Project Quality Assurance Project Plan

Water Quality Monitoring to Determine the Effectiveness of Nonpoint Source Pollution Controls on San Antonio Creek on the Valles Caldera National Preserve, NM
(San Antonio Creek Monitoring Project)

Section 319 Grant 2008, C9-99610113-1

Submitted by:
New Mexico Environment Department
Surface Water Quality Bureau

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ACRONYMS

EPA	United States Environmental Protection Agency
NMED	New Mexico Environment Department
PQAPP	Project Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedures
SWQB	New Mexico Environment Department Surface Water Quality Bureau
VCNP	Valles Caldera National Preserve
VCT	Valles Caldera Trust
WPS	Watershed Protection Section, Surface Water Quality Bureau
WQPD	Water Quality Protection Division

INTRODUCTION

The purpose of this Project Quality Assurance Project Plan (PQAPP) is to document the results of the technical planning process for the San Antonio Creek Monitoring Project.

The full title of this project is "Water Quality Monitoring to Determine the Effectiveness of Nonpoint Source Pollution Controls on San Antonio Creek on the Valles Caldera National Preserve, NM."

This PQAPP refers to the project as the "San Antonio Creek Monitoring Project."

EPA funding under Section 319 of the Clean Water Act provides resources to implement activities described in a document: *Workplan, Nonpoint Source Program Effectiveness Assessment, 2008-2011*. The workplan states, "This project [the effectiveness monitoring project] will develop and implement a statewide program to assess the effectiveness of 319 watershed projects on water quality." Task 6 of the workplan, Monitoring Plan Implementation, states that the project will research and obtain existing baseline data and conduct post implementation monitoring. The San Antonio Creek Monitoring Project is being done in partial fulfillment of Workplan Task 6.

This PQAPP is a companion document to the Bureau QAPP (*Surface Water Quality Bureau Quality Assurance Project Plan for Water Quality Management Programs*, NMED/SWQB 2009a or most current version). The Bureau SOP (*Standard Operating Procedures for Data Collection*, NMED/SWQB 2007 or most current version) is incorporated in the Bureau QAPP by reference. All of the policies and procedures specified in the Bureau QAPP will be followed for the San Antonio Creek Monitoring Project.

When changes affect the scope, implementation or assessment of the outcome, this PQAPP will be revised to keep project information current. The Project Coordinator, with the assistance of the QA Officer, will determine the impact of any changes on the technical and quality objectives of the project. This QA Project Plan will be reviewed annually by the Project Coordinator to determine the need for revision.

