



Document Title:

Wyoming Department of Environmental Quality  
Water Quality Division  
Watershed Program

**Quality Assurance Project Plan (QAPP) for  
Beneficial Use Reconnaissance Project (BURP)  
Water Quality Monitoring**

(303(d) List; Best Management Practice (BMP) Implementation Effectiveness; Citizen Complaint Investigation; TMDLs; Clean Water Act Section 319(h) and 205(j)(5) Federal Grants; Designated Use Determination, Use Attainment and Use Verification

Revised March 2001  
Replaces

Nonpoint Source Program Quality Assurance Project Plan (November 1993)



Wyoming Department of Environmental Quality  
Dennis Hemmer, Director

Gary Beach  
Water Quality Division Administrator  
email address: gbeach@state.wy.us

Beth Pratt  
Program Manager  
Watershed Program  
email address: bpratt@state.wy.us

### **Water Quality Division Contact Information**

Phone: 307 777-7781

Fax 307 777-5973

#### **Mail Address**

State of Wyoming  
Department of Environmental Quality  
Water Quality Division, Watershed Program  
Program Manager  
122 West 25<sup>th</sup> Street  
Cheyenne, Wyoming 82002

#### **Suggested Citation Information**

Wyoming Department of Environmental Quality, Water Quality Division,  
Watershed Program. September 2000. Quality Assurance Project Plan (QAPP)  
for Beneficial Use Reconnaissance Project (BURP) Water Quality Monitoring.  
Cheyenne, Wyoming.

Persons who require additional information about or alternative means for communication of the information in this document  
should contact

Walter Whetham  
Phone: 307-777-6891  
Fax: 307-777-5973  
e-mail: wwtheth@state.wy.us

The State of Wyoming, Department of Environmental Quality, Water Quality Division, Watershed Program does not discriminate on the basis of  
race, color, national origin, gender, religion, age, disability, political beliefs and/or marital or familial status.

Published by the Wyoming Department of Environmental Quality, Water Quality Division, Watershed Program  
Cheyenne, Wyoming 82002

**Produced in part with funding provided by the United States Environmental Protection Agency**

Printed on recycled paper

## Table of Contents

Part I .....	1
Project Management .....	1
Section I .....	2
PROJECT ORGANIZATION .....	2
PRINCIPAL DATA USER(S) .....	7
PROJECT QUALITY ASSURANCE MANAGER(S) .....	8
PERSONS RESPONSIBLE FOR IMPLEMENTATION .....	9
ORGANIZATION CHARTS .....	10
DATA FLOW CHART .....	10
Section II .....	11
Problem Definition, Background Information,	
Historical and Scientific Perspective .....	11
INTRODUCTION .....	11
PURPOSE .....	12
COMPARABILITY .....	13
SOURCES AND AMOUNTS OF FUNDING (1999) .....	14
BURP Monitoring and 319(h)/205(j)(5) Federal Grant Program .....	14
319(h) and 205(j)(5) Federal Grant Projects .....	15
APPROVAL AND DISTRIBUTION .....	15
CHANGES AND REVIEW .....	16
QUALITY ASSURANCE (QA) AND	
QUALITY CONTROL (QC) .....	16
CONTENTS .....	17
PROBLEM DEFINITION .....	17
BURP Monitoring .....	18
Clean Water Act Section 319(h)	
Federal Grant Projects .....	18
Clean Water Act Section 205(j)(5)	
Federal Grant Projects .....	18
Clean Water Act Section 303(d) Listing .....	19
Total Maximum Daily Load (TMDL) Establishment .....	19
Incremental Fund Grant Program .....	19
Best Management Practice (BMP) Implementation Effectiveness .....	20
INCORPORATED REFERENCES .....	20
HISTORICAL AND SCIENTIFIC PERSPECTIVE .....	21
Federal Water Pollution Control Act (Clean Water Act)	
Section 319(h) and 205(j)(5) Federal Grant Program .....	21
303(d) and TMDL Programs .....	22
BURP Monitoring .....	22
Volunteer Monitoring .....	23

Section III .....	24
Project/Task Description and Schedule .....	24
WORK TO BE PERFORMED .....	24
BURP Monitoring .....	24
Section 319(h) and 205(j)(5) Federal Grants .....	24
TMDL Development .....	25
MEASUREMENTS TO BE MADE .....	25
BURP Monitoring .....	25
319(h)/205(j) Federal Grant Project Monitoring .....	29
EQUIPMENT REQUIREMENTS .....	30
PROGRAM TECHNICAL REVIEWS, PEER REVIEWS, SURVEILLANCE AND TECHNICAL AUDITS .....	30
BURP Monitoring .....	30
Water Quality Division Laboratory .....	30
319(h) and 205(j)(5) Federal Grant Projects .....	30
PROPOSED SCHEDULE .....	30
Citizen Complaint Investigation .....	30
1999 BURP Monitoring .....	31
Casper/Cheyenne Field Crew .....	31
Lander Field Crew .....	34
Sheridan Field Crew .....	35
319(h)/205(j)(5) Existing Project Monitoring .....	37
PROJECT RECORDS NEEDED (QUALITY RECORDS, PROJECT REPORTS) .....	37
BURP Monitoring .....	37
319(h) and 205(j)(5) Federal Grant Projects .....	39
Water Quality Division Laboratory .....	39
Contract Laboratories .....	40
Section IV .....	41
Quality Objectives and Criteria for Measurement Data .....	41
PROJECT QUALITY OBJECTIVES .....	41
BURP Monitoring .....	45
319(h) and 205(j)(5) Federal Grant Projects .....	45
MEASUREMENT PERFORMANCE CRITERIA .....	45
BURP Monitoring .....	45
319(h) and 205(j)(5) Federal Grant Projects .....	45
TOLERABLE DECISION ERROR .....	46
Part II .....	47
Measurement Systems Design and Implementation and Data Acquisition .....	47
Section I .....	48
Sampling Process Design (Experiment Design) .....	48
EXPERIMENT AND DATA COLLECTION DESIGN .....	48
BURP Monitoring .....	48

319(h) and 205(j)(5) Federal Grant Projects .....	48
TMDL Development .....	48
303(d) List .....	49
BMP Implementation .....	49
Section II .....	50
Sampling Methods Requirements .....	50
SAMPLE COLLECTION PROCEDURES .....	50
BURP Monitoring .....	50
319(h) and 205(j)(5) Federal Grant Projects .....	50
SUPPORT FACILITIES .....	50
SAMPLING OR MEASUREMENT SYSTEM FAILURES AND CORRECTIVE ACTION .....	51
SAMPLING EQUIPMENT PREPARATION AND DECONTAMINATION .....	52
BURP Monitoring .....	52
Contract Laboratories .....	52
319(h) and 205(j)(5) Federal Grant Projects .....	52
SELECTION AND PREPARATION OF SAMPLING MATERIALS AND PRESERVATIVES .....	53
BURP MONITORING .....	53
Sampling Containers .....	53
Sample Preservatives and Holding Times .....	53
319(h) AND 205(j)(5) Federal Grant Projects .....	53
Section III .....	54
Sample Handling and Custody Requirements .....	54
IN THE FIELD .....	54
BURP Monitoring .....	54
319(h) and 205(j)(5) Federal Grant Projects .....	54
DURING TRANSPORT .....	54
BURP Monitoring .....	54
319(h) and 205(j)(5) Federal Grant Projects .....	54
IN THE LABORATORY .....	55
BURP Monitoring .....	55
319(h) and 205(j)(5) Federal Grant Projects .....	55
EXAMPLES OF LABELS, FORMS AND LOGS .....	55
BURP Monitoring .....	55
319(h) and 205(j)(5) Federal Grant Projects .....	55
Section IV .....	56
Analytical Methods Requirements .....	56
ANALYTICAL METHODS .....	56
ANALYTICAL SYSTEM FAILURES .....	56
CORRECTIVE ACTION AND EFFECTIVENESS OF CORRECTIVE ACTION .....	57
NON-STANDARD METHODS .....	58
BURP Monitoring .....	58
319(h) and 205(j)(5) Federal Grant Projects .....	58

REQUIRED LABORATORY TURNAROUND TIME .....	59
BURP Monitoring .....	59
319(h) and 205(j)(5) Federal Grant Projects .....	59
FIELD SAMPLING AND/OR	
LABORATORY NARRATIVES .....	59
Laboratory Narrative .....	59
Field Sampling Narrative .....	59
Section V .....	60
Quality Control Requirements .....	60
QUALITY CONTROL PROCEDURES .....	60
Water Quality Division Laboratory .....	60
BURP Monitoring Contract Laboratories .....	61
BURP Monitoring .....	62
319(h) and 205(j)(5) Federal Grant Projects .....	62
QUALITY CONTROL CHECKS .....	63
FREQUENCY OF QUALITY CONTROL CHECKS .....	63
BURP Monitoring .....	63
319(h) and 205(j)(5) Projects .....	63
QUALITY CONTROL LIMITS .....	63
Water Quality Division Laboratory .....	63
Contract Laboratories .....	63
BURP Monitoring .....	64
319(h) and 205(j)(5) Federal Grant Projects .....	65
QUALITY CONTROL CORRECTIVE ACTION .....	66
BURP Monitoring .....	66
319(h) and 205(j)(5) Federal Grant Projects .....	68
DETERMINING THE EFFECTIVENESS OF	
QUALITY CONTROL CORRECTIVE ACTION .....	69
BURP Monitoring .....	69
319(h) and 205(j)(5) Federal Grant Projects .....	69
QUALITY CONTROL STATISTICS COMPLETENESS .....	69
Water Quality Division Laboratory .....	69
BURP MONITORING .....	69
Samples Collected .....	69
Water Chemistry .....	69
Macroinvertebrate Samples .....	70
Habitat Assessments .....	70
319(h) and 205(j)(5) Projects .....	70
PRECISION .....	70
Water Chemistry .....	70
Macroinvertebrate Samples .....	71
Habitat Assessment .....	71
Fecal Coliform Samples .....	71
319(h) and 205(j)(5) Projects .....	72
Section VI .....	73
Instrument Calibration and Frequency .....	73

CALIBRATION PROCEDURES .....	73
BURP Monitoring .....	73
319(h) and 205(j)(5) Federal Grant Projects .....	73
CALIBRATION STANDARDS .....	73
BURP Monitoring .....	73
319(h) and 205(j)(5) Federal Grant Projects .....	74
Part III .....	75
Project Assessment and Oversight .....	75
Section I .....	76
Assessments and Response Actions .....	76
ASSESSMENTS USED IN THIS PROJECT .....	76
Management Systems Review .....	76
Technical Systems Audit .....	76
Performance Evaluation .....	77
Data Quality Assessment (DQA) .....	77
Goals and Performance Objectives .....	77
Schedule .....	78
Self-Assessments .....	78
INDEPENDENT ASSESSMENTS .....	78
REPORTING ASSESSMENT RESULTS .....	78
BURP Monitoring .....	78
Water Quality Division Laboratory .....	79
319(h) and 205(j)(5) Federal Grant Projects .....	79
Part IV .....	80
Quality Assurance, Data Validation and Usability .....	80
Section I .....	81
Data Review, Verification and Validation Requirements .....	81
ACCEPTANCE/REJECTION/QUALIFICATION CRITERIA .....	81
BURP Monitoring .....	81
319(h) and 205(j)(5) Federal Grant Projects .....	81
CALCULATIONS .....	81
BURP Monitoring .....	81
319(h) and 205(j)(5) Federal Grant Projects .....	81
Section II .....	82
Verification and Validation Methods .....	82
DATA VERIFICATION AND	
VALIDATION PROCESS .....	82
BURP Monitoring .....	82
319(h) and 205(j)(5) Federal Grant Projects .....	85
Water Quality Division Laboratory .....	85
Contract Laboratories .....	86

CHAIN OF CUSTODY .....	86
BURP Monitoring .....	86
319(h) and 205(j)(5) Federal Grant Projects .....	86
ISSUES RESOLUTION .....	86
BURP Monitoring .....	86
319(h) and 205(j)(5) Federal Grant Projects .....	86
VERIFICATION AND VALIDATION	
RESULTS AVAILABILITY .....	86
BURP Monitoring .....	86
319(h) and 205(j)(5) Federal Grant Projects .....	87
Water Quality Division Laboratory .....	87
VERIFICATION ISSUES VS VALIDATION ISSUES .....	87
Data Verification .....	87
Data Validation .....	87

## Tables

### Part I

#### Section II

Table 1.2.1 Sources and Amounts of Funding .....	14
--	----

#### Section III

Table 1.3.1 BURP Core Monitoring Parameters .....	26
Table 1.3.2 1999 Casper/Cheyenne Crew: Stream Segments to be Monitored (secondary or inconclusive data) .....	31
Table 1.3.3 1999 Casper/Cheyenne Crew: TMDL Monitoring .....	33
Table 1.3.4 1999 Casper/Cheyenne Crew: Threatened Waterbodies .....	33
Table 1.3.5 1999 Casper/Cheyenne Crew: Long Term Trend/Reference Sites ..	34
Table 1.3.6 1999 Lander Crew: Stream Segments to be Monitored (secondary or inconclusive data) .....	34
Table 1.3.7 1999 Lander Crew: TMDL Monitoring .....	35
Table 1.3.8 1999 Lander Crew: Long Term Trend/Reference Sites .....	35
Table 1.3.9 1999 Sheridan Crew: Stream Segments to be Monitored (secondary or inconclusive data) .....	35
Table 1.3.10 1999 Sheridan Crew: TMDL Monitoring .....	37
Table 1.3.11 1999 Sheridan Crew: Long Term Trend/Reference Sites .....	37
Table 1.3.12 Project Reports .....	38

#### Section IV

Table 1.4.1 Summary of BURP Monitoring Calibration and Field QC Objectives	41
Table 1.4.2 Types of BURP Monitoring QC Samples .....	43

### Part II

#### Section II

Table 2.2.1 Sampling/Measurement System Failures and Corrective Action(s) ..	51
--	----

Section IV		
Table 2.4.1	Analytical Systems Failures .....	56
Table 2.4.2	Corrective Action and Effectiveness of Corrective Action .....	57
Section V		
Table 2.5.1	BURP Monitoring Quality Control Limits .....	64
Table 2.5.2	Quality Control Corrective Action .....	66
Part IV		
Section II		
Table 4.2.1	BURP Monitoring Data Verification Steps .....	82
Table 4.2.2	BURP Monitoring Data Validation Steps .....	84
Appendices		
Appendix A	Organization Charts (3) WDEQ - Overall Organization Chart WQD Organization Chart Watershed Program Organization Chart	
Appendix B	Data Flow Chart	
Appendix C	State of Wyoming State of Wyoming Enrolled Act 47, Credible Data Legislation	
Appendix D	BURP Monitoring Long Term Trend Sites (monitored annually) as of 1999	
Appendix E	BURP Monitoring Reference Sites as of 1999	
Appendix F	BURP Monitoring Field Data Sheets	
Appendix G	BURP Monitoring Event Decision Tree	
Appendix H	Water Quality Division Laboratory Equipment and Use	
Appendix I	Water Quality Division Laboratory Methods and Quality Assurance Goals (precision, accuracy, completeness)	
Appendix J	BURP Monitoring Data Use Tables (14)	
Appendix K	Beneficial Use Reconnaissance Project Monitoring and Assessment Report - Format and Content	
Appendix L	(Proposed) Alphabetical List of BURP Monitoring SOPs	

Plan Title: **Quality Assurance Project Plan (QAPP) for  
Beneficial Use Reconnaissance Project (BURP)  
Water Quality Monitoring**

Organization Implementing the Project:

Wyoming Department of Environmental Quality (WDEQ)  
Water Quality Division (WQD)  
Watershed Program

Address: Herschler Building  
122 West 25<sup>th</sup> Street  
Cheyenne, Wyoming 82002

Purpose of Plan:

This document describes the Wyoming Department of Environmental Quality (WDEQ), Water Quality Division (WQD), Watershed Program Quality Assurance Project Plan (QAPP) for the Beneficial Use Reconnaissance Project (BURP) statewide continuous water quality monitoring. BURP activities monitor and establish the degree of state defined use support for all waters of the state. The monitoring program addresses waters involved in but not limited to: 303(d) List, Total Maximum Daily Load (TMDL) Plans, citizen complaints, Volunteer Monitoring, Clean Water Act Section 319(h) and 205(j)(5) grants and Best Management Practice (BMP) implementation effectiveness.

## **Part I**

# **Project Management**

**Section I**  
**PROJECT ORGANIZATION**

These individuals and/or organizations are participating in the project. Their specific roles and responsibilities are described in the following table.

