US Army Corps
of Engineers®
Albuquerque District

Final Environmental Assessment
for the

West Puerto de Luna Acequia Rehabilitation Project
Guadalupe County, New Mexico
Section 1113 of P.L. 99-662 (WRDA 1986)

Prepared by

U.S. ARMY CORPS OF ENGINEERS
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Finding of No Significant Impact
West Puerto de Luna Acequia Rehabilitation Project
Guadalupe County, New Mexico

The U.S. Army Corps of Engineers (Corps), Albuquerque District, in cooperation with and at the request of the New Mexico State Engineer's Office and the members of the Puerto de Luna West Side Acequia (Acequia) Association, is planning a project to rehabilitate the West Puerto de Luna Acequia, Guadalupe County, New Mexico. The project area is located along Agua Negra Creek, just west of the Pecos River, approximately 13 miles south south-east of Santa Rosa and 2.5 miles northwest of the historic community of Puerto de Luna.

The proposed rehabilitation work would be conducted under Section 1113 of the Water Resources Development Act of 1986 (Public Law 99-662), as amended. Section 1113 authorizes the Acequia Rehabilitation Program to conduct restoration and rehabilitation of irrigation ditch systems (acequias) in New Mexico. Under Section 1113, Congress has found that New Mexico's acequias date from the eighteenth century and, because of their significance in the settlement and development of the western United States, should be restored and preserved for their cultural and historic values to the region. The Secretary of the Army has been authorized and directed to undertake, without regard to economic analysis, such measures as are necessary to protect and restore New Mexico's acequias. The Federal responsibility is 75 percent while the non-Federal financial responsibility is 25 percent for any work carried out under Section 1113.

West Puerto de Luna Acequia diverts water from Agua Negra Creek and serves 53 members to irrigate approximately 330 acres of cropland. The acequia has been in operation since the 1800s and the most recent diversion dam was constructed in the 1940s. This diversion dam was completely destroyed in two successive floods in 2006. The purpose of this acequia rehabilitation project is to replace the destroyed diversion dam. The proposed action would not change or affect water rights, or the amount of flows diverted.

The Corps proposes to rehabilitate the West Puerto de Luna Acequia by replacing the washed out fill section of the irrigation diversion dam to pre-disaster function and design. The new structure would be earth-filled, have a centerline cross section of 120 feet at the top, 60 feet at the bottom, a height of 35 feet and a width of 40 feet. Total earthen fill volume would be 12,834 cubic yards (cy) and would use 2:1 slopes along the stream. The upstream fill face would have grouted rip-rap three feet thick as additional protection. The acequia members would be responsible for assuring operation and maintenance upon project completion.

The Corps has previously undertaken a project to rehabilitate parts of West Puerto de Luna Acequia (U.S. Army Corps of Engineers 2005). In 2005, 686 feet of existing concrete ditch were replaced with newer concrete, 5,239 feet of earthen ditch were replaced with concrete, and a failing flume was replaced.

The proposed action is in compliance with cultural resources laws, including the National Historic Preservation Act. A cultural resources survey found no prehistoric or historic archaeological sites or other historic properties within or immediately adjacent to the project area, with the exception of the acequia itself and seven non-significant Isolated Occurrences. The

Corps has received no indication of tribal concerns that would impact the project. The Corps has determined that the acequia system is eligible for listing on the National Register of Historic Places. The Corps is of the opinion that there would be no adverse affect to historic properties by the proposed undertaking, or on the historic and cultural resources of the region.

As required by the Endangered Species Act, the Corps has determined that the project would have no effect on any threatened or endangered species or designated or proposed critical habitat receiving protection under the Endangered Species Act.

The proposed action is the reconstruction of an existing, recently damaged irrigation structure. Therefore, under 33 CFR 323.4, the project is exempt from the provisions of Section 404 of the Clean Water Act (33 CFR 323.4). The project complies with Executive Order 11990, Protection of Wetlands because there are no naturally occurring wetlands within the project area, and therefore, there would be no impacts to wetlands.

Measures to protect the environment that would be implemented as part of this project include the following:

- The contractor would be required to have emission control devices on all equipment.
- To control dust and wind erosion, soils within the construction zone would be kept wet. Stockpiles of debris, soil, sand, or other materials that could produce dust would be watered or covered. Materials transported on- or off-site by truck would be covered. The contractor would be required to comply with local soil sedimentation and erosion-control regulations.
- All fuels and lubricants would be stored outside of the 100-year floodplain of the Pecos River and construction equipment would be inspected daily and monitored during operation to prevent leaking fuels or lubricants from entering surface water.
- Aquatic habitat in the Agua Negra Creek channel below the proposed action site would be protected with silt fencing, geotextiles, or straw bales to prevent runoff of sediments from areas disturbed by construction.
- All construction equipment would be cleaned with a high-pressure water jet before entering and upon leaving the project area to prevent introduction or spread of invasive plant species.
- Following construction, the soil would be stabilized and revegetated with appropriate native plant species.

The proposed action would not change or affect water rights or the amount of water diverted. The proposed action would result in minor or temporary effects on soils, air quality, noise levels, vegetation, and wildlife species and habitat. The following elements were analyzed, but would not be significantly affected by the proposed action: climate, physiography, geology, water quality, waters of the U.S., wetlands, floodplains, special status species, land use, visual resources, human health and safety, aesthetics, land use, Indian Trust Assets, socioeconomics, and environmental justice. Beneficial effects would occur to land use and socioeconomics with renewed use of the acequia.

The proposed action is being coordinated with Federal, state, and local agencies with jurisdiction over the biological and cultural resources of the proposed action area. Based upon these factors and others discussed in the following environmental assessment, the proposed action would not have significant effects on the human environment. Therefore, an environmental impact statement will not be prepared for the proposed rehabilitation work on the West Puerto de Luna Acequia.

11/14/10
Date

Kimberly M. Colloton
Lieutenant Colonel, U.S. Army
District Commander

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1.0 INTRODUCTION

1.1 Background and Location

The U.S. Army Corps of Engineers (Corps), Albuquerque District, in cooperation with and at the request of the New Mexico Office of the State Engineer and the members of the Puerto de Luna West Side Acequia Association (Acequia Association), is planning a project that would rehabilitate part of the West Puerto de Luna Acequia, Guadalupe County, New Mexico. The project area is located along Agua Negra Creek, just west of the Pecos River, approximately 13 miles south south-east of Santa Rosa and 2.5 miles northwest of the historic community of Puerto de Luna in south-central Guadalupe County, New Mexico (see Figures 1, 2). Puerto de Luna is about 10 miles south of Interstate Highway 40 at Santa Rosa.

The proposed rehabilitation work on the West Puerto de Luna Acequia would be conducted under Section 1113 of the Water Resources Development Act of 1986 (WRDA 1986; Public Law 99-662, as amended. Section 1113 authorizes the Acequia Rehabilitation Program for the restoration and rehabilitation of irrigation ditch systems (acequias) in New Mexico. The Corps would provide 75 percent of construction funding and is therefore the action agency for this project. The Office of the State Engineer would be the project sponsor, and with the Acequia Association, would be responsible for the remaining 25 percent of construction costs. The Acequia Association would be responsible for operation and maintenance once the project is complete.

Much of the information in this Environmental Assessment (EA) describing the physical and environmental resources at and near the proposed action area and the history of the West Puerto de Luna Acequia project has been taken from two previous Environmental Assessments that documented other rehabilitation projects completed for the acequia or in the area by the Corps: 1) "Acequia Rehabilitation Program, West Puerto De Luna Acequia, Guadalupe County, New Mexico," August, 2005; and 2) "Final Environmental Assessment East Puerta de Luna Community Ditch Pipeline Rehabilitation Project" September 2003. These documents are hereby incorporated by reference.

Rehabilitation and improvements to the acequia have been undertaken in the past as the Acequia Association obtained necessary funds (USACE, 2000; USACE, 2003). The first of these projects were completed by the Soil Conservation Service, the predecessor of the NRCS. In 1967, a 686- foot segment of ditch was lined with concrete. Following the 1986 Water Resources Development Act's authorization of the Acequia Rehabilitation Program, the Corps provided funding for the replacement of that concrete-lined section in 2005 (USACE, 2005). During the same rehabilitation project, an additional 5,278 feet of earthen ditch was lined with concrete and a failing flume was replaced. The proposed action would continue the work of rehabilitating the acequia.

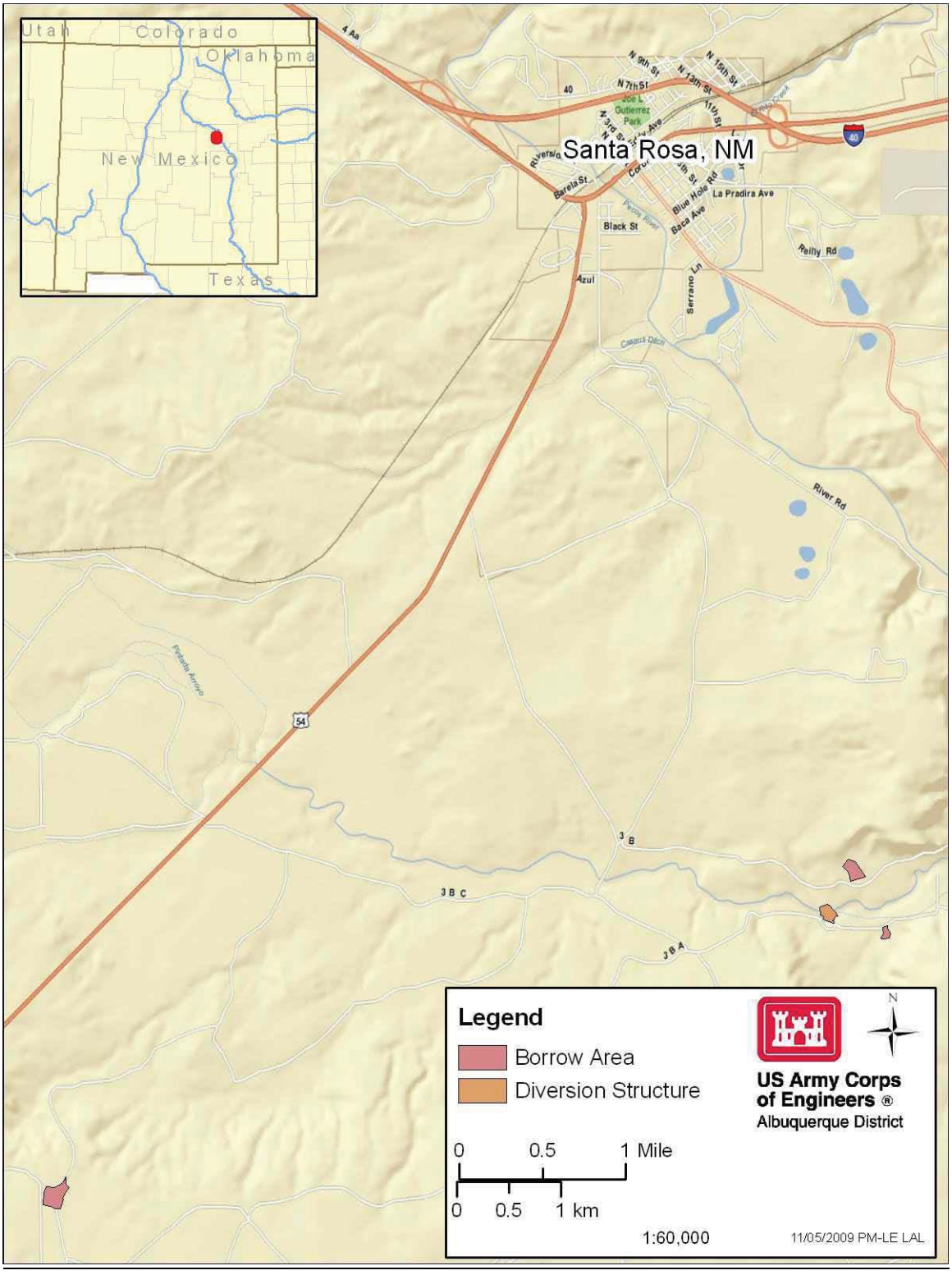

Figure 1: Vicinity map of proposed action area, Guadalupe County, New Mexico.

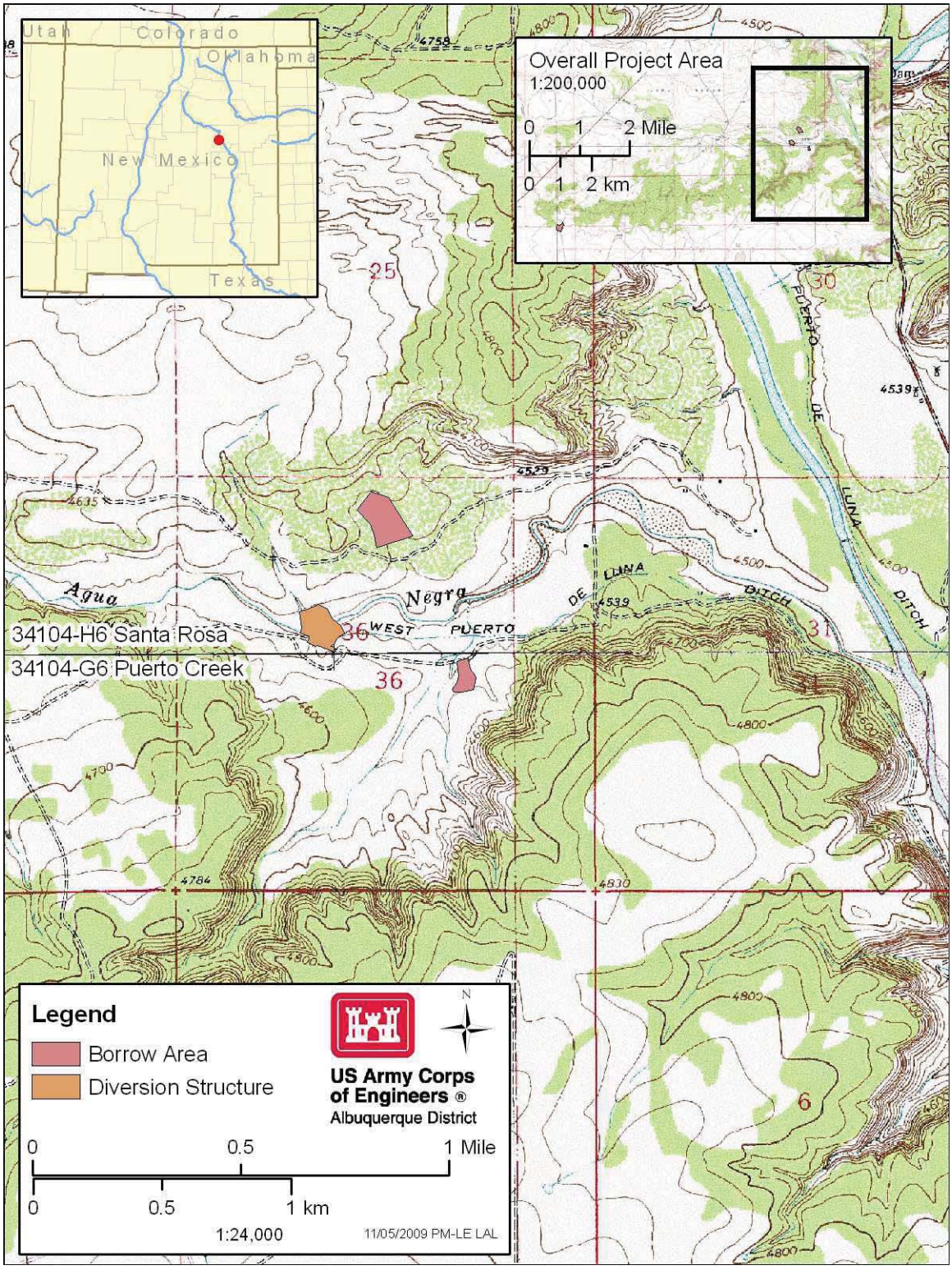

Figure 2: West Puerto de Luna Acequia Project Area and Borrow Areas 1 and 2.

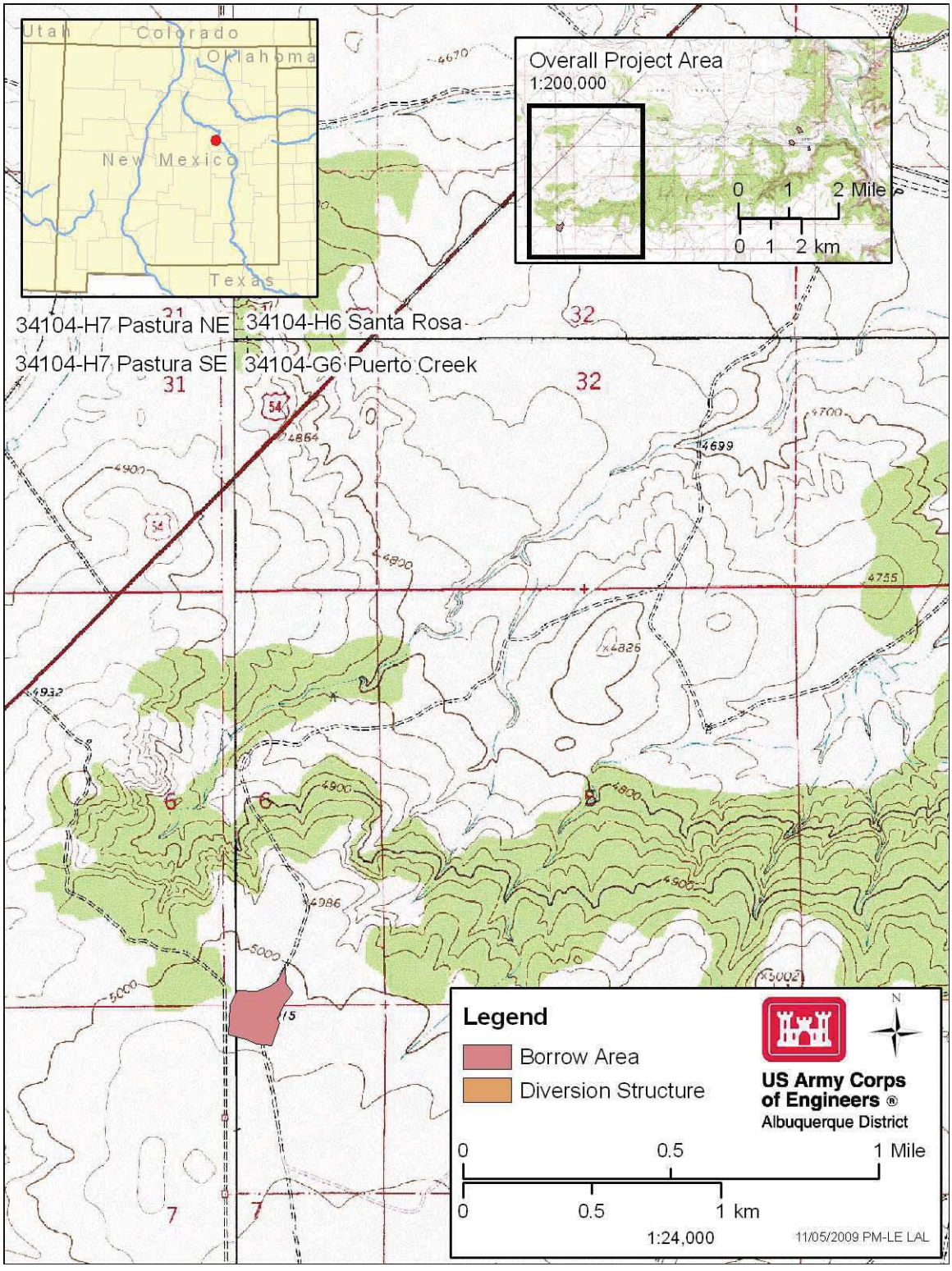

Figure 3: West Puerto de Luna Acequia Borrow Area 3.

1.2 Purpose and Need

The West Puerto de Luna diversion dam was built in 1883. In 1942, the dam was destroyed by a flood and rebuilt from earth, brush, and boulders from the surrounding area. Severe storms and flooding between 26 July 2006 and 18 September 2006 completely washed out that dam (Site Photos, Appendix A). In addition, the stream bed eroded nearly 20 feet both upstream and downstream of the diversion dam. Since 2006, the 53 families and 330 acres served by the acequia have been without irrigation water. The need for the project is irrigation water for acequia users.

The Corps proposes to rehabilitate the acequia by reconstructing the recently damaged diversion dam and spillway on Agua Negra Creek. After the dam failed in 2006, the Federal Emergency Management Agency (FEMA) provided funds for the design of a replacement dam. Project design and specifications were completed by HDR, Inc. Project construction is scheduled during the non-irrigation season beginning in February 2010 with an expected duration of about four months. The purpose of this project is to allow the ditch to be used again after three seasons of disuse. The Puerto de Luna West Side Acequia Association members would be responsible for assuring operation and maintenance upon project completion.

1.3 Regulatory Compliance

This Environmental Assessment (EA) was prepared by the Corps, Albuquerque District, in compliance with all applicable Federal Statutes, Regulations, and Executive Orders as amended, including the following:

- National Historic Preservation Act, as amended (16 U.S.C. 470 *et seq*.)
- Archaeological Resources Protection Act (16 U.S.C. 470 *aa et seq*.)
- Clean Water Act (33 U.S.C 1251 *et seq.*)
- Clean Air Act (42 U.S.C. 7401 *et seq.*)
- Endangered Species Act (16 U.S.C. 1531 *et seq*.)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations
- Executive Order 11988, Floodplain Management
- National Environmental Policy Act (42 U.S.C 4321 *et seq*.)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Part 1500 *et seq*.)
- Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 *et seq*.)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 11990, Protection of Wetlands
- U.S. Army Corps of Engineers' Procedures for Implementing NEPA (33 CFR Part 230; ER 200-2-2)
- Farmland Protection Policy Act (7 U.S.C. 4201 *et seq.*)
- Executive Order 13112, Invasive Species
- Federal Noxious Weed Act (7 U.S.C. 2814)

This EA also reflects compliance with all applicable State and local regulations, statutes, policies, and standards for conserving the environment such as water and air quality, endangered plants and animals, and cultural resources.

2.0 DESCIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

The Corps proposes to rehabilitate the West Puerto de Luna Acequia by reconstructing the washed out fill section of the irrigation diversion dam to pre-disaster function and design (see Appendix A for photos). The new structure would be earth-filled, have a centerline cross section of 120 feet at the top, 60 feet at the bottom, a height of 35 feet and a width of 40 feet (Figure 4). Total earthen fill volume would be 12,834 cubic yards (cy) and would use 2:1 slopes along the stream. The upstream fill face would have grouted rip-rap three feet thick as additional protection. The concrete spillway and rock gabions that were not washed away in 2005 would be removed during the proposed project. Three potential borrow areas for this project have been identified (Figures 2 and 3).

During project analysis and design, completed by HDR, Inc., the proposed action was determined to be most effective. The design would allow impoundment sufficient to convey water into the acequia via the existing headgate. The design was based on the irrigation water needs of the community and the acequia's allocation.

2.2 The No-Action Alternative

Under the no-action alternative the diversion structure would not be reconstructed. Acequia Association members would be without irrigation water, threatening their livelihood and that of the small historic agricultural community.

2.3 Alternatives Considered but Not Analyzed

Alternatives that were considered and eliminated from further analysis included replacing the failed diversion dam with a concrete structure but this alternative was discarded as it is too costly. This alternative was not carried forward for further review in the Draft EA.

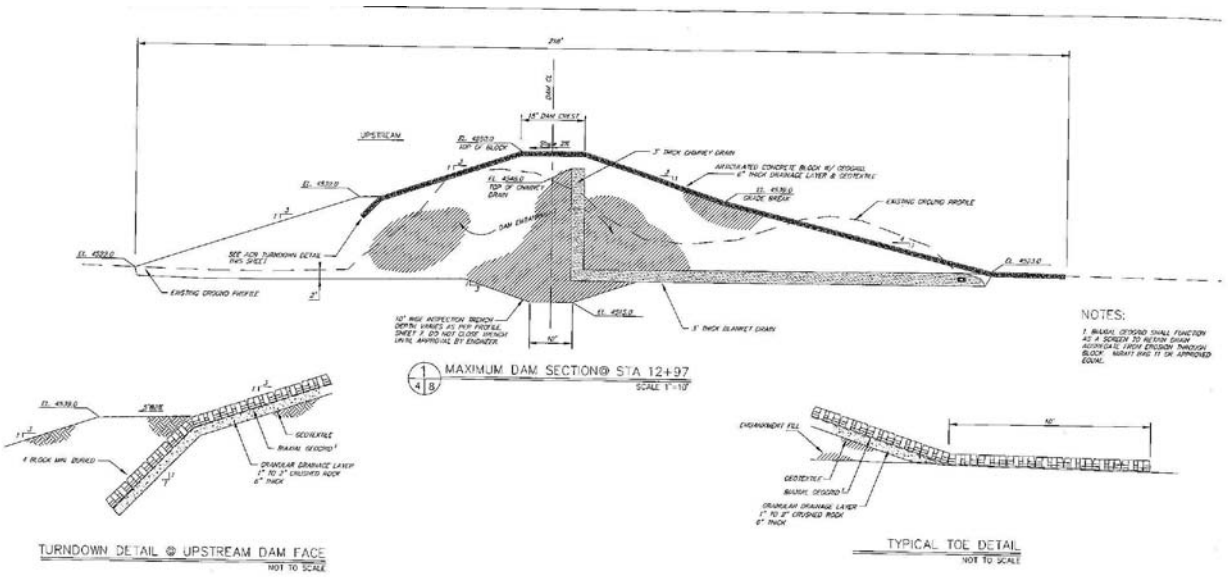

Figure 4: Design cross section

3.0 EXISTING ENVIRONMENT AND FORESEEABLE EFFECTS

3.1 Physiography, Geology, and Soils

The Santa Rosa/Puerto de Luna area lies within the Plains and Great Basin Grassland biotic province as defined by Brown and Lowe (1977), in the Pecos Valley in east-central New Mexico. Elevations in the region vary from about 1,520 to 1,830 meters (5,000 to 6,000 feet) on the mesas and upland areas on either side of the Pecos valley to about 1,365 meters (4,480 feet) at the project area.

The geology of the Santa Rosa area includes underlying sedimentary deposits of the Paleozoic San Andres limestone with some karst topography as seen in the area's numerous shallow sinks. Triassic sediments, primarily red sandstones, overlie the limestone. Surficial deposits of soil, gravel, silt, and clay of late Tertiary and Quaternary age cover the Triassic rocks in places. Most of these materials were deposited during the past two million years as the Pecos River cut into its present valley.