1.0 PROJECT MANAGEMENT

1.1 Distribution List

Table 1
Distribution List and Project Roles and Responsibilities

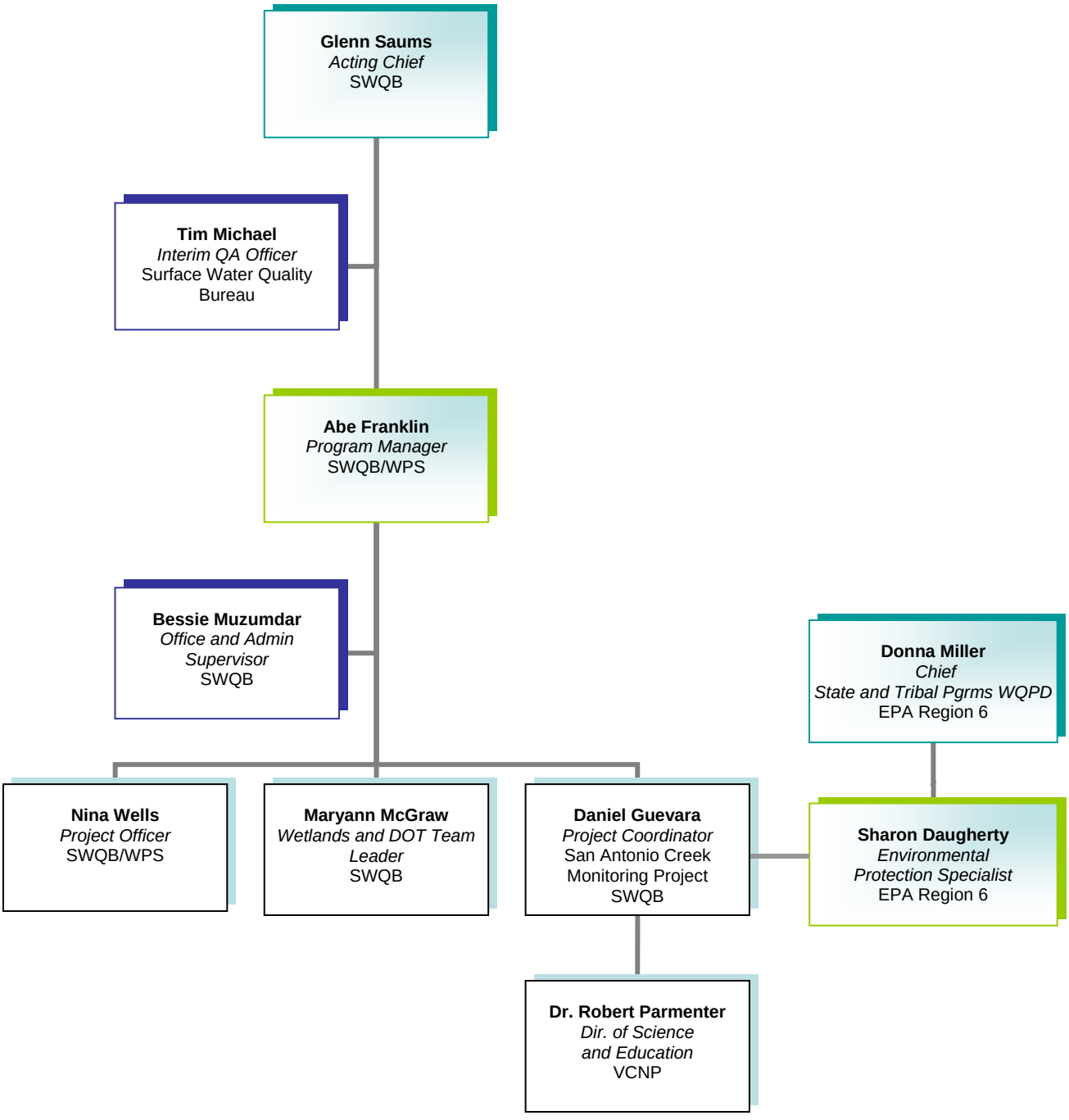
Name	Organization	Position/Role	Responsibility for	Contact Information
Abe Franklin	SWQB	WPS Program Manager	Reviewing and approving QAPP; managing project personnel and resources	(505) 827-2793 abraham.franklin@state.nm.us
Bessie Muzumdar*	SWQB	Office and Admin Supervisor	Maintaining project files	(505) 827-0584 bessie.muzumdar@state.nm.us
Tim Michael	SWQB	Interim QA Officer	Reviewing and approving QAPP	(505) 476-3799 tim.michael@state.nm.us
Daniel Guevara	SWQB	San Antonio Creek Monitoring Project Coordinator	Preparing QAPP, ensuring completion of work, overseeing monitoring, collecting data, training cooperators, managing and analyzing data, reporting	(505) 476-3086 daniel.guevara@state.nm.us
Nina Wells*	SWQB	319 Project Officer	Assist in data collection, training, and report preparation; act as liaison between cooperators and project coordinator	(505) 827-0572 nina.wells@state.nm.us
Maryann McGraw*	SWQB	Wetlands and DOT Team Leader	Assist in data collection, training, and report preparation; act as liaison between cooperators and project coordinator	(505) 827-0581 maryann.mcgraw@state.nm.us
Dr. Robert Parmenter*	VCNP	Director of Science and Education	Providing data, assisting in data collection	(505) 428-7728
Sharon Daugherty	EPA	Environmental Protection Specialist	Reviewing and approving QAPP	(214) 665-2259 daugherty.sharon@epa.gov
Donna Miller	EPA	Chief, State and Tribal Programs Section	Reviewing and approving QAPP	(214) 665-8093 miller.donna@epa.gov

The persons listed above will receive a copy of the PQAPP. The Project Coordinator will require those marked with an asterisk to sign the QAPP Acknowledgement Statement.