Name	Beth Pratt
Title	Watershed Program Manager
Organization	WDEQ, WQD, Watershed Program
Role	Manages all Watershed Program functions; implements required corrective actions; reports to Gary Beach
Responsibility	BURP monitoring, 319(h) and 205(j)(5) federal grant projects, TMDLs, NPDES permitting, citizen complaints, 303(d) list, designated use definition/attainment/verification, BMP implementation verification and evaluation

Name	Bill DiRienzo
Title	Watershed Program Planning Supervisor
Organization	WDEQ, WQD, Watershed Program
Role	Planning functions for SOPs, BURP Monitoring QAPP, 319(h) and 205(j)(5) projects, QA/QC, TMDLs, 303(d) list, state water quality standards (designated uses), final approval for SOPs and BURP QAPP; reports to Beth Pratt
Responsibility	Water quality assessments, water quality monitoring for certifications and wetlands permits, QA, TMDLs, 303(d) list, 319(h)/205(j)(5)

Name	Maggie Davison
Title	Watershed Program NPDES Supervisor
Organization	WDEQ, WQD, Watershed Program
Role	Supervise and implement corrective actions for WQD Laboratory; supervise NPDES permitting (including response to citizen complaints); reports to Beth Pratt
Responsibility	WQD Laboratory, NPDES permitting

Name	Jack Smith
Title	Watershed Program Technical Support Supervisor
Organization	WDEQ, WQD, Watershed Program
Role	Watershed Program Technical Support Supervisor
Responsibility	Hire, supervise, train and spot check BURP field monitoring staff; verify that all records associated with BURP monitoring sites are filed and complete; provide training and technical assistance as needed to groups or organizations which do monitoring covered by this plan; prepare plans, papers and other documents related to BURP monitoring activities; decide on number and type of field QC samples and verify that they are being collected on schedule; prepare annual field monitoring schedule; respond to citizen complaints; with Bill DiRienzo, review SOPs and authorize changes; final decision maker on use(s) of BURP monitoring data and SOP content; prepare annual BURP monitoring QC report; supervise data validation and data entry into Watershed Program databases; initiate, implement and follow up on any corrective actions required for the BURP monitoring program; reports to Beth Pratt

Name	Edward R. Mock, Ph. D.
Title	Supervisor, WDEQ, WQD Laboratory
Organization	WDEQ, WQD
Role	WQD Laboratory Supervisor/QA Officer
Responsibility	Supervise, train and check work of laboratory staff; initiate, implement, document and follow up on any corrective actions required for the WQD laboratory; prepare laboratory analysis reports; implement and maintain laboratory QA/QC and all associated records; maintain and repairs laboratory equipment; prepare laboratory and field standards and field QC spikes; furnish spot checked sample bottles to field samplers; inspect, repair and maintain field equipment and assign it to samplers each field season; supervise and implement sampling error recovery efforts; track number of field QC samples submitted and notify Monitoring Supervisor if number does not appear to be on target; prepare monthly and annual laboratory QA/QC reports; furnish analytical results reports to supervisors and field personnel; reports to Maggie Davison

Name	Brian Lovett
Title	Watershed Program Nonpoint Source Coordinator
Organization	WDEQ, WQD, Watershed Program
Role	Supervise, define, oversee and implement corrective actions to all aspects of the 319(h) and 205(j)(5) grant program, including overall QA/QC of project monitoring data, project specific Sampling and Analysis Plans and SOPs; reports to Bill DiRienzo
Responsibility	319(h) and 205(j)(5) federal grant program coordinator

Name	Chuck Harnish, Barb Sahl, Diana Heft, Tavis Eddy, Kevin Frederick, Steve Bubnick (USEPA IPA), Glen Garton, Lanny Goyn, Eric Felbeck, Kim Parker, Mark Conrad
Title	Watershed Program 319(h) and/or 205(j)(5) grant project officers for state's grantees
Organization	WDEQ, WQD, Watershed Program
Role	Watershed Program contact for grantees
Responsibility	Work with grantee to create project specific Sampling and Analysis Plan (SAP) and Project Implementation Plan (PIP); monitor progress through periodic reports and site visits; initiate contract amendments; assist grantee to produce water quality monitoring data that are defensible and of known and documented quality; enter project information in GRTS (NOTE: refer to GRTS entries for the project officer assigned to specific projects, budgets, start and end dates and the project purpose); project officers report to Brian Lovett

Name	Walter Whetham
Title	Watershed Program QA/QC Coordinator
Organization	WDEQ, WQD, Watershed Program
Role	QA/QC administrative work
Responsibility	QA related document production and review; data entry; field and laboratory QC report production; reports to Brian Lovett

Name	Robert W. Wisseman
Title	QA Officer, Principal Scientist
Organization	Aquatic Biology Associates, Corvallis, Oregon
Role	Contract laboratory for macroinvertebrate sample identification
Responsibility	Implement and maintain laboratory QA/QC and all associated records; check Chain of Custody form for completeness and accuracy; prepare laboratory analysis reports; provide macroinvertebrate reference collection samples; provide copy of laboratory QA/QC Plan on request; prepare laboratory analysis reports; hire and supervise subcontractors

Name	Mary D. Simmons
Title	Laboratory Manager/QA Manager
Organization	InterMountain Laboratories (Sheridan or Gilette)
Role	Contract lab for fecal coliform testing
Responsibility	Implement and maintain laboratory QA/QC (including corrective actions) and all associated records; check Chain of Custody form for completeness and accuracy; supervise fecal coliform tests on BURP monitoring samples when samplers have more work than they can complete; supervise preparation of laboratory analytical reports; provide copy of laboratory QA/QC plan on request

Name	Dave K. Olson
Title	Laboratory Manager
Organization	Core Laboratories, Casper, Wyoming
Role	Contract laboratory for miscellaneous parameter testing
Responsibility	Implement and maintain laboratory QA/QC (including corrective actions) and all associated records; check Chain of Custody form for completeness and accuracy; supervise preparation of laboratory analytical reports; provide copy of laboratory QA/QC plan on request

Name	Ken McMillan
Title	Laboratory Manager/State Chemist
Organization	Wyoming Department of Agriculture Analytical Services, Laramie, Wyoming
Role	Contract laboratory for miscellaneous parameter testing
Responsibility	Implement and maintain laboratory QA/QC (including corrective actions) and all associated records; check Chain of Custody form for completeness and accuracy; supervise preparation of laboratory analytical reports; provide copy of laboratory QA/QC plan on request

Name	various
Title	various
Organization	Conservation Districts (statewide) and other 319(h)/205(j)(5) federal grant recipients
Role	Water quality data collection, analysis and reporting under project-specific, approved Sampling and Analysis Plan (SAP) for Clean Water Act 319(h) and 205(j)(5) grants
Responsibility	Implement water quality monitoring plan; report monitoring data to Watershed Program to be considered for incorporation into BURP monitoring database and possible use in TMDL/303(d) list/BMP implementation decisions

Name	George W. Cleek IV
Title	Assistant State Conservationist - Operations
Organization	United States Department of Agriculture, Natural Resources Conservation Service
Role	USDA-NRCS liaison
Responsibility	Coordinate training for non-DEQ-WQD Watershed Program monitoring personnel, using USDA-NRCS <u>National Handbook of Water Quality Monitoring</u> and the training course materials; provide information and education to conservation districts involved in water quality monitoring, TMDLs, BMP implementation

## PRINCIPAL DATA USER(S)

Name	Chuck Harnish
Title	Watershed Program TMDL Coordinator, 305(b) report, 303(d) list
Organization	WDEQ, WQD, Watershed Program

Name	Jack Smith
Title	Watershed Program Technical Support Supervisor
Organization	WDEQ, WQD, Watershed Program

Name	Bruce Zander
Title	TMDL Coordinator
Organization	United States Environmental Protection Agency, Region VIII

Name	varies
Title	Watershed Program Field Samplers
Organization	WDEQ, WQD, Watershed Program

Name	varies
Title	Watershed Program 319(h) and 205(j)(5) project officers
Organization	WDEQ, WQD, Watershed Program

Name	Local stakeholders; interested members of the public; private land owners; conservation and land use groups; local and downstream city, county, and state governments and groups; federal government agencies
Title	Various
Organization	USDA-NRCS, BLM, Forest Service, Park Service, Conservation Districts, Wyoming Association of Conservation Districts, etc.

Name	319(h) and 205(j)(5) project sponsors
Title	Project Manager/Coordinator
Organization	Conservation districts, local stakeholder groups, other grant recipients

## PROJECT QUALITY ASSURANCE MANAGER(S)

Name	Robert W. Wisseman
Title	Quality Assurance Manager and Principal Scientist
Organization	Aquatic Biology Associates, Corvallis, Oregon

Name	Mary D. Simmons
Title	Quality Assurance Manager
Organization	InterMountain Laboratories

Name	David K. Olson
Title	Quality Assurance Manager
Organization	Core Laboratories, Casper, Wyoming

Name	Ken McMillan
Title	Laboratory Manager and State Scientist
Organization	Wyoming Department of Agriculture Analytical Services, Laramie, Wyoming

Name	Edward Mock, Ph. D.
Title	Quality Assurance Manager
Organization	WDEQ, WQD Laboratory

## PERSONS RESPONSIBLE FOR IMPLEMENTATION

Name	Gary Beach
Title	WQD Administrator
Organization	WDEQ, WQD

Name	Beth Pratt
Title	Watershed Program Manager
Organization	WDEQ, WQD, Watershed Program

Name	Jack Smith
Title	Watershed Program Technical Support Supervisor
Organization	WDEQ, WQD, Watershed Program

Name	Bill DiRienzo
Title	Watershed Program Planning Supervisor
Organization	WDEQ, WQD, Watershed Program

Name	Maggie Davison
Title	Watershed Program NPDES Supervisor
Organization	WDEQ, WQD, Watershed Program

Name	Brian Lovett
Title	Watershed Program Nonpoint Source Coordinator
Organization	WDEQ, WQD, Watershed Program

Name	Edward Mock, Ph. D.
Title	WQD Laboratory Supervisor
Organization	WDEQ, WQD Laboratory

Name	Brent Truskowski
Title	Wyoming Project Officer - 319(h) and 205(j)(5) project grants
Organization	United States Environmental Protection Agency, Region VIII

Name	Bruce Zander
Title	USEPA TMDL Coordinator
Organization	United States Environmental Protection Agency, Region VIII

## **ORGANIZATION CHARTS**

The three organization charts in Appendix A show:

1. WDEQ - Overall Organization Chart
2. WDEQ - WQD Organization Chart
3. WDEQ - WQD, Watershed Program Organization Chart

Each chart shows the relationship and the lines of communication among all project participants. WQD Laboratory and BURP field samplers occasionally use a contract laboratory. Those are the only subcontractor relationships in the Watershed Program. These laboratories are named in Part II, Section II, Support Facilities.

## **DATA FLOW CHART**

Appendix B contains a chart which shows Watershed Program data flow and quality control. The chart includes potential data users outside WDEQ WQD.

## **Section II Problem Definition, Background Information, Historical and Scientific Perspective**

### **INTRODUCTION**

Environmental issues and related data operations are becoming increasingly complex. Existing and anticipated environmental decision-making objectives drive the need to establish a systematic process and structure which assure the data consistency and quality decision makers must have if they are to have confidence in the data which supports their decisions.

United States Environmental Protection Agency (USEPA) policy requires that the collection of environmental data by and on behalf of the Agency be supported by a mandatory quality assurance system. This requirement is documented in:

- ! Title 48, Code of Federal Regulations (48 CFR) Chapter 15, Subpart 1546.2 “Contract Quality Requirements” and
- ! Title 40, Code of Federal Regulations, (40 CFR) 1, Parts 31 and 35, “Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments” and
- ! Delegation of Authority I-41, April 1981, “Mandatory Quality Assurance program.”

This regulatory text is incorporated by reference into this document and can be viewed and downloaded at: [www.epa.gov/earth1r6/6wq/ecopro/watershd/monitrng/cfr\\_req.htm](http://www.epa.gov/earth1r6/6wq/ecopro/watershd/monitrng/cfr_req.htm).

No work funded by USEPA and involving the acquisition of environmental data generated from direct measurement activities, collected from other sources, or compiled from computerized data bases and information systems can be implemented without an approved Quality Assurance Project Plan (QAPP) being available prior to the start of the work.

Work performed on behalf of USEPA includes activities performed under contracts, assistance agreements (cooperative agreements, grants), interagency agreements, in response to statutory or regulatory requirements and in some cases consent orders and/or agreements negotiated as part of enforcement actions. Since 1979, non-USEPA organizations performing work in behalf of USEPA have been required to participate in the agency quality system. This policy is documented in USEPA order 5360.1, April 1984, The EPA Quality Manual for Environmental Programs. USEPA’s agency-wide quality system is based on a national standard, ANSI/ASQC E4-1994, Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs, which requires an approved QAPP for environmental data operations. USEPA order 5360.1, Change 1, July 1998, Policy and Program Requirements for the Mandatory Agency-wide Quality System, requires that

all environmental data used for decision making be supported by an approved QAPP. All of these documents are incorporated by reference into this document.

Environmental data include any measurements or information that describe environmental processes, location or conditions; ecological or health effects and consequences; or the performance of environmental technology; information collected directly from measurements, produced from models and compiled from other sources such as data bases or the literature. An “environmental data operation” refers to activities or work performed to obtain, use or report information pertaining to environmental processes and conditions, and to the analysis and evaluation of data.

## **PURPOSE**

USEPA developed the QAPP as a tool for project managers and planners to document the type and quality of data needed for environmental decisions. All work performed by extramural organizations (organizations outside USEPA) on behalf of or funded by USEPA that involves the collection or use of environmental data in agency programs must be done in accordance with a USEPA approved QAPP. The philosophy and implementation of the QAPP is described in USEPA manual QA/R-5 (October 1998), incorporated by reference in this document. The USEPA manual can be ordered by telephone at 202 564-6830, by e-mail at [ord-qad@epa.gov](mailto:ord-qad@epa.gov), or downloaded from <http://es.epa.gov/ncerqa/qa/index.html>.

A project QAPP documents how data Quality Assurance (QA) and Quality Control (QC) are applied to an environmental data operation to assure the results are of the kind and quality needed and expected. The QAPP functions as a planning document for an environmental data operation and defines in detail how QA and QC will be applied during the term of a specific program, project or task. It documents how the environmental data operations will be planned, implemented and assessed with respect to quality. A project which has an approved QAPP for its planning, implementation and assessment phases will result in products that are useable and decisions that are defensible.

A QAPP usually includes a Sampling and Analysis Plan (SAP) which defines the schedule, methods, QC requirements and corrective actions for the field sampling work. Activities and QA/QC for Beneficial Use Reconnaissance Project (BURP) monitoring are described in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999. From 1999 on, each Watershed Program 319(h)/205(j)(5) grant project which includes water quality monitoring or Best Management Practice (BMP) implementation has its own project-specific SAP, all of which are incorporated by reference in this document. Each project SAP is approved before sampling work and reimbursement from project funds begin. QA/QC measures for the WQD Laboratory, which has a QA/QC Plan, and all contract laboratories involved in the work covered by this QAPP are discussed in Part II, Section V.

This document, which replaces the Nonpoint Source Program Quality Assurance Project Plan (1993), will describe how Watershed Program will define and/or determine whether the BURP monitoring chemical, physical and biological data and 319(h) / 205(j)(5) project data meet the state’s credible data

legislation objectives (refer to Appendix C), and are of a quality and quantity that can be used for the Watershed Program's various decisions:

- ! litigation and regulatory compliance;
- ! initial use determination, use attainment and use verification for the surface waters of the state;
- ! TMDLs and TMDL-type plans: Watershed Plans, Watershed Improvement Plans, Watershed Management Plans, Water Quality Management Plans;
- ! watershed planning;
- ! as cooperative data for other research/scoping/planning, both internal and external.

### **COMPARABILITY**

Comparability is a qualitative evaluation of the degree of confidence a data collection entity has in the ability of data users to compare or use its data with another data set. Comparability for an environmental data operations is achieved by: (1) adhering to standard methods for data collection and analysis (refer to the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999); (2) using standard units, reporting formats, field data collection forms and definitions of terms; (3) consistent quality assurance and quality control for field and laboratory activities; (4) documenting the precision and accuracy of the data set; (5) performance evaluations and audits; (6) regular, structured record keeping, data archiving and report writing during the life of the project; and (7) communicating the characteristics of the data set to each user (internal or external) with a standardized metadata document. USEPA requires comparable data from all projects funded as described on pages 17-18 of this section. Watershed Program is committed to producing comparable data from the BURP monitoring activities covered by this QAPP.

For this project plan and the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, the standard definitions from ANSI/ASQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs) of the terms shall, must, should and may, quoted below, are used:

- ! shall, must - when the element is required and deviation from the specification will constitute nonconformance with the standard; conformance is measured by completion or implementation of the action specified
- ! should - when the element is recommended
- ! may - when the element is optional

**SOURCES AND AMOUNTS OF FUNDING (1999)**  
**BURP Monitoring and 319(h)/205(j)(5) Federal Grant Program**

Table 1.2.1 below shows the most recent sources and amounts of funding, which will change periodically.

Table 1.2.1

<b>Grant Number</b>	<b>From-To Dates</b>	<b>Funding Source</b>	<b>Amount</b>	<b>Funds Used For</b>
	7-1-98 6-30-00	Water Development Commission Fund	\$802,083	TMDL related monitoring and TMDL-type plan development; salaries for new employees doing BURP monitoring; equipment and travel for BURP monitoring
		State General Fund, appropriated every two years	varies	Used as match for federal grants; general NPDES budget for salaries and travel if BURP monitoring is being done in response to a discharger; also used for NPDES related WQD Laboratory sample testing fees
CP998641-01	8-1-97 1-30-00	federal grant through USEPA under section 104 (b) (3) of the Clean Water Act	\$75,000*	pays approximately 58% of the contract with Teton Science School for BURP monitoring by their interns during the 1999 field season
	8-1-97 1-30-00	state match for Clean Water Act section 104 (b) (3) federal grant	\$22,321	see above; the primary goal is to conduct BURP monitoring on at least 60 stream segments and develop TMDLs/Watershed Improvement Plans for each pollutant causing a loss of designated use
C9008630-94	6-1-93 9-30-99 (grant end date will be extended)	federal Congressional appropriation under section 319(h) of the Clean Water Act	\$2,111,754*	Nonpoint source budget used for some specific nonpoint source monitoring; also pays approximately 42% of the Teton Science School contract for BURP monitoring by their interns during the 1999 field season

<b>Grant Number</b>	<b>From-To Dates</b>	<b>Funding Source</b>	<b>Amount</b>	<b>Funds Used For</b>
	6-1-93 9-30-99 (grant end date will be extended)	federal Congressional appropriation under section 319(h) of the Clean Water Act	\$41,000*	Pays contract laboratory fees for macroinvertebrate sorting and identification
	6-1-93 9-30-99 (grant end date will be extended)	state match for Clean Water Act section 319(h) federal grant	\$844,702	Nonpoint source budget used for some specific nonpoint source monitoring; also pays approximately 42% of the Teton Science School contract for BURP monitoring by their interns during the 1999 field season
X988101-01	9-30-00	federal grant through USEPA under section 104 (b) (3) of the Clean Water Act	\$8,000*	TMDL related supplies (any commodity under \$5,000)

\*These amounts are the TOTAL federal grant award. A portion of this money is used for direct monitoring activities.

### **319(h) and 205(j)(5) Federal Grant Projects**

Nonpoint source activities are guided by the Wyoming Nonpoint Source Management Plan (1989) and its update (2000), the Nonpoint Source Strategic Plan (September 1996) and the Wyoming Nonpoint Source Information and Education Strategy (September 1996). 319(h) and 205(j)(5) projects are funded for up to two years through an annual grant to the State of Wyoming from the USEPA (under the federal Clean Water Act) which varies in dollar amount from year to year. In addition, USEPA has made nonpoint source Incremental Funds grants available to the state for watershed restoration activities.

### **APPROVAL AND DISTRIBUTION**

None of the environmental data operations addressed by a QAPP may be started until the QAPP has been approved and distributed to all project personnel, unless the project addresses situations requiring immediate action to protect human health and the environment, or unless the operations are conducted under police powers. The initial QAPP for BURP monitoring and 319(h)/205(j)(5) projects is the Nonpoint Source Program Quality Assurance Project Plan (November 1993). This document, which

updates and replaces the 1993 information, describes how Watershed Program currently conducts BURP water quality monitoring, quality assurance and quality control. Conditional approval of a QAPP may be granted to permit some work to begin while non-critical deficiencies in the QAPP are being resolved. Subject to these exceptions, it is the responsibility of the organization(s) performing the work, in this case the WDEQ, WQD, Watershed Program, to assure that no environmental data are acquired before the QAPP is approved and received by project personnel. For the Watershed Program BURP and 319(h)/205(j)(5) monitoring, project personnel and their roles are listed under the Project and/or Task Organization heading in Part I, Section I.

### **CHANGES AND REVIEW**

When conditions or requirements change during environmental data operations, the QAPP shall be revised, then reviewed and approved in the same manner as the original QAPP. For multi-year programs or projects, the QAPP will be reviewed at least annually and revised to incorporate all corrective actions taken in the previous year. This QAPP updates and revises the Watershed Program 1993 Nonpoint Source Program Quality Assurance Project Plan. For the Watershed Program, future annual reviews will be conducted and corrective actions described and implemented by the following Watershed Program management personnel: the Program Manager, Planning Supervisor (for 319(h) and 205(j)(5) grants), Technical Support Supervisor (for BURP monitoring), NPDES Supervisor (for citizen complaints), Nonpoint Source Coordinator (for 319(h) and 205(j)(5) grants) and TMDL Coordinator (for TMDLs and similar plans), whose roles and responsibilities are described in Part I, Section I tables and shown in the organization charts in Appendix A. The resulting review and corrective actions document will be incorporated in this QAPP.

