QUALITY ASSURANCE PROJECT PLAN
FOR
WATER QUALITY MANAGEMENT PROGRAMS

2016

Surface Water Quality Bureau
New Mexico Environment Department

Approved: January 26, 2016

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

JAN 26 2016

Mr. Jodey Kougioulis
Quality Assurance Officer
Surface Water Quality Bureau
New Mexico Environment Department
1190 St. Francis Drive
Santa Fe, NM 87505

Dear Mr. Kougioulis:

The Region 6, EPA office has completed review of the *Quality Assurance Project Plan (QAPP) for Water Quality Management Programs 2016* submitted by the New Mexico Environment Department's Surface Water Quality Bureau (SWQB). This QAPP is a deliverable under the Cooperative Agreement (# I-006350-12) awarded under Section 106 of the Clean Water Act.

This document covers all SWQB activities related to the collection of water quality and watershed data. The QAPP is approved for a 34-month period; however, any significant changes to this document must be submitted immediately to this office for review and approval. The QAPP will expire on December 15, 2018 and a revised/updated QAPP must be submitted at least 60 days prior to the expiration date of this document (i.e. by October 15, 2018).

Enclosed is the completed QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference QTRAK # 16-101. If you have any questions, you may contact me at (214) 665-7163.

Sincerely yours,

Arlene Gaines
Project Officer
State & Tribal Programs Section

Enclosure

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FOR

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Surface Water Quality Bureau
New Mexico Environment Department

APPROVAL PAGE

Jodey Kougioulis Quality Assurance Officer, Surface Water Quality Bureau	12/10/15 Date
James Hogan Chief, Surface Water Quality Bureau	12·10·15 Date
Arlene Gaines Project Officer Water Quality Protection Division, EPA Region 6	1/26/16 Date
Curry Jones Chief, State and Tribal Programs Section, Water Quality Protection Division, EPA Region 6	1/26/16 Date

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ABBREVIATIONS

ADB	Assessment Database
ASTM	American Society for Testing and Materials
BMP	Best Management Practices
CFR	Code of Federal Regulations
CI	Confidence Intervals
CV	Coefficient of Variation
CWA	Clean Water Act
DO	Dissolved Oxygen
DQI	Data Quality Indicator
DQO	Data Quality Objectives
E. coli	Escherichia coli
GIS	Geographic Information System
GRTS	Grant Reporting and Tracking System
GWQB	Ground Water Quality Bureau
ID	Identification
LRG	Lower Rio Grande
MAS	Monitoring and Assessment Section
MDL	Method Detection Limit
MRL	Method Reporting Limit
MQO	Measurement Quality Objectives
µmhos/cm	Micromhos per centimeter
NM	New Mexico
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
SQUID	New Mexico Environmental Data Analysis System
NMSA	New Mexico Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
PSRS	Point Source Regulation Section
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RID	Request Identification
RPD	Relative Percent Difference
SDL	Sample Detection Limit
SLD	Scientific Laboratory Division
SOP	Standard Operating Procedure
SPRT	Standards, Planning and Reporting Team
STORET	Storage and Retrieval System
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
UAA	Use Attainability Analysis
EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WPS	Watershed Protection Section
WQA	Water Quality Act
WQS	Water Quality Standards
WQCC	Water Quality Control Commission
WQX	Water Quality Exchange

1. PROJECT MANAGEMENT

This document was prepared in accordance with U.S. Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans (EPA 2002a) and the EPA Requirements for Quality Assurance Project Plans (EPA 2001). The Surface Water Quality Bureau's (SWQB) Standard Operating Procedures are incorporated in the SWQB's Quality Assurance Project Plan (QAPP) by reference.

1.1. Distribution List

The Surface Water Quality Bureau's (SWQB) Quality Assurance (QA) Officer will provide a copy of the approved Quality Assurance Project Plan (QAPP) to the EPA Region 6 Project Officer and the Chief of the Surface Water Quality Bureau. The QA Officer will ensure that a copy of the approved QAPP is available on the Bureau website. Verification that SWQB staffs listed in Figure 1.2 and contractors have access to and comply with the requirements of the QAPP will be documented by written or electronic acknowledgement statements or documented training.

EPA: EPA Region 6 Water Division, State/Tribal Programs Section (6WQ-AT) 1445 Ross Avenue, Suite 1200 Dallas, TX 75202-2733 Telephone: (214) 665-7163 FAX: (214) 665-6490	Arlene Gaines, Project Officer (gaines.arlene@epa.gov)
New Mexico Environment Department (NMED): NMED/SWQB Harold Runnels Building, N2050 P. O. Box 5469 Santa Fe, NM 87502 Telephone: (505) 476-3671 FAX: (505) 827-0160	James Hogan, Chief (james.hogan@state.nm.us)

1.2. Project/Task Organization

All project activities covered by this QAPP are performed by NMED SWQB personnel or its contractors. The organization and responsibilities are discussed below.

1.2.1 Surface Water Quality Bureau

For the purposes of QA, the QA Officer reports to the Bureau Chief. The QA Officer is responsible for updating and maintaining the QAPP.

The SWQB is organized into four sections and one team that report to the Bureau Chief. The majority of Bureau personnel have responsibilities that include environmental data collection and analysis. Their responsibilities are summarized in Table 1.1. The Financial and Administrative Section and the Utility Operators Certification Program do not collect environmental data.

The Program Managers and Team Leaders of the Point Source Regulation Section (PSRS), Monitoring, Assessment, and Standards Section (MASS), and the Watershed Protection Section (WPS) are responsible for verifying that all applicable activities of these sections and teams comply with the provisions of this QAPP and all associated Standard Operating Procedures (SOP). All SWQB personnel who collect environmental data are responsible for the implementation of methods and procedures described in this QAPP, and must be familiar with and follow the provisions of this QAPP. In addition, Project Coordinators are responsible for verifying that all data collection, storage, and management activities related to the project comply with the provisions of this plan. Project Coordinators include leads of watershed and lake surveys, special water quality projects, Lead Inspectors for NPDES compliance monitoring, CWA §319 monitoring leads, and CWA §104(b)(3) Wetlands Program monitoring leads.

The management structure of the SWQB is shown in Figure 1.1. Organizational structure of the various sections and teams in Santa Fe and field offices is given in Figure 1.2.

Detailed descriptions and additional information on Surface Water Programs administered by the SWQB can be found in the Statewide Water Quality Management Plan (WQMP), the Continuing Planning Process (CPP) and other water quality planning related documents available on the Bureau's website at https://www.env.nm.gov/swqb/.

1.2.2 SWQB Contractors

The SWQB on occasion hires contractors to collect environmental data for the Bureau. Contractors must provide sufficient QA/QC information to ensure the data meet the Bureau's QA/QC requirements or must follow the Bureau QAPP. Each contractor will report and provide data to the appropriate Project Coordinator or designee.

The majority of environmental data collected by the SWQB are analyzed by NM Department of Health Scientific Laboratory Division (SLD) and other contract laboratories. Each analytical laboratory must provide QA/QC information and conform to the specifications and requirements of this QAPP. Each contract laboratory will be provided with a copy of this QAPP and will report and provide data to the appropriate Project Coordinator, QA Officer, or designee.

Table 1.1 Summary of SWQB Responsibilities

Organizational Unit	Responsibilities
Point Source Regulation Section (PSRS)	Administers the State's responsibilities for the National Pollutant Discharge Elimination System (NPDES) program in NM
Industrial Team	• Inspects public and private facilities in NM for federal NPDES permit and State compliance issues • Inspects water, wastewater, stormwater facilities in NM for federal NPDES permit and State compliance issues • Reviews and certifies NPDES permits • Reviews environmental assessments and environmental impact statements
Municipal Team	• Inspects public and private facilities in NM for federal NPDES permit and State compliance issues • Inspects water, wastewater, stormwater facilities in NM for federal NPDES permit and State compliance issues • Reviews and certifies NPDES permits • Reviews environmental assessments and environmental impact statements
Monitoring, Assessment, and Standards Section (MASS)	Acquires, integrates, analyzes and summarizes surface water quality data for NM
Monitoring Team	• Coordinates water quality surveys to collect and analyze water quality data in streams, rivers, and lakes of New Mexico for use in various Clean Water Act activities • Organizes and conducts chemical data collection efforts (nutrients, metals, bacteria, organics, radionuclides and cyanide) • Organizes and conducts physical data collection efforts (habitat, geomorphology, sondes, thermographs, streamflow and hydrology) • Organizes and conducts biological data collection efforts (algae/periphyton, phytoplankton, benthic macroinvertebrates and fish) • Verifies water quality assessments of chemical, physical and biological data, including lake and nutrient data, for use attainment determinations • Assists with development of Total Maximum Daily Loads (TMDLs) • Assists with refinement of water quality standards (WQS)
Assessment and TMDL Team	• Coordinates water quality assessment activities for NM • Assesses chemical, physical and biological data for use attainment determinations • Assesses lake and nutrient data for use attainment determinations • Coordinates TMDL activities for NM and develops watershed-based TMDL bundles • Develops and maintains the Integrated Report
Standards Planning & Reporting Team	• Maintains, refines and develops the State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) • Maintains and updates SWQB planning documents such as the Quality Management Plan, Statewide Water Quality Management Plan and Continuing Planning Process • Performs bureau-wide support tasks in program enhancement, quality assurance and project development
Watershed Protection Section (WPS)	Develops watershed stakeholder groups and watershed restoration projects and implements best management practices (BMPs) for the prevention/reduction of nonpoint source pollution.
NM Field Office Team	• Provides oversight of watershed and wetlands restoration projects, primarily in southern New Mexico • Reviews environmental assessments and environmental impact statements • Reviews proposed mining and milling projects and close-out plans to assist GWQB with NM Mining Act and Superfund • Implements BMPs to prevent/reduce nonpoint source pollution • Reviews CWA §401/§404 permits for southern NM
Watershed Implementation & Restoration Team	• Conducts implementation and effectiveness monitoring of watershed and wetlands restoration projects • Provides oversight of watershed and wetlands restoration projects, primarily in northern NM • New Mexico Reviews environmental assessments and environmental impact statements • Reviews proposed mining and milling projects and close-out plans to assist GWQB with NM Mining Act and Superfund • Reviews CWA §401/§404 permits for northern and central NM • Facilitates watershed restoration projects
Wetlands & Department of Transportation Team	• Provides oversight of watershed and wetlands restoration projects • Manages Wetlands Program • Reviews environmental assessments and environmental impact statements
Facility Operations Team	Administers Water and Wastewater Operators at all public water and wastewater utilities in New Mexico
Operator Certification Program	• Works with the New Mexico Water Quality Control Commission and the Utility Operators Certification Advisory Board to maintain and revise Utility Operator Certification regulations (20.7.4 NMAC). • Develops, schedules, and administers certification examinations. • Processes applications for certification and renewal. • Tracks all certified operators continuing education courses, evaluates training courses for relevance to program, and tracks compliance with operator certification requirements.

Figure 1.1 Management Structure of the SWQB

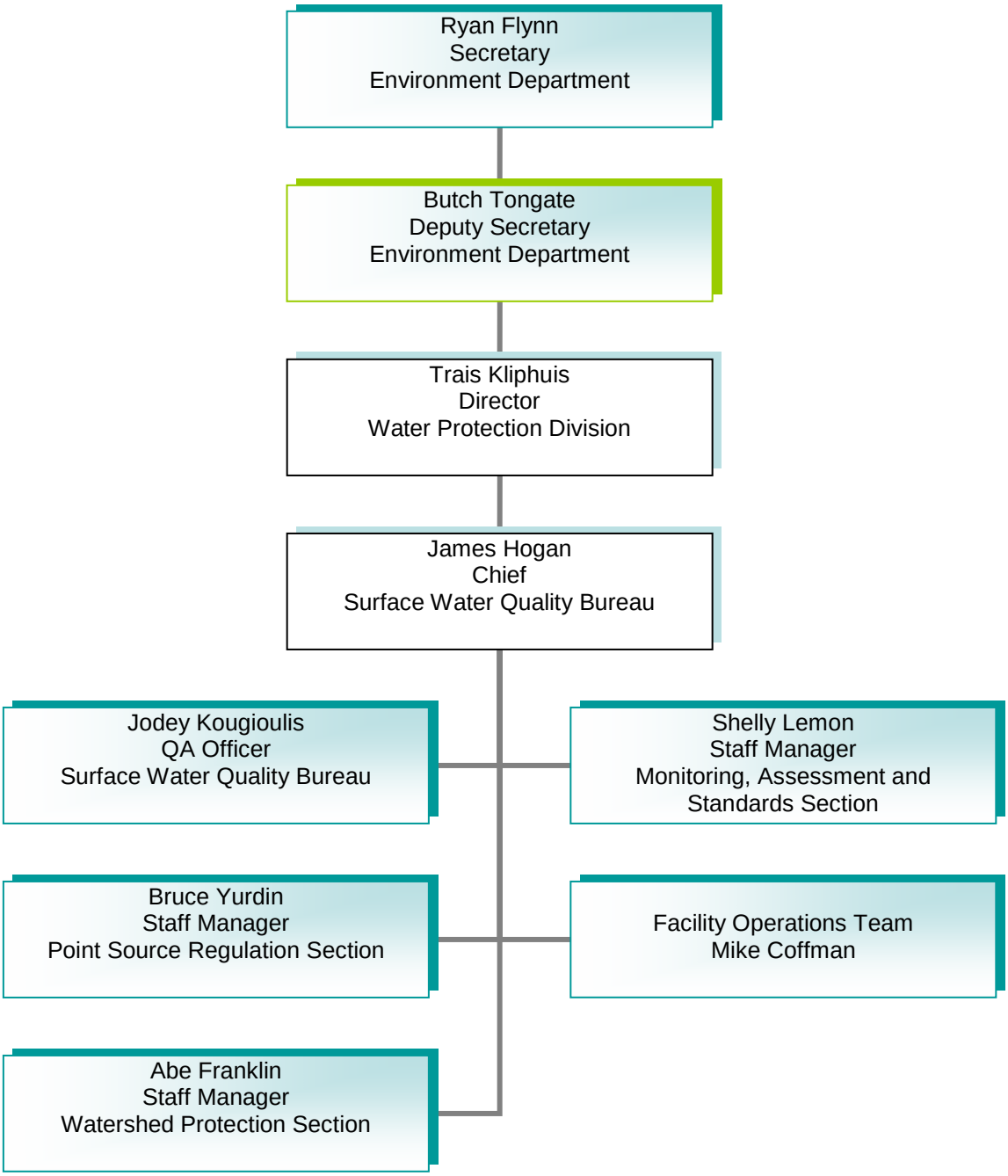
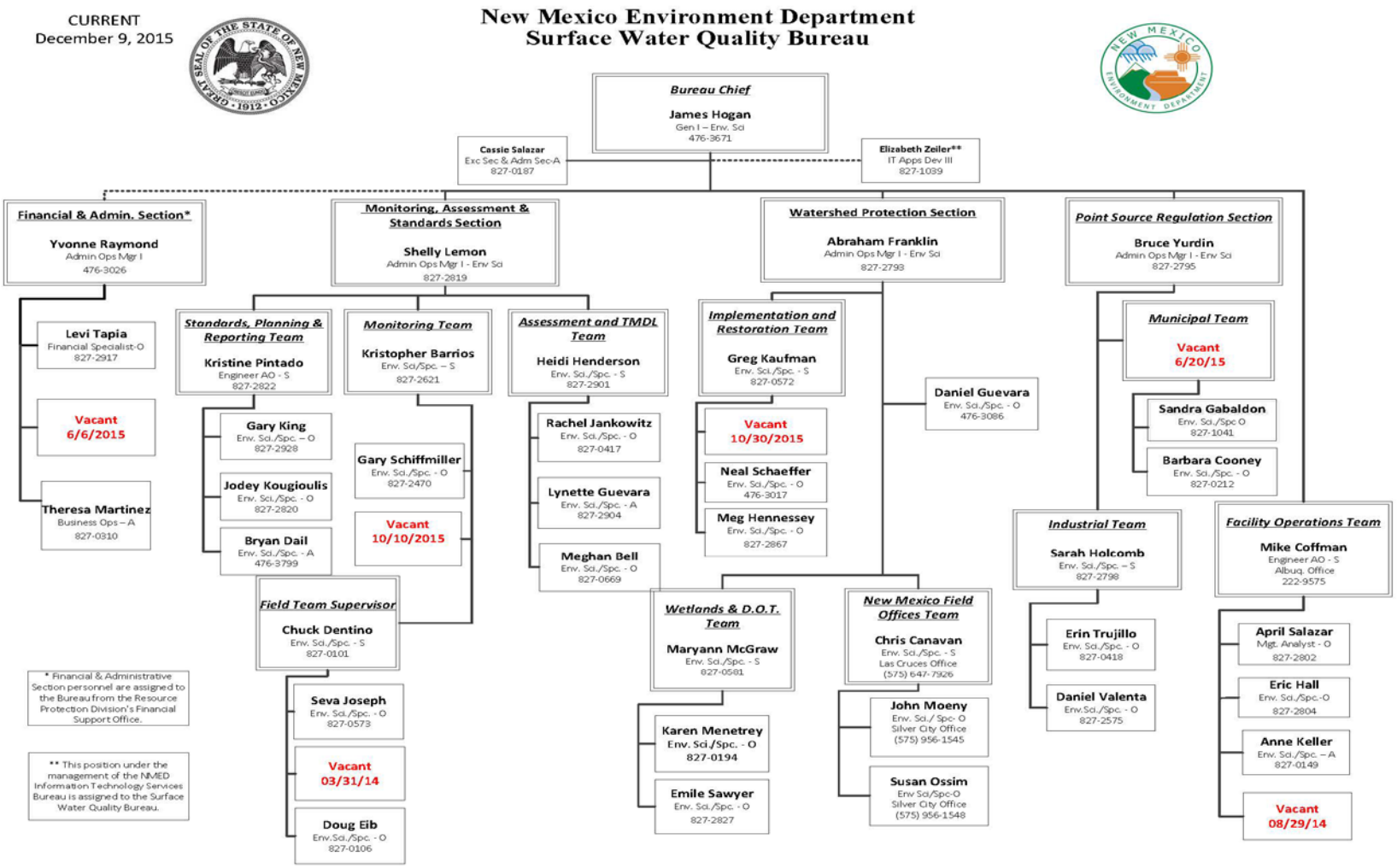


Figure 1.2 Surface Water Quality Bureau Organizational Chart January 2012



1.3. Problem Definition/Background

1.3.1 Background

Section 101(a) [Declaration of Goals and Policy] of the federal Clean Water Act (CWA) states that "The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) restates the objective of the CWA and goes on to say that the waters include "those in New Mexico."

