Quality Assurance Project Plan

East Fork Jemez River Innovative Wetland Restoration Using Contour Swales, Sod Bowls and Sod Berms
CWA Section 104(b)(3) Wetlands Program Development Grant
Assistance Agreement CD #01F39601-0 (FY2018)

Submitted by:

New Mexico Environment Department
Surface Water Quality Bureau

GROUP A: PROJECT MANAGEMENT

A.1 Title and Approval Sheet

Maryann McGraw — Digitally signed by Maryann McGraw Date: 2022.04.22 11:20:50 -06'00' — April 22, 2022

Maryann McGraw
Wetlands Program Coordinator, SWQB — Date

Miguel Montoya — Digitally signed by Miguel Montoya Date: 2022.04.25 07:39:32 -06'00'

Miguel Montoya
Quality Assurance Officer, SWQB — Date

Abraham Franklin — Digitally signed by Abraham Franklin Date: 2022.04.22 16:33:13 -06'00'

Abraham Franklin
Program Manager, SWQB Watershed Protection Section — Date

Kyla Chandler — Digitally signed by Kyla Chandler DN: cn=Kyla Chandler, o, ou, email=chandler.kyla@epa.gov, c=US Date: 2022.06.21 17:01:19 -05'00'

Kyla Chandler
Project Officer, WDAS, EPA Region 6 — Date

NELLY SMITH — Digitally signed by NELLY SMITH DN: c=US, o=U.S. Government, ou=Environmental Protection Agency, cn=NELLY SMITH, 0.9.2342.19200300.100.1.1=68001003655673 Date: 2022.06.24 08:53:00 -05'00'

Nelly Smith
Chief, State and Tribal Programs Section, WDAS, EPA Region 6 — Date

THIS PAGE INTENTIONALLY LEFT BLANK

A.2 Table of Contents

Table of Contents

List of Tables

List of Figures

ACRONYMS

ACOE	Army Corps of Engineers
DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
KRE	Keystone Restoration Ecology
NPS	National Park Service
NMED	New Mexico Environment Department
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
RPA	Rio Puerco Alliance
SOP	Standard Operating Procedures
SWQB	Surface Water Quality Bureau
TBD	To Be Determined
TMDL	Total Maximum Daily Load
VCNP	Valles Caldera National Preserve

A.3 Distribution List

Table 1. below contains the distribution list, project roles and responsibilities for this project. The Quality Assurance Officer (QAO) will ensure that copies of this QAPP and any subsequent revisions are distributed to members who have signature authority to approve this QAPP. The NMED/SWQB Wetlands Program Coordinator will ensure that copies of the approved QAPP and any subsequent revisions are distributed to all other project personnel listed in Table 1. All members of the distribution list who do not have signature authority to approve this QAPP will review the QAPP and sign the Acknowledgment Statement prior to initiating any work for this project. The signed Acknowledgement Statements will be collected by the NMED/SWQB Wetlands Program Coordinator and will be given to the QAO for filing with the original approved QAPP.

Table 1. Distribution List, Project Roles, and Responsibilities

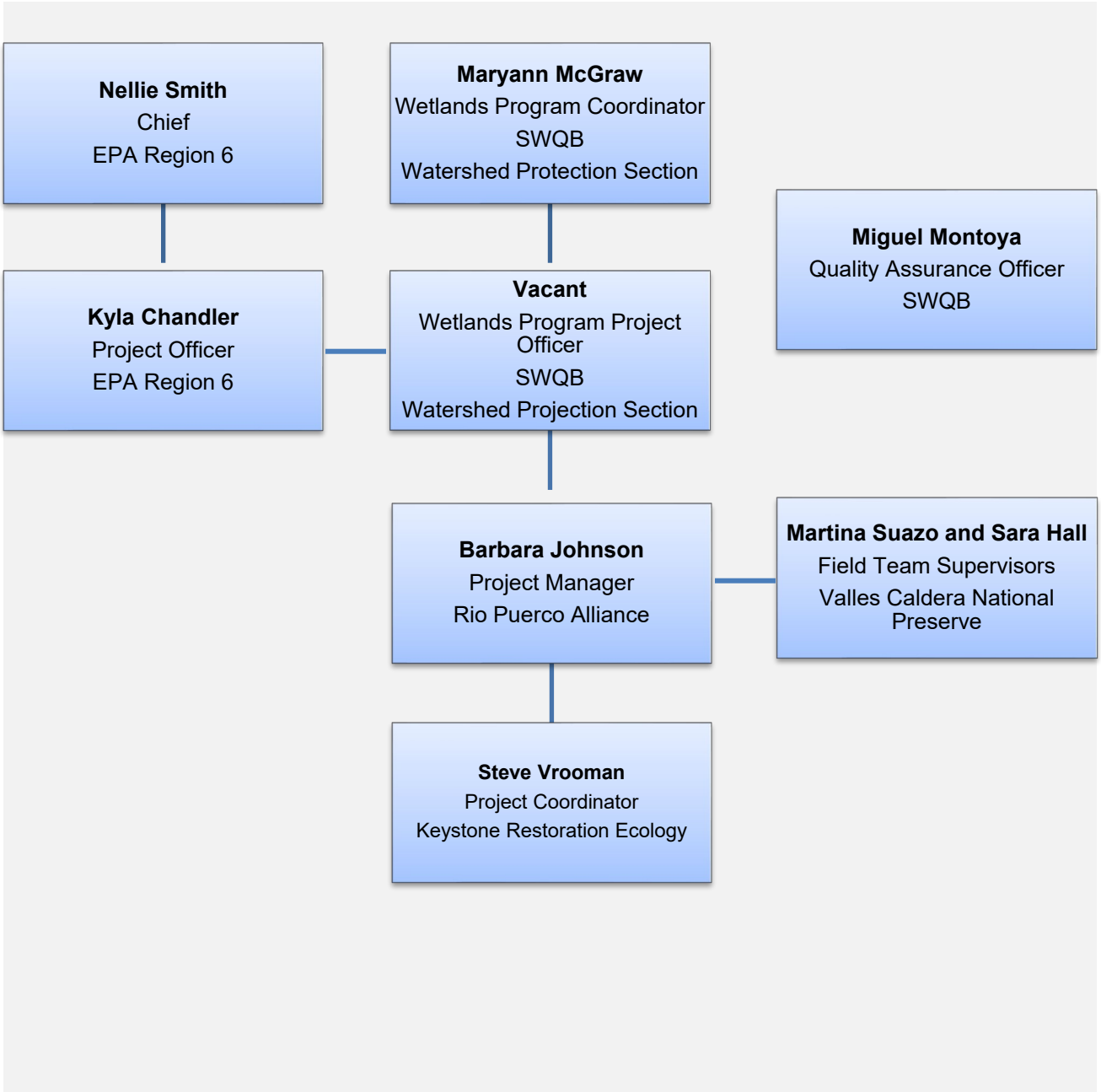
Name	Organization	Title/Role	Responsibility	Contact Information
Abe Franklin	SWQB	Watershed Protection Program Manager	Reviewing and approving QAPP	(505) 946-8952 abraham.franklin@state.nm.us
Maryann McGraw	SWQB	Wetlands Program Coordinator	Preparing and revising QAPP, distribution of QAPP, project reporting, coordinating with contractor, photographic monitoring, oversight of data collection, EPA reporting, reviewing and approving QAPP, managing project personnel and resources	505-490-3135 maryann.mcgraw@state.nm.us
Miguel Montoya	SWQB	Quality Assurance Officer	Reviewing and approving QAPP	505-819-9882 miguel.montoya@state.nm.us
Barbara Johnson	Rio Puerco Alliance (RPA)	Project Manager	Project oversight, data management, and submittal of quarterly reports	505-474-6689 lunah3@comcast.net
Steve Vrooman	Keystone Restoration Ecology (KRE)	Project Coordinator	Project design and implementation, construction, monitoring	505-490-0594 stevevrooman@gmail.com
Martina Suazo	Valles Caldera National Preserve (VCNP)	Field Team Supervisor	Field monitoring, data collection, record keeping, and submitting reports	575-829-4856 martina_suazo@nps.gov
Sara Hall	Valles Caldera National Preserve (VCNP)	Field Team Supervisor	Field monitoring, data collection, record keeping, and submitting reports	575-829-4856 sara_hall@nps.gov