### **QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)**

QA is the set of overall management techniques or processes related to planning, implementation, assessment and reporting that is designed to assure that the environmental data are defensible, and of the kind and quality needed to make Watershed Program decisions. Standard operating procedures (SOPs), SOP review and revision, data validation, data verification, data quality assessment, QA reports, project-specific SAPs, field audits and technical audits are examples of quality assurance activities.

QC is the set of techniques and/or activities that Watershed Program uses to assure and document the actual quality of the monitoring data produced by the Program. Metadata files for databases, data qualification codes, chain of custody, instrument calibration, field log books, field and laboratory QC samples (duplicates, blanks, spikes, splits) and training are all examples of quality control.

USEPA suggests that the QA and QC applied to a project should vary according to the project purpose and the type of work being done. Watershed Program quality assurance and quality control activities are based on the assumption that all data collected under its monitoring programs may be subject to litigation, and that the data must meet the provisions of the state law commonly known as the Credible Data Legislation. A copy of this bill is in Appendix C.

## CONTENTS

Each QAPP must include standardized, recognizable subject groups (elements) which cover the entire project from planning to implementation to assessment. USEPA suggests these four element groups (parts) and their contents, which are used in this document:

Part I:	Project Management
Part II:	Measurement/Data Acquisition
Part III:	Assessment/Oversight
Part IV:	Data Validation/Usability

Approval Signature pages and a Title Sheet or Abstract are also required in this document. They are in Part I, pages 1-4. Project Organization Information is in a table in Part I, Section I. Tables and charts are used throughout this document where possible to present information. This document contains many references to the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, which is available on the WDEQ state web site, <http://deq.state.wy.us>. Choose WQD on the right side of the page, then Watershed Program. The SOP Manual is available in either .wpd (WordPerfect9<sup>©</sup>) or .pdf<sup>™</sup> (portable document file) format. Revisions to existing SOPs and new SOPs will be added to this web site periodically. Persons who do not have access to the Internet can obtain a paper copy of the manual and updates by contacting Watershed Program. Contact information is provided on the inside of the title page of this document.

## PROBLEM DEFINITION

Wyoming DEQ-WQD Watershed Program needs:

1. a more accurate picture of the condition of surface waters of the state;
2. current information of adequate spatial variability to verify water use designations and determine the level of use support;
3. a framework for data collection on an ongoing basis;
4. to comply with state's credible data legislation (see Appendix C);
5. to comply with the requirements of the Federal Water Pollution Control Act, known as the Clean Water Act;
6. to develop data that allow (a) long term trend analysis for decision making; (b) anticipating problems;
7. to develop and implement watershed restoration plans as required by the Clean Water Action Plan, using federal Incremental Funds allotted to the state for that purpose.

Watershed Program activities covered by this QAPP are:

### **BURP Monitoring**

The WDEQ, WQD, Watershed Program's BURP provides continuous surface water quality monitoring for all waters of the state to support the assessment of attainment and maintenance of state-defined designated uses. Designated uses are a part of the state's water quality standards, incorporated by reference in this document. BURP monitoring does not include ground water monitoring. Sampling protocols for lakes and large rivers are being developed; therefore at this time there are no SOPs specific to those activities. When these protocols and SOPs are in place, this document will be revised to include them.

### **Clean Water Act Section 319(h) Federal Grant Projects**

The WDEQ, WQD, Watershed Program administers federal Clean Water Act (CWA) Section 319(h) projects under an annual CWA federal grant from USEPA. There are four 319(h) project categories:

1. groundwater assessment and/or protection;
2. watershed implementation and assessment;
3. information and education and/or demonstration;
4. assessment.

Section 319(h) grant funds are used to implement the prevention, control and/or abatement of nonpoint source pollution through technology transfer, education, training and technical assistance. Ground water activities are eligible for section 319(h) grants to the extent that they are identified directly or through incorporation in the state's nonpoint source management program. Section 319(h) grant funds may be used to fund urban storm water activities that are not specifically required by NPDES permits. Grants are awarded to local planning agencies (conservation districts, cities, counties) or other groups through proposals. These projects can help identify sources, document the effectiveness of individual measures and BMP systems, and develop watershed level strategies to prevent and control nonpoint source pollution. Monitoring is necessary to develop information and data needed to demonstrate project effectiveness. Project monitoring data collected under a project-specific approved Sampling and Analysis Plan (SAP) would qualify to be accepted as BURP monitoring data.

### **Clean Water Act Section 205(j)(5) Federal Grant Projects**

The WDEQ, WQD, Watershed Program administers federal CWA Section 205(j)(5) projects under an annual CWA federal grant from USEPA. Section 205(j)(5) grant funds are used in nonpoint source water quality investigations, watershed management, water quality management planning, watershed assessments and/or work program development. Project grants are awarded to local government agencies (conservation districts, cities, counties) through proposals. These projects can help identify sources, plan mitigation and/or implementation projects, investigate BMP systems and develop watershed level strategies to prevent and control nonpoint source pollution. Monitoring may be necessary to develop information and data. Project monitoring data collected under a project-specific approved SAP would qualify to be accepted as BURP monitoring data.

### **Clean Water Act Section 303(d) Listing**

Sections 303 and 303 (c) and (d) of the Clean Water Act require states to establish designated protected uses for state waters and then to identify and prioritize, based on currently available information, the waters and/or watersheds which do not or are not expected to meet water quality standards with technology-based controls alone or which are threatened by nonpoint source pollution. State 303(d) lists must identify which waters are targeted for TMDL-type plans during the coming two years. Monitoring is necessary to verify existing conditions, establish priorities and/or plan mitigation programs for TMDL-type documents. BURP monitoring data and 319(h) / 205(j)(5) project data collected under a project-specific approved SAP are used to compile the 303(d) list and to remove waters from the 303(d) list.

### **Total Maximum Daily Load (TMDL) Establishment**

Section 303(d) of the Clean Water Act establishes the TMDL approach to provide for more stringent water quality based controls when technology based controls or other legally required pollution control mechanisms are inadequate to achieve state water quality standards. The TMDL process is established by the Code of Federal Regulations, 40 CFR Part 130. The purpose of a TMDL is to allocate pollutant loadings among point and nonpoint sources. A TMDL:

- ! is based on the relationship between pollution sources and in-stream water quality conditions,
- ! establishes the allowable loadings or other quantifiable parameters, and
- ! thereby provides the basis for the state to establish water quality based controls.

Implementation of a TMDL or a Wyoming TMDL-type plan supports the attainment and maintenance of state-defined designated uses for all waters of the state. Monitoring may be needed during the implementation and/or maintenance of a TMDL to establish load allocations and/or changes in ambient water quality or biological conditions. BURP monitoring data and 319(h) / 205(j)(5) project data collected under a project-specific approved SAP would qualify to be used in the TMDL process to produce a TMDL or TMDL-type plan, which for WDEQ, WQD Watershed Program work may also be called a Water Quality Management Plan, Watershed Plan, Watershed Improvement Plan, or other similarly titled plan.

### **Incremental Fund Grant Program**

The Clean Water Action Plan, released by the President of the United States in February 1998, provides for additional funds to be used to implement the Plan's three Watershed Restoration Action Strategies. States and territories are to work with appropriate private, public and government organizations and agencies and citizens to:

1. create Unified Watershed Assessments (UWAs) that identify watersheds that do not meet clean water and other natural resource goals and where preventive action is needed to sustain water quality and aquatic resources;
2. define watershed restoration priorities, with special attention to watersheds most in need of restoration and protection. This schedule must be coordinated with Section 303(d)

of the Clean Water Act and provide an opportunity to bundle TMDLs on a watershed scale. The schedule must identify the highest priority watersheds to be addressed during the first two years, or through the year 2000. These priority watersheds were to be defined by October 1, 1998; and

3. develop Watershed Restoration Action Strategies (WRAS) for watersheds most in need of restoration. At the end of year 2000 and periodically thereafter USEPA will submit a Watershed Restoration Progress Report to the President and the public.

Federal incremental funds are those monies appropriated by Congress in excess of the base funding amount specified in the Clean Water Action Plan. A portion of those incremental funds is made available to the State of Wyoming under Section 319(h) of the federal CWA. Use of incremental funds must be focused on implementing Watershed Restoration Action Strategies in areas identified by the State of Wyoming's UWA as being in need of restoration. These areas are referred to as Category I watersheds and are defined as those which "...do not now meet, or face imminent threat of not meeting, clean water and other natural resource goals." TMDLs are the primary activity which can help implement a WRAS. A portion of the incremental funds may be used to carry out additional assessment work as part of specific watershed projects or as part of an overall statewide, regional or ecoregional assessment effort.

### **Best Management Practice (BMP) Implementation Effectiveness**

BMPs are put in place to protect, maintain and/or improve water quantity and/or quality a stable plant community and soil stability. Follow-up water quality monitoring either as part of an implementation project or by BURP monitoring personnel provides water quality data which are used to evaluate the effectiveness of BMP implementation.

### **INCORPORATED REFERENCES**

The following documents are incorporated by reference into this document. All documents listed below are the most recent versions.

1. United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) National Handbook of Water Quality Monitoring, December 1996
2. WDEQ, WQD, Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999 and updates
3. WDEQ, WQD, Water Quality Rules and Regulations, Chapter 1, November 1990
4. Draft Development of Biological and Physical Habitat Criteria for Wyoming Streams and Their Use in the TMDL Process (Draft), United States Environmental Protection Agency Region VIII and TetraTech, Inc., June 1999

5. Wyoming Nonpoint Source Management Plan, 1989 and Draft Wyoming Nonpoint Source Management Plan update, August 1999, both WDEQ, WQD
6. Ecological Data Application System (EDAS) User's Manual, June 1999, TetraTech, Inc., Owings Mills, Maryland
7. Watershed Program BURP Monitoring Proposed Five Year Comprehensive Monitoring Plan
8. Program to Address Total Maximum Daily Loads (TMDLs), State of Wyoming
9. Handbook for Analytical Quality Control in Water and Wastewater Laboratories, United States Environmental Protection Agency, 1979

**HISTORICAL AND SCIENTIFIC PERSPECTIVE  
Federal Water Pollution Control Act (Clean Water Act)  
Section 319(h) and 205(j)(5) Federal Grant Program**

States investigate water quality, develop management plans and implement general programs to reduce nonpoint source pollution using grant funds provided through USEPA under Sections 319(h) and 205(j)(5) of the CWA. In May 1996, USEPA and the states reached agreement to upgrade Section 319(h) grant programs to address nine key elements, including but not limited to:

- ! establishing short- and long-term goals and objectives;
- ! strengthening working partnerships with all appropriate public- and private-sector groups;
- ! focusing on impaired waters and waters threatened by new sources and activities;
- ! implementing better-focused programs to address these problems;
- ! working to promote consistency of federal programs among state and tribal nonpoint source programs; and
- ! using monitoring and feedback loops to ensure continued progress.

Wyoming is currently working toward those goals.

The CWA Section 319(h) National Monitoring Program (NMP), implemented by USEPA, is directed at monitoring water quality associated with land treatment, and documenting water quality changes associated with land treatment. USEPA has established minimum tracking and reporting requirements for land treatment and water quality in support of this program. Pre- and post-implementation monitoring will be used to evaluate the extent to which project goals are achieved and to evaluate the water quality impacts of nonpoint source controls. Section 319(h) and 205(j)(5) grant program water quality information is intended to be used by state and local watershed managers to determine best solutions for watershed nonpoint source problems.

### **303(d) and TMDL Programs**

An essential feature of effective nonpoint source programs is coordination and integration with other federal, state, public interest group and tribal-managed water quality programs such as source water protection programs under the Safe Drinking Water Act (SDWA) and TMDL programs under section 303(c) and (d) of the CWA. Partnerships and cooperative action will help to ensure that all appropriate programs, authorities, and resources are used effectively and consistently to solve shared problems and address common issues.

### **BURP Monitoring**

**Pre 1992:** Before 1992, the WQD's monitoring was oriented toward NPDES permit renewals, permit violations and citizen complaints. WQD obtained a suite of water quality monitoring data regularly collected once each quarter through a cooperative agreement with the United States Geologic Survey (USGS), by helping to fund a limited number of USGS fixed station water quality monitoring stations through an annual 319(h) federal project grant. The number of stations varied from year to year, but was usually around 20. The data were and are uploaded to the USEPA data storage and retrieval (STORET) database and made available to the public on request free of charge. The data have been and are published in the USGS annual Wyoming Water Resources Data Yearbook, Volume 1 (surface water). SOPs were written and distributed internally in 1991, and were oriented toward NPDES sampling, the main purpose for sample collection at that time. A Nonpoint Source Management Plan was written in 1989, and is being revised through a Draft Update, August 1999.

**1992:** In 1992, WQD started the Reference Stream project. This was the first year that macroinvertebrate sampling was done. The purpose of the Reference Stream Project was and is to collect water chemistry, habitat and macroinvertebrate data at the least impaired stream sites that can be found in the state. Nominations and suggestions for sites to sample were solicited from the public and land management professionals. The nominated/suggested sites were sampled once each year, at approximately the same time. The data were to be combined by ecoregion and sorted within an ecoregion by elevation, with the intention of using this information to define data ranges and variability within and between ecoregions. Some of these locations have become Long Term Trend monitoring sites, and are still sampled annually. These locations are in Appendix D, BURP Monitoring Long Term Trend Reference Sites. Watershed Program's reference sites as of 1999 are in Appendix E, BURP Monitoring Reference Sites. These are sampled annually if time and resources allow.

**1993:** The Nonpoint Source Quality Assurance Project Plan (which is replaced by this document) was written in 1993, before BURP monitoring was developed, and has not been updated since then.

BURP monitoring was developed and implemented for two main purposes: collecting the type and quality of monitoring data that could be used to determine and/or confirm state-defined designated use support for surface waters of the state, and to formalize the macroinvertebrate monitoring and data collection.

**1997-98:** Suggestions for BURP monitoring core parameters to be used in an organized WQD monitoring program were solicited through a Draft document on BURP monitoring that was distributed in 1997. The Draft document contents have not yet been finalized. The core monitoring parameters used at this time address water chemistry, macroinvertebrate sampling, physical parameters

and habitat assessment, are documented in the SOP for BURP Monitoring Core Parameters and in Part I Section III of this document. In 1998, in response to concerns about the very subjective nature of the BURP monitoring habitat assessment, Watershed Program began doing quality control on 10 per cent of the BURP monitoring sites, using both inter- and intra-crew assessments. These QC sites were intended to define the nature and degree of the subjectivity in the standard BURP habitat assessment.

**1999:** In August 1999 Watershed Program released a Manual of Standard Operating Procedures for Sample Collection and Analysis, commonly known as the SOP Manual, and made it available on the state's web site, <http://deq.state.wy.us>. Choose WQD on the right side of the page, then Watershed Program. The manual is listed under the topic Quality Assurance. This manual is followed for BURP monitoring activities. 310(h) and 205(j)(5) project sponsors have the option to use these SOPs for their water quality monitoring work.

### **Volunteer Monitoring**

WQD has not had and does not now have a formal Volunteer Monitoring Project, with a project-specific SAP, SOPs and a project QAPP. However, since approximately 1995 the Teton Science School in Jackson, Wyoming has trained volunteer monitors through a CWA 319(h) federal project grant. At this time, over 100 persons have been trained. The monitoring data resulting from this effort were sent to Teton Science School, to be forwarded to the Watershed Program and used as an indicator of potential problem areas.

### **Section III Project/Task Description and Schedule**

#### **WORK TO BE PERFORMED**

The work to be performed is described in the SOP for BURP Monitoring Core Parameters, and is also provided below under the heading Measurements to be Made. A copy of the 1999 Draft BURP monitoring Field Data Sheets, which show the information recorded, is in Appendix F. All BURP monitoring activities covered by this QAPP are carried out using the procedures in the Watershed Program Manual of Standard Operating Procedures for Sampling and Analysis, August 1999, incorporated by reference in this document.

#### **BURP Monitoring**

BURP monitoring includes chemical, physical and biological (macroinvertebrate) reconnaissance sampling done on a rotating schedule, with each sampling station on the annual field schedule being visited once during that season. The BURP monitoring decision trees are shown in Appendix G. Watershed Program recently identified ongoing BURP project monitoring objectives during the development of the Proposed Five Year Comprehensive Monitoring Plan, incorporated by reference in this document. Annual objectives include: BURP monitoring of at least 20 per cent of the proposed monitoring list waters; monitoring high priority 303(d) list waters and monitoring approximately 25 long-term reference sites. In addition, the project will respond to citizen complaints and conduct National Pollutant Discharge Elimination System (NPDES) monitoring verifications. During the next five years, the state comprehensive monitoring program will continue to concentrate on determining the current status of 303(d) list streams or stream segments and establishing watershed-based TMDL-type plans. In addition, BURP monitoring must conform to the requirements of the state's Credible Data legislation, shown in Appendix C.

#### **Section 319(h) and 205(j)(5) Federal Grants**

Work to be performed under Section 319(h) and (205(j)(5) grant projects depends upon the individual project goal(s) and is detailed in the Project Implementation Plan (PIP) and approved project-specific Sampling and Analysis Plan (SAP) for each project. These individual project plans are incorporated by reference in this document and are kept in the project file at the WQD, Watershed Program office in Cheyenne, Wyoming. Project monitoring must conform to the requirements of the state's Credible Data legislation, shown in Appendix C.

Project objectives may include but are not limited to one or more of the following:

- ! determine source and extent of NPS pollutants
- ! determine relationship of riparian condition, stream flow, groundwater, land uses, soil, elevation, meteorological and natural causes to NPS pollution

- ! assess existing or potential NPS impacts to surface and/or ground water resources
- ! plan and prioritize NPS related water quality improvement projects
- ! develop biological criteria for Wyoming waters
- ! assess biodiversity in Wyoming waters
- ! determine composition of biological communities
- ! determine ambient stream, lake and/or reservoir water quality
- ! determine biological community improvement and/or deterioration
- ! evaluate effectiveness of BMP implementation

### **TMDL Development**

A CWA Section 303(d) List is developed every two years and is the result of the CWA 305(b) state water quality assessment process. The state also lists waters which have NPDES discharge permits due for renewal during the following two years if they require a wasteload allocation. During the two years following 303(d) List development, Watershed Program should prioritize, write and adopt TMDLs or TMDL-type plans for these impaired waters. Prioritization takes into account public health and environmental risk. The 1998 303(d) list contains fourteen priority stream segments, twenty-nine discharge permits with wasteload allocations and twenty stream segments which appear to be threatened. The 303(d) List will be revised and re-prioritized and the TMDL list revised and re-prioritized in 2000.

### **MEASUREMENTS TO BE MADE**

#### **BURP Monitoring**

BURP monitoring includes chemical, physical and biological (macroinvertebrate sampling, and covers NPDES permit verifications, citizen complaints, TMDLs, 303(d) listings and may also include BMP implementation and volunteer monitoring. Core parameters for BURP monitoring are listed in Table 1.3.1 below and in the SOP for BURP Monitoring Core Parameters.