1.2 Project Organization

The Bureau QMP (NMED/SWQB 2009b) documents the independence of the QAO from this project. The QAO is responsible for maintaining the official approved PQAPP.

Figure 1
Organization Chart
San Antonio Creek Monitoring Project



1.3 Problem Definition/Background

Goals

The goals of the San Antonio Creek Monitoring Project are:

(1) to evaluate the effectiveness of the restoration projects in the San Antonio Creek watershed in reducing stream temperature and turbidity, and

(2) to develop and test a method for evaluating changes in stream temperature and turbidity.

Background of the San Antonio Creek Restoration Projects

San Antonio Creek from the Valles Caldera National Preserve boundary to its headwaters is included on the 2008-2010 New Mexico 305(b)/303(d) list for not attaining the designated use of high quality coldwater aquatic life due to temperature impairment. The lower portion of the creek (from the East Fork of the Jemez River to the preserve boundary) is listed for temperature and turbidity.

For this reason and because of public interest in improving the condition of the watercourses in the Valles Caldera National Preserve, a number of restoration projects are being implemented or planned that include San Antonio Creek. A 319 project is currently being implemented and another is in development. A 104(b)(3) wetland project is being implemented. In addition, a River Ecosystem Restoration Initiative project is being funded by the State of New Mexico. The common goal of these projects is to restore the river ecosystem in upper San Antonio Creek.

1.4 Project/Task Description

Description

The San Antonio Creek Monitoring Project will use the "Upstream and Downstream/Before and After" method at locations immediately upstream and downstream of the project reach both before and after the implementation of restoration activities to evaluate the effectiveness of the San Antonio Creek restoration projects.

Schedule

Monitoring is planned for at least five years, beginning with baseline data collection from 2009 – 10, and continuing through post implementation monitoring in 2013. Thermographs will be deployed during the warm season, from May through September, to capture daily maximum temperatures. Sondes for the measurement of turbidity will be deployed for several weeks during the summer. Explanatory parameters of canopy cover, flow and stream dimensions will be measured during the summer of each monitoring year. These data will be examined each year to determine the effects of the project on water quality, with the understanding that some effects may take longer to detect due to the lag time of vegetation growth rates and ecological response.

Location

The project area is in the headwaters of San Antonio Creek on the Valles Caldera National Preserve. (Figure 2).

