

South Dakota Quality Assurance Project Plan for Reference Site Development



South Dakota

Department of Agriculture and Natural Resources

Division of Resource Conservation and Forestry

Watershed Protection Program

April 2022

A1: Signature Page

REFERENCE SITE DEVELOPMENT PROJECT
QUALITY ASSURANCE PROJECT PLAN

SUBMITTED BY:

SOUTH DAKOTA DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
DIVISION OF RESOURCE CONSERVATION AND FORESTRY
WATERSHED PROTECTION PROGRAM

APPROVED BY:


South Dakota Watershed Protection Program
Administrator


5-24-2022
Date


South Dakota Watershed Protection Program
Environmental Scientist Manager, Assessment Team


5-24-2022
Date


South Dakota Watershed Protection Program
Environmental Scientist Manager, Implementation Team

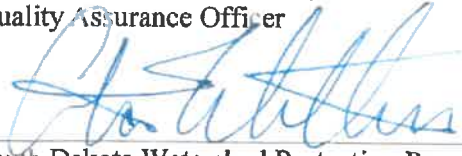
5-24-2022
Date


South Dakota Watershed Protection Program
Quality Assurance Officer

5-24-22
Date


South Dakota DANR Quality Assurance Officer
Quality Assurance Officer

5.27-22
Date


South Dakota Watershed Protection Program
REFDEVA Project Officer

5/23/2022
Date

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A3: Distribution List

The current version of the Quality Assurance Project Plan (QAPP) will be posted on the [DANR website](#). It will also be saved under the file pathway; N:/WATRSBED/QAQC – SOP/QAPP.

Table 1: Distribution List

Name	Title
Bill Smith	Division Director
Barry McLaury	Administrator, Watershed Protection Program, Manager II
Paul Lorenzen	Team Leader/Environmental Scientist Manager I Assessment Team
Kris Dozark	Team Leader/Environmental Scientist Manager I Implementation Team

All personnel involved with assessment and implementation sampling activities for the South Dakota Department of Agriculture and Natural Resources, Watershed Protection Program (SD DANR WPP) shall receive a copy of this plan and therefore should be thoroughly familiar with WPP sampling policies, management structure, and procedures. Compliance with QAPP elements results in data collection and management that is valid and suitable for use in implementation, water quality and (TMDL) Total Maximum Daily Load assessments projects, other programs, and projects.

A4: Project Organization

The following individuals are responsible for the design and implementation of this project:

Roles and Responsibility:

The Reference Site Development (REFDEV) project officer, Alan Wittmuss, will be responsible for identifying randomly selected stream locations for sampling. The project officer will also contact landowners via phone and mail for permission to access stream locations. DANR staff will collect all samples in each stream location, and the project officer will coordinate with the State Public Health Lab in Pierre, SD, Mid Continent Testing Labs, Inc. in Rapid City, SD, and Rhithron Associates, Inc. in Missoula, MT for assessment of samples. The officer will also communicate with East Dakota Water Development District (EDWDD) to aid with the assessment of random sites.

Individual Responsibilities and Program Hierarchy:

The organizational chart in (Figure 1) visually demonstrates program hierarchy. Key individual responsibilities can be located in the South Dakota Nonpoint Source Program QAPP. The current version of the Quality Assurance Project Plan (QAPP) will be posted on the [DANR website](#). It will also be saved under the file pathway; N:/WATRSBED/QAQC – SOP/QAPP.