Between Santa Rosa and Puerto de Luna, in the immediate project area, surface geology includes the Paleozoic Artesia Group along the Pecos River bottoms and the Triassic Santa Rosa formation east of the Pecos (New Mexico Bureau of Geology and Mineral Resources 2005; New Mexico Environmental Department Surface Water Quality Bureau 2005). In previous works, the Santa Rosa Formation was included in the Chinle Group, comprised of red Triassic sandstone, siltstone, and conglomerate. Subsurface limestone is evident in the immediate project area where the new acequia channel was cut through the high bank of the Pecos River. The recommended plan and the no action alternative would have no foreseeable effects upon existing or potential geologic resources of the area.

Soils within the project area are mapped in three units. The Agua Negra Creek floodplain, where the diversion dam is located, and Borrow Area 1 are Minnesota very fine sandy loam, 0 to 2 percent slopes. Borrow Area 2 is Ima-La Lande fine sandy loams, 2 to 10 percent slopes. Borrow Area 3 is Pastura loam, 0 to 5 percent slopes (USDA NRCS 2009).

Minnesota loam is found on stream terraces and is associated with the *Populus fremontii-Populus sargentii/Salix exigua-Baccharis glutinosa*/*Pascopyrum smithii* ecological site. This is a well drained, nonsaline soil containing up to 30 percent calcium carbonate and 1 percent gypsum. Depth to water table is more than 80 inches. Ima-La Lande soils are associated with the Sandy Loam ecological site and occur on alluvial fans and slopes. These are also well-drained, nonsaline soils derived from redbed sandstone and shale. Depth to water table is greater than 80 inches. Ima and La Lande soils contain up to 15 percent calcium carbonate and 2 percent gypsum. Pastura loam is associated with a shallow ecological site (soils are typically cemented at deeper than 15 inches) on plateaus. These are well-drained, nonsaline soils derived from limestone, sandstone, and shale. Pastura loam soils contain up to 40 percent calcium carbonate and 1 percent gypsum. Borrow Area 3, which occurs on this soil type, has previously been used as a source of caliche on unrelated projects.

The proposed action would have a minor, temporary effect to these soils during construction. A total of approximately 2.4 acres would be disturbed during construction of the diversion dam and spillway. Three potential borrow areas totaling 18.2 acres have been identified near the proposed diversion dam site. Standard Best Management Practices (BMPs) to prevent on- and off-site erosion would be incorporated in contract specifications, and would include silt fences, straw bales, geotextiles, or similar measures. Following installation of the diversion dam and spillway, the soil would be stabilized and revegetated using appropriate native plant materials. Use of these BMPs would ensure that soils are only minimally affected by the proposed work. The No-Action alternative would have no effect to soils.

The rehabilitation of the acequia would provide a benefit to soils outside the immediate project area. Ensuring the continued delivery of irrigation waters would allow valley croplands to remain productive, preventing soil erosion in the project area. The no action alternative would lead to decline of the acequia system and abandonment of farmland, which would be prone to soil erosion unless revegetated with native grasses.

3.2 Climate

The climate of the Pecos Valley is semiarid, with average annual precipitation of about 12 to 14 inches. The summers are hot and breezy and the winters are clear and sunny. The majority of the annual precipitation comes from brief but intense afternoon thunderstorms, some of which can be severe. These storms usually occur during the late summer and early fall. Humidity is generally low. Winter snowfall is low, but common. The average annual temperature is about 58° to 60° Fahrenheit with maximum summer temperatures in the 90s and winter lows in the 20s. The frost-free season is 180 to 200 days (USDA, NRCS 2009).

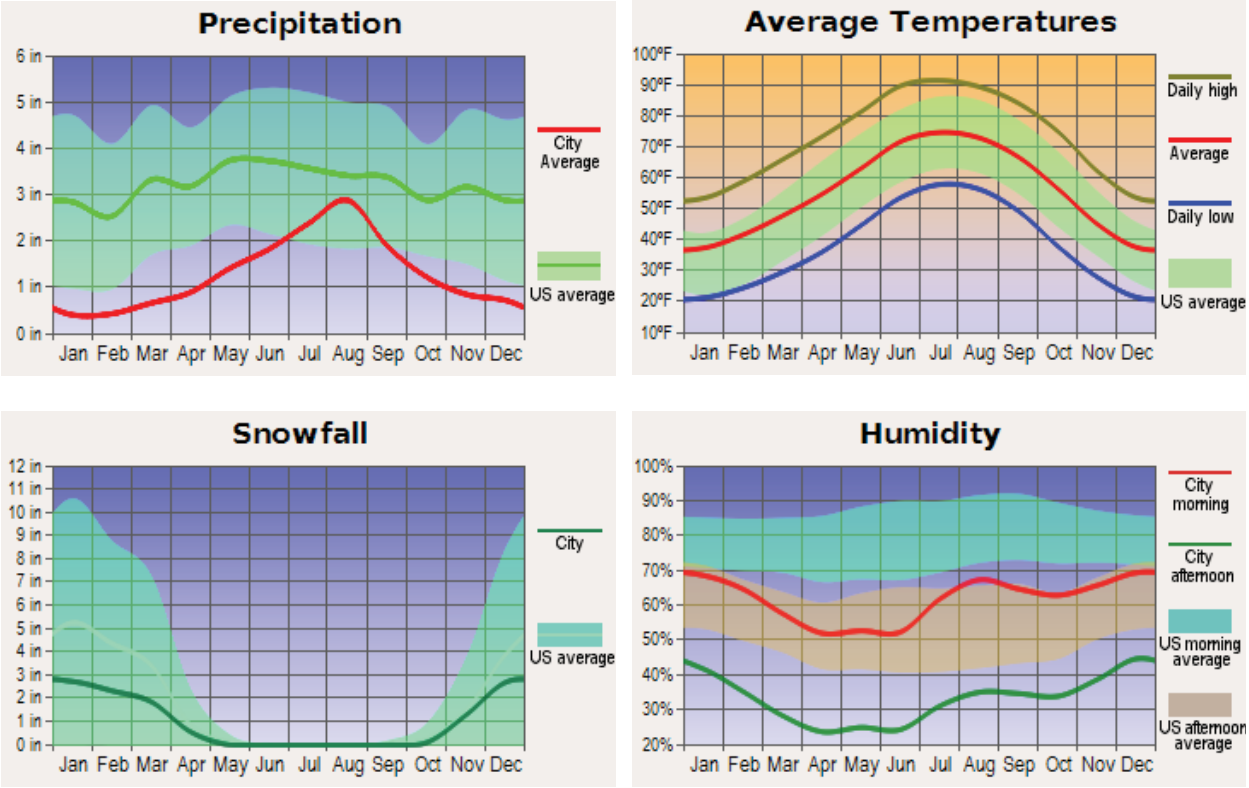

Figure 5: Climate characteristics in Santa Rosa, Guadalupe County, NM near project area. Graphs generated by City-data.com (2009).

Some experts predict that global climate change related to emissions of greenhouse gases (*e.g.* carbon dioxide, methane, nitrous oxide, chlorofluorocarbons) will result in a dryer Southwest with greater variation in precipitation (Backlund, Janetos, and Schimel 2008). In 2005, New Mexico Governor Bill Richardson signed Executive Order 05-33, which included development of recommendations for reducing greenhouse gas emissions in the State to year 2000 levels by 2012, 10 percent below 2000 levels by 2020, and 75 percent below 2000 levels by 2050. The year 2000 reference level is 83 million metric tons of carbon dioxide equivalent gases ($MMtCO_2e$; New Mexico Climate Change Advisory Group 2006: 2-2).

The contribution of the proposed action to greenhouse gas emissions would likely be negligible. Construction traffic during the construction phase as well as resumed farming traffic after construction would result in slight carbon emissions. However, neither the proposed action nor the No-Action alternative would have a detectable effect on climate in the short or long term.

3.3 Water Quality

Section 402 of the Clean Water Act (CWA; 33 U.S.C. 1251 *et seq.*), as amended, regulates point-source discharges of pollutants into waters of the United States and specifies that

storm-water discharges associated with construction activities shall be conducted under the National Pollution Discharge Elimination System (NPDES) guidance. Construction activities characterized by clearing, grading, and excavation are associated with storm-water discharges, subjecting the underlying soils to erosion by storm-water. The NPDES general permit guidance would apply to this project because the total project area is more than one acre. Therefore, a Storm-Water Pollution Prevention Plan (SWPPP) is required. Standard Best Management Practices to prevent on- and off-site erosion, sediment and storm-water discharges would be incorporated in contract specifications, as described in Section 3.1 above. Therefore, impacts from storm-water due to the proposed work are expected to be negligible and short-term.

Section 404 of the CWA, as amended, regulates the discharge of dredged or fill material into waters of the United States. The proposed action is the rehabilitation of an existing irrigation structure. Therefore, the project is exempt from the provisions of Sections 404 of the Clean Water Act (33 CFR 323.4). See Appendix B for a summary of the Irrigation Exemption from the Regulatory Division, Albuquerque District Corps.

Section 401 of the CWA, as amended, requires that an applicant for a Section 404 permit also obtain water quality certification for the proposed action prior to initiating the proposed construction. For projects located in New Mexico, the New Mexico Environment Department administers the water quality certification process for U.S. Environmental Protection Agency. Since a Section 404 permit is not required for this project, Section 401 state water quality certification also is not required. However, ephemeral watercourses are protected and the project is still subject to the State of New Mexico Standards for Interstate and Intrastate Streams that include isolated wetlands and ephemeral watercourses.

Under Section 303(d)(1) of the CWA, states are required to develop a list of waters within the state that do not support their designated uses as established in the state water quality standards (WQS). For each water body on this §303(d) list, states must establish a total maximum daily load (TMDL) for each pollutant that causes the waters to be "impaired." A TMDL analysis is established to restore a water body and to ensure that WQS are maintained for that water body. The New Mexico Environment Department's Surface Water Quality Bureau (NMED-SWQB) completed a water quality assessment for the Pecos headwaters watershed in 2001 (NMED-SWQB 2001), however, Agua Negra Creek was not assessed and therefore TMDLs do not exist for this watershed. In general, BMPs are encouraged to reduce sedimentation/siltation in the river.

During construction of the proposed action, BMPs would be used to control erosion in the project area and to prevent sediment from entering Agua Negra Creek, as described in Paragraph 3.1, and a SWPPP would be required. BMPs for ground water and surface water discussed in the letter from the New Mexico Environment Department (Appendix D) will also be followed. Therefore, the proposed action would not increase sedimentation and would have no effect on water quality or quantity in Agua Negra Creek, and there would be no measurable cumulative impacts on water quality due to the proposed work.

3.4 Floodplains and Wetlands

Executive Order 11988 (Floodplain Management) requires Federal agencies to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Although this portion of Guadalupe County has not been mapped for flood hazard, the proposed action area is located adjacent to Agua Negra Creek and it is therefore reasonable to conclude that it is within a flood hazard area. The nature of acequia systems inherently depends on the diversion structure or distribution system being located in the floodplain, however, no additional development would occur within the floodplain. The acequia's water users are all located downstream and their substantial structures are believed to be located above the floodplain. Reconstructing the acequia with its small water allocation would not contribute to additional development, but would allow present agricultural land uses to continue. Neither the proposed action nor the No-Action alternative would result in any additional development in the Agua Negra Creek floodplain. Therefore, no adverse effect to the floodplain is anticipated.

Executive Order 11990 (Protection of Wetlands) requires that Federal agencies take action to minimize the destruction, loss or degradation of wetlands. Agencies must avoid undertaking or providing assistance for new construction located in wetlands whenever there is a practicable alternative. There are no naturally occurring wetlands within the project area, and therefore, no impacts to wetlands would occur. Neither the proposed action nor the No-Action alternative would affect wetlands or change wetland acreage in the area.

3.5 Air Quality, Noise, and Aesthetics

Air quality in the Santa Rosa Area is generally good. The New Mexico Environment Department Air Quality Bureau (NMED-AQB) monitors air quality throughout the state in areas of State jurisdiction according to need. In 2008 the Bureau operated 30 criteria air pollutant monitoring sites located in 11 of the State's 33 counties. All air monitoring locations are sited in major population centers or near known pollution sources. The NMED-AQB formerly monitored carbon monoxide (CO) and particulate matter in Guadalupe County. Currently, the county does not have an air-quality monitoring station because air quality standards were met in past monitoring and because of the absence of industries that would produce regulated pollutants. The nearest monitoring stations are in Santa Fe (~90 miles northwest) and Roswell (~110 mi south). Guadalupe County is classified as an air quality attainment area (USEPA 2009).

Class I air quality areas are designated natural areas, including national parks, national monuments, and wilderness areas, where air quality is subject to maximum limits on degradation. The Class I air quality areas closest to the project are the Pecos wilderness in the Santa Fe National Forest, 75 miles away, and Bitter Lake National Wildlife Refuge, about 90 miles from Puerto de Luna. (NMED-AQB 2009) Because of their distance from the proposed action and the limited scope and duration of the proposed work, Class I air quality areas would not be affected by the project or by the No-Action alternative.

The proposed action would result in a temporary but negligible, localized increase in suspended dust (coarse particles) from construction activities. BMPs to be followed during construction to minimize dust include the following: access roads and disturbed soil would be wetted; all vehicles involved in transporting fill material, rubble and spoil to or from the project site would be covered and would have required emission control equipment; and stockpiles of debris, soil, sand, or other materials that could produce dust would be watered or covered. BMPS listed in the letter from the New Mexico Environment Department for Air Quality (Appendix D) will also be followed. These practices would minimize dust and emissions-related air quality impacts during construction. Once construction is complete, the operation of the acequia would have minimal effects on air quality in the area, caused in particular by farm vehicle operation or particulates mobilized by plowing soil. In contrast, the No-Action alternative would likely have adverse affects to air quality in the region. Disuse of the acequia would lead to abandonment of the previously irrigated agricultural fields and unless these fields are planted with native or drought-tolerant vegetation, fugitive dust from bare patches of ground might be problematic.

Background noise levels in the proposed action area are low, as typical for an agricultural area. The Occupational Safety and Health Administration (OSHA) noise standards limit noise levels to 90 decibels (dBA) averaged over an eight-hour day (29 CFR 1910.95). The Noise Center (League for the Hard of Hearing, 2009) advises that noise levels above 85 dBA would harm hearing over time and noise levels above 140 dBA can cause damage to hearing after just one exposure. During construction, noise would temporarily increase in the vicinity during vehicle and equipment operation and may be audible from nearby residences. Noise levels in the immediate work area would likely be comparable to that generated by a tractor (up to 90 dBA) during work hours. The increase in noise during construction would not be loud enough to harm hearing and would be temporary, ending when construction is complete. To reduce temporary construction noise, construction contract BMPs would require that construction equipment and activities comply with state and local noise control ordinances. Therefore, the proposed action would have no significant affect on noise levels in the environment. The No-Action Alternative would not change the background noise levels in the project area.

Aesthetically, the project area is rural with open space, minimal development with ample space between residences and associated farm buildings, and a mix of native and cultivated vegetation. The Pecos Valley is scenic, with a wooded riparian corridor, farm land in the valley bottom, and adjacent hills and uplands in a relatively natural state. During construction, equipment would be temporarily present at the site of the diversion dam, borrow areas, and along access roads. The short-term presence of vehicles and disturbed ground in the fields during construction would be the only apparent visual change to the area. After project completion, the landscape would return to its 'natural' appearance. Aesthetic conditions would therefore not be affected in the long term by the proposed action or by the No-Action alternative.

3.6 Vegetation Communities

The proposed action area lies within the Plains and Great Basin Grassland biotic community (Brown and Lowe 1977; Brown 1982) or Plains-Mesa Grassland as described by Dick-Peddie (1993). New Mexico's Comprehensive Wildlife Conservation Strategy (NMDGF

2006) places the area within the Southern Shortgrass Prairie Ecoregion. The Pecos River riparian corridor itself is an altered Floodplain-Plains riparian community. Corps personnel visited the site on 3 September and 23 October 2009. Photographs taken at the proposed action and borrow areas show the existing vegetation condition (Appendix A). The Pecos River channel supports a thinly wooded riparian community of cottonwood mixed with non-native Russian olive and saltcedar. There is little vegetation at the proposed diversion dam site where the ground has been disturbed. Agua Negra Creek upstream of the washed-out diversion dam has incised approximately 20 feet and tamarisk (*Tamarix* sp.) and Russian thistle (*Salsola* sp.) have colonized the lower banks. Borrow Area 1 has also been previously disturbed for the construction of a stock pond. Other vegetation present include one-seeded juniper (*Juniperus monosperma*), soapweed yucca (*Yucca glauca*), mesquite (*Prosopis glandulosa*), tree cholla (*Opuntia imbricata*), Christmas cholla (*Cylindropuntia leptocaulis*), prickly pear (*Opuntia engelmannii*), gaillardia (*Gaillardia pulchella*), winterfat (*Krascheninnikovia lanata*), side-oats grama (*Bouteloua curtipendula*), Bailey's rabbitbrush (*Lorandersonia baileyi*), and cocklebur (*Xanthium strumarium*, within dry portions of the stock pond only). Borrow Area 2 is located adjacent and upland to a dense giant sacaton (*Sporobolus wrightii)* grassland. The proposed borrow area itself has similar vegetation to Borrow Area 1 with more sparsely scattered juniper, mesquite, and tree cholla. Borrow Area 3 is located approximately five miles southwest of the proposed diversion dam site and was previously used as a source of caliche for an unrelated project. Vegetation present includes Bailey's rabbitbrush, and scattered forbs. The No-Action alternative would result in no effects to this vegetation.

Under the proposed action, a small amount of vegetation (up to 20.6 acres, which includes the borrow area, staging area and construction zone) would be disturbed. The native grasses and forbs are expected to return following construction and reseeding.

3.7 Noxious Weeds and Invasive Species

Executive Order 13112 directs Federal agencies to prevent the introduction of invasive (exotic) species and to control and minimize the economic, ecological, and human health impacts that invasive species cause. In addition, the State of New Mexico, under administration of the New Mexico Department of Agriculture (NMDA), designates and lists certain weed species as being noxious (NMDA 2009). "Noxious" in this context means plants not native to New Mexico that may have a negative impact on the economy or environment and are targeted for management or control. In order to prevent new infestations of noxious weeds and invasive species, all equipment would be cleaned with a high-pressure water jet before entering the area. Following construction, native species would be planted, minimizing the opportunity for invasive species to colonize the area. Salt cedar, which is a state noxious weed, was identified during the site visits. Russian thistle, which is not listed due to being widespread, is also present. To minimize the spread of these and other invasive species that may have escaped detection, the contractor would also be required to clean equipment upon leaving the project area. Removal of either type of vegetation during construction will be reseeded with native vegetation once construction is complete. Therefore, the proposed action is in compliance with Executive Order 13112.

3.8 Wildlife

The wildlife species discussed here represent a partial list of species occurring in Guadalupe County, New Mexico, as listed by previous Environmental Assessments (USACE 1996, 2000, 2003), BISON-M (New Mexico Department of Game and Fish 2009) and New Mexico's Comprehensive Wildlife Conservation Strategy (New Mexico Department of Game and Fish 2006).

Mammals occurring in Guadalupe County typically include small mammals such as squirrels, mice, gophers, rats, rabbits, badgers, raccoon, and skunks as well as larger mammals such as foxes (*Urocyon cinereoargenteus, Vulpes macrotis, V. vulpes, V. velox*), coyote (*Canis latrans*), bobcat (*Lynx rufus baileyi*), and mule deer (*Odocoileus hemionus*). Mountain lion (*Puma concolor*) are unlikely to venture within the immediate project area due to proximity to humans. New Mexico's Comprehensive Wildlife Conservation Strategy (NMDGF, 2006) identifies the following mammals as Species of Greatest Conservation Need (SGCN) for the Southern Shortgrass Prairie Ecoregion: Least Shrew (*Cryptotis parva*), Arizona Myotis (*Myotis occultus*), Prairie Vole (*Microtus ochrogaster*), Black-Tailed Prairie Dog (*Cynomys ludovicianus*), Swift Fox (*Vulpes velox*) and Mule Deer (*Odocoileus hemionus*). For riparian habitats, 33 mammalian species are listed as SGCNs, including several bats, shrews, mice, voles, squirrels, and Black Bear (*Ursus americanus)*.

Resident and migratory birds observed or expected in the area include Western Kingbird (*Tyrannus verticalis*), Turkey Vulture (*Cathartes aura*), Northern Mockingbird (*Mimus polyglottos*), Common Raven (*Corvus corax*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Western Meadowlark (*Sturnella neglecta*), Great Horned Owl (*Bubo virginianus*), Red-tailed Hawk *(Buteo jamaicensis*), American Kestrel (*Falco sparverius*) and various swallows and sparrows. Bird Species of Greatest Conservation Need for the Southern Shortgrass Prairie and occurring in Guadalupe County include Bald Eagle (*Haliaeetus leucocephalus*), Scaled Quail (*Callipepla squamata*), Sandhill Crane (*Grus canadensis*), Mountain Plover (*Charadrius montanus)*, Long-Billed Curlew (*Numenius americanus*), Wilson's Phalarope (*Phalaropus tricolor*), Baird's and Grasshopper Sparrow (*Ammodramus bairdii*, *A. savannarum*), Ferruginous Hawk (*Buteo regalis*), Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*), Mourning Dove (*Zenaida macroura*), Burrowing Owl (*Athene cunicularia*), and Loggerhead Shrike (*Lanius ludovicianus*) (NMDGF 2006). Due to the limited scope of work and the timing of construction outside the nesting season, there would be no effect to these species from the proposed action.

Reptiles and amphibians (herptiles) in the area may include Plains spadefoot (*Spea bombifrons*), Woodhouse's toad (*Bufo woodhousii*), Great Plains toad (*B. cognatus)*, yellow mud turtle (*Kinosternon flavescens*), plateau striped whiptail (*Cnemidophorus velox*), southern prairie lizard (*Sceloporus undulatus consobrinus*), prairie ringneck snake (*Diadophis punctatus arnyi*), short-horned lizard *(Phrynosoma hernandesi*), Great Plains skink (*Eumeces obsoletus*), whiptails (*Aspidoscelis* spp.), garter snakes (*Thamnophis* spp.), and Western rattlesnake (*Crotalus viridis*). Species of Greatest Conservation Need in the Southen Shortgrass Prairie include Western Chorus Frog *(Pseudacris triseriata)*, Plains Leopard Frog *(Rana blairi)*, Tiger Salamander (*Ambystoma*

tigrinum), Ornate Box Turtle (*Terrapene ornata*), Collared Lizard (*Crotaphytus collaris*), Milk Snake *(Lampropeltis triangulum)*, Western Diamondback Rattlesnake *(Crotalus atrox)*, and Desert Massasauga *(Sistrurus catenatus edwardsii)* (NMDGF 2006). Because construction is scheduled for winter when these species are not active, the proposed work would have no effect on herptiles.

Fifty-eight Species of Greatest Conservation Need (SGCN), including eighteen fish, are associated with aquatic habitats of the Pecos watershed (NMDGF 2006). The Pecos bluntnose shiner (*Notropis simus*) is not known to occur in the Pecos River in the vicinity of Agua Negra Creek. Pecos Watershed SGCNs in Guadalupe County include bigscale logperch (*Percina macrolepida*), rainwater killifish (Lucania parva), central stoneroller (*Campostoma anomalum*), Mexican tetra (*Astyanax mexicanus*), Rio Grande chub (*Gila pandora*), smallmouth buffalo (*Ictiobus bubalus*), and speckled chub (*Macrhybopsis aestivalis*) (BISON-M 2009).

Agua Negra Creek is a small, perennial stream capable of supporting populations of smaller fish species. The creek has been isolated from the Pecos River by the diversion dam since 1883. Periodic flooding has provided opportunities for Pecos River fish populations to interbreed with resident populations upstream of the diversion dam. During construction, BMPs would be used to continue to prevent fish from entering the construction area, and also to prevent sediment from entering Agua Negra Creek or the Pecos River. Reconstruction of the diversion dam would again result in isolation of Agua Negra Creek, with the fish community to reverting to fish species and population numbers sustainable by the small creek. The effects to fish and other aquatic species by the proposed work would be small and within normal ecosystem processes.

The foreseeable effects of the proposed action on wildlife of the proposed construction area would be minor, of short duration, and temporary in nature, and would result in negligible disturbance. Wildlife species in or near the proposed construction area generally have adapted to the existing human presence. There are no foreseeable effects from the no-action alternative other than those effects resulting from the existing human presence and the existing conditions at the proposed diversion dam site. Under the proposed action, some wildlife species would be temporarily displaced during construction, but are expected to return after construction is complete. Because the work would take place during the winter, there would be no effect to migratory birds or to nesting or breeding behavior. Herptiles and many small mammals would not be active during this time. No direct negative impacts are expected occur to wildlife as a result of the proposed action or the No-Action alternative.

3.9 Special Status Species

Three agencies have primary responsibility for protecting and conserving plant and animal species within the proposed action area. The United States Fish and Wildlife Service (USFWS), under authority of the Endangered Species Act of 1973, has the responsibility for Federal listed species. The New Mexico Department of Game and Fish (NMDGF) has the responsibility for state-listed wildlife species. The New Mexico State Forestry Division (Energy, Minerals, and Natural Resources Department) has the responsibility for state-listed plant species.

Special status species that occur in Guadalupe County are listed below in Table 2 (USFWS 2008, NMDGF 2008).

None of the special status animals listed in Table 1 have been detected in the project area on two site visits (September 3 and October 23, 2009), nor is suitable habitat present. These species would not be affected by the proposed action due to the limited disturbance and the lack of preferred habitat in the project area.

The Forestry Division of the New Mexico Energy, Minerals, and Natural Resources Department has the responsibility for maintaining the state list of rare, threatened and endangered plant species. The New Mexico Rare Plants Technical Council list indicates that there are three rare plant species that occur in Guadalupe County (New Mexico Rare Plants Technical Council 2008; included in Table 2). Populations of the federally-threatened Pecos sunflower exist in the Santa Rosa area and critical habitat has been designated at Blue Hole and Westside Spring in Santa Rosa. Both Pecos sunflower and the state-endangered Wright's marsh thistle require spring and cienega habitats, which are not present in the proposed action area. Although these plants occur in Guadalupe County, they are not known to exist within the project area, nor were these species or their habitats detected in site visits. Therefore, there would be no direct or indirect effect to these rare plants by the proposed action or the No-Action alternative.