Kyla Chandler	EPA	Project Officer WDAS, Region 6	Reviewing and approving QAPP	(214) 665-2166 Chandler.Kyla@epa.gov
Nelly Smith	EPA	Chief, State and Tribal Programs Section WDAS, Region 6	Reviewing and approving QAPP	(214) 665-7109 smith.nelly@epa.gov

A.4 Project Organization

The SWQB Quality Management Plan (NMED/SWQB 2019) documents the independence of the QAO from this project. The QAO is responsible for maintaining the official approved QAPP. Figure 1 presents the organizational structure for the East Fork Jemez River Innovative Wetland Restoration Using Contour Swales, Sod Bowls and Sod Berms.

Figure 1. Organization Chart



A.5 Problem Definition/Background

The purpose of this Quality Assurance Project Plan (QAPP) is to document procedures for determining the extent of wetlands before and after implementation of a restoration project that is intended to demonstrate new restoration techniques and expand wetland acreage by at least 30 acres in Valles Caldera National Preserve (VCNP). This QAPP refers to the project as the "East Fork Jemez River Innovative Wetland Restoration" project. The East Fork Jemez Innovative Wetland Restoration Project is being managed by Rio Puerco Alliance (RPA) in cooperation with VCNP.

Background

The 89,000-acre VCNP in the Jemez Mountains in northern New Mexico is known for its high mountain meadows, abundant wildlife, meandering streams, and remarkable scenery. In 2000, the Baca Ranch owners sold the property to the federal government and the VCNP became part of the Santa Fe National Forest System. In 2015, the property was transferred to the National Park Service (NPS). Under previous private ownership, the area was used for grazing by tens of thousands of sheep and cattle annually, logging, exploratory well development for geothermal energy, gravel mining, and unmanaged elk foraging.

The headwaters of the streams that flow out of the VCNP are almost entirely contained within the VCNP's boundaries. Any changes in the ecological condition of its aquatic wetland and riparian communities are wholly attributable to the interplay of human activities, ecological succession, geology, climate, and other natural processes occurring within the VCNP. The VCNP contains several unique aquatic and wetland features, ranging from warm, mineralized and extremely acidic geothermal waters to numerous springs, seeps, wet meadows and fens. These water-rich environments, combined with the VCNP's many creeks, streams and riparian areas, provide a robust foundation for the ecological diversity and productivity that characterize the VCNP.

Under NPS management, cattle numbers have been greatly reduced. However, past grazing management practices have degraded some areas of this watershed. The streams have erosion issues, not enough pools, and are too wide and shallow in places. Poorly designed and placed low-standard roads, poor culvert placement, and livestock trailing have led to poor distribution of runoff onto the wet meadows. Poorly maintained roads contribute to sedimentation.

Specifically, the East Fork Jemez River sub-watershed has numerous gullies where livestock created trails by walking up and down the drainage channels. These trails captured water and funneled it directly down the channel, creating V-shaped gullies. These gullies are the demonstration sites for the contour swales, sod bowls and sod berms. The 1,200-acre demonstration project area has several spring-fed slope wetland areas. Vegetation in these areas, specifically *Deschampsia cespitosa* (Tufted Hairgrass), a facultative wetland (FACW) indicator species, suggests that wetlands were formerly more abundant. The project will re-wet at least 30 acres of wetlands by constructing innovative treatments that redistribute

runoff. The design and installation of this project will increase the quantity and ecological functioning of wetlands, thereby helping mitigate effects of climate change in the watershed.

These impacts have partially drained the wetlands, reducing their size and quality. Continued drying and loss of the headwater wetlands results in diminished watershed health overall. Loss of headwater slope wetlands has negative downstream effects including increased erosion, sedimentation, fragmented wildlife habitat, loss of riverine wetlands/riparian vegetation, encroachment of upland vegetation, reduced base flows, increased nutrient loading, and warmer stream temperatures. Restoring headwater wetlands has significant positive downstream effects that buffer climate change by increasing the quality and quantity of downstream riverine wetlands, reducing stream sediment, nutrient loading, and temperature, supporting wildlife habitat, and regulating and increasing stream base flows.

Objective

The NMED SWQB Wetlands Program will implement a demonstration project that restores at least 30 acres of former wetlands in the upper reaches of the East Fork Jemez River watershed on the VCNP using contour swales, sod bowls and sod berms. The objective of the project will demonstrate the effectiveness of these innovative water-slowing, spreading, and infiltrating structures. Design and implementation information about the new techniques will be shared with multiple agencies, landowners, restoration volunteers, and the public through a series of restoration workshops, guided tours, presentations and the distribution of a Technical Guide and fact sheet. The new techniques will be applicable to gullies in slope wetlands on gentle topographic gradients that have vegetation and soils characteristic of former wetlands. The contour swales, sod bowls and sod berms will work together in series to redirect and slow the flow of water at various locations along the flow path within a degraded channel: 1) upstream of a headcut, 2) at the headcut, and 3) downstream of the headcut. This project will also convene stakeholders to develop a Wetlands Action Plan using existing information for the 38,134-acre East Fork Jemez River watershed to guide future monitoring, restoration, management and protection in a coordinated and comprehensive manner.