Water Protection Program Organizational Chart

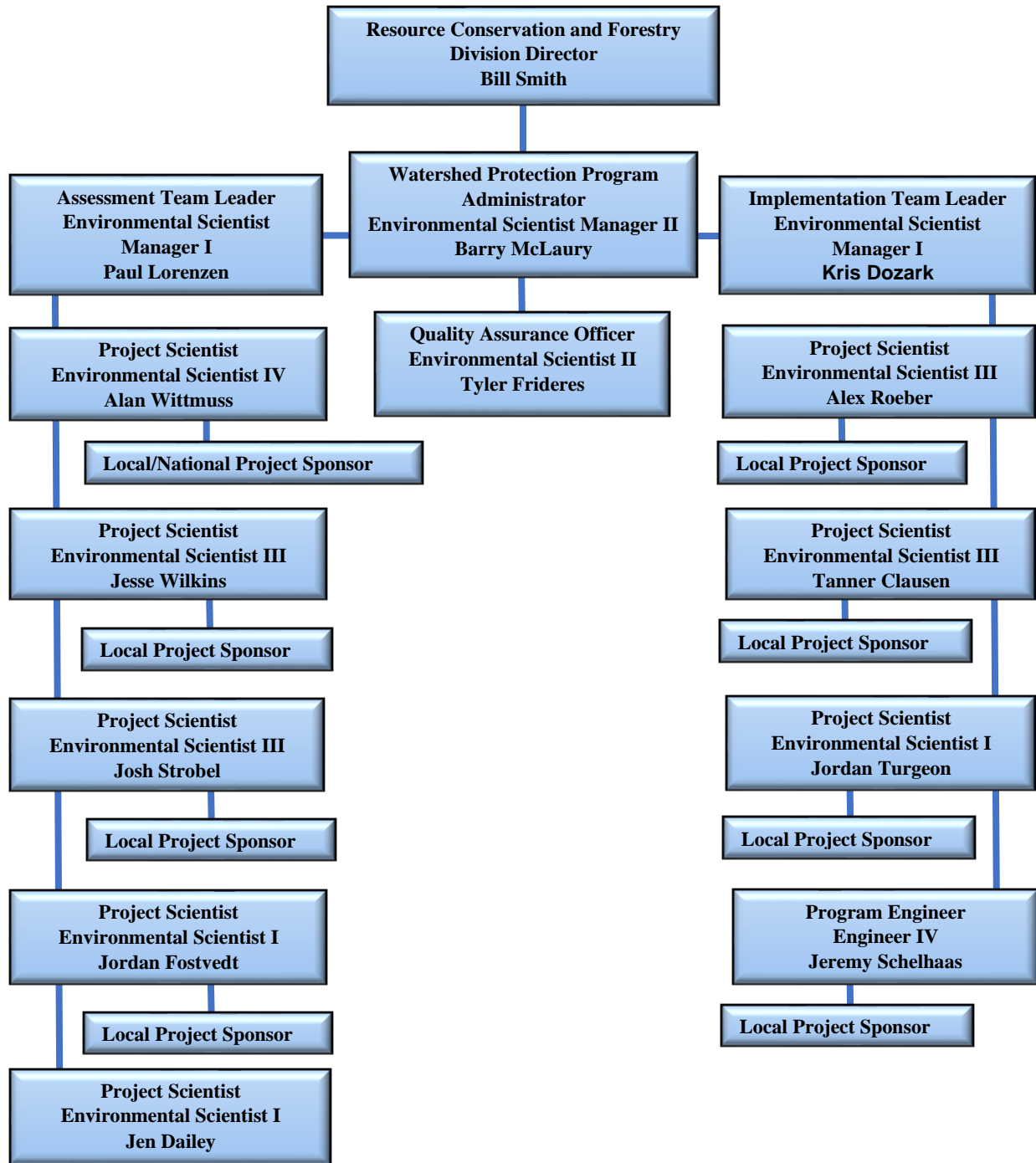


Figure 1. SD DANR Watershed Program Organizational Chart 2022.

Management Responsibilities:

Quality Assurance (QA) Responsibilities:

The DANR QA Office, Tyler Frideres, will be responsible for interpreting the validity of the data. State Public Health Lab, Mid Continent Labs, and Rhithron Associates analysts will be responsible for conducting the laboratory analyses according to their approved Standard Operating Procedures (SOPs) and ensuring that all field documentation submitted with samples has been satisfactorily completed. The project officer will ensure that all samples are collected according to the laboratory guidance from the Labs and the SD DANR WPP SOP.

Laboratory Responsibilities:

The State Public Health Lab and Mid Continent Labs will be responsible for lab analysis of water samples. Rhithron Associates Inc. will be responsible for the lab analysis of aquatic macroinvertebrate samples.

Laboratory and Field Audit Responsibilities:

Laboratory audits will occur as specified in the State Public Health Lab, Mid Continent Labs, and Rhithron's Lab. All field sampling will be conducted by DANR staff. No field audits will be conducted as part of this project.

The project officer will make sure that the QAPP is followed as approved; and that all DANR and EDWDD staff have access to the most current version of the QAPP and all necessary documents to sample. Personnel will be informed of all requirements for the project prior to any sampling.

Field Responsibilities:

All samples will be collected by DANR staff or EDWDD and will follow all QAPP guidance and SOP methods.

A5: Problem Definition/Background

Nutrient enrichment is one of the main causes of impairment to aquatic systems nationwide according to the EPA. States need to adopt numeric nutrient standards to protect aquatic resources from impacts associated with nutrient enrichment. South Dakota currently has literature-based exceedance thresholds for nitrogen and phosphorus, but these thresholds are based on a large regional reference site analysis using National Rivers and Streams Assessment data. The EPA recommended that South Dakota should build nutrient impairment thresholds based on the state's regional-specific reference sites. However, South Dakota lacks the necessary reference site capacity in the Northern Glaciated Plains (NGP) to establish nutrient impairment thresholds. To build a robust reference condition for use in nutrient impairment threshold establishment, many factors of the current system need to be addressed including limitations with the current reference site data, increase the number of reference sites in the NGP, and validation of these reference sites.

