibration.

Note: If the meter indicates that calibration values are out of range, DO NOT accept the calibration. Start the calibration process over.

Note: Recalibrate dissolved oxygen if the weather changes significantly or if you make a significant change in elevation when travelling from one lake to another.

Set up the multi-meter for logging data by creating files for the A, B, and C data collection stations in the site list. Make sure that the file for each station includes the 4-digit lake ID and A, B, or C. These files will be used to store data when the vertical profile is measured.

Data Collection Activities

Lake data collection stations may be visited in any order so long as resulting data is associated with the appropriate station ID. For example, it is acceptable to start at station C or station B rather than station

A. You may collect the E. coli sample before, after, or during the collection of the composite sample. Be sure to save vertical profile measurements to the correct file in the multi-meter handheld and label the Secchi disk results with the correct station in your notes. If you are not able to reach a station due to safety concerns or because you can't reach the location in your boat, skip that station and proceed with data collection at the other stations. Make a note in the field comments section of the sample data sheet that you were not able to collect water and data at a station.

Note: Do your best to locate the A, B, and C stations. It is ok to be not at the exact coordinates of the station when using paper maps to navigate, but you should be relatively close (i.e. in the same water depth and/or distance from shore as the station).

Note: Anchor the boat at the A, B and C stations so you can collect a vertical profile and Secchi disk measurement without significant lateral movement of the boat. This may not be necessary on calm days, but is always necessary on windy days. A trolling motor with an "anchor mode" or "spot lock" is also acceptable.

Multi-meter Vertical Profile Measurement

Tutorial video: https://youtu.be/5eI73EQn7fU

1. With the boat stationary at the first station (A, B or C), put the multi-meter sonde in the water and lower it until the depth sensor reads 0.5 meters. Allow readings for specific conductivity (micro-siemens), pH, dissolved oxygen (mg/L), and depth (meters) to stabilize. Log one sample at a depth of approximately 0.5 meters.
2. Lower the sonde to log additional samples every 1 m from the water surface, allowing the sensors enough time to stabilize, until reaching the bottom. Be careful to not drop the sonde rapidly in such a manner that it sticks in the lake substrate and gets fouled by mud.
3. After locating the bottom, raise the sonde 0.5 m from the bottom and log a sample after the sensors have stabilized.
4. Repeat this process at the remaining two lake sampling stations.

Secchi Disk

Tutorial video: https://youtu.be/m4fd2_MjCFM

1. Confirm that the lowering line is firmly attached to the Secchi disk.
2. Remove sunglasses and hat. Also, do not use view scopes or other visual aids. If wearing prescription sunglasses, temporarily replace them with regular clear lens prescription glasses.
3. Lower the Secchi disk over the shaded side of the boat until it disappears. Lower it one third of a meter and then slowly raise the disk until it just reappears. Move the disk up and down until the exact vanishing point is found.
4. Read the depth indicated on the lowering line or use a tape measure to measure the distance from the water surface to the Secchi disk at the disappearance depth. Record the disappearance depth in a field notebook or enter it in the comments of the SD DANR Water Quality Data lab sheet (Appendix).
5. Note any conditions that might affect the accuracy of the measurement in your field notes.
6. Repeat this process at the remaining two lake sampling stations.

Total Depth

Measure the total depth at the in-lake data collection sites A, B, and C using a sonar, push pole, multi-meter depth sensor, or any other reliable measuring device. On the SD DANR Field Data Collection Sheet (Appendix), record the depth in meters of the deepest station on the lake (A, B or C).

Composite Water Sample Collection

Tutorial video: https://youtu.be/GfO0Q8c_gJ0

In-lake water sampling will entail the use of an integrated depth sampler (Figures 3 and 4), which composites water from multiple sites within in a lake (A, B and C) into a composite sample container (Figure 2). The integrated depth sampler is a PVC tube that is 2 meters long with an inside diameter of 1.25 inches (3.18 centimeters) fitted with a stopper plug on one end and a ball valve on the other. The device allows collection of water from the upper two meters of the water column (within the euphotic zone).

Figure 2. Composite sample container.

Note: The composite sample container should be rinsed on shore three times with distilled or deionized water before use. Do not use lake water to rinse the container as it could spread invasive species.