In conformance with the CWA and 20.6.4 NMAC, the goal of the SWQB's water quality monitoring program is to generate and provide information to the public, the NMED and the EPA that can be used to restore and maintain the integrity of surface waters of the State of NM. To achieve this goal, the SWQB conducts water quality monitoring to meet responsibilities pursuant to grants or requirements under §§104(b), 106, 201, 205(j), 301(b), 303, 305(b), 314, 319(h), 401(a) and 604(b) of the federal CWA as well as sections of the NM Water Quality Act (WQA).

1.3.2 Problem Definition

The integrity or condition of New Mexico's surface waters may not always be known due to a lack of information or because of changing conditions. For example, the location of degraded waters and/or the level of degradation or contamination may not be known or may change as a result of human activities or natural occurrences. In other cases, the guidelines as promulgated in 20.6.4 NMAC for evaluating the condition of surface waters may change.

The SWQB addresses the problem of the need for information on the integrity or conditions of New Mexico's surface waters through the collection of chemical, physical and biological data.

1.4. Project/Task Description

1.4.1 Schedule

The SWQB identifies surface water quality problems and associated data needs by means of a structured, 8-year rotating basin, water quality survey and planning process. This eight-year rotation may include basin surveys over two consecutive years. These efforts identify waterbodies where water quality problems exist and serve to prioritize and direct the water quality monitoring program, watershed protection projects, and guides NPDES permitting and Standards revisions.

1.4.2 Summary of work and products

The SWQB conducts different types of monitoring depending on the specific objective, and uses different strategies to acquire the necessary data. Monitoring types and strategy details are described in Table 1.2. Details regarding monitoring decisions, outcomes and primarily responsible sections are found in Table 1.3.

Table 1.2 SWQB Environmental Monitoring Types and Strategy Details

Type of Monitoring	Monitoring Strategies
Water Quality Ambient/Assessment Monitoring – Collection and evaluation of ambient water quality data to obtain information to determine the status of the physical, chemical, and biological characteristics of the environment (i.e., if the existing and attainable designated uses of water are protected) and identify trends of improvement or deterioration in water quality parameters. Ambient/Assessment water quality monitoring may not apply for purposes of enforcement actions.	Targeted Monitoring - Collection and evaluation of environmental data from sites selected based upon known or suspected influences on water quality (both natural and anthropogenic) to define water quality in a specific segment or region and at the same time, and to partition out potential sources and causes of impairment.
	Fixed-Station Monitoring - The repeated long-term sampling or measurement of water quality parameters at representative locations for the purpose of determining environmental quality characteristics and trends.
	Water Quality Surveys - Water quality sampling of a localized watershed or a distinct sub-watershed area. The fundamental goal of this design is to comprehensively assess all possible sources of stress and influence within a defined localized area. It is dependent on the ability to identify and locate potential sources of human influence and natural variation prior to and during sampling.
NPDES Permit Compliance Evaluation - Collection and evaluation of data, including self-monitoring reports, to determine whether pollutant concentrations in a waterbody and/or discharge effluent are in compliance with the limits and conditions specified in an individual NPDES permit or in the State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) for the purposes of considering enforcement action. Compliance monitoring does not apply for purposes of determining attainment of uses. More information regarding NPDES Permit Compliance Inspections can be found in the NPDES Compliance Inspection Manual (EPA 2004).	NPDES Compliance Evaluation Inspection – A review of a permitted facility's records and a visual examination of the treatment facility, effluent, and receiving waters. Records reviews vary depending on the type of facility and specifications in the permit, but may include: monitoring reports, inspection reports, permit applications, permits, past or pending EPA enforcement actions, laboratory records, operational records, facility design records, self-monitoring records, employee training records, nutrient management records, etc. Visual examinations include a walk-through of the facility to determine the general status (appearance, operation, treatment quality, discharge status, etc.) of the treatment unit(s).
	NPDES Compliance Sampling Inspection – Incorporates all components of a Compliance Evaluation Inspection and adds to it the collection of effluent samples and verification of flow measurements to determine effluent quality and receiving-stream quality. Samples of the receiving stream above and below the outfall are also collected in some instances to evaluate the chemical impact of the effluent on the stream.
	NPDES Performance Audit Inspection - Evaluation of permittee's sampling, laboratory and record-keeping procedures. Inspectors verify the permittee's reported data and permit compliance by reviewing appropriate records and observing the permittee going through the steps of the self-monitoring process: collecting samples, measuring flow, processing data, calibrating equipment and preparing reports.
	NPDES Reconnaissance Inspection - An abbreviated Compliance Evaluation Inspection often used to determine the general status of a facility or to focus on only one aspect of compliance, such as effluent quality, without performing a complete review.
Water Quality Standards (WQS) Compliance Monitoring for Enforcement Purposes- Collection and evaluation of data to determine whether pollutant concentrations in a waterbody are in compliance with the limits and conditions specified in the State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) for the purposes of considering enforcement action. Compliance monitoring does not apply for purposes of determining attainment of uses.	WQS Compliance Sampling - Collection and evaluation of environmental data from sites selected based upon known or suspected influences on water quality (both natural and anthropogenic) to determine compliance with State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC) for purposes of considering enforcement action. This type of monitoring is similar to Targeted Monitoring with modified procedures pertaining to number of samples collected and chain of custody requirements.
Effectiveness Monitoring	Collection and evaluation of environmental data to monitor and model changes in physical, chemical, and biological water quality indicators associated with nonpoint source pollution control projects. Sampling design typically consists of upstream/downstream locations to be sampled before and after project implementation.

Table 1.3 SWQB Environmental Monitoring Summary

	Monitoring Objective	Question or Decision	Decision Criteria	Products/Outcomes	Monitoring Type	Primary Responsible Sections		
						MASS	WPS	PSRS
Primary Objective	Assess designated use attainment for the Integrated Report and provide information to the public on the condition of surface water	Are sampled waterbodies meeting WQS criteria?	WQS as interpreted by the Assessment Protocols	Survey Report; Integrated Report	Ambient/ Assessment	X		
Secondary Objectives	Develop load and waste load allocations for TMDLs	What is the maximum pollutant load a waterbody can receive and meet the requirements of the WQS?	WQS as interpreted by the Assessment Protocols	TMDL loading calculations and NPDES permit limits	Ambient/ Assessment	X		X
	Evaluate restoration and mitigation measures implemented to control NPS pollution	Have watershed restoration activities and mitigation measures improved water quality?	WQS as interpreted by the Assessment Protocols	Project Summary Reports, NPS Annual Report, Integrated Report (Delisting)	Effectiveness	X	X	
	Develop or refine surface WQS	Are existing uses appropriate for the waterbody?	Are data sufficient to support a petition to the WQCC to revise WQS	Use Attainability Analyses (UAA); Amendments to NM WQS	Ambient/ Assessment	X		
	Develop NPDES permit limits	What are the maximum concentrations pollutants that can be discharged and meet the requirements of the WQS?	WQS and receiving water assimilation capacity	NPDES Permit Limits	Ambient/ Assessment			X
	Evaluate compliance with WQS	Does the water quality meet the WQS requirements?	WQS and WQMP	Enforcement Action (Compliance Order or Civil Action)	WQS Compliance	X		X
	Evaluate compliance with NPDES permit limits	Does the effluent quality meet the NPDES permit requirements?	NPDES permit limits	Inspection Reports	NPDES Permit Compliance			X
	Develop wetlands standards	What are the appropriate criteria for wetlands?	Data sufficient to support wetlands WQS	Amendments to NM WQS	Ambient/ Assessment	X	X	
	Respond to citizen complaints, fish kills, spills and emergencies	Is the water or effluent quality a hazard to human or environmental health?	WQS	Public communication	Ambient/ Assessment	X	X	X

1.5. Quality Objectives and Criteria for Measurement Data

The establishment of quality objectives ensures that the SWQB makes decisions relating to water quality management that are:

- consistent with the mission, goals and objectives of the NMED and SWQB;
- based on proper application of policy and guidance;
- based on all available pertinent information;
- based on a thorough understanding of the information; and
- based on accurate information.

Data Quality Objectives (DQOs) are statements about how certain the decision-maker wants to be about the decision that will be made based on the data. For SWQB environmental monitoring, data collected to support the decisions listed in Table 1.3 should be of sufficient quality to provide a high level of confidence in the resulting decisions.

Measurement Quality Objectives (MQOs) are statements about how good the measurements need to be in order to be useful as inputs to the decision process. MQOs are often expressed as statements about the acceptable values of Data Quality Indicators (DQIs).

There are four quantitative DQIs: accuracy, precision, completeness and sensitivity. Accuracy and precision are monitored by Quality Control (QC) samples. Completeness is calculated based on the required number of samples. Sensitivity is monitored through instrument calibration and the determination of method detection and reporting limits. The three qualitative DQIs, bias, representativeness and comparability are assessed through the sample design process and selection of methods.

1.6. Special Training/Certifications

Although no special certification is required to implement this QAPP, proper training of field personnel represents a critical aspect of QC. All SWQB staff with the responsibility of collecting water quality data will have sufficient training and experience. Additionally, all newly hired personnel undergo a period of apprenticeship and are accompanied by experienced staff when collecting samples or field measurements until the Project Coordinator determines that the staff person is appropriately trained and qualified to collect quality data. On occasion, interns assist with data collection efforts and are directly supervised by qualified staff throughout the course of data collection efforts.

All SWQB personnel are required to be familiar with the Statewide Water Quality Management Plan (WQMP) and Continuing Planning Process (CPP) and the Quality Management Plan (QMP). Supervisors will provide these and other applicable documents to all new staff.

All SWQB personnel are required to complete the National Safety Council Defensive Driving Course and retain a copy of the Defensive Driving training certificate. Additional field safety training that are encouraged and provided by NMED as funds allow are detailed in the SWQB's Field Safety Manual and Job Hazard Analyses. All personnel participating in field activities are required to be familiar with these documents.

All SWQB Program Managers and staff who are responsible for collecting and/or managing data/information and producing planning or reporting documents are required to be familiar with this QAPP and the most current associated Standard Operating Procedures for Data Collection [SOPs].

The SWQB's PSRS inspection personnel are required to receive NPDES inspector training and be familiar with this QAPP and the NPDES Compliance Inspection Manual (EPA 2004a). This training includes, among other things, instruction in proper entry, evidence gathering, documentation and report writing procedures. All new PSRS personnel are accompanied on NPDES inspections by experienced inspection officers until the Program Manager or direct Supervisor determines that the staff person is

appropriately trained and qualified to conduct an inspection, deal with compliance issues and write an inspection report. In addition to the training requirements described above, inspectors conducting inspections on behalf of EPA Region VI to fulfill CWA §106 grant requirements are required to obtain EPA credentials. This requires that the inspector receive the minimum training described in Appendix 3 of the September 2004 Guidance for Issuing Federal EPA Inspector Credential to Authorize Employees of State/Tribal Governments to Conduct Inspections on Behalf of EPA (EPA 2004b). Copies of training records are maintained in the PSRS Personnel files.

Many of the data collection and analytical methods and procedures used by the SWQB are based on or have been adapted from methods and procedures developed by other entities such as EPA. Workshops, conferences and other types of training and educational forums on these methods and procedures are offered periodically. As resources allow, SWQB staff are encouraged to seek out and attend appropriate events and to share what they have learned with other staff. Information pertaining to attending these types of events is maintained in personnel files and, as appropriate, by the Program Manager.

1.7. Documentation and Records

1.7.1 Documentation

This QAPP and referenced procedures includes methods related to the collection, processing, analysis, and reporting and tracking of environmental data. This QAPP is updated tri-annually and made available to SWQB staff and contractors responsible for collecting, processing, and analyzing data.

Data generated from projects covered by this QAPP must be of sufficient quality to withstand challenges to their validity, accuracy, and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures. The documentation of all environmental data collection activities must meet the following minimum requirements:

Data and associated information must be documented directly, promptly, and legibly. All reported data must be uniquely traceable to the raw data. Data reduction/transformation formulas must be documented.

All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification (Request Identification [RID] number), station or location identification (if applicable), name (signature or initials) of the person collecting the data, and date of collection.

Any changes to the original (raw data) entry must not obscure the original entry. The reason for the change must be documented, the change must be initialed and dated by the person making the change and approved by the Program Manager.

Each section within the SWQB has internal policies and guidelines for managing records. Tables 1.4 and 1.5 summarize how records are managed by the bureau. Other specific documentation requirements are discussed below and throughout this QAPP and the most current NMED/SWQB SOPs.

Documentation of Planning Processes

Each project taken on by the SWQB has a planning process that is documented in a variety of different ways depending on the type of project. These documents include work plans, Joint Power Agreements, Contracts, project specific Field Sampling Plans or Sample and Analysis Plans and project specific QAPPs. All of these project planning documents must meet the requirements specified in the QMP and this QAPP. Each Project Coordinator is responsible for ensuring that the planning process is documented.

Documentation of Data Collection (Field) Activities

Records are maintained for each data collection activity to ensure that samples and data are traceable and defensible. Field records will be documented on forms or in designated field logbooks (WPS only) to provide a secure record of field activities, observations and measurements during sampling. Field data and observations will be recorded in real time on activity-specific data forms. Entries are never erased nor

pages removed. Mistakes are lined out and initialed by the data recorder. Completion of appropriate field documentation and forms for each sample is the responsibility of the Project Coordinator or designee.

Documentation of Analytical (Laboratory) Activities

Documentation of all water quality samples to be analyzed by an external laboratory is critical for tracking data and evaluating the success of any activity. Each analytical laboratory is required to provide the SWQB with a current QAPP (or equivalent) and must meet the requirements specified in this QAPP. Documentation may include, but is not limited to, the following:

- Calibration and maintenance records for all instruments and equipment involved in the collection of environmental data;
- Records of preparation of calibration standards, spiking solutions, and dosing solutions such that each unique preparation can be tracked to the original (neat) material;
- Lot numbers for all standards, stock solutions, reagents, and solvents;
- Records of all sample processing or preparation for testing such that it is traceable to sample receipt records;
- All sample analyses request forms and results of analyses (all rejected data are accompanied by explanations of the failure and the corrective action); and
- All data reduction/transformation formulas such that reported data can be reproduced from the raw data.

1.7.2 Records

Water quality survey project files maintained by the MASS for water quality surveys include numerous and diverse documents and records. Project files are maintained by the Project Coordinator; however, the file is used by numerous staff within the section for various purposes. To ensure consistency and accessibility to all users, water quality survey and special studies project files are maintained in three ring binders as follows:

Label each binder on spine and front cover with the following information:

Survey Title
Survey Year(s)
Project Coordinator
[Binder X of X]
Hydrologic Unit Code/Watershed

Create tab dividers with labels for the sections listed below and place all associated documents and records in the applicable section of the binder in the same order as listed below:

- Introductory Information
  - Map(s) of survey area
  - Field Sampling Plan
- Background Information
  - Reconnaissance Information
  - Access information (if not in database)
  - Supplemental information pertinent to the survey (land-use, land activities, BMPs, etc.)
- Chemical Data
  - Field Forms
  - Analytical Laboratory submittal forms – date stamped copies (in lieu of chain of custody)
- Physical Data
  - Habitat Field Sheets
  - Sonde and thermograph deployment sheets
  - Flow field forms and flow calculation worksheets
- Biological Data
  - Macroinvertebrates - Benthic macroinvertebrate collection forms

  - Periphyton/Chlorophyll collection forms
  - Phytoplankton and/or diatom collection forms
  - Fish Collection Forms
- Data Verification/Validation
  - Data Verification and Validation Worksheet and associated attachments
  - Additional paperwork associated with the verification and validation process
- External Data (paper or CD form)
- Sources/Causes
  - Probable Source Field Forms

1.7.3 Reporting Documents

Numerous reporting documents are produced by the various sections of the SWQB and are summarized in Table 1.4. In addition to the reports described below many SWQB projects require the submittal of progress reports to provide periodic status reports on a project.