Limited water quality (nutrients, dissolved oxygen, pH, etc.) data is available for the currently established reference sites. To accurately characterize water quality for the collective reference sites it is imperative to acquire data that spans the range of conditions to capture within and between year variation. Focusing sampling efforts during the growing season (May-September) over multiple years will provide a mechanism in which to acquire statistically valid data to characterize water quality of the collective

reference sites. Having a statistically defensible reference site dataset is vital for the development of nutrient thresholds.

Nutrient threshold development will be based on descriptive statistics (median, average, percentiles, etc.) from the data distribution of the collective reference sites. An analysis of current reference site phosphorus data revealed the average concentration is 0.16 mg/L, the median concentration is 0.093 mg/L, and the standard deviation is 0.21 mg/L. It is expected that the addition of phosphorus data would change these measures of central tendency and variance. Therefore, additional data is necessary to obtain statistical confidence that the measures are stable.

Additional habitat and biological data are also needed to better characterize habitat conditions and index of biological integrity for the collective reference sites for threshold development. The data requirements for biology and habitat are different than water quality. Invertebrates and fish are exposed to variable water quality throughout the growing season all though community dynamics are more stable in late summer. Accounting for year-to-year variation in habitat and biology will provide a better characterization of biological integrity and habitat condition for the reference sites. A minimum of three Index of Biological Integrity (IBI) and Habitat Condition Index (HCI) values are required from each reference site to develop statistically valid thresholds. Currently, each reference site has two measures of IBI and habitat. The addition of new reference sites into the network will require the same biological and habitat data requirements.

There are currently only seven reference sites to represent the least impacted condition for the entire wadeable stream population in the NGP. Consequently, five of the seven reference sites are clustered around the Coteau Des Prairie escarpment in the northeast portion of the NGP. Improving reference site distribution outside the Coteau is essential to assure that the reference condition is representative of all wadeable-perennial streams in the region. Therefore, completing the reference site network will depend more on distribution of sites than an overall number. These reference sites will also need to be validated. The validation process is an important component of reference site development and will need to be developed before candidate reference sites can be added to the NGP reference site network. The constructed validation process will assure that all reference sites within the network represent the least impacted condition for this region.

It is important to follow through with all the components of reference site development in South Dakota to avoid the potential of adopting EPA nutrient-based standards or impairment thresholds developed at larger regional scales. Developing meaningful thresholds based on a localized regional references site approach will help avoid erroneous 303(d) listings and other issues that could arise (standards changes) with adopting inappropriate standards.

Goals and Objectives:

The goal of this monitoring project is to increase reference site capacity to establish nutrient-based assessment criteria. The criteria will incorporate multiple ecological lines of evidence and impairment thresholds needed to evaluate aquatic life use support for wadable-perennial streams in the Northern Glaciated Plains (NGP) ecoregion of eastern South Dakota.

The objectives of this project can be separated into two main components; 1) collecting water quality data at existing reference sites and 2) collecting water quality, habitat, and biological data at randomly selected stream sites to identify/validate candidate reference sites and strengthen linkages (relationships) between IBI, habitat and water quality data. Both components of this project are equally important to achieving the goal.

A6: Project Description and Schedule

The DANR Reference Site Development Project is designed to assist South Dakota in the better development of vital nutrient enrichment thresholds. The impacts of nutrient enrichment on aquatic communities within the NGP ecoregion in South Dakota are expected to be more complex than in other areas of the country. Wadeable streams in the NGP are subject to a wide range of natural stressors, and biological communities have evolved to survive relatively harsh environments.

This project will use a completely random probabilistic sampling design to identify and validate reference sites. This provides the best practical way to identify high quality reference sites by selecting sites that represent the range of possible conditions for the entire population of wadeable streams. Stream sites with the best IBI, HCI, and water quality will be considered reference sites. The random approach will help avoid exclusive targeting of any specific region within the NGP.

All data collection will be performed by DANR or EDWDD. Laboratory analysis will be performed by the State Public Health Lab, Mid Continent Testing Labs, Inc., and Rhithron Associates, Inc.

This QAPP provides information regarding the routine collection and analysis of data for current reference locations, as well as collection and analysis of new data for reference site development.

At existing sites, sampling will consist of taking a grab sample and a YSI reading to test the water quality. These sites will be sampled routinely during the months of May through September. A list of the sites for routine sampling is included in Appendix A. Samples will be sent to the State Public Health Lab or Mid Continent Labs for analysis.