Table 1.3.1

<b>Wyoming Department of Environmental Quality, Water Quality Division</b> <b>Watershed Program</b> <b>Beneficial Use Reconnaissance Project</b> <b>Core Monitoring Parameters</b>						
<b>Parameter</b>	<b>Units</b>	<b>Method</b>	<b>Quantitative</b>	<b>Qualitative</b>	<b>Lab</b>	<b>Field</b>
alkalinity	mg/l CaCO 3	360.1 USEPA 1983	X		X	
bank vegetation protection	N/A	best professional judgement		X		X
bank stability	N/A	best professional judgement		X		X
bankfull channel shape	N/A	best professional judgement		X		X
canopy cover over stream	N/A	best professional judgement		X		X
channelization /alteration	N/A	best professional judgement		X		X
chloride	mg/l	325.2 USEPA 1983	X		X	
color, odor and sheen	N/A	best professional judgement		X		X
coordinates (GPS or map)	dms	measured or plotted	X			X
current velocity	ft/sec or m/sec	flow probe	X			X
discharge	cfs	calculated	X			X
disruptive pressures	N/A	best professional judgement		X		X

Beneficial Use Reconnaissance Project (BURP) Quality Assurance Project Plan

<b>Wyoming Department of Environmental Quality, Water Quality Division</b> <b>Watershed Program</b> <b>Beneficial Use Reconnaissance Project</b> <b>Core Monitoring Parameters</b>						
<b>Parameter</b>	<b>Units</b>	<b>Method</b>	<b>Quantitative</b>	<b>Qualitative</b>	<b>Lab</b>	<b>Field</b>
dissolved oxygen (DO)	mg/l	360.1 USEPA 1983	X		X	X
embeddedness/silt cover	N/A	best professional judgement		X		X
instream fish cover	N/A	best professional judgement		X		X
macroinvertebrates	N/A	Watershed Program SOPs, USEPA Revised RBPs 1999	X		X	
nitrate nitrogen	mg/l	353.2 USEPA 1983	X		X	
nitrate/nitrite	mg/l	353.2 USEPA 1983	X		X	
pH	SU	150.1 USEPA 1983	X			X
photo points	N/A	photography		X		X
pool/riffle ratio	N/A	best professional judgement		X		X
predominant geology	N/A	best professional judgement / maps		X		X

<b>Wyoming Department of Environmental Quality, Water Quality Division  Watershed Program  Beneficial Use Reconnaissance Project  Core Monitoring Parameters</b>						
<b>Parameter</b>	<b>Units</b>	<b>Method</b>	<b>Quantitative</b>	<b>Qualitative</b>	<b>Lab</b>	<b>Field</b>
predominant soil type	N/A	best professional judgement / maps		X		X
primary/secondary land use	N/A	best professional judgement		X		X
relative abundance of aquatic biota	N/A	best professional judgement		X	X	
riffle surface gradient	% slope /100 ft	clinometer	X			X
riparian zone width	N/A	observation		X		X
Rosgen stream channel classification	N/A	best professional judgement / Rosgen method		X		X
site sketch	N/A	observation		X		X
specific conductivity	µmhos/cm	120.1 USEPA 1983	X			X
stream substrate composition	N/A	best professional judgement		X		X
sulfate	mg/l	375.2 USEPA 1983	X		X	
temperature	deg C	170.1 USEPA 1983	X			X

Wyoming Department of Environmental Quality, Water Quality Division Watershed Program Beneficial Use Reconnaissance Project Core Monitoring Parameters						
Parameter	Units	Method	Quantitative	Qualitative	Lab	Field
total phosphorus	mg/l	365.3 USEPA 1983	X		X	
total suspended solids	mg/l	160.1 USEPA 1983	X		X	
total hardness	mg/l	130.1 USEPA 1983	X		X	
turbidity	NTU	180.1 USEPA 1983	X		X	X
width/depth ratio	N/A	site measurements		X		X

Macroinvertebrate sampling, described in SOPs for Macroinvertebrate Sampling, Macroinvertebrate Sample Preservative and Macroinvertebrate Identification, is included in BURP monitoring. Routine sampling for fecal coliform levels is not.

Ninety per cent of the BURP monitoring stations get a qualitative physical condition assessment; 10 per cent get a semi-quantified physical habitat measurement. Physical factor measurements include: channel size and shape, substrate composition, stream discharge, habitat types and quality, channel stability and modification and riparian characteristics. These are non-core parameters.

Additional site-specific parameters are based on: 1) discharge permit effluent limits; and/or 2) historical water quality data; and/or 3) any permit violations identified in NPDES inspections or self-monitoring programs; and/or 4) an identified need to determine fecal coliform levels.

### **319(h)/205(j) Federal Grant Project Monitoring**

Sample collection and analysis(es) conform to all applicable parts of the WDEQ WQD Watershed Program SOP for a Sampling and Analysis Plan, Contents of, as described in individual project contracts, incorporated by reference in this document. Grantees whose projects include water quality sampling may be trained by WDEQ WQD BURP monitoring personnel and/or may attend the United States Department of Agriculture/Natural Resources Conservation Service (USDA/NRCS) course

which is based on the National Water Quality Monitoring Handbook, or attend other project-specific training. BMP or volunteer monitoring may be included in 319(h)/205(j)(5) project work or in BURP monitoring.

### **EQUIPMENT REQUIREMENTS**

All personnel, equipment and chemical reagent requirements for BURP monitoring are described in the equipment and parameter SOPs in the Watershed Program Manual of Standard Operating Procedures for Sampling and Analysis, August 1999 and in the project-specific SAPs for 319(h) and 205(j)(5) projects.

### **PROGRAM TECHNICAL REVIEWS, PEER REVIEWS, SURVEILLANCE AND TECHNICAL AUDITS**

Any BURP monitoring and 319(h)/205(j)(5) field and laboratory activities are subject to review by the USEPA Region VIII Quality Assurance Group and/or Wyoming project officer at their discretion, and by Watershed Program management at their discretion.

### **BURP Monitoring**

BURP monitoring internal technical reviews and audits are conducted by the program's Technical Support Supervisor as required. Audits and reviews are described in detail in Part III, Section I.

### **Water Quality Division Laboratory**

All laboratory reviews and audits are described in the laboratory Quality Assurance Plan (1993). There is no USEPA laboratory certification for any laboratory program except drinking water testing, which the WQD Laboratory does not do. However, the WQD Laboratory does participate in the USEPA annual proficiency test program. USEPA furnishes samples for each analyte the laboratory routinely tests for. Test results are sent to USEPA, and the laboratory is notified in writing how closely the test results matched the known concentration.

### **319(h) and 205(j)(5) Federal Grant Projects**

The type and schedule for all technical reviews and audits are project specific, and are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

### **PROPOSED SCHEDULE Citizen Complaint Investigation**

These investigations are scheduled by the Watershed Program Technical Support Supervisor and completed as required by BURP monitoring field personnel.

**1999 BURP Monitoring**

The following tables show the 1999 field season proposed monitoring schedule. In subsequent years the current five year statewide monitoring cycle will end, and a new cycle will begin in 2003.

**Casper/Cheyenne Field Crew**

Table 1.3.2 Casper/Cheyenne: Stream segments with secondary or inconclusive data requiring BURP monitoring

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Belle Fourche	10120203	Sundance Fairgrounds Pond (Lake Protocols)	147-1	Devils Tower	April
N. Platte	10180012	Bear Creek	234-1	Laramie County	Sept
N. Platte	10180012	Horse Creek	019-4	S. Goshen	Late Sept
N. Platte	10180012	Bear Creek	056-3	S. Goshen	Sept
N. Platte	10180012	Bear Creek	055-3	S. Goshen	Sept
N. Platte	10180011	Chugwater Creek*	059-3	Platte County	Oct
N. Platte	10180009	North Platte River (Large River Protocols)***	001-5	N. Platte Valley	Oct
N. Platte	10180012	Bear Creek	100-2	S. Goshen	Sept
Niobrara	10150002	Silver Springs Creek **	647-1	Niobrara	Late Sept
Powder	10090202	Pumpkin Creek	049-2	Powder River	Oct
Powder	10090202	Powder River	018-4	Powder River	Oct
Powder	10090201	Pass Creek	303-1	Powder River	Late Sept
Powder	10090201	Beaver Creek	072-2	Powder River	Late Sept

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Powder	10090201	Arch Creek	301-1	Powder River	Late Sept
Powder	10090203	Powder River-South Fork**	032-3	Powder River	Late Aug
Powder	10090203	Posey Creek	281-1	Powder River	Late Aug
Powder	10090204	Castle Creek	076-2	Natrona Coounty	Sept
Powder	10090204	Meadow Creek*	256-1	Powder River	Sept
Powder	10090201	Bear Trap Creek*	322-1	Powder River	Late Sept
Powder	10090201	Bear Trap Creek	071-2	Powder River	Late Sept
Powder	10090201	Powder River, Red Fork	070-2	Powder River	Sept
Powder	10090201	Powder River, N. Fork	068-2	Powder River	Sept
Powder	10090201	Powder River, M. Fork	030-3	Powder River	Sept
Powder	10090202	Fourmile Creek	055-2	Powder River	Oct
Powder	10090202	Fifteenmile Creek	201-1	Powder River	Oct
Powder	10090202	Fourmile Creek	053-2	Powder River	Oct
S. Platte	10190009	Crow Creek*	002-3	Laramie County	Early Oct

\* Segment has station established as part of the Reference Stream Project

\*\* Segment identified for monitoring in 1998

\*\*\* Segment has a USGS surface water monitoring station collecting water quality data

Table 1.3.3 Casper/Cheyenne: Stream Segments Requiring Monitoring for TMDL Development (Table A)

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name (Impairment)</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Belle Fourche	10120201	Belle Fourche River*** (Fecal bacteria)	009-4	Devils Tower	May/June
Belle Fourche	10120201	Belle Fourche River*** (Fecal bacteria)	004-4	Devils Tower	May/June
N. Platte	10180011	Wheatland Creek*** (NH3)	311-1	Platte County	July
Powder	10090202	Powder River*** (Chloride)	020-4	Powder River	Oct
S. Platte	10190009	Crow Creek*.*** (Fecal, NH <sub>3</sub> , Cd)	001-3	Laramie County	May/June

\* Segment has station established as part of the Reference Stream Project

\*\*\* USGS Station collecting water quality data

Table 1.3.4 Casper/Cheyenne: Monitoring necessary for threatened waterbodies (Table C Waters)

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name (Threat)</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Niobrara	10150002	McMasters Reservoir (Fish Kills) Lake/Resv Protocols	664-3	Niobrara	April
Powder	10090204	Salt Creek*.*** (Oil Spills, TDS)	035-3	Powder River	Sept

\* Segment has station established as part of the Reference Stream Project

\*\*\* USGS Station collecting water quality data

Table 1.3.5 Casper/Cheyenne: Long term trend reference site monitoring

<b>Reference ID</b>	<b>Reference Stream Name</b>	<b>County</b>	<b>Location</b>	<b>Timing</b>
MRE1	Whitelaw Creek-Upper	Crook	S9, T52, R63	Sept
SR15	Encampment River-Wilderness	Carbon	S15, T12, R84	Sept
SR16	N. Fork Little Snake River	Carbon	S14, T12, R86	Sept
SR3	Rock Creek	Carbon	S36, T19, R79	Sept
WB3	Little Laramie River	Albany	S1 , T15, R77	Sept
WBI4	Deweese Creek	Carbon	S13, T27, R85	Sept
WHP16	Crow Creek-Cheyenne Station 6	Laramie	S26, T14, R67	Sept

**Lander Field Crew**

Table 1.3.6 Lander: Stream Segments with Secondary or Inconclusive Data Requiring BURP Monitoring

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Big Horn/ Wind	10080001	Wind River (Large River Protocol)	014-5	Dubois/Crowheart	Early Sept
Big Horn/ Wind	10080001	Wind River	074-3	Dubois/Crowheart	Early Sept
Big Horn/ Wind	10080001	Wind River	167-2	Dubois/Crowheart	Early Sept
Big Horn/ Wind	10080001	Wind River, East Fork	070-3	Dubois/Crowheart	Late Sept

\* Segment has station established as part of the Reference Stream Project

\*\* Segment identified for monitoring in 1998

\*\*\* Segment with USGS water quality monitoring station

Table 1.3.7 Lander: Stream Segments Requiring Monitoring for TMDL Development (Table A)

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name (Impairment)</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Green	14040107	Green River, Hams Fork (pH)	020-3	Lincoln County	July - Oct
N. Platte	10180006	Crooks Creek (Extent of Oil Deposits)	678-2	Popo Agie	April

Table 1.3.8 Lander: Long Term Trend Reference Sites Requiring Monitoring

<b>Reference ID</b>	<b>Reference Stream Name</b>	<b>County</b>	<b>Location</b>	<b>Timing</b>
MRW-17	Roaring Fork	Sublette	S10, T39N, R109W	Sept
MRW1	Cache Creek	Teton	S1, T40N, R116W	Sept
MRW3	Snake River-Flagg Ranch	Teton	S28, T48N, R115W	Sept
MRW56	W. Fork Smiths Fork	Uinta	S10, T12N, R116W	Sept
WB23	Fontenelle Creek- Lower	Lincoln	S2, T24N, R113W	Sept
WB28	New Fork River - Bull Pasture	Sublette	S24, T34N, R110W	Sept

**Sheridan Field Crew**

Table 1.3.9 Sheridan: Stream segments with secondary or inconclusive data requiring BURP monitoring

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Powder	10090202	Powder River	017-4	Powder River	Oct
Powder	10090205	Crazy Woman Creek*	014-4	Lake DeSmet	Early Sept
Powder	10090202	Spotted Horse Creek	044-2	Sheridan County	Late Aug
Powder	10090202	Spotted Horse Creek	172-1	Campbell County	Late Aug
Powder	10090202	Barber Creek	047-2	Lake DeSmet	Late Aug
Powder	10090202	Flying E Creek	311-1	Lake DeSmet	Late Aug
Powder	10090202	Fortification Creek	183-1	Lake DeSmet	Late Aug

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Powder	10090202	Powder River (Large River Protocols)	003-5	Sheridan County	Oct
Powder	10090202	Powder River (Large River Protocols)	004-5	Sheridan County	Oct
Powder	10090202	Powder River(Large River Protocols)	006-5	Sheridan County	Oct
Powder	10090202	Powder River	015-4	Lake DeSmet	Oct
Powder	10090202	Powder River	016-4	Lake DeSmet	Oct
Powder	10090206	Clear Creek	009-4	Lake DeSmet	Sept
Powder	10090206	Clear Creek	010-4	Lake DeSmet	Sept
Powder	10090205	Crazy Woman Creek, S. Fork	029-3	Lake DeSmet	Early Sept
Powder	10090205	Crazy Woman Creek, S. Fork	067-2	Lake DeSmet	Early Sept
Powder	10090206	Clear Creek	007-4	Lake DeSmet	Sept
Powder	10090206	Clear Creek	008-4	Lake DeSmet	Sept
Powder	10090207	Powder River (Large River Protocols)	002-5	Sheridan County	Oct
Powder	10090206	Clear Creek*	011-4	Lake DeSmet	Sept
Powder	10090207	Powder River (Large River Protocols)	001-5	Campbell County	Oct
Powder	10090208	Little Powder River***	021-4	Campbell County	Oct
Tongue	10090101	Hanging Woman Creek***	009-2	Sheridan County	Early Sept
Tongue	10090101	Soldier Creek	047-1	Sheridan County	Late Aug

- \* Segment has station established as part of the Reference Stream Project
- \*\* Segment chosen in order to arrive at a more complete watershed assessment
- \*\*\* Segment has a USGS surface water monitoring station collecting water quality data

Table 1.3.10 Sheridan: Stream segments requiring monitoring for TMDL development (Table A)

<b>River Basin</b>	<b>Wyoming Waterbody</b>	<b>Name (Impairment)</b>	<b>Segment</b>	<b>Conservation District</b>	<b>Timing</b>
Belle Fourche	10120201	Gillette Fishing Lake (Lake Protocols)	150-2	Campbell County	April/May
Tongue	10090101	Little Goose Creek (Fecal)	020-2	Sheridan County	May/June
Tongue	10090101	Big Goose Creek (Fecal)	006-3	Sheridan County	May/June

Table 1.3.11 Sheridan: Long term trend reference sites requiring monitoring in 1998

<b>Reference ID</b>	<b>Reference Stream Name</b>	<b>County</b>	<b>Location</b>	<b>Timing</b>
MRC18	Little Bighorn River	Sheridan	S20, T58, R89	Late Sept
MRC24	Tongue River	Sheridan	S10, T56, R84	Sept
MRC26	N. Fork Crazy Woman Creek	Johnson	S36, T49, R84	Sept
MRCI29	Muddy Creek-Middle	Johnson	S35, T49, R83	Sept
MRW18	Crow Creek	Park	S3, T52, R109	Sept
MRW45	Middle Creek	YNP	S18, T52, R109	Sept

### **319(h)/205(j)(5) Existing Project Monitoring**

For those projects which include monitoring, the schedule is project-specific and is shown in the project milestone table and SAP. Some of these projects may include BMP implementation monitoring.

### **PROJECT RECORDS NEEDED (QUALITY RECORDS, PROJECT REPORTS) BURP Monitoring**

State of Wyoming requirements for data archiving are described in the SOP for Data Archiving. Project record keeping and forms are described in the SOPs for Field Log Books, Chain of Custody, Equipment Calibration and Calibration Logs, Photographic Documentation, Completeness, Data Validation, Data Validation Report, Data Verification, Data Verification Report, Macroinvertebrate Metrics Scoring, BURP Monitoring Field Data Sheets, Fecal Coliform Testing, and Sampling and Analysis Plan, Contents of. The project reports shown below in Table 1.3.12 are described in SOPs.

Table 1.3.12 Project Reports

<b>Project Reports</b>			
Type of Report	SOP Name	Prepared For	Frequency
Data Validation Report	Data Validation Report, Data Validation	Technical Support Supervisor, Planning Supervisor	monthly during the field season
Data Verification Report	Data Verification	Technical Support Supervisor, Planning Supervisor	as corrective actions need to be taken
Field Quality Control Report	Quality Control Report, Field	Planning Supervisor, Program Manager	monthly during the field season
Field Sampling Summary Quality Control and Completeness Report	Completeness, Duplicates	Technical Support Supervisor, Planning Supervisor	end of each field season (December-January)
WQD Summary Laboratory QC (accuracy and precision for lab QC) and Completeness Report	Completeness	Technical Support Supervisor, Planning Supervisor	when all analytical results for the field season are complete and entered in the database

All reports are a permanent part of project records. Originals are kept in Watershed Program public access files in the Cheyenne, Wyoming office. Copies are kept in field offices in project files.

In addition, BURP field samplers prepare and the Technical Support Supervisor reviews Beneficial Use Reconnaissance Monitoring and Assessment Reports. There is no SOP for this report, but a example of the report format is in Appendix K. The purposes of the report are: 1) to present the results of the field sampler's evaluation and assessment of BURP monitoring and historical data which relate to streams on the state's 303(d) list; 2) to address complaints or apparent conflicts in water quality monitoring data; 3) to provide input in the Use Attainability Analysis (UAA) process, which is used to reclassify a surface water.