Note: It is helpful to make depth gradations with a permanent Sharpie marker on the outside of the integrated depth sampler so you can measure the depth you are sampling to using the sampler itself. Mark depths along the sampler tube every 0.1 meters from the bottom of the sampler.

Figure 3. Photo of integrated depth sampler for lakes.

The composite sample container (Figure 2) is used to hold the composite sample until it is transferred to bottles and preserved. Many types of containers may be used for the composite sample container if they do not contaminate the sample. Typically, food grade plastic carboys and drinking water containers with a spout for filling sample bottles are used for the composite sample container.

1. Calculate the euphotic zone depth by multiplying the Secchi disk disappearance depth from the station you are sampling by 2 (see equation below). The resulting value determines the depth to which water samples will be collected at this station with an integrated depth sampler. If the euphotic zone is greater than or equal to 2 meters (Secchi depth is greater than or equal to 1 meter), water samples will be taken from the top 2 meters of the water column.

$$Secchi\ depth * 2 = depth\ of\ integrated\ sample$$

2. Note any conditions that might affect the accuracy of the measurement (waves, sun, excessive algal bloom, etc.) in the notes field at the bottom of the datasheet.
3. Remove the rubber stopper cap and open the ball valve on the bottom end of the integrated sampler (Figure 4). On the opposite side of the boat you plan to collect the sample from, rinse the integrated sampler by submerging the sampler in the lake three times and draining.
4. In a location away from the boat motor, slowly lower the sampler into the lake as vertically as possible. Stop when the upper end is just above the surface if the euphotic zone is $\geq$ 2 m deep. SD DANR WPP protocols are to collect two full (2 m) integrated samplers of surface water at each in-lake sampling site (a total of 4 m of euphotic surface water per sampling site). If the euphotic zone is < 2.0 m deep, the integrated sampler will be vertically lowered into the lake to the depth of the previously calculated euphotic zone for that station; additional samples will be taken to collect the total volume needed to equal a total of 4 m of water.
   Note: If the Secchi depth is less than 0.3 meters (euphotic zone < 0.6 meters) you may lay the integrated sampler in the water horizontally to collect a full tube of water in the euphotic zone. This eliminates the need to fill the sample many times to collect sufficient water from the station.

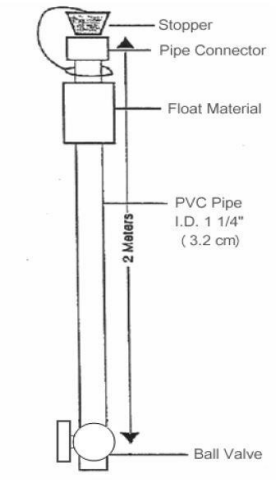

Figure 4. Integrated depth sampler diagram.

5. Cap the upper end with the rubber stopper firmly and slowly raise the sampler while holding it as vertical as possible. When the bottom of the sampler is just below the water surface, reach underneath the surface of the water and close the ball valve on the bottom end of the sampler.
6. Lift the sampler into the boat, keeping it as vertical as possible.
7. Dispense the contents of the sampler into the previously rinsed composite sample container by opening the lower ball value to drain contents of the sampler into an appropriate pre-rinsed composite storage container. When the last sample is transferred to the composite container at each station, cap the sample container, and move it to a shaded area of the boat or cover it to avoid exposing the sample to direct sunlight and/or higher temperatures.
8. Proceed to the next sampling location on the lake and repeat the vertical profile measurement, Secchi disk measurement, total depth measurement, and water sample collection. Repeat these steps for all sample stations on each lake.

Bottle Labeling and Datasheets for Lake Composite Sampling

Entering information on datasheets and labels typically occurs on shore at the boat launch.