For the development of new sites, sampling will also consist of sampling of water quality, biology, and habitat data. A list of candidate sites for data collection will be developed using a completely random probabilistic sampling design. Data will be collected by DANR or EDWDD staff throughout the months of June to August. Water samples will be sent to the State Public Health Lab or Mid Continent Labs for analysis, and aquatic macroinvertebrate samples will be sent to Rhithron Associates, Inc. for analysis. All other data collected will be analyzed by DANR staff. All data collected will be used to develop IBIs and HCIs for each site. These scores will then be ranked and the upper 5th percentile of scores will represent the best conditions or reference quality.

Table 2: Parameters to be routinely sampled

Parameter	Category
Total Ammonia as N	water sample
TKN	
Nitrate	
Total Phosphorus	
Total Suspended Solids	
Total Dissolved Solids	Calculated (TDS+TSS)
Total Solids	
Water Temperature	YSI multi-probe
Dissolved Oxygen	
pH	
Specific Conductance	

Table 3: Parameters to be sampled for site development

Parameter	Category
Total Ammonia as N	water sample
TKN	
Nitrate	
Total Phosphorus	
Total Suspended Solids	
Total Dissolved Solids	Calculated (TDS+TSS)
Total Solids	
Water Temperature	YSI multi-probe
Dissolved Oxygen	
pH	
Specific Conductance	
Water Slope	habitat measurement
Water Bearings	
Stream Velocities	
Large Wood Debris	
Habitat Types	
Substrate Types	
Canopy Cover	biology measurement
Fish	
Macroinvertebrates	

Changes to the sampling approach identified in this QAPP will be documented as necessary. The schedule for the 2022 field season is shown below. Please note that this table is an estimated timeline of events for the year.

Table 4: Estimated Timeline for 2022 Field Season REFDEV Sampling

Task	2021 - 2022													
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
QAPP Development	X	X	X											
QAPP Approval				X	X	X								
Sampling							X	X	X	X	X			
Lab Analysis & Reporting								X	X	X	X	X		
Project Analysis											X	X	X	X

A7: Data Quality Objectives and Criteria

The data collected for the Reference Site Development project will be used for validating both current reference sites and the development and validation of candidate sites. Overall, the data will allow for the development of water quality thresholds for the state of South Dakota. The routine collection of data for current reference sites will help provide statically valid data to characterize the water quality of the collective reference sites. The data collected from the project will help determine the top 5th percentile of streams in eastern South Dakota to be used as reference sites. New reference sites will then be added to the routinely sampled sites for a full list of reference sites for the state of South Dakota to use for water quality threshold development.

In addition to the SOP, DANR will follow the criteria for deciding if data quality objectives have been met in terms of Completeness, Representativeness, Comparability, Precision, and Accuracy.

Completeness is a measure of the amount of valid data obtained from measurement systems compared to the amount that is expected to be obtained under optimum conditions. For a set of data to be utilized with confidence to assess a parameter for a waterbody, the data must be complete, i.e., there must be enough valid data from analysis to facilitate making the assessment.

Representativeness expresses the degree to which data accurately and precisely represents the characteristics of that which is being measured. All samples will be collected in such a manner and at such sites to be representative of the medium from which they are taken.

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be measured and assessed using standard, published sampling, and analytical data. The comparability of data is achieved by the commitment of SD DANR and EDWDD staff, local coordinators, and contracted laboratories to use standardized methods, where possible, including the SD DANR SOP volume 1 and 2, EPA-approved analytical methods, standard methods, or documented modifications thereof which provide equal or better results. All analytical results will be reported inappropriate concentration values and units to facilitate comparison.

Precision is a measure of the reproducibility of the measurement when an analysis is repeated. It is reported in Relative Percent Difference (RPD) or Relative Standard Deviation (RSD). Precision will be assessed through field duplicate and lab duplicate analyses. The collection of field blanks will also make sure there is no cross-contamination.

Accuracy is a measure of how much of the constituent present is determined. It shows how close the sample value is to the “true” value. Accuracy will be assessed through the project by the collection of field blanks and duplicates. Also, following QA/QC practices will help ensure that accuracy is accounted for.

Please refer to Section 7.0 and 8.0 of the SD DANR WPP SOP Volume 1 for measurements of precision and accuracy and specific procedures for corrective actions.

A8: Special Training and Certification

Any special training requirements needed for the completion of this project will be written in the Response Protocol and Assessment Strategy. Any associated costs with training will be documented in the budget table in the Response Protocol and Assessment Strategy. The project officer, Alan Wittmuss, will make sure that any necessary and needed training is documented and completed. All certifications will be discussed with the Quality Assurance Officer (QAO), Tyler Frideres.