Table 1.4 Summary of SWQB Reporting Documents

Organizational Unit	Reporting Documents Produced	Description
Point Source Regulation Section (PSRS)	Inspection Reports	Inspection reports are partially based on a review and evaluation of records maintained by the facility and PSRS. Records reviews vary by the type of facility (different facilities/permits have different record keeping requirements) and may include: monitoring reports, previous inspection reports, permit applications, permits, and past or pending EPA enforcement actions, laboratory records, site self-inspection records, employee training records, nutrient management records, etc. Results from inspections are documented on EPA from 3560-3 and are discussed in the Inspection Report. Inspections Reports include details on all findings made during an inspection and may include photographs taken during the inspection. Inspection reports are submitted to both the facility operator(s) and EPA. Inspection reports may be used to determine compliance with the federal CWA.
Monitoring, Assessment, and Standards Section (MASS)	State of NM Clean Water Act §303(d)/§305(b) Integrated Report	A summary of the water quality status of NM waters and the management actions necessary to protect and restore them.
	Water Quality Survey Summaries	Summary of the results of a water quality survey that includes a map of the study area, descriptions of the sampling stations, and a summary of the sampling events.
	TMDL Planning Documents	A written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards including consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads.
	State of NM Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC)	Defines water quality goals by designating the use or uses to be made of the water and by setting criteria necessary to protect those uses for the purposes of protecting public health or welfare, enhancing the quality of water and serving the purposes of the CWA.
	Statewide Water Quality Management Plan/Continuing Planning Process	Establishes state's processes for permitting, planning and implementation of water quality programs.
	Quality Management Plan	Describes the Bureau's quality system for planning, implementing, documenting and assessing the effectiveness of environmental data operations.
	Quality Assurance Project Plan	Planning document that describes the necessary QA procedures, QC activities, and other technical activities that are implemented by the SWQB.
Watershed Protection Section (WPS)	Nonpoint Source Pollution (NPS) Annual Report	Provides an overview of NPS management related activities conducted in NM each year and summarizes the status of NPS 319(h) projects and wetland restoration activities.
	Project Summaries	Provide detailed information on the results of individual watershed restoration projects.

1.7.4 Location of Documents

Physical files are maintained for all projects undertaken by the SWQB. Table 1.5 identifies the contents of each file type and the respective locations. The public has access to SWQB files in accordance with the Inspection of Public Records Act, NMSA 1978, Sections 14-2-1 et seq. and the NMED Inspection of Public Records Policy 01-06 (2004). All SWQB files and documents will be maintained in accordance with the New Mexico Executive Record Retention and Disposition Schedule (**1.18.667**.1 NMAC - N, 7/8/2000; A, 5/14/2007).

Table 1.5 Locations of Documents Available from the SWQB

Records	Location	Contents
Project Files	Project Coordinator or designee's office or SWQB Library (Ste. N2104 Rolling Files)	A project file is maintained for each project undertaken by the SWQB. The Project Coordinator creates the file immediately upon assignment and maintains the file until completion. Each project file includes all documents (hard copy and/or electronic copies) pertaining to the project, including data forms, data reports, QA/QC and Data Verification and Validation information, notes, etc. Once a project is considered complete the file is transferred to the appropriate SWQB Library location for according to that section's record retention and disposition schedule.
Quality Assurance Files	QA Officer's office or SWQB Library (Ste. N2104 Rolling Files)	Quality Assurance files include all information relating to QAPP and QMP revisions, QAPP training, contractor's QA information, copies of Data Validation and Verification results and Data Quality Assessment information.
Administrative Record	SWQB Ste. N2100	The Administrative Record contains all documents that set forth decisions made by the SWQB regarding the development of the Integrated Report and TMDL documents including: final decision documents such as assessment sheets that contain information and data used to make designated use impairment determinations, final TMDL documents and associated public comments and EPA approval letters, historic versions of the Integrated Report and associated Record of Decision, all guidance documents used to make any decisions, all relevant factual material considered by the SWQB in making its decision, and any relevant comments/correspondence from outside parties relating to the aforementioned decisions and/or documents.
NPDES Records, PSRS Public Files	SWQB Ste. N2050	All information pertaining to NPDES permits and inspections. Files are maintained by facility type and filed under facility type, name and permit number in a "Reports" file. Results of non-traditional NPDES inspections and inspection reports are filed under "Reports" by NPDES permit type (i.e., CAFO, storm water, etc.). Any additional records obtained from the facility during an NPDES inspection or submitted by a facility operator for clarification subsequent to an inspection are also filed under the appropriate "Reports" file. Reports and files are maintained indefinitely; however, older files are transferred to microfiche, compact disc, or archived.
Other Records	SWQB Premises	Each Section within the SWQB maintains the documents produced by the section. In addition, each section also maintains reference and informational documents pertinent to that section. Contact Program Manager for information on exact locations.

2. DATA GENERATION AND AQUISITION

This section provides information on how environmental data are obtained and managed by the SWQB. The guidelines specified in this section were developed to ensure that data collected for ambient/assessment or compliance purposes are appropriate and reliable and of sufficient quality to fulfill the project goals and objectives.

2.1. Sampling Process (Experimental) Design

General guidelines for the sampling process design for ambient/assessment and compliance monitoring are described below. Information regarding specific sampling designs can be found in the Field Sampling Plans. Field Sampling Plans for surveys conducted under this QAPP include sampling locations, sampling frequencies, dates/timeframes, sample size and frequency and location of QC samples. A summary of the previous year's Field Sampling Plans are attached as Appendix D

The sampling process design for projects implemented under this QAPP will vary depending on the objectives of the project; however, the majority of the sampling done by the SWQB is based on some form of a judgmental sampling design. Judgmental sampling design is the selection of sampling locations, dates, parameters, and frequencies based on knowledge of the features and conditions under investigation and on professional judgment, with no randomization. The SWQB is aware that although a judgmental sampling design can be implemented at a relatively low cost, the design does not allow the level of confidence to be quantified and limits the statistical inferences that can be made (EPA 2002b). In New Mexico however, given the limited number of perennial waterbodies, SWQB achieves a near census of these waters limiting this issue.

2.1.1 Water Quality Ambient/Assessment Monitoring

The waterbodies that are surveyed during a given calendar year are determined by immediate need and age of existing data. Waterbodies with data greater than five years old are given a higher priority. An eight year rotational monitoring schedule for water sampling activities is currently being utilized. This rotational cycle may be modified as necessary to reflect changing priorities and special requirements. Watershed surveys are undertaken by MASS; however representatives from other SWQB sections provide input on study design.

The Monitoring, Assessment, and Standards Section also conducts water quality surveys on a watershed scale using a targeted monitoring approach because of the usefulness of this approach in relating water quality data to specific water quality problems. Details on the development of water quality survey plans are found in the Field Sampling Plan SOP 2.1.

Table 2.1 Parameters Commonly Sampled for Ambient/Assessment Monitoring Purposes

Analytical Suite	Parameters	Notes, if applicable
Field Parameters	pH	Both instantaneous and long-term data logger
	Temperature	Both instantaneous and long-term data logger
	Specific Conductance	Both instantaneous and long-term data logger
	Dissolved Oxygen (DO)	Both instantaneous and long-term data logger
	Turbidity	Both instantaneous and long-term data logger
	Flow (Discharge)	Flow not taken if USGS gage present
Metals	Dissolved Metals	
	Total Al, Hg and Se	Total Al: 10 μm filter for Turbidity > 30 NTU, Total Al requires 10 μm filtration
Anion and Cations	Alkalinity	
	Bicarbonate	
	Calcium	For hardness calculation
	Carbonate	
	Chloride	Subject to segment-specific numeric criteria
	Hardness	Must be collected concurrently with metals for which the WQS criterion is “hardness dependent”
	Magnesium	For hardness calculation
	Sulfate	Subject to segment-specific numeric criteria
	Total Dissolved Solids	Subject to segment-specific numeric criteria
	Total Suspended Solids	
Nutrients	Ammonia	
	Nitrate plus Nitrite	
	Phosphorus, total	
	Total Kjeldahl Nitrogen	
Bacteria	Escherichia coli	
Organic Chemicals	Base/Neutral/Acids Semivolatiles (SVOCs)	See USEPA Method 8270D or Appendix B for list of specific SVOCs analyzed
	Volatile Organic Chemicals (VOCs)	See USEPA Method 8260B or Appendix B for list of specific VOCs analyzed
Radionuclides	Radium 226/228	
	Gross α/Gross β	
Other Parameters	Cyanide	WQS criteria is for dissolved and weak acid dissociable cyanide
	Total Chlorine Residual	
	Surfactants	Indicator for waste water and Prymnesium parvum
	Chlorophyll a	Collected for nutrient assessment
Toxicity	Ambient Toxicity	Analysis performed by USEPA Region VI
Biological	Macroinvertebrates	
	Fish	
	Periphyton	
	Phytoplankton	
Physical	Habitat	

Table 2.2 Parameters Associated with Designated Uses

Designated Use	Parameters
Aquatic Life[1]	- Dissolved oxygen, pH, specific conductance and turbidity (5-8 day sonde deployment, generally in late summer and fall) - Temperature (minimum 30-day thermograph summer deployment) - Total nutrients[2], total metals[3], dissolved metals[4], hardness -Flow (if a stream) and depth (if a lake)
Primary or Secondary Contact	*Escherichia coli* and pH
Domestic Water Supply	Total nutrients[2], total metals[3], dissolved metals[4], radionuclides[5], and organics[6]
Irrigation	pH, dissolved metals[4], TDS/TSS, hardness, chloride, and sulfate
Livestock Watering	Total nutrients[2], total metals[3], dissolved metals[4], and radionuclides[5]
Wildlife Habitat	Total metals and cyanide
Human Health	Dissolved metals[4] and organics[6]

1 Parameters collected for aquatic life use are also used to assess narrative standards such as biological integrity, bottom deposits, plant nutrients, and turbidity.
2 Total Nutrients include nitrate + nitrite, ammonia, total Kjeldahl nitrogen, and total phosphorus.
3 Total metals include mercury and selenium at a minimum.
4 Dissolved metals include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.
5 Radionuclides generally include gross alpha/beta and Ra-226 + Ra-228.
6 Organics include base/neutral acid extractables (Method 8270) and volatile organic compounds (Method 8260).

Core biological indicators for surface waters

SWQB measures biological indicators of water quality at selected sites when core indicators indicate reasonable probability impairment or to support special studies. Core biological indicators may include:

- Benthic macroinvertebrate collection (during index period – August through November), identification, and enumeration
- Fish survey (during index period), identification, and enumeration
- Nutrient survey (during index period) to include chlorophyll *a*, ash free dry mass, and periphyton community composition
- EMAP habitat survey (during index period) to include physical habitat data such as substrate composition, geomorphology, and riparian health assessments
- Fish tissue samples for updates to fish consumption advisories

2.1.2 NPDES Permit Compliance Evaluations

The federal NPDES permit program is the principal mechanism used by New Mexico for the protection of its surface waters from pollution by point-source discharges. Under this program, a permit specifies the amounts and concentrations of contaminants that a permittee may discharge to a waterbody. In addition, various (depending on the type of facility permitted) administrative (e.g., signatory, reporting and legal, etc.) and procedural (e.g., frequency and type of monitoring and analysis, etc.) requirements, and specific structural (e.g., detention/retention basins, vegetated swales and natural depressions, infiltration of runoff

onsite, etc.) and non-structural (e.g., good housekeeping, preventive maintenance, spill prevention and response procedures, periodic inspections, employee training, nutrient management, etc.) pollution prevention measures and practices may be specified.

New Mexico does not directly implement the federal NPDES permitting program; however, the Point Source Regulation Section provides assistance to EPA in the following ways:

- Conducting compliance inspections on behalf of EPA;
- Providing information to the regulated community and the public;
- Reviewing NPDES permits proposed by EPA to assure that these permits are compliant with applicable provisions of the federal Clean Water Act §§208(e), 301, 302, 303, 306, and 307 and appropriate requirements of state law;
- Issuing CWA Section401 State Certification for all NPDES permits to assure compliance with applicable state water quality standards.

EPA categorizes NPDES permits as either “municipal,” “non-municipal (often termed “industrials”),” or “federal.” Municipal permits are issued for publicly owned community wastewater treatment plants. Other dischargers are classified as non-municipal or federal. Many of the discharges covered by individual NPDES permits for non-municipal sources are from small private domestic wastewater or mining operations. Discharges covered by general NPDES permits include Concentrated Animal Feeding Operations (CAFOs) and storm water run-off associated with construction or industrial facilities. NPDES permittees are further categorized by EPA as either “major” or “minor” dischargers. Major municipal permittees are generally those with design flows of one million gallons per day (MGD) or greater. Industrial permittees are classified based upon a number of factors, including the type of industry, chemical constituents in the discharge and designated uses of the receiving stream.

According to EPA policy, all active permitted facilities classified as major (municipal, non-municipal or federal) should be inspected periodically by either EPA or the SWQB’s PSRS. Each year EPA coordinates with the PSRS to identify inspections that will be conducted by the PSRS or EPA. Facilities classified as minor dischargers are inspected on a prioritized basis. The priority list is based primarily on the date of the last inspection, with the facilities having gone the longest without an inspection receiving the highest priority. Additional factors considered when determining which minor facilities to inspect include citizen complaints, specific requests from EPA, and proximity to the above major and traditional minor facility inspection locations.

Several methods are used for ensuring compliance with environmental laws and regulations. These include conducting NPDES compliance evaluation activities (including inspections) to detect violations and create a strong enforcement presence. Enforcement actions may be taken by EPA against violators to correct violations. Inspections are a crucial link in this effort. An effective enforcement program begins with individual inspections and the specific enforcement responses to violations detected by those inspections. A principal function of an inspection, regardless of inspection type (evaluation, sampling, audit or reconnaissance, see Table 1.2 for descriptions) is to detect and document violations at the facility. Evidence collected during the inspection supports the resulting enforcement action that will bring the facility into compliance with EPA regulations. Inspections can also provide an opportunity to communicate regulatory requirements to the facility operator, thus enhancing their ability to meet EPA program requirements. Requirements for inspection of NPDES permittees are addressed in §308 of the CWA. Guidelines for conducting these inspections are available in the NPDES Compliance Inspection Manual (EPA 2004).

Effluent samples collected by the PSRS in conjunction with an NPDES permit compliance sampling inspection are collected from the facility outfall sampling location if practical and appropriate; and from existing stations, if available. If pre-existing stations are not available, then the Lead Inspector will select stations from a location that is representative of the effluent discharge quality. An accessible station will be selected far enough upstream from the discharge point to eliminate any possibility of influence from the discharge. A downstream station will be selected at a point where the effluent is completely mixed in

the receiving water. This point can be determined by checking the specific conductance of a transect taken completely across the receiving water. When the readings are consistent, (±10 µmhos/cm) the effluent is considered to be completely mixed for sampling purposes. Table 2.2 provides a general summary of the parameters commonly sampled for compliance monitoring purposes. Sampling frequency is once per compliance sampling inspection event and the number of samples taken is one for all parameters except bacteria, which has a sample size of two. Any deviations from the generalized sampling plan set forth in Table 2.3 is documented as part of the NPDES permit compliance sampling inspection. Specific procedures, methods, and consideration are documented in SOP 8.3 (NPDES Wasterwater Sampling.

Table 2.3 Parameters Commonly Sampled for NPDES Permit Compliance Evaluation Purposes

Analytical Suite	Parameters	Notes, if applicable
Field Parameters	pH	
	Temperature	
	Specific Conductance	
	Dissolved Oxygen (DO)	
	Turbidity	
	Flow (Discharge)	Inspection team evaluates permittee's flow-measuring equipment and uses the flow obtained if the equipment is found to be acceptable
Metals	Dissolved Metals	List of metals analyzed is determined on a permit-specific basis
	Total Metals	List of metals analyzed is determined on a permit-specific basis
	Hardness	Must be collected concurrently with metals for which the WQS criterion is "hardness dependent"
Anion and Cations	Alkalinity	
	Bicarbonate	
	Calcium	
	Carbonate	
	Chloride	
	Fluoride	
	Magnesium	
	Potassium	
	Sodium	
	Sulfate	
	Total Dissolved Solids	
	Total Suspended Solids	
Nutrients	Ammonia	
	Nitrate plus Nitrite	
	Phosphorus, total	Orthophosphate is analyzed only when specifically requested
	Total Kjeldahl Nitrogen	
	Total Organic Carbon	Sampled only if required in NPDES permit
	Chlorophyll a	Sampled only if required in NPDES permit
Bacteria	Fecal coliform	Duplicate Samples Required
	Escherichia coli	
Other Parameters	Cyanide	Sampled only if required in NPDES permit; WQS criterion is for dissolved and weak acid dissociable cyanide
	Biochemical Oxygen Demand (5-day)	

Analytical Suite	Parameters	Notes, if applicable
	Chemical Oxygen Demand	Sampled only if required in NPDES permit
	PCBs	Sampled only if required in NPDES permit
	Total Chlorine Residual	Sampled only if required in NPDES permit

2.1.3 WQS Compliance Monitoring for Enforcement Purposes

The sampling process design for enforcement purposes will be developed on a case by case basis in cooperation with EPA to determine sampling locations, frequency of data collection and parameters to be sampled.