Table 1: Federal and State Threatened, Endangered, and Candidate Species Listed for Guadalupe County, New Mexico with Potential to Occur in the Project Area

Common Name	Scientific Name	Federal Status (USFWS) [a]	State of New Mexico status
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	C	-
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E
Black-footed ferret	*Mustela nigripes*	E	X
Pecos sunflower	*Helianthus paradoxus*	T	E
Baird's sparrow	*Ammodramus bairdii*	SoC	T
Mountain plover	*Charadrius montanus*	SoC	-
Northern goshawk	*Accipiter gentilis*	SoC	-
Western burrowing owl	*Athene cunicularia hypugaea*	SoC	-
Yellow-billed Cuckoo	*Coccyzus americanus*	C	-
Bald eagle	*Haliaeetus leucocephalus*	DM	T
Peregrine falcon	*Falco peregrinus anatum*	SOC	T
Arctic peregrine falcon	*Falco peregrinus tundrius*	SOC	T
Gray vireo	*Vireo vicinior*	-	T
Common Black-Hawk	Buteogallus anthracinus	SoC	T
Neotropic Cormorant	Phalacrocorax brasilianus	-	T
Piping plover	Charadrius melodus circumcinctus	T (not in county)	T
Black-tailed prairie dog	*Cynomys ludovicianus*	SoC	-
Pecos River muskrat	*Ondatra zibethicus ripensis*	SoC	-
Swift fox	*Vulpes velox*	SoC	-
Rio Grande shiner	*Notropis jemezanus*	SoC	-
Bigscale Logperch	Percina macrolepida (Native pop.)	-	T
Suckermouth Minnow	Phenacobius mirabilis	-	T
Mexican Tetra	Astyanax mexicanus	-	T
Wright's marsh thistle	*Cirsium wrightii*	SoC	E
Flint Mountains milkvetch	*Astragalus siliceus*	SoC	SoC

[a] **Endangered Species Act (ESA)** (as prepared by U.S. Fish and Wildlife Services) **status:**
E= Endangered: any species that is in danger of extinction throughout all or a significant portion of its range.
T= Threatened: any species that is likely to become and endangered species within the foreseeable future throughout all or a significant portion of its range.
C= Candidate: taxa for which the Services has on file sufficient information to support proposals to list them as endangered or threatened species.
SOC = Species of concern (included for planning purposes; not protected under ESA)

[b] **State of New Mexico status:**
E= Endangered: Animal species whose prospects of survival or recruitment within the state are in jeopardy.
T= Threatened: Animal species whose prospects of survival or recruitment within the state are likely to become jeopardized in the foreseeable future.
S= Sensitive Taxa (informal).
X= Taxa considered to be Extirpated

3.10 Cultural Resources

This proposed action is in compliance with the cultural resources laws, including as the National Historic Preservation Act. In terms of cultural resources, the Area of Potential Effects (APE) for this project is considered to be 4.83-acres for the diversion structure and staging area, 1.85-acre for a potential borrow pit to the southeast, a 6.04-acre potential borrow pit to the northeast, and a 10.34-acre borrow pit to the west. The western borrow area is an existing caliche pit that has been 100 percent disturbed.

Consistent with the Department of Defense's American Indian and Alaska Native Policy, signed by Secretary of Defense William S. Cohen on October 20, 1998, and based on the State of New Mexico Indian Affairs Department's Native American Consultations List, American Indian tribes that have indicated they have concerns in Guadalupe County were contacted regarding the proposed action (Appendix C). The Corps has received no indication of tribal concerns that would impact this project. No known Traditional Cultural Properties are known by the Corps to occur within the project area. All tribal correspondence is presented in Appendix C.

A Corps archaeologist conducted a field visit to the project area on September 3, 2009, and Corps archaeologists surveyed the APE on October 23, 2009 and prepared a report of the findings (Appendix C). With the exception of seven Isolated Occurrences (IOs), the survey did not identify any historic properties aside from the acequia itself. The Corps considers none of the IOs to be significant and no further work is recommended for these IOs. Included in the report is a detailed documentation of what remains of the existing diversion structure and associated structures, with the purpose of recording for historic research value.

The Corps considers the Acequia to be eligible for listing on the National Register of Historic Places under Criterion (a) of 36 CFR 60.4, as irrigation features such as this one made possible the settling and farming of the area, and is thus associated with events that have made a significant contribution to the broad patterns of our history.

The Corps considers the failed diversion structure to lack integrity, as it was mostly washed out during the 2006 flooding. The Corps cannot reconstruct the diversion structure exactly to the previous standards, as diversion structures of this size are regulated by the Office of the State Engineer Dam Safety Bureau and must meet current State standards for dam construction and safety. However, the proposed reconstructed dam would retain the same basic form, placement, and function, and would also be of earthen berm design. The Corps considers the effects to the acequia system not to be adverse. In fact, without this project, this historic property could no longer be used for its intended function, as water would not flow in the acequia without a new diversion structure.

The Corps is of the opinion that the proposed undertaking would have **no adverse effect to historic properties**, and hand-delivered documentation of this finding to the NMSHPO on November 17, 2009 (see Appendix C). As of December 23, 2009, 36 days after the Corps submitted its determination to NMSHPO for review, the Corps had not received a response from NMSHPO. Pursuant to 36 CFR 800.5(c)(1), “the agency official may proceed after the close of the 30 day review period if the SHPO/THPO has agreed with the finding or has not provided a

response." Given this, and the time-sensitive nature of the proposed action, the Corps stands by its determination of **no adverse effect to historic properties** and may proceed with the undertaking pursuant to 36 CFR 800.5(c)(1). Documentation of NMSHPO consultation is presented in Appendix C.

The Corps is of the opinion that the proposed undertaking would have no adverse effect to historic properties, and is seeking New Mexico State Historic Preservation Office (NMSHPO) concurrence. Documentation of draft SHPO consultation is presented in Appendix C. Should previously undiscovered artifacts or features be discovered during construction, work would stop in the immediate vicinity of the find, a determination of significance made, and consultation would take place with the NMSHPO and with Native American groups that may have concerns in the project area, to determine the best course of action.

3.11 Socioeconomic Considerations and Land Use

The population of Guadalupe County was 4,680 persons in 2000 (U.S. Census Bureau 2000). The July 2008 population estimate was 4,346, a decline of 7.1 percent (U.S. Census Bureau, USA Counties, 2009). The estimated 2007 median household income was $26,929 while the personal income per capita in 2006 was $17,047. Personal and median household income in Guadalupe County is significantly lower than that estimated for New Mexico as a whole ($41,509). During 2007, 25.5 percent of the Guadalupe County population and 30 percent of the population under 18 was below the poverty level. Ethnically, approximately 81 percent of Guadalupe County is Hispanic, a greater percentage than the State of New Mexico as a whole (42.1%). The Native American population of Guadalupe County (1.1 percent) is proportionally smaller than that of the state as a whole. The nearby community of Santa Rosa is the county seat and the largest town in Guadalupe County. In Santa Rosa, the local employers are primarily in retail trade, tourism (including lodging), and food services. Other local work involves health care, social assistance, construction and transportation. Public services include education, utilities, and government services.

The annual average unemployment rate in 2008 was 5.7% for Guadalupe County compared to the statewide rate of 4.2% (New Mexico Department of Workforce Solutions 2009). In 2009 the monthly unemployment rates were slightly higher; Guadalupe County's unemployment rate of 6.4%in May 2009 was similar to the statewide rate of 6.5%.

The proposed action area is rural with small farms and residential housing. There is no Prime Farmland in the project area. Current land use centers on families farming small acreages of irrigated cropland with livestock grazing (cattle, sheep, goats, and horses). Other land use includes gravel and rock quarrying. Recreational use of the proposed action area may include hiking, horseback riding, and nature appreciation.

The proposed action would not result in any significant alteration of existing land uses or socioeconomic resources in the project area and would permit the traditional acequia culture to continue. All acequia members would benefit from the proposed action. The proposed action would benefit land use in the short and long term. The No-Action alternative, in contrast, would compromise the viability of the West Puerto de Luna Acequia. Without reconstruction of the

diversion dam, irrigated agriculture would not be possible and the historic community of Puerto de Luna would stagnate or possibly decline. The lack of irrigation water combined with a trend of decline in available labor and the farming population would threaten the acequia's viability and the agricultural economic base of the community (Ackerly 1996).

3.12 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the United States for Indian tribes or individuals. Examples of ITAs include land, minerals, hunting and fishing rights, water rights, titles and money. The Indian Trust Responsibility requires that all Federal agencies take all actions reasonably necessary to protect such trust assets. The Department of Defense's American Indian and Alaska Native Policy, signed by Secretary of Defense William S. Cohen on October 20, 1998, and DOI's Secretarial Order 3175 require that the Corps consult with tribes and assess the impacts of its projects on ITAs. American Indian tribes that have indicated they have concerns in Guadalupe County have been contacted regarding the proposed action, as described in Section 3.10 above. To date, the Corps has received no indication of concern regarding effects to ITAs from the proposed work. There would be no effect on Indian Trust Assets by the proposed action or the No-Action alternative.

3.13 Human Health and Safety

There would be no effect from the proposed action on community services, such as law enforcement, fire protection, emergency medical care, or schools. Neither the proposed action nor the No-Action alternative is expected to create adverse effects on human health or safety.

3.14 Hazardous, Toxic, and Radioactive Waste (HTRW)

Since the proposed action would be in a rural area and the water would be used exclusively for irrigation, there appear to be little risk of HTRW contamination.

All work planned to construct the proposed features would be conducted in accordance with Federal, State, and local pollution control laws. Requirements would include the contractor's storage and use of fuels, herbicides, and other potential contaminants, and the implementation of the National Pollutant Discharge Elimination System (NPDES) permit for storm water pollution prevention from construction activities. Therefore, there would be no adverse effect to or by HTRW by the Proposed Action.

3.15 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Low-Income Populations; February 11, 1994) was designed to focus the attention of federal agencies on the human health and environmental conditions of minority and low-income

communities. It requires federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations and proposed actions. The 1995 EPA guidance document, "Environmental Justice Strategy: Executive Order 12898" defines the approaches by which the EPA would ensure that disproportionately high environmental and/or socioeconomic effects on minority and low-income communities are identified and addressed. Further, it establishes agency-wide goals for all Native Americans with regard to Environmental Justice issues and concerns.

The proposed action would be conducted under Section 1113 of the Water Resources Development Act of 1986. The Section 1113 program is largely intended to provide needed technical and financial assistance to Acequia and Community Ditch associations in which water resources are degrading and in need of improvement. Acequia associations find maintenance of these systems increasingly challenging. The proposed action would benefit all acequia members and the community as a whole by allowing the culturally and historically significant West Puerto de Luna Acequia to continue to function. All proposed work would be in a rural, agricultural area. The construction would not disrupt or displace any residential, farms, or commercial structures. There would be no disproportional affect on the health or environment of minority and low-income communities as a result of the proposed action. Under the No-Action alternative, the acequia members would likely face increasing difficulty in farming without irrigation water. As Guadalupe County residents have relatively lower incomes than average for New Mexico, the No-Action alternative likely would adversely affect this low-income community.

3.16 Cumulative Impacts

NEPA defines cumulative effects as "…the impact on the environment which results from the incremental impact of the action when added to other, past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."

Cumulative effects address the cumulative impact of the direct and indirect effects of the proposed action when added to the aggregate effects of past, present, and reasonably foreseeable future actions. For all resources, the aggregate effect of past and present actions was considered to be represented by the current, existing condition of the resource (Council on Environmental Quality 2005). Therefore, the specific effects of individual past and present actions typically were not cataloged in the analysis. In order for direct or indirect effects to incrementally add to the effects of past, present, or reasonably foreseeable future actions, they must overlap with those effects in time or space (Council on Environmental Quality 1997).

The time frame for analysis of cumulative effects varied, depending on the duration of direct and indirect effects. For example, direct effects resulting from construction were expected to persist for relatively short periods of time (about four months). Conversely, indirect effects resulting from operation of the rehabilitated acequia system would persist for the life of the facility. Similarly, the geographic bounds for cumulative effects analysis varied with the resource under consideration, depending on zone of influence of the direct or indirect impact being analyzed.

The proposed action lies within a rural area in Guadalupe County (Figures 1, 2, 3). The proposed work would not significantly impact the current conditions of the local environment and would help retain the farming practices of the community. Because each of the past rehabilitation projects on the West Puerto de Luna Acequia has used BMPs to control wind and water erosion, and similar BMPs would be used for the proposed action, cumulative impacts to soils would be negligible. As the proposed action would not affect visual resources or land uses in the long term, there would be no cumulative effects to these resources.

The proposed action is in addition to other rehabilitation projects on the acequia that provide an overall benefit the agricultural community of the Puerto de Luna area. These projects have been described above and include: Rehabilitation of an Irrigation Flume for the Puerto De Luna East Side Acequia (USACE, 2000), West Puerto de Luna Community Ditch Pipeline Rehabilitation (USACE, 2003), and Acequia Rehabilitation Program, West Puerto De Luna Acequia (USACE, 2005).

4.0 CONCLUSIONS AND SUMMARY

This Environmental Assessment addresses the potential effects of the rehabilitation of the West Puerto de Luna Acequia. The proposed location is in the Pecos River valley approximately 13 miles southeast of Santa Rosa. Adverse impacts to the environment would be non-significant and short-term. Long-term benefits to the acequia members and to the historic character of the Puerto de Luna community would result from the project. The proposed action would not result in any moderate or significant, long-term, or cumulative adverse effects. Therefore, construction of the proposed action would not significantly affect the quality of the human environment and is recommended for implementation.

5.0 PREPARATION, CONSULTATION AND COORDINATION

5.1 Preparation

This Environmental Assessment was prepared by the U.S. Army Corps of Engineers, Albuquerque District. Personnel primarily responsible for preparation include:

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5.2 Quality Control

This EA has been reviewed for quality control purposes. Reviewers include:

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Agencies and entities that were consulted in preparation of this Environmental Assessment include:

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6.0 REFERENCES CITED

Ackerly, Neal W. 1996. A review of the historic significance and management recommendations for preserving New Mexico's acequia systems. Report prepared by Dos Rios Consultants, Inc. for the New Mexico Historic Preservation Division, Santa Fe. http://www.nmacequiacommission.state.nm.us/Publications/nackerly_aceq_rpt96.pdf .

Backlund, Peter, Anthony Janetos, and David Schimel. 2008. The effects of climate change on agriculture, land resources, water resources, and biodiversity in the United States. Final Report of the U.S. Climate Change Science Program Subcommittee on Global Change Research. http://www.climatescience.gov/Library/sap/sap4-3/final-report/default.htm

Brown, David E. 1982. Desert Plants: Biotic Communities of the American Southwest-United States and Mexico. University of Arizona, Superior, Arizona.

Brown, David E. and C.H. Lowe. 1977. Biotic Communities of the Southwest Map. USDA Forest Service, Ft. Collins, Colorado.

City-data.com 2009. Profiles- New Mexico Smaller Cities, Towns, and Villages (between 1000 and 6000 residents). http://www.city-data.com/city/Santa-Rosa-New-Mexico.html (accessed: 27 August 2009)

League for the Hard of Hearing. 2008. Noise levels in our environment fact sheet. http://www.lhh.org/noise/facts/evironment.html (Accessed: 16 September 2008).

New Mexico Bureau of Geology and Mineral Resources. 2005. Geologic Map of New Mexico, 2003, Scale 1:500,000. Available at: http://geoinfo.nmt.edu/publications/maps/geologic/state/home.cfm#download

New Mexico Climate Change Advisory Group. 2006. *Final Report, December 2006*. New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Department of Agriculture. 2009. New Mexico Noxious Weed List (Updated April 2009). Available at http://www.nmda.nmsu.edu/animal-and-plant-protection/noxious-weeds.

New Mexico Department of Game and Fish. 2006. Comprehensive Wildlife Conservation Strategy for New Mexico. New Mexico Department of Game and Fish. Santa Fe, New Mexico. 526 pp + appendices. Available: http://fws-nmcfwru.nmsu.edu/cwcs/New_Mexico_CWCS.htm

New Mexico Department of Game and Fish. 2009. New Mexico Species List/Species Account – BISON-M. http://www.bisonm.org (Accessed: 22 June 2009).

New Mexico Department of Workforce Solutions. 2009. Economic Research and Analysis. Table A: Civilian Labor Force, Employment, Unemployment and Unemployment rate. http://www.dws.state.nm.us/LMI/dws-data.html#TA (Accessed: 14 July 2009).

New Mexico Environment Department Air Quality Bureau. 2008. Ambient Air Monitoring in New Mexico. http://www.nmenv.state.nm.us/aqb/monitor/index.html (Accessed: 24 June, 2009).

New Mexico Environmental Department Surface Water Quality Bureau. 2005. Final Approved Total Maximum Daily Load (TMDL) for the Pecos Headwaters Watershed. Ft. Sumner Reservoir to Headwaters. Available: http://www.nmenv.state.nm.us/SWQB/Pecos/Upper/PecosHeadwatersTMDL.pdf

_____. 2001. Water Quality Survey Summary for the Upper Pecos River Watershed, Part III (Between Tecolote Creek and Sumner Reservoir) http://www.nmenv.state.nm.us/swqb/Surveys/UpperPecosPartIII-2001.pdf

New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants Home Page. Albuquerque, NM. http://nmrareplants.unm.edu (Latest update: 22 January 2009)

U.S. Army Corps of Engineers. 1996. Final Environmental Assessment: Rehabilitation of Puerto De Luna East Side Ditch, Guadalupe County, New Mexico. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico

_____. 2000 . Final Environmental Assessment, Acequia Rehabilitation Program: Rehabilitation of an Irrigation Flume for the Puerto De Luna East Side Acequia, Guadalupe County, New Mexico. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico

_____. 2003. Final Environmental Assessment: West Puerto de Luna Community Ditch Pipeline Rehabilitation, Guadalupe County, New Mexico. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico

_____. 2005. Acequia Rehabilitation Program, West Puerto De Luna Acequia, Guadalupe County, New Mexico. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico

U.S. Census Bureau. 2000. Profile of General Demographic Characteristics: 2000 Census of Population and Housing: New Mexico. http://www.census.gov/prod/cen2000/dp1/2kh35.pdf (Accessed: 24 June, 2009).

U.S. Census Bureau. 2009a. USA Counties General Profile: Guadalupe County, New Mexico. http://censtats.census.gov/usa/usa.shtml (Accessed: 24 June, 2009)

U.S. Census Bureau. 2009b. Small Area Income and Poverty Estimates for New Mexico Counties, 2007. http://www.census.gov/hhes/www/saipe/county.html (Page Last Modified: January 02, 2009; Accessed: 24 June, 2009).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2009. Online Soil Survey for Guadalupe County. http://websoilsurvey.nrcs.usda.gov/app/ (Accessed: 10 April 2009).

U.S. Environmental Protection Agency. 2008. *Air data by geographic area: State of New Mexico*. http://www.epa.gov/air/data/repsst.html?st~NM~New%20Mexico (Accessed: 24 June, 2009).

U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office. 2009. New Mexico Listed and Sensitive Species Lists and recommendations for project proposals. http://www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm (Accessed: 17 June 2009).

Appendix A
Existing Conditions and Site Photos

Washed-out West Puerto de Luna diversion dam on Agua Negra Creek, looking upstream and to the west.

Washed out West Puerto de Luna diversion dam on Agua Negra Creek, looking downstream and to the east.

West Puerto de Luna Acequia head gate and washed-out diversion dam, looking north.

Incised Agua Negra Creek upstream of washed-out diversion dam and invading Salt Cedar, looking west.

Proposed Borrow Area 1, looking north.

Proposed Borrow Area 1, looking south.

Proposed Borrow Area 2, looking southwest.

Proposed Borrow Area 2, looking west.

Proposed Borrow Area 3, looking south.

Proposed Borrow Area 3, looking west.

Appendix B
Clean Water Act Section 404
Irrigation Exemption Memo and Summary

CESPA-RD October 19, 2009

MEMORANDUM FOR Ch, Environmental Resources Section, (CESPA-PM-LE/Julie Alcon)

SUBJECT: Action Number SPA-2009-00629-ABQ; West Puerto de Luna Community Ditch Rehabilitation

1. This is in response to an email request from Sarah Beck dated October 14, 2009 concerning a proposal to rehabilitate the West Puerto de Luna Community Ditch, Guadalupe County, New Mexico. The work would occur on an existing earthen irrigation ditch near the Pecos River, shown on USGS topographic quadrangle Puerto Creek (34104-g6). This project has been assigned Action Number SPA-2009-00629-ABQ.

2. We have reviewed this proposed project in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

3. Based on your description of the proposed work, and other information available to us, we have determined that the project may involve discharges of dredged or fill material into a water of the United States. However, the specific activity that is proposed is currently exempt from regulation by a specific provision of the Clean Water Act as implemented by the Corps regulations at 33 CFR 323.4(a). Therefore, the project will not require Department of the Army authorization.

4. A copy of the Irrigation Exemption Summary is attached and is also available at http://www.spa.usace.army.mil/reg/Exemptions/exemption.asp. Please keep in mind that compliance with the restrictions outlined in the Irrigation Exemption Summary is required.

5. If you have any questions or need additional information, please contact Mr. Chris Grosso, extension 3374, or christopher.m.grosso@usace.army.mil.

Lesley McWhirter

Encl

Lesley McWhirter
Chief, NM/TX Branch

US Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, NM 87109-3435
Fax No. 505-342-3498

Irrigation Exemption Summary

FARM OR STOCK POND OR IRRIGATION DITCH CONSTRUCTION OR MAINTENANCE

Pursuant to Section 404 of the Clean Water Act (33 USC 1344) and Federal Regulations (33 CFR 323.4(a)(3)), certain discharges for the construction or maintenance of farm or stock ponds or irrigation ditches have been exempted from requiring a Section 404 permit. Included in the exemption are the construction or maintenance of farm or stock ponds or irrigation ditches, or the maintenance (but not the construction) of drainage ditches. Discharges associated with siphons, pumps, headgates, wingwalls, weirs, diversion structures, and such other facilities as are appurtenant and functionally related to irrigation ditches are included in this exemption.

A Section 404 permit is required if either of the following occurs:

(1) Any discharge of dredged or fill material resulting from the above activities which contains any toxic pollutant listed under Section 307 of the Clean Water Act shall be subject to any applicable toxic effluent standard or prohibition, and shall require a permit.

(2) Any discharge of dredged or fill material into waters of the United States incidental to the above activities must have a permit if it is part of an activity whose purpose is to convert an area of the waters of the United States into a use to which it was not previously subject, where the flow or circulation of waters of the United States may be impaired or the reach of such waters reduced. Where the proposed discharge will result in significant discernible alterations to flow or circulation, the presumption is that flow or circulation may be impaired by such alteration. For example, a permit will be required for the conversion of a wetland from silvicultural to agricultural use when there is a discharge of dredged or fill material into waters of the United States in conjunction with construction of dikes, drainage ditches, or other works or structures used to effect such conversion. A discharge which elevates the bottom of waters of the United States without converting it to dry land does not thereby reduce the reach of, but may alter the flow or circulation of, waters of the United States.

If the proposed discharge satisfies all of the above restrictions, it is automatically exempted and no further permit action from the Corps of Engineers is required. If any of the restrictions of this irrigation exemption will not be complied with, an individual permit is required and should be requested using ENG Form 4345 (Application for a Department of the Army permit). A nationwide permit authorized by the Clean Water Act may be available for the proposed work. State or local approval of the work may also be required.

For additional information concerning exemptions, nationwide permits, or for a written determination regarding a specific project, please contact the Corps at the following addresses:

In New Mexico:
Albuquerque District Corps of Engineers
ATTN: Regulatory Branch
4101 Jefferson Plaza, NE
Albuquerque, New Mexico 87109-3435
Phone: (505) 342-3283

In southeastern Colorado:
Southern Colorado Regulatory Office
720 North Main Street, Room 300
Pueblo, Colorado 81003-3047
Phone: (719) 543-9459

In southern New Mexico and western Texas:
El Paso Regulatory Office
P.O. Box 6096
Ft. Bliss, Texas 79906-0096
Phone: (915) 568-1359

Appendix C
Cultural Resources Documentation

West Puerto de Luna Tribal Mailing Directory
November 10, 2009

To:
Honorable Donald G. Tofpi
Chairman, Kiowa Tribe of Oklahoma
Post Office Box 369
Carnegie, Oklahoma 73015

To:
Honorable Joe Shirley
President, Navajo Nation
Post Office Box 9000
Window Rock, Arizona 86515

Carbon Copy:
Mr. Alan Downer
Tribal Historic Preservation Officer
Navajo Nation
Post Office Box 4950
Window Rock, Arizona 86515

Mr. Ron Maldonado
Historic Preservation Department
Navajo Nation
PO Box 4950
Window Rock, Arizona 86515

Mr. Tony H. Joe, Jr.
HPD, Tradional Cultural Program
Navajo Nation
Post Office Box 4950
Window Rock, Arizona 86515

To:
Honorable Levi Pesata
President, Jicarilla Apache Nation
Post Office Box 507
Dulce, New Mexico 87528

Carbon Copy:
Ms. Lorene Willis
Office of Cultural Affairs
Jicarilla Apache Nation
Post Office Box 507
Dulce, New Mexico 87528

To:
Honorable Wallace Coffey
Chairman, Comanche Nation of Oklahoma
Post Office Box 908
Lawton, Oklahoma 73502

Carbon Copy:
Mr. Jimmy Arterberry
Tribal Historic Preservation Officer
Comanche Nation of Oklahoma
Post Office Box 908
Lawton, Oklahoma 73502

To:
Honorable Carleton Naiche-Palmer
President, Mescalero Apache Tribe
Post Office Box 227
Mescalero, New Mexico 88340

Carbon Copy:
Ms. Holly Houghton
Tribal Historic Preservation Officer
Mescalero Apache Tribe
Post Office Box 227
Mescalero, New Mexico 88340

To:
Honorable Max Zuni
Lt. Governor, Pueblo of Isleta
Post Office Box 1270
Isleta Pueblo, New Mexico 87022

Carbon Copy:
Mr. Henry Walt
Cibola Research Consultants
Pueblo of Isleta
508 Hermosa SE
Albuquerque, New Mexico 87108

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

November 10, 2009

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Division

Honorable Donald G. Tofpi
Chairman, Kiowa Tribe of Oklahoma
Post Office Box 369
Carnegie, Oklahoma 73015

Dear Chairman Tofpi:

The U.S. Army Corps of Engineers, Albuquerque District (Corps) is planning to rebuild a diversion structure for the Puerto de Luna West Side Acequia Association, Guadalupe County, New Mexico that failed during record storms in 2006. The project area is located along Agua Negra Creek, just west of the Pecos River, approximately six miles south south-east of Santa Rosa in south-central Guadalupe County, New Mexico (see Enclosures 1 and 2). The diversion structure and three potential borrow areas are located in Township 8N, Range 21E, Section 36 of the USGS 7.5' Santa Rosa (34104-H6), Puerto Creek (34104-G6), and Pastura SE (34104-H7) quadrangles.