A9: Documents and Records

Documentation and record collection is an integral part of maintaining proper QA protocols. The project officer will make sure that before any sampling is done, a copy of the most current version of the REFDEV QAPP is available. Prior to project sampling, the project officer will also make sure that all sampling sites have been entered into the NR92/WISKI database with the correct results and latitude and longitude. All data will be stored indefinitely on a SQL server and backed up to the state IT system. Information about sample analysis and location will be shared with the public. South Dakota DANR will make sure that all field notes documented will be sent to EPA Region 8 upon their request.

At the completion of the project, all project data, reports, documentation, and records will be given to the project officer and stored. After multiple years of sampling for REFDEV, the goal is to have long-term datasets containing data from routine sites and candidate sites. The data from routinely sampled reference sites will be used to track trends and validate the reference sites. The data from candidate sites will be used to find the top 5th percentile of streams in SD for creation of routinely measured reference sites. All lab results from sampling will be sent to the project officer. The project officer will make sure that all documentation is put into the associated folders.

B1: Data Generation and Acquisition

Sampling Design (Experimental Design):

For current reference sites, South Dakota DANR or EDWDD staff will be taking routine water quality measurements and collecting grab samples for the parameters listed in Table 2. At each location (Appendix A), field staff will collect two grab samples and a YSI multi-probe reading, in addition to the field duplicate and field blank for each sampling event. Samples will be delivered to the State Public Health Lab or Mid Continent Labs for analysis.

For reference site development, South Dakota DANR or EDWDD staff will be taking measurements and collecting samples for the parameters listed in Table 3. Locations will be determined by random selection of stream segments. The field staff will take two bottle samples (A & B bottles), a YSI multi-probe reading, habitat measurements, obtain fish data, and collect macroinvertebrates with a D-frame net.

Sampling Schedule:

For routine recreational samples, DANR staff will sample each reference site once a month from the months of May to September, during the growing season in South Dakota. For candidate reference sites, DANR will record field data at least once a week from June to August.

Sample Identification:

Sampling locations and descriptions for routinely sampled reference sites have been assigned by the State of South Dakota and can be found in Appendix A. Sampling locations for candidate sites will be assigned as developed. Sampling locations will also be identified on the bottles and datasheets.

Sample Bottles:

Samples will be collected following the DANR standard operating procedures (SOP). Water samples will be collected in a 1L bottle. The A bottle is tested for total suspended solids and total dissolved solids. The B bottle for sampling ammonia, Nitrate, TKN, and total phosphorus will be preserved using hydrochloric acid. All bottles will be placed in a cooler on ice for preservation and delivered to the State Public Health Lab or Mid Continent Labs. The holding time is 48 hours for the A bottle and 28 days for the B bottle.

B2: Sampling Methods

Sampling Methods:

Routine samples are collected by DANR staff or EDWDD using the following method:

1. Calibrate YSI multi-probe sonde.
2. Fill the cooler with ice and label bottles.
3. Rinse the 1L A, B, and Chlorophyll-a sample bottles and caps 3 times with sampling water.
4. Take all the grab samples by positioning the open end of the bottle toward the current flow and away from the hand of the collector. Plunge the bottle to avoid surface scum and fill to the 1L line at a depth of 15 cm to 30 cm.
5. To preserve the A and Chlorophyll a bottle, place them in a cooler with ice. To preserve the B bottle, add 2 mL of concentrated sulfuric acid (H_2SO_4). Invert the bottle to mix and place in a cooler with ice. Ice should keep the bottles at a temperature of 6°C.
6. Take a YSI reading from the stream by placing it in a flowing section of the stream and allowing the values to stabilize.
7. Record YSI values on the lab datasheet.
8. Deliver A and B bottles to the State Public Health Lab or Mid Continent Labs within the proper hold time of 48 hours for the A bottle and 28 days for the B bottle and ensure that preservation temperature is kept. Deliver the Chlorophyll a bottle to the SD DANR lab for analysis.

Samples for candidate sites are collected by DANR staff or EDWDD using the following method:

1. Determine the preliminary mean stream width (PMSW) by measuring the width across the stream in 5 locations within the estimated reach to be sampled.
2. Split a reach into 11 different transects.
 - a. If the stream has a width less than 10m, the transects will be 3 times the PMSW apart.
 - b. If the stream has a width greater than 10m, the transects will be 2 times the PMSW apart.
 - c. If PMSW is less than 4m, use 150m as a minimum reach length.