A.6 Project/Task Description

Description

Data will be collected to determine the effectiveness of the innovative restoration techniques by evaluating the change in rewetted wetland acres. Pre-treatment data collection activities will be conducted prior to installation of water redistribution structures. Structures will include contour swales, sod bowls and sod berms, as well as ancillary structures such as excavator plugs, headcut ponds, one rock dams, plug and ponds, and rolling dips on the road. Structures will be constructed using machinery and hand labor. The techniques employed will use local materials, be low maintenance and hands-on.

Post treatment monitoring data and collection activities will be used to evaluate the effectiveness of the project. Changes within the project area will be addressed by the following monitoring methodologies:

1. Monitoring changes to the wetland perimeter and overall wetland acreage using vegetation and hydrology indicators (Army Corps of Engineers 2008);
2. Establishing permanent photo point locations to visually and qualitatively monitor changes to the wetlands and the structures installed following *Stream Channel Reference Sites: An Illustrated Guide to field Technique* (Harrelson et al. 1994); and
3. Monitoring changes to vegetation abundance and species along treated channels (VCNP 2001)

Schedule

Table 2. Project tasks, products, responsible party, timeline

Task	Product	Responsible Party	Approximate Start Date	Approximate Completion Date
Administrative	Procurement for contract	NMED/SWQB, RPA	April 1, 2020	TBD 2023
Planning	Field site visit (no data collection)	NMED/SWQB, VCNP, RPA, KRE	April 2020	June 2020
Quality Assurance Project Plan and Update	Approved QAPP	NMED/SWQB with input from VCNP, RPA, and KRE	April 2020 Update April 2022	June 2020 Update May 2022
Develop restoration design	Restoration Design	KRE	May 2020	June 2020
Pre-treatment Wetland Delineation	Wetland delineation using vegetation, soils, hydrology	VCNP and KRE	June 2020	August 2020
Pre-treatment Vegetation Monitoring	Point-line survey	VCNP and KRE	June 2020	August 2020
Pre-treatment Photographic Monitoring	Photos and location data sheets	NMED	June 2020	August 2020
Implementation of restoration design	Restoration implementation	KRE	August 2020	September 2020

Post-treatment Wetland Delineation	Wetland delineation using vegetation, soils, hydrology	VCNP and KRE	March and June 2021, 2022, TBD 2023	TBD 2023
Post-treatment vegetation monitoring	Point-line survey	VCNP and KRE	June 2021. 2022, TBD 2023	August 2021, 2022, TBD 2023
Post-treatment photographic monitoring	Photos and location data sheets	NMED	June 2021, 2022, TBD 2023	August 2021, 2022, TBD 2023
Reporting to SWQB Project Officer	Quarterly	RPA	June 30, 2020	TBD 2023
Reporting to EPA	Semi-Annual and Final Report to EPA	NMED/SWQB	November 30, 2017	TBD 2023

Project Area

The restoration project area is located on the southeast side of the Valle Grande within the VCNP, in 12 - digit HUC #130202020203 (East Fork Jemez River). See area in pink on **Figure 2. Project Area Map**.

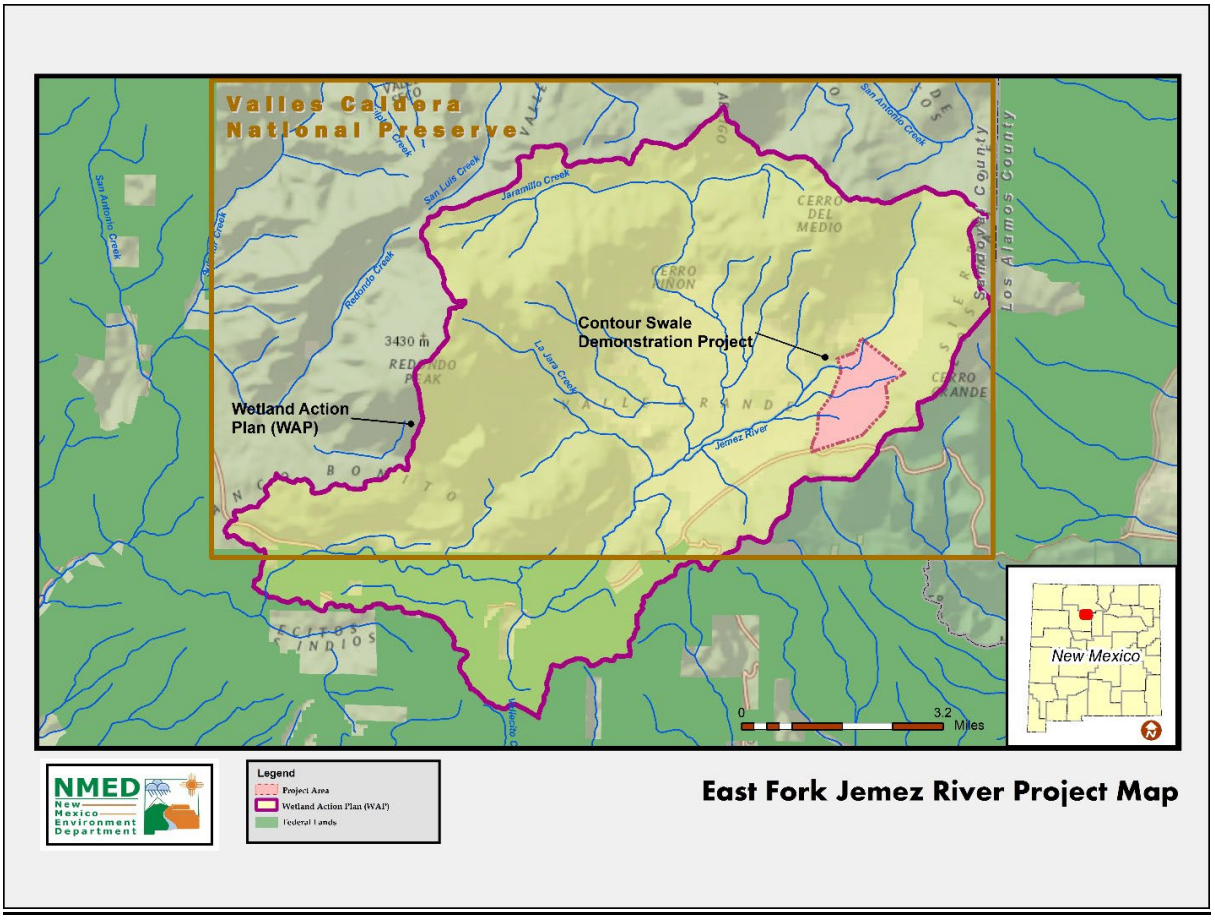


Figure 2. Project Area Map. The SWQB Wetlands Program will use innovative restoration structures to restore a minimum of 30 acres of wetlands within the 1,200 acre Demonstration Project area.