BURP monitoring project records which are kept in public access files in the Cheyenne, Wyoming office include original copies of:

- ! all calculations and calculation sheets used to develop the data;
- ! BURP monitoring field data sheets;
- ! site photographs and negatives;
- ! hand drawn maps;
- ! pre-monitoring evaluation information;
- ! laboratory analytical results for both water chemistry and macroinvertebrate samples;
- ! chain of custody forms;
- ! sample shipping receipts;
- ! sub-sampling forms for macroinvertebrates;

- ! correspondence;
- ! any materials (including historic information) which are cited in the Beneficial Use Reconnaissance Monitoring and Assessment Report; and
- ! the Beneficial Use Reconnaissance Monitoring and Assessment Report, if one has been prepared.

Instrument calibration and maintenance logs are archived in the WQD Laboratory (see below under the topic WQD Laboratory). Field sampler's Field Log Books are archived in the field office where they were created in chronological order in a central file under the supervision of the Technical Support Supervisor. Fecal coliform sampling is not included in BURP monitoring core parameters but is done under the BURP. All information related to fecal coliform sampling (including the sampling and test results forms, narratives, and statistical calculation sheets) are archived in the Watershed Program public access files in Cheyenne, Wyoming. Instrument calibration and maintenance logs and Field Log Books are also public access information, and will be made available on request.

### **319(h) and 205(j)(5) Federal Grant Projects**

All 319(h) and 205(j)(5) monitoring records and results are the property of WDEQ WQD, Watershed Program, and copies (paper and electronic) are included in the project final report. One copy of the report is sent to USEPA Wyoming Project Officer, and one copy is archived in Watershed Program public access files in Cheyenne, Wyoming. Each project contract specifies the number and due date for progress reports to the Watershed Program project officer. These reports are filed in the Cheyenne office in the project folder. The grantee's Project Manager/Coordinator has the ongoing responsibility for preparing and acting on any reports submitted during the life of the project, including the project final report and data analysis. The number and due date for those reports is specified in the project SAP, PIP and Milestone Table. The SAP includes information about where and for how long all project records will be archived by the grantee and by Watershed Program, and how they will be made available to interested parties (refer to the SOP for Sampling and Analysis Plan, Contents of). Information from progress reports and the project final report is entered in USEPA's Grants Reporting and Tracking System (GRTS) database by the Watershed Program project officer. USEPA makes this information available to the public on the Internet at [www.epa.gov/surfnewi/grts/index.html](http://www.epa.gov/surfnewi/grts/index.html). Link to The Non-Point Source Grants Database or to Surf Your Watershed to access the grants database entries.

### **Water Quality Division Laboratory**

The WQD Laboratory archives all test results, Chain of Custody forms, instrument calibration and maintenance logs and its quarterly and annual reports for five years, as described in the Laboratory Quality Assurance Plan (1993). The Laboratory prepares and submits to the Program Supervisor (who distributes it internally) an annual Laboratory Completeness Report (January). A monthly Quality Assurance Compliance Report shows the total number of samples submitted by each sampler, total number run, number of duplicates and blanks. This report is made available to the Technical Support Supervisor, who uses it to determine that field QC requirements are being met on an ongoing basis throughout the field season.

### **Contract Laboratories**

Contract Laboratories currently used by Watershed Program are listed in Part II, Section II, Support Facilities. Originals of quality and test results records and Chain of Custody forms from contract laboratories for any water quality monitoring or sample testing which is performed in support of BURP monitoring are kept in Watershed Program public access files in Cheyenne, Wyoming. Copies are kept in the relevant sampling station/location folder in field offices. The Technical Support Supervisor has oversight responsibility for these records.

**Section IV**  
**Quality Objectives and Criteria**  
**for Measurement Data**

**PROJECT QUALITY OBJECTIVES**

Table 1.4.1 below summarizes the type and frequency for field equipment QC checks and calibration for instruments used to collect data in the field under this QAPP. All field analytical instrument calibration procedures, decontamination and maintenance will be done according to the instrument manufacturer's instructions. Quality control requirements for each project covered by this QAPP will be addressed in the project-specific SAP developed for each sampling effort. Each parameter listed in table 1.4.1 is covered by an SOP.

Table 1.4.1

<b>Summary of BURP Monitoring Calibration and Field QC Objectives</b>					
USEPA Method	Parameter	Field QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
330.5	Chlorine, Total Residual	sample	before each sample reading	zero meter	re-test; check low battery indicator; use a different meter; use DPD pellets from another sampler; repeat measurement
		duplicates	10% of the readings taken each day must be duplicated, or a minimum of 1 reading if fewer than 10 samples are read	RPD #5%*	
360.1	Dissolved Oxygen	air calibration	before each sample reading	±10%	re-enter altitude; re-test; check low battery indicator; use a different meter; repeat measurement
180.1	Turbidity	1, 10 and 100 NTU latex check standards	before each sample reading	±10%	re-test; check low battery indicator; use a different meter; use different standards; repeat measurement

<b>Summary of BURP Monitoring Calibration and Field QC Objectives</b>					
USEPA Method	Parameter	Field QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		duplicate	10% of the readings taken each day must be duplicated, or a minimum of 1 reading if fewer than 10 samples are read	RPD #10%*	
150.1	pH	2 point calibration with pH buffer standards	once a day, before the first sample measurement	±0.05 pH unit	re-test; check low battery indicator; use a different meter; use different standards; repeat measurement
		pH7 buffer	at each sampling location	±0.1 pH unit	
		duplicate	10% of the readings taken each day must be duplicated, or a minimum of 1 reading if fewer than 10 samples are read	RPD ±0.1 pH unit*	
170.1	Temperature	duplicate	10% of the readings taken each day must be duplicated, or a minimum of 1 reading if fewer than 10 samples are read	±1.0° C*	re-test with a different thermometer; repeat measurement
120.1	Conductance, Specific	1000µmho/cm KCl standard	once a day, before the first sample measurement	±5%	re-test; check low battery indicator; use a different meter; use different standards; repeat measurement

Summary of BURP Monitoring Calibration and Field QC Objectives					
USEPA Method	Parameter	Field QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		duplicate	10% of the readings taken each day must be duplicated, or a minimum of 1 reading if fewer than 10 samples are read	RPD #10%*	

\* normally based on relative per cent difference, or RPD; refer to the SOP for Precision.

Table 1.4.2 defines and describes the kinds of QC samples used for the activities covered by the BURP monitoring project. There are SOPs for Blanks, Duplicates, Spikes and Precision. Acceptance criteria for blanks are that blanks must show that for the parameter or preservative of interest, the constituent tested below the detection limit for the method and analytical equipment used. Acceptance criteria for duplicates are shown in Table 1.4.1, above.

Table 1.4.2

Types of BURP Monitoring QC Samples			
Type of Sample	Field or Lab	Definition	Purpose
duplicate sample	field and lab	two or more samples from one sample collection pail; two or more samples taken consecutively at the same site, two or more measurements made consecutively with a field instrument; two laboratory analytical samples taken from one field sample	used to evaluate the precision of field sampling techniques and laboratory analysis
macroinvertebrate duplicate sample (co-located samples or replicates at the field level)	field	two samples collected independently in different containers at the same time	used to evaluate the natural variability in the system being sampled and the sampling technique
container or bottle blank	field	deionized water in a polyethylene or glass bottle or vial used for sample collection	used to evaluate sample contamination from sample containers

<b>Types of BURP Monitoring QC Samples</b>			
Type of Sample	Field or Lab	Definition	Purpose
preservative blank	field	a blank prepared from deionized water and the preservative, in the usual kind and amount for the parameter	used to evaluate whether a preservative is contributing to sample contamination or matrix effects
trip blank	field	a blank prepared in the office from deionized water, using the type of bottle (glass or polyethylene) which will be used for sample collection	used to establish that a sample is not being contaminated by the storage and transport conditions for the trip
field blank	field	a blank prepared at the sample site	used to establish that a sample is not being contaminated by conditions associated with the collection or custody of a sample, or by cross-contamination during sampling or shipping
equipment decontamination or rinseate blank	field and lab	a blank prepared by rinsing cleaned field equipment with deionized water, collecting the water in a sample bottle, and submitting the water for analysis	used to verify that field equipment cleaning/decontamination procedures work, that there is no cross-contamination between samples and that there is no induced contamination from the sample collection method.
spiked sample	field and lab	the laboratory supplies a known volume and concentration of a substance, which is added to a field sample known to contain a detectable concentration of the same substance; appropriate preservatives are added to both the spiked and the regular sample	used to verify that equipment (including sample bottles) and preservatives are not contaminated, that laboratory and field equipment is functioning correctly, that samples are not being contaminated during shipping, that laboratory recovery is within QC limits, and that sampling procedures are being followed; submitted to the laboratory as a blind test of laboratory recovery

### **BURP Monitoring**

BURP monitoring data must be of a known and documented quality, defensible, address the BURP monitoring objectives described in Part I, Section II, must meet the state's credible data legislation requirements (see Appendix C), and must be fully qualified before being uploaded to the USEPA national data storage and retrieval (STORET) database. Quality objectives will be used to define and/or determine whether the BURP Monitoring Project chemical, physical and biological data meet the state's credible data legislation objectives, and are of a quality and quantity that can be used for the Watershed Program's various decisions:

- ! litigation and regulatory compliance
- ! initial use determination, use attainment and use verification
- ! TMDLs and TMDL-type plans: Watershed Plans, Watershed Improvement Plans, Watershed Management Plans, Water Quality Management Plans
- ! watershed planning
- ! conformance with the state's Credible Data legislation
- ! as cooperative data for other research/scoping/planning, both internal and external.

### **319(h) and 205(j)(5) Federal Grant Projects**

Monitoring data collected during these projects must meet the requirements of the state legislation commonly known as the Credible Data Bill (see Appendix C). Watershed Program Environmental Analysts, Senior Analysts and Program Principals serve as project officers. The Watershed Program project officer has the primary WQD responsibility for overseeing the development of a project-specific Sampling and Analysis SAP and Project Implementation Plan (PIP) for each 319(h) and 205(j)(5) project that s/he is assigned to. The project-specific SAP assures that monitoring data will be of a known and documented quality, defensible, and meet the state's credible data legislation requirements.

### **MEASUREMENT PERFORMANCE CRITERIA BURP Monitoring**

Measurement performance criteria are defined by the BURP Technical Support Supervisor.

### **319(h) and 205(j)(5) Federal Grant Projects**

Performance criteria are developed during project planning, using methods and procedures in the USDA-NRCS Handbook of National Water Quality Monitoring and described in the project SAP. 319(h) and 205(j)(5) project water quality monitoring data collected under an approved SAP are fully qualified, incorporated in Watershed Program databases, uploaded to USEPA's STORET data warehouse and would be considered in Watershed Program decisions.

## **TOLERABLE DECISION ERROR**

Appendix J, BURP Monitoring Data Use Tables, displays tolerable decision error for each of the six identified Watershed Programs decisions (see the topic Project Quality Objectives, above) where BURP monitoring data might be used. In these tables, a shaded block indicates that the data are not suitable for the decision; an X indicates that they are. Column headings are the project data objectives. The leftmost column describes the error condition or missing information related to a data point. The Technical Support and Planning Supervisors define and implement standards for tolerable decision error.

**Part II**  
**Measurement Systems Design and Implementation**  
**and**  
**Data Acquisition**

## **Section I Sampling Process Design (Experiment Design)**

### **EXPERIMENT AND DATA COLLECTION DESIGN BURP Monitoring**

The R in BURP stands for reconnaissance. Reconnaissance monitoring is commonly used as a preliminary survey to determine the extent and perhaps magnitude of a water quality problem, and results in a general overview of water quality. Reconnaissance monitoring requires sampling at approximately the same time each year at each site, usually by taking a grab sample. Macroinvertebrate samples are composited. The time of year is based on the ecoregion where the site is located, and is called the index period (refer to the SOP for BURP Reference Site Scheduled Monitoring for a definition of an index period and the index period for each ecoregion).

Since the state-wide Watershed Program monitoring (now called BURP monitoring) began in 1992, sites have been chosen because:

- ! they represent a least-impacted location in a watershed,
- ! of regulatory requirements,
- ! they were identified in the past as lacking credible data, or
- ! of an identified need for information.

Scheduled BURP monitoring is grouped by major river basin on a five year rotation. A new five year basin rotation will begin in 2003. Each BURP monitoring station (including reference sites), therefore, is not sampled annually, except for Long Term Trend sites shown in Appendix D. New stations are added each year.

The annual monitoring schedule (see Part I, Section III, proposed schedule for 1999 field season) is determined by the Technical Support Supervisor, based on the 303(d) List, citizen complaints, TMDLs and other needs. 303(d) List locations are prioritized for each annual schedule. Within a ten year period, beginning in 1998, Watershed Program intends to conduct at least one BURP monitoring and establish a monitoring station on each perennial stream in the state.

#### **319(h) and 205(j)(5) Federal Grant Projects**

These water quality monitoring projects may be site-specific or watershed based. Experiment, data collection and quality assurance/control designs are developed using the USDA-NRCS National Handbook of Water Quality Monitoring and described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of, which lists required contents for a SAP).

#### **TMDL Development**

TMDL monitoring is done under the BURP monitoring project.

### **303(d) List**

Streams are added to or removed from the 303(d) list based on BURP monitoring and the Beneficial Use Reconnaissance Monitoring and Assessment Report (see Appendix K for the report format and Part I, Section III, Project Records Needed, for a description of the report contents). 303(d) stream monitoring is prioritized by the Technical Support Supervisor for each monitoring season.

### **BMP Implementation**

BMP implementation monitoring is done as required under the BURP monitoring project.

## **Section II Sampling Methods Requirements**

### **SAMPLE COLLECTION PROCEDURES**

#### **BURP Monitoring**

Sampling equipment, performance requirements, methods, equipment cleaning and maintenance, QC samples and sample collection procedures for all monitoring parameters (including macroinvertebrate sample collection) covered by this QAPP are described in individual SOPs in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999. Watershed Program management acknowledge that a method is not an SOP, and that if any additional methods are used for sampling, the existing relevant SOP must be revised, or a new SOP must be written and added to the manual as a revision.

Existing Watershed Program SOPs (which are public access information on the Internet at [deq.state.wy.us](http://deq.state.wy.us); refer to Part I, Section II, the Contents topic for specific location instructions) may be revised at the request of users (internal or external) or Watershed Program management. The revision/update process is described in the Updates topic of the Introduction to the SOP manual. Any changes to Watershed Program SOPs will follow professional, commonly accepted and documented protocols and methods (which will be referenced in the SOP) so as to produce comparable data which meet the requirements of the state's Credible Data Bill and USEPA.

#### **319(h) and 205(j)(5) Federal Grant Projects**

Sampling equipment, performance requirements, methods, equipment cleaning and maintenance, and sample collection procedures are described in the project-specific SAP (refer to the SOP for Sampling and Analysis Plan, Contents of). The SAP SOP includes the requirement that if a method is not covered in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, the grantee will need to write an SOP with references for that method and have the SOP approved by USEPA and Watershed Program. 319(h) and 205(j)(5) monitoring work is done with federal funds and must produce comparable data that meet the requirements of the state's Credible Data Bill and USEPA. SAPs are reviewed by Watershed Program personnel and reviewed and approved by the USEPA Wyoming Project Officer.

### **SUPPORT FACILITIES**

Support facilities include the WQD Laboratory and contract laboratories as required for sample analyses. The current BURP monitoring contract laboratories are:

- ! Aquatic Biology Associates, Corvallis, Oregon,
- ! Wyoming Department of Agriculture Laboratory, Laramie, Wyoming (intergovernmental work exchange controlled by state law),
- ! Intermountain Laboratories, Sheridan, Wyoming.

319(h) and 205(j)(5) projects may use these or other contract laboratories, which are listed in the project-specific SAP.

In addition, Watershed Program has standard small laboratory facilities at the Sheridan field office, and limited laboratory facilities (fume hood, balance, chemical storage and chemicals) at the Casper and Lander field offices.

### **SAMPLING OR MEASUREMENT SYSTEM FAILURES AND CORRECTIVE ACTION**

Table 2.2.1

<b>Project</b>	<b>Sampling or System Measurement Failure Addressed By</b>	<b>Corrective Action Taken</b>
BURP Monitoring	Technical Support Supervisor	re-train sampler, revise SOP, adopt different method and write new SOP, repair, recalibrate and/or replace equipment, use different equipment, correct data or reconstruct missing data
319(h) and 205(j)(5) Projects	Grantee's Project Manager/Coordinator	re-train sampler, repair, recalibrate and/or replace equipment, use different equipment, suggest revision to Watershed Program SOP, choose different method, revise SAP, correct data and/or reconstruct missing data
319(h) and 205(j)(5) Projects	Watershed Program Project Officer	report to Watershed Program QA/QC Personnel, determine corrective action, notify grantee's Project Manager/Coordinator
Any Project	Watershed Program QA/QC Personnel	report to Watershed Program Planning Supervisor, Technical Support Supervisor, Project Office as appropriate, suggest corrective action
Any Project	Field Samplers	report to Watershed Program Technical Support Supervisor, QA/QC Personnel, grantee's Project Manager/Coordinator as appropriate

## **SAMPLING EQUIPMENT PREPARATION AND DECONTAMINATION**

### **BURP Monitoring**

Equipment calibration, preparation, maintenance and decontamination procedures are described in the SOPs for: Macroinvertebrate Sampling; Instrument Calibration and Calibration Logs; pH; Blanks; Cleaning Previously Used Sample Bottles; Turbidity; Dissolved Oxygen; Conductivity; Current Velocity; Metals, Total and Dissolved; Fecal Coliform Sampling; Fecal Coliform Testing; Sample Collection; parameter SOPs for organics and volatile organics; and Discharge, Stream.

The WQD Laboratory follows United States Environmental Protection Agency standard laboratory methods and procedures for equipment preparation and decontamination. The documents which apply to laboratory equipment are:

- !     Handbook for Analytical Quality Control in Water and Wastewater Laboratories, United States Environmental Protection Agency, EPA-600/4-79-019
  
- !     Methods for Chemical Analysis of Water and Wastes, United States Environmental Protection Agency, EPA-600/4-79-020
  
- !     Handbook for Sampling and Sample Preservation of Water and Wastewater, United States Environmental Protection Agency, EPA-600/4-82-029
  
- !     Water Quality Division Laboratory Handbook, 1985 and updates
  
- !     Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, United States Environmental Protection Agency, September 1986,

all incorporated by reference in this document.

### **Contract Laboratories**

Each contract laboratory has a QA/QC Plan which addresses these issues. These plans are on file with Watershed Program in the Cheyenne, Wyoming office.

### **319(h) and 205(j)(5) Federal Grant Projects**

Equipment calibration, preparation, maintenance and decontamination procedures are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

## **SELECTION AND PREPARATION OF SAMPLING MATERIALS AND PRESERVATIVES**

Sample containers, sample volumes, preservatives and maximum holding times conform to USEPA standard methods requirements for all test parameters, and are described in individual parameter SOPs and the SOPs for Holding Time; Quality Control Measures, Summary of; and Sample Preservation and Holding Time, Summary of.