- d. The middle transect (X-site or transect F) is the randomly determined location of the stream.
3. For water quality, follow steps 1-7 from the routinely sampled locations. Water quality is sampled at the X-site.
4. Take an aquatic macroinvertebrate sample. A 30 second sample will be taken with a D-frame net at each of the 11 transects beginning at the most downstream and combined for a composite sample.
 - a. Samples are either taken by the left bank, right bank, or middle of the stream. At the first site, randomly determine which location to start at, and continue up the stream in the pattern of left, right, and then middle only sampling in one of the locations for each transect.
 - b. Position the D-frame net in the stream so the opening faces upstream. Disturb a 1m³ area in front of the net for 30 seconds, allowing invertebrates and debris to flow into the net.
 - c. Combine all 11 samples into a seine bucket and rinse in the stream.
 - d. Place the contents of the bucket into jars, only filling the jar $\frac{3}{4}$ full.
 - e. Cover the contents of each jar with 90% Ethanol to preserve the macroinvertebrates.
 - f. Send samples to Rhithron Labs for analysis.
5. Sample for fish. The stream will either be seined or electroshocked to sample for fish.
 - a. For seining, start at the most downstream site and work upstream, holding the ends of the seine on each bank of the stream. Use a standard bag seine with $\frac{3}{16}$ inch to $\frac{1}{4}$ inch mesh and 4 to 6 feet in height depending on the depth.
 - b. For electroshocking, set the voltage and frequency at an adequate level depending on the specific conductance of the stream. Further adjustments to the voltage and frequency may need to be made to get the optimal fish shocking efficiency.
 - c. Once fish are collected, identify, sort, weigh, measure, and count the fish in each species.
 - d. Record values in an excel document and collect photo vouchers of each fish species.
6. Take habitat measurements.
 - a. Record the number and type of pools present, the number of runs/glides, the number and length of riffles, and any other habitat type.
 - b. Take water slope measurements. Use a land survey slope transit and a graduated survey rod. The rod is placed where the bank meets the water.
 - c. Take bearing measurements between each transect. The primary measurement is the degree closest to the most downstream transect. Include the percentage of the stream section between the transect that is covered by that bearing. If the bearing does not cover 100% of the stream section, including secondary and/or tertiary bearings with coverage percentages.
 - d. Take stream velocities at $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ of the stream width at each transect using the SonTek FlowTracker II.
 - e. Note any large woody debris, where it's located, what angle, and how large it is.
 - f. Take measurements of station location and water depth at these locations on both the left and right banks: flood-prone, bank full, channel bottom, and edge of water. Also take depth measurements at $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ widths across the stream and note the bank full height.
 - g. Take measurements of streambank and riparian features at each transect on both the left and right bank including dominant bank substrate, presence of bank slumpage, bank height, bank angle, streambank length, percent streambank vegetated, eroded, or deposited, riparian buffer width, presence of overhanging vegetation, undercut bank

length, submergent macrophytes, emergent macrophytes, riparian land use, animal vegetation use, riparian vegetation type, and age class of riparian trees.

- h. Take measurements of canopy cover at each transect. One measurement is taken at both the right and left bank, and four measurements in the center, one facing each direction of the stream.
- i. Take measurements of bed substrate by sampling 8 evenly spaced locations on the bed of the stream.

All sampling should follow the standard operating procedures for DANR. SOP methods can be found in the SD DANR WPP SOP Volumes 1 and 2.

Site Disturbance:

Ensure that the sample site is not disturbed prior to sample collection. When sampling a candidate site, take the water samples and YSI measurements first, invertebrate samples next, fish samples after that, and habitat measurements last. When taking the water samples, take them from the bank and avoid disturbing the water.

Field Duplicates:

A field duplicate is collected in the same manner as a regular sample. The duplicates are given their own sample number and labeled as “duplicate” for the sample type. The field duplicate sample is factored into the total number of samples. A field duplicate will be collected for every 10 samples.

Blank:

A field blank is treated in the same manner as a regular sample. The blanks are given their own sample number and labeled as “blank.” The field blank sample is factored into the total number of samples (e.g., one sample plus one duplicate and one field blank for a total of three samples). Field blanks should be filled with deionized water. A blank will be collected for every 10 samples.

Corrective Actions:

Corrective actions for deficiencies will be addressed immediately in the field or after lab receipt (documentation errors). Corrective actions include but are not limited to; discarding improperly collected or handled samples, re-sampling, and correcting labels or lab documents. The State of South Dakota will work and communicate to fix any issues or deficiencies with sample collection and documentation.