2.1.4 Effectiveness Monitoring

The study designs for projects to be monitored for effectiveness are described in project QAPPs. The study design will generally consist of sampling stations both upstream and downstream of the project areas, with sampling conducted before and after project implementation (Grabow et al. 1998). Exact locations will be determined in the field with cooperator assistance for each project. For temperature-related projects, thermographs are generally deployed at the selected locations between May and September of each monitoring year to construct a continuous record of temperature during this period to identify maximums and minimums, as well as diel fluctuations. The thermographs will be deployed in locations representative of ambient stream conditions, generally in the transition between a riffle/run and a pool, or at the toe of a pool, rather than in shallow riffles or deep pools. Certain locations may be selected for analysis with the Stream Segment Temperature Model (SSTEMP, Bartholow 1999). At these locations additional measurements will be collected such as channel geometry, flow, canopy cover, and meteorology to feed into the model.

2.2. Sampling Methods

Methods of sample collection, preservation and handling used in determining water quality as a part of this QAPP shall be in accordance with methods described in the following references or otherwise approved by EPA:

- “Guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act,” 40 CFR Part 136 or any test procedure approved or accepted by EPA using procedures provided in 40 CFR Parts 136.3(d), 136.4 and 136.5;
- Standard Methods for the Examination of Water and Wastewater, latest edition, American Public Health Association;
- Methods for Chemical Analysis of Water and Waste, and other methods published by EPA Office of Research and Development or Office of Water;
- Techniques of Water Resource Investigations of the USGS;
- Annual Book of American Society for Testing and Materials (ASTM) Standards. Volumes 11.01 and 11.02, Water (I) and (II), latest edition, ASTM International;
- Federal Register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations;
- National Handbook of Recommended Methods for Water-Data Acquisition, latest edition, prepared cooperatively by agencies of the U.S. Government under the sponsorship of the USGS; or
- Federal Register, latest methods published for monitoring pursuant to the Safe Drinking Water Act regulations.

Detailed procedures for collecting environmental data are provided in the most current NMED/SWQB SOPs. All field activities will be conducted in accordance with the SOPs; however, site conditions or project-specific data collection objectives may necessitate the use of alternative field procedures not included in the SOPs. The use of field methods other than those presented in the SOPs must be approved by the Program Manager and documented properly.

2.3. Sample Handling and Custody

This section describes SWQB's efforts to ensure that each sample collected retains its original physical form and chemical composition from time of collection through final disposal.

2.3.1 Sample Handling

The details of the sample handling procedures, and copies of all forms for ambient/assessment and compliance monitoring are found in the most current NMED/SWQB SOPs (https://www.env.nm.gov/swqb/SOP/). A summary of handling procedures is presented in Appendix A. In addition to the handling procedures described in this section, this QAPP requires an additional handling step of sealing all samples collected for compliance monitoring purposes with evidence tape to prevent tampering or contamination. Sampling handling requirements are often amended and SWQB uses the most current requirements listed under Table II at 40 CFR 136.3(e) "*Required Containers, Preservation Techniques, and Holding Times*".

2.3.2 Sample Custody

Two levels of sample custody are practiced at the SWQB: a sample tracking procedure used for ambient/assessment water quality monitoring samples and a formal chain of custody procedure used for compliance monitoring samples.

Samples taken for ambient/assessment monitoring purposes do not require formal chain of custody procedures. However, to ensure the integrity and quality of these samples, the SWQB uses a sample tracking procedure that can be found in the most current NMED/SWQB SOPs and basically requires that the receiving laboratory acknowledges receipt of the samples by date stamping the submittal forms and providing copies of the stamped forms to the person delivering the samples.

A formal chain of custody is required for compliance monitoring purposes only. Generally, a chain of custody is intended to ensure the integrity of samples so they can be used as admissible evidence to enforce environmental laws and regulations. Facility samples taken in cases involving an enforcement or administrative action related to a permit, certificate, order, or potential violation of a regulation or law shall follow chain of custody procedures provided by the contracted analytical laboratory.

2.4. Analytical Methods

Analytical methods used for Water Quality Ambient/Assessment Monitoring, WQS Compliance Monitoring for Enforcement Purposes, and Effectiveness Monitoring as a part of this QAPP shall be in accordance with methods described in the references listed in Section 2.2 or otherwise approved by EPA. Appendix B includes a list of analytical methods and associated method detection limits for Water Quality Ambient/Assessment Monitoring, WQS Compliance Monitoring for Enforcement Purposes, and Effectiveness Monitoring. Methods used for NPDES Permit Compliance Evaluations shall be in accordance with those approved under 40 CFR Part 136 unless other test methods have been specified in the permit or approved by the Regional Administrator.

Analytical procedures used by contract laboratories are provided to the SWQB in their approved QAPP or equivalent. Analytical methods used by contract laboratories must be in accordance with the procedures listed above.

2.5. Quality Control

Quality control is the system of technical activities, including data verification and validation procedures, that measures the attributes and performance of a process, item or service against defined standards.

2.5.1 Field Quality Control

Newly hired SWQB field personnel will learn sampling techniques through training and apprenticeship with experienced SWQB personnel. The SWQB controls the quality of the data by using standardized methods that are documented in the most current NMED/SWQB SOPs. All personnel who collect

environmental data must be familiar with these protocols and collect data in accordance with the procedures as they are defined in the SOPs.

The collection of field QC samples is an important part of the continuing effort to improve the quality of the resultant data by assessing and possibly refining the collection, transportation, and handling techniques. Appendix C summarizes field QC sampling conducted by SWQB.

An additional check on the quality of field activities includes periodic Quality Assurance Audits. Quality Assurance Audits will be performed periodically as resources allow. Field crews to be audited will be randomly selected and the audits will be performed by the QA Officer or designee.

2.5.2 Blanks

A blank sample is a sample that is processed and handled in the same manner as the associated environmental sample and is intended to be free of the analytes of interest. The following types of QC blank samples are used by SWQB:

- Trip Blank – A sample of analyte-free water that is prepared in the laboratory. Trip blanks are used for volatile organic compound samples only. Trip blanks are prepared by the analytical laboratory using deionized, distilled water, preserved as required. They are transported, unopened, to the field with other sample containers, handled like environmental samples and shipped to the laboratory for analysis with the collected samples. Trip blanks are used to identify contamination that might occur during sample transport and analysis rather than during sample collection and processing (WQX Activity Type #26).
- Field Blank – A sample of analyte-free water that is prepared in the field without use of sampling equipment. An aliquot of deionized water is placed in a clean sample container in the field. Field blanks are treated as regular samples in all respects, including exposure to sampling station conditions, storage, preservation and filtration, if applicable. The purpose of these samples is to determine if any of these conditions or processes have caused sample contamination (WQX Activity Type #21).
- Equipment Blank – A sample of analyte-free water that is prepared in the field using the appropriate sampling equipment. An aliquot of distilled and deionized water is processed using applicable field equipment in the same manner as environmental samples. Equipment blanks are used to demonstrate that sample-collection equipment and sample-processing equipment are not introducing contamination. Equipment blanks can be prepared for individual pieces of collection and processing equipment. Typically, SWQB equipment blanks are only prepared to assure non-contamination of samples during the filtration process (WQX Activity Type #28).
- Reagent Blank – A sample of analyte-free water and reagent that is not exposed to site conditions. (Reagent blanks are collected in the laboratory to check the sample for contamination from the sample bottle and preservative or growth agents (WQX Activity Type #27)

*WQX # refers to the applicable STORET WQX activity type identifier

Although other blanks may be collected depending on the purpose of the study, for most studies the following should be collected: field blanks for *E. coli*, nutrients and cyanide, trip blanks for VOCs, and equipment blanks for dissolved metals. In some cases, a reagent blank may be used for *E. coli.*

2.5.3 Blank Validation Codes

An analysis of blank contamination is conducted during the data validation process. After validation is completed, qualifier codes are assigned to any data points that, based on the blank samples, may have been contaminated. Qualifier codes indicate to the data user that chemicals were detected in the associated blank and that the sample results may be contaminated.

If a chemical is not measured in the blank at a concentration greater than or equal to the Sample Detection Limit (SDL) [defined as the sample-specific Method Detection Limit (MDL)], generally the MDL times the dilution factor if the sample was diluted for analysis), no blank validation code is assigned.

If a chemical is measured in the blank at a concentration greater than or equal to the SDL then all results for that chemical since the last blank with a result less than the SDL will be reviewed and a validation code of “B1” or “RB1” will be assigned depending on the monitoring type. If only one blank sample was collected during a discrete sampling campaign then the all samples collected during the campaign will be reviewed.

If the sample was collected for compliance or enforcement purposes, and the blank concentration is greater than or equal to the SDL, a blank validation code of RB1 will be assigned indicating that the results are rejected.

If the sample was collected for assessment purposes, and the blank concentration is greater than or equal to the SDL, the following guidelines apply:

- If the blank concentration is greater than or equal to 5% of the sample concentration, a blank validation code of RB1 will be assigned.

- If the blank concentration is less than 5% of the sample concentration, or if the sample concentration is less than the SDL, a blank validation code of B1 will be assigned. Results with a B1 validation code may be used for assessment purposes. Results are usable for assessment purposes because the analytical error associated with the reported sample concentration is typically 5% or greater, and the blank contamination is considered to be indistinguishable from analytical error. Analytical error is the coefficient of variation (the standard deviation of replicate measurements divided by the mean) expressed as a percent.

These guidelines are summarized below:

Table 2.4 Blank validation codes

Concentration in Blank	Monitoring Type	
	I	II
< SDL	No Code	No Code
≥ 5% of Sample Concentration	RB1	RB1
≥ SDL and <5% of Sample Concentration	B1	RB1
≥ SDL and Sample Concentration <SDL	B1	RB1

I = Ambient/Assessment and Effectiveness Monitoring
II = NPDES Compliance Evaluation and WQS Enforcement Monitoring

Run/Sampling Run – A period of time used to represent and define the most common collecting period or grouping of sampling activities that are indicative of SWQB MASS sampling operations. Typically, most samples are collected during multi-day collection events that depart and return to the office in a given week (M-F). Blanks associated with a run are assumed to collectively represent a grouping of samples whereby the staff, equipment, vehicle, reagents, preservation, and storage remain constant. When multiple single day trips are planned within a given week that maintain constant variables as described above, the single day trips may be considered collectively as a run, provided that the number of blank QC samples collected represents at least 10% of ambient samples collected, preferably at a one blank sample per ten ambient sample frequency to allow for QC blank distribution.

If greater than 50% of the reported chemicals in the blank analyzed by a particular method are measured at concentrations greater than or equal to the SDL, then all of the results for the chemicals analyzed by that method since the last blank with a result less than the SDL for that chemical are rejected. Flagging is limited to the QC sample/or samples associated with a given run. When multiple blank QC samples are collected (minimum 10% of ambient samples) during a given run, ALL data collected since the last

compliant QC sample and all data up to the next compliant QC sample are assigned validation codes. If the non-compliant event is not preceded and followed by a compliant event, within that sampling run, the qualified data range would include the entire sample run. For this reason, when more than ten samples are anticipated to be collected during a given run, it is best to collect blank QC samples at a continual 1 per 10 frequency during the run so that QC blank sample occur on different days. This minimizes the risk of qualifying an entire run when complaint and non-complaint blank QC samples are taken. These Blank Validation codes serve to alert the data user that the results are outside Quality Assurance control limits and may require re-sampling or a separate qualitative analysis based on professional judgment.

There may be cases where, due to the sensitivity of the analytical method (e.g. PCB congener analytical method) or other characteristics of the procedures, it may be appropriate to subtract the value of the blank from the value of the result. If this is done, the subtraction should be approved by the SWQB QA officer and documented.

2.5.4 Field Replicates and Duplicates

SWQB may collect replicates or duplicates as needed for special investigations. However, the Bureau does not routinely collect replicates because replicate samples do not isolate sample collection and analytical error from environmental variability, and because a small set of replicate samples does not provide information that is useful for making decisions about the other samples on the sampling run. Also, the Bureau does not routinely collect duplicate samples, and instead relies on standard procedures and laboratory quality assurance to ensure the repeatability of the data. Field replicates and duplicates are defined as:

- Duplicate – a sample that is split and submitted and analyzed as two routine samples. (WQX Activity Type #14.

- Replicate – a sample that is collected within 15 minutes and within 1 meter of routine sample and analyzed as a routine sample. (WQX Activity Type #22).

2.5.5 Laboratory Quality Control

All samples, with the exception of those bacteria samples analyzed in-house using IDEXX water microbiology test kits, are analyzed by laboratories that have established QA programs that implement the following key elements:

- Demonstrate the laboratory's capability and qualifications to perform environmental analyses by summarizing and documenting the QA procedures employed by the laboratory,
- Control laboratory operations by establishing procedures that measure the laboratory's performance on a daily, weekly, monthly, quarterly, and yearly basis,
- Measure matrix effects to determine the effect of a specific matrix on method performance and analyte recoveries, and
- Provide a means of ensuring that appropriate QC information is consistent, available and recoverable, to enable the end user to assess the quality of the data.

Statistical criteria used by the contract laboratories for validating and expressing the variability of analytical results are described in the QAPP or equivalent that is provided by each laboratory. The majority of samples are analyzed by SLD. Their data qualifiers are listed in the Data Verification and Validation SOP 15.0 Worksheet.

Bacteria samples analyzed in-house use a certified thermometer to record incubator temperatures. A certified thermometer is kept in the incubator, and temperatures are recorded on the *E. coli* data sheet when the sample tray is placed in the incubator and at the end of the incubation period. If both the temperature at the initiation and conclusion of the incubation are within 35 ± 0.5°C, the results of the *E. coli* count are not flagged and can be used for assessment purposes without reservation. If either the initiation or the conclusion temperature is less than 34.5 °C, the data is discarded. If either temperature is

between 35.5 and 38 °C, the data is flagged and may only be used as supporting evidence for assessments. If either temperature is greater than 38 °C, the data is discarded.

2.6. Instrument/Equipment Testing, Inspection and Maintenance

2.6.1 Field Operations

All field equipment must be inspected and refurbished as necessary prior to each sampling trip. Complete procedures for operating and maintaining equipment used for collecting environmental measurements are contained in the manufacturer's instruction manual for each instrument and in the SWQB SOPs. Results of equipment inspections will be noted in the file for each instrument. Any deficiencies in equipment must be noted and reported immediately to the appropriate person who will recheck the equipment and arrange for repair by the manufacturer or replacement. SWQB staff will not use equipment if the working condition of the equipment is in doubt. Major pieces of field equipment are listed in Appendix D, which also includes specific inspection and maintenance requirements.

2.6.2 Laboratory Operations

Information regarding analytical equipment and associated maintenance used by contract laboratories is provided in the laboratory's QAPP or equivalent.

2.7. Instrument/Equipment Calibration and Frequency

A summary of calibration for field equipment is provided in Appendix C. Additional calibration and instrument information can be found in the most current NMED/SWQB SOPs and the manufacturer's instruction manual.

2.7.1 Field Operations

Complete procedures for calibrating instruments used for collecting environmental measurements are contained in the manufacturer's instruction manual for each instrument. All SWQB personnel using field equipment are expected to read and be thoroughly familiar with all procedures detailed in these manuals. In particular, Project Coordinators and sampling personnel shall follow the calibration procedures given by the instrument manufacturer. A calibration log shall be kept for each instrument which includes all of the calibration forms associated with the instrument. SWQB staff routinely enter dates of calibration, calibration methods used, and any other pertinent data, e.g., erratic instrument behavior in the logbook.

2.7.2 Laboratory Operations

Analytical instruments and equipment used by the contract laboratory are calibrated prior to each instrument analysis batch using manufacturer's recommended procedures and the guidelines provided in the Handbook for Analytical Quality Control (EPA 1979). All calibration procedures are validated and documented by the contract laboratory and are described in the laboratory's QAPP or equivalent.

2.8. Data Acquisition Requirements

Most SWQB decisions made pursuant to this QAPP involve new data acquired using procedures described or referenced in this document. When decisions must be partially based on historical data, past data acquired by the SWQB are given preference because of known data quality. Data acquired by EPA or by USGS are generally considered to meet SWQB QA requirements and may be used for most purposes if referenced.

To be used for water quality assessment, development of the Integrated List and TMDL development, data collected by individuals or organizations other than the SWQB must, at a minimum, meet the QA/QC requirements described in this document. SWQB will determine whether the data meets these requirements. Specifically, the data must be accompanied by a QAPP (or equivalent) under which it was collected. Analytical methods used must meet the requirements specified in Analytical Methods and Detection Limits (Appendix B) and the methods of data collection must be the same as, or comparable to, those included in the most current NMED/SWQB SOPs referenced in the current QAPP. Additionally, the QC criteria used to verify and validate the data must be the same, or similar, to those listed in the SWQB

Field Quality Control Sampling Summary (Appendix E) and the SWQB Data Verification and Validation SOP 15.0.

To be used for enforcement of water quality standards under the NM Water Quality Act (74-6-10 NMSA) data may be also be collected by the SWQB or external organizations. However, the data must meet the QA/QC requirements described in the preceding paragraph, and SWQB will determine whether the data meets these requirements.

To be used for NPDES permit enforcement, data must be collected either by the SWQB, EPA, or permittee. It may be possible to use data that does not meet SWQB QA/QC requirements for purposes other than those listed above.

2.9. Data Management

The primary data management tools used by the SWQB are summarized in Table 2.5.