Monitoring Location Selection Criteria

Monitoring locations will be determined during the course of the project by NMED/SWQB, RPA, VCNP and KRE once a final restoration design is complete.

Wetland delineation will include all wetland vegetation within the project area. Initial determinations of historic and current wetlands were made using 1935 aerial photography, 2016 Google Earth imagery, 2016 National Wetland Inventory Mapping data, and 2012 LiDAR imagery.

Three vegetation transect sites will be located in the downslope portions of the project area where increases in wetland acreage are expected to occur as a result of project implementation.

Photographic monitoring will include at least 15 repeat photo points at locations where structures will be built, based on the projects design. At least two of the photo points will be selected to provide a landscape view of the project area looking upslope and downslope.

Restoration Activities

KRE will design the project for approval by RPA, VCNP and NMED/SWQB. A draft project design has been completed as shown in **Figure 3**. Following approval of the final design, KRE will work with VCNP to submit documentation to ACOE for Clean Water Action Section 404/401 permitting. A cultural survey has already been completed by VCNP contract archeaologists. A biological survey for threatened and endangered species has been completed by a VCNP biologist. National Environmental Protection Act compliance has also been satisfied.

KRE will construct the project using heavy machinery during approximately August-September 2020. Additional ancillary wetland restoration structures will be constructed by volunteers affiliated with Albuquerque Wildlife Federationa and Pajarito Evironmental Eduction Center during two summer weekend workshops in 2021 and 2022.

Innovative restoration techniques are described below.

Contour swales will be installed upstream of gully-forming headcuts. Machinery will be used to dig contour swales, shaped concave-down, on the slopes above the headcuts. The downslope edges of the contour swales will be deeper than the upslope edges. Stormwater runoff and snow melt will catch on the lower lips of the contour swales, then either infiltrate or be shunted off to the side slopes, thereby changing water flow directions and dissipating erosive energy. Contour swales will route the flow away from headcuts, onto former wetlands that were dewatered by the headcuts. Seepage through the contour swale will flow down the channel where it will then encounter the next innovative structure at the headcut.

Sod bowls will be installed as soft, absorbent treatment structures that fill a headcut. Sod containing wetland sedges will be stacked and layered from the base to the top of the headcut, forming the overall shape of a bowl. The sod bowl will fill the former headcut and the sedge roots will bind the sod in place. The layers of sod will create small terraces for the water to descend, each terrace dropping only a couple of inches along the soft, permeable, live sod. The sod bowls will be effective because the contour swales installed upstream will route some of the flow away from the gully, reducing the erosive energy of water within the channel.

Sod berms will be installed in series in the gullies downstream of the headcuts. The bottoms of V-shaped gullies will be flattened and smoothed with machinery and sod will be laid across the channel as low-height berms (approximately 3-6 inches high) oriented perpendicular to flow direction. Blocks of wetland sod will be harvested from wet meadows adjacent to the gullies as well as from the contour

swales. The sod berms will create small rises at intervals as water moves down slope. The sod berms will provide grade control that slows and infiltrates water, and propagules for local native wetland vegetation to spread. Installation of the sod berms will render the valley form and width more suitable for sedge growth, thereby expanding wetland acreage within the former gullies, and catching sediment by increasing the roughness of the channel bottom.

Structure designs will be based on the principles of natural channel design and will adapt and expand on structures developed and used in New Mexico for previous SWQB Wetland Program Development Grants (such as Zuni bowls for headcuts, one rock dams for water-slowing and worm ditches and media lunas for water-spreading). These structures are expected to lie gently on the land and become invisible after two or three growing seasons. This is especially appropriate for a high-profile area like the VCNP where people have opportunities to visit nature in a relatively pristine state without much human infrastructure. Because this is a demonstration project, conceptual designs of the innovative restoration structures are subject to revision and improvement as the project develops.