B3: Sample Handling, Custody, and Documentation

For water samples, both bottles will be stored on ice or refrigerated (4-8°C). A and B bottles will be delivered to the State Public Health Lab or Mid Continent Labs well before the 48 hour hold time for the A bottle and can only be accepted Monday – Friday. Coordination of sampling schedule will be arranged to accommodate this and will only sample Monday – Thursday.

In regard to chlorophyll-a samples, the WPP staff preserves the samples by placing the sample in a concealed chlorophyll-a sample bottle and stored at (4-8°C) up to two weeks prior to being analyzed.

The samples will be received accompanied by the datasheets containing the agency code, sample date, time, sampler, source water, station ID, site location, project, project ID, type of sample, medium, depth, YSI measurements, and bottle types sent/what they’re to be tested for.

For macroinvertebrate samples, all bottles will be preserved with 90% ethanol and will be shipped to Rhithron labs with all necessary information. The chain of custody form can be found under the pathway address; N:\WATRSBED\REFDEVA\Forms and Lists\REFDEVA Chain of Custody.

B4: Analytical Methods

A and B bottle water samples will be analyzed by the State Public Health Lab in Pierre, SD or Mid Continent Testing Labs, Inc. in Rapid City, SD. Macroinvertebrate samples will be analyzed by Rhithron Associates, Inc. in Missoula, MT. Chlorophyll-a samples will be analyzed internally by WPP staff out of the Joe Foss Lab located in Pierre, SD. Fish samples will be analyzed in the field and photo vouchers will be confirmed by state fish biologists. Habitat will be analyzed by DANR staff. IBIs and HCIs will be determined by DANR staff using all the data collected. All analysis will follow EPA approved methods. DANR analytical methods for specific parameters can be found in the SD DANR WPP SOP Volume 1.

B5: Quality Control

South Dakota DANR staff will meet quality assurance/quality control (QA/QC) requirements and ensure that procedures including field duplicates, field blanks, field techniques, holding times, and datasheets are completed. Alan Wittmuss, the project officer will evaluate blanks and duplicates of all samples and will check equipment to determine if acceptability requirements have been met. The South Dakota DANR field staff will follow their own QA/QC requirements of 20% (10% blanks and 10% replicates). The State Public Health Lab and Mid Continent Labs will also follow their procedures for QA/QC. For more information on how precision, accuracy, and completeness is calculated refer to the current version of the [Quality Assurance Project Plan](#) (QAPP) on the [DANR website](#). It will also be saved under the file pathway; N:\WATRSBED/QAQC – SOP/QAPP.

Field Techniques:

DANR field staff and EDWDD field staff will ensure that all samples are collected using proper techniques and following EPA approved methodology.

Field Duplicate:

The field duplicate samples will provide an indication of variability within the sampling. The selection of sites for duplication is determined by field staff.

Field Blank:

A sterile bottle containing ultra-pure deionized water will be provided to the State Public Health Lab or Mid Continent Labs as a field blank. The blank sample should be treated like all other samples for the remainder of the field visit, during transportation and shipment.

Holding Times:

A maximum holding time of 48 hours for the A bottle and 28 days for the B bottle will be followed for the project as identified in the DANR SOP and analytical methods.

B6: Instrument/Equipment Testing, Inspection, and Maintenance

The YSI multi-probe will be inspected prior to the sampling trip to ensure that all probes are undamaged and working properly. The temperature probe will be tested against a NIST thermometer yearly to monitor accuracy and variation. The probe can be cleaned as needed by submerging in hot tap water and

dishwashing soap. A lab rinse bottle can also be used to flush out the ports. If necessary, the YSI can be sent to the manufacturer for inspection and maintenance as well.

The SonTek Flow Tracker II will be inspected prior to the sampling trip to ensure there is full battery and that the tracker is undamaged and working properly.

Any unexpected results during testing, inspection, and maintenance should be reported to the project officer.

B7: Instrument/Equipment Calibration and Frequency

Calibration of the YSI multi-probe should be completed the morning of sampling at the sampling location. Optical dissolved oxygen (ODO) will be calibrated by placing the sensor in the calibration cup with 1/8 of an inch of water and the threads of the cup should be loosened from the base. Conductivity and pH will be calibrated by placing enough calibration solution in the clean calibration cup to cover the sensor. Conductivity calibration solution for DANR is produced by the State Public Health Lab and is 1,410 $\mu\text{s}/\text{cm}$ at 25°C. pH will be calibrated at both 7.00 and 10.00 at 25°C. When calibrating, follow the on-screen guide on the YSI multi-probe for each calibration. Calibration is documented internally on the YSI.

The SonTek FlowTracker II will be calibrated prior to the sampling trip following the instructions in the technical manual.

