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QUALITY CONTROL/QUALITY ASSURANCE DOCUMENTATION

Title: Collection and Preservation of Wadable Wetland Water Column Samples for Chemical Analysis
Type: Standard Operation Procedure #7.07
Version: 3.0
Date: 03/17/2020
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REVISION HISTORY

Revision	Change Description	Date	Authorization
1	Department address updated	06/08/2023	
1.1	Program Manager Update	02/06/2024	

ACKOWLEDGEMENTS

(Place to acknowledge peer reviewer)

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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 wadable wetland water column samples. This SOP applies to all DWQ field staff, non-DWQ cooperators, and citizen volunteers.

2.0 SUMMARY OF METHODS

Water column samples of shallow wetlands should be reflective of the whole wetland. To be representative of the entire wetland, samples must be carefully collected, properly preserved, and appropriately analyzed.

Generally, one sample is collected from the wetlands deepest, open area in the largest aquatic zone present. Shallow wetlands are waded or canoed for sample collection. Care must be taken to sample undisturbed water not influenced by bottom sediments stirred up by wading into the wetland. This often requires collecting a mobile sample where the sampler continues to move in a forward direction away from the sediment plume.

3.0 HEALTH AND SAFETY WARNING

Field personnel should take appropriate precautions when operating watercraft and working on, in, or around water. All canoes used for wetland sampling 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 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.

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. Ensure there is access to water, sunscreen, and extra clothing.

4.0 CAUTIONS

Care must be taken to sample undisturbed water not influenced by bottom sediments stirred up by wading. This often requires collecting a mobile sample where the sampler continues to move in a forward direction away from the sediment plume.

5.0 INTERFERENCES

The sampler must ensure there is no disturbed sediment in the sample as sediment can cause misleading results.

6.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

All personnel taking field measurements using a handheld meter 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 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

- Life Vest
- Vest or other garment large enough to carry sampling supplies
- Waders
- Gloves
- Sample containers.
- Acid for sample preservation.
- Sample labels.
- Coolers with ice or frozen gel packs.
- Deionized water for sample blanks and decontamination.
- Filter apparatus.
- 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)
- Peristalic 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 5.0 µm cartridge pre-filters (Geotech dispos-a-filter or equivalent).
- Tubing (Masterflex silicone Cat No. P-96400-24 or equivalent).
- Churn Splitter.
- Field report form.
- Sample ID/Custody Record.
- Black ballpoint pen or mechanical pencil.
- Sample and blank log forms.

- Power ice auger (winter sampling).
- Ice skimmer (winter sampling).
- Sled (winter sampling).

8.0 PROCEDURE

1. Following collection of the temperature/dissolved oxygen concentration(s), collect sample at fifty percent of the water depth while wearing gloves.

2. Rinse each sample bottle three times using water from below the surface. This is accomplished by leaving the lid on the bottle, inserting to the correct depth, removing the lid and allowing the bottle to fill with no forward motion.

3. The sample is collected at fifty percent the total water depth using the same method as described in step 2.

4. Preserve the nutrient samples to a pH of ≤ 2 with 2 ml 1/5th sulfuric acid. Preserve the ICP metals or ICP and Trace metals samples to a pH of 2 with 2 ml concentration nitric acid. Note: Do not preserve the total dissolved phosphorus sample until after filtration which will be accomplished on shore.

5. Place a label on each sample container (Figure 7.07.4). Each sample container should be labeled accordingly with the appropriate analyte group as indicated in Figure 7.07.2.

6. Place the samples in a cooler on ice.

7. Fill out the field report form (Figure 7.07.3), Sample ID/Custody Record (Figure 7.07.2), and the water column chemistry sample log (Figure 7.07.1).

Field Bottle Blank Sample Collection

1. Field bottle blank samples are collected with the first sample and every tenth sample (i.e., 1, 10, 20...).

2. Triple rinse each sample bottle using deionized water.

3. Fill each bottle with deionized water.

4. Preserve each sample appropriately. Note: Do not preserve the total dissolved phosphorus sample until after filtering.

5. Place a label on each sample container (Figure 7.07.4). Note: Field bottle blanks should be identified with STORET number 389990. Be sure to indicate on the label

the wetland name, associated site identification number and the depth of the sample being duplicated.

6. Place the sample in a cooler on ice.

Field Duplicate Sample Collection

1. Field duplicates are collected on the first sample and every tenth sample (i.e., 1, 10, 20....). If the sample log indicates a duplicate should be collected, follow the steps below.

2. Collect the sample following step (2) in the procedure for Field Sample Collection.

3. Place a label on each sample container (Figure 7.07.4). Note: Field sample duplicates should be identified with STORET number 389999. Be sure to indicate on the label the wetland name, associated site identification number and the depth of the sample being duplicated.