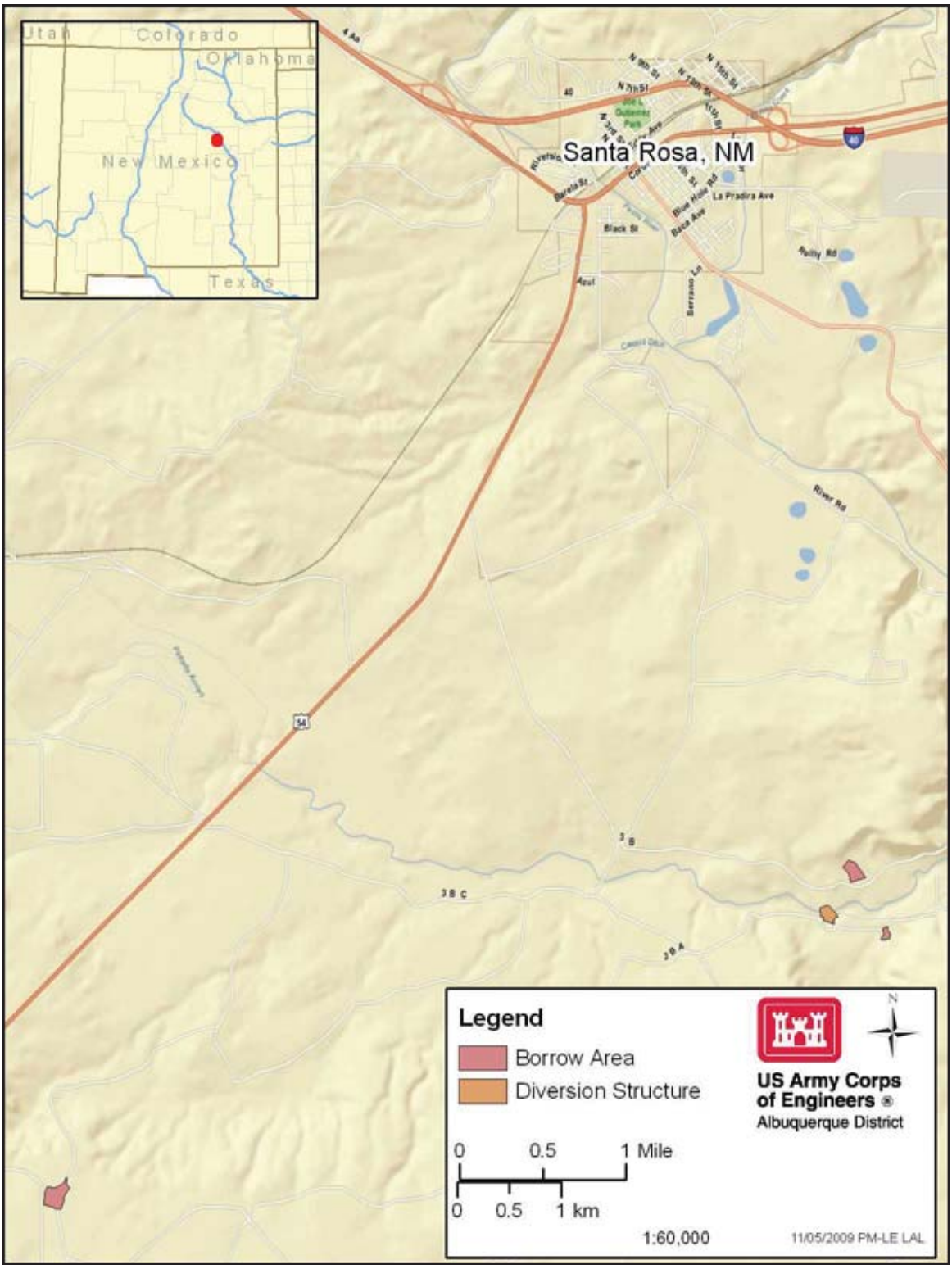
Corps archaeologists surveyed the 4.83-acre diversion structure, the southern 1.85-acre potential borrow area, and the 6.04-acre potential northern borrow area for historic properties and recorded seven Isolated Occurrences (IOs), all located in the northernmost potential borrow area. Five of the IOs consist of a single flake, one IO is an informal uniface, and the final IO consists of two flakes. All IOs are of local materials. No historic properties were located during survey. The westernmost 10.34-acre borrow area has been used as a caliche mine and is completely disturbed.

The purpose of this letter is to inform you about this project, so that you may provide comments regarding this project. If you have any questions or require additional information, please contact Mr. Lance Lundquist, archaeologist at (505) 342-3671 or me at (505) 342-3281. You may also provide comments to the above address.

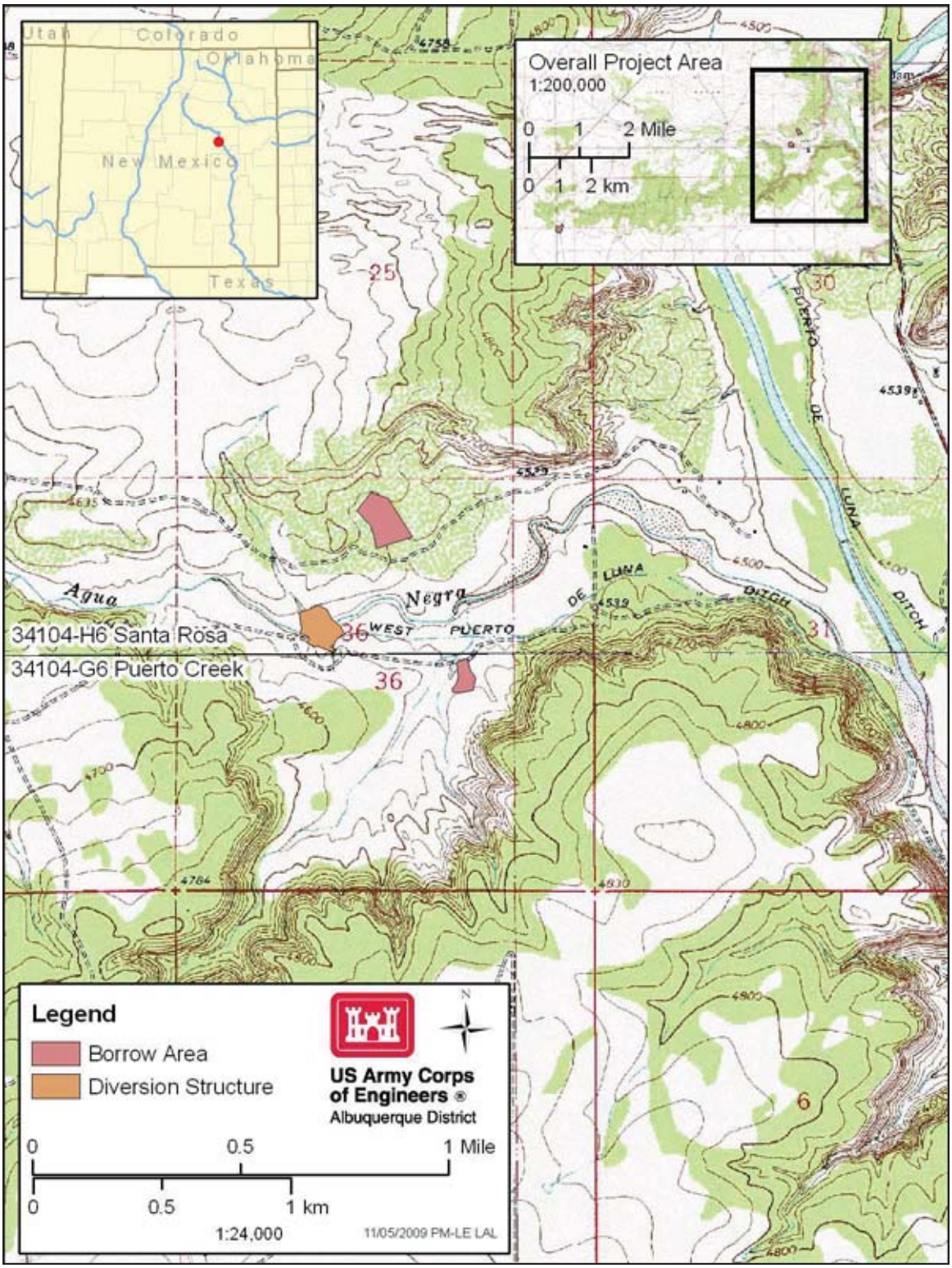
Sincerely,

Julie Alcon
Chief, Environmental Resources Section

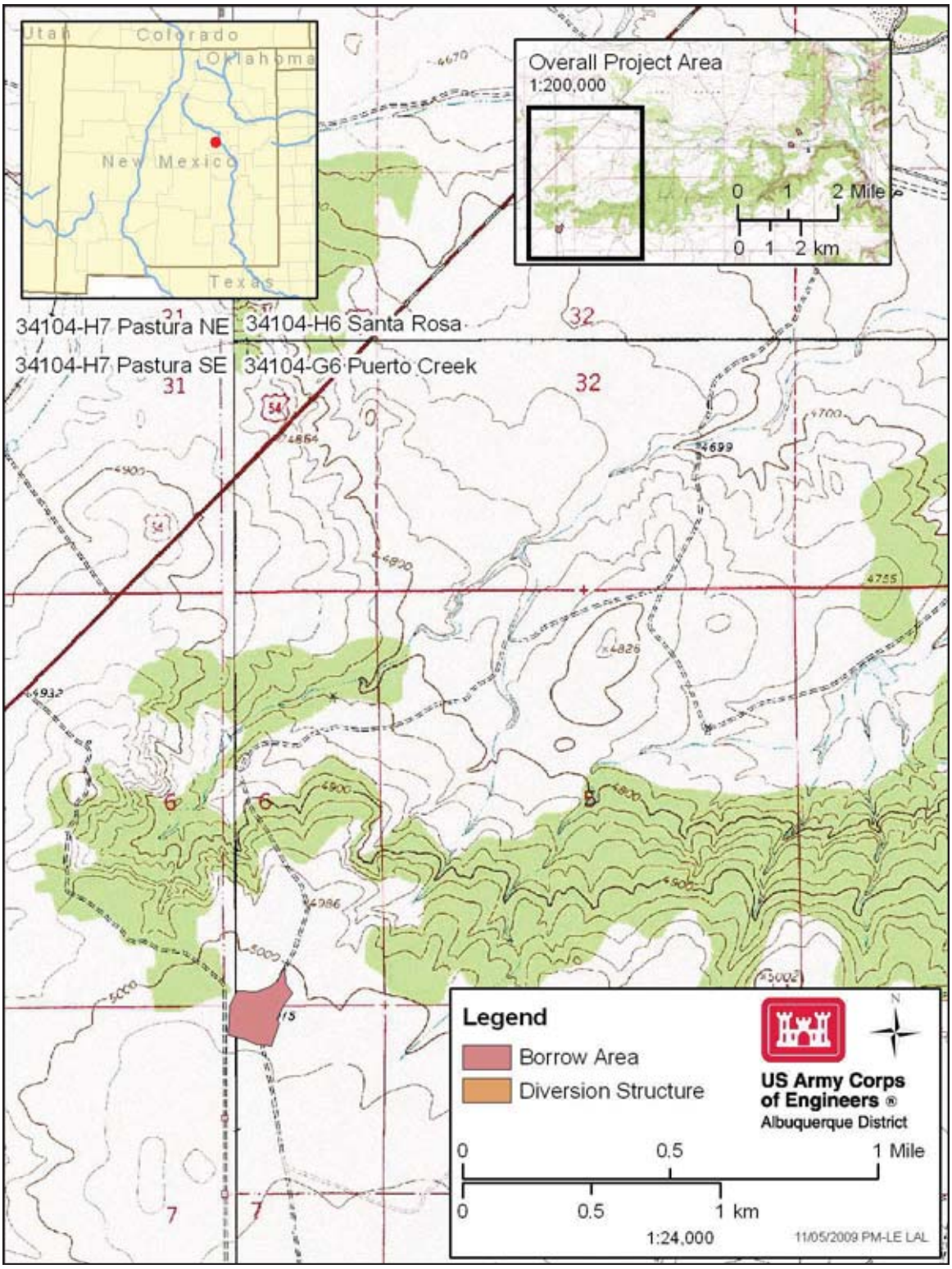
Enclosures



Enclosure 1: General location of the proposed project.



Enclosure 2a: Location of the proposed project based on USGS 7.5 minute series quadrangle maps (page 1 of 2).



Enclosure 2b: Location of the proposed project based on USGS 7.5 minute series quadrangle maps (page 2 of 2).

PUEBLO OF ISLETA
GOVERNOR'S OFFICE

P.O. BOX 1270, ISLETA, NM 87022

PHONE: 505-869-3111
FAX: 505-869-4236

November 13, 2009

Department of The Army
Albuquerque District, Corps of Engineers
Julie Alcon, Chief Environmental Specialist
4101 Jefferson Plaza, N.E.
Albuquerque, NM 87109-3435

Dear Ms. Alcon:

This letter is in response to your letter regarding the proposed diversion structure for the Puerto De Luna West Side Acequia Association, Guadalupe County, New Mexico.

I am pleased to inform you that this project will not have an impact on religious or cultural sites affiliated with the Pueblo of Isleta.

However, in the event that discoveries are found during construction, we would appreciate being advised of such findings. Please forward all environmental assessment plans to our office.

Thank you for your consideration in contacting this office to express our concerns.

Sincerely,

PUEBLO OF ISLETA

for J. Robert Benavides
Governor

cc: files

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 JEFFERSON PLAZA NE
ALBUQUERQUE NM 87109-3435

November 13, 2009

Planning, Project and Program Management Division
Planning Branch
Environmental Resources Section

Ms. Jan Biella
Interim State Historic Preservation Officer
New Mexico Department of Cultural Affairs
Historic Preservation Division
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe, New Mexico 87501

Dear Ms. Biella:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, is seeking your concurrence in our determination of no adverse effect to historic properties for a proposed rehabilitation of the West Puerto de Luna acequia (Acequia), Guadalupe County, New Mexico (see Enclosure 1). The Corps, at the request of the New Mexico Office of the State Engineer (NMOSE) and the Puerto de Luna West Side Acequia Association (Association), is planning a project that would replace the failed diversion structure with a new one. Work would be conducted under the Water Resources Development Act of 1986 (Public Law 99-662), as amended.

According to Association records, the Acequia has been in use since at least 1864, and the Association was established in 1883. The construction of the original WPDL Giddings diversion dam was initiated in 1894, and the Hope Decree adjudicated water rights of Agua Negra creek in 1932. In 1942 the dam was destroyed by a flood and rebuilt to its modern form from nearby earth, brush, and boulders. This dam was damaged and repaired in 2005. According to the NMOSE, severe storms and flooding between July 26 and September 18, 2006 completely washed out the dam. In addition, the stream bed eroded nearly 20 vertical feet both upstream and downstream of the diversion dam. Since 2006, the 53 families and 330 acres served by the acequia have been without irrigation water.

The Corps proposes to build a new diversion dam and spillway on Agua Negra Creek in the same location. After the dam failed in 2006, the Federal Emergency Management Agency (FEMA)

provided funds for the design of a replacement dam. Project design and specifications were completed by HDR, Inc. The objectives of the project are to allow the ditch to be used again after three seasons of disuse. Association members would be responsible for assuring operation and maintenance upon project completion. Specifically, the Corps would replace the washed-out fill section of the irrigation diversion dam to pre-disaster function. Similar to the old dam, the new structure will be earth-filled, have a centerline cross section of 120 feet at the top, 60 feet at the bottom, a height of 35 feet and a width of 40 feet. Total earthen fill volume will be 12,834 cubic yards (cy) and will use 2:1 slopes along the stream. The upstream fill face will have grouted rip-rap three feet thick as additional protection. The concrete spillway and rock gabions that were not washed away in 2005 will be removed during the current project. In addition, areas to the north and south of the diversion itself will be graded to improve water flow and runoff, which will result in the removal of some older masonry wall elements on the north bank of the river. Three potential borrow areas for this project have been identified (see Enclosure 1).

The total length of the acequia madre is approximately 7.17 miles, as measured on a USGS 7.5” quadrangle map. Rehabilitation and improvements to the acequia have been undertaken in the past as the Association obtained necessary funds. The Association has made improvements to the spillway area, by covering rock walls with a coat of concrete, adding gabion baskets, and adding concrete pads to the spillway area. Most of this work appears to have occurred within the last 50 years. In 1967, the Soil Conservation Service, the predecessor of the NRCS, lined a 686-foot segment of ditch with concrete. Following the 1986 Water Resources Development Act’s authorization of the Acequia Rehabilitation Program, the Corps provided funding for the replacement of that concrete-lined section in 2005. During the same rehabilitation project, an additional 5,278 feet of earthen ditch was lined with concrete and a failing flume was replaced. In 2005, flooding destroyed a portion of the dam, which the Association patched. Flooding in 2006 destroyed the dam beyond repair. Based on the documented data above, approximately 15.7 percent of the ditch is concrete lined, while the remaining 84.2 percent of the acequia remains as open earthen ditch; however, the focus of this project is only on the diversion structure, and the amount of concrete-lining was not field-checked. The current project would replace the failed diversion structure and spillway with a modern structure.

Pursuant to 36 CFR 800.4(a)(1), the Area of Potential Effects (APE) for this project is considered to be 4.83-acres for the diversion structure and staging area, 1.85-acre for a potential borrow pit to the southeast, a 6.04-acre potential borrow pit to the northeast, and a 10.34-acre borrow pit to the west. The western borrow area has been used as a source of caliche and has been 100 percent disturbed.

Pursuant to 36 CFR 800.4(b), a Corps archaeologist conducted a field visit to the project area on September 3, 2009, and Corps archaeologists surveyed the project area on October 23, 2009. Enclosed for your review is the report titled "A 23.06-Acre Cultural Resources Inventory for the West Puerto de Luna Acequia Rehabilitation Project, Guadalupe County, New Mexico, and Detailed Documentation of the Failed Diversion Structure and Associated Features", by Jonathan E. Van Hoose and Lance Lundquist (NMCRIS 115748, Corps Report No. USACE-ABQ-2009-016). With the exception of seven Isolated Occurrences (IOs), the survey did not identify any historic properties aside from the acequia itself. The seven IOs consist of seven flakes and an informal uniface, all of local materials. The Corps considers none of the IOs to be significant and no further work is recommended for these IOs.

Consistent with the Department of Defense's American Indian and Alaska Native Policy, signed by Secretary of Defense William S. Cohen on October 20, 1998, and based on the State of New Mexico Indian Affairs Department's Native American Consultations List, American Indian tribes that have indicated they have concerns in Guadalupe County have been contacted regarding the proposed project. To date, the Corps has received no indication of tribal concerns that would impact this project. No known Traditional Cultural Properties are known by the Corps to occur within the project area.

The Corps considers the Acequia to be eligible for listing on the National Register of Historic Places under Criterion (a) of 36 CFR 60.4, as irrigation features such as this one made possible the settling and farming of the area, and is thus associated with events that have made a significant contribution to the broad patterns of our history. We seek your concurrence in our eligibility determination.

The proposed project involves removing the remains of the failed diversion structure and its associated features, and replacing it with a new one in the same location as the failed dam. The Corps considers the failed diversion structure to lack

integrity as a contributing element to the acequia system, as it was mostly washed out due to flooding in 2006. The Secretary of the Interior's Standards for the treatment of historic properties include four types of treatments: preservation, rehabilitation, restoration, and reconstruction (36 CFR 68). The Corps cannot rebuild the diversion structure to any of the Secretary's standards, as diversion structures of this size are regulated by the Office of the State Engineer Dam Safety Bureau and must meet current State standards for dam construction and safety. This project would change the physical features of the diversion structure. However, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. The current diversion structure lacks integrity and in its current condition is not a contributing element to the acequia's historic significance.

Without this project, this historic acequia cannot be used for its intended function, as water will not flow in the acequia without a new diversion structure; indeed, the acequia has not been able to function since the breach three years ago. As stated above, the Corps cannot rehabilitate the diversion structure to any of the Secretary's standards. Therefore, this project would change the physical features of the previous diversion structure, although in its current condition, the diversion structure lacks integrity. With the exception of the diversion structure and associated features, this project will not affect the acequia system.

Although the dam must be constructed to modern standards, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. Included in the enclosed report is a detailed documentation of what remains of the existing diversion structure and associated structures, with the purpose of recording for historic research value. Given (1) the lack of integrity of the diversion structure; (2) the fact that it will be rebuilt in the same place using similar materials (i.e., relatively similar form, same function and alignment); (3) the fact that it will allow this historic property to function; and (4) provided the enclosed documentation of the failed diversion structure that serve to document its historic aspects, the Corps is of the opinion that the proposed project will have no adverse effect to the West Puerto de Luna acequia system or to other historic properties in the area. We seek your concurrence on this determination of <u>no adverse effect to historic properties</u>.

Should previously undiscovered artifacts or features be discovered during construction, work will stop in the immediate vicinity of the find, a determination of significance made, and consultation would take place with the New Mexico State Historic Preservation Office and with Native American groups that may have concerns in the project area, to determine the best course of action.

In sum, we seek your concurrence in our eligibility determination and in our determination of no adverse effect to historic properties by this project. If you have questions or concerns regarding the West Puerto de Luna Acequia Rehabilitation Project, please contact Dr. Jonathan Van Hoose, archaeologist, at (505) 342-3687, Mr. Lance Lundquist, archaeologist, at (505) 342-3671, or me at (505) 342-3281.

Sincerely,

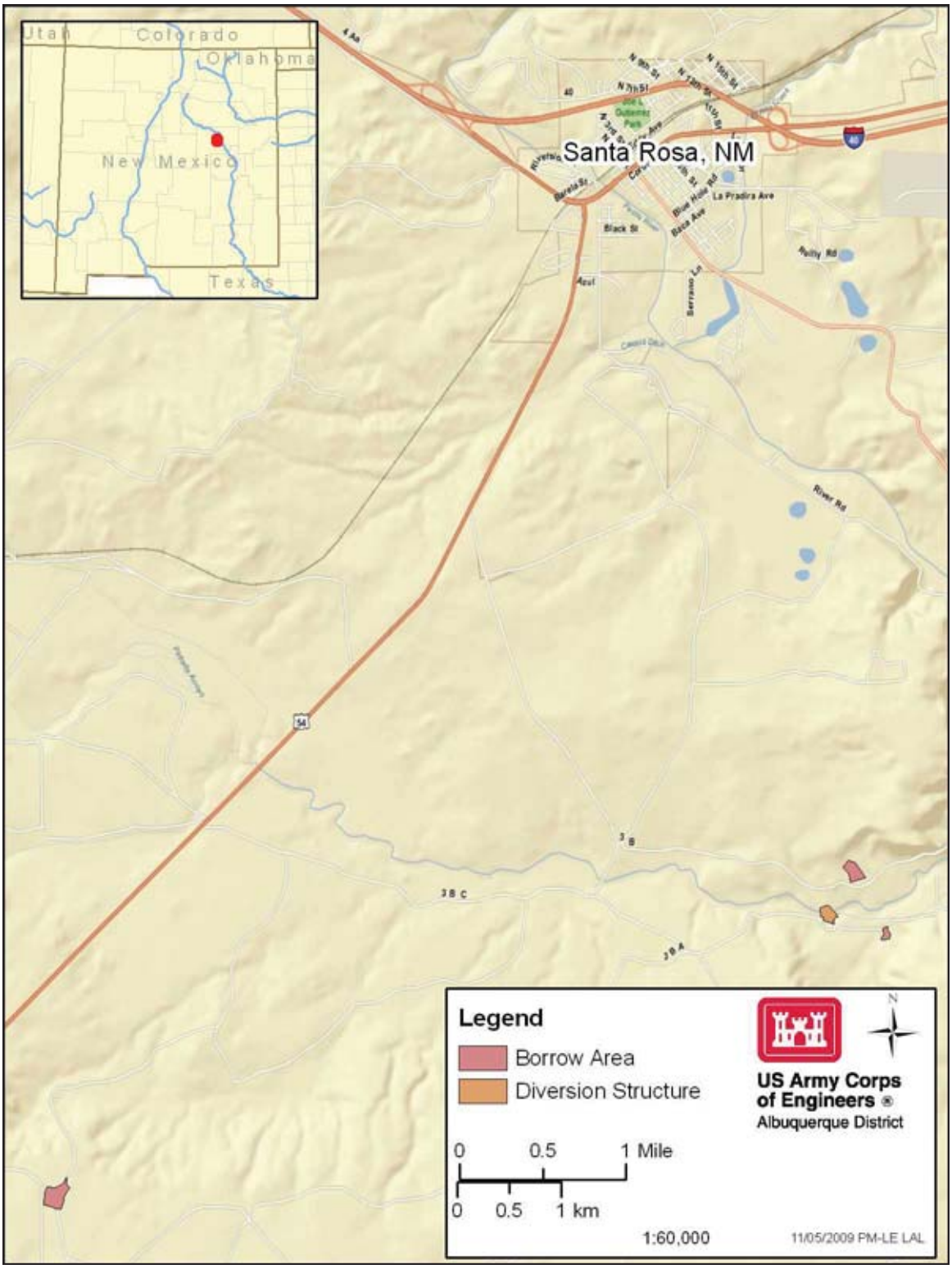
Julie Alcon
Chief, Environmental Resources Section

_____ I CONCUR _____

Date

JAN BIELLA
Interim New Mexico State
Historic Preservation Officer

Enclosures



Enclosure 1. Location of project area.

NMCRIS No. 115748

A 23.06-ACRE CULTURAL RESOURCES INVENTORY FOR THE WEST PUERTO DE LUNA ACEQUIA REHABILITATION PROJECT, GUADALUPE COUNTY, NEW MEXICO, AND DETAILED DOCUMENTATION OF THE FAILED DIVERSION STRUCTURE AND ASSOCIATED FEATURES

Prepared by

Jonathan E. Van Hoose and Lance Lundquist

With contributions by

Sarah E. Beck, Gregory Everhart, Lance Lundquist, and Jonathan E. Van Hoose

Prepared by and for

U.S. Army Corps of Engineers, Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, NM 87109-3435
Office: (505) 342-3283; Fax: (505) 342-3668

New Mexico Annual State General Permit No. NM-09-193

Report No. USACE-ABQ-2009-016

November 13, 2009

US Army Corps
of Engineers
Albuquerque District

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NMCRIS INVESTIGATION ABSTRACT FORM (NIAF)

1. NMCRIS Activity No.:	2a. Lead (Sponsoring) Agency:	2b. Other Permitting Agency(ies):	3. Lead Agency Report No.:
115748	USACE, Albuquerque District		USACE-ABQ-2009-016

4. Title of Report: A 23.06-ACRE CULTURAL RESOURCES INVENTORY FOR THE WEST PUERTO DE LUNA ACEQUIA REHABILITATION PROJECT, GUADALUPE COUNTY, NEW MEXICO, AND DETAILED DOCUMENTATION OF THE FAILED DIVERSION STRUCTURE AND ASSOCIATED FEATURES

Author(s) Jonathan E. Van Hoose and Lance Lundquist

5. Type of Report ☐ Negative ☒ Positive

6. Investigation Type
☐ Research Design ☒ Survey/Inventory ☐ Test Excavation ☐ Excavation ☐ Collections/Non-Field Study
☐ Overview/Lit Review ☐ Monitoring ☐ Ethnographic study ☐ Site specific visit ☒ Other **Detailed documentation of the failed acequia diversion structure.**

7. Description of Undertaking (what does the project entail?): The Corps is planning to replace the failed diversion structure of the West Puerto de Luna acequia. This project entails removal of the remains of the existing diversion structure and building a new diversion structure. Borrow for dirt is considered from three possible sources.