Any errors with calibration should be communicated to the project officer prior to sampling.

B8: Inspection/Acceptance of Supplies and Consumables

No special supplies or consumables are necessary for this project.

B9: Non-direct Measurements

All available assessments and sampling for reference site development will be used to compare to this new data as well as in the development of nutrient thresholds for the State of South Dakota.

B10: Data Management

Information management occurs on several levels. First, sample collection must be completed in a manner to ensure the quality, compatibility, and timeliness of the data collected. Once collected and organized, it must be available for review, analysis, and interpretation. Ultimately, the data will be used in the development of nutrient thresholds for the state of South Dakota.

Field notes for each site will be recorded on a field datasheet, and include the following:

- Sampler(s) name(s)
- State location ID
- Date sample collected
- Time sample collected
- Additional observations

Hard copies of field datasheets and laboratory results are scanned and saved in electronic format under the file pathway: N/WATRSBED/Biological Monitoring and Assessment

C1: Assessment and Response Actions

The State of South Dakota is responsible for field sample collection and QA/QC procedures. Corrective actions for deficiencies will be addressed immediately in the field or will be resolved through collaboration of project staff.

The State of South Dakota will use the following assessments for REFDEV:

Surveillance:

The project officer, Alan Wittmuss, will ensure that all QA/QC components are being followed.

Peer Review:

Peer review may be performed before a project starts and after a project is completed. DANR staff members will review the REFDEV project for completeness, accuracy, and proper documentation.

Systems Audit:

A full scale systematic, qualitative review of equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of the SD DANR WPP will be completed by the SD DANR Quality Assurance Officer (QAO), Tyler Frideres, every 5 years to evaluate SD DANR WPP QA/QC Procedures.

The EPA project officer or a representative of the Regional Quality Assurance Officer may, at any time, conduct an announced or unannounced audit or review of any data collection and analysis activities with assessment and implementation projects. This includes any contracts or subcontracts thereof used in the data collection and analysis effort.

C2: Reports to Management

On an annual basis the SD DANR WPP QAO, Tyler Frideres, will submit a quality assurance report to the SD DANR QAO, Shannon Minerich, who in turn reports the information to EPA and the Program Administrator in an annual report covering the SD REFDEV project. All reports will also be sent to the Team Leader and Administrative Leader. The report should include the following:

- Assessment results of measurement data, accuracy, precision, and completeness
- Results of performance and system audits
- Quality assurance issues
- List of training activities including dates
- Corrective actions and results
- A list of all QA documents, including status, and if the document is for a new or continuing project; (this would be a list of all SOPs, QAPPs, PIPs, SAPs and indicate if they are new, under revision, or approved)

D1: Data Review, Verification, and Validation

The objective of data review is to assess whether the data collected achieved the quality objectives of the project. All analytical data generated for the Watershed Protection Program by a laboratory undergoes reduction and report preparation by the respective laboratory. Laboratory reports are reviewed by the project officer and the SD DANR WPP QAO for reasonableness. The field data recorded in the laboratory (date, time collected, depth, site number, etc.) are also checked against field reports for accuracy. Data

review, verification, and validation are key steps in the transition from the assessment and TMDL phase to the implementation phase. Data review, verification, and validation are the responsibility of the Project Officer and are accomplished by following quality assurance guidelines and criteria addressed in the [SD DANR WPP-SOP, Volume I](#).

D2: Verification and Validation Methods

Data verification will include a review of the findings of all QA/QC assessment activities including:

- Appropriate sample collection and preparation of field transfer blank sample: assessed during sample collection by responsible field personnel.
- Analytical data collection, recording, and reporting including laboratory QA/QC procedures: assessed by State Public Health Lab or Mid Continent Labs.

Data review, verification, and validation are key steps in the transition from data collection to data review and acceptance. Data review, verification, and validation are the responsibility of the project offer and are accomplished by following the quality assurance guidelines and criteria addressed in the SD DANR WPP SOP, Volume 1.

D3: Reconciliation with User Requirements

All data and related information obtained during this project will be assessed and interpreted by SD DANR. Any limitations found in the data should be reported to the project officer and program managers.

Appendix A: South Dakota DANR Current Reference Site Sampling List

Site Code	Stream Name	Latitude	Longitude
4081850	Little Minnesota	45.46340	-97.04391
4084690	SF Whetstone	45.22356	-96.79473
4085112	NF Yellow Bank	45.12514	-96.83950
4112142	Gary Creek-Lac qui parle	44.78802	-96.46658
4112768	Cobb Creek	44.78798	-96.46683
12668554	North Branch Dry Creek	43.40183	-97.81482
12715986	Mud Creek	45.34297	-97.92678