4. Place the samples in a cooler on ice.

Field Sample Filtration Vacuum Method

1. Unpreserved total dissolved phosphorus samples should be filtered immediately.

2. Remove filter holder from the plastic bag and assemble.

3. Put on latex gloves

4. Rinse the filter apparatus three times with approximately 250 ml of deionized water each time.

5. Load a pre-filter in the filter apparatus and connect the vacuum pump.

6. Leach the filter twice with approximately 250 ml of deionized water.

7. Filter the sample through the pre-filter. Place the sample back into the sample container.

8. Remove the pre-filter from the filter apparatus and repeat step 4.

9. Load a 0.45 µm filter into the filter apparatus and connect the vacuum pump.

10. Repeat step 6.

11. Filter the sample through the 0.45 µm filter.

12. Triple rinse the sample container with deionized water.

13. Transfer the filtered sample back into the sample container.

14. Preserve the sample with 2 ml 1/5 sulfuric acid lowering the pH to 2 or less.

15. Place the preserved sample in the cooler on ice.

16. If additional samples require filtration, repeat steps 3 through 15.

Field Sample Filtration Peristaltic Method

1. Peristaltic filtration method is used to collect dissolved nutrient(s), dissolved mineral(s) and dissolved metal(s). The dissolved nutrient and/or dissolved mineral and metal samples should be filtered and preserved immediately upon reaching shore.

2. Rinse a churn splitter three (3) times with water from the sampling depth.

3. Fill churn splitter with water from the appropriate depth. Note: This often requires taking a 500 or 1000 ml bottle along and filling and emptying it into the churn splitter multiple times until full.

4. Assemble and attach pump head to power drive.

5. Plug in power drive.

6. Put on gloves.

7. 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.

8. Turn on pump and rinse tubing with a minimum of 250 ml of sample water from churn splitter.

9. As tubing rinses remove cartridge filter from plastic bag and insert cartridge while pump is still running. Care should be taken to ensure filter cartridge is inserted in the correct direction. Note: Arrow on side of cartridge.

10. Run 250 ml of sample water through cartridge filter.

11. Place labels on bottles.

12. Triple rinse the sample bottles and lids with sample water coming out of the filter cartridge.

13. Fill sample bottles.

14. Preserve nutrient sample with 2 ml 1/5 sulfuric acid and ICP Metals or Trace metals with 2 ml concentrated nitric acid lowering the pH to 2 or less.

15. Place samples in the cooler on ice.

16. If cartridge becomes plugged, repeat steps 6 through 15 with an in-line 2.0 µm pre-filter placed between the pump and the in-line prior to the 0.45 µm filter

9.0 DATA AND RECORDS MANAGEMENT

Sample information 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

Blank and duplicate samples should be taken every first and tenth sample to ensure QA/QC.

11.0 REFERENCES

Methods for Evaluating Wetland Condition.
www.epa.gov/sites/production/files/documents/wetlands_4studydesign.pdf.

APPENDIX A

Field Reporting Forms

Water Quality Field Log
North Dakota Department of Environmental Quality
Division of Water Quality
Telephone: 701.328.5210
Fax: 701.328.5200

Sample No.	Storet No.	Location/Comment	Depth	Date	Time	QA/QC		Observer
						DUP	BLK	

Figure 7.07.1 Water Quality Field Log.

CUSTODY RECORD AND ANALYSIS REQUEST – Watershed Management Program

Account #	Project Code:	Project Name:	FOR LABORATORY USE ONLY
DEQ Program:	DEQ Project #:	DEQ Cost Center #: / Point of Contact/DPM:	Nutrient/Nitrate bottle(s) checked for preservation by:
Sampled By:	Sampler Phone #:		
Analysis Requested:	*Collection Method: (See Note)	Matrix: Soil Water Other (explain) _____	Enforcement? Yes No

Lab ID (Enter # from lids of samples here)	Site ID/STORET #	Sample Location (Lat Long or TRS)	Sample Date	Sample Time	# of Bottles	Cooler #	Co-located Site ID and/or Comments	Depth in meters	Field Measurements	
									Temp	DO
									SC	pH
									Temp	DO
									SC	pH
									Temp	DO
									SC	pH
									Temp	DO
									SC	pH
									Temp	DO
									SC	pH
									Temp	DO
									SC	pH

*** Collection Methods (Record Above):** Depth Integrated (DI) ~ Depth/Width Integrated (DWI) ~ Grab ~ 0-2 meter column

When collecting lake samples, you ***MUST*** include the sampling depth(s).