Table 2.5 SWQB Data Management Tools

Data Management Tool	Description
Surface Water Quality Bureau (SWQB) Water Quality Database	Archival Access-based database used by the SWQB to house water quality data (chemical, physical, biological) collected by the Water Quality Monitoring Program for data collected in 2000- 2009.
SQUID	Oracle-based modified version of EDAS2 used by SWQB to house water quality data (chemical, physical, biological) collected by the Water Quality Monitoring Program. It replaces the SWQB Water Quality Database and EDAS. Used for data collection activities starting 2010.
SWQB's NPDES database	Access-based database that helps the Bureau track the status of the permits and the state's certification of the permits (and is not intended to duplicate database information maintained by EPA for NPDES permits). The database contains information about individual permits in relation to waterbody assessment units for integration into Bureau projects such as TMDL development and watershed assessment/planning activities.
Assessment Database (ADB)	Access-based database for tracking water quality assessment data, including use attainment, and causes and sources of impairment. The ADB supports three principal functions: (1) Improve the quality and consistency of water quality reporting (2) Reduce the burden of preparing reports under CWA §§ 303(d), 305(b), 314, and 319 (3) Improve water quality data analysis The ADB provides data entry forms and automates the production of reports that NM submits to EPA through the 303(d)/305(b) process.
Grants Reporting and Tracking System (GRTS)	The Nonpoint Source Program's main reporting vehicle for the CWA Section 319 program. GRTS is a data management system that enables EPA and States to describe the progress they have made in implementing the national Nonpoint Source (NPS) Pollution program. GRTS electronically tracks projects and activities funded with CWA Section 319(h) funds.
STORET	The STORET Data Warehouse (referred to as STORET) is EPA's repository of the water quality monitoring data collected by water resource management groups across the country. STORET is populated with biological, chemical and physical data on surface and ground water collected by federal, state and local agencies, Indian Tribes, volunteer groups, academics and others. Groups submit data to STORET through a framework called the Water Quality Exchange, or WQX.

All data collected by the SWQB are maintained in either hard copy or electronic formats, depending on how the data were received from the laboratory, by the Project Coordinator using the appropriate data management tools. The tools consist primarily of databases, geographic information systems (GIS), spreadsheets, and statistical and word processing computer software. To facilitate the integration of all of these tools, waterbodies are georeferenced, or categorized, based on geographic location. Additional categories are applied to waterbodies, such as assessment unit, watershed size/area, designated uses, ecoregion, elevation, habitat type, etc., to facilitate data comparability and communication within and among the assorted data management tools used by various water quality management programs.

SWQB data obtained or received in hard copy formats are entered into one of these databases by the Project Coordinator or designee. SWQB data obtained or received in electronic formats are imported or entered into the appropriate database(s) by the designated staff person dependent on data type.

Chemical data received electronically are provided to the Quality Assurance Officer who is responsible for uploading into SQUID. All chemical analytical results received by the SWQB must include the following information:

- Data Source – the lab code from which the data originated
- SWQB unique sample location ID (specific to location)
- SWQB unique sample ID
- Sample Collection Date
- Sample Collection Time
- Laboratory Sample Number
- Sample Analysis Date
- Sample Analysis Time
- Analytical Method
- Analyte Suite
- Analyte Name
- Chemical Abstracts Service Reference Number (CASRN)
- Concentration Units
- Method Detection Limit (MDL) – The minimum concentration of a substance that can be measured and reported with 99 % confidence that the analyte concentration is greater than zero.
- Minimum Reporting Level (MRL) - Lowest concentration that can be reported.
- Sample Detection Limit (SDL) – The sample specific detection limit; equal to (Dilution Factor x MDL (organics) or Dilution Factor x MRL (inorganics)).
- Result Concentration Value and Laboratory Qualifier Codes

Numerical results should be reported in number format (not numbers in text format) with the maximum number of appropriate significant figures possible, typically 2-3, depending on laboratory section/instrument.

Most chemical analysis for SWQB is done by the NM Department of Health SLD. The laboratory sections report method detection limits, method reporting limits, and sample detection limits according to Table 2.5 and 2.6.

2.9.1 Detection Limits and Laboratory Reporting Conventions

The New Mexico State Laboratory Division (SLD) Chemistry Bureau Sections (Air and Heavy Metals, Organics, Water, and Radiochemistry) use a software-based Laboratory Information Management System (LIMS) to issue standardized result reports which include detection limits, quantitation limits, and data qualifiers. The following tables summarize the reporting conventions that the Organic and Inorganic Chemistry Sections have adopted.

- Method Detection Limit (MDL) – The minimum concentration of a substance that can be measured and reported with 99 % confidence that the analyte concentration is greater than zero.
- Minimum Reporting Level (MRL) - Lowest concentration that can be reported.
- Sample Detection Limit (SDL) – The sample specific detection limit; equal to (Dilution Factor x MDL (organics) or Dilution Factor x MRL (inorganics)).

The reporting of detection and quantitation limits for the Organics section (Table 2.6) and Inorganic sections (Table 2.7) are summarized in the following tables:

Table 2.6 SLD Organic Section Detection and Quantitation Limits

SLD Section	Method Detection Limit (MDL)		Dilution Factor (DF)		Sample Detection Limit (SDL)		Method Reporting Limit (MRL)
Organic	MDL	x	DF	=	SDL	=	MRL

Table 2.7 SLD Inorganic Section Detection and Quantitation Limits

SLD Section	Method Reporting Limit (MRL)		Dilution Factor (DF)		Sample Detection Limit (SDL)
Air and Heavy Metals	MRL*	x	DF	=	SDL
Water Chemistry	MRL*	x	DF	=	SDL

Because "MDL" refers to a method detection limit and "SDL" incorporates both a quantitation factor and a sample-specific dilution factor, SWQB has requested that the Organics section assign "U" and "J" flags according to Table 2.8, Inorganic sections will report results as either positive values or <SDL. The SLD Inorganic sections use the MRL as a consistent reporting limit for a given analyte. It is always greater than the MDL, which is instrument and operator specific, by a factor that may range between 3 and 10.

Table 2.8 Organic Section Qualifiers and Reporting Conventions

LABORATORY QUALIFIERS AND REPORTING CONVENTIONS				
		Logical Response(1)	Flag	Reporting Convention
not detected a C ≥ SDL	C < SDL	TRUE	U	Report SDL
detected at C ≥ SDL but < MRL	SDL ≤ C <MRL	FALSE	J	Report estimated value
detected at C ≥ MRL	C ≥ MRL	FALSE	No Flag	Report value

Biological data are provided to the Project Coordinator expert or designee who is responsible for importing or entering the data in the appropriate database. All biological analytical results received by the SWQB must include the following information:

- Sample Location,
- Sample Collection Date,
- Sample Collection Time,
- Sample Collection Method, and
- Results (list of specimens to lowest practical taxon and enumeration).

Paper Data Management

All paper data should be filed and labeled in a consistent manner. Project specific data are filed as specified in each data management section below. Paper copies of project specific data and associated materials are maintained in a project binder. Additional information pertaining to documents to be included in the project binders is provided in Section 1.7.2.

Electronic Data Management

Electronic data are initially managed on individual computers temporarily prior to being transferred to a specified location in the SWQB Magneto Directory or uploaded to SQUID. These data are filed and labeled in a consistent manner using a dedicated filing system. The files and folders are named as clearly as possible, typically including the survey/project title and year and any other descriptors to help identify what is included in the file. All data housed on individual computers either awaiting calculations, V&V, or upload are backed up to the Magneto Directory on a weekly basis at a minimum. For data filed in SWQB Magneto Directory either awaiting upload or stored for Assessment purposes, the following file structure is utilized.

[Organized in additional folders under each heading by Project Title and Year]

DATA
- Upload Templates
- Calculation Templates
- Assessment Files
- ASSESSMENT FORMS
  (including ALL associated attachments and supporting documents)

- CHEMICAL DATA
  - Field Data – SQUID, survey binder
  - Chemical Analytical Data – SQUID, assessment folder
  - Fish Tissue Data
  - Ambient Toxicity Data

  - Chlorophyll *a* Data (included in chemistry section because it is managed in same manner as chemical data) – SQUID (upload files), nutrient assessment folder
  - Bacteriological Data (Included in chemistry section because it is managed in same manner as chemical data) – SQUID (upload files), assessment folder
- LONG TERM DATA (LTD)
  - Raw Data
  - Adjusted/Corrected Data
- PHYSICAL DATA
  - Habitat Data – SQUID (upload files), assessment folder
  - Flow Data (calculation spreadsheets)
- BIOLOGICAL DATA
  - Fish Health Data
  - Fish Community Data
  - Macroinvertebrate Data – SQUID
  - Periphyton/Phytoplankton Data – SQUID

2.9.2 Chemical Data

Field Data (physico-chemical data)

Field data originate when the data is collected and recorded directly onto field sheets by SWQB technical staff. Field data include direct observations recorded by technical staff and data recorded immediately from various equipment onto field sheets (e.g. sondes and other meters). Field data only include instantaneous readings and do not include long term deployment data that are electronically downloaded

from recording devices such as thermographs or sondes that record data over an extended period of time (these data are covered in subsequent section). Original field forms are maintained by the Project Coordinator and kept in the project binder. Data from the field forms are entered into the SWQB SQUID database by the Project Coordinator or designee. Once the data are in the database they are then verified and validated accordance with the procedures set forth in Data Verification and Validation SOP 15.0. The data are usable following the completion of the data verification and validation process.

Chemical Analytical Data

Chemical analytical data originate when the contracted analytical laboratory produces results from the water samples submitted by the SWQB. Chemical analytical data include measurements from the water column or sediment of chemical parameters such as ions, nutrients, metals, volatile organic compounds, and radionuclides. Analytical results are provided in both paper copy and/or electronic files, depending on the laboratory and/or parameters. When chemical analytical data are received back from the laboratory in paper format the data are entered into a spreadsheet by the designated project member who then forwards to the QA officer for upload to the database. If paper copies of data are received, they are maintained in the project binder. When data are received from the analytical laboratory in electronic formats, they are given to the QA officer for upload to the database. The QA officer performs an initial quality assurance audit of the reported detection flags and then informs project staff when all uploads have been completed. Once the data are in the database they are then verified and validated by the designated project member in accordance with the procedures set forth in
Data Verification and Validation SOP 15.0. The data are usable following the completion of the data verification and validation process. Data transformations must be performed on subsets of data in order to assess the attainment of water quality standards:

- Hardness calculations are completed for a subset of metals data reported above a screening threshold set at the minimum possible standard (i.e. lowest possible hardness) and are performed using Microsoft Excel spreadsheets. These metals include dissolved silver, dissolved cadmium, dissolved chromium, dissolved copper, dissolved lead, total aluminum, dissolved manganese dissolved nickel and dissolved zinc. A paper copy of the calculation spreadsheet is attached to the applicable assessment form for those data.

- Logarithm of Relative Bed Stability (LRBS) calculations are performed on sediment data to determine the relationship of the median particle size in a stream reach compared to the critical particle size calculated to be mobilized by standardized fluvial stresses in the reach. Median particle size is determined using a reach-wide pebble count (Peck et al. 2006). Critical particle size is calculated from channel dimensions, flow characteristics, and channel roughness factors (Kaufmann et al. 2007). The measure is expressed as a logarithm of the ratio of geometric mean to critical particle size.

- Gross alpha (Am-241 reference) transformations are done for data reported at or above the quantification limit. The transformations are performed manually and reported on the applicable assessment forms.

Fish Tissue

Fish tissue data originate when the contracted analytical laboratory produces results from the fish tissue samples submitted by the SWQB. Fish tissue data include measurements of toxic chemicals present in fish tissue such as mercury, DDT, and PCBs to be used for development of fish consumption advisories. The data are received from the analytical laboratory in both paper copy and/or electronic formats. All paper copies of data are maintained by the SWQB fish biologist in cabinet files. Data are organized by waterbody. The data are eventually transferred to a summary spreadsheet. Electronic data are loaded into the SQUID database by the SWQB fish biologist. The data are usable once incorporated into the summary spreadsheet and placed in the referenced repositories (paper file location or SQUID database). SWQB staff have access to the data directly via the database. These data are also provided to EPA annually who maintains a national database for fish consumption advisories at: http://map1.epa.gov/. Data users can obtain data through EPA's website or through requests to SWQB staff.

Ambient Toxicity

Ambient toxicity data originate when EPA or the contracted analytical laboratory produces results from water or sediment samples submitted by SWQB. Ambient water toxicity results include the results from analyses of water or sediment samples as measured by an organism's response upon exposure to the sample (e.g., lethality, impaired growth, or reproduction). These data are received from the lab in electronic and/or paper copies. Paper copies of the data are maintained in the project file by the project coordinator and electronic copies are filed according to the filing system described previously. Data are usable upon receipt from lab. Data can be obtained through requests to SWQB staff or via EPA's website at: http://www.epa.gov/earth1r6/6wq/ecopro/watershd/monitrng/toxnet/index.htm.

Data Logger Data (Sonde/Thermograph Data) (Large Data Sets)

Sonde/thermograph data originate when the data are uploaded from the recording device and exported to spreadsheets by the Sonde and Thermograph data managers who coordinate the management of large data sets. Sonde/thermograph data include parameters that can be recorded from long term data loggers that are placed in a waterbody for an extended period of time such as sondes and thermographs and includes parameters such as dissolved oxygen, pH and temperature. The electronic files are maintained by the Project Coordinator according to the filing system described previously. The data are QA'd following procedures outlined in the most current LTD Data Quality Assurance SOP. QA'd data files are uploaded into the SWQB SQUID database by the Project Coordinator or designee. The data are usable following the completion of the QA/upload process.

Bacteriological Data

(Included under chemistry section because it is managed in same manner as chemical data) Bacteriological data originate when the contracted analytical laboratory produces results from the water samples submitted by the SWQB or when the results are produced from analyses conducted in-house by SWQB staff using IDEXX equipment. Results received from analytical laboratories are managed in the same way as chemical analytical data. Refer to that section for managing bacteriological data. If results are produced in-house, then the results are transcribed from the results form into a spreadsheet that is then uploaded into SQUID. The results forms are filed in the Project Binder and the spreadsheets are maintained by the Project Coordinator on his/her computer. The data are usable following the completion of the Data Verification and Validation process described in SOP 15.0.

Physical Data

Habitat Data and Hydrology Protocol

Habitat and hydrology protocol data originate when the field measurements are recorded directly onto field forms by project team members. Data include physical habitat and geomorphological measurements such as percent canopy cover, pebble counts, stream sinuosity, etc. Each field form associated with habitat or hydrology protocol data are checked for completeness and accuracy by the crew lead in the field prior to leaving the site. Completely checked field forms are indicated by crew lead's initials on each page of field data. For physical habitat data collected following SWQB's SOP data will be entered into electronic spreadsheets for upload to SQUID. The spreadsheets are maintained by the Project Coordinator using the filing system described previously. The data are usable following the completion of the Data Verification and Validation process. Usable data are indicated as "V V" in the database heading for each study. SWQB staff have access to the data directly via the database. In 2006 habitat data collected using EPA's EMAP procedures were scanned and put into electronic format by EPA; however, that service is no longer provided on a consistent basis. If EPA is able to scan the field forms, then an additional copy of each field form is made so that the originals can be provided to EPA for scanning.

Flow

Flow data originate when the data are recorded directly onto flow field form by SWQB technical staff. Flow data include measurements recorded directly from various flow meters or equipment or using best professional judgment (method is indicated with data), including entering a "0" for dry, non-flowing streams. Upon returning from field, the flow data are entered into Microsoft Excel template [located in SOP folder in MASS Core Documents public directory (Magneto)] for Q determination. All flow calculation

files are maintained by project using the filing system described previously. Copies of the calculation spreadsheets are printed out and included in the project binder with original field sheet or copy of field notebook page(s). Once the calculations have been completed the results are entered into the SQUID database by a designated project member. Once the data are in the database they are then verified and validated in accordance with the procedures set forth in Data Verification and Validation SOP 15.0. The data are usable following the completion of the Data Verification and Validation process.

Biological Data

Fish Ecology

Fish community data originate when the data are recorded directly onto field forms by technical staff. Fish community data include species composition, number of each species collected, etc. Voucher specimens are typically taken for each species of fish for taxonomic verification. Any questionable identifications are verified upon returning to the SWQB lab, indicating any corrections directly on the field form. Museum of Southwestern Biology (Museum) staff also perform taxonomic verification on voucher specimens. Specific information from the field forms are transcribed to Museum field notes form and submitted to the Museum for archiving. Copies of the museum forms and the SWQB field forms are maintained by SWQB's fish biologist and are housed in the file cabinet located in their office. Data are organized by watershed. Data from field forms are entered into the SQUID database. Once the data are in the database they are then verified and validated in accordance with the procedures set forth in

Data Verification and Validation SOP 15.0. The data are usable following the completion of the Data Verification and Validation process. Macroinvertebrates

Macroinvertebrate data originate when the contracted taxonomic laboratory produces results from the macroinvertebrate samples submitted by SWQB. Macroinvertebrate data include identification to lowest practical taxon and enumeration of aquatic macroinvertebrate specimens collected from a waterbody. Results are received in electronic format and are maintained by the Program Manager or designee. The data are uploaded to SQUID database where a series of calculations are performed for use in biological assessments. The data are usable following import into SQUID.

Periphyton/Phytoplankton Data

Periphyton and phytoplankton data originate when the contracted analytical and/or taxonomic laboratory produces biomass (chlorophyll a) and community composition results from the periphyton and phytoplankton samples submitted by SWQB. Results from contract laboratories are received in electronic format and are maintained by the Program Coordinator or designee. The data are uploaded to SQUID by the Project Coordinator or designee and are usable following import into the database.