Figure 2
Project Area

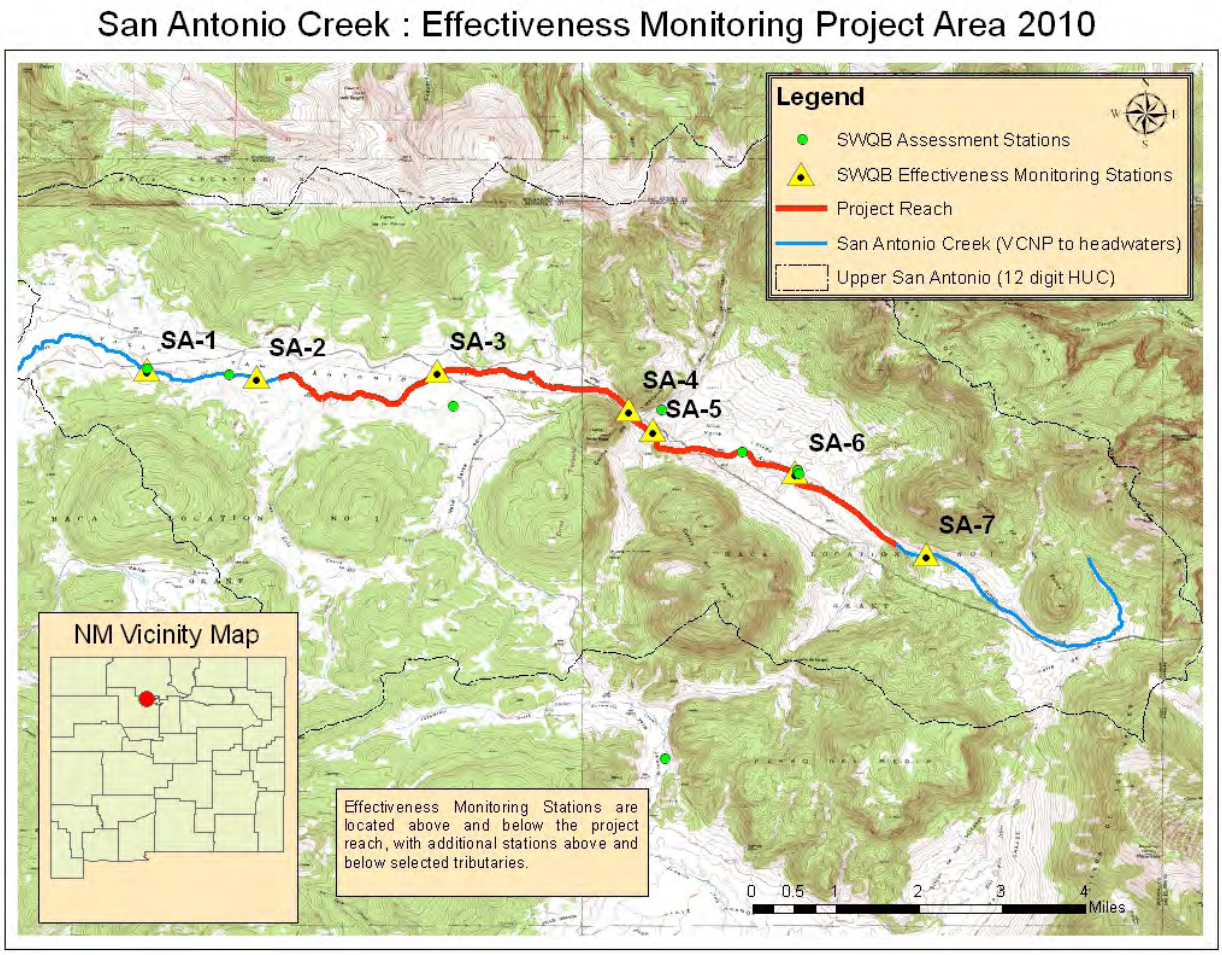


Table 2
San Antonio Creek Effectiveness Monitoring Stations

Station	Description and Rationale	Previous Data
SA-1	Downstream of all restoration activities; but also downstream of warm spring input	2001 MAS
SA-2	Downstream of most restoration activity, and above warm spring input	
SA-3	Downstream of initial 319 project, upstream of proposed 319 project	2009 WPS
SA-4	Downstream of Rio de los Indios	2009
SA-5	Upstream of Rio de los Indios	2009
SA-6	Tributary input from Artesian well	2001 MAS
SA-7	Upstream of all restoration activities but may also be above perennial reach	

These stations have been selected to cover the range of projects and tributaries in the upper San Antonio Creek watershed. Further study may indicate that some stations may not be necessary if the associated tributary is not affecting temperature or turbidity.

Table 3
Waterbody Attributes for San Antonio Creek

Waterbody	Assessment Unit Name	Assessment Unit ID	8 digit HUC name	12-digit HUC	12-digit HUC Name
San Antonio Creek	San Antonio Creek (VCNP bnd to headwaters)	NM-2106.A_26	Jemez River	130202020201	Headwaters San Antonio Creek

A small portion of AU NM-2106.A_26 lies in another watershed (HUC 130202020204), but water quality improvement activities and monitoring will take place primarily in the upper watershed. Note that while direct monitoring of only AU NM-2106.A_26 will be conducted under this PQAPP, another section of San Antonio Creek downstream of the VCNP boundary (AU NM-2106.A_20) has a TMDL and recognized impairment for turbidity, and much of the turbidity in that assessment unit may originate on the VCNP.