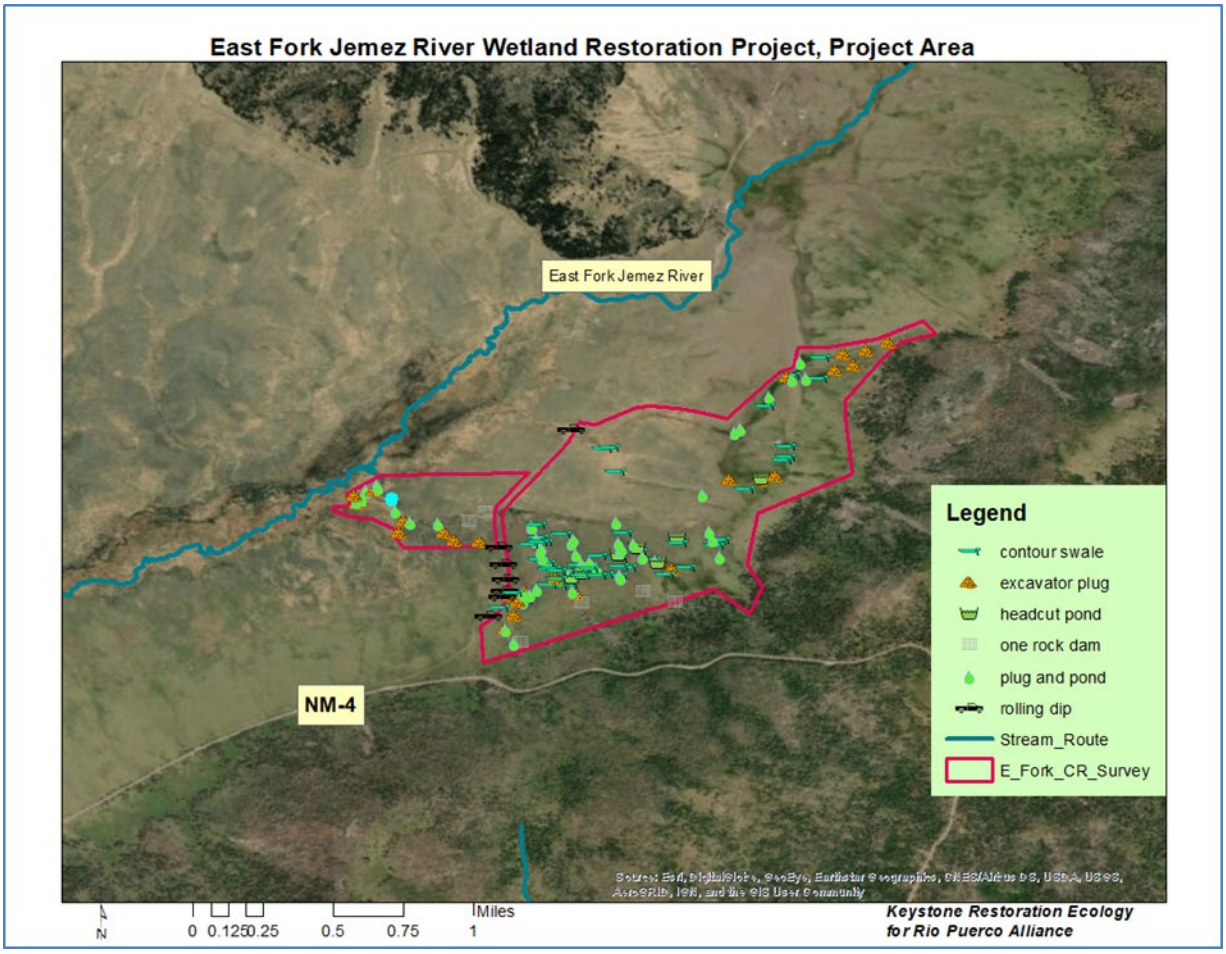


Figure 3. Draft Project Design.

Quality Objectives and Criteria for Measurement Data

Question/Decision

The baseline data collection and monitoring components of the East Fork Jemez River Innovative Wetland Restoration Project are intended to answer the following questions: 1) Have restoration treatments increased wetland acreage; and 2) are structures intact and functioning as intended?

Stated as a decision: The information gathered by the East Fork Jemez River Innovative Wetland Restoration Project will be used to decide whether the restoration treatments have increased wetland acreage and whether structures remain intact and functional throughout the monitoring period.

Data Quality Objective (DQO)

The quality of the data will be adequate to provide a high level of confidence in determining whether wetted area has increased in the project area as identified by hydrology and vegetation indicators, and whether structures remain intact and functioning throughout the monitoring period.

Data Quality Indicators

The measurement quality objectives will be sufficient to achieve the DQO and will be in conformance with those listed in the SWQB's QAPP. The Data Quality Indicators listed in the SWQB's QAPP and applicable to the data collected for this project are precision, bias, accuracy, representativeness, comparability, completeness, and sensitivity (Table 3).

Table 3. Data Quality Indicators

DQI	Determination Methodologies
Precision	The basis for determining precision will be the comparison of photo-documentation of prior and post project construction activity images. Photos and vegetation transects will be GPS-ed and monumented for repeat sampling events for the life of project. Wetland delineation will be GPS-ed. Precision will also be ensured by consistently assigning the same people the responsibilities of collecting, recording and analyzing data with the expert assessments of members of the monitoring team.
Bias	To reduce the systematic or persistent distortion of any measurement process, bias will be minimized by using professional and experienced staff to collect and analyze data.
Accuracy	The basis for determining accuracy will be the comparison of photo-documentation, measurements obtained from predetermined monument locations, the recording of GPS location data for each sampling event as well as through the expert assessments of members of the monitoring team.
Representative	Data collection will be completed at sites that are targeted to represent results of the wetland restoration project.
Comparability	This project will collect new data where no data is available for comparison. However, methods for data collection are standardized and reproducible using procedures identified in this QAPP. Wetland delineation, vegetation and photographic monitoring employ established methods that can be compared to other data collected with same method.
Completeness	Completeness will be achieved by following the sampling design and methods within this QAPP required to obtain useable data that will enable the proper evaluation of project success or failure using the expert

	assessments of members of the SWQB project team. Complete wetland delineation, vegetation and photographic data will be ensured by collecting all of the required data for each sampling method and verifying before leaving the field.
Sensitivity	Sensitivity is ensured based on the manufacturer's specified range and accuracy of the equipment being used and the expertise of the field staff to use and apply data collection methods in a manner that minimizes subjectivity or gross data collection errors.

A.7 Special Training/Certification

This project will be primarily implemented by Rio Puerco Alliance, Wetland delineation monitoring and vegetation transect monitoring for this project will be implemented by VCNP and Keystone Restoration Ecology (under subcontract to RPA) with technical assistance and oversight from the NMED/SWQB Wetlands Program Coordinator. Repeat photography will be taken by the NMED/SWQB Wetlands Program Coordinator. Any individual conducting work for the project will review this QAPP and sign the acknowledgment statement prior to initiating any work for this project. The signed acknowledgment statements will be kept on file with original QAPP by the QAO.

Martina Suazo, VCNP Plant Ecologist/Botanist, will provide vegetation and wetland delineation monitoring for the project. Her education includes a Bachelor's degree in Organismal Biology from Adams State College, Alamosa, Colorado in addition to a Master's degree in Biology with a concentration in Plant Ecology obtained from the University of New Mexico. Over the past 12 years Ms. Suazo has applied her knowledge of techniques and principles for conducting ecological investigations towards land and wildlife management with various federal government agencies. She has been with VCNP since 2013.

Steve Vrooman, President, Keystone Restoration Ecology Inc. will assist with vegetation and wetland delineation monitoring. Keystone Restoration Ecology is a business specializing in the ecological restoration of watersheds. Mr. Vrooman has over 19 years of experience as a professional ecologist and scientist as well as stream and wetland restoration designer. He is trained in ACOE wetland delineation protocol and has experience delineating numerous wetlands. He teaches applied stream morphology workshops and trainings for environmental professionals and the public throughout the southwest and internationally. Mr. Vrooman has completed several restoration projects in the VCNP from 2010 thru 2019 including work on La Jara Creek, Valle Seco, Rito de los Indios, Jaramillo Creek, and slope wetland restoration work on East Fork Jemez River, Nina Springs, six tributaries to San Antonio Creek and Tres Arroyos. Recently, he has co-authored a wetland restoration book with Bill Zeedyk, titled *The Plug and Pond Treatment: Restoring Sheetflow to High Elevation Slope Wetlands in New Mexico.*

Maryann McGraw (WPC), received her Bachelor's and Master's Degrees in Geology from University of Texas at Austin, and is an Environmental Scientist/Specialist Supervisor for SWQB. Ms. McGraw has attended advanced training sessions in fluvial geomorphology assessment of stream conditions and departures conducted by Dave Rosgen, California Rapid Assessment Method (CRAM), HGM training, NWCA training and Stream Pyramid Training. The WPC has also conducted monitoring of riparian areas and assisted monitoring protocols for other wetlands projects during the last 15 years. She worked for NRCS Los Lunas Plant Materials Center propagating wetland plants. Maryann has been the principal investigator and contributing author for all NMRAMs to date. She has also participated in the development of the Rio Puerco Monitoring Manual and is qualified for reviewing the design, conducting and participating in workshops, and for overseeing and managing any of the restoration and monitoring procedures specified for this project.