8. Dates of Investigation: (from: 9/3/2009 to: 10/23/2009)

9. Report Date: November 12, 2009

10. Performing Agency/Consultant: USACE, Albuquerque District
Principal Investigator: Jonathan E. Van Hoose
Field Supervisor: Jonathan E. Van Hoose
Field Personnel Names: John Schelberg, Gregory Everhart, Lance Lundquist

11. Performing Agency/Consultant Report No.: USACE-ABQ-2009-016

12. Applicable Cultural Resource Permit No(s): NM-09-193

13. Client/Customer (project proponent): USACE
Contact: Lance Lundquist
Address:
U.S. Army Corps of Engineers, Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, NM 87109
Phone: (505) 342-3687

14. Client/Customer Project No.: N/A

15. Land Ownership Status *(Must be indicated on project map):*

Land Owner	Acres Surveyed	Acres in APE
Private	23.06	23.06
TOTALS	23.06	23.06

16 Records Search(es):

Date(s) of ARMS File Review 9/4/2009	Name of Reviewer(s) Jonathan E. Van Hoose	
Date(s) of NR/SR File Review 9/4/2009	Name of Reviewer(s) Jonathan E. Van Hoose	
Date(s) of Other Agency File Review 9/4/2009	Name of Reviewer(s) Jonathan E. Van Hoose	Agency USACE

17. Survey Data:

a. Source Graphics ☒ NAD 27 ☐ NAD 83
☒ USGS 7.5' (1:24,000) topo map ☐ Other topo map, Scale:
☒ GPS Unit Accuracy ☒ <1.0m ☐ 1-10m ☐ 10-100m ☐ >100m

b. USGS 7.5' Topographic Map Name / USGS Quad Code

Santa Rosa, NM	34104-H6
Puerto Creek, NM	34104-G6
Pastura SE, NM	34104-H7

c. County(ies): Guadalupe

17. Survey Data (continued):

d. Nearest City or Town: Santa Rosa, NM

e. Legal Description:

Township (N/S)	Range (E/W)	Section	¼ ¼ ¼
8 N	21 E	36	NW, NW, NE.
8 N	21 E	36	NE, NW, NE.
8 N	21 E	36	SW, NW, NE.
8 N	21 E	36	SE, NW, NE.
8 N	21 E	36	SW, SE, NE.
8 N	21 E	36	SE, SE, NE.
8 N	21 E	36	NW, NE, SE.
8 N	21 E	36	NE, NE, SE.
8 N	21 E	36	NW, SE, NW.
8 N	21 E	36	NE, SE, NW.
8 N	21 E	36	SE, SE, NW.
8 N	21 E	36	SW, SW, SW.
8 N	21 E	36	SE, SW, SW.
8 N	21 E	36	SE, SW, SW.
8 N	21 E	36	SE, SE, SW.
7 N	21 E	6	SE, SW, SE.
7 N	21 E	6	SW, SE, SE.
7 N	21 E	7	NE, NW, NE.
7 N	21 E	7	NW, NE, NE.

Projected legal description? Yes [ ] , No [X] Unplatted [ ]

f. Other Description (e.g. well pad footages, mile markers, plats, land grant name, etc.): The project area is on private land just south of Santa Rosa, and is part of the Agua Negro Grant. From Santa Rosa, take U.S. Route 54 1.98 miles south, turn east on dirt road 3B 3.54 miles, and the acequia diversion structure is approximately 1,200 feet south on a dirt road.

18. Survey Field Methods:

Intensity: ☒ 100% coverage ☐ <100% coverage

Configuration: ☒ block survey units ☐ linear survey units (l x w): ☐ other survey units (specify):

Scope: ☒ non-selective (all sites recorded) ☐ selective/thematic (selected sites recorded)

Coverage Method: ☒ systematic pedestrian coverage ☐ other method (describe)

Survey Interval (m): 15 Crew Size: 4 Fieldwork Dates: 10/23/2009

Survey Person Hours: 15 Recording Person Hours: 15 Total Hours: 30

Additional Narrative: The survey consisted of three parts: the diversion structure and staging area, two potential borrow areas to the east, and an existing borrow pit to the west. The diversion structure and staging area was surveyed by Jonathan Van Hoose and Lance Lundquist in 15 m intervals, and the entire diversion structure was mapped. The borrow pit to the west has been used as a a source for caliche and the extent of survey was to confirm that the area has been 100 percent disturbed. The two potential borrow areas to the east (one on each side of the river) were surveyed by John Schelberg and Gregory Everhart.

19. Environmental Setting (NRCS soil designation; vegetative community; elevation; etc.): Soils within the project area are mapped in two units. The Agua Negra Creek floodplain, where the diversion dam is located, and the northeastern borrow area is Minnesota very fine sandy loam, 0 to 2 percent slopes. The southeastern borrow area is Ima-La Lande fine sandy loams, 2 to 10 percent slopes. The western borrow area is Pastura loam, 0 to 5 percent slopes The project area lies within the Plains and Great Basin Grassland biotic community. The diversion structure is located at 4,580'.

20. a. Percent Ground Visibility: 90 b. Condition of Survey Area (grazed, bladed, undisturbed, etc.): The diversion structure has been mostly disturbed by construction and maintenance activities. The west borrow pit has been used as a source for caliche and is 100 percent disturbed. For the eastern borrow pits, the southern area is undisturbed while the northern area includes a stock pond but is otherwise undisturbed.

21. CULTURAL RESOURCE FINDINGS ☒ Yes, See Page 3 ☐ No, Discuss Why:

22. Required Attachments (check all appropriate boxes):	23. Other Attachments:
☒ USGS 7.5 Topographic Map with sites, isolates, and survey area clearly drawn ☒ Copy of NMCRIS Mapserver Map Check ☐ LA Site Forms - new sites (*with sketch map & topographic map)* ☐ LA Site Forms (update) - previously recorded & un-relocated sites (*first 2 pages minimum)* ☐ Historic Cultural Property Inventory Forms ☒ List and Description of isolates, if applicable ☐ List and Description of Collections, if applicable	☐ Photographs and Log ☒ Other Attachments *(Describe)*: Acequia form

24. I certify the information provided above is correct and accurate and meets all applicable agency standards.

Principal Investigator/Responsible Archaeologist: Jonathan E. Van Hoose

Signature _____ **Date** _____ **Title (if not PI):**

25. Reviewing Agency: USACE, Albuquerque	26. SHPO
Reviewer's Name/Date	Reviewer's Name/Date:
Accepted ( ) Rejected ( )	HPD Log #:
Tribal Consultation (if applicable): ☒ Yes ☐ No	SHPO File Location: Date sent to ARMS:

CULTURAL RESOURCE FINDINGS

[fill in appropriate section(s)]

1. NMCRIS Activity No.:	2. Lead (Sponsoring) Agency:	3. Lead Agency Report No.:
115748	USACE, Albuquerque District	USACE-ABQ-2009-016

SURVEY RESULTS:

Sites discovered and registered: 0
Sites discovered and NOT registered: 0
Previously recorded sites revisited (*site update form required*): **0**
Previously recorded sites not relocated *(site update form required):* 0
TOTAL SITES VISITED: 0
Total isolates recorded: 7 **Non-selective isolate recording?** ☐
Total structures recorded (*new and previously recorded, including acequias*): **1**

MANAGEMENT SUMMARY: The U.S. Army Corps of Engineers (Corps), Albuquerque District, at the request of the New Mexico Office of the State Engineer (NMOSE) and the Puerto de Luna West Side Acequia Association (Association), is planning a project that would replace the failed diversion structure with a new one. Work would be conducted under the Water Resources Development Act of 1986 (Public Law 99-662), as amended.

According to Association records, the Acequia has been in use since at least 1864, and the Association was established in 1883. The construction of the original WPDL Giddings diversion dam was initiated in 1894, and the Hope Decree adjudicated water rights of Agua Negra creek in 1932. In 1942 the dam was destroyed by a flood and rebuilt to its modern form from nearby earth, brush, and boulders. This dam was damaged and repaired in 2005. According to the NMOSE, severe storms and flooding between July 26 and September 18, 2006 completely washed out the dam. In addition, the stream bed eroded nearly 20 vertical feet both upstream and downstream of the diversion dam. Since 2006, the 53 families and 330 acres served by the acequia have been without irrigation water.

The Corps proposes to build a new diversion dam and spillway on Agua Negra Creek in the same location. After the dam failed in 2006, the Federal Emergency Management Agency (FEMA) provided funds for the design of a replacement dam. Project design and specifications were completed by HDR, Inc. The objectives of the project are to allow the ditch to be used again after three seasons of disuse. Association members would be responsible for assuring operation and maintenance upon project completion. Specifically, the Corps would replace the washed-out fill section of the irrigation diversion dam to pre-disaster function. Similar to the old dam, the new structure will be earth-filled, have a centerline cross section of 120 feet at the top, 60 feet at the bottom, a height of 35 feet and a width of 40 feet. Total earthen fill volume will be 12,834 cubic yards (cy) and will use 2:1 slopes along the stream. The upstream fill face will have grouted rip-rap three feet thick as additional protection. The concrete spillway and rock gabions that were not washed away in 2005 will be removed during the current project. In addition, areas to the north and south of the diversion itself will be graded to improve water flow and runoff, which will result in the removal of some older masonry wall elements on the north bank of the river. Three potential borrow areas for this project have been identified (see Enclosure 1).

The total length of the acequia madre is approximately 7.17 miles, as measured on a USGS 7.5" quadrangle map. Rehabilitation and improvements to the acequia have been undertaken in the past as the Association obtained necessary funds. The Association has made improvements to the spillway area, by covering rock walls with a coat of concrete, adding gabion baskets, and adding concrete pads to the spillway area. Most of this work appears to have occurred within the last 50 years. In 1967, the Soil Conservation Service, the predecessor of the NRCS, lined a 686-foot segment of ditch with concrete. Following the 1986 Water Resources Development Act's authorization of the Acequia Rehabilitation Program, the Corps provided funding for the replacement of that concrete-lined section in 2005. During the same rehabilitation project, an additional 5,278 feet of earthen ditch was lined with concrete and a failing flume was replaced. In 2005, flooding destroyed a portion of the dam, which the Association patched. Flooding in 2006 destroyed the dam beyond repair. Based on the documented data above, approximately 15.7 percent of the ditch is concrete lined, while the remaining 84.2 percent of the acequia remains as open earthen ditch; however, the focus of this project is only on the diversion structure, and the amount of concrete-lining was not field-checked. The current project would replace the failed diversion structure and spillway with a modern structure.

Pursuant to 36 CFR 800.4(a)(1), the Area of Potential Effects (APE) for this project is considered to be 4.83-

acres for the diversion structure and staging area, 1.85-acre for a potential borrow pit to the southeast, a 6.04-acre potential borrow pit to the northeast, and a 10.34-acre borrow pit to the west. The western borrow area has been used as a source of caliche and has been 100 percent disturbed.

Pursuant to 36 CFR 800.4(b), a Corps archaeologist conducted a field visit to the project area on September 3, 2009, and Corps archaeologists surveyed the project area on October 23, 2009. With the exception of seven Isolated Occurrences (IOs), the survey did not identify any historic properties aside from the acequia itself. The seven IOs consist of seven flakes and an informal uniface, all of local materials. The Corps considers none of the IOs to be significant and no further work is recommended for these IOs.

Department's Native American Consultations List, American Indian tribes that have indicated they have concerns in Guadalupe County have been contacted regarding the proposed project. To date, the Corps has received no indication of tribal concerns that would impact this project. No known Traditional Cultural Properties are known by the Corps to occur within the project area.

The Corps considers the Acequia to be eligible for listing on the National Register of Historic Places under Criterion (a) of 36 CFR 60.4, as irrigation features such as this one made possible the settling and farming of the area, and is thus associated with events that have made a significant contribution to the broad patterns of our history.

The proposed project involves removing the remains of the failed diversion structure and its associated features, and replacing it with a new one in the same location as the failed dam. The Corps considers the failed diversion structure to lack integrity as a contributing element to the acequia system, as it was mostly washed out due to flooding in 2006. The Secretary of the Interior's Standards for the treatment of historic properties include four types of treatments: preservation, rehabilitation, restoration, and reconstruction (36 CFR 68). The Corps cannot rebuild the diversion structure to any of the Secretary's standards, as diversion structures of this size are regulated by the Office of the State Engineer Dam Safety Bureau and must meet current State standards for dam construction and safety. This project would change the physical features of the diversion structure. However, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. The current diversion structure lacks integrity and in its current condition is not a contributing element to the acequia's historic significance.

Without this project, this historic acequia cannot be used for its intended function, as water will not flow in the acequia without a new diversion structure; indeed, the acequia has not been able to function since the breach three years ago. As stated above, the Corps cannot rehabilitate the diversion structure to any of the Secretary's standards. Therefore, this project would change the physical features of the previous diversion structure, although in its current condition, the diversion structure lacks integrity. With the exception of the diversion structure and associated features, this project will not affect the acequia system.

Although the dam must be constructed to modern standards, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. Given (1) the lack of integrity of the diversion structure; (2) the fact that it will be rebuilt in the same place using similar materials (i.e., relatively similar form, same function and alignment); (3) the fact that it will allow this historic property to function; and (4) provided the enclosed documentation of the failed diversion structure that serve to document its historic aspects, the Corps is of the opinion that the proposed project will have no adverse effect to the West Puerto de Luna acequia system or to other historic properties in the area.

IF REPORT IS NEGATIVE YOU ARE DONE AT THIS POINT.

SURVEY LA NUMBER LOG

Sites Discovered:

LA No.	Field/Agency No.	Eligible? (Y/N, applicable criteria)

Previously recorded revisited sites:

LA No.	Field/Agency No.	Eligible? (Y/N, applicable criteria)

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1. INTRODUCTION AND PROJECT DESCRIPTION

Lance Lundquist and Sarah E. Beck

1.1. Purpose of the Survey and Project Background

The Water Resources Development Act (WRDA) of 1986 (Public Law 99-662; 33 U.S.C. 2201 et. seq. as amended), authorizes the Acequia Rehabilitation Program for the restoration and rehabilitation of irrigation ditch systems (acequias) in New Mexico. Under Section 1113 of the Act, Congress has found that New Mexico's acequias date from the eighteenth century and, due to their significance in the settlement and development of the western United States, should be restored and preserved for their cultural and historic values to the region. The Secretary of the Army, therefore, has been authorized and directed to undertake, without regard to economic analysis, such measures as are necessary to protect and restore New Mexico's acequias. The Act also recognized community acequias as public entities, allowing acequia officials to serve as local sponsors of water related projects through the Department of Defense.

Section 215 of the Flood Control Act of 1968 (P.L. 90-483), as amended, provides that the Secretary of the Army may enter into an agreement to credit or reimburse the costs of certain work accomplished by states or political subdivisions thereof, which later is incorporated into an authorized project. The Secretary of the Army, when he determines it to be in the public interest, may enter into agreements providing for reimbursement to States or political subdivisions thereof for work to be performed by such non-Federal public bodies at water resources development projects authorized for construction under the supervision of the Chief of Engineers. The U.S. Army Corps of Engineers, Albuquerque District (Corps) would reimburse 75 percent of total project cost and is, therefore, the lead agency for this project in terms of Section 106 of the National Historic Preservation Act compliance. The Corps has the authority for review and approval of the environmental and cultural impacts of the proposed project. The New Mexico Office of the State Engineer (NMOSE) is the project sponsor, and with the Puerto de Luna West Side Acequia Association (Association), would be responsible for the remaining 25 percent of construction costs. Project design and inspection would be undertaken by the USDA Natural Resources Conservation Service.

1.2. Project Description and Location

The Corps, in cooperation with and at the request of the NMOSE and the Association, is planning a project that would rebuild a failed diversion structure of the West Puerto de Luna acequia, Guadalupe County, New Mexico. The project area is located along Agua Negra Creek, just west of the Pecos River, approximately six miles south south-east of Santa Rosa in south-central Guadalupe County, New Mexico (Figure 1.1, Figure 1.2, Figure 1.3). The acequia is about six miles south of Interstate Highway 40 at Santa Rosa.

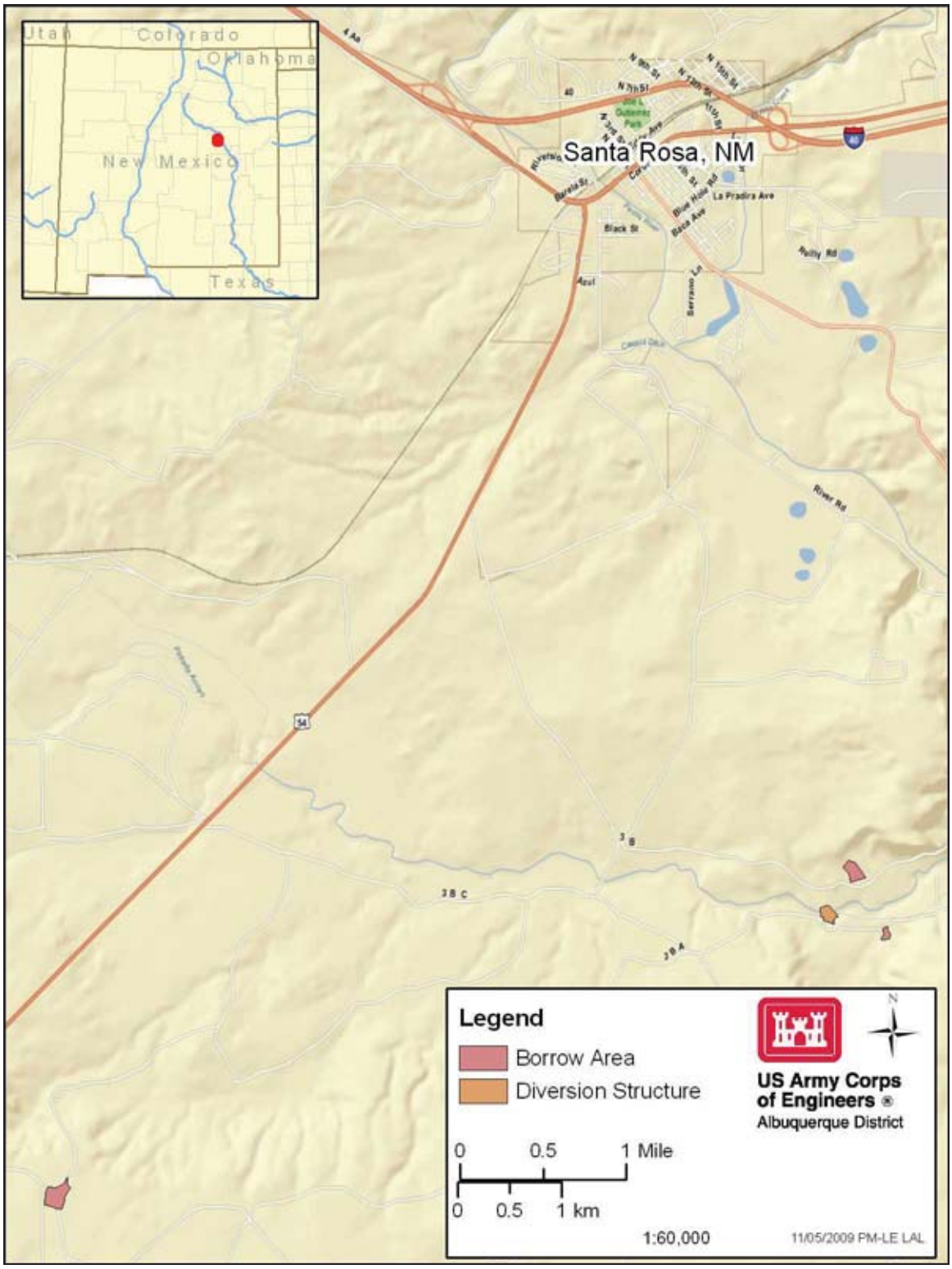

Figure 1.1. Project location map.

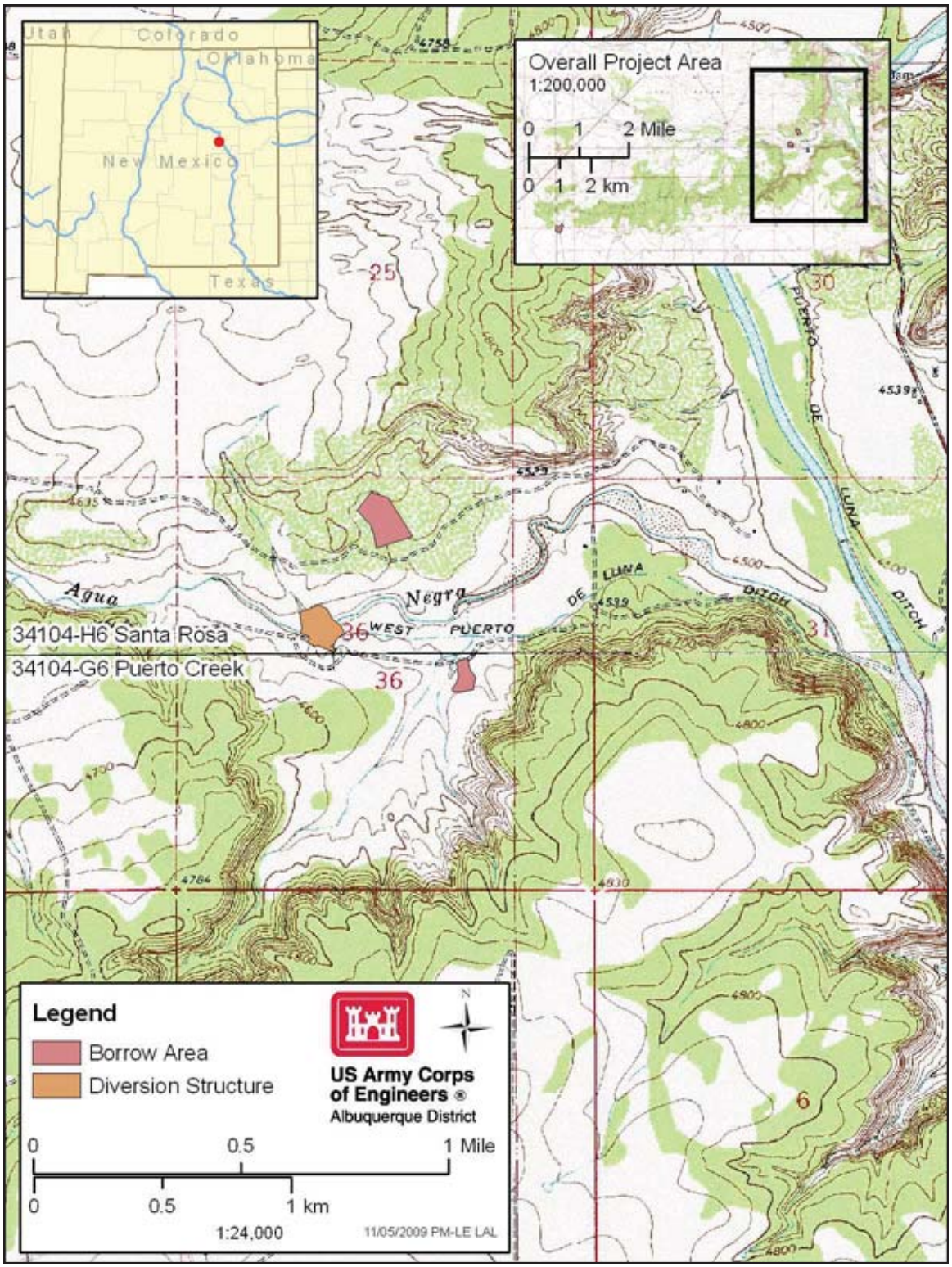

Figure 1.2. Location of project area, shown on USGS 7.5" quadrangles maps. Part 1 of 2.

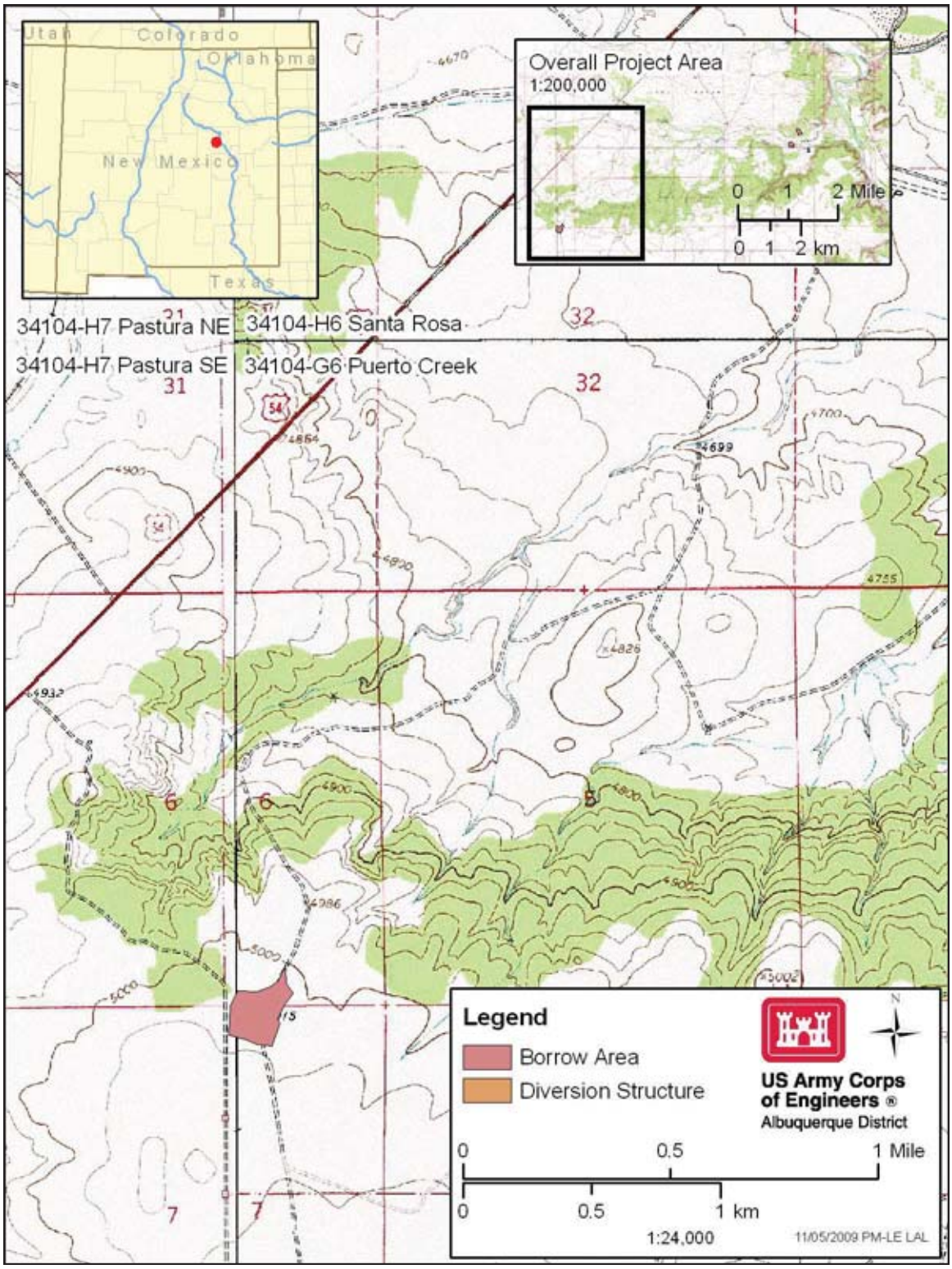

Figure 1.3. Location of project area, shown on USGS 7.5" quadrangle maps. Part 2 of 2.