1.5 Quality Objectives and Criteria for Measurement Data

Question/Decision

The San Antonio Creek Monitoring Project is intended to answer the following question: Have the restoration activities in the San Antonio Creek watershed lowered water temperatures and turbidity on San Antonio Creek?

Stated as a decision: The information gathered by the San Antonio Creek Monitoring Project will be used to decide whether the restoration activities in the San Antonio Creek watershed have lowered water temperatures and turbidity on San Antonio Creek.

Data Quality Objective

The quality of the data will be adequate to provide a high level of confidence in deciding whether the restoration activities in the San Antonio Creek watershed have lowered water temperatures and turbidity on San Antonio Creek.

Measurement Quality Objectives

The measurement quality objectives will be sufficient to achieve the DQO and will be in conformance with those listed in the Bureau QAPP.

1.6 Special Training/Certification

This project will be primarily implemented by SWQB personnel who are responsible for following the requirements of the Bureau QAPP. No further specialized training is required for SWQB staff. Training of cooperating personnel will be in accordance with the Bureau QAPP.

1.7 Documents and Records

The Project Coordinator will make copies of this PQAPP and any subsequent revisions available to all individuals on the distribution list.

Project documents include this PQAPP, field notebooks, calibration records, sonde download data, validation and verification records, sample collection data, records of analytical data in hard copy or in electronic form and QC records. Also included are project interim and final reports. Documents will be maintained in accordance with the requirements of the Bureau QAPP.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design

The study design consists of monitoring stations both upstream and downstream of the restoration areas, with monitoring conducted before and after implementation (Grabow et al. 1998). Exact locations will be determined in the field with cooperator assistance. Thermographs will be 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 diurnal fluctuations with special emphasis on the daily maximum. Sondes for the measurement of turbidity will be deployed for several weeks during the summer.

An attempt will be made to adjust for sources of system variability that may make it difficult to detect a statistically significant change in the target variables of temperature and turbidity.

The Minimum Detectable Change (MDC) is defined as the minimum change in the mean value of a water quality parameter over time that is considered to be statistically significant (Spooner et al. 1987).

The MDC is a function of watershed size, monitoring design, frequency of samples, length of monitoring time, hydrology and meteorology. The MDC can be reduced by adjusting for the sources of variability. For example, one could adjust for changes in flow rates in streams or runoff, precipitation, land use, incoming upstream concentrations to the system, etc. The MDC can also be reduced by lengthening sample time and frequency and by using more sensitive statistical analysis techniques (Spooner et al. 1987).

Some of the significant sources of system variability can be controlled by accounting for the effects of hydrology and meteorology and by increasing the frequency or number of samples. For this study, hydrology will be considered by using flow measurements in nearby streams to estimate flow in San Antonio Creek. These and other measurements will be used to account for changes in local meteorology. Because sondes and thermographs collect hourly data, the number of data points will be large and will also reduce the uncontrolled variability that might result from a small number of grab samples.

Spooner et al. (1987) concludes that "...the change per year required over a 4 to 10-year period using regression analysis is much less [than that for 2 years]." For this study, monitoring is planned for at least five years.

Monitoring will be conducted at 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. Air temperatures will also be recorded in selected locations to determine the buffering effects of the local riparian areas. Certain locations may be selected for analysis with the Stream Segment Temperature Model. At these locations, additional measurements will be collected such as channel geometry, flow, canopy cover, meteorology to feed into the model.

2.2 Sampling Methods

This study is intended to measure temperature and turbidity using recording thermographs and sondes. There are no plans to collect samples that would require outside analysis.

Continuous monitoring will be accomplished using SWQB sondes and data loggers as described in the Bureau QAPP.

2.3 Sample Handling and Custody

Because there are no plans to collect samples for laboratory analysis, there no handling requirements.

2.4 Analytical Methods

Because there are no plans to collect samples, no analytical methods are needed.