.

A.8 Documents and Records

The NMED/SWQB Wetlands Program Coordinator will make copies of this approved QAPP and any subsequent revisions available to all individuals on the distribution list who do not have signature authority for approving the QAPP.

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

Project documents include this QAPP and recorded field data (wetland delineation, vegetation transect, photos). Also included are project interim and final reports. Data captured on a global positioning system (GPS), camera, smart phone, tablet, or laptop will be downloaded to a VCNP or SWQB computer or an external hard drive at the end of each day. Copies will be made of all data and stored separately from the original data.

All digital project data will be kept in a project file on a VCNP or NMED/SWQB computer (for wetland delineation and vegetation transects; and photos, respectively) and on a separate external backup hard drive at the respective office. Hard copy project documents will be kept in a project folder in a filing cabinet at the respective office. All hard copy documents will be digitized and stored on an RPA computer and backup hard drive (see Table 5). Copies of the data will be distributed by RPA to the NMED/SWQB Wetlands Program Coordinator after data collection (prior to paying an invoice for data collection).

Table 3. Data Records for the Project

Document	Type of Form	Storage Location	Field Sheet Used
QAPP	Electronic (.doc) & Hard Copy	NMED/SWQB Central Wetland Program files	EPA Requirements for Quality Assurance Project Plan. EPA QA/R-5. Located at: https://www.epa.gov/sites/production/files/2016-06/documents/r5-final_0.pdf
Wetland Delineation	Electronic GPS files	NMED/SWQB Wetlands Program Coordinator files, upon submittal by RPA	NA
Vegetation Transects	Electronic Excel Macro files	NMED/SWQB Wetlands Program Coordinator files, upon submittal by RPA	NA
Photos	Electronic (.jpg)	NMED SWQB Wetlands Program Coordinator files	Permanent Photo Point Record. Appendix I *"Let the Water do the Work"*
Interim and Final Reports	Electronic (.doc) & Hard Copy	NMED/SWQB Central Wetland Program files	NA

GROUP B: DATA GENERATION AND ACQUISITION

B.1 Sampling Design

Table 5 describes specifics for the three types of monitoring that will be conducted for the East Fork Jemez River Innovative Wetland Restoration project: 1) Wetland delineation; 2) Vegetation monitoring; and 3) Photographic monitoring.

Table 4. Project Monitoring Specifics

Responsible Party	Monitoring	Location	Frequency
CONTRACTOR/COOPERATOR	TYPE OF MONITORING	LOCATION OF MONITORING	FREQUENCY OF MONITORING

VCNP and KRE	Wetland Delineation	Perimeters of wetland acreage within the project area	Annually
VCNP and KRE	Vegetation Monitoring	3 vegetation transect sites downslope of restoration structures; 2 vegetation reference transect sites within the subwatershed	Annually
NMED	Photographic Monitoring	At least 15 photo points of wetland restoration structures; at least two to include landscape views	March and August Annually

B.2 Sampling Methods

Wetland Delineation

Wetland delineation will be conducted using ACOE standards - Arid West Supplement (ACOE 2008). This monitoring method will delineate 100-200 acres of wetland, potential wetland, and former wetland area degraded by erosion. Over a decade of working on VCNP projects, KRE has developed a technique that focuses on hydrology and vegetation indicators, which can respond to wetland restoration techniques and the restoration of the hydrology of the site within the 2-4 year follow-up monitoring timeline. This method allows delineation of wetlands before and after restoration implementation and shows the response within the timeline of the grant. Hydrology indicators respond immediately to restoration techniques, as soon as the next heavy rainfall or Spring snowmelt.

Soil indicators will not be used, as they may take up to five years to develop after the restoration of the wetland, (Vepraskas et al, 1999). In addition, the process of digging soil pits at 30-50 small wetland sites and analyzing soils is too time consuming and too great an expense.

Some of the soils in wetlands at the VCNP are histosols formed under saturated conditions. The primary soil type in the East Fork Jemez River Innovative Wetlands project area is “fine-loamy mixed frigid typic Argialbolls”, a mollisol. For histosols in degraded wetland areas drained by gullies, hydric soil indicators may still denote that the soil was formed under hydric conditions even if the hydrology and vegetative indicators are no longer present.

The survey area will be assessed for hydrology indicators early in the growing season. Weather station data was analyzed for Spring 2020, and the approximate date of April 26th was chosen as the start of the growing season due to soil temperature readings at the Valle Grande weather station https://wrcc.dri.edu/vallescaldera/. Each year, weather station data will be analyzed, and the start of

the growing season will be identified from soil temperature data according to the information below. This will be compared with vegetative indicators as shown below.

Hydrophytic vegetation is present when the plant community is dominated by species that can tolerate prolonged inundation or soil saturation during the growing season. If a site is dominated by plant species that are classified as hydrophytic, the area is a wetland.

The first step is to stratify the site so that the major landscape or vegetation units can be evaluated separately. Routine wetland determinations are based on visual estimates of percent cover of plant species that can be made either (1) within the vegetation unit as a whole, or (2) within one or more sampling plots established in representative locations within each unit.

According to the Arid Southwest Supplement (pp13), if more than 50 percent of the dominant plant species across all strata are rated OBL, FACW, or FAC, the area is a wetland. This is called the "dominance test" and is the primary technique used to delineate hydrophytic vegetation. If the plant community fails the dominance test, but indicators of hydric soil and wetland hydrology are both present, the prevalence test is used (Indicator 2).

To calculate the prevalence index, at least 80 percent of the total vegetation cover on the plot (summed across all strata) must be of species that have been correctly identified and have an assigned wetland indicator status (Reed 1988 or current list) or are upland (UPL) species.