Data Access

SWQB staff have access to the data directly via the database. Other data users may obtain data through either requests to SWQB staff or through a formal Inspection of Public Records Act requests submitted to the NMED.

2.9.3 Other Data Types/Databases

Photographs

SWQB manages photographs on an individual project or survey basis. Photographs use predefined labeling conventions that incorporate site location, date, and watershed.

STORET/WQX

Data to be uploaded to STORET originate when the data have been verified and validated in accordance with the procedures set forth in
Data Verification and Validation SOP 15.0.

and considered to be "quality data" within SQUID. Quality data in SQUID will be submitted to Internal Node, which in turn generates XML file and submits it to WQX. WQX Web utilizes a standard set of data elements and internet protocols to create and store XML data submission files. The data are then imported by EPA STORET staff to the STORET national data warehouse. Data that are uploaded to STORET include field data and chemistry analytical data. All data that meet the QA/QC specifications are uploaded to STORET. Data are usable once they become available through the national data warehouse (www.epa.gov/storet/). Figure 2.1 illustrates the data flow from SWQB field collection activities through the storage of validated data on the STORET system.

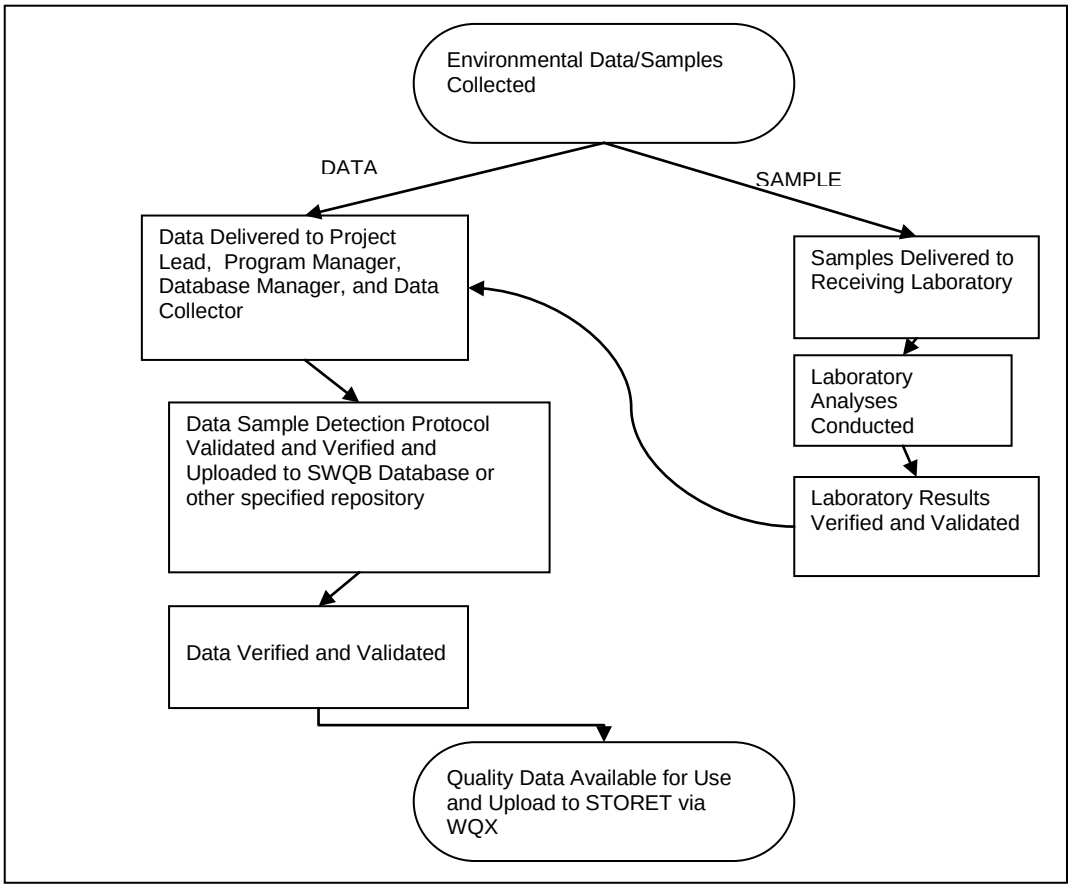


Figure 2.1 SWQB Data Flow Summary (Collection to STORET)

Assessment Database (ADB)

Data to be input into the Assessment Database (ADB) originate primarily from water quality standards attainment assessments and approved revisions to the WQS. The data/information entered into the ADB includes designated use support determinations, possible causes and sources information, water quality standards updates and assessment unit updates. All data and information included in the ADB are manually entered by SWQB's Assessment Coordinator WQS updates are entered into ADB following approval by NM WQCC. Assessment results are entered into ADB upon receipt of completed and verified assessment forms. Assessment forms are submitted to the Assessment Coordinator in electronic format. Final and verified assessment forms are maintained by the Assessment Coordinator on a secure drive using the filing system described previously. Once the Integrated List has been completed and approved by the NM WQCC, two paper copies of the assessment forms are printed. One copy is placed in the project binder and the second copy is filed in the Administrative Record by the Assessment Coordinator. The data are usable following entry into the ADB. Currently the only way to access ADB is through requests to the Assessment Coordinator.

Grant Reporting and Tracking System (GRTS)

Information to be input into the Grant Reporting and Tracking System (GRTS) originates when a contract or interagency agreement is approved for a 319-funded project identified through a request for proposals. Each 319 project has an assigned SWQB Project Officer who is responsible for maintaining the project-specific information in GRTS. Upon being assigned a project, the Project Officer logs onto the GRTS database at http://iaspub.epa.gov/pls/grts/f?p=110 and enters the identified mandatory elements for each project. The Project Officer is responsible for maintaining and updating the database throughout the course of the project. The information input into GRTS is usable immediately. GRTS is an EPA mandated database and can be accessed by EPA, SWQB staff and the general public (log on to database as guest user).

National Pollutant Discharge Elimination System (NPDES) Database

National Pollutant Discharge Elimination System (NPDES) Database
Data to be entered into the National Pollutant Discharge Elimination System (NPDES) Database fall into primarily four categories: permits information, permittee reporting information, inspection information and enforcement information. Unless otherwise indicated, each PSRS staff member is responsible for inputting and maintaining the data for the permits to which they are assigned. Permit information originates when either a permit application is received from an existing or potential permittee or when the U.S. EPA sends NMED a draft permit to be certified by the state. The permittee reporting information originates when a permitted facility submits Discharge Monitoring Reports (DMRs) as required by the NPDES permit. Two processes are in place for permittees to submit their DMRs; electronically through the NetDMR system set up by U.S.EPA and/or by hard copy. Permittees who have opted into the NetDMR system enter their monitoring information to the web based program. The State's PSRS staff members are then able to review the submitted data by logging into the NetDMR system. When the hard copies of DMRs are received the SWQB Administrative is responsible for input to the database. Inspection information originates when a PSRS staff member conducts a Compliance Evaluation Inspection (CEI), Compliance Sampling Inspection (CSI), or any other formal inspection. The summary of the inspection report is entered into the database by the staff member who conducted the inspection. Enforcement information originates when the U.S. EPA issues an Administrative Order (AO), Administrative Penalty Order (APO) or a Consent Agreement and Final Order (CAFO) to a permittee or a non-permitted facility for violations of NPDES program requirements. NMED receives copies of these orders and the Industrial Inspections Team Leader is responsible for inputting the data into the database. The data are usable following entry into the database.

3. QUALITY SYSTEM ASSESSMENT AND OVERSIGHT

3.1. Quality System Assessment and Response Actions

SWQB field sampling and measurement techniques are continually undergoing review and modification. It is envisioned that all SWQB procedures will continue to evolve and be refined. Techniques will never be considered “final,” but will always be examined for possible improvements. The findings of procedural evaluations should be shared and discussed with other SWQB field personnel, Team Leaders, and Program Managers. Decisions will be made by Team Leaders, Project Coordinators, and Program Managers, with input from field staff, whether to continue with existing methods and techniques, switch to new methods and techniques or to use combinations of both. Any changes to procedures covered or referenced by this QAPP will be documented and reflected by future revisions to the document. Procedural changes may be made by staff during the field season with concurrence of the appropriate Program Manager and Team or Project Coordinators, when the need arises, and subsequently be documented in the revised QAPP and SOP. The collection of high-quality and representative data is the most important consideration. It is important that all SWQB technical staff communicate throughout the entire survey process, from initial planning to final report publication. Quality Assurance Evaluations/Audits will be conducted periodically to provide assessment of the implementation of the procedures outlined and/or referenced in this QAPP.

At the end of each field season (i.e., annually), data are verified and validated by the SWQB Project Coordinator or designee (see Data Verification and Validation SOP 15.0) to determine variability and data usability. The QA Officer will work with appropriate staff and summarize QA issues periodically. Problem areas will be identified through this process and the QA Officer and appropriate Project Coordinators will work to take corrective action. QA reports prepared by contract laboratories further help to determine accuracy and the limits of the data. Due to the fact that analytical methods are continuously becoming more sensitive, this communication process is vital and on-going.

3.2. Reports to Management

The Project Coordinator is responsible for keeping the Program Manager and Team Leaders informed concerning the progress of the survey and any problems or anomalies encountered. The Project Coordinator or designee is responsible for maintaining and completing the applicable Data Verification and Validation Worksheet(s) and submitting a copy of the results to the QA Officer. The original Verification and Validation Worksheet(s) will be maintained in the survey project binder and electronic version are maintained within the MASS Core folder on the public drive. Data collected by WPS or PSRS will follow procedures outline in SOP 15.0 and maintain their own project binders and electronic version. The SWQB QA Officer and technical personnel in conjunction with appropriate laboratory staff will determine if any corrective actions are necessary. Upon request laboratories will submit a summary of data accuracy and precision, results of performance and system audits, and discussion of significant QA problems and recommended solutions. The QA Officer will periodically compile a summary report of all QA/QC issues encountered to be distributed to the contract laboratories, EPA Region 6 and appropriate SWQB staff. Any adopted changes will be subsequently reflected as changes to this QAPP.

4. DATA VALIDATION AND USABILITY

All data collected by the SWQB undergo a series of checks to ensure that the data are of sufficient quality and conform to a project's specific objectives. . Previous SWQB Water Quality Databases are maintained for data retrieval purposes only and all data maintained in these databases have undergone Verification and Validation in previous years.

4.1. Data Review, Verification, and Validation

Data review, verification and validation are key steps for ensuring the integrity, suitability, and usability of the data. All field and analytical data are continually reviewed by the Project Coordinator or designee and verified and validated according to the procedures provided in summarized in Appendix C. Results from the data verification and validation process are summarized on the Data Verification and Validation Worksheet (Data Verification and Validation SOP 15.0) and included in the project file. Copies of these results are also provided to the QA Officer for use in the Data Quality Assessment process. The Project Coordinator and/or QA Officer will resolve data quality issues. All information pertaining to this process will be documented thoroughly and maintained in the project file.

4.2. Verification and Validation Methods

The data verification and validation procedures conducted by the SWQB are described in SOP 15.0. This process establishes the criteria for accepting, rejecting or qualifying data. The Data Verification and Validation Worksheet serves as the summary of results for each type of data verified and validated. These worksheets serve as a record for the Project Coordinator and QA Officer, who will resolve any data quality issues. The QA Officer will also use the information provided in the Data Verification and Validation Worksheet to prepare a summary of the issues that arose and resulting resolution status on a periodic basis. All information pertaining to this process is documented and included in the project file. Data validation and verification procedures and associated acceptance criteria used by a contract analytical laboratory are described in the QAPP (or equivalent) as provided by each laboratory. Statistical criteria used by the laboratory for validating and expressing the variability of analytical results are the standard deviation, coefficient of variation, range, 95-percent confidence limits and control charts.
All data not meeting the appropriate QA/QC requirements as identified through the data verification and validation process are assigned appropriate laboratory qualifier or SWQB validation codes. A summary of laboratory and the SWQB's qualifier codes is provided in the Data Verification and Validation SOP 15.0 Worksheet.

4.3. Reconciliation with User Requirements

Data are considered usable once the data verification and validation process has been completed and the data have been accepted, rejected or qualified. The SWQB uses the data to meet the objectives described in Section 1 of this QAPP. Guidelines for using qualified data are provided in the Assessment Protocols (NMED/SWQB 2012). In general, data rejected (i.e., with a data qualifier of "R," "R1," "R2," etc.) are considered unusable for ambient/assessment or compliance purposes. Other data that are qualified (as specified by qualifier or validation code), but not rejected, may be used provided the potential uncertainties associated with the data are addressed and appropriate caveats attached. The data are also provided to the public for use through EPA's STORET database.

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Appendix A
Sample Handling Procedures and Holding Times

Sample Type	Sample Container	Preservation [1]	Maximum Holding Time[13]
Inorganic Tests			
Ions – full Suite[2] Ions – SWQB suite [3]	1-quart polyethylene cubitainer	On ice, approximately 6°C	7 days TSS – TDS 14 days other
TDS and TSS only	250 ml HDPE or 1 quart polyethylene cubitainer	On ice, approximately 6°C	7 days
Chloride	1-quart polyethylene cubitainer	None	28 days
Total Nutrients [4]	1-quart polyethylene cubitainer	1.8 mL H_2SO_4, on ice, approximately 6°C	28 days
Dissolved Nutrients [5]	1-quart polyethylene cubitainer	Filtered within 15 minutes of sample collection,, 1.80mL H_2SO_4, on ice, approximately 6°C	28 days
Cyanide [6]	1-quart polyethylene cubitainer	5-7 pellets NaOH, 0.6g ascorbic acid if chlorine present on ice, approximately 6°C	14 days
Hardness Ca + Mg	1-quart polyethylene cubitainer	1.8 mL H_2SO_4, on ice, approximately 6°C	180 days
Metals			
Total Metals [7]	1-quart polyethylene cubitainer	1.8 mL HNO_3,	28 days mercury – 6 months other
Dissolved Metals [8]	1-quart polyethylene cubitainer	Filtered within 15 minutes of sample collection, 5.0 mL HNO_3	28 days mercury – 6 months other
Microbiological Tests			
Coliform: total, fecal, and *E. coli* [9]	100-mL polystyrene vessel (IDEXX) 100-mL LDPE vessel (lab)	0.0008% $Na_2S_2O_3$, on ice, approximately 10°C	8 hours
Organic Tests [10]			
Method 8270 – Base/Neutral Acid Extractables [11]	Two 1-liter amber glass bottles (lab)	On ice, approximately 6°C	7 days until extraction, 40 days after extraction
Method 8260 – Volatile Organic Compounds [11]	Two 40-mL glass vials (lab)	2 drops HCl (HCl provided by lab), on ice, approximately 6°C	14 days
Radiological Tests			
Radionuclides [12]	Two 1-gallon polyethylene cubitainers	10.0 mL HNO_3,	6 months
Biological Tests			
Ambient Toxicity (acute and chronic) in water and sediment	1-gallon polyethylene cubitainer (water) and/or Two 1-quart, wide-mouth glass containers (sediment)	On ice, approximately 6°C	36 hours
Chlorophyll *a* (streams/rivers)	1-quart polyethylene cubitainer	Place in cooler with dry ice and keep frozen	28 Days
Chlorophyll *a* (lakes)	Petri dish	Place filter in petri dish, wrap in foil , and place cooler with dry ice and keep frozen	28 Days
Phytoplankton (lakes)	1-quart polyethylene cubitainer	10-25 mL Acid Lugol's Solution, on ice, approximately 6°C	indefinitely
Diatoms (lakes)	glass or plastic vials, <100 mL	On ice, approximately °C	indefinitely
Periphyton community composition (streams/rivers)	50-mL plastic vial	2-4 mL of 10% formalin	indefinitely
Macroinvertebrates	glass or polypropylene jar(s), size varies	fill jar with 95% ethanol; remove air bubbles	not applicable
Fish	plastic bags	10% formalin to cover; remove air bubbles	not applicable

Notes:

1 Preserve samples as soon as reasonably possible, preferably immediately after sample collection. Pre-preserved sample containers may be used.
2 Ions (full suite) include calcium, magnesium, potassium, sodium, hardness, alkalinity, bicarbonate, carbonate, sulfate, chloride, TDS, and TSS.
3 Ions (SWQB suite) include TDS, TSS, hardness, fluoride, chloride, and sulfate.
4 Total Nutrients include nitrate + nitrite, ammonia, total Kjeldahl nitrogen, and total phosphorus.
5 Dissolved nutrients include nitrate + nitrite, ammonia, orthophosphate, and dissolved phosphorus.
6 If chlorine or sulfide is suspected to be present, see SWQB SOPs for alternative handling procedures and holding times.
7 Total metals include aluminium, mercury and selenium at a minimum.
8 Dissolved metals include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc.
9 $Na_2S_2O_3$ is included in containers provided by IDEXX. If samples analyzed by SLD, contact SLD Environmental Microbiology regarding sample containers and schedule.
10 Various other organic analyses are available upon request. Refer to the SLD Organic Chemistry section (505 841-2571) or other contract labs for sample container, preservation and holding time information.
11 Refer to 40CFR136 for the list of parameters analyzed using methods 8270 and 8260.