West Puerto de Luna Acequia diverts water from Agua Negra Creek and serves 53 members to irrigate approximately 330 acres of cropland. The total length of the acequia madre is approximately 7.17 miles, as measured on a USGS 7.5" quadrangle map. The acequia has been in operation since the 1800s and the most recent diversion dam was constructed in the 1940s. This diversion dam was completely destroyed in two successive floods in 2006.

Rehabilitation and improvements to the acequia have been undertaken in the past as the Association obtained necessary funds. Rehabilitation and improvements to the acequia have been undertaken in the past as the Association obtained necessary funds. The Association has made improvements to the spillway area, by covering rock walls with a coat of concrete, adding gabion baskets, and adding concrete pads to the spillway area. Most of this work appears to have occurred within the last 50 years. In 1967, the Soil Conservation Service, the predecessor of the NRCS, lined a 686-foot segment of ditch with concrete. Following the 1986 Water Resources Development Act's authorization of the Acequia Rehabilitation Program, the Corps provided funding for the replacement of that concrete-lined section in 2005. During the same rehabilitation project, an additional 5,278 feet of earthen ditch was lined with concrete and a failing flume was replaced. In 2005, flooding destroyed a portion of the dam, which the Association patched. Flooding in 2006 destroyed the dam beyond repair. Based on the documented data above, approximately 15.7 percent of the ditch is concrete lined, while the remaining 84.2 percent of the acequia remains as open earthen ditch; however, the focus of this project is only on the diversion structure, and the amount of concrete-lining was not field-checked. The current project would replace the failed diversion structure and spillway with a modern structure. As detailed in this report, the current diversion structure is beyond repair.

According to Association records, the Acequia has been in use since at least 1864, and the Association was established in 1883. The construction of the original WPDL Giddings diversion dam was initiated in 1894, and the Hope Decree adjudicated water rights of Agua Negra creek in 1932. In 1942 the dam was destroyed by a flood and rebuilt to its modern form from nearby earth, brush, and boulders. This dam was damaged and repaired in 2005. According to the NMOSE, severe storms and flooding between July 26 and September 18, 2006 completely washed out the dam. In addition, the stream bed eroded nearly 20 vertical feet both upstream and downstream of the diversion dam. Since 2006, the 53 families and 330 acres served by the acequia have been without irrigation water.

The Corps proposes to build a new diversion dam and spillway on Agua Negra Creek. After the dam failed in 2006, the Federal Emergency Management Agency (FEMA) provided funds for the design of a replacement dam. Project design and specifications were completed by HDR, Inc. The objectives of the project are to allow the ditch to be used again after three seasons of disuse. Association members would be responsible for assuring operation and maintenance upon project completion. Specifically, the Corps would replace the washed out fill section of the irrigation diversion dam to pre-disaster function. The new structure will be earth-filled, have a centerline cross section of 120 feet at the top, 60 feet at the bottom, a height of 35 feet and a width of 40 feet. Total earthen fill volume will be 12,834 cubic yards (cy) and will use 2:1 slopes along the stream. The up-

stream fill face will have grouted rip-rap three feet thick as additional protection. The concrete spillway and rock gabions that were not washed away in 2005 will be removed during the current project. Three potential borrow areas for this project have been identified (Figure 1.2).

1.3. Land Ownership

All land in the project area is currently privately owned by Lady Hawk Agua Negra Ranch L.L.C., a member of the Association.

1.4. Project Personnel and Schedule

Jonathan Van Hoose, Corps archaeologist, conducted a visit to the project area with Corps biologist Sarah Beck on September 3, 2009. Corps archaeologists Jonathan Van Hoose, Lance Lundquist, Gregory Everhart, and John Schelberg conducted a cultural resources survey on October 23, 2009. Photographs from both visits are included in this report. Jonathan Van Hoose and Lance Lundquist prepared this report, and Sarah Beck, Corps biologist, prepared the natural setting section appearing in Chapter 2 and contributed to this chapter. The culture history section was modified from a report by Gregory Everhart (2009) on the nearby East Puerto de Luna acequia. Project construction has an expected duration of about four months, and the Association would like to divert water for the 2010 growing season.

2. ENVIRONMENTAL SETTING

Gregory Everhart, Sarah E. Beck, and Lance Lundquist

2.1. Natural Environment

The first section of this chapter discusses the environmental setting for the project, and include information on physiology and geology, soils, climate, water resources, and vegetation and wildlife. This section is adapted from the Corps draft environmental assessment for this project (U.S. Army Corps of Engineers 2009).

2.1.1. Physiography and Geology

The Santa Rosa/Puerto de Luna area lies within the Plains and Great Basin Grassland biotic province as defined by Brown and Lowe (1977), in the Pecos Valley in east-central New Mexico. Elevations in the region vary from about 1,520 to 1,830 meters (5,000 to 6,000 feet) on the mesas and upland areas on either side of the Pecos valley to about 1,365 meters (4,480 feet) at the project area.

The geology of the Santa Rosa area includes underlying sedimentary deposits of the Paleozoic San Andres limestone with some karst topography as seen in the area's numerous shallow sinks. Triassic sediments, primarily red sandstones, overlie the limestone. Surficial deposits of soil, gravel, silt, and clay of late Tertiary and Quaternary age cover the Triassic rocks in places. Most of these materials were deposited during the past two million years as the Pecos River cut into its present valley.

Between Santa Rosa and Puerto de Luna, in the immediate project area, surface geology includes the Paleozoic Artesia Group along the Pecos River bottoms and the Triassic Santa Rosa formation east of the Pecos (New Mexico Bureau of Geology and Mineral Resources 2005; New Mexico Environmental Department Surface Water Quality Bureau 2005). In previous works, the Santa Rosa Formation was included in the Chinle Group, comprised of red Triassic sandstone, siltstone, and conglomerate. Subsurface limestone is evident in the immediate project area where the new acequia channel was cut through the high bank of the Pecos River.

2.1.2. Soils

Soils within the project area are mapped in three units. The Agua Negra Creek floodplain, where the diversion dam is located, and the northeastern borrow area are Minnesota very fine sandy loam, 0 to 2 percent slopes. The southeastern borrow area is Ima-La Lande fine sandy loams, 2 to 10 percent slopes. The western borrow area is Pastura loam, 0 to 5 percent slopes (USDA NRCS 2009). Overview pictures of the diversion dam and borrow areas are presented in Figure 2.2, Figure 2.1, Figure 2.3, and Figure 2.4.

Figure 2.1. Overview of the diversion structure, looking west.

Figure 2.2. Overview of the westernmost borrow area, looking south.

Figure 2.3. Overview of northeastern borrow area, looking northwest.

Figure 2.4. Overview of southeastern borrow area, looking west.

Minnesota loam is found on stream terraces and is associated with the *Populus fremontii-Populus sargentii/Salix exigua-Baccharis glutinosa/Pascopyrum smithii* ecological site. This is a well drained, nonsaline soil containing up to 30 percent calcium carbonate and 1 percent gypsum. Depth to water table is more than 80 inches. Ima-La Lande soils are associated with the Sandy Loam ecological site and occur on alluvial fans and slopes. These are also well-drained, nonsaline soils derived from redbed sandstone and shale. Depth to water table is greater than 80 inches. Ima and La Lande soils contain up to 15 percent calcium carbonate and 2 percent gypsum. Pastura loam is associated with a shallow ecological site (soils are typically cemented at deeper than 15 inches) on plateaus. These are well-drained, nonsaline soils derived from limestone, sandstone, and shale. Pastura loam soils contain up to 40 percent calcium carbonate and 1 percent gypsum. The western borrow aera, which occurs on this soil type, has previously been used as a source of caliche on unrelated projects.

2.1.3. Climate

The climate of the Pecos Valley is semiarid, with average annual precipitation of about 12 to 14 inches. The summers are hot and breezy and the winters are clear and sunny. The majority of the annual precipitation comes from brief but intense afternoon thunderstorms, some of which can be severe. These storms usually occur during the late summer and early fall. Humidity is generally low. Winter snowfall is low, but common. The average annual temperature is about 58° to 60° Fahrenheit with maximum summer temperatures in the 90s and winter lows in the 20s. The frost-free season is 180 to 200 days (USDA, NRCS 2009). Figure 2.5 provides graphs of climate characteristics in Santa Rosa (graphs from City-data.com 2009).

2.1.4. Vegetation and Wildlife

The project area lies within the Plains and Great Basin Grassland biotic community (Brown and Lowe 1977; Brown 1982). New Mexico's Comprehensive Wildlife Conservation Strategy (NMDGF 2006) places the area within the Southern Shortgrass Prairie Ecoregion. The Pecos River riparian corridor itself is an altered Floodplain-Plains riparian community. Corps personnel visited the site on September 3, 2009 and October 23, 2009. The Pecos River channel supports a thinly wooded riparian community of cottonwood mixed with non-native Russian olive and saltcedar. There is little vegetation at the proposed diversion dam site where the ground has been disturbed. Agua Negra Creek upstream of the washed-out diversion dam has incised approximately 20 feet and tamarisk has colonized the lower banks. The northeastern borrow area has also been previously disturbed for the construction of a stock pond. Other vegetation present include one-seeded juniper, soapweed yucca, mesquite, tree cholla, Christmas cholla, prickly pear, gaillardia, winterfat, side-oats grama, Bailey's rabbitbrush, and cocklebur (within dry portions of the stock pond only). The southeastern borrow area is located adjacent and upland to a dense giant sacaton grassland. The proposed borrow area itself has similar vegetation to Borrow Area 1 with more sparsely scattered juniper, mesquite, and tree cholla. The western borrow area is located approximately five miles southwest of the diversion dam and was previously used as a source of caliche for an unrelated project.

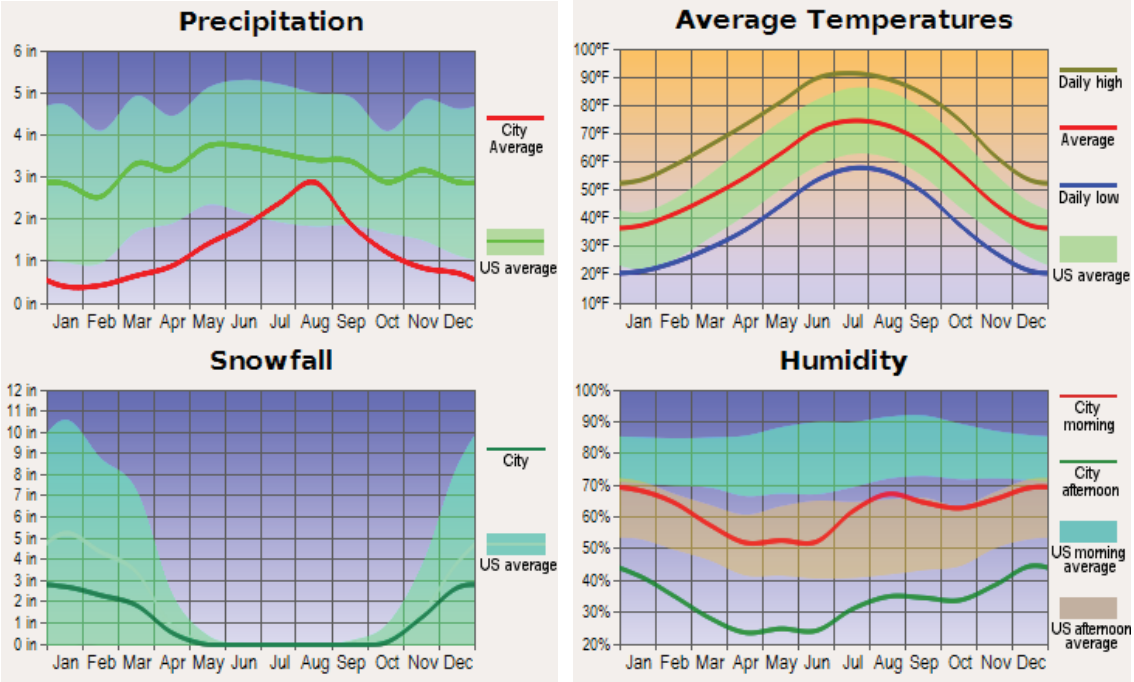

Figure 2.5. Climate characteristics in Santa Rosa, Guadalupe County, NM near project area.

The wildlife species discussed here represent a partial list of species occurring in Guadalupe County, New Mexico, as listed by previous Environmental Assessments (U.S. Army Corps of Engineers 1996, 2000, 2003), BISON-M (New Mexico Department of Game and Fish 2009) and New Mexico's Comprehensive Wildlife Conservation Strategy (New Mexico Department of Game and Fish 2006).

Mammals occurring in Guadalupe County typically include small mammals such as squirrels, mice, gophers, rats, rabbits, badgers, raccoon, and skunks as well as larger mammals such as foxes, coyote, bobcat, and mule deer. Mountain lion are unlikely to venture within the immediate project area due to proximity to humans.

Resident and migratory birds observed or expected in the area include Western Kingbird, Turkey Vulture, Northern Mockingbird, Common Raven, Red-headed Woodpecker, Western Meadowlark, Great Horned Owl, Red-tailed Hawk, American Kestrel and various swallows and sparrows. Bird Species of Greatest Conservation Need for the Southern Shortgrass Prairie and occurring in Guadalupe County include Bald Eagle, Scaled Quail, Sandhill Crane, Mountain Plover, Long-Billed Curlew, Wilson's Phalarope, Baird's and Grasshopper Sparrow, Ferruginous Hawk, Lesser Prairie-Chicken, Mourning Dove, Burrowing Owl, and Loggerhead Shrike (New Mexico Department of Game and Fish 2006).

Reptiles and amphibians (herptiles) in the area may include Plains spadefoot, Woodhouse's toad, Great Plains toad, yellow mud turtle, plateau striped whiptail, southern prairie lizard, prairie ringneck snake, short-horned lizard, Great Plains skink, whiptails, garter snakes, and Western rattlesnake. Species of Greatest Conservation Need in the Southen

Shortgrass Prairie include Western Chorus Frog, Plains Leopard Frog, Tiger Salamander, Ornate Box Turtle, Collared Lizard, Milk Snake, Western Diamondback Rattlesnake, and Desert Massasauga (New Mexico Department of Game and Fish 2006).

2.2. Cultural Resources

The following sections provide background information on cultural resources.

2.2.1. Results of Records Check

An online records check of the New Mexico Office of Cultural Affairs, Historic Preservation Division, Archaeological Records Management Section's (ARMS) database was conducted by Jonathan Van Hoose on September 4, 2009. Table 2.1 lists archaeological surveys that have been conducted within 0.5 miles of the project area. A screen-capture of the ARMS map server search is shown in Appendix A, Figure A.1.

According to the ARMS database and Corps' records, two surveys have been conducted within 0.5 miles of the project area. These surveys total 60.87 acres and resulted in the recording of zero unique historic properties. One of the surveys (NMCRIS 102074) was conducted for this project prior to the Corps' involvement; however, the areas for staging and borrow areas are different for the current project, and all areas were resurveyed. There are no known archaeological sites or registered historic properties within one-half mile of the project area, with the exception of the West Puerto de Luna acequia.

Table 2.1. Surveys conducted within 0.5 miles of project area.

NMCRIS Number	Performing Agency	Survey End Date	Acres	Number of Sites	Survey Type
91633	ASLM	2/4/2005	42.12	0	Intensive
102074	ANTIGUA	11/10/2006	18.75	0	Intensive

2.2.2. Results of Tribal Consultation

Consistent with the Department of Defense's American Indian and Alaska Native Policy, signed by Secretary of Defense William S. Cohen on October 28, 1998, and based on the State of New Mexico Indian Affairs Department's 2009 Native American Consultations List, American Indian tribes that have indicated they have concerns in Guadalupe County were sent scoping letters regarding the proposed project. To date, the Corps has received no indication of tribal concerns that would impact this project.

2.2.3. Culture History and Literature Review

The following culture history is adapted from Gregory Everhart (2009) from his report prepared for the nearby East Puerto de Luna acequia project. The culture history for the project area generally follows that of the Southwest and the nearby High Plains, and has been chronologically generalized into several classification schemes. These descriptions utilize noticeable changes in the cultural record, as seen in temporal and spatial similarities and differences, to assist in the explanation and interpretation of the cultural record. Table 2.2 lists the primary periods and their approximate dates.

Table 2.2. Culture history time periods.

Time Period	Dates
Paleoindian	~11,500 B.P. - ~7,500 B.P.
Archaic	~7,500 B.P. - ~AD 1
Formative	~AD 1 - AD 1540
Historic	AD 1540 - Present

These Periods are further subdivided to describe specific regional and local variations in the archaeological record (Cordell 1997, 1984; Stuart and Gauthier 1984; Simmons et al. 1989; Hoffman et al. 1989). Some archaeological and historic work with local and regional information is documented in reports such as Hofman et al. (1989), Simmons et al. (1989), Ward, Schelberg, and Widdison (1987), Gunnerson (1987), Stuart and Gauthier (1984), Kessell (1979), Levine and Mobley (1976), and Jelinek (1967). Documentation more specific to acequias in the state and near the project area includes Ackerly (1996), Rivera (1998), and Rodríguez (2006), Baxter (1997), and Clark (1987). Covering east and northeast New Mexico, good prehistoric and historic overviews regarding American Indian archaeology and historic use of the area are provided by Sebastian and Larralde (1989), Gunnerson (1987), Gunnerson and Gunnerson (1988), and Winter (1988). A recent discussion regarding the interaction between the Southwest and the Southern Great Plains is found in Spielmann (1991).

In New Mexico, Paleoindian sites are known primarily from the eastern plains and the Rio Grande valley, with a few being known in the western part of the state (Cordell 1997:67-100, 1984:121-151; Stuart and Gauthier 1984:28-33, 291-300; Simmons et al. 1989:21-38; Sebastian and Larralde 1989:19-39). There are also numerous, scattered isolated artifacts reported from across the state. The Paleoindian studies in the Rio Grande valley, reported by Judge and Dawson (1972) and Judge (1973) are widely referenced for the Paleoindian sequence in New Mexico. Their studies indicate that there are Clovis, Folsom, and Plano sites in the Rio Grande valley consisting mostly of surface finds of isolated artifacts; however, stratified sites have been found such as a camp site identified and excavated on Albuquerque's West Mesa (Cordell 1984:148). The Paleoindian peoples were thought to be primarily mobile big game hunter-gathers who probably also scavenged. Paleoindian sites in New Mexico have been found primarily on eroded surfaces, especially in sand dune areas and on upper terraces along rivers and their tributaries.

The Paleoindian and Archaic time periods are typically identified by the presence of morphologically diagnostic projectile points. Paleoindian point types from widely separate areas located to the north, south, east, and west (i.e., Clovis, Folsom, Midland, Firstview, Midland, Plainview, Cody and Eden) have been reported from surface finds and excavated sites within a 100-mile radius of the project area. The Clovis type site is located only about 90 miles to the southeast of the project area and the Folsom type site is located about 150 miles to the north. A similar variety in known Archaic diagnostics also occur in the area (Ward et al. 1987:30-33) and the bow and arrow with corner notched points come into use toward the end of the Archaic (Jelinek 1967:110).

In New Mexico, the chronology defined by Cynthia Irwin-Williams (1973) for the Arroyo Cuervo region in northwestern New Mexico has been the most widely utilized for the Archaic Period. Huckell (1996) has brought together recent documentation for the period in the Southwest. While the Archaic Period for the Southwest is becoming fairly well defined, sites across the state remain difficult to distinguish. Many lithic scatters in the Southwest may date to the Archaic, but positive dating and association to the Archaic Period eludes archaeologists at this time. Dating sites is usually accomplished with diagnostic projectile points although many newly discovered Southwestern sites are producing dateable materials (Huckell 1996:325-327). Northeast and eastern New Mexico are even less documented for the Archaic Period although the lengthy period is known to generally date from about 6,000 BC to 1,000 AD, and in some areas, as late as 1,400 AD (Simmons et al. 1989:65; Stuart and Gauthier 1984:300-303; Sebastian and Larralde 1989:41-57). Archaic peoples were thought to be very mobile, but had an increased reliance on small game, the collecting and gathering of plant foods, and likely utilized a seasonal migratory pattern in their subsistence strategies. Toward the end of the Archaic period, many social and technological changes occur with increased dependence on wild plants and the adoption of Mesoamerican cultigens. Examples would be changes found in ground stone technology, in site sizes and distributions, and the introduction of the bow and arrow about AD 200.

A confusing culture-historical terminology has resulted from the lack of adequate archaeological research in East-Central and Northeast New Mexico (Stuart and Gauthier 1984:291, 303; Hofman et al. 1989:53, 66; Simmons et al. 1989:99-100, 108-109). This problem is most evident for the Formative or Woodland Period (ca. AD 400-1000 to AD 1500). Jelinek (1967:64) has defined the 18 Mile Phase of the Plains Woodland archaeological tradition from sites on the Middle Pecos River, just south of the project area and dates this phase prior to AD 1000. However, Stuart and Gauthier (1984:270-273), in their analysis of regional trends suggest that the 18 Mile Phase (both Early and Late) should be slightly earlier. It is interesting to note that the ceramic assemblages of this time are typically Jornada Brownwares (Jelinek 1967:64). These types of ceramics are related to the Mogollon ceramic types of the southwestern part of the state, suggesting influences from the southwest as early as or earlier than the Plains (Hofman et al. 1989:66-67; Sebastian and Larralde 1989:73-92). Stuart and Gauthier (1984:270-273) also take notice of Jelinek's ceramic "intrusives," and suggest contacts and possibly trade with several other areas in western New Mexico.

Pithouse architecture becomes common in the area around AD 1000. By the 12th century, above-ground, contiguous-room "pueblos" become the customary residential unit. These multiroom structures; however, feature construction methods different from the more commonly recognized Ancestral Puebloan (Anasazi) pueblos to the west and suggests that wood for construction purposes was scarce (Jelinek 1967:156). Perhaps the most important attribute of this area's Formative as well as the subsequent Protohistoric occupation is that while horticulture became relied upon, some buffalo hunting and gathering continued (Simmons et al. 1989:75, 94-96, 112-113, 124-128; Stuart and Gauthier 1984:270-276). Horticulture in the area would have always been at risk from drought and events such as summer floods and insects that could wipe out a seasons crop in one event; as is evidenced by the much later 1860s Bosque Redondo experiment noted below. Un-

fortunately, quantitative estimates of the contribution of buffalo to diet are lacking. The presence of ungulate remains typical of the Plains contributes to the perception of Plains influences, though much of the area's material culture is more characteristic of the Southwest.

Between AD 1300 and AD 1450, the area's ceramic assemblage is dominated by local manufactures, and Ancestral Puebloan, also known in the literature as Anasazi, type ceramics are reduced in number and referred to as "intrusive." The aggregated sedentary village adaptation common in the region declines and is seen in dramatic decreases in maize pollen while bison exploitation increases (Simmons et al. 1989:75, 112-113, 127-128; Stuart and Gauthier 1984:270-276). These shifts seem to be related to environmental changes; however, little research has documented this shift or investigated its possible antecedents (Sebastian and Larralde 1989:73-92; Ward et al. 1987:36-37).

The Rio Grande valley, then portions of eastern New Mexico and possibly the local area were some of the first areas to be visited by Francisco Vásquez de Coronado's 1540-1541 entrada to what became known as New Mexico and the Great Plains. Although some consider Coronado's expedition to the plains a “futile act” or failed attempt in the quest for the mythic Strait of Anian, for gold, and glory, it none the less opened the possibility of future exploration by Europeans (Thomas 1966:5). Spanish colonization in Nuevo Mexico began in 1598, when don Juan de Oñate and his colonist followers traveled the route northward up the Rio Grande from Mexico and established the first Spanish colonial settlement near the immediate vicinity of today’s Ohkay Owingeh (formerly known as San Juan Pueblo) (Cordell 1997:438-440; Simmons 1988:35-38). Recalling the Coronado expedition, one of the first things Oñate did was to also conduct an expedition to the plains (Thomas 1966; Simmons 1988:41). Subsequently, many others such as Archuleta, de Vargas, Ulibarri, Hurtado, Valverde, Villasur, and later Vial, traveled to the plains so that by the time of the 1786 Comanche Peace, the Spanish had a fairly good geographic idea of what lay east of the Rocky Mountains (Thomas 1966; Loomis and Nasatir 1967; Weber 1992; Kessell 2002). While the above were all official, documented expeditions, this is not to say that the local peón, shepherding his flock, was not grazing east of the mountains; Hispanos were well known for extending their range while seeking new grazing pastures, even their ranchos were “dispersed,” to the great consternation of Spanish officials (Nostrand 1992:43-44, Note No. 34; Simmons 1979:105-107).

The Spanish during the Colonial Period were aware of numerous nomadic American Indian tribes that traveled over the Great Plains. Early on, these included the tribes they identified as the Tejas and Querechos (Sebastian and Larralde 1989:100-101). Later, these plains tribes were known as the Jicarilla, Lipan, and Kiowa Apache as well as the Farons, Palomas, Cuartelejos, and Carlanas. They also knew of the Utes to the mountainous north, the Pawnee to the far northeast, and the Jumanos to the southeast (Gunnerson 1979:162-169; Kenner 1994:7-22; Thomas 1966:1-50). The Athapaskan tribes are generally thought, due to significant linguistic similarities, to have migrated from west-central Canada, and arrived in northern New Mexico sometime in about the mid-1500s. Through the 1600s, the Puebloans of New Mexico and the Rio Grande valley where trying to coexist with the Spaniards; however, social conflict between the two groups subsequently resulted the famed 1680 Pueblo Revolt.