2.5 Quality Control

For this project, the QC activities are those needed to assess and demonstrate the reliability of the data. The Bureau QAPP describes the quality control activities that apply to measurements of variables such as channel geometry, flow and canopy cover.

The chief source of data is measurements of temperature and turbidity made using thermographs and sondes. The QC activities relating to thermographs and sonde measurements are described in Sections 2.6 and 2.7 below. Control limits and descriptions of corrective actions for thermographs and sondes are found in the Bureau QAPP.

2.6 Instrument/Equipment Testing, Inspection and Maintenance

The primary equipment needing maintenance, testing and inspection are thermographs and sondes. Requirements and procedures are specified in the Bureau QAPP.

2.7 Instrument/Equipment Calibration and Frequency

It should be possible to show that all data was collected with monitoring devices that can be shown to have been properly calibrated. Calibration requirements, methods and standards, and procedures for the maintenance of calibration records are specified in the Bureau QAPP. For this project, specific calibration requirements apply to sondes. Sondes will be calibrated at the beginning and end of the deployment, and at approximately two-week intervals during deployment.

2.8 Inspection/Acceptance of Supplies and Consumables

The only consumables that could affect the quality of data are the calibration standards. Control of the calibration standards is in accordance with the requirements of the Bureau QAPP.

2.9 Non-direct Measurements

There are no plans to use data from non-measurement sources.

2.10 Data Management

Data will be managed in accordance with Bureau QAPP.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessment and Response Actions

Assessments and response actions will be reported as described below in 3.2.

3.2 Reports to Management

Annual reports for the overall effectiveness monitoring project will include documentation of the San Antonio Creek Monitoring Project. A summary of the overall effectiveness monitoring project annual report will be included in the Nonpoint Source Management Program Annual Report. The Project Coordinator will also report to EPA in the Grant Reporting and Tracking System and in the final project report, which will be prepared in accordance with EPA Region 6 guidance. Additional reports for EPA or SWQB will be prepared on request.

4.0 DATA VALIDATION AND USABILITY

4.1 Data Review, Verification and Validation

Data, whether collected by SWQB or others, will be considered usable if it has been collected in accordance with this PQAPP. The QAO is responsible for determining if the data was collected according the PQAPP.

4.2 Verification and Validation Methods

Project data will be verified and validated according to the procedures described in Bureau QAPP. Verification and validation issues will be resolved by the Project Coordinator and the Quality Assurance Officer. Results of the validation process will be conveyed using validation and verification worksheets.

Verification issues include the completeness of the record, and verification of calibration. Validation issues include the review of the data for anomalous data points and removal of data points based on reasonable explanation.

4.3 Reconciliation with User Requirements

The user requirement is a restatement of the data quality objective: The data should be adequate to provide a high level of confidence in deciding whether the restoration activities in the San Antonio Creek watershed have lowered water temperatures and turbidity on San Antonio Creek.

If project results do not meet this requirement, then additional monitoring may be necessary to fill in data gaps or it may be necessary to extend the monitoring period to measure effects that were not apparent during the project period.

5.0 REFERENCES

Grabow, G.L., Spooner, J., Lombardo, L.A.., and Line, D.E., 1998. *Detecting Water Quality Changes Before and After BMP Implementation: Use of a Spreadsheet for a Statistical Analysis*. NCSU Water Quality Group Newsletter, Number 92, November 1998.

NMED/SWQB 2007. *Standard Operating Procedures for Data Collection*. New Mexico Environment Department/Surface Water Quality Bureau, July 26, 2007.

NMED/SWQB 2009a. *Quality Assurance Project Plan for Water Quality Management Programs.* New Mexico Environment Department/Surface Water Quality Bureau, April 2009.

NMED/SWQB 2009b. *Quality Management Plan for New Mexico Environment Department Surface Water Quality Bureau Environmental Data Operations 2010*. New Mexico Environment Department/Surface Water Quality Bureau, October 2009.

Spooner, J., Jamieson, C.J., Maas, R.P., Smolen, M.D., 1987. *Determining Statistically Significant Changes in Water Pollutant Concentrations*. Lake and Reservoir Management. Volume III.