Bottle Labeling Procedure

1. Using waterproof labels and a waterproof pen or pencil (fine tip Sharpie recommended), fill out the empty fields on the labels for the A, B and chlorophyll-α bottles. If waterproof labels and pens/pencils are not available, apply packing tape over the top of the label to protect it from getting wet. In most cases when using pre-printed labels, most fields other than Station ID, sampler initials, date, and time will be filled out. Other fields that may need to be filled include Project, Source (the waterbody being sampled), Code or Agency Code (your unique billing ID from the SD Health Lab), whether it is a surface, midwater, or bottom sample (usually surface), and the sample bottle type (A, B or Chl A for the chlorophyll-α bottle).
2. For the chlorophyll-α bottle, enter the volume of the composite sample that was put into the chlorophyll-α bottle. Typical volumes for chlorophyll-α samples are 500 mL, 1000 mL, or 2000 mL. Larger bottles are used in lakes that typically have less algae.
3. Place the labels on their corresponding bottles.
4. If you are collecting algae ID/enumeration sample and/or cyanotoxin samples, write the date, time, mid-lake station, and sampler's initials on the algae ID/enumeration and cyanotoxin bottle labels using a fine-tip Sharpie or other waterproof pencil or pen.

Filling Out Datasheets

Note: Datasheets accompany only the A and B bottles. Chlorophyll-a, cyanotoxin and algae ID/enumeration bottles do not have accompanying datasheets because they are not analyzed at the South Dakota State Health Lab.

1. Fill out the empty fields on the sample collection datasheets to match the values entered on the A and B bottle labels for Agency Code, Sample Date, Time, Sampler, Source Water, Station ID, Project, and Project ID.
2. Using a field notebook, iPad, or scratch-paper, calculate the averages of the surface measurements (0.5m depth) from the three lake sampling stations (A, B and C) for specific conductivity, dissolved oxygen, pH, water temperature. Enter the resulting averages on the datasheet in the appropriate fields.
3. Using a field notebook, iPad, or scratch-paper, calculate the average of the three Secchi disk measurements from the A, B and C stations. Enter the resulting value on the datasheet.
4. On the datasheet, review the boxes that are checked for each bottle for the parameters to be analyzed by the lab. Ensure they are correct for the parameters you intend to have analyzed.
5. Be sure to keep a record of Secchi disk results from the individual A, B, and C stations to provide to the volunteer monitoring coordinator for entry into the DANR water quality database. If notes are kept on an iPad or other electronic device, you may email the notes to the volunteer monitoring coordinator.

Composite Sample Processing

Tutorial video: https://youtu.be/dg1ZnTue74Y

Bottle Overview

In most cases, a total of 3 sample bottles will be filled from the composite container at each lake. The A and B bottle are both white 1 liter narrow-mouth Nalgene bottles. Both the A and B bottle should be triple rinsed with lake water before filling. The chlorophyll-α bottle is a brown bottle with a volume of either 500 mL, 1 liter, or 2 liters and should be triple rinsed with lake water before filling.

In some cases, an algae ID/enumeration sample and/or cyanotoxin sample will be collected from lake composite samples. These samples differ from harmful algal bloom samples collected along a shoreline in the sense that they are representative of the whole lake rather than a localized area near the shoreline. These samples are sent to out-of-state laboratories for analysis and do not follow the same labeling and datasheet convention as the A, B and chlorophyll-α bottles. The algae bottle is a 125 mL brown bottle that is pre-preserved with Lugol's solution and **should not be rinsed** before filling. The cyanotoxin bottle is either a 30mL or 60 mL bottle that can be filled directly from the composite jug to the volume line indicated on the bottle (30 mL or 60mL).

Note: It is good practice to label sample bottles before filling and preserving samples. See the Bottle Labeling and Datasheets for Lake Composite Sampling section on page 8 for instructions on bottle labeling.

Sample Processing Procedure

1. Mix the composite jug by shaking the jug.
2. Rinse bottles labeled A, B, and chlorophyll-α three times each with a small amount of lake water from the composite jug. Fill bottles A, B, and chlorophyll-α to the shoulder of the bottle from the composite jug. Place the A bottle and the chlorophyll-α bottle in the cooler under loose ice.
3. Using a plastic pipette, add 2 mL of sulfuric acid (H_2SO_4) to the B bottle if using a 1 liter bottle. If using a 250 mL B bottle, add 0.5 mL H_2SO_4.
4. Place the cap on the bottle. Invert the bottle several times to mix the contents and place the B bottle in the cooler under loose ice.
5. If collecting an algae ID/enumeration sample: **Without rinsing**, fill the 125 mL pre-preserved algae bottle to the shoulder. Store the algae bottle in an upright position at room temperature or on ice in a cooler. Do not allow this sample bottle to be frozen or become hot.
6. If collecting a cyanotoxin sample: Without rinsing, fill the cyanotoxin bottle from the composite jug to the volume line indicated on the bottle, either 30 mL or 60 mL. Cap the bottle and store in a cooler on ice until you return to your home/office, then immediately put the sample in a freezer. It is vital that the bottle remain frozen up until the time it is shipped to DANR via the health lab courier.