### **BURP MONITORING Sampling Containers**

Sample containers are furnished to the field samplers by the WQD Laboratory (refer to parameter SOPs). The containers are sealed, pre-cleaned, disposable HPE plastic with locking caps, lot checked by the WQD Laboratory. Fecal coliform samples are collected in sterile Whirl-Pak™ plastic bags (approximately 125 ml volume) which contain sodium thiosulfate. Oversize Whirl-Pak™ bags can be requested from the WQD Laboratory (refer to the SOP for Fecal Coliform Sampling). Macroinvertebrate samples are collected in 500 and 1000 ml Nalgene™ wide mouth plastic containers (refer to SOP for Macroinvertebrate Sampling). Required sample volumes are given in each parameter SOP. Sampling waste containers and disposal are defined in the SOP for Wastes, Field.

### **Sample Preservatives and Holding Times**

Sample preservation is described in each SOP. The SOP for Sample Preservation and Holding Time, Summary of presents all parameter preservation and holding time information in a table. Chemical preservatives are supplied to the field samplers by the WQD Laboratory. The laboratory supplies and uses only certified acids as preservatives; therefore, there should be no copper or zinc contamination from the acid used to preserve a sample (refer to the applicable parameter SOPs). Macroinvertebrate preservative is prepared by the field samplers (refer to SOP for Macroinvertebrate Sample Preservative) in the field offices as needed, using materials supplied by the WQD Laboratory Supervisor.

### **319(h) AND 205(j)(5) Federal Grant Projects**

Sample containers, sample volumes, preservatives and maximum holding times are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of). Most contract laboratories used by these projects supply pre-cleaned, lot-checked bottles identified with the correct preservative in them for each parameter.

### **Section III Sample Handling and Custody Requirements**

#### **IN THE FIELD BURP Monitoring**

Field samplers' bound field log books, BURP monitoring Field Data Sheets (example sheets are in Appendix F), sample log sheets and chain of custody forms are a record of sample handling and chain of custody. Field sample handling procedures and instructions are described in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, and the USEPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories, 1979, both incorporated by reference in this document. Some tests (pH, dissolved oxygen, conductance, turbidity, fecal coliform) are performed in the field, with equipment pre-calibrated in the office or calibrated in the field as required by the SOP. Equipment and calibration logs are required (refer to the SOP for Instrument Calibration and Calibration Logs). The SOP for Sample Preservation and Holding Time, Summary of, is a table which shows that information for each parameter. The SOP for Holding Time defines how holding time is determined for BURP monitoring samples. The field sampler completes a chain of custody form, places it in a plastic bag and seals it in the sample container before sealing the container with a custody label in such a way that the container cannot be opened without destroying the label. The Chain of Custody SOP defines custody and describes Watershed Program procedure.

#### **319(h) and 205(j)(5) Federal Grant Projects**

Field sample handling procedures and instructions and project chain of custody are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

#### **DURING TRANSPORT BURP Monitoring**

During transport, sample handling and custody conform to USEPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories, 1979, incorporated by reference in this document and are described in the SOP for Chain of Custody. The Chain of Custody forms (examples are included in the SOP Manual) and the SOPs for Chain of Custody and Temperature Check require that each cooler shipped by Watershed Program personnel contain a bottle of either dilution or tap water which is used to verify that the samples were at the required preservative temperature when the sampler relinquished them, and that they were at that temperature when they arrived at the laboratory.

#### **319(h) and 205(j)(5) Federal Grant Projects**

During transport, sample handling and custody conform to the procedures described in the project SAP (refer to the SOP for a Sampling and Analysis Plan, Contents of). The Project Manager/Coordinator may elect to develop a Chain of Custody form, use the BURP monitoring form, or use a form supplied

by their contract laboratory(ies). The SAP SOP includes a requirement that examples of all project forms be in an Appendix in the SAP.

## **IN THE LABORATORY BURP Monitoring**

The Chain of Custody form has space for comments on sample condition, date and time received, and sample temperature. WQD laboratory sample handling, analyses and storage conform to USEPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories, 1979 and the Laboratory Quality assurance Plan (1993), incorporated by reference in this document. Contract laboratory QA plans, which include a description of the laboratory chain of custody and sample handling procedures, are on file with the Watershed Program in the Cheyenne, Wyoming office.

### **319(h) and 205(j)(5) Federal Grant Projects**

The project SAP either contains a copy of the laboratory QA/QC Plan, which describes the laboratory sample handling and processing procedures to maintain chain of custody, or a copy is on file in the project office or has been reviewed by the Project Manager/Coordinator. All contract laboratories used for the project are listed in the SAP.

## **EXAMPLES OF LABELS, FORMS AND LOGS BURP Monitoring**

A copy of the BURP monitoring Field Data Sheets is in Appendix F of this document. The SOP for Field Log Books and for Instrument Calibration and Calibration Logs describes the content of log book information, including the entry correction method. The SOP for Sample Labeling describes the contents of a sample label and the order in which they are written. The Chain of Custody SOP includes an example of an Inspector's Seal, used to maintain chain of custody on sample containers, and the three types of Chain of Custody forms.

### **319(h) and 205(j)(5) Federal Grant Projects**

Each project SAP contains examples of all labels, forms and logs used during the project, either in the document section or in an Appendix (refer to the SOP for Sampling and Analysis Plan, Contents of).

## Section IV Analytical Methods Requirements

### ANALYTICAL METHODS

All analytical methods (used in the field and in the WQD Laboratory) and equipment conform to USEPA standard methods described in:

- ! USEPA Microbiological Methods for Monitoring the Environment, EPA-600/8-78-017;
- ! USEPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories, EPA-600/4-79-020 (March 1983);
- ! USEPA Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020;
- ! USEPA Handbook for Sampling and Sample Preservation of Water and Wastewater EPA-600/4-82-029;
- ! WDEQ WQD Watershed Group Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999;
- ! Revision to Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates and Fish, EPA 841-D-97-002, May 1999;

all incorporated by reference in this document. WQD Laboratory equipment, test methods, accuracy and completeness goals are in Appendix H and I.

Macroinvertebrate analysis methods and deliverables are described in the contract laboratory agreement and in less detail in the SOP for Macroinvertebrate Sample Identification.

### ANALYTICAL SYSTEM FAILURES

Table 2.4.1

Project	Analytical System Failure Addressed By	Corrective Action Taken
DEQ Water Quality Division Laboratory	Laboratory Supervisor	discard test results; re-run new samples; recalibrate and/or repair equipment
BURP monitoring	Technical Support Supervisor	discard test results; resample and retest if possible

<b>Project</b>	<b>Analytical System Failure Addressed By</b>	<b>Corrective Action Taken</b>
Volunteer Monitoring	Technical Support Supervisor, appropriate Conservation District manager	discard test results; resample and retest if possible
319(h) and 205(j) grant projects	Technical Support Supervisor, Nonpoint Source Program Coordinator, grantee's project manager	discard test results; resample and retest if possible
TMDL Monitoring	Technical Support Supervisor, TMDL Coordinator, Planning Supervisor	discard test results; resample and retest if possible
303(d) Monitoring	Technical Support Supervisor	discard test results; resample and retest if possible
BMP Implementation Monitoring	Technical Support Supervisor	discard test results; resample and retest if possible

**CORRECTIVE ACTION AND  
EFFECTIVENESS OF CORRECTIVE ACTION**

Table 2.4.2

<b>Area</b>	<b>Action</b>	<b>Responsible Party</b>	<b>Effectiveness Documentation</b>
Laboratory (DEQ WQD)	corrective action decisions are planned, supervised and implemented by the Laboratory Supervisor based on the problem that is identified	supervisor determines effectiveness by evaluating whether the action will eliminate or reduce the problem	Precision and accuracy calculations are done at the end of every sample run as a QA measure; if the laboratory standards are not met, the samples and data are discarded, and new samples are run
Contract Laboratory(ies)	corrective action decisions are specified in individual laboratory QA/QC Plans	specified in QA/QC Plan	specified in QA/QC Plan
Field Sampling	corrective action decisions are planned, supervised and implemented by the Technical Support Supervisor, based on the problem that is identified	supervisor determines their effectiveness by evaluating whether the action will eliminate or reduce the problem	record in field log book and/or BURP field data sheets; describe in sampler's reports

Area	Action	Responsible Party	Effectiveness Documentation
319(h) and 205(j) federal grant funded projects	Sampling and Analysis Plans (SAPs) have a Corrective Actions section which describes the action to be taken; each SAP is different; the Nonpoint Source Coordinator, Planning Supervisor and/or the grantee's project manager may also initiate, supervise and implement corrective action	grantee's project manager, DEQ-WQD Nonpoint Source Coordinator determine the effectiveness	determined on an individual project basis; documented in the SAP and project reports (quarterly/annual/final)

### NON-STANDARD METHODS

#### BURP Monitoring

WQD Laboratory and contract laboratory sample testing conform to USEPA methods, as documented in the laboratories' QA/QC Plans (refer to Appendix I for WQD Laboratory methods) and the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999. If in the future a method is used which is not covered by the manual, a new SOP will be written and approved by the WQD Laboratory, Watershed Program Technical Support Supervisor and USEPA before sampling begins. For non-standard methods, such as unusual sample matrices and situations, appropriate method performance study information is needed to confirm the performance of the method for the particular matrix. If previous performance studies are not available, they will be developed during the project and included as part of the project results. This QAPP and its relevant appendices will be updated during the annual review.

#### 319(h) and 205(j)(5) Federal Grant Projects

319(h) and 205(j)(5) grant projects may occasionally need non-USEPA methods which are in general use, and those will be documented in the project-specific SAPs and reviewed and approved by the Watershed Program project officer and USEPA before sampling begins. If a grantee uses a method which is not covered by the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, the grantee will be responsible for writing an SOP for that method and having it approved by their Watershed Program project officer (who will in turn submit it for comment and approval to the WQD Laboratory and USEPA) before project sampling work begins. For non-standard methods, such as unusual sample matrices and situations, appropriate method performance study information is needed to confirm the performance of the method for the particular matrix. If previous performance studies are not available, they will be developed during the project and included as part of the project results.

## **REQUIRED LABORATORY TURNAROUND TIME BURP Monitoring**

The Technical Support Supervisor has identified one turnaround time requirement, which is 120 days from receipt for macroinvertebrate sample identification. This turnaround time is specified in the contract with the laboratory. Laboratory results and macroinvertebrate identification are entered in Watershed Program databases at the end of each field season during the winter months when field sampling cannot be performed.

### **319(h) and 205(j)(5) Federal Grant Projects**

All laboratory turnaround time requirements are project-specific and described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of)

## **FIELD SAMPLING AND/OR LABORATORY NARRATIVES**

### **Laboratory Narrative**

Damaged samples, incorrect preservative, sample temperature exceedance and expired holding time are all noted on the Chain of Custody form, which is a permanent part of Watershed Program records and retained in WQD Laboratory files for seven years. Questionable samples are usually run, but the test results are flagged on the laboratory test results report. Data not rejected are qualified in all databases (refer to the SOP for Qualified Monitoring Data Codes). Qualification codes are listed in the database Metadata file (refer to the SOP for Metadata), which is distributed with the database. Macroinvertebrate sample identification deliverables do not include a narrative. Watershed Program management determine how and if each test result will be used for Watershed Program decisions. 319(h) and 205(j)(5) project SAPs describe the content and format of laboratory narrative information for each laboratory used during the project.

### **Field Sampling Narrative**

Field sampling narrative requirements are specified on the BURP monitoring Field Data Sheets (see Appendix F for the full set of data sheets), in the SOP for Field Log Books, and in SOPs used for BURP monitoring. Field Log books are archived in the Field Office where they were created (refer to SOP for Data Archiving and SOP for Field Log Books) and BURP data sheets are kept in the monitoring station/site file. All of these documents are under the oversight and responsibility of the Technical Support Supervisor. Field sampling narratives, retention times and ownership/transfer for 319(h) and 205(j)(5) projects are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

## **Section V**

### **Quality Control Requirements**

#### **QUALITY CONTROL PROCEDURES**

##### **Water Quality Division Laboratory**

The WQD Laboratory follows United States Environmental Protection Agency standard laboratory quality control for all laboratory work. Laboratory procedures, quality control limits, quality control system failures and corrective actions are described in the laboratory QA/QC Plan. Laboratory Quality Assurance Goals are in Appendix I. The reference documents used to define and implement laboratory quality control procedures are:

- ! Handbook for Analytical Quality Control in Water and Wastewater Laboratories, United States Environmental Protection Agency, EPA-600/4-79-019
- ! Methods for Chemical Analysis of Water and Wastes, United States Environmental Protection Agency, EPA-600/4-79-020
- ! Handbook for Sampling and Sample Preservation of Water and Wastewater, United States Environmental Protection Agency, EPA-600/4-82-029
- ! Water Quality Division Laboratory Handbook, 1985 and updates
- ! Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, United States Environmental Protection Agency, September 1986,

all incorporated by reference in this document.

The Laboratory furnishes all dated standards, reagents, acids, filters, filtering apparatus, pre-cleaned bottles and sterile sample containers to the BURP field samplers as described in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999.

WQD Laboratory does a duplicate analytical test or suite of tests on every tenth sample, as documented in the laboratory QA/QC plan. Duplicates are analyzed in the laboratory for the same parameters as the monitoring sample to which they apply. Laboratory duplicates which exceed QA/QC standards for the parameter are retested. If they still exceed laboratory QC limits, the analytical results for that sample run are not reported out. All data which are reported out, therefore, have met laboratory QC, and field duplicate samples which exceed project precision criteria must be evaluated as field sampling errors (refer to the SOPs for Duplicates, Macroinvertebrate Sampling, Fecal Coliform Testing, and Precision). Field duplicate sample analytical results are shown on the laboratory analysis report which is supplied to the field sampler who submitted the samples. The laboratory analytical report must show test results for the duplicates, blanks and spikes, the method and the results for summary quality control statistics calculations. Copies of these reports are a permanent part of the site file. The originals are retained in

the WQD Laboratory files for five years. Blind duplicates are not required in the WQD Laboratory because the laboratory assigns its own sample numbers for testing.

Completeness for the laboratory is defined as the total number of samples for the sampling season which could not be analyzed divided by the total number of samples submitted for the season, times 100. Examples of issues which may affect laboratory completeness are: sample holding time was exceeded, containers were broken or damaged, the sample temperature (as determined by the temperature blank) was too high when the samples were received, the preservative was incorrect, the samples were improperly labeled, the Chain of Custody form was missing or incomplete.

The Laboratory Supervisor takes immediate corrective action on any laboratory quality control issues and attempts to resolve situations which may affect the ability to report out analytical results.

### **BURP Monitoring Contract Laboratories**

Watershed Program management has on file in Cheyenne, Wyoming a copy of the QA/QC Plan for each contract laboratory which analyzes BURP monitoring samples. Refer to Part II, Section II, Support Facilities for a list of those laboratories. Contract laboratory analytical reports must provide, at a minimum, the following information:

1. General Information, such as problems, general comments, specific case narratives; a table or list which shows all samples received, the contract laboratory sample identification number and the test performed on the sample;
2. Analytical Data reported by sample or by test, with field sample identification number, date of sample collection, date sample was received at the contract laboratory, date sample was analyzed, dilution factors, analytical results units, sample preservation; if original samples are diluted because the analyte exceeds the calibrate range of the equipment, both the original and diluted sample results are reported;
3. Calibration Information such as initial and continuing calibration curves, standards, blanks and acceptance ranges for them;
4. Laboratory Performance information such as spike recovery, method blanks, laboratory control samples;
5. Other Information such as copies of chain of custody forms, transportation receipt forms, validation forms, checklists (including turnaround time);
6. Electronic Data, with the platform, application program and media specified.

## **BURP Monitoring**

Field Quality Control procedures for each sampling analysis or measurement technique are in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, and listed by SOP name below:

a summary SOP titled Quality Control Measures, Summary of; individual parameter SOPs; Aseptic Technique; Bioassessment Quality Control Criteria; Blanks; Duplicates; Field Log Books; Holding Time, Definition of; Instrument Calibration and Calibration Logs; Photographic Documentation; Sample Collection; Sample Labeling; Spikes; Split Samples; BURP Reference Site Locations; BURP Reference Site Scheduled Monitoring; BURP Reference Site Selection; Sampling Location, Determining; BURP Pre-Monitoring Site Evaluation; BURP Monitoring Procedure Sequence; Fecal Coliform Sampling; Fecal Coliform Testing; Macroinvertebrate Sampling; Macroinvertebrate Sample Identification; Macroinvertebrate Sample Fixative/Preservative, Preparation of; Macroinvertebrate Sample Preservation; Macroinvertebrate Sample Packing and Shipping; Surber Sampler Techniques; Global Positioning System (GPS) Data; Temperature Blank; Waste Disposal, Field Sampling; Sample Preservation and Holding Time, Summary of; Paired Stream/Paired Watershed Monitoring; Geology Abbreviations, Surficial; Soil Type Abbreviations and Definitions; Chain of Custody; Conversion Factors.

Data quality control procedures are described in the SOPs for Precision; Completeness; Qualified Monitoring Data Codes; BURP Monitoring Electronic Data Entry; Data Verification; Data Verification Report; Data Validation and Data Validation Report.

The BURP Technical Support Supervisor has oversight responsibility for all field procedures and for field QC. BURP monitoring overall quality systems are based on the guidelines contained in American National Standard ANSI/SQC E4-1994, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs. Watershed Program is committed to working toward the standards for a quality system outlined in the manual.

The WQD Laboratory furnishes all non-powdered disposable gloves, wrapped disposable sterile pipettes, disinfectant detergent, distilled de-ionized water (dilution water), filters, filtering equipment, petri dishes, media, thermometers, chemical standards, reagents, acids and pre-cleaned lot checked polyethylene bottles or sterile sample containers to the BURP field samplers as described in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, but it is the sampler's responsibility to check these items regularly for signs of deterioration such as precipitates or change of color, signs of contamination, apparent changes in concentration or expiration date, and to cease using questionable materials and notify the Laboratory Supervisor immediately.

### **319(h) and 205(j)(5) Federal Grant Projects**

Field quality control procedures are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of). Laboratory quality assurance and quality control are described in the

laboratory QA/QC Plan for the contract laboratory(ies) used for each project. The Project Manager/Coordinator will review the plan from each laboratory which supplies analytical results.

### **QUALITY CONTROL CHECKS**

Required field and laboratory QA checks (blanks, duplicates, spikes, laboratory control samples) for both BURP monitoring and 319(h)/205(j)(5) projects are specified in the documents referenced in the above section. 319(h)/205(j)(5) Project Managers/Coordinators perform periodic quality control checks as described in the project-specific Sampling and Analysis Plan (SAP). The Watershed Program Technical Support Supervisor defines the nature of and performs periodic audits of the field samplers' techniques, evaluates whether SOPs are being followed, and initiates and documents corrective action (including retraining) when necessary.