By the early 1700s, the Comanche are reported to have started occupying areas along the Arkansas River valley in southeastern Colorado, to have been allied with the Ute, and were raiding into New Mexico (Kenner 1969:23-52; Gunnerson 1987:128; Winter 1988:113-115). The Comanche were known to be fierce and about the same time the Jicarilla Apache, although they still frequented the northeastern New Mexico plains, began to occupy parts of the northern Rio Grande valley (Gunnerson 1979:162-169). Many of these outlying tribes traded with the Puebloans as well as the Spanish in the Rio Grande valley; however, raiding never ceased to be an option. Apachean groups such as the Jicarilla and the Kiowa-Apache as well as the Ute, Navajo, and perhaps other plains tribes continued to raid the Rio Grande valley from outlying areas on all sides of the valley. The Spaniards led many punitive raids against these tribes trying to counter the raiding threat; as early as 1630, the Spanish had even authorized slave raids against the Apaches (Sebastian and Larralde 1989:96-97; Weber 1971:25-28).

Settlement east of the Southern Rocky Mountains, first being along the Pecos River and other small, watered foothill valleys, began in the late 1700s and early 1800s, relatively late considering the long Spanish Colonial history in the Rio Grande Valley. Settlement became possible primarily due to the reduced threat of Plains Indian raiding. Governor Juan Baptista de Anza's defeat of Chief Cuerno Verde in 1779 resulted in the 1786 treaty with the hostile Comanche (Simmons 1988:88-92; Kenner 1969:49-52). Although there had been numerous early exploring and military expeditions into eastern New Mexico, with the Comanche Peace and reduced threat of raiding, local Hispano and Puebloan ciboleros and Comancheros increased their travels to the eastern plains and Hispanos saw the grazing opportunity as well as the opportunity for acquiring east mountain lands (Kessell 1979:416, 434; Chávez 1955:318-319).

The first settlements along the Pecos River were associated with the 1794 San Miguel del Vado (Bado) Community Land Grant as well as the nearby settlement of San José del Vado (Kessell 1979:415-419; GAO 2001). The grantees, after having established their community, having made the required improvements per the Royal Ordinances, and after having lived there for five consecutive years, were ceremoniously given the land by don Pedro Bautista Pino on March 12, 1803 (Kessell 1979:419; Simmons 1979:99-101; Nuttall 1922).

As New Mexico's Hispanic population continued to grow, there was a continuing demand for more arable land. The petitions for land grants were all similar in regard for needing more land and water with which they could maintain their rather meager but growing agrarian subsistence lifestyle. Kessell (1979:416) quotes from the San Miguel del Vado petition: "Although we all have some pieces of land in this villa [Santa Fe], they are not sufficient for our support, both because they are small and because of the great shortage of water and the crowd of people who make it impossible for all of us to enjoy its use." Once settled at San Miguel, the local folks naturally began grazing their livestock in the rather lush prairie grasses located to the northeast near today's community of Las Vegas as well as further downstream along the Pecos River. Again, the grant lands became filled with people and additional petitions for land were submitted, for "…relief from so many miseries" (Kessell 1979:445). "San Miguel [and later Las Vegas]

became the springboard for village-founding in the upper Pecos watershed" (Nostrand 1987:367-369).

The number and frequency of French, British, and then U.S. expeditions into the west such as the early 1739 expedition of the Mallet brothers, the French explorers who first penetrated the Spanish Colonial realm, began to worry the Spanish, and Pedro Vial, "…a foreigner in the service of Spain" by 1792 had proven the closeness of Santa Fe to St. Louis alarming Spanish officials (Loomis and Nasatir 1967:xvii-xxv, 52-53; Weber 1971:32-50). French and American fur trappers were regularly penetrating New Mexico by the early 1800's. The 1805-1806 Zebulon Pike expedition traveling through the southern portion of the United States' 1803 Louisiana Purchase and into Spain's Nuevo Mexico piqued the interest of Americans in that mysterious and ancient Spanish colony located to the southwest, especially after the publication of Pike's journals in 1810 (Boyle 1994:3; Simmons 1988:98). By 1819, numerous trappers had traveled to Taos and other local villages were they explored and probably were illegally trapping beaver in the near-by mountains (Pratt and Snow 1988:289; Weber 1971:32-50). By 1822, it was reported that "…several streams in the Taos region [were] already trapped out" (Pratt and Snow 1988:289; Weber 1971).

Due to the Spaniards' fear of intruders, several more land grants were established in the upper portions of the Pecos River valley and in northeastern New Mexico; later more grants were let by the Mexicans. The authorities were trying to create a buffer against outsiders since settlement and occupation of an area represented viable ownership. After Mexico's 1820 independence from Spain and the opening of Mexico to foreign trade, for better or worse, practically all things changed in New Mexico. From the Mexican side, in the inhabited areas of the New Mexico frontier, things were also changing. It was the trader William Becknell, in 1821, that initiated what became a significant American as well as Mexican commercial trade over the famous Santa Fe Trail (Lavender 1954; Gregg 1967; Weber 1971:52-65; Beachum 1982; Boyle 1994). Other than the ciboleros and Comancheros that frequented the area, historic settlement and related use of the project area most likely began in the early 1820s with the establishment of nearby land grants including the Los Trigos (1814), Antonio Ortiz (1819), Anton Chico (1822), Preston Beck (1823), Agua Negra (1824), and the Jose Perea (1825) (Ward et al. 1987:43-46). To take advantage of the fur and later the buffalo hide trade with the local trappers/hunters and Indians, and to capitalize on the commerce and freighting business on the Santa Fe Trail, the commercially connected Bent brothers, Charles and William, established a trading post on the north side of the Arkansas River in about 1833/1834 (Lavender 1954; Thompson 1979; Boyle 1994). The introduction of trade along the historic Santa Fe Trail boosted New Mexico's barter economy into one of cash as the local people began to provide flour, some produce, and feed for travelers and their livestock (Boyle 1994).

With the opening of the Santa Fe Trail, some interested explorers and U.S. reconnaissance surveys were being conducted early on such as Glenn-Fowler expedition in 1821-1822 that traveled to Santa Fe and that by Albert Pike who traveled down the Pecos and "…through the Los Esteros [Santa Rosa] Reservoir…" in 1833 (Coues 1898; Weber 1971; Ward et al. 1987:49). By the 1820s, the Cheyenne, who became well known as

horse traders/raiders, raiding as far south as into portions of today's Mexico, were occupying the Arkansas River valley with their allies the Arapahoe (Gunnerson and Gunnerson 1988:ix-x; Winter 1988:115-116); the Comanche having moved further to the south and into Texas and the Jicarilla moving further to the west (Winter 1988:121). To the north, additional land grants were being let such as the significant Mora (1835) and Las Vegas (1835) grants, and others such as the extensive Maxwell Grant (1841) going to those with close connections with the U.S. (Ebright 1994:189-193, Map Figure 8.5, 188; Van Ness 1980; Lavender 1992:11-25; Keleher 1984). Subsequently, the Santa Fe Trail was not the only route into New Mexico as famous traders such as Josiah Gregg also utilized a cross country route directly west from Fort Smith, Arkansas (Gregg 1954, 1967).

Pressing to widen the Texas realm and with an eye on Santa Fe, the Texas–Santa Fe Expedition penetrated into Mexico in 1841 but failed (McClure 1973:45-56). The increasing presence of U.S. traders, merchants, and opportunists were pushing the trade further south into Mexico. With the increasing tensions between the American Indians, the Mexicans, the Texans, and the huge influx of Americans, for many years there was a growing discussion on both the American and Mexican sides regarding the idea that New Mexico would be better off if it were a part of the United States (Boyle 1994:13-28; Simmons 1988:121-122; Twitchell 1976:17-36).

In 1846, Colonel Stephen Watts Kearny and his Army of the West were ordered to invade Mexico; by June they had left Fort Leavenworth (Schubert 1980:41-44; Simmons 1988:121-131). With the expedition, Topographical Engineer Lt. William H. Emory, began making the first accurate U.S. maps of the Santa Fe Trail corridor into New Mexico; Lieutenants Peck and Abert conducted much of this field work (Emory 1951:74-75; Twitchell 1976; Goetzmann 1991:128, 134, 142, 144-147). In the New Mexican capital of Santa Fe, Kearny, now promoted to Brigadier General, proclaimed that the U.S. had taken New Mexico "…without firing a gun, or spilling a single drop of blood…"; however, there was naturally a lot of fear and resentment among the Mexicans (Twitchell 1976:80, 122-124). The January 1847 Mexican uprising against U.S. occupation led to the killing of Charles Bent, the newly appointed Military Governor of New Mexico (Simmons 1988:129-130; Twitchell 1976:84, 124-128, 149-198; Lavender 1954:283-284, 302-303; Horn 1963:14, 21-22). In quelling the uprising, Taos Pueblo and shortly thereafter, the village of Mora were nearly destroyed by the U.S. Army (Twitchell 1976:124-138; deBuys 1985:105-108; Murphy 1972:33-48; Goodrich 1972:49-60).

The Treaty of Guadalupe–Hidalgo was signed in 1848 ending the Mexican War with a huge portion of the Southwest and New Mexico becoming a U.S. Territory (Simmons 1988:132-136). With the responsibility of protecting the population as well as the Santa Fe Trail trade, Fort Union was established in 1851 north of Las Vegas with Fort Stanton being established in 1855 a short distance northeast of the Sacramento Mountains (Utley 1962; Sebastian and Larralde 1989:107). A significant amount of supplies were needed to provide for the U.S. Army forts and other outlying posts such as Fort Union, Fort Stanton, Hatch's Ranch, and later Fort Bascom, Fort Sumner and Bosque Redondo (Flint and Flint 2002:27-55; Miller 1989; Frazer 1972: 213-238; Sebastian and Larralde 1989:106-107, 111). "The military demand for bread literally created the flour-milling industry in the Southwest" (Miller 1989:173). Military supply had huge impacts as Sam Watrous,

who set up a ranch at the La Junta de los Rios Mora y Sapello, had "…found the Army's appetite for beef to be equally profitable, and many other settlers in the area [i.e., in the Mora and Pecos River valleys] made good money supplying the fort with corn, oats, and vegetables" (deBuys 1985:111; Julyan 1996:376-377). While military supply had a huge effect on the Southwest as a whole, it did not affect numerous small Hispanic communities that were some distance away from the major commercial centers or the alignment of the Santa Fe Trail (Ward et al. 1987:46-48).

There was a flurry of U.S. Army activity all across the Southwest after New Mexico was incorporated into the U.S. as a Territory. The Army was conducting reconnaissance surveys for potential road and railroad alignments and communication routes (Goetzmann 1991). Captain Judd's 1850 reconnaissance down the Pecos resulted in "…the first map of the Middle Pecos River" produced by cartographer R.H. Kern (Sebastian and Larralde 1989:50). The map with its road alignments was later utilized in determining the location for the establishment of Fort Sumner and the Bosque Redondo Reservation, located a relatively short distance downstream of the EPdL Ditch project area. Whipple conducted a survey along the 37th parallel for a potential railroad alignment; the survey crosses in the immediate vicinity of Santa Rosa Lake, a short distance north of the project area (Sebastian and Larralde 1989:53).

In 1861, the Confederates made a Civil War push into New Mexico trying to take Fort Union and its supply of military stores; however, they were crushed with a defeat in the Battle of Glorieta Pass (Simmons 1988:141-149). Through the years, Fort Union had a significant economic impact of New Mexico, at one time having a peak population of 3,000 (Flint and Flint 2002:27-55; Miller 1989; Frazer 1972: 213-238; Julyan 1996:136-137). With the end of the Civil War, the military immediately went to work to suppress the Indians; specifically they set to work confining the Navajo and Mescalero to a reservation at Bosque Redondo (Sebastian and Larralde 1989:110-114). In 1866, Loving and Goodnight trailed Texas cattle up the Pecos and through New Mexico to supply the mining boom in Colorado and the next year John Chisum followed in their path (Sebastian and Larralde 1989:119-120).

Locally however, the U.S. Army's Bosque Redondo experiment had been a horrific experience for the Mescalero and Navajo, who had been traditional enemies. The conditions were so bad that the Mescalero finally escaped and the Navajo being there for almost four years were finally released by General Sheridan in 1868 (Thompson 1976:151-157; Sebastian and Larralde 1989:113). By 1872, Chisum had established his Jinglebob Ranch further down the Pecos at Bosque Grande. Due to abuses and depradations on both sides, the Comanchero trade was finally brought to an end in 1872 (Sebastian and Larralde 1989:108; Kenner 1969:176-200). The arrival of and the efficiency of the railroads brought an end to wagon train freighting on the Santa Fe Trail. In a sense, the old ways and times were on the way out and a new era was beginning as the famous Atchison, Topeka and Santa Fe Railroad, laying tracks across the prairie, reached Las Vegas in 1879 (Simmons 1988:160; Myrick 1970:18). The railroads along with many other factors resulted in the eventual confinement of the numerous Plains Indian tribes to reservations and the near extinction of their primary food source, the buffalo (American bison). With a greater sense of security and easier transportation, now began a huge influx of traders,

merchants, entrepreneurs of all sorts, businessmen, bankers, land speculators, and settlers and farmers.

In both prehistoric and historic times, the Los Esteros-Santa Rosa area with its fresh water springs would have seemed like an oasis, especially during times of drought. Although they were taking advantage of the local spring and river water, it may be just an interesting coincidence that the Homestead Act was passed in 1862 and the communities of West and East Puerto de Luna were established in the 1863 (Nostrand 1992:94-95; 1987:383-385; Cabeza de Baca 1958:20, 42-43). However, Hispanic folks had been periodically grazing as well as occupying this area of the Pecos River valley since at least the early 1800s. "It is clear from the Agua Negra and Pedro Jose Perea land grants that lands were often occupied for long periods of time before a grant was petitioned" (Levine 1987:45). Appeals were made in November 1824 before the court in Santa Fe for both the Agua Negra and Pedro Jose Perea land grants. Levine (1987:45-46) provides the following information: "Perea came before the court 'showing it is now nine years [since 1815] that he possess[ed] a ranch officiously and voluntarily, the location of which is on the opposite side of the Pecos River (from Sandoval's Agua Negra Grant), below the swamps [Los Esteros]' (Spanish Archives of New Mexico 710:1)." The Agua Negra Grant was confirmed by Congress/Court of Private Land Claims in 1860 and has a patent date of 1900 (GAO 2001). The southeast boundary corner of Sandoval's Agua Negra Grant is located about two miles northwest of the community of Puerto de Luna. The Pedro José Perea Grant, a short distance north of Santa Rosa, was confirmed by Congress/Court of Private Land Claims in 1860 and has a patent date of 1877 (GAO 2001). Some members of the EPdL Association strongly believe that the EPdL Ditch was originally constructed in about 1849 and that records may be found to support that date.

The eastern plains of New Mexico were well known for their grazing capacity. From the Spanish Colonial days, eastern New Mexico had produced thousands of sheep and tens of thousands were tailed as far south as Mexico City (Wentworth 1948:28-29, 112-113; Pratt and Snow 1988:376-379). As noted above, the U.S. Army as well as other American entrepreneurs took early notice of this productivity (Gregg 1954:134; Tainter and Levine 1987:109-111). Later, in the early 1850s, thousands of sheep were trailed from New Mexico to California where in 1849, miners were facing near starving conditions in the gold fields (Wentworth 1948:135, 165-169). In the late 1800s, it became again profitable to replenish diminished herds in New Mexico by trailing sheep from California back to New Mexico; one example being a 10,000 head herd driven from Merced County, CA to Puerto de Luna (Wentworth 1948:261). Las Vegas, with its close proximity to the plains grasslands, became a commercial boom town with the arrival of the Atchison, Topeka and Santa Fe Railroad in 1879; the rails making for fast and efficient delivery of livestock and related products such as wool to eastern markets (Knowlton 1980:16; de Buys 1985:150, 219-220; Nostrand 1992:113-114). The community of Puerto de Luna, being approximately 70 miles southeast of Las Vegas, was close enough to have taken advantage of at least a portion of this commercial opportunity.

With the railroads, the work of extracting the West's natural resources began and did not slow down. The railroads expanded sending spur lines throughout the mountainous West. Northeast New Mexico was also to supply some of those resources such as the good qual-

ity coal from near Raton and Trinidad, and timber for railroad cross ties coming from throughout the Southern Rocky Mountains. From the 1880s until 1903, the community of Puerto de Luna was the county seat with a peak population of about 1,500 residents (Julyan 1996:278; Goetz 1948). Nearby Santa Rosa, originally named Agua Negra Chiquita, had been settled in 1865. With the local boom generated by the arrival and joining of the Chicago, Rock Island and Pacific railroad with the El Paso and Southwestern in 1902 at Santa Rosa, Santa Rosa became the county seat the next year (Myrick 1970:56, 120; Ward et al. 1987:53; Julyan 1996:326).

New Mexico was full of corruption as greed and the control of land and water became paramount to many. In the midst of numerous protests as well as evidence of fraud, investigations found that huge tracts of public lands had been fenced with "perjured preemption entries" (Clark 1987:44-52). In 1884, H. H. Eddy was sent to the Pecos to continue the investigations; at Puerto de Luna. Clark (1987:52) describes the results of this visit:

> The settlement itself was largely Mexican and dated back to the time when the residents had to live close together for protection against the Indians. Although they were technically in violation by not actually residing on their [individual farm] lands, Eddy recommended that they be given patents because they were certainly within the spirit of the Homestead Act.

Table 2.3 presents a table prepared by the Puerto de Luna West Side Acequia Association documenting historic milestones of the acequia. More detailed information on the history of the acequia is presented in Chapter 4, results of survey.

Table 2.3. West Puerto de Luna acequia association historical timeline.

Year	Event
1824	Agua Negra land grant established by Mexican government for Antonio Sandoval. Land primarily used for cattle grazing.
1851	Agua Negra settled by James Giddings and begins farming.
1854	Completion of initial Giddings diversion dam and north acequia system established, private diversion dam.
1864	Completion of Giddings south acequia system established. Irrigation limited to immediate Giddings family.
1876	Jesus Bazan marries daughter of James Giddings. Water rights to south acequia system relinquished to him.
1883	Limited use of south acequia by West Puerto de Luna community. Puerto de Luna West Side Acequia Association is established and uses only excess water.
1894	Construction of West Puerto de Luna – Giddings diversion dam initiated. West Puerto de Luna (south) and Giddings (north) acequia systems sourced from one diversion dam. Puerto de Luna West Side Acequia Association expanded.
1920's	Giddings and West Puerto de Luna acequia system managed separately.
1932	Hope decree adjudicates water rights of aqua Negra creek.
1942	West Puerto de Luna – Giddings diversion dam destroyed by massive flood. Reconstructed with only Puerto de Luna West Side Acequia Association resources and for the use of Puerto de Luna West Side Acequia Association. Giddings (north) acequia ceases to function.
2005	West Puerto de Luna diversion dam again destroyed by massive floods.

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3. FIELD METHODS

Lance Lundquist and Jonathan E. Van Hoose

3.1. Introduction

This section details the field methods used for the survey. The Area of Potential Effects (APE) for this project is considered to be 4.83-acres for the diversion structure and staging area, 1.85-acre for a potential borrow pit to the southeast, a 6.04-acre potential borrow pit to the northeast, and a 10.34-acre borrow pit to the west (Figure 1.1, Figure 1.2, Figure 1.3). The western borrow area has been used as a source of caliche that has been 100 percent disturbed.

3.2. Size of the Survey Crew, Transect Interval(s) and Transect Method

The survey crew consisted of four Corps archaeologists: Jonathan Van Hoose (field director), Lance Lundquist, John Schelberg, and Gregory Everhart. The first field trip was conducted by Jonathan Van Hoose on September 3, 2009. During this initial site visit Jonathan Van Hoose determined that the 10.34-acre borrow pit to the west of the diversion structure was 100 percent disturbed. No further survey was conducted at this site.

On October 23, 2009, Lance Lundquist and Jonathan Van Hoose surveyed and mapped the 4.83-acre diversion structure, while John Schelberg and Gregory Everhart surveyed the eastern two potential borrow areas. Lance Lundquist helped complete the survey of the southeasternmost potential borrow area. Transect intervals were 15 m or less and transect method was block.

All locational information, including acequia alignment and survey boundaries, was recorded with a Trimble Geo-XH GPS sub-foot unit for the diversion structure, and a Garmin 12 XL GPS for the borrow areas.

3.3. Field Conditions

During the January 28, 2009 field visit, average temperatures ranges in the 30s and 40s Fahrenheit, with partly cloudy skies, good visibility, and no precipitation. During the September 3, 2009 site visit, average temperatures were in the 80s Fahrenheit, with sunny skies, while the October 23, 2009 visit average temperatures were in the 50s Fahrenheit, with sunny skies.

Ground visibility was fairly good for the borrow areas and most of the diversion structure area. Ground visibility was poor in the heavily vegetated sliver on the northwest portion of the diversion structure. Most of the area around the dam has been extensively disturbed during original construction and maintenance of the diversion structure and asso-

ciated features. The northeasternmost potential borrow area has a stock tank in the middle of the survey area as a source of disturbance.

3.4. Methods of Site Location and Site Recording

A pre-field check of the New Mexico Office of Cultural Affairs Archaeological Records Management Section's (ARMS) database on September 4, 2009 by Jonathan Van Hoose recorded zero archaeological sites within 0.5 miles of the project area. See Appendix A, Figure A.1 and Chapter 2.2.1 for the results of this ARMS search.

Standard survey methods, such as presence of features and artifacts, were used to identify historic properties. Prior to going to the field, a 100 m UTM grid was superimposed over a color 2005-2006 aerial image of the project area. The diversion structure including all associated features (e.g., each gabion basket, concrete abutment, river channel, wall sections, etc.) was mapped using a hand-held Trimble Geo-XH sub-foot GPS unit and dimensions were measured with a tape and recorded. Isolated Occurrences (IOs) were individually flagged and piece-plotted using a Garmin GPS.

3.5. Photography and Documentation Methods

Hundreds of digital photographs of the diversion structure were taken at different points during the survey using Ricoh Caplio 500SE 8.0-megapixel camera with GPS capabilities, while representative pictures of the borrow areas and IOs were taken with a the same model of camera. Additional photographs were taken by Corps biologist Sarah Beck with a personal camera. Some of these photos have been incorporated into this document. This report was prepared using the notes, photographs, taken in the field. Copies of the report, notes, and photographs are stored at the Corps' Albuquerque District office.

3.6. Strategies Employed for Collection or Limited Tests

No artifact collection or testing was conducted as part of this project.

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4. RESULTS OF SURVEY

Jonathan E. Van Hoose and Lance Lundquist

4.1. Location of Historic Properties

The chapter details the results of survey, and is divided into a detailed discussion of the West Puerto de Luna acequia, followed by a description of archaeological findings and Isolated Occurrences (IOs). An interpretive summary is included at the end of the section. Note that the public disclosure of the location of archaeological sites on state and private lands is prohibited by Section 18-6-11.1 NMSA 1978, and the public disclosure of archaeological site locations is federally prohibited by 16 USC 470hh (36 CFR 296.18). For this reason, confidential site location information is not included in this chapter and is provided in Appendix A. Appendix A should be removed prior to public disclosure of this report.

4.1.1. West Puerto de Luna Acequia

This survey and report was conducted specifically to replace the failed diversion structure of the West Puerto de Luna acequia, a known historic property. In consideration of the proposed replacement of the diversion structure, extensive documentation of the structures to be replaced was conducted and is described in detail below.

4.1.1.1. The West Puerto de Luna Acequia Diversion Complex

The diversion complex for the West Puerto de Luna acequia, as documented here, covers both the north and south shores of the Rio Agua Negra. While it was functioning, the system worked as follows: a large rock-and-brush diversion dam traversing the river channel raised the water level to that of the surrounding terrain; it was then channeled to flow over the southern bank toward the location of the headgate and spillway.

The diversion complex consists of three major sets of components: a northern earthen berm with retaining walls, a series of wooden pilings, and an armored bank; the diversion itself, a large brush-and-rubble diversion that once crossed the Agua Negra channel; and a southern concrete spillway, with associated gates and other features. An overview illustration of the diversion complex is presented in Figure 4.1. This section will first describe in detail the current condition of this diversion complex, providing drawings and photographs of key elements, followed by a discussion of the extrapolated pre-breach configuration of this complex.

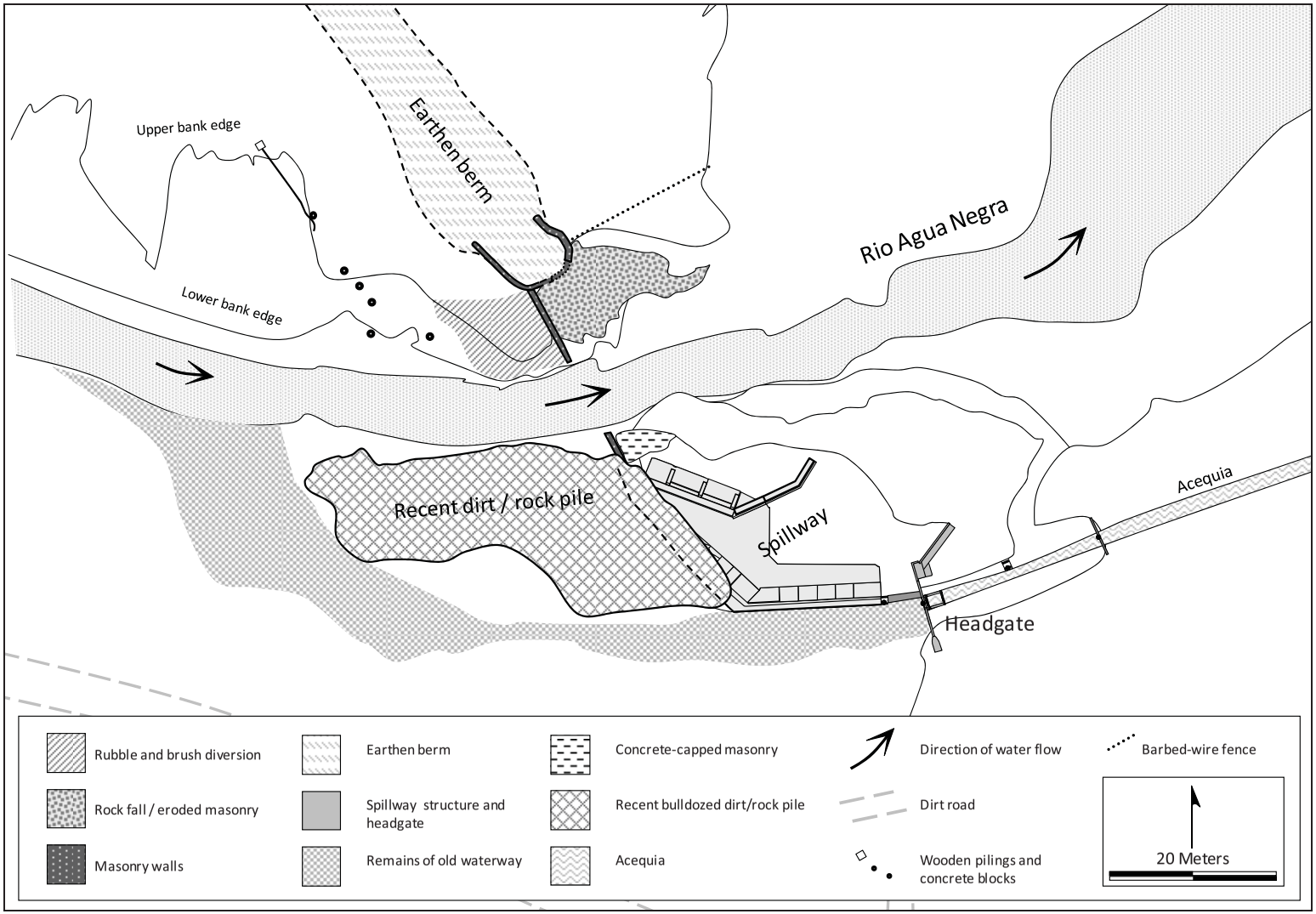

Figure 4.1. Map showing current diversion complex and associated structures.