12 Radionuclides generally include gross alpha/beta and Ra-226 + Ra-228.
13 Contact laboratory in advance of sampling to ensure that samples can be analyzed within the required holding times.

Appendix B

Analytical Methods and Detection Limits *for Water Quality Ambient/Assessment Monitoring, WQS Compliance Monitoring for Enforcement Purposes, and Effectiveness Monitoring*

(Methods and detection limits for NPDES Permit Compliance Evaluations will be those approved under 40 CFR 136, specified in the permit or approved by the Regional Administrator, as appropriate).

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Potassium	7440-09-7	Total	200.7	20.68
Sodium	7440-23-5	Total	200.7	73.69
Boron	7440-42-8	Dissolved	200.7	0.87
Calcium	7789-78-8	Total	200.7	8.38
Hardness (Ca + Mg)	NA	Total	200.7	2.4
Aluminum	7429-90-5	Dissolved	200.8	1.24
Aluminum	7429-90-5	Total	200.8	1.24
Iron	7439-89-6	Dissolved	200.8	3.11
Lead	7439-92-1	Dissolved	200.8	0.9
Magnesium	7439-95-4	Dissolved	200.8	2.12
Molybdenum	7439-98-7	Dissolved	200.8	0.03
Nickel	7440-02-0	Dissolved	200.8	0.24
Silver	7440-22-4	Dissolved	200.8	0.02
Thallium	7440-28-0	Dissolved	200.8	0.02
Antimony	7440-36-0	Dissolved	200.8	0.11
Arsenic	7440-38-2	Dissolved	200.8	0.17
Barium	7440-39-3	Dissolved	200.8	0.22
Beryllium	7440-41-7	Dissolved	200.8	0.17
Cadmium	7440-43-9	Dissolved	200.8	0.13
Chromium	7440-47-3	Dissolved	200.8	0.06
Cobalt	7440-48-4	Dissolved	200.8	0.02
Copper	7440-50-8	Dissolved	200.8	0.38
Uranium	7440-61-1	Dissolved	200.8	0.02
Vanadium	7440-62-2	Dissolved	200.8	0.06
Zinc	7440-66-6	Dissolved	200.8	0.57
Selenium	7782-49-2	Dissolved	200.9	0.27
Selenium	7782-49-2	Total	200.9	0.39
Mercury	7439-97-6	Dissolved	245.1	0.01
Mercury	7439-97-6	Total	245.1	0.01

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Chloride	16887-00-6	Total	300	544
Sulfate	18785-72-3	Total	300	430
Ammonia	7664-41-7	Dissolved	350.1	40.32
Ammonia	7664-41-7	Total	350.1	31.32
Total Kjehldal Nitrogen	17778-88-0	Total	351.2	116.9
Nitrate + Nitrite	14797-55-8	Dissolved	353.2	14.5
Nitrate + Nitrite	14797-55-8	Total	353.2	14.5
Nitrate as N	84145-82-4	Total	353.2	5.73
Orthophosphate	98059-61-1	Dissolved	365.1	3
Phosphate	98059-61-1	Dissolved	365.4	34.1
Phosphate	98059-61-1	Total	365.4	34.1
Radium-226	13982-63-3	Total	903.1	0.14 pCi/L
Radium-228	15262-20-1	Total	904	0.21 pCi/L
Polychlorinated biphenyls (PCBs)	1336-36-3	Total	1668	N/A
Toxaphene	8001-35-2	Total	8081	0.145
Manganese	7439-96-5	Dissolved	200.7; 200.8	8.17
Fluoride	7782-41-4	Total	340.2, SM 4500-F	7.4
4-Nitroaniline	100-01-6	Total	8270D	0.2
4-Nitrophenol	100-02-7	Total	8270D	0.4
1,4-Dinitrobenzene	100-25-4	Total	8270D	0.3
Ethylbenzene	100-41-4	Total	8260B[1]	0.2
Styrene	100-42-5	Total	8260B[1]	0.1
Benzyl alcohol	100-51-6	Total	8270D	0.1
cis-1,3-Dichloropropene	10061-01-5	Total	8260B[1]	0.1
trans-1,3-Dichloropropene	10061-02-6	Total	8260B[1]	0.1
4-Bromophenyl Phenyl Ether	101-55-3	Total	8270D	0.1
Heptachlor epoxide	1024-57-3	Total	8270D	0.2
Endosulfan sulfate	1031-07-8	Total	8270D	0.2
bis(2-Ethylhexyl)adipate	103-23-1	Total	8270D	0.2
Azobenzene	103-33-3	Total	8270D	0.1
Propylbenzene	103-65-1	Total	8260B[1]	0.2
n-Butylbenzene	104-51-8	Total	8260B[1]	0.3
2,4-Dimethylphenol	105-67-9	Total	8270D	0.1
4-Chlorotoluene	106-43-4	Total	8260B[1]	0.2
1,4-Dichlorobenzene	106-46-7	Total	8270D	0.1
4-Chloroaniline	106-47-8	Total	8270D	0.1

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
1,2-Dibromoethane (Ethylene dibromide (EDB))	106-93-4	Total	8260B[1]	0.1
Acrolein	107-02-8	Total	8260B[1]	0.7
Allyl Chloride	107-05-1	Total	8260B[1]	0.2
1,2-Dichloroethane	107-06-2	Total	8260B[1]	0.1
Propionitrile	107-12-0	Total	8260B[1]	4.1
Acrylonitrile	107-13-1	Total	8260B[1]	1
Vinyl Acetate	108-05-4	Total	8260B[1]	0.1
4-Methyl-2-pentanone	108-10-1	Total	8260B[1]	0.1
meta para Xylene mix	108-38-3 & 106-42-3	Total	8260B[1]	0.3
3-Methylphenol & 4-Methylphenol	108-39-4 & 106-44-5	Total	8270D	0.1
bis(2-Chloroisopropyl)ether	108-60-1	Total	8270D	0.1
1,3,5-Trimethylbenzene	108-67-8	Total	8260B[1]	0.2
Bromobenzene	108-86-1	Total	8260B[1]	0.1
Toluene	108-88-3	Total	8260B[1]	0.2
Chlorobenzene	108-90-7	Total	8260B[1]	0.1
Phenol	108-95-2	Total	8270D	0.1
Tetrahydrofuran (THF)	109-99-9	Total	8260B[1]	7.9
trans-1,4-Dichloro-2-butene	110-57-6	Total	8260B[1]	0.2
2-Chloroethyl Vinyl Ether	110-75-8	Total	8260B[1]	10
Pyridine	110-86-1	Total	8270D	0.3
bis(2-Chloroethyl)ether	111-44-4	Total	8270D	0.1
bis(2-Chloroethoxy)methane	111-91-1	Total	8270D	0.1
bis(2-Ethylhexyl)phthalate	117-81-7	Total	8270D	0.2
Di-n-octyl phthalate	117-84-0	Total	8270D	0.2
Hexachlorobenzene	118-74-1	Total	8270D	0.1
Anthracene	120-12-7	Total	8270D	0.3
1,2,4-Trichlorobenzene	120-82-1	Total	8270D	0.1
1,2,4-Trichlorobenzene	120-82-1	Total	8260B[1]	0.1
2,4-Dichlorophenol	120-83-2	Total	8270D	0.1
2,4-Dinitrotoluene	121-14-2	Total	8270D	0.2
Simazine	122-34-9	Total	8270D	0.1
1,2-Diphenylhydrazine	122-66-7	Total	8270D	10.4
1,4-Dioxane	123-91-1	Total	8260B[1]	0.1
Dibromochloromethane	124-48-1	Total	8260B[1]	2.3
Methacrylonitrile	126-98-7	Total	8260B[1]	0.2
Chloroprene	126-99-8	Total	8260B[1]	0.2

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Tetrachloroethene	127-18-4	Total	8260B[1]	0.1
Pyrene	129-00-0	Total	8270D	0.1
Dimethylphthalate	131-11-3	Total	8270D	0.1
Dibenzofuran	132-64-9	Total	8270D	0.2
sec-Butylbenzene	135-98-8	Total	8260B[1]	0.2
1,3-Dichloropropane	142-28-9	Total	8260B[1]	0.1
cis-1,4-Dichloro-2-butene	1476-11-5	Total	8260B[1]	0.4
cis-1,2-Dichloroethene	156-59-2	Total	8260B[1]	0.2
trans-1,2-Dichloroethene	156-60-5	Total	8260B[1]	0.2
Alachlor	15972-60-8	Total	8270D	0.2
tert-Butyl Methyl Ether (MTBE)	1634-04-4	Total	8260B[1]	0.1
Atrazine	1912-24-9	Total	8270D	0.1
Benzo(g,h,i)perylene	191-24-2	Total	8270D	0.3
Indeno(1,2,3-cd)pyrene	193-39-5	Total	8270D	0.2
Benzo(b)fluoranthene	205-99-2	Total	8270D	0.1
Fluoranthene	206-44-0	Total	8270D	0.1
Benzo(k)fluoranthene	207-08-9	Total	8270D	0.1
Acenaphthylene	208-96-8	Total	8270D	0.1
Metribuzin	21087-64-9	Total	8270D	0.1
Cyanazine	21725-46-2	Total	8270D	0.2
Chrysene	218-01-9	Total	8270D	0.2
Aldrin	309-00-2	Total	8270D	0.2
alpha-BHC	319-84-6	Total	8270D	0.1
beta-BHC	319-85-7	Total	8270D	0.2
delta-BHC	319-86-8	Total	8270D	0.2
Endosulfan II	33213-65-9	Total	8270D	0.2
4,4'-DDT	50-29-3	Total	8270D	0.3
Benzo(a)pyrene	50-32-8	Total	8270D	0.3
cis-Chlordane	5103-71-9	Total	8270D	0.2
trans-Chlordane	5103-74-2	Total	8270D	0.2
Metolachlor	51218-45-2	Total	8270D	0.1
2,4-Dinitrophenol	51-28-5	Total	8270D	0.4
1,2-Dinitrobenzene	528-29-0	Total	8270D	0.2
4,6-Dinitro-2-methylphenol	534-52-1	Total	8270D	0.4
Endrin ketone	53494-70-5	Total	8270D	0.2
Dibenz(a,h)anthracene	53-70-3	Total	8270D	0.3

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
1,3-Dichlorobenzene	541-73-1	Total	8270D	0.1
1,3-Dichlorobenzene	541-73-1	Total	8260B[1]	0.1
gamma-BHC (lindane)	55963-76-6	Total	8270D	0.1
Carbon Tetrachloride	56-23-5	Total	8260B[1]	0.2
1,1-Dichloropropene	563-58-6	Total	8260B[1]	0.2
Benzo(a)anthracene	56-55-3	Total	8270D	0.2
2,3,4,6-Tetrachlorophenol	58-90-2	Total	8270D	0.4
2-Hexanone	591-78-6	Total	8260B[1]	0.1
2,2-Dichloropropane	594-20-7	Total	8260B[1]	0.3
4-Chloro-3-methylphenol	59-50-7	Total	8270D	0.1
Dieldrin	60-57-1	Total	8270D	0.1
2,6-Dinitrotoluene	606-20-2	Total	8270D	0.1
N-nitroso-di-n-propylamine	621-64-7	Total	8270D	0.1
Aniline	62-53-3	Total	8270D	0.1
N-nitrosodimethylamine	62-75-9	Total	8270D	0.2
1,1,1,2-Tetrachloroethane	630-20-6	Total	8260B[1]	0.1
Acetone	67-64-1	Total	8260B[1]	1.2
Chloroform	67-66-3	Total	8260B[1]	0.2
Hexachloroethane	67-72-1	Total	8270D	0.1
4-Chlorophenyl Phenyl Ether	7005-72-3	Total	8270D	0.1
Benzene	71-43-2	Total	8260B[1]	0.2
1,1,1-Trichloroethane	71-55-6	Total	8260B[1]	0.4
Endrin	72-20-8	Total	8270D	0.2
Methoxychlor	72-43-5	Total	8270D	0.2
4,4'-DDD	72-54-8	Total	8270D	0.1
4,4'-DDE	72-55-9	Total	8270D	0.1
Prometryne	7287-19-6	Total	8270D	0.1
Endrin aldehyde	7421-93-4	Total	8270D	0.1
Bromomethane	74-83-9	Total	8260B[1]	1.9
Chloromethane	74-87-3	Total	8260B[1]	0.2
Iodomethane	74-88-4	Total	8260B[1]	0.2
Dibromomethane	74-95-3	Total	8260B[1]	0.1
Bromochloromethane	74-97-5	Total	8260B[1]	0.1
Chloroethane	75-00-3	Total	8260B[1]	0.5
Vinyl Chloride	75-01-4	Total	8260B[1]	0.3
Acetonitrile	75-05-8	Total	8260B[1]	7.6

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Methylene Chloride (Dichloromethane)	75-09-2	Total	8260B[1]	0.1
Carbon Disulfide	75-15-0	Total	8260B[1]	0.2
Bromoform	75-25-2	Total	8260B[1]	0.1
Bromodichloromethane	75-27-4	Total	8260B[1]	0.1
1,1-Dichloroethane	75-34-3	Total	8260B[1]	0.2
1,1-Dichloroethene	75-35-4	Total	8260B[1]	0.3
Trichlorofluoromethane	75-69-4	Total	8260B[1]	0.3
Dichlorodifluoromethane	75-71-8	Total	8260B[1]	0.3
Pentachloroethane	76-01-7	Total	8260B[1]	0.1
Heptachlor	76-44-8	Total	8270D	0.1
Hexachlorocyclopentadiene	77-47-4	Total	8270D	0.2
Isophorone	78-59-1	Total	8270D	0.1
Isobutyl Alcohol	78-83-1	Total	8260B[1]	4.5
1,2-Dichloropropane	78-87-5	Total	8260B[1]	0.1
2-Butanone (MEK)	78-93-3	Total	8260B[1]	0.6
1,1,2-Trichloroethane	79-00-5	Total	8260B[1]	0.1
Trichloroethene	79-01-6	Total	8260B[1]	0.2
1,1,2,2-Tetrachloroethane	79-34-5	Total	8260B[1]	0.1
Methyl Methacrylate	80-62-6	Total	8260B[1]	0.1
Acenaphthene	83-32-9	Total	8270D	0.1
Diethylphthalate	84-66-2	Total	8270D	0.2
Di-n-butyl Phthalate	84-74-2	Total	8270D	0.1
Phenanthrene	85-01-8	Total	8270D	0.1
Butyl Benzyl Phthalate	85-68-7	Total	8270D	0.1
N-nitrosodiphenylamine	86-30-6	Total	8270D	0.1
Fluorene	86-73-7	Total	8270D	0.1
Carbazole	86-74-8	Total	8270D	0.1
1,2,3-Trichlorobenzene	87-61-6	Total	8260B[1]	0.1
Hexachlorobutadiene	87-68-3	Total	8270D	0.1
Hexachlorobutadiene	87-68-3	Total	8260B[1]	0.1
Pentachlorophenol	87-86-5	Total	8270D	0.2
2,4,6-Trichlorophenol	88-06-2	Total	8270D	0.2
2-Nitroaniline	88-74-4	Total	8270D	0.1
2-Nitrophenol	88-75-5	Total	8270D	0.2
1-Methylnaphthalene	90-12-0	Total	8270D	0.1
Naphthalene	91-20-3	Total	8270D	0.1

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Naphthalene	91-20-3	Total	8260B[1]	0.2
2-Methylnaphthalene	91-57-6	Total	8270D	0.1
2-Chloronaphthalene	91-58-7	Total	8270D	0.1
3,3'-Dichlorobenzidine	91-94-1	Total	8270D	0.4
Benzidine	92-87-5	Total	8270D	0.1
2,3,5,6-Tetrachlorophenol	935-95-5	Total	8270D	0.4
ortho-Xylene	95-47-6	Total	8260B[1]	0.2
2-Methylphenol	95-48-7	Total	8270D	0.1
2-Chlorotoluene	95-49-8	Total	8260B[1]	0.2
1,2-Dichlorobenzene	95-50-1	Total	8270D	0.1
1,2-Dichlorobenzene	95-50-1	Total	8260B[1]	0.1
2-Chlorophenol	95-57-8	Total	8270D	0.1
1,2,4-Trimethylbenzene	95-63-6	Total	8260B[1]	0.2
2,4,5-Trichlorophenol	95-95-4	Total	8270D	0.2
Endosulfan I	959-98-8	Total	8270D	0.1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	Total	8260B[1]	0.1
1,2,3-Trichloropropane	96-18-4	Total	8260B[1]	0.1
Ethyl Methacrylate	97-63-2	Total	8260B[1]	0.5
tert-Butylbenzene	98-06-6	Total	8260B[1]	0.2
Isopropylbenzene	98-82-8	Total	8260B[1]	0.2
Nitrobenzene	98-95-3	Total	8260B[1]	0.1
Nitrobenzene	98-95-3	Total	8270D	0.1
3-Nitroaniline	99-09-2	Total	8270D	0.3
1,3-Dinitrobenzene	99-65-0	Total	8270D	0.2
4-Isopropyltoluene	99-87-6	Total	8260B[1]	0.2
Trihalomethanes	N/A	Total	8260B[1]	0.1
Xylene	N/A	Total	8260B[1]	0.1
1,3-Dinitrobenzene	99-65-0	Total	8270D	0.09
Chemical Oxygen Demand	E1641638[2]	Total	HACH	5100
Cyanide dissolved	57-12-5	Dissolved	HACH 10-204-00-1-X	1.4
Cyanide, Total	57-12-5	Total	HACH 10-204-00-1-X	1.4
Cyanide, WAD	57-12-5	Total	HACH 10-204-00-1-X	1.4
Uranium - 234 (isotopic)	15117-96-1	Total	Method 900	0.06 pCi/L
Uranium - 238 (isotopic)	7440-61-1	Total	Method 900	0.04 pCi/L
Gross alpha (adjusted)	NA	Total	Method 900	0.1 pCi/L
Gross Alpha and Gross Beta	NA	Total	Method 900	0.1 pCi/L

Analyte (Bold Indicates WQS)	CAS #	Fraction	Method #	MDL (ug/l)
Tritium	10028-17-8	Total	N/A	N/A
Strontium	10098-97-2	Total	N/A	1.11
Asbestos	1332-21-4	Total	N/A	N/A
Chromium III	16065-83-1	Dissolved	N/A	1.38
Dioxin	1746-01-6	Total	N/A	N/A
Chromium VI	18540-29-9	Dissolved	N/A	1.38
Methylmercury	22967-92-6	Total	N/A	N/A
Chlorine	7782-50-5	Dissolved	N/A	N/A
Silicon	N/A	total	N/A	3.4
Radium-226 + 228	NA	Total	N/A	0.7 pCi/L
Carbonate	3812-32-6	Total	SM 2320B	1600
Bicarbonate	71-52-3	Total	SM 2320B	519
Alkalinity	E1640192[2]	Total	SM 2320B	1188
Total Dissolved Solids	E1642222[2]	Total	SM 2540C	60.4
Total Suspended Solids	NA	Total	SM 2540D	968
Total Organic Carbon	E701250[2]	Total	SM 5310B	409
Biological Oxygen Demand	N/A	Total	Standard Methods	930

Appendix C

SWQB Equipment Maintenance and Calibration

The requirements provided below are examples that have been summarized and are not meant to be exhaustive procedures—always refer to the manufacturer's instruction manual for each instrument.