Once the major vegetative units are identified, the boundaries between wetland and upland communities are mapped by a monitoring team of at least two people with a sub-meter GPS. To assist in identification of the boundary, one technician walks ahead with "pin flags", marking the boundaries of each wetland unit. The second person follows behind with the GPS and walks between the flags. This two-step process has been found to help reduce errors such as mapping the same site twice or missing small clumps of wetland vegetation.

The U.S. Army Corps of Engineers (2008) provides a technical standard for monitoring hydrology on such sites. This standard requires 14 or more consecutive days of flooding or ponding, or a water table 12 in. (30 cm) or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability).

Once the site has been delineated for wetland vegetation and hydrology, the project is expected to be implemented the same year. Since the major vegetative units have already been mapped, a GPS map of the delineated wetlands is used to guide the post-implementation delineation. The first indicator that appears is the wetland hydrology indicator, this may occur as soon as 1-2 months after implementation, depending on rainfall. Surface water, drift lines and a high water table can all be seen. Hydrophytic vegetation may take 2-3 years after implementation to meet the dominance test. However, several vegetative features may show that the hydrology of the site has been restored. Kentucky bluegrass (*Poa pratensis*) and Dandelion (*Taraxacum officinale*) are very prevalent at VCNP, and both bloom in

profusion in May-June with the addition of additional water. In year two after implementation, remnant wetland vegetation such as *Juncus articus* begins to dominate and the Kentucky Bluegrass and Dandelion may begin to die off, leaving areas of bare soil.

Vegetation Monitoring

Vegetation transect monitoring will be conducted by line-point intercept in accordance with the VALL Rangeland Monitoring Protocol (VCNP 2001). While wetland delineation offers a broad-brush assessment of wetland areas, vegetation transect data provide a wetland vegetation comparison between restoration treatment sites and control (reference) sites.

There are numerous reference sites from which to compare against in the watershed and elsewhere across VCNP. The control plots selected to serve as references for this monitoring project were installed in 2001 as part of a rangeland and riparian monitoring program. Reference site configuration is different from the treatment plot design but sampling methodology is identical with 300 points total of data per site. The control sites for this project will consist of riparian and wet mountain meadow sites in areas with similar landforms to the treatment sites but with existing wetland vegetation composition – the target plant community composition and distribution this restoration project aims to achieve. New treatment plots will need to be installed, there are no pre-established vegetation monitoring plots within the project area.

Three new treatment monitoring plots will be installed and sampled in 2020. These vegetation transect sites will be established in locations that will capture plant community changes resulting from wetland restoration. Each vegetation monitoring plot will consist of 300 points of data as follows: Three 50-meter transect lines with readings taken every half meter; lines will run parallel to each other and will be separated by 20 meters. The azimuth for these lines will be determined on site by KRE based on direction of water flow expected after construction. Measurements will be taken with the use of a thin rod, 1.2 meters in length by 1 cm in diameter. The species of every live plant touching the rod, or intersecting the vertical line drawn by the rod from the top of the plant canopy down to the ground surface, will be recorded to species level in most cases. The surface substrate touched by the base of the rod at ground level will also be recorded and used to determine basal litter coverage. If one species occurs more than once at a particular point, only its highest appearance will be recorded. Canopy height measurements, estimated to the nearest centimeter, will be recorded as the height of the point at which the tallest plant intersected the sampling rod. Two photos will be taken of each transect line with the measuring tape present on the ground for a total of six photographs per site per year. Photographic monitoring of the transects and data collection will be conducted annually during the growing season (June-Sept.).

Photographic Monitoring

Photographic documentation will be conducted using the protocols identified in *Let the Water Do the Work* (Zeedyk, et al, 2009) Appendix I, Outline for Photographic Monitoring Plan. Photo points will be recorded using Permanent Photo Point-Record-Initial Take (Form 1). This documentation provides location and time information necessary for repeat photos to be taken annually at the same time and location. At least 15 photo points will be established and monumented at sites that capture wetland restoration structures. At least two of the photo points will provide a landscape view (upslope and downslope) that shows wetlands affected by the restoration project.

B.3 Sample Handling and Custody

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

B.4 Quality Control

Quality control (QC) activities are technical activities performed on a routine basis to quantify the variability that is inherent to any environmental data measurement activity. The purpose for conducting QC activities is to understand and incorporate the effects the variability may have in the decision-making process. Additionally, the results obtained from the QC analysis, or data quality assessment, may identify areas where the variability can be reduced or eliminated in future data collection efforts, thereby improving the overall quality of the project being implemented.

Quality Control mechanisms are implemented as described under the Quality Objectives and Criteria for Measurement Data as well as the sampling methodologies identified under this QAPP. Additional Quality Control includes the professional expertise of the personnel working under this project.

The monitoring team has many years of experience working on wetland restoration projects and have successfully completed many seasons of monitoring.

Wetland delineation will be completed using a sub-meter GPS unit by an experienced VCNP botanist and KRE wetland scientist trained in ACOE wetland delineation procedures.

Vegetation transects will be completed using a measuring tape by an experienced VCNP botanist familiar with vegetation occurring on VCNP with assistance from a KRE wetland scientist. Cross section start and end locations will be GPS-ed and monumented with metal stakes. Data collected from before and after restoration treatments will be collected by the same field team and will correspond to the same locations on the cross section tape.

Repeat photography will be conducted from the same location each field season documented by a GPS location and by metal skate monuments using a Nikon 5300 (or comparable) camera.

B.5 Instrument/Equipment Testing, Inspection and Maintenance

Equipment used for this project includes SWQB's GPS unit (Garmin MAPS 64 or comparable) and camera (Nikon 5300 or comparable). VCNP and Keystone Restoration Ecology will use their own comparable equipment.

B.6 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. GPS units have a calibration system for the compass. To calibrate the compass, the user must be outdoors, away from objects that influence magnetic fields, such as cars, buildings, or overhead power lines. The Garmin MAPS64 device has a 3-axis electronic compass. The user should calibrate the compass at the start of the field day (or after moving long distances, experiencing temperature changes, or changing the batteries).

Field equipment will be inspected prior to each sampling trip. All instruments and equipment will be tested, inspected and maintained in accordance with the manufacturer's specifications as included in the associated instrument/equipment manual. If condition of equipment is in doubt, it will not be used. In the event of instrument failure, the SWQB Wetlands Program Coordinator will correct the problem, rejecting the resultant data or accepting the data with notations.

B.7 Inspection Inspection/Acceptance for Supplies and Consumables

There are no supplies or consumables that could affect the quality of data related to this project.