4.1.1.1.1. North Side

The main components of the diversion complex on the north side of the river are a large earthen berm with associated retaining walls, an segment of the river bank adjacent to the diversion that appears to have been heavily armored with rock; a series of heavy wooden pilings connected to each other with steel cable; and the northern portion (with cross-section) of the rock and brush diversion itself (see again Figure 4.1). Each of these is described in detail below.

4.1.1.1.1.1. Berm and Retaining Walls

On the north side of the river, there is a raised earthen berm extending from the diversion approximately 90 meters to the northwest (Figure 4.2; see again Figure 4.1). As it approaches the diversion, it measures between approximately 8.7 meters wide to a maximum of 13.5 meters wide, with a height above surrounding ground surface ranging between approximately one and two meters. At the berm's southern end, where it reaches the upper river bank and the beginning of the rock-and-brush diversion dam, it is surrounded on west, south, and eastern sides by masonry retaining walls (Figure 4.3).

Figure 4.2. Earthen berm extending northwest from diversion, facing west.

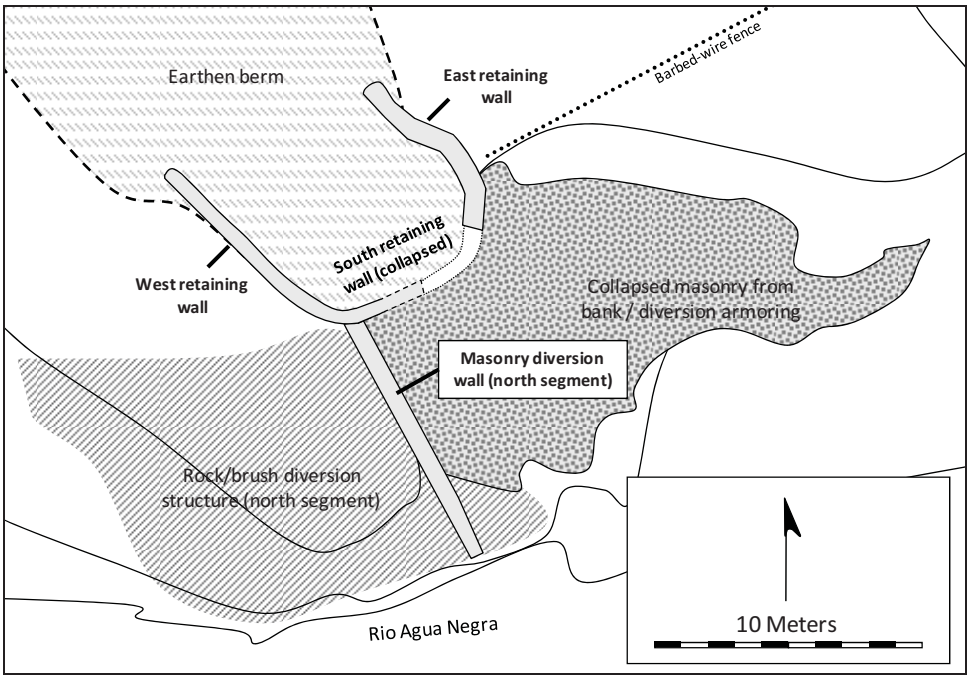

Figure 4.3. Northern portion of diversion complex showing retaining walls, masonry bank armoring, diversion remnants and portion of berm.

The retaining walls are built of coursed and unshaped or minimally shaped tabular sandstone slabs. The walls vary from approximately 70 to 130 cm in height, and between 7 and 10 courses tall. Walls are between one and two courses deep, and none show evidence of mortar. A retaining fence of chicken wire secured to rough-hewn wooden posts extends around the entire southern end of the earthen berm, serving to support all of the remaining masonry retaining walls. The wire fence itself is failing at multiple locations.

The eastern and western retaining wall segments are still largely intact, the most intact being the western wall. The western retaining wall is mostly straight and largely undamaged. It is between four and ten courses high (Figure 4.4, Figure 4.5). The eastern retaining wall is curved, following the curvature of the end of the earthen berm (Figure 4.6, Figure 4.7). It is two courses deep and between six and nine courses high. It is partially collapsed, but is being held in place by the wire fence, visible in Figure 4.6. The southern retaining wall, however, has largely collapsed, with the rock falling downslope onto a large mass of collapsed sandstone rock originally used to armor the northern river bank (Figure 4.3; also visible in Figure 4.8). The sandstone used in all of these walls and in the collapsed masonry now littering the northern river bank all appears to be of the same type, and likely came from the same general source areas.

Figure 4.4. Western retaining wall, facing east.

Figure 4.5. Western retaining wall, facing southeast.

Figure 4.6. Eastern retaining walls at southern end of earthen berm, facing west.

Figure 4.7. Northern end of eastern retaining wall, arcing inward toward the earthen berm.

4.1.1.1.1.2. Bank Armoring

As noted above, there is a large, dense scatter of unshaped tabular sandstone covering the northern river bank and the eastern face of the remaining portion of the rock and brush diversion dam, extending in a disorganized and displaced fashion down to near the river channel (Figure 4.3, Figure 4.8, and Figure 4.9). This masonry appears originally to have been installed as a method of armoring the northern river bank against erosion, as well as strengthening the downstream face of the diversion dam and protecting it from erosion as well. After the dam was breached, much of this appears to have been eroded, displaced and collapsed. The original extent of this armoring is unclear, but it appears to have extended over some portion of the northern bank and at least over the entire eastern face of the diversion dam (see discussion of diversion structure below).

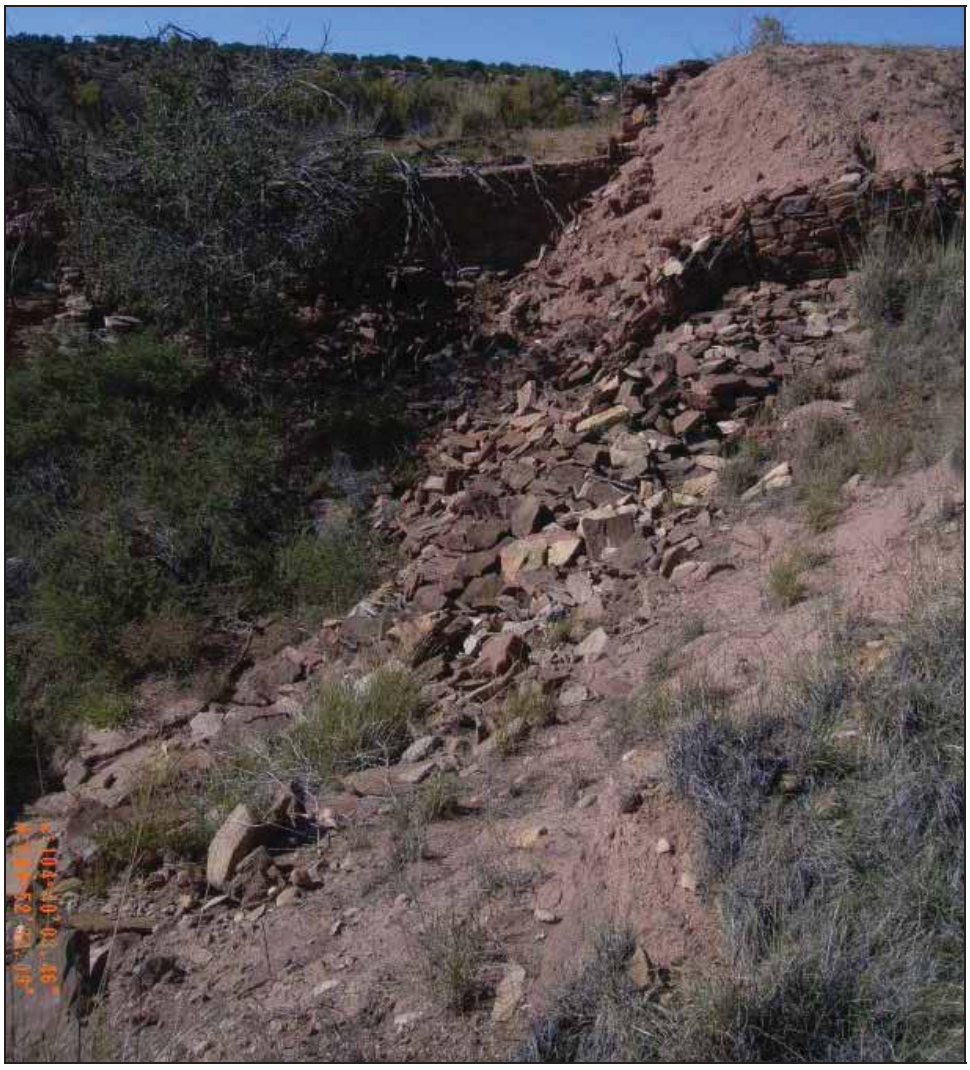

Figure 4.8. Remnants of masonry armoring river bank, facing west toward earthen berm and diversion wall.

Figure 4.9. Remnants of masonry armoring river bank, facing northwest (uphill) toward earthen berm.

Within the rubble downslope, archaeologists noted a severed segment of one-inch braided steel cable of the same type found associated with wooden posts/pilings appearing west of the berm and diversion structures. These are discussed in greater detail below; the precise association of this cable with those is unclear, however, as the cables on the western side of the berm appear to be connected to a large series of wooden pilings that have not been found on the eastern side of the diversion.

Figure 4.10. Braided steel cable found among collapsed sandstone rubble.

4.1.1.1.1.3. Wooden Pilings

On the northern side of the river, archaeologists observed a number of what appear to be wooden pilings or posts arranged in a roughly northwest-to-southeast direction to the east of the berm, and possibly extending down into the area once covered by the diversion dam itself (see Figure 4.1). The most highly visible of these are the set of three posts eroding out of the northern river bank (Figure 4.11). These were presumably originally dug down into the sediment to a depth of several feet, but are now standing with approximately 20 feet of height exposed. Around two of them are the remains of a one-inch diameter braided steel cable of the same type found in the eastern collapsed-rubble area (see above).

In addition to these, a number of additional posts / pilings were observed in less-eroded areas to the north. All posts have the same dimensions (one-foot diameter, and hand-hewn to a tapered size of approximately nine inches; see Figure 4.12), and several still have segments of steel cable attached (Figure 4.13, Figure 4.14). In all cases, the steel cable is looped once fully around the post. As seen in the site map (Figure 4.1), these are not arranged in a highly ordered fashion or evenly spaced, but with the exception of the two southernmost extant posts, these appear to be arranged in a straight line oriented from northwest to southeast. The two remaining posts eroding out of the bank itself suggest that these may originally have been arranged in two parallel rows; however, the area where this second row might have been has now been completely eroded, and no displaced pilings were noted in the area.

Following the steel cables in a line toward the northwest, field personnel noted a series of concrete blocks set into the ground and eroding out of an arroyo cut. These concrete blocks appeared to serve as an anchor point for the northernmost segment of steel cable (Figure 4.15). The drawing presented in Figure 4.16 shows the configuration of the blocks that were visible in the field; there appeared to be a minimum of three blocks of roughly cubic shape, measuring 30 centimeters on an edge. The steel cable is formed into a loop with a knot; however, the portion of the assembly that the cable is looped around is not evident in what is now visible.

In addition to the posts observed during this survey, a photograph of the diversion structure taken after the first incomplete breach in 2005 shows the presence of three pilings matching these in description situated just west of, or possibly within, the diversion dam itself (Figure 4.20). Triangulating from other features in the photograph, however, it does not appear that these are the same three posts that were observed eroding out of the bank during the survey; based on other landmarks in the photograph, it appears that these posts may have been located within the diversion structure itself. No remnants of these posts were noted on survey.

The actual purpose of these posts, all apparently connected to other posts with steel cable, is unclear. It is possible that they were intended to shore up and strengthen the diversion structurally. It is also possible that they served as supports for some sort of other structure, such as a bridge or similar feature.

Figure 4.11. Wooden pilings eroding out of northern bank, facing southwest.

Figure 4.12. Top of one of the wooden pilings eroding out of the south bank, showing attached steel cable, facing west. Dangling cable end points southeast.

Figure 4.13. Steel cable connecting wooden pilings to one another.

Figure 4.14. Another wooden piling protruding approximately one foot above current ground surface. Note steel cable wrapped around it.

Figure 4.15. Concrete blocks and steel cable.

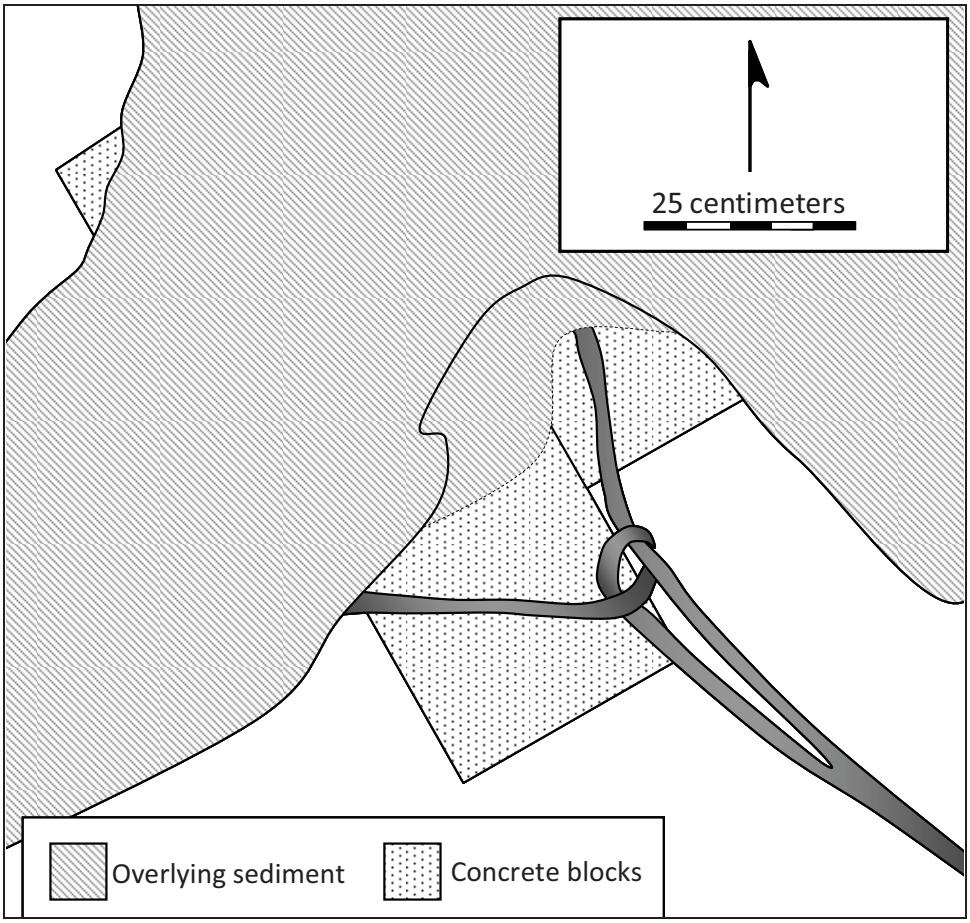

Figure 4.16. Plan-view drawing of steel cable and concrete blocks.

Figure 4.17. View of the diversion dam after the initial 2005 breach, facing west. Note wooden pilings visible over the top left.

4.1.1.1.1.4. Northern Diversion Wall Segment

In addition to the earthen berm, retaining walls, bank armoring, and wooden pilings, the northern side of the river also contains a segment of a masonry wall that once extended entirely across the river channel, forming an integral part of the diversion structure itself (Figure 4.3). This extends directly southward from the earthen berm's southern end, where it abuts the western and southern retaining walls. This wall will be discussed in detail further below, as part of the overall description of the diversion dam itself.

4.1.1.1.2. South Side

The south side of the river is dominated by the acequia diversion's spillway, an agglomeration of concrete, masonry, and gabion elements (Figure 4.18). In addition to the spillway is an outfall gate immediately southeast of the spillway, and the headgate to its east. The headgate structure is essentially a concrete wall and gabion with a sliding metal gate. In addition, the south side also contains remnants of the original diversion structure, including a portion of a masonry wall that once extended across the channel as part of the diversion dam (joining with the northern segment mentioned immediately above), and a portion of masonry that originally armored the eastern face of the dam and was capped with concrete (Figure 4.18, near upper left portion of drawing).

4.1.1.1.2.1. Spillway

The spillway is a set of connected concrete and masonry elements that together worked to channel the flow of water along the spillway's southern margin to the location of the headgate just east of the spillway's southern edge. Excess water would then flow over the top of the spillway's southern margin and down a series of flat and/or concave concrete slabs and three natural large sandstone bedrock ledges before returning to the Rio Agua Negra (Figure 4.18, Figure 4.22; see also Figure 4.1).

As illustrated in Figure 4.18, the primary components of the spillway are: a low wall forming a rough "L" shape, which directed water toward the headgate; a series of flat and concave concrete slabs immediately adjacent to the "L"-shaped wall, armoring the ground and directing flow of water spilling over the wall; a sandstone masonry wall plastered with concrete, with three perpendicular support walls abutting the wall's north face; and an additional concrete wall with gabion extending northeastward from the wall's eastern edge. Descriptions of each of these components follow.

4.1.1.1.2.1.1. Southern Portion of Spillway

The southern portion of the spillway served as a low wall to channel water diverted from the Rio Agua Negra eastward toward the headgate, as shown in the photograph in Figure 4.21, taken when the acequia was still functioning. If water levels exceeded the height of the low wall (approximately 30 centimeters in height), the excess would flow over the wall and concrete slabs that form the spillway, emptying onto bare sandstone bedrock. The water would flow over three discrete sandstone ledges (see Figure 4.1 and Figure 4.19) before emptying into the river channel. At present, the spillway is partially covered on its western edge by a large pile of dirt and rock, bulldozed into place within the last four years, dating after the breach of the diversion (Figure 4.22, Figure 4.23).

The concrete slabs that make up most of the spillway were laid at different times; most of them appear to be fairly old based on the levels of erosion and wear present on them, while others appear to be later patches and additions. One slab, located near the elbow of the "L" shape, bears an inscription dated June 1957 (Figure 4.24); the full text of the inscription is as follows:

SEO PROJECT 18E
JUNE 1957
ORMONDE EARP.
JOSE GARCIA
FRANK OCANA
MARCELINO OCANA
ROBERT FLORES
JULiO SALAZAR
AMADO CHAVEZ
LUiS SAiZ
LUiS SAiZ JR.

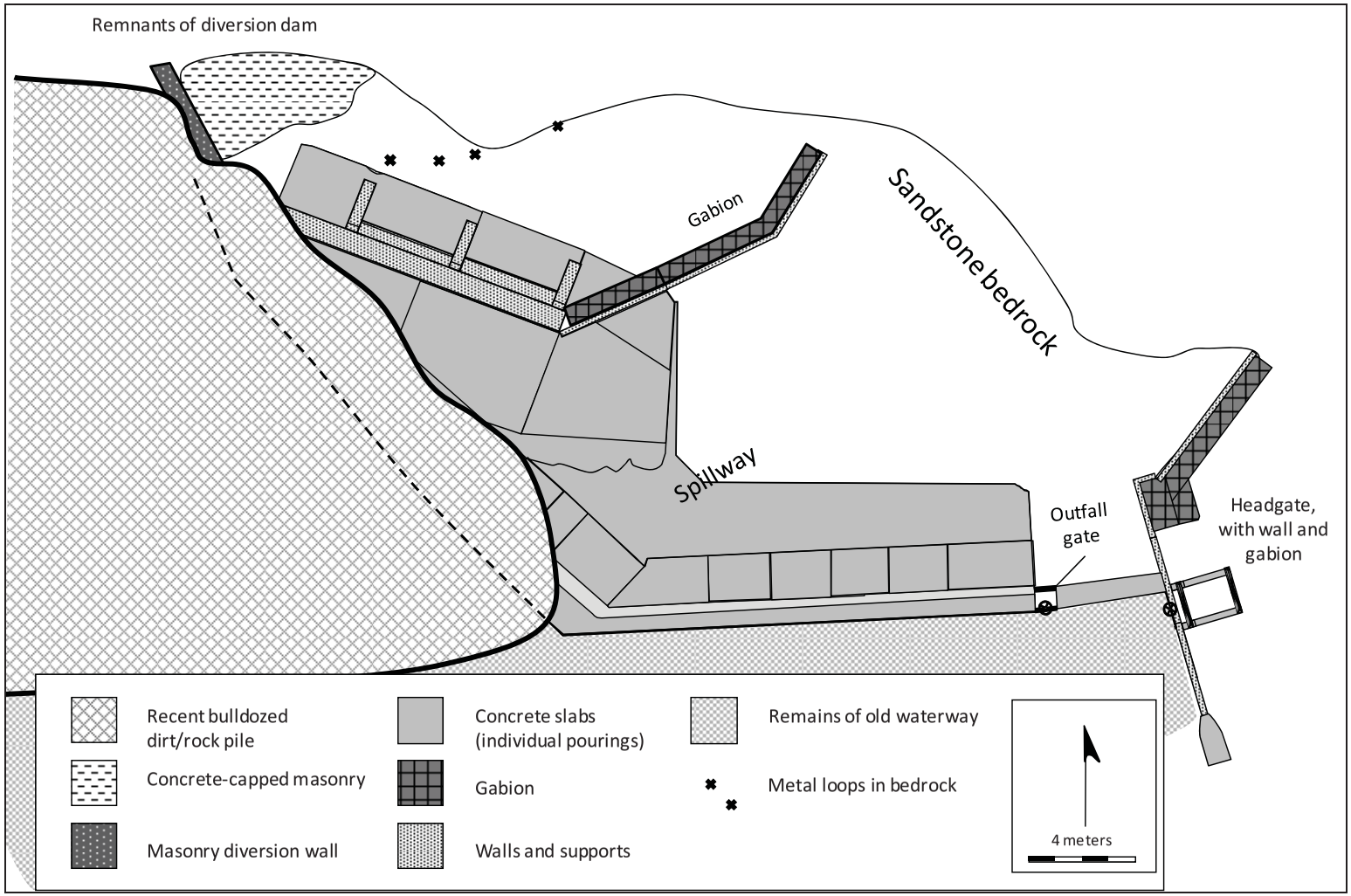

Figure 4.18. Overview of spillway and headgate, showing remnants of diversion dam (masonry wall with concrete-capped masonry armoring), outfall, and headgate.

Figure 4.19. Spillway before breach, facing southwest. (Photograph courtesy of the West Puerto de Luna Acequia Association).

Figure 4.20. Overview of wall and gabion portions of spillway complex, facing south.

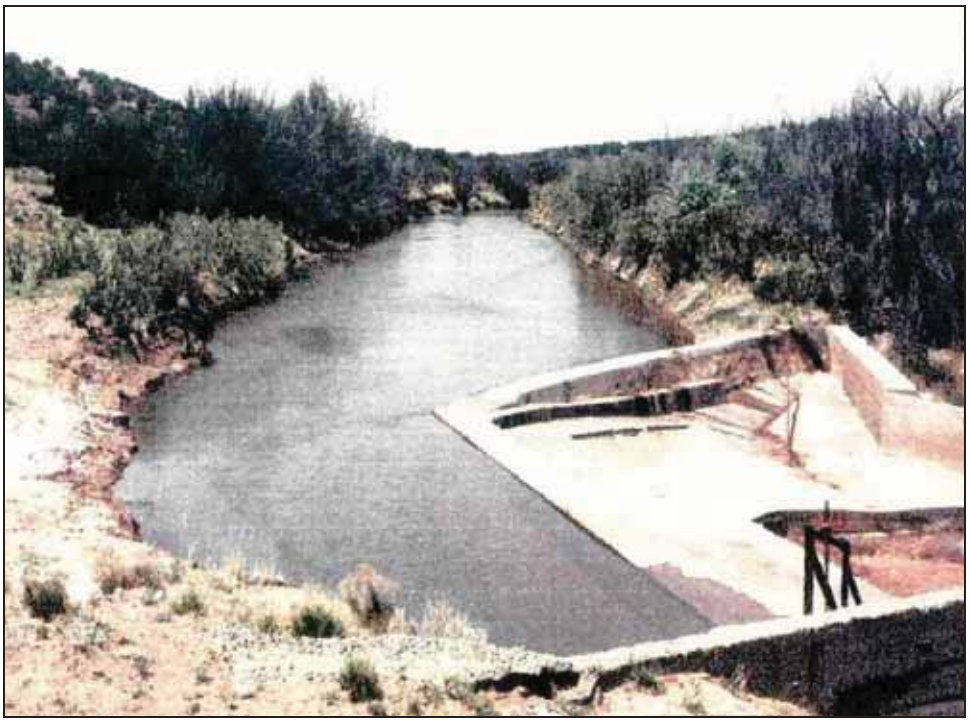

Figure 4.21. Diverted water approaching spillway and headgate, before the breach. (Photograph courtesy of the West Puerto de Luna Acequia Association).

Figure 4.22. View of southern portion of spillway, facing west. Note recent bulldozed rock / dirt pile covering the spillway's western edge.

Figure 4.23. Large pile of rocks and dirt recently bulldozed over part of the spillway. This was done after the diversion was breached in 2006.