### **FREQUENCY OF QUALITY CONTROL CHECKS**

Frequency for each type of QC check is specified in the documents listed above. Frequency for the WQD Laboratory is listed in the laboratory QA/QC plan. The Watershed Program Technical Support Supervisor determines the frequency of field activity quality control checks.

### **BURP Monitoring**

Spike compounds and specific instructions for preparing the spiked sample are furnished to field samplers by the WQD Laboratory Supervisor, as described in the SOP for Spikes.

### **319(h) and 205(j)(5) Projects**

The Quality Control check frequency is described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

### **QUALITY CONTROL LIMITS Water Quality Division Laboratory**

Laboratory quality control limits are shown in the table in Appendix I.

### **Contract Laboratories**

Laboratory quality control limits are stated in the laboratory QA/QC plan for each laboratory. These plans are on file in the Watershed Program Cheyenne, Wyoming office and in the offices of each 319(h)/205(j)(5) grantee as described in the project SAP.

## BURP Monitoring

The QC limits are described in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999 in the SOPs for Blanks, Duplicates, Fecal Coliform Testing, and all the instrument related SOPs. The information is summarized in the following table.

Table 2.5.1

<b>BURP Monitoring Quality Control Limits</b>			
QC Sample Type	Field or Laboratory Frequency	Acceptance Criteria	Possible Corrective Actions (one or more)
bottle blank	1%*	<method / instrument detection limit	Random check of other bottles in the same lot; prepare another bottle blank from the same lot under the same conditions and analyze; prepare another bottle blank with a different bottle of water
preservative blank	1%***	<method / instrument detection limit	prepare and analyze another blank using: 1) the same preservative lot and bottle lot; 2) the same preservative lot and a different bottle lot; 3) water from a different bottle
trip blank	1%	<method / instrument detection limit	prepare another trip blank with: 1) a bottle from a different lot; 2) water from a different bottle; 3) the same or a different preservative lot
field filter blank	5%	<method / instrument detection limit	re-sample; re-analyze
field duplicates	10%	<method / instrument detection limit	re-calibrate instrument; replace batteries; perform instrument field check with different standards; audit sampler and verify sample collection procedure; re-sample; re-analyze; revise SOP; repair or replace instrument
contract laboratory duplicates	refer to**** laboratory QA/QC plan	<method / instrument detection limit	re-sample; re-analyze
macroinvertebrate duplicates**	10%	RPD #	re-sample; re-analyze

<b>BURP Monitoring Quality Control Limits</b>			
QC Sample Type	Field or Laboratory Frequency	Acceptance Criteria	Possible Corrective Actions (one or more)
Water Quality Division Laboratory Duplicates	10%	varies by parameter; refer to Appendix I	re-calibrate, re-analyze; prepare new standards; repair or replace instrument
contract laboratory standards	refer to laboratory QA/QC plan	refer to laboratory QA/QC plan	refer to laboratory QA/QC plan
macroinvertebrate identification standards (reference collection or voucher collection)	10%	98%	submit reference specimen for identification to additional laboratories
Water Quality Division Laboratory Standards	10%	80 - 120% recovery	re-analyze; re-calibrate; prepare new standards; repair or replace instrument

\* Refer to the SOP for Blanks and the parameter SOPs. Bottles (plastic or glass) supplied to the BURP field samplers are new and have been lot checked by the WQD Laboratory. Bottles supplied to 319(h) / 205(j)(5) grantees by their contract laboratories have also been lot checked. Bottles are rarely cleaned and reused in the field.

\*\* The purpose of, frequency for and definition of macroinvertebrate duplicate samples is explained in the SOPs for Duplicates, Macroinvertebrate Sampling and Macroinvertebrate Sample Identification.

\*\*\* Preservative contamination has historically been a very rare event in the history of Watershed Program sampling. The correct preservative is supplied in the sample collection bottle to 319(h) and 205(j)(5) grantees by their contract laboratory.

\*\*\*\* Watershed Program and 319(h) / 205(j)(5) grantees are required to have and to have reviewed the QA/QC plans for any contract laboratory which performs analysis related to BURP monitoring.

### **319(h) and 205(j)(5) Federal Grant Projects**

The QC limits are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of) and in table 2.5.1 and 2.5.2 . Grant project QC limits must be equal to or better than those for BURP monitoring.

**QUALITY CONTROL CORRECTIVE ACTION  
BURP Monitoring**

Table 2.5.2 lists a number of failures and the corrective action/effectiveness for each. The Technical Support Supervisor is responsible for oversight and documentation of all BURP monitoring quality control corrective actions. The documentation will be considered during the annual BURP QAPP review and may be used to revise portions of the QAPP.

Table 2.5.2

<b>Quality Control System Failure</b>	<b>Corrective Action Taken</b>	<b>Effectiveness Documentation</b>
Macroinvertebrate Samples: Improper preservation resulting in loss of samples	Specific sample identified as invalid. If completeness >95%, additional training required. If completeness <95%, evaluate procedure and additional training required.	Evaluate sample completeness following necessary training and/or implementation of new method. Report results in Annual Monitoring Summary Report.
Macroinvertebrate Samples: Duplicate samples exceed target precision. Relative Percent Difference (RPD) of >50% for Abundance or >15% for Number of Taxa	Specific sample identified as evaluated data. If duplicate completeness >95%, additional training required. If completeness <95%, evaluate procedure and additional training required.	Evaluate duplicate sample completeness following necessary training and/or implementation of new method. Report results in Annual Monitoring Summary Report.
Macroinvertebrate Samples: Insufficient number if duplicate samples collected to meet QC in SOP.	Samples identified as valid. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Macroinvertebrate Samples: Evidence of container or sample tampering during transport.	Specific samples identified as invalid. Evaluate for new shipping agent.	Evaluate results of new shipping agent. Report results in Annual Monitoring Summary Report.
Macroinvertebrate Samples: Chain of Custody forms not complete. No evidence of container or sample tampering (seals unbroken).	Specific samples identified as valid for reconnaissance monitoring but not suitable as evidence. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Macroinvertebrate Samples: Voucher specimen taxonomy does not match taxonomy from contract lab.	Specific sample identified as evaluated data. If voucher completeness >95%, notify lab and voucher taxonomist of discrepancy. If voucher completeness <95%, send voucher specimen to second taxonomist and evaluate new lab.	Evaluate voucher completeness following review by second taxonomist and repeat with new lab (if discrepancy was determined to be from contract lab and new lab was selected). Report results in Annual Monitoring Summary Report.

<b>Quality Control System Failure</b>	<b>Corrective Action Taken</b>	<b>Effectiveness Documentation</b>
Water Quality Samples: improper preservation, container, holding time, or failure to maintain temperature.	Specific samples identified as invalid. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Duplicate sample exceeds any specific precision (RPD) objective.	Specific sample parameter identified as evaluated data. If duplicate completeness >95%, additional training required. If duplicate completeness <95%, evaluate procedure and additional training required.	Evaluate sample completeness following necessary training and/or implementation of new method. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Insufficient number of duplicate samples collected to meet QC in SOP.	Samples identified as valid. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Duplicate samples not collected randomly with respect to within day, week, or season.	Samples identified as valid. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Evidence of container or sample tampering during transport.	Specific samples identified as invalid. Evaluate for new shipping agent.	Evaluate results of new shipping agent. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Chain of Custody forms not complete. No evidence of container or sample tampering (seals unbroken).	Samples identified as valid for reconnaissance monitoring, but not suitable as evidence. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Field, trip, or bottle blanks not collected according to QC requirements.	Samples identified as valid for reconnaissance monitoring but not suitable as evidence. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Field, trip, or bottle blanks indicate detectable sample contamination.	Samples collected during specific field exercise are identified as invalid. If blank completeness >95%, additional training required. If blank completeness <95%, evaluate procedure and additional training required.	Evaluate blank completeness following necessary training and/or implementation of new method. Report results in Annual Monitoring Summary Report.

Quality Control System Failure	Corrective Action Taken	Effectiveness Documentation
Water Quality Samples: Spike samples not returned to WQD Laboratory.	Evaluate blank and duplicate sample precision and follow appropriate corrective actions. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Equipment calibration not performed according to the SOP.	Specific parameter identified as evaluated data. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Water Quality Samples: Equipment calibration logs not maintained.	Specific parameters identified as evaluated data. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Habitat Assessments: Duplicate assessments exceed target precision. Relative Percent Difference (RPD) of Total Assessment Score >20%.	Specific Sample identified as evaluated data. If duplicate completeness >95%, additional training required. If duplicate completeness <95%, evaluate procedure and additional training required.	Evaluate duplicate sample completeness following necessary training and/or implementation of new method. Report results in Annual Monitoring Summary Report.
Habitat Assessments: Insufficient number of duplicate quantitative assessments collected to meet QC in the SOP.	Samples identified as valid. Additional training required.	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Habitat Assessments: Insufficient number of quantitative QC assessment measurements collected.	Samples identified as valid. Additional training required	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.
Field Logs: Field log books not maintained/corrected according to the SOP.0	Samples identified as valid. Additional training required	Evaluate sampling following necessary training. Report results in Annual Monitoring Summary Report.

### 319(h) and 205(j)(5) Federal Grant Projects

The QC corrective action(s) are described in the project-specific SAP Corrective Actions section, which is a required part of the SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

**DETERMINING THE EFFECTIVENESS OF  
QUALITY CONTROL CORRECTIVE ACTION  
BURP Monitoring**

Effectiveness is determined by the Technical Support Supervisor, Planning Supervisor and/or WQD Laboratory Supervisor, and documented as shown in the table above.

**319(h) and 205(j)(5) Federal Grant Projects**

The effectiveness determination and procedure for revising the project SAP when necessary are described in the project SAP Corrective Actions section, which is required in each SAP (refer to the SOP for Sampling and Analysis Plan, Contents of).

**QUALITY CONTROL STATISTICS COMPLETENESS  
Water Quality Division Laboratory**

Completeness is the number of samples submitted by a sampler/project/program actually run divided by the total number of samples submitted. Completeness can be calculated monthly and/or annually. The WQD Laboratory makes every effort to rescue samples, resolve questions and produce analytical results.

**BURP MONITORING  
Samples Collected**

Completeness for the BURP monitoring field season is defined as the ratio of the number of BURP stations with valid Water Chemistry, Biological, and Habitat monitoring data to the number of BURP stations sampled, expressed as a percent. Completeness for the BURP Monitoring Field Season is calculated on a state-wide basis. The formula is: valid BURP stations / total number of BURP stations x 100 = percent completeness. BURP monitoring requires 95% completeness for each season.

**Water Chemistry**

Completeness of a BURP Monitoring water chemistry data set for each Field Office is defined as the ratio of valid data points to total data points collected, and is expressed as a percent. "Invalid" and "evaluated" data are not included in this percentage. The formula is: valid samples / total number of samples collected during the reporting period x 100 = percent completeness. BURP monitoring requires 95% completeness for each Field Office.

Examples of data sets being determined as "invalid" or "evaluated" are:

Invalid Data

1. Improper Preservation or Temperature
2. Sample Loss or Tampering
3. Blanks Detection

Evaluated Data

1. Insufficient Precision
2. Insufficient Instrument Calibration
3. Incomplete Calibration Logs

Corrective actions will be determined, initiated, and administered by the Monitoring Supervisor.

### **Macroinvertebrate Samples**

Completeness of a BURP monitoring macroinvertebrate data set for each Field Office is defined as the ratio of valid data points to the total number of macroinvertebrate data points collected for the field season, and is expressed as a percent. The formula is: valid samples / total number of samples x 100 = percent completeness. BURP monitoring requires 95% completeness for each Field Office.

Examples of data set being determined as “invalid” or “evaluated” are:

- | <u>Invalid</u>              | <u>Evaluated Data</u>                    |
|-----------------------------|--|
| 1. Improper Preservation    | 1. Insufficient Precision                |
| 2. Sample Loss or Tampering | 2. Voucher specimen Taxonomy Discrepancy |

### **Habitat Assessments**

Completeness of a BURP Monitoring habitat assessment data set for each Field Office is defined as the ratio of valid data points to the total number of assessment data points collected for the field season, and is expressed as a percent. “Evaluated” data, assessment data that do not meet precision objectives, are not included in this percentage. The formula is: valid samples / total number of samples x 100 percent completeness. BURP monitoring requires 95% completeness for each Field Office.

### **319(h) and 205(j)(5) Projects**

QC statistics are described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of) and are based on recommendations in the USDA-NRCS National Handbook of Water Quality Monitoring.

### **PRECISION Water Chemistry**

Precision indicates the degree of agreement between sequential independent samples at a site, collected by applying the same collection method. Field duplicates are used to indicate the amount of random error (scatter) in the data due to sample collection and preservation. Field sampling precision of a BURP Monitoring water chemistry data set requires field duplicate samples and is based on the number of duplicates (refer to SOP for Duplicates) collected by each Field Office. The minimum number of duplicate samples per field office per season is 10% of the total water quality samples collected. Duplicates must be collected on an ongoing basis during the field season. The WQD Laboratory maintains records of laboratory analytical precision. All laboratory precision requirements are covered by the laboratory QAPP and QA/QC Plan.

The precision measurement is calculated using the relative percent difference (RPD) between duplicate sample results per analyte (parameter). For duplicate samples, the smaller test result is subtracted from the larger test result. That number is divided by the average of the two results, and the result is multiplied by 100 to express the number as a percent. The formula is:  $[(S_1 - S_2) / ((S_1 + S_2)/2)] \times 100 = \text{RPD}$ , where  $S_1$  is the larger test result value.

### **Macroinvertebrate Samples**

Precision for macroinvertebrate samples indicates the degree of agreement between simultaneous, and immediately adjacent, independent samples. Field duplicates are used to indicate the amount of variability in the data due to sampler collection techniques and training. Field sampling precision of a BURP Monitoring macroinvertebrate data set requires field duplicate samples collected independently by different samplers working simultaneously at the same site. The minimum number of duplicate samples per field office per season is 10% of the total macroinvertebrate samples collected. Duplicates must be collected on an ongoing basis during the field season and sent to the contract laboratory “blind duplicates” (identified using a fictitious stream name).

Macroinvertebrate sample precision is calculated for total abundance (number / square meter) and total number of taxa. Precision requirements for total abundance is  $\pm 50\%$  and for total number of taxa is  $\pm 15\%$ . The precision measurement is calculated using the relative percent difference (RPD) between duplicate sample results per each parameter. For duplicate samples, the smaller test result is subtracted from the larger test result. That number is divided by the average of the two results, and multiplied by 100 to express the number as a percent. The formula is:  $[(S1 - S2) / (S1 + S2) / 2] \times 100 = \text{RPD}$ , where S1 is the larger test result value.

### **Habitat Assessment**

Precision indicates the degree of agreement between independent assessments at a site, collected by applying the same assessment method. Habitat assessment duplicates are used to indicate the amount of variability in the assessment due to observer bias and training. Habitat assessment precision of a BURP Monitoring Field assessment data set requires field duplicate assessments collected independently by different samplers working the same site at a later time (inter-crew). The minimum number of duplicate assessments per field office per season is 10% of the total assessments conducted. Duplicates must be collected on an ongoing basis during the field season.

Habitat assessment precision is calculated for the Total Assessment Score and is set at  $\pm 20\%$ . The precision measurement is calculated using the relative percent difference (RPD) between duplicate score results. For duplicate samples, the smaller test result is subtracted from the larger test result. That number is divided by the average of the two results, and multiplied by 100 to express the number as a percent. The formula is:  $[(S1 - S2) / ((S1 + S2) / 2)] \times 100 = \text{RPD}$ , where S1 is the larger test result value.

### **Fecal Coliform Samples**

Precision indicates the degree of agreement between sequential independent samples at a site, collected by applying the same collection method. The minimum number of duplicate samples is 10% of the samples collected or at least one duplicate per sampling event when less than 10 samples are collected.

Fecal coliform duplicate precision is calculated for the Number of Colonies / 100 ml value and is set at  $\pm 50\%$ . The precision measurement is calculated using the relative percent difference (RPD) between duplicate sample results of the same aliquot. For duplicate samples, the smaller test result is subtracted from the larger rest result. That number is divided by the average of the two results, and multiplied by

100 to express the number as a percent. The formula is:  $[(S1 - S2) / ((S1 + S2) / 2)] \times 100 = \text{RPD}$ , where S1 is the larger test result.

### **319(h) and 205(j)(5) Projects**

QC statistics are described in the project-specific SAP (refer to the SOP for Sampling and Analysis Plan, Contents of) and are based on recommendations in the USDA-NRCS National Handbook of Water Quality Monitoring.

## **Section VI Instrument Calibration and Frequency**

All tools, gauges, instruments, and other sampling, measuring and test equipment used for BURP monitoring data collection are covered by SOPs in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999. The sampling, measuring and test equipment for 319(h) and 205(j)(5) projects are described in the individual project SAPs (refer to the SOP for Sampling and Analysis Plan, Contents of).

### **CALIBRATION PROCEDURES BURP Monitoring**

The Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999, incorporated by reference in this document, contains calibration and maintenance instructions and an SOP for Instrument Calibration and Calibration Log. The SOP describes standards, procedures, calibration, repair, maintenance and the required log book. If the BURP monitoring project uses a piece of equipment for which no documented or recognized calibration method/standard exists, a new SOP which documents the calibration method, standards and source of the standards will be written before the equipment is used.

### **319(h) and 205(j)(5) Federal Grant Projects**

Each project SAP discusses standards, source for the standards, procedures, calibration and repair and the required records and retention time for each piece of equipment used for sampling and measuring (refer to the SOP for a Sampling and Analysis Plan, Contents of). An Instrument Calibration and Maintenance Log is required. If the grantee uses a piece of equipment for which no documented or recognized calibration method/standard exists, the grantee will be responsible for documenting the calibration method, standards and source of the standards in the project SAP. The equipment manufacturer's instructions for maintenance and calibration may also be included in the SAP.

### **CALIBRATION STANDARDS BURP Monitoring**

Calibration standards are supplied to the field samplers at the beginning of each field season by the WQD Laboratory, and replaced as needed during the season. If QC samples show that the standard is not performing accurately, the field sampler immediately notifies the Technical Support Supervisor, who contacts the WQD Laboratory Supervisor. The data are discarded, the standard is replaced and the sites are re-sampled if possible.

### **319(h) and 205(j)(5) Federal Grant Projects**

Standards sources are project-specific, and are described in the project SAP (refer to the SOP for a Sampling and Analysis Plan, Contents of). A source for calibration standards and the replacement frequency will be described in the SAP.

**Part III**  
**Project Assessment and Oversight**

## **Section I Assessments and Response Actions**

### **ASSESSMENTS USED IN THIS PROJECT Management Systems Review**

Watershed Program has no formal procedure or schedule for any kind of management systems review or assessment at this time. However, management is committed to working toward planning, scheduling and periodically conducting the management and technical self-assessment and independent technical assessment described in American National Standard ANSI/ASQC E4-1995, Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs. As an informal management review, the Technical Support Supervisor, NPDES Supervisor and Planning Supervisor discuss the previous season's work in the months between field seasons. The Technical Support Supervisor conducts field sampler training and plans the next season's work and monitoring schedule. For 319(h) and 205(j)(5) projects, Watershed Program management will provide oversight if it determines that is necessary, but in the absence of information to the contrary may assume that the SAP is being followed and that the grantee's Project Manager/Coordinator is conducting ongoing review/audits/evaluations and implementing necessary corrections. Watershed Program may elect to exercise some oversight action options if:

- ! the grantee's required periodic progress reports are not submitted, or
- ! progress reports indicate that the project is not on schedule, and/or
- ! the sampling does not conform to the original or amended project SAP.