Quality Assurance/Quality Control Sample Collection for Lake Composite Sampling

Blank Sample Procedure

Tutorial video: https://youtu.be/N6BLXkPW8vM

1. To submit a blank sample to the lab, triple rinse and fill bottles A, B, and chlorophyll-α with distilled or deionized water.

2. Preserve the B bottle with 2 mL of sulfuric acid (H_2SO_4) as you would with a regular sample (add 2 mL H_2SO_4 if using a 1 liter bottle – if using a 250 mL B bottle, add 0.5 mL H_2SO_4).
3. Place the sample bottles in the cooler on ice.
4. On the sample labels, indicate that the sample is a blank sample by checking the box or writing "BLANK" on the label.
5. Fill out a datasheet as you normally would with the date, time, station ID, and sampler. Check the box next to "Blank" to indicate it is a blank sample. You may use any real station ID for a blank sample. Do not make up a fake station ID for the blank sample.
6. Ship the blank sample to the South Dakota State Health Lab using the courier in the same manner as a regular sample would be shipped.

Replicate Sample Procedure

Tutorial video: https://youtu.be/sWRn3_4_7yU

Note: If you are collected a replicate lake composite sample you may need to collect extra lake water at the A, B and C stations. Be sure relatively equal amounts of water are collected at each station.

1. To submit a replicate sample, triple rinse and fill bottles A, B, and chlorophyll-α with lake water from the composite jug as you are filling the bottles for the regular sample. Place the A and chlorophyll-α bottle under loose ice in the cooler.
2. Preserve the B bottle with 2 mL of sulfuric acid (H_2SO_4) as you would with a regular sample (add 2 mL H_2SO_4 if using a 1 liter bottle – if using a 250 mL B bottle, add 0.5 mL H_2SO_4).
3. Place the B bottle under loose ice in the cooler.
4. On the sample labels, indicate that the samples are replicate samples by checking the box or writing "REPLICATE" on the label.
5. Fill out a datasheet as you normally would with the date, time, station ID, and sampler. Enter the exact same time on the replicate datasheet that you entered on the regular sample datasheet. Do not enter a time that is slightly different from the normal sample time.
6. On the replicate sample datasheet, check the box next to "Replicate" to indicate it is a replicate sample.
7. Ship the replicate sample to the South Dakota State Health Lab using the courier in the same manner as a regular sample would be shipped.

☐ Lake E. coli Sampling

E. coli is a bacterial indicator. It shows if there is contamination from fecal bacteria. Lake E. coli samples are collected at stations located along a lake's shoreline to determine if there is a risk to people engaging in water recreation.

Equipment List

- Lake maps and/or GPS with station location
- Cooler(s) for holding and shipping samples
- Waders/hip boots/rubber boots (If needed)
- C bottle
- Nitrile Gloves
- Ice
- Fine-tip Sharpie markers or pencils

- Preprinted labels and datasheets

Tutorial video: https://youtu.be/DNn5ZoYkoDo

Note: The C bottle is either a 100 mL clear bottle or a 250 mL white bottle that should not be rinsed before sample collection.

Lake Bacteria Sample Collection

1. Put on a pair of nitrile or latex gloves and proceed to the designated bacteria collection station (Figure 1).
2. Do not rinse the C bottle (100 mL or 250 mL bottle).
3. In water at least 0.3 meters (1 foot) deep, invert the C bottle so the bottle mouth is facing down and submerge the bottle in the water approximately halfway to the lake bottom. Avoid collecting surface scum or sediment from the lake bed.
4. While holding the bottle underwater, tip upright so the bottle fills. Remove the bottle from the water and screw on the cap.
5. Fill out the label on the C bottle for date, time, and sampler's initials and place it in a cooler under loose ice.
6. On the lake bacteria datasheet, enter the date, time, and sampler's initials.
7. Ship the bacteria sample using the health lab courier on the day of collection. The sample must arrive at the Health Lab within 24 hours of collection.

Blank Sample Collection for Lake Bacteria

1. Wearing nitrile or latex gloves, without rinsing, fill the C bottle to the shoulder using distilled or deionized water.
2. Fill out the label on the C bottle for date, time, and sampler's initials.
3. On the sample labels, indicate that the sample is a blank sample by checking the box or writing "BLANK" on the label.
4. Place the sample bottle in the cooler on ice.
5. On the lake bacteria datasheet, enter the date, time, and sampler's initials.
6. Check the box on the datasheet to indicate it is a blank sample.
7. Ship the blank sample using the Health Lab courier as you would with a normal bacteria sample.

Replicate Sample Collection for Lake Bacteria

1. Without rinsing the bottle, fill the replicate C bottle at the same time using the same technique as the C bottle for the regular sample.
2. On the sample label, indicate that the samples are replicate samples by checking the box or writing "REPLICATE" on the label.
3. Fill out the label on the C bottle for date, time, and sampler's initials and place it in a cooler under loose ice.
4. Fill out a datasheet as you normally would with the date, time, station ID, and sampler. Enter the exact same time on the replicate datasheet that you entered on the regular sample datasheet. Do not enter a time that is slightly different from the normal sample time.
5. On the replicate sample datasheet, check the box next to "Replicate" to indicate it is a replicate sample.
6. Ship the blank sample using the Health Lab courier as you would with a normal bacteria sample.

Sample Care, Shipping, and Packaging

South Dakota State Health Lab

Sample Shipping

Tutorial video: https://youtu.be/KlS_9eUpCBI

Sample shipping will primarily be conducted using the South Dakota Health Laboratory courier system, which is conducted by Sameday Express. The courier has scheduled pick-up locations and times throughout eastern South Dakota. Scheduled pick-up locations and times are shown in Table 2. If the courier system is unavailable in your region or does not fit your needs, samples may also be Priority shipped via the US Postal Service. Contact the Volunteer Monitoring Coordinator for information about shipping the samples with the US Postal Service.

Table 1. Courier pickup locations and times in eastern South Dakota.

City	Address/Location	Address	Courier Departure Time
Webster	SD Game Fish & Parks office	603 E 8th Ave, Webster, SD 57274	5:00 PM
Watertown	DANR field office	2001 9th Avenue SW, Suite 500	4:00 PM
Aberdeen	St. Luke's Hospital	305 S State St, Aberdeen, SD 57401	3:30 PM
Huron	Huron Regional Hospital - lab entrance on east side	172 4th St SE, Huron, SD 57350	5:00 PM
Brookings	Brookings Regional Hospital	300 22nd Ave S, Brookings, SD 57006	4:00 PM
Mitchell	Queen of Peace Hospital	1900 Grassland Drive, Mitchell, SD 57301	8:00 PM
Yankton	Sacred Heart Hospital	501 Summit St, Yankton, SD 57078	3:30 PM
Sioux Falls	SF Airport Business Aviation	43 N John Orr Drive, Sioux Falls, SD 57104	7:00 PM

If you are not able to reach a scheduled pick-up location, or if it isn't sensible to use one of the scheduled pick-up locations, you can call Sameday Express to schedule a pick-up nearly anywhere in South Dakota by calling **605-366-3299**. Be sure to call early in the morning to schedule your pick-up to allow the courier ample time to coordinate.

Samples collected in western South Dakota outside of the Rapid City area can also be delivered to the South Dakota Health Laboratory using Sameday Express. There are no set pick-up locations in western South Dakota, so arrangements must be made prior to sample collection by calling **605-366-3299.**

Sample Care and Packaging

All samples should be held and shipped in a hard-sided cooler with enough loose ice to cover all sample bottles. Samples must be kept at a temperature of <4° C. Datasheets should be sealed in a 1 gallon zip-seal bag and taped to the inside of the cooler lid. Take precautions to ensure the datasheets do not get wet.

Note: Ice in the sample cooler should be removed from the bag it came in and spread over the top of the sample bottles. If ice is left in the bag, the sample bottles will not reach a temperature of <4° C.

The cooler should be taped shut with packing tape. Make sure the cooler drain plug is closed. A shipping label with the South Dakota State Health Laboratory's address (below) should be taped on the lid of the cooler in such a manner that it will not come off during shipping.