B.8 Non-direct Measurements

Existing aerial and satellite imagery and wetland mapping of Valles Caldera National Preserve will be used to aid in determining pre-implementation wetland delineation. These data are available through Google Earth, NM RGIS, and the National Wetlands Inventory.

No non-direct measurements used during the course of this project will affect the quality of data related to this project.

B.9 Data Management

VCNP and the NMED/SWQB Wetlands Program Coordinator will be responsible for data management (VCNP for wetland delineation and vegetation transects, and NMED for photos). All data will be converted to electronic format, stored and backed up by VCNP or NMED. Computer hard drives are backed up daily or will be backed up on external hard drives, respectively. Hard copies of field sheets will be maintained in a project binder organized by assessment and date and stored in a key protected filing cabinet in the office of VCNP or the NMED/SWQB Wetlands Program Coordinator for their respective data.

Data will be sent to the NMED/SWQB Wetlands Program Coordinator by the end of each field season by Rio Puerco Alliance, prior to the end of October or prior to requesting reimbursement for the monitoring work whichever occurs first. Upon receiving data, the SWQB Project will store data on SWQB network drive. The SWQB network drive is backed up daily and maintained by the NMED Office of Information Technology. Electronic data files will be stored on the SWQB network drive in accordance with 1.21.2 NMAC, *Retention and Disposition of Public Records.*

GROUP C: ASSESSMENT AND OVERSIGHT

C.1 Assessment and Response Actions

The NMED/SWQB Wetlands Program Coordinator will provide project oversight by periodically assisting with and/or reviewing data collection efforts. A review of the data collection and monitoring efforts by the SWQB Wetlands Program Coordinator will take place at the end of each monitoring season. The SWQB Wetlands Program Coordinator will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Any problems encountered during the course of this project will be immediately reported to the NMED/SWQB Wetlands Program Coordinator who will consult with appropriate individuals to determine appropriate action. Should the corrective action impact the project or data quality, the NMED/SWQB Wetlands Program Coordinator will alert the QAO. If it is discovered that monitoring methodologies must deviate from the approved QAPP, a revised QAPP must be approved before work can be continued. All problems and adjustments to the project plan will be documented in the project file and included in the final report.

C.2 Reports to Management

Quarterly reports will be submitted by RPA to the NMED/SWQB Wetlands Program Coordinator and will include progress of project and any available monitoring data. Printouts, status reports or special reports for SWQB or EPA will be prepared upon request. The final report will be submitted to the SWQB Wetlands Program Coordinator by September 30, 2022. The SWQB Wetlands Program Coordinator will be responsible for submitting the final project deliverables to EPA through their Grants Reporting Tracking System.

GROUP D: DATA VALIDATION AND USABILITY

D.1 Data Review, Verification and Validation

Data will be reviewed by the Monitoring Team in the field for erroneous data, incomplete data and transcription errors prior to demobilization from the field site. Data will be considered usable if the requirements of this QAPP were followed and the data is within acceptable range limits as defined under this QAPP. Data that appears incomplete or questionable for the parameter will be flagged for review. Flagged data will be discussed with the SWQB Wetlands Program Coordinator to determine the potential cause and usability. If a reasonable justification for use of the data cannot be attained, those

data will be not used in analysis and implementation of activities listed under this QAPP unless the data can be recollected and assessed for usability.

D.2 Validation and Verification Methods

KRE, VCNP and NMED (for wetland delineation, vegetation transects, and photo monitoring, respectively) will ensure that valid and representative data are acquired. Review of field data will be performed as described in section D1 of this QAPP, Verification of data will be completed using the attached Verification and Validation (V&V) worksheets. Verification of data will occur after returning from the field, or as soon as practical. Validation (V&V) of data will occur after every field season, both the Verification and Validation of data will utilize the attached V&V worksheets. The V&V will be completed by appropriate monitoring team members in accordance with the applicable sections of SWQB SOP 15.0 for *Data Verification and Validation* (NMED/SWQB 2020). In the event questionable data are found, the SWQB Wetlands Program Coordinator will notified and will consult appropriate personnel to determine the validity of the data. Results of the verification and validation process will be included in the final reports.

D.3 Reconciliation with User Requirements

The user requirement is a restatement of the data quality objective: The information gathered by the East Fork Jemez River Innovative Wetland Restoration Project will be used to decide whether the restoration treatments have increased wetland acreage, and whether structures remain intact and functional throughout the monitoring period. The quality of the data will be adequate to provide a high level of confidence in determining whether the East Fork Jemez River Innovative Wetland Restoration Project is meeting the project goals, as stated in the approved scope of work.

If the project's results do not meet this requirement, then additional monitoring may be necessary to fill in data, which may include an extension of the monitoring period to measure effects that were not apparent during the project period.

REFERENCES

Army Corps of Engineers. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) Wetlands Regulatory Assistance Program. U.S. Army Corps of Engineers.

NMED/SWQB. 2016a. Quality Assurance Project Plan for Water Quality Management Programs [QAPP]. Approved January 26, 2016. https://www.env.nm.gov/swqb/QAPP/2016QAPPFinal_Complete_withAppendices_Approval_Signatures.pdf

NMED/SWQB. 2020. 15.0 SOP Data Verification and Validation. Effective May 28, 2020. https://www.env.nm.gov/swqb/SOP/documents/15VVSOP03_15_2016.pdf

VCNP. 2001. VALL Rangeland Monitoring Protocol, 4 p.

Vepraskas, M. J., Richardson, J. L., Tandarich, J. P., & Teets, S. J. (1999). Dynamics of hydric soil formation across the edge of a created deep marsh. Wetlands, 19(1), 78–89.

Zeedyk, W.D; Clothier, V. 2009. *Let The Water Do The Work,* Appendix I, Outline for Photographic Monitoring Plan. The Quivira Coalition, Santa Fe, NM.

APPENDIX I

Data Verification and Validation Worksheet

Type of Data, Name and Date of Personnel Collecting Data	Verification of Complete Record [Y/N]	Instrument in working order [Y/N]	Checked for anomalous data [Y/N]	Validated by [name of reviewer]	Validated on [Date]

Acknowledgement Statement

New Mexico Environment Department Surface Water Quality

East Fork Jemez River Innovative Wetland Restoration

Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy (in hard copy or electronic format) of the *East Fork Jemez River Innovative Wetland Restoration Quality Assurance Project Plan*.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to read, understand, become familiar with and comply with the information provided in the document to the best of my ability.

_____
Signature

_____
Name (Please Print)

_____
Date

Return to SWQB Wetlands Program Coordinator **Maryann McGraw**