### **Technical Systems Audit**

Audits show the corrective actions often necessary during the life of a project. Audits are performed to verify that QA/QC is being done according to the SAP, and that SOPs are being followed. All field and laboratory activities performed under this QAPP and through contract and/or sub-contract are subject to discretionary, unannounced audit by Watershed Program and/or USEPA. USEPA Project Manager(s) and/or QA staff may request and conduct a technical audit at any time during a grant period. A technical audit can consist of site visits to evaluate sample collection and/or laboratory activities, a technical review and/or an evaluation of performance. The Technical Support Supervisor conducts the Watershed Program internal Technical Systems Audit, prepares a report and is responsible for initiating and documenting all corrective actions. Audit reports (internal and external) will be a part of project records, will be incorporated in revisions to this QAPP and will be used to revise SAPs and relevant SOPs. The Technical Support Supervisor, Planning Supervisor and NPDES Supervisor have the final decision on the content of and revisions to existing SOPs and new proposed SOPs.

The minimum items to be checked during a field sampling audit are:

- ! sample custody procedures
- ! instrument calibration procedures and documentation

- ! completeness of field log books, field data forms
- ! documentation of field sampler training
- ! minimization of potential sample degradation and contamination
- ! correctness of sample preservation
- ! correctness of sample collection, storage and transport to the laboratory.

For 319(h) and 205(j)(5) projects, the Watershed Program project officer assigned to the project exercises oversight for all data collection activities and implementation of the project SAP. S/he may request and perform a technical systems audit.

### **Performance Evaluation**

Watershed Program management has the ultimate responsibility for the success of its quality system. The Technical Support Supervisor conducts performance evaluations of the contract laboratories and field samplers, reviews the field QC, determines, implements and documents the corrective action(s). For 319(h) and 205(j)(5) projects, the Watershed Program project officer assigned to the project by Watershed Program management is responsible for notifying management if schedules are not being met, projected work is not being accomplished on schedule, and other performance goals are not being met. WQD Laboratory performance evaluation is described in the laboratory QA/QC Plan (1993). The WQD Laboratory is subject to both an internal self-audit and an external unscheduled performance evaluation audit by USEPA. This performance audit involves testing samples submitted by USEPA for each analytical method used by the laboratory, and a quantitative results report from USEPA. A performance evaluation can help the Laboratory Supervisor determine whether the equipment is operating correctly and within control limits.

### **Data Quality Assessment (DQA)**

A data quality assessment is used to determine whether project data are adequate for the goals stated in Part I. Watershed Program has no formal procedure for a data quality assessment at this time. Watershed Program Supervisors assume that if the SOPs are followed for BURP monitoring and the SAPs are followed for 319(h) and 205(j)(5) projects, the data will be of sufficient quality for program decisions. Data qualification codes are listed in the SOP for Qualified Monitoring Data Codes and are assigned under the direction and with the approval of the Technical Support Supervisor. The Planning Supervisor, Technical Support Supervisor and NPDES Supervisor make all final decisions on data quality, data qualification and what the data can be used for (refer to Appendix J for examples of BURP monitoring data use tables).

### **Goals and Performance Objectives**

BURP monitoring goals and performance objectives for field monitoring are described in the SOPs; for 319(h) and 205(j)(5) projects in the project SAP, and for the WQD Laboratory in the laboratory QA/QC Plan (1993), all incorporated by reference in this document.

### **Schedule**

Before each field season, the Technical Support Supervisor decides on a season monitoring schedule and training schedule. The 1999 proposed schedule is provided as an example in Part I, Section III. At this time, Watershed Program does not have a formal audit or assessment schedule. Each 319(h) and 205(j)(5) project is unique. The PIP lists all projects tasks and objectives, and the project Milestone Table shows the project tasks and the schedule for each one. The project-specific SAP contains one or more tables with the detailed monitoring schedule and assessment schedule. Grantees are required to submit quarterly or semi-annual progress reports to their Watershed Program project officer, who reviews the reports and investigates and works with the grantee to resolve any deviations from the Milestone Table and SAP.

### **Self-Assessments**

The Watershed Program Technical Support Supervisor conducts all BURP monitoring program self-assessments, evaluates the results, implements and documents the required corrective action(s). For 319(h) and 205(j)(5) projects, the grantee's Project Manager/Coordinator does ongoing self-assessments based on the project SAP, defines, implements and documents the required corrective action(s). These self-assessments are part of the project records. The WQD Laboratory Supervisor conducts laboratory self-assessments, reports the results to the NPDES Supervisor and implements corrective action(s).

### **INDEPENDENT ASSESSMENTS**

USEPA Project Manager(s) and/or QA staff may request and conduct a BURP monitoring or 319(h) and 205(j)(5) project assessment at any time during a grant period, with no advance notice. The resulting report will be incorporated in project records, and report recommendations may be used to revise this QAPP and relevant SOPs. 319(h) and 205(j)(5) Project Managers/Coordinators as well as the Watershed Program project officer and/or Watershed Program management have the discretion to initiate any type of independent assessment during the life of the project. Such an assessment will be described in the project SAP and the resulting report will become a part of the project records. The WQD Laboratory is subject to independent assessment by USEPA.

### **REPORTING ASSESSMENT RESULTS**

Reports and recommendations from audits and assessments for all BURP monitoring activities are a permanent part of the respective project files, laboratory files and the BURP QAPP.

### **BURP Monitoring**

The Watershed Program Technical Support Supervisor conducts all project assessments and reports the results to the NPDES Supervisor, Planning Supervisor and Watershed Program Manager. Watershed Program supervisors determine, implement and document corrective actions. Corrective actions documentation is also a permanent part of project records.

### **Water Quality Division Laboratory**

The Laboratory Supervisor reports all assessment results (internal and external) and corrective actions to the NPDES Supervisor, who sends copies to the Technical Support and Planning Supervisors.

### **319(h) and 205(j)(5) Federal Grant Projects**

Assessment results may be included in the required periodic progress reports specified in the project contract, or may appear only in the project final report, which is required for each project. Assessment reports and corrective actions are a permanent part of project files, and are reviewed for completeness by the Watershed Program project officer assigned to the project.

## **Part IV**

### **Quality Assurance, Data Validation and Usability**

## **Section I**

### **Data Review, Verification and Validation Requirements**

#### **ACCEPTANCE/REJECTION/QUALIFICATION CRITERIA**

##### **BURP Monitoring**

The Technical Support Supervisor reviews all data with the NPDES and Planning Supervisors, and together they make the final decision(s) about acceptance, rejection and qualification. Data quality objectives for BURP monitoring data are shown in the tables in Appendix J. Each table addresses one part of BURP monitoring (quality control, physical data, chemical data, metadata, biological data, holding time, etc.) and shows which of the five main Watershed Program decision groups the data may be accepted/rejected for under the specified conditions of incompleteness. The incomplete condition will be the subject of a qualification code. The same criteria can be applied to 319(h) and 205(j)(5) project data which may be included in Watershed Program databases and considered in Watershed Program decision making.

##### **319(h) and 205(j)(5) Federal Grant Projects**

Project data collected with an approved Sampling and Analysis Plan (SAP) would qualify to be included in Watershed Program databases, and will be subject to BURP monitoring acceptance/rejection/qualification criteria and codes described above. The grantee's Project Manager/ Coordinator performs and/or oversees an initial review and data validation as described in the project SAP (refer to the SOP for Sampling and Analysis Plan, Contents of). The Watershed Program project officer reviews the data. Qualification codes are assigned in the same manner as for BURP monitoring data.

#### **CALCULATIONS**

##### **BURP Monitoring**

BURP calculations are described in SOPs for Precision, Completeness, Geometric Mean, Fecal Coliform Testing, Macroinvertebrate Metrics Scoring, Data Validation, Data Validation Report, Data Verification and Data Verification Report.

##### **319(h) and 205(j)(5) Federal Grant Projects**

All calculations are described in the individual project-specific SAPs (refer to the SOP for Sampling and Analysis Plan, Contents of) and are based on instructions in the USDA- NRCS National Handbook of Water Quality Monitoring and/or relevant SOPs.

## Section II Verification and Validation Methods

### DATA VERIFICATION AND VALIDATION PROCESS

Data verification and validation procedures are designed to ensure that transcription and data reduction errors are minimized, a full and complete data collection record exists and can be produced on demand, the data are actually reviewed, that all variances which affect the data are noted and the data are qualified, and most important that any variances or issues which may result in loss of use for the data are documented and if possible, corrected.

### BURP Monitoring

Watershed Program data verification and validation processes and reports are described in the SOPs for Data Verification, Data Verification Report, Data Validation and the Data Validation Report. Data are qualified (refer to the SOP for Qualified Monitoring Data Codes) when acceptance criteria were not met or a corrective action could not be performed and documented in the relevant database metadata file (refer to SOP for Metadata). Any QC problems are noted. Table 4.2.1 below shows BURP data verification steps and the responsible party.

Table 4.2.1

<b>BURP Data Verification Steps</b>			
<b>Procedure or Step</b>	<b>Purpose</b>	<b>Responsible Party Watershed Program BURP Monitoring</b>	<b>Responsible Party 319(h) / 205(j) (5) Projects</b>
Sampler training	Verifies that project staff are qualified to perform the work to be done	Technical Support Supervisor	Project Manager
Field data collection audit	Verifies that applicable SOPs are followed for sample collection	Technical Support Supervisor	Project Manager
Field blank and duplicate sample collection	Verifies that the required number of blanks and duplicates are collected	Field Sampler Technical Support Supervisor	Field Sampler Project Manager
Calibration and calibration log (field equipment)	Verifies that field instruments have been calibrated according to the manufacturer's instructions and that the calibration is documented in the log	Field Sampler Technical Support Supervisor	Field Sampler

<b>BURP Data Verification Steps</b>			
<b>Procedure or Step</b>	<b>Purpose</b>	<b>Responsible Party Watershed Program BURP Monitoring</b>	<b>Responsible Party 319(h)/205(j)(5) Projects</b>
Calibration corrective action	Verifies that the appropriate action is taken if the calibration/ calibration log fail to meet acceptance criteria	Technical Support Supervisor	Project Manager
Sample preservation and handling	Verifies sample integrity (temperature, macroinvertebrate preservation, chain of custody form entries, custody seal)	Field Sampler WQD Laboratory Contract laboratory	Field Sampler Contract laboratory Project Manager
Instrument inspection and maintenance	Verifies that all sampling equipment is in proper operating condition and that logs are correctly filled out	WQD Laboratory Supervisor Field Sampler Technical Support Supervisor	Project Manager
Data entry	Verifies that the internal checks used to ensure correct data entry, consistent data elements and the procedures for documenting and correcting data entry errors are followed	Technical Support Supervisor	Project Manager
Calculations	Verifies correctness of calculation method and result	Field Sampler Technical Support Supervisor	Field Sampler Project Manager
Raw data	Examine raw data (including BURP Field Data Sheets) for anomalies (transcription errors, calculation errors, outliers) and missing information	Field Sampler WQD Laboratory Supervisor Technical Support Supervisor	Project Manager
Chain of Custody documentation	Verifies that a complete chain of custody exists for the sample from time of collection until disposal, and that all documentation is complete and properly filed	Technical Support Supervisor QA Officer	Project Manager
Sample records documentation	Verifies that an accurate record (field data sheets and field log) was maintained and is properly filed for for sample collection and treatment (preservation and shipping) from time of collection until disposal	Field Sampler Technical Support Supervisor WQD Laboratory Supervisor	Project Manager

<b>BURP Data Verification Steps</b>			
<b>Procedure or Step</b>	<b>Purpose</b>	<b>Responsible Party Watershed Program BURP Monitoring</b>	<b>Responsible Party 319(h) / 205(j) (5) Projects</b>
Documentation of QC results	Documents effectiveness of QC measures (instrument calibration verification, field data sheets and log books, QC samples, laboratory QC) in corrective action reports	QA Officer	Project Manager
Document field corrective action	Reports the actions taken and their effectiveness when SOPs or other standard field practices are not followed	Technical Support Supervisor	Project Manager
Field sampler self-assessments	Deficiencies and problems recorded during monitoring activities are reported to the Technical Support Supervisor or other responsible party	Field Sampler	Field Sampler
Document location and format of computer files	Verifies that the location, format, media and platform of original computer files and backup copies are a part of project records	Technical Support Supervisor	Project Manager

Table 4.2.2 below shows BURP data validation steps and the responsible party.

Table 4.2.2

<b>BURP Data Validation Steps</b>			
<b>Procedure or Step</b>	<b>Purpose</b>	<b>Responsible Party Watershed Program BURP Monitoring</b>	<b>Responsible Party 319(h) / 205(j) (5) Projects</b>
Data qualification codes	Assigns the correct data qualification codes	QA Officer	Project Manager

<b>BURP Data Validation Steps</b>			
<b>Procedure or Step</b>	<b>Purpose</b>	<b>Responsible Party Watershed Program BURP Monitoring</b>	<b>Responsible Party 319(h)/205(j)(5) Projects</b>
Data validation report	Documents sampling and analytical precision, analytical accuracy, SOP/method conformance, provides a narrative that discusses any deviations from the QAPP, including quality control failures and the impact of those failures on the data	QA Officer	Project Manager
Determine that data conform to BURP QAPP	Verifies that data are of the type and quality specified in the BURP QAPP	Technical Support Supervisor Planning Supervisor	Project Manager
Document corrective actions	Report all corrective actions needed for the next field season to assure that data will meet BURP QAPP requirements	Technical Support Supervisor	Project Manager

### **319(h) and 205(j)(5) Federal Grant Projects**

The data validation and verification process, calculations, reports and corrective actions are described in each project-specific SAP, and will be based on one or more of the processes and procedures defined and described in the USDA NRCS National Handbook of Water Quality Monitoring, the SOPs for Data Verification, Data Verification Report, Data Validation, Data Validation Report and/or the tables above.

### **Water Quality Division Laboratory**

Laboratory analysts perform a 100 per cent review of the test results and if necessary, qualify the data. After the analyst's review, the Laboratory Supervisor reviews 100 per cent of the test results and if necessary, initiates corrective action. Quality control samples which do not meet laboratory QC while being tested are rejected and re-run if possible. The validation and verification process and the precision criteria for each parameter are all described in the laboratory QA/QC Plan (1993). The Laboratory Supervisor determines whether the data quality objectives (DQOs) for the laboratory have been met. The laboratory does not report out any analytical results for a sample run unless the laboratory QC requirements are not met.

### **Contract Laboratories**

The verification and validation process for each laboratory (contract and the WQD Laboratory) is stated in the laboratory QA/QC Plan. Watershed Program maintains a copy of each plan at the office in Cheyenne, Wyoming. 319(h) and 205(j)(5) grantees are required to read or obtain and file a copy of their contract laboratory QA/QC plans.

### **CHAIN OF CUSTODY**

#### **BURP Monitoring**

BURP monitoring Chain of Custody is described and sample forms included in the SOP for Chain of Custody in the Watershed Program Manual of Standard Operating Procedures for Sample Collection and Analysis, August 1999. This SOP addresses both macroinvertebrate and water chemistry samples, and defines chain of custody for both field and laboratory, including contract laboratories.

#### **319(h) and 205(j)(5) Federal Grant Projects**

Chain of Custody is described and sample forms are included in each project-specific SAP (refer to the SOP for Sampling and Analysis Plan, Contents of). The Project Manager/Coordinator has the option to incorporate the Watershed Program SOP for Chain of Custody or to write one. A project-specific Chain of Custody SOP must describe how the sample is tracked from time of collection until the analyzed sample is disposed of in the laboratory, and must include a sample of the project custody seal and custody form.

### **ISSUES RESOLUTION**

#### **BURP Monitoring**

The Technical Support Supervisor, NPDES Supervisor and Planning Supervisor have the final decision making authority for all issues resolution related to BURP monitoring data.

#### **319(h) and 205(j)(5) Federal Grant Projects**

Each Project Manager/Coordinator directs and participates in issues resolution, sometimes including the Watershed Program project officer. The corrective action process is described in each project-specific SAP in the Corrective Actions section, which is required.

### **VERIFICATION AND VALIDATION**

#### **RESULTS AVAILABILITY**

#### **BURP Monitoring**

BURP monitoring data are collected primarily with federal grant funding provided through USEPA, and with state funds, and both the data and the verification and validation reports are full public access information. The Technical Support Supervisor and the WQD Laboratory Supervisor prepare monthly

verification reports which state that the data under their control has been subject to verification, that verification was performed, and the corrective actions that were required and could be performed have been. Data validation reports (with summary QC statistics) are completed at the end of each monitoring season. Report contents are specified in the SOPs for Data Verification Report and Data Validation Report. These reports are part of the BURP monitoring project files and WQD Laboratory files. Retention time for these reports is documented in the SOP for Data Archiving.

### **319(h) and 205(j)(5) Federal Grant Projects**

Data verification and validation procedures and reports are described in the project-specific SAP and summarized in required periodic project reports to Watershed Program. Copies of the reports are included in the project Final Report and are a permanent part of the project file, which is full public access information available in Watershed Program files in Cheyenne, Wyoming. Data which were collected without an SAP are available for inspection and review in Cheyenne in closed out project files. To inquire about access to this information, contact the Watershed Program, using the information provided inside the front cover of this document.

### **Water Quality Division Laboratory**

Verification and validation results are reported to the NPDES Supervisor, who is the responsible manager for the laboratory, and are kept on file in the laboratory for five years. The Laboratory maintains sufficient records to recreate each analytical event for that time period. To inquire about access to this information, contact the Watershed Program, using the information provided inside the front cover of this document.

## **VERIFICATION ISSUES VS VALIDATION ISSUES**

### **Data Verification**

Data verification is used to evaluate the extent to which the collected data can be used for the purposes described in Part I, Section II to draw correct and reliable conclusions. Data verification activities are discussed in the SOP for Data Verification and in Table 4.2.1 above.

### **Data Validation**

Data validation is the process used to qualify the data, reject them, or accept them with no conditions or qualifications. Data validation activities are discussed in the SOP for Data Validation and in Table 4.2.2 above. Minimum steps in the validation process are to review:

- ! sampling process design;
- ! sample collection and handling procedures;
- ! analytical methods and procedures;
- ! field QC procedures and results;
- ! lab QC procedures and results;
- ! field equipment calibration and calibration records;

! data entry, processing, reduction steps, problems and results.

During the validation review, any deviation(s) from SOPs, the project-specific SAPs and/or this QAPP must be documented in the Data Validation Report Narrative section. Their potential effect on the usability and quality of the BURP monitoring data must be evaluated and discussed. Deviations must also be evaluated for the potential effect they may have on any decision making which is based on the BURP monitoring data. The qualified monitoring data codes which are assigned to all but fully accepted data must be documented and discussed.

/pjb  
10573-doc.wpd