Equipment Description	Maintenance
YSI Model 6820, 6920 and 600 XLM Sondes	The YSI sondes are currently the primary instruments for SWQB field data collection. All field staff should acquaint themselves with the details of their operation and maintenance as per factory specifications. Intractable problems should be referred to designated staff for correction or shipment to an approved repair facility. Prior to use, inspect instrument to ensure all components are clean and in good working order. If sonde is to be used in unattended mode, ensure that batteries retain a full charge or replace batteries. Assure that all appropriate probes are activated and set to report. Calibrate all probes prior to use, and recalibrate Dissolved Oxygen (DO) probe to altitude once in the field as needed. While operation remains normal, other probes should not require further calibration.
YSI 6560 Conductivity/ Temperature Probe	Periodically clean ports with tubing brush (provided) and mild soap.
YSI 6561 pH probe	In the event that the probe will not calibrate, carefully clean electrode as per manufacturer's instructions. See manual. If the probe still will not calibrate, refer problem to designated staff for correction or replacement.
YSI 6562 DO probe (rapid pulse)	Check membrane for bubbles and electrode for corrosion prior to calibration. Replace membrane/clean clean silver electrode as per manufacturer's instructions as needed (see manual). Refresh potassium chloride (KCl) solution and change membrane prior to unattended deployment.
YSI 6150 optical DO probe	Ensure wiper pad is clean and that wiper arm is parking correctly. Inspect membrane for scratches.
YSI 6026 and 6136 Turbidity probes, wiped	Ensure proper functioning of wiper arm. If wiper arm pad is discolored, replace pad.
YSI 650 MDS Data logger.	Keep clean and dry. Check batteries and battery compartment for leakage. Protect from excessive heat and the screen from direct sunlight. Cables and connectors must be in good working order.
Hach HydroLab MS5 Sondes	The HydroLab sondes are currently the newest sondes in SWQB collection. All field staff should acquaint themselves with the details of their operation and maintenance as per factory specifications, and note there are significant differences from the more familiar YSI sondes. Intractable problems should be referred to designated staff for correction or shipment to an approved repair facility. Inspect the instrument prior to use to ensure all components are clean and in good working order. If sonde is to be used in unattended mode, ensure that batteries retain a full charge or replace batteries. The PocketPC handsets use rechargeable battery packs, so fully charge the unit prior to use. Using the Hydras 3LT software, assure that all appropriate probes are activated and set to report. Calibrate all probes prior to use, and recalibrate Luminescent Dissolved Oxygen (LDO) probe to elevation once in the field as needed. While operation remains normal, other probes should not require further calibration.
Hach HydroLab LDO probe	The manufacturer recommends periodic maintenance to remove contaminants such as oil, biological growth, dirt, etc. Sensor maintenance should be conducted after every deployment cycle. Do not use organic solvents, as they damage the plastic sensor cap.
Hach HydroLab pH probe	In most cases, pH 7 and pH 10 buffers will be acceptable. If a low pH is expected in the field, calibrate with pH 4 and pH 7. Always start calibration with the pH 7 buffer. After long term storage, clean the pH sensor, replace Reference Electrolyte, and replace the Reference Junction.
Hach HydroLab Self-Cleaning Turbidity Probe	Ensure proper functioning of the wiper arm and clear any debris near the optics. Replace the wiper and brush when they become fouled with biological growth or debris or if cracked.
Hach HydroLab Conductivity Probe	Periodically clean debris from the gap in the probe using the included brush and mild soap. Calibrate the upper point with calibration standard. Calibrate the 0 point out of water and completely dry.

Equipment Description	Maintenance
Hach Pocket Colorimeter	Turn meter on and check for any errors indicated by the meter's self-check display. Taking spare batteries (four AAA) is strongly advised.
Hach Turbidimeter Model 2100P	Turn meter on and check for any errors indicated by the meter's self-check display; check for calibration. Taking spare batteries (four AA) is strongly advised. After the meter indicates a low-battery condition, the batteries can be replaced in 30 seconds or less and maintain the calibration. Check cuvettes for dirt or scratches.
HF Scientific Pocket Colorimeter	Maintain as per manufacturer's instructions. Check to ensure instrument is in good working order and cuvettes are clean and/or replaced as needed. Taking spare batteries is strongly advised.
GeoTech GeoPump II	Wipe off outside of GeoPump with a damp cloth; check pump head and power cords.
Filtration Tubing	Soak new tubing for not less than one hour and not more than two hours in 10% hydrochloric acid (HCl) solution. Rinse inside and out with deionized (DI) water. Using clean technique (gloved, clean hands/dirty hands), transfer tubing into new re-closable plastic bags for transport to field. Tubing is used once, re-bagged, and returned to the lab for cleaning and re-use. Used tubing will be washed in laboratory grade detergent and rinsed in tap water prior to immersion in acid bath. Sufficient tubing to accomplish all sampling objectives should be prepared prior to each sampling run.
Wildco Kemmerer Bottle	Inspect before each sampling trip and check operation. Adjust as necessary. Worn or age-hardened stoppers should be replaced to prevent leakage.
Kahl Irradiometer	Inspect deck sensors, underwater sensors, and power cord before each sampling trip and check operation.
Ekmann Dredge	Inspect before each sampling trip and check operation. Adjust as necessary.
ISCO® Automatic Sampler	At the beginning of a monitoring season (May – Oct) replace peristaltic pump tubing and check program for compliance with SAP. Prior to deployment, charge battery if needed. Replace paper in flow meter if needed. Replace suction line at each deployment. Taking a spare ISCO® , flow meter, and battery is advised. After a sampling trip, thoroughly clean (and acid rinse) the sample bottles, and peristaltic pump tubing of the ISCO® and allow to air dry. If repair is required new parts will be ordered and replaced. Upon retrieval from field in fall or when changing locations decontaminate sampler and perform winter maintenance for the next deployment. Follow the ISCO® instruction manual and decontamination procedures in *SOPs*.
HOBO® Water Temp Pro V. 2	A National Institute of Standards and Technology (NIST) traceable thermometer, with a resolution and accuracy of 0.1°C or better, should be used to test accuracy annually. The NMDoH, SLD can certify a thermometer for accuracy and NIST traceability at no cost to SWQB.
Oxford Macro-Set Pipetter	Check pipetter for smoothness of operation through maximum stroke. Install a tip, draw a sample of liquid, hold the pipetter vertically, and check for leaks. If operation is not smooth, disassemble and clean cylinder wall, the O-ring, and the piston of all deposits and old lubricants. Lubricate and recheck. If leakage or lack of smoothness persists, replace O-ring. Separate pipetters will be used for sulfuric acid (H_2SO_4) (pH <2) and nitric acid (HNO_3) (pH <2), to avoid cross contamination. The separate pipetters should be transported and stored separately.
Smith-Root Type 12-B P.O.W. Electrofisher	Assure that gel-pack batteries are fully charged before each trip. Take at least two batteries for most routine fish-shocking trips. If several sites will be shocked during a sampling trip, take battery charger along for overnight charging. Gel-pack batteries must be maintained while in storage on the Model MC-24 Maintenance Charger.
Laser Level LB-1	Charge batteries prior to field use. Check batteries on sensors. Check accuracy, precision, and reproducibility by closing a survey loop back to an initial benchmark. After use, clean instrument, repack in case and carefully secure in vehicle.
Marsh-McBirney Flo-Mate FlowMeter Model 2000	Check the probe to see that it is clean; if dirty, clean with mild soap and water. Check batteries by looking to see if low battery flag is displayed. If batteries are low, replace with two fresh D-size batteries.
Pygmy/AA Flow Meters	Clean, dry and lubricate after each use and check that these procedures have been followed prior to each use. Examine for damage and perform "spin test" prior to use—cup wheel should spin for one minute. When not in use, insert shipping pin or equivalent.

Equipment Description	Maintenance
Top-setting Wading Rod	This equipment shall be cleaned and examined before and after each discharge measurement. The examination shall include a check on the sliding rod and lockset mechanism.
V-Notch and Rectangular Weir Plates	Clean and examine before and after each field installation. Clean plates with soapy water, then rinse in distilled water. Inspect the weir plates to ensure that the upstream edge remains sharp.
USGS Staff Gages	Check for damage, warping, legibility, etc. before use.
Garmin eTrex Vista personal navigator	Check battery power prior to use and take spare batteries.
IDEXX Quanti-Tray System	Use and maintain as per manufacturer's instructions. Ensure equipment is clean and in proper working order.

Equipment	Calibration Requirements
Hach Turbidimeter Model 2100P	Check the turbidity of the Gelex secondary standard closest to the expected range daily. If the reading varies by more than ±5 percent, recalibrate with primary formazin standards. Instrument must be recalibrated with primary formazin standards every three months or after battery replacement if calibration is lost. Refer to manual for formazin-standard preparation. After calibration, read each of the Gelex secondary standards in the kit and mark the lids with the proper reading. These secondary standards must always be re-read after formazin calibration of the meter
Hach Pocket Colorimeter	The instrument is factory calibrated and is ready for use. Test the accuracy of the meter by using a chlorine voluette ampoule standard solution at least once a quarter. Refer to the manual for proper procedures. If there are any discrepancies, contact the manufacturer
Marsh-McBirney Flo-Mate FlowMeter Model 2000	Clean sensor; place in 5 gallon plastic bucket of water, keeping it at least 3 in from sides; wait 10-15 min to settle water; simultaneously press STO and RCL keys (will see "3" on display). Decrement to zero using the ↓ key and then you will see "32" on display; the unit will automatically decrement to zero and turn off and calibration is complete.
Pygmy/AA Flow Meters	Clean, dry and lubricate after each use. Perform "spin test" prior to use—cup wheel should spin for a full minute. When not in use, insert shipping pin or equivalent
ISCO® Automatic Sampler	When in use, check periodically to assure that the aliquot bottles are filling properly and that a new aliquot is automatically collected at the lapsed time selected
YSI model 6920 Sondes	Calibrate probes according to manufacturer's specifications prior to a sampling event. Recalibrate DO probe as necessary in the field to compensate for changes in altitude. Initial calibration verification shall be performed immediately following calibration. With the exception of DO, continuing calibration verification shall also be performed following the sampling event using standards (if available) that bracket sampling result values between initial and continuing verification. DO continuing calibration verification shall be determined by verifying local saturation in the field. Turbidity and pH shall receive two-point calibration and verification at a minimum. The temperature thermistor accuracy will be tested following the thermograph procedures listed below.
Hach HydroLab MS5 Sondes	Calibrate probes according to manufacturer's specifications prior to a sampling event. Recalibrate DO probe as necessary in the field to compensate for changes in altitude. Initial calibration verification shall be performed immediately following calibration. With the exception of DO, continuing calibration verification shall also be performed following the sampling event using standards (if available) that bracket sampling result values between initial and continuing verification. DO continuing calibration verification shall be determined by verifying local saturation in the field. Turbidity and pH shall receive two-point calibration and verification at a minimum. The temperature thermistor accuracy will be tested following the thermograph procedures listed below.

HOBO® Water Temp Pro V. 2 thermographs and associated optic shuttles and optic couplers	Accuracy of the thermistor must be verified both preceding and following field deployment (biannually, at a minimum) in a stable water bath or other controlled temperature environment at both a low range of approximately 4°C and a high range of approximately 35°C. The stable temperature of a controlled environment allows direct comparison of the unit's readout with that of the certified or calibrated thermometer. Accuracy should be within ±0.5°C. A log must be kept that documents each unit's calibration date, test result, and the reference thermometer used. Thermographs that fall outside the acceptable accuracy range should be returned to the manufacturer for adjustment or replacement.
Garmin eTrex Vista personal navigator	Calibrate electronic compass according to manufacturer's instructions after changing batteries or if last calibration is unknown.

Appendix D

2016 Field Sampling Plan Summary

The following combined Water Quality Survey will be conducted by the New Mexico Environment Department Surface Water Quality Bureau in 2016:

Canadian River and Dry Cimarron River Combined Watershed Survey
Project Coordinators: Kris Barrios 505-827-2621 and Chuck Dentino, 505-827-0101

A combined Field Sampling Plan for the above survey project is maintained and available upon request from the Project Coordinators or QA Officer.

SWQB QA Officer: Jody Kougioulis, 505-827-2820

New Mexico Environment Department
Surface Water Quality Bureau
Runnels Building, N2050
1190 St. Francis Dr.
Santa Fe, NM 87505
505-827-0187

Appendix E

Field Quality Control Summary

Data Type	QC Check	QC Criteria	Action for Data Not Meeting QC Requirements	Information Provided	QC Frequency
Chemical Data	Field Blank for cyanide, TSS/TDS/Cl/SO4, Nutrients, and *E. coli*	Parameter detected at concentration ≥ SDL	Flag data appropriately; determine source of contamination and implement corrective action	Sample collection, transportation and/or handling bias	1 per sampling run **
	Equipment Blank for dissolved metals	Parameter detected at concentration ≥ SDL	Flag data appropriately; determine source of contamination and implement corrective action	Sample collection, transportation and/or handling bias	1 per sampling run **
	Trip Blank for VOCs	Parameter detected at concentration ≥ SDL	Flag data appropriately; determine source of contamination and implement corrective action	Sample collection, transportation and/or handling bias	1 per sampling run **
	Reagent Blank For Nutrients	Parameter detected at concentration ≥ SDL	Flag data appropriately; determine source of contamination and implement corrective action	Contamination from sampling equipment and reagent	1 per sampling run **
	Replicates/Duplicates	RPD between samples greater than analytical uncertainty	Determine possible cause (variability in environmental conditions, improper sampling technique, lack of training, etc.); flag data if appropriate and implement corrective action	Performance characteristics for sampling protocols; environmental variability	Determined on project specific basis
Macro-invertebrate Data	Sample Sorting Efficiency (done by contractor)	≥ 95% sorting efficiency* defined as: $SE = \frac{n_1}{n_2} \times 100$	Re-sort entire sample and adjust data, with proper notations, to incorporate missed specimens; determine cause and implement corrective actions (retrain sorter, use larger magnification, etc.)	Sample sorter bias	100% of total samples
	Taxonomic Verification (done by contractor)	≥ 95% similarity between original and QC identifications	Adjust data, with proper notations, according to mutual agreement of the original and QC taxonomists; determine source of differences (specimen damage, regional familiarity, etc.) and implement corrective action	Taxonomic Identification bias	10% of total samples
Habitat Data	Field Replicates (Site sampled by different field crew)	• For % sand and fines, RPD ≤ 15%	Determine possible cause (variability in environmental conditions, improper sampling technique, lack of training, etc.); flag data appropriately and implement corrective action	Data collector bias; performance characteristics for sampling protocols (primarily field sampling precision)	1 per survey per sample index period
Hydrology Protocol	Field Replicates (Site sampled by different field crew)	For all attributes measures: • +/- one scoring category For aggregate score: • difference ≤ 3	Determine possible cause (variability in environmental conditions, improper sampling technique, lack of training, etc.); flag data appropriately and implement corrective action	Data collector bias; performance characteristics for sampling protocols (primarily field sampling precision)	1 per sample field season

NOTES:
RPD = Relative Percent Difference
* An independent observers microscopically re-examine 20% of sorted substrate from each sample. All organisms that were missed are counted. n_1 is the total number of specimens in the first sort, and n_2 is the total number of specimens in the first and second sorts combined.

** Run is usually equivalent to a sampling trip. Some surveys are composed of multiple day trips in which case blanks should be collected at a rate of 10% of the total number of samples for each parameter.