South Dakota State Health Laboratory
615 E. 4th Street
Pierre, SD 57501

The cooler should also be labeled with the cooler owner's organization name, phone number, and address so the cooler can be returned to the owner. Write this information on the cooler with a Sharpie or attach a label with this information to the cooler.

Note: The health lab will ship your coolers back to you with empty sample bottles.

Mid Continent Testing Labs

Samples collected in the Rapid City area will be sent to Mid Continent Testing labs for analysis and must be delivered in person. Samples should be transported by the sampler in a cooler under ice with accompanying datasheets to **2381 South Plaza Drive, Rapid City, SD 57709.**

Sample Holding Times

Table 2. Sample holding times, preservation, and bottle type information.

Bottle	Size & Material	Preservative	Parameters	Holding Time
A	1,000 mL HDPE or 250 mL HDPE	Cool to 4°C	Alkalinity, total solids, TSS, volatile solids, TDS, BOD, CBOD, CO_3, Hardness, K, lab pH, lab conductivity, nitrate, chloride, fluoride, HCO_3, SO_4	48 hours
B	1,000 mL HDPE or 250 mL HDPE	2 mL H_2SO_4 pH <2 Cool to 4°C	Ammonia, Nitrate+Nitrate, TKN, Total P, COD	28 days
C	100 mL or 250 mL sterilized HDPE	Na_2SO_3 if chlorinated Cool to 4°C	Fecal coliform, *E. coli*, total coliform, enterococci, fecal PFG	24 hours
Chlorophyll-a	500, 1,000, or 2,000 mL brown HDPE bottle	Cool to 4°C	Chlorophyll-a	48 hours (unfiltered) 28 days (filtered)
Algae ID/enumeration	125 mL brown HDPE	Lugol's Solution, keep in dark place	Algae identification, algae enumeration	1 year at room temp

Laboratory Services

The South Dakota State Health Lab will be the primary laboratory service for Statewide Lake Assessment. The health lab courier service allows free transport of samples on the day of collection. However, crews operating in the Rapid City/Black Hills area may use Mid Continent Testing Labs in Rapid City because of its proximity to the region and an existing working relationship with SD DANR. All sample collection, processing, and holding procedures outlined in the preceding sections apply to samples sent to Mid Continent Testing Labs, as well as the SD State Health Lab.

When using the State Health Lab, sample results are electronically delivered to the SD DANR water quality database. This results in less time between sample collection and the public display of results on the SD DANR Water Quality Monitoring Access Portal. Results from samples sent to the State Health Lab will typically be available for review and approval by the Statewide Lakes Assessment coordinator within 1 week. Results from samples sent to Mid Continent Testing will typically be available for review and approval within 1 month because data must be requested from the lab and manually uploaded to the SD DANR water quality database. Using the SD State Health Lab results in less turn-around time between sample collection and public reporting.

Aquatic Analysts in Friday Harbor, WA provides algae ID/enumeration services. A selection of algae ID/enumeration samples will be sent to Aquatic Analysists by the SWLA coordinator after the conclusion of the field season.

Appendix

YSI Calibration Worksheet

Date: _____ Sonde SN: _____ Technician: _____

Pre/Post-Calibration Values

Before **After**

Conductivity: _____ _____ Cell Constant: _____

pH 7: _____ _____ pH MV: _____

(pH 7 MV range: 0 MV ± 50 MV)

pH 10: _____ _____ pH MV: _____

(pH 10 MV range: -180 MV ± 50 MV. Millivolt span between pH 7 and 10 should be ≈165 to 180 mv)

Optical DO: Was the wiper replaced? Y N Does the wiper park 180° from sensor? Y N

The **ACCEPT/REJECT** criteria as follows:

The DO output in % must start at a positive number and decrease during the warm up. Should the output display a negative number or start at a low number and climb up to the cal point, the probe is rejected and must not be deployed.