Relinquished by	Date and Time	Received by	Date and Time

CUSTODY RECORD AND ANALYSIS REQUEST – Watershed Management Program

Account #	**Project Code:** NRWAS	**Project Name:** No River Watershed Assessment	**FOR LABORATORY USE ONLY**
DEQ Program:	**DEQ Project #:**	**DEQ Cost Center #:**	**Point of Contact/DPM:** Sammy Sampler
Sampled By: Sammy Sampler		**Sampler Phone #:** 222-2222	**Nutrient/Nitrate bottle(s) checked for preservation by:**
Analysis Requested: 30, 118, 144, 30130		***Collection Method: (See Note)** Grab	**Matrix:** Soil **Water** Other (explain) / **Enforcement?** Yes No

Lab ID (Enter # from lids of samples here)	Site ID/STORET #	Sample Location (Lat Long or TRS)	Sample Date	Sample Time	# of Bottles	Cooler #	Co-located Site ID and/or Comments	Depth in meters	Field Measurements	
1	388001	No River @ Steele	06/01/20	11:30	4	1			Temp	DO
									SC	pH
1a	389999	Duplicate for 388001	06/01/20	11:40	4	1			Temp	DO
									SC	pH
2	388002	No River @ Moffit	06/01/20	13:00	7	1			Temp	DO
									SC	pH
3	388003	No River @ Pingree	06/01/20	14:00	7	1			Temp	DO
									SC	pH
4	388004	No River @ Lake Williams	06/01/20	15:00	7	2			Temp	DO
									SC	pH
									Temp	DO
									SC	pH

If there are additional samples the numbering would continue from this page.

th/Width Integrated (DWI) ~ Grab ~ 0-2 meter column

When collecting lake samples, you ***MUST*** include the sampling depth(s).

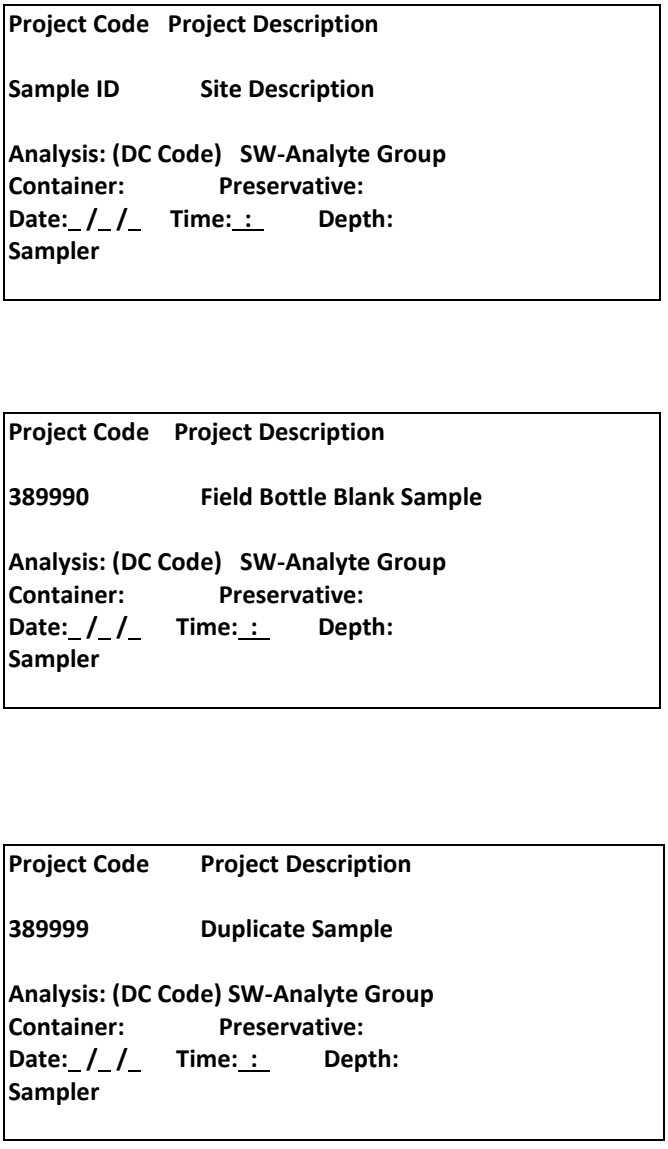
Relinquished by	Date and Time	Received by	Date and Time
Sammy Sampler	06/02/20 8:00pm		

North Dakota Department of Environmental Quality
Division of Water Quality
Lake and Wetland Profile Field Log
Telephone: 701.328.5210
Fax: 701.328.5200

Project Code:		**Project Name:**	
Site Identification:		**Site Description:**	
Date: / /	**Time: :**	**Ambient Temp:**	**Wind Speed:**
Wind Direction:	**%Cloud Cover:**	**Secchi Disk: (m)**	**Baro: (mm/Hg)**
Chlorophyll-a:	**Phytoplankton:**	**Initial DO:**	**Final DO:**
Sample Depths:_____ Meters _____		**Meters _____**	**Meters _____**
Sampler(s):			
Comments:			

Depth (m)	Temp (c)	DO (Mg/L)	pH	Specific Conduct.	Comments

Figure 7.07.3 Lake and wetland field form.



SWQMP Water Chemistry Label, Water Chemistry Blank Label, and Water Chemistry Duplicate Label.
Figure 7.07.4

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:	
Document Revision Number:	
Document Revision Date:	

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."

Printed Name	Signature	Date

SOP Acknowledgement and Training Form (cont.)

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.

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