



## **ACKNOWLEDGEMENTS**

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## **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 collecting and preserving stream and river grab samples. This SOP applies to all DWQ field staff, non-DWQ cooperators, and citizen volunteers. Grab samples collected for chemical analysis should be representative of the entire stream or river. To be representative, samples must be carefully collected, properly preserved, and appropriately analyzed. In general, samples should be collected from the main current of the stream or river at 60% of the total stream depth.

## **2.0 SUMMARY OF METHOD**

Grab samples are only collected on low gradient and slow-moving streams. The grab sample can be collected either by wading or by lowering a sampling device such as a Kemmerer sampler, Van Dorn sampler or weighted open bucket from a bridge crossing.

When collecting the sample by wading, enter the stream slightly down current from the appropriate sampling site, then wade to the area with the greatest current. Triple-rinse each sample bottle with stream water prior to collecting the sample. Place lid on sample bottle then submerge to approximately 60 percent of the stream depth, remove the lid and allow the bottle to fill facing towards the current. Replace the lid prior to removing bottle from stream. A small portion of the sample will need to be decanted off prior to preserving and/or placing in cooler. Note: In very shallow streams care must be taken not to contaminate the sample with bottom sediments.

When collecting from a bridge using a Kemmerer or Van Dorn sampler, triple rinse sample device prior to collection, lower the device into the stream and trip the sampler at 60 percent of the total stream depth. In cases where a sample cannot be taken from a bridge, a dipper cup would be used.

## **3.0 HEALTH AND SAFETY WARNING**

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 should 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. Samplers should be aware of ice conditions when sampling during winter months. If ice is dangerous, samples should be taken at a different time.

Field personnel should also be aware of wildlife, insects, and plants that could be harmful as well as heat stroke and hypothermia. A first aid kit should be accessible for any potential cuts, stings, bites, or contact with poisonous plants. Also ensure there is access to water, sunscreen, insect repellent, and extra clothing.

## **4.0 CAUTIONS**

Care should be taken not to disturb sediment and/or substrate during sample collection. Disrupted sediment can give invalid results and plug the filters. (e.g. Geotech inline filters, etc.)

## **5.0 INTERFERENCES**

Note all factors that may affect the water sample such as high winds/wave action, cattle in water, observed flow, water surface, water clarity, water color, water odor, visual algae cover, number of dead fish, present weather, estimated inches of rain fall in past 72 hours, and any other comments that may be of interest.

## **6.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES**

All personnel collecting and preserving grab samples 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 personnel 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 non-metallic sampler (e.g., Kemmerer or Van Dorn sampler), with rope marked at 0.5-meter depth intervals and a messenger.
- Churn splitter
- Sample containers
- Acid for sample preservation
- Sample labels.
- Clear tape for sample containers
- Coolers with ice and/or frozen gel pack(s).
- Deionized water for sample blanks and decontamination.

- For vacuum method.
  - Vacuum filter holder.
  - Vacuum pump.
  - 0.45 µm membrane filters (Millipore HAWP 047 00 or equivalent).
  - Pre-filters (Millipore AP40 0047 05 or equivalent).
  - Stainless steel forceps.
- For peristaltic method.
  - Power Drive (Compact Cat No. P-07533-50 or equivalent)
  - Peristaltic head (Easy Load II Cat No. P-77200-62 or equivalent).
  - In-line 0.45 µm cartridge filters (Geotech dispos-a-filter or equivalent).
  - In-line 0.70 µm cartridge pre-filters (Geotech dispos-a-filter or equivalent).
  - Tubing (Masterflex silicone Cat No. P-96400-24 or equivalent).
- Field report form.
- Sample ID/Custody Record
- Black ballpoint pen or pencil
- Sample and blank log forms
- Power ice auger (winter sampling)
- Ice skimmer (winter sampling)
- Sled (winter sampling)

## 8.0 PROCEDURE

### Stream Sample Collection Wading

1. Place a label on each sample container and use clear tape to secure the label to the container. Note: Add information to the cap (e.g., number of sample; analysis type) to make the sample identifiable if the label were to fall off)
2. Triple rinse each sample bottle using stream water. Note: Do not rinse the fecal coliform bacteria or the pesticide sample bottles.
3. Fill the sample bottle: Samples should be collected in the main current at that depth which is approximately 60 percent of the total water depth. Wade to the stream sampling location and inserting sample container facing against the current, allowing it to fill naturally at the appropriate depth. At greater water depths, an appropriate sampling device should be used. Note: Care should be taken so that the sample is not contaminated by disturbing the stream bed

upstream from the collection point.

4. Preserve the sample containers appropriately with sulfuric or nitric acid and place samples in a cooler on ice.
5. Fill out the Sample ID/Custody Report (Appendix A) and the water chemistry sample log (Appendix A).

### **Stream Sample Collection using Dipper Cup**

1. Place a label on each sample container and use clear tape to secure the label to the container. Note: Add information to the cap (e.g., number of sample; analysis type) to make the sample identifiable if label were to fall off.
2. Triple rinse dipper cup and churn splitter using stream water.
3. Fill the churn splitter using the dip cup: Samples should be collected in the main current. Note: Care should be taken so that the sample is not contaminated by disturbing the stream bed upstream from the collection point.
4. Sample bottles will be triple rinsed and filled from the churn splitter. Any samples that need to be filtered will be filtered from the same churn splitter.
5. Preserve the sample containers appropriately and place samples in a cooler on ice.
6. Fill out the Sample ID/Custody Report (Appendix A) and the water chemistry sample log (Appendix A).

### **Stream Sample Collection using Van Dorn**

1. Place a label on each sample container and use clear tape to secure the label to the container. Note: Add information to the cap (e.g., number of sample; analysis type) to make the sample identifiable if label were to fall off)
2. Triple rinse Van Dorn and churn splitter using stream water.



3. Fill the churn splitter using the Van Dorn: Samples should be collected in the main current on the bridge. Samples should be collected in the main current at 60 percent of the total water depth. Note: Care should be taken so that the sample is not contaminated by disturbing the stream bed upstream from the collection point.
4. Sample bottles will be triple rinsed and filled from the churn splitter. Any samples that need to be filtered will be filtered from the same churn splitter.
5. Preserve the sample containers appropriately and place samples in a cooler on ice.
6. Fill out the Sample ID/Custody Report (Appendix A) and the water chemistry sample log (Appendix A).

### **Stream Sample Filtration Vacuum Method**

1. Total dissolved phosphorus samples should be filtered immediately.
2. Put on new latex surgical gloves.
3. Remove filter holder from the plastic bag and assemble.
4. Rinse filter apparatus with stream water.
5. Rinse the filter with 1,000 mL of DI water.

#### ❖ If Pre-filter is needed

- Load a pre-filter in the filter apparatus and connect the vacuum pump.
- Leach the filter with 1,000 ml of DI water.
- Filter the sample through the pre-filter. Place the sample back into the sample container.

- Load a 0.45  $\mu\text{m}$  filter into the filter apparatus and connect the vacuum pump.
5. Filter the sample through the 0.45  $\mu\text{m}$  filter.
  6. Triple rinse the sample container with deionized water.
  7. Transfer the filtered sample back into the sample container.
  8. Preserve the sample with 2 mL 1/5 sulfuric acid or 0.2 mL concentrated sulfuric acid lowering the pH to 2 or less.
  9. Place the preserved sample in the cooler on ice.
  10. If additional samples require filtration, repeat Steps (3) through (9).

#### **Field Sample Filtration Peristaltic Method**

1. Assemble and attach pump head to power drive.
2. Plug in power drive.
3. Put on new latex surgical gloves.
4. Remove acid rinsed tubing from plastic bag, taking care to prevent contamination and place in head draping a long end into the churn splitter and dangling the short end out of contact with anything.
5. Turn on pump and begin rinsing tubing with a minimum of 1,000 mL of DI water.
6. As tubing rinses remove cartridge filter from plastic bag and insert cartridge to the tube's dangling end while pump is still running. Care should be taken to ensure filter cartridge is inserted in the correct direction, by noting directional arrow on side of filter.

7. Run 250 ml of sample water through cartridge filter.
8. Place labels on bottles.
9. Triple rinse the sample bottles and lids with sample water coming out of the filter cartridge.
10. Fill sample bottles.
11. Preserve nutrient sample with 2 ml 1/5 sulfuric acid or 0.2 ml concentrated sulfuric acid and ICP Metals or Trace metals with 2 ml concentrated nitric acid lowering the pH to 2 or less. Note: Dissolved minerals are not preserved.
12. Place samples in the cooler on ice.
13. Replace hose in bag to avoid contamination.

If cartridge becomes plugged repeat Steps (6) through (13) with an in-line 2.0 µm pre-filter placed in-line prior to the 0.45 µm filter.

## **9.0 DATA AND RECORDS MANAGEMENT**

Data collected 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, cattle in water, observed flow, water surface, water clarity, water color, water odor, visual algae cover, number of dead fish, present weather, estimated inches of rain fall in past 72 hours, and any comments. Field forms and notes should be stored in the appropriate project folder at DWQ.

## **10.0 QUALITY ASSURANCE AND QUALITY CONTROL**

### **Stream Blank Sample Collection**

1. Field blank samples are collected with the first and every tenth stream sample collected

(i.e., 1, 10, 20....). If the sample log indicates a blank sample should be collected, follow the steps below.

2. Place a label on each sample container and fill out the sample information log form (Appendix A). Note: Field sample blanks should be identified with STORET number 389990. Be sure to indicate on the label the project name and type of sample being duplicated.
3. Using DI water, triple-rinse each sample bottle.
4. Fill each bottle with DI water. Note: No blank is done for E. coli.
5. Samples that need to be filtered will be done identically, including rinsing the filter with 1000 mL of DI water.
5. Preserve each sample appropriately. Note: Do not preserve the total dissolved phosphorus sample.
6. Place the sample in a cooler on ice.

### **Stream Duplicate Sample Collection**

1. Similar to blanks, duplicate samples are collected with the first and every following tenth stream sample collected (i.e., 1<sup>st</sup>, 10<sup>th</sup>, 20<sup>th</sup>....). If the sample log indicates a duplicate sample should be collected, follow the steps below.
2. Place a label on each sample container and fill out the Sample ID/Custody Report (Appendix A). Note: Duplicate samples should be identified with STORET number 389999. Be sure to indicate on the label the project name and type of sample being duplicated.
3. Collect the sample following steps in the procedure for Stream Sample Collection.
4. Place the samples in a cooler on ice.

## **11.0 REFERENCES**

INTERAGENCY FIELD MANUAL FOR THE COLLECTION OF WATER-QUALITY DATA Collecting Water-Quality Samples. USGS [https://pubs.usgs.gov/of/2000/ofr00-213/manual\\_eng/collect.html](https://pubs.usgs.gov/of/2000/ofr00-213/manual_eng/collect.html).

**APPENDIX A**  
Field Reporting Form

## CUSTODY RECORD AND ANALYSIS REQUEST – Watershed Management Program

Account #		Project Code:		Project Name:				<b>FOR LABORATORY USE ONLY</b> Nutrient/Nitrate bottle(s) checked for preservation by:  Temp of Cooler:			
DEQ Program:		DEQ Project #:		DEQ Cost Center #:		Point of Contact/DPM:					
Sampled By:				Sampler Phone #:							
Analysis Requested:				*Collection Method: (See Note)		Matrix: Soil    Water    Other (explain)					Enforcement?    Yes    No
Lab ID <small>(Enter # from lids of samples here)</small>	Site ID/STORET #	Sample Location <small>(Lat Long or TRS)</small>	Sample Date	Sample Time	# of Bottles	Cooler #	Co-located Site ID and/or Comments	Depth in meters	Field Measurements		
									Temp °C	DO mg/L	
									SC u	pH	
									Temp °C	DO mg/L	
									SC u	pH	
									Temp °C	DO mg/L	
									SC u	pH	
									Temp °C	DO mg/L	
									SC u	pH	
									Temp °C	DO mg/L	
									SC u	pH	
<b>* Collection Methods (Record Above):</b> Depth Integrated (DI) ~ Depth/Width Integrated (DWI) ~ Grab ~ 0-2 meter column When collecting lake samples, you <b><u>MUST</u></b> include the sampling depth(s).											
Relinquished by			Date and Time		Received by			Date and Time			



**River and Stream Sampling Field Log**  
**North Dakota Department of Environmental Quality**  
**Division of Water Quality - Watershed Management Program**  
**Telephone: 701-328-6140**  
**Fax: 701-328-6280**

Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	
Sample #:		Site ID:	Site Description:		Comments:
Dup	Blk	Date: / /	Temperature	DO	
		Time: :	SC	pH	





**APPENDIX B**  
SOP Acknowledgement and Training Form