_____ **ACCEPT** _____ **REJECT**

ODO Gain: _____ Barometric Pressure:_____

DO% Calculated – (BARO mmHg divided by 7.6) = % saturation Example: 760 ÷ 7.6 = 100.0%

DO% Calculated: _____ DO% Before: _____ DO% After: _____

Depth: If zero was entered, record barometric pressure at time of calibration

If offset depth was entered, record value _____ meters/feet and pressure

Notes:

SD DANR Blank Datasheet

Agency Code

SD DANR Water Quality Data

Rev 05/21

Sample Date | Time | Samplers Print/Sign

Source Water | Station ID

Site Location

Project | Project ID

Type of Sample: ☐ Replicate ☐ Grab ☐ Integrated Vertical ☐ Blank ☐ Composite ☐ Integrated Flow

Medium: ☐ Water / Other

Relative Depth: ☐ Surface ☐ Bottom ☐ Midwater

H2O Temp		C	Sample Depth		Ft
SPC		µmho/cm	Total Depth		Ft
DO		mg/L	Width		Ft
pH		SU	Gage Stage		Ft
Secchi		Meters	Discharge		CFS

Field Comments

All Samples must be packed in ice and chilled to 6 C

A - 1 Liter
- ☐ Alkalinity
- ☐ TSOL
- ☐ TSSOL
- ☐ VTSS
- ☐ TDSOL
- ☐ BOD
- ☐ CBOD
- ☐ CO3
- ☐ Hardness
- ☐ K
- ☐ Lab Cond
- ☐ Cl
- ☐ Fluoride
- ☐ HCO3
- ☐ SO4

B - 1 Liter
pH<2 ~2 mL H2SO4
- ☐ Ammonia
- ☐ NO3+NO2-N
- ☐ TKN
- ☐ Total P
- ☐ COD

D - 100 mL
Filtered + pH<2 0.25 mL H2SO4
☐ TDP ☐ DIN

R - 4L Cube
☐ Ra 226 ☐ Ra 228

CN - 150 mL
pH >10 ~0.4 mL NAOH
☐ CN ☐ WADCN

H - Liter Glass Amber
pH<2 ~2 mL HCL
☐ TPH Diesel

OG - Liter Glass Amber
pH<2 ~2 mL HCL
☐ Oil Grease

Dissolved Metals - 100 mL
Filtered + pH<2 ~0.5 mL HNO3
☐ Ca ☐ Na ☐ Mg ☐ Mn ☐ K ☐ Fe

Recoverable Metals - 100 mL
pH<2 ~0.5 mL HNO3
☐ Ca ☐ Na ☐ Mg ☐ Mn ☐ Fe

E - 1 Liter *Filtered*
☐ HCO3 ☐ Cl ☐ SO4 ☐ Fluoride

C - 100 mL Idex *Na2SO3 if source is Chlorinated*
Note: Use 250 mL bottle if requesting multiple tests
☐ Fecal Coliform* ☐ Total Coliform ☐ Fecal PFGE ☐ E Coli* ☐ Entercocci*

V-40mL	V1-40 mL	V2-120 mL	V3-120 mL
3 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space	*2 - 40 mL Amber Vials 0.5 mL HCL Zero Head Space*	*120 mL Amber Bottle 1.5 mL H2SO4*	*120 mL Amber Bottle Filtered 1.5 mL H2SO4*
☐ TPH Gas	☐ VOC	☐ TOC	☐ DOC

Lab Comments

Dissolved Metals - 250 mL
Filtered + pH<2 ~1.5 mL HNO3
- ☐ Al
- ☐ Sb
- ☐ As
- ☐ Ba
- ☐ Be
- ☐ B
- ☐ Cd
- ☐ Cr
- ☐ Cu
- ☐ Hg
- ☐ Pb
- ☐ Ni
- ☐ Se
- ☐ Ag
- ☐ Ti
- ☐ U
- ☐ V
- ☐ Zn
- ☐ Mo
- ☐ Silica

Recoverable Metals - 250 mL
pH<2 ~1.5 mL HNO3
- ☐ Al
- ☐ Sb
- ☐ As
- ☐ Ba
- ☐ Be
- ☐ B
- ☐ Cd
- ☐ Cr
- ☐ Cu
- ☐ Hg
- ☐ Pb
- ☐ Ni
- ☐ Se
- ☐ Ag
- ☐ Ti
- ☐ U
- ☐ V
- ☐ Zn
- ☐ Mo

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

Relinquished By: _____ Date/Time _____

Received By: _____ Date/Time _____

Sample Temp (C) **Date / Time Received** **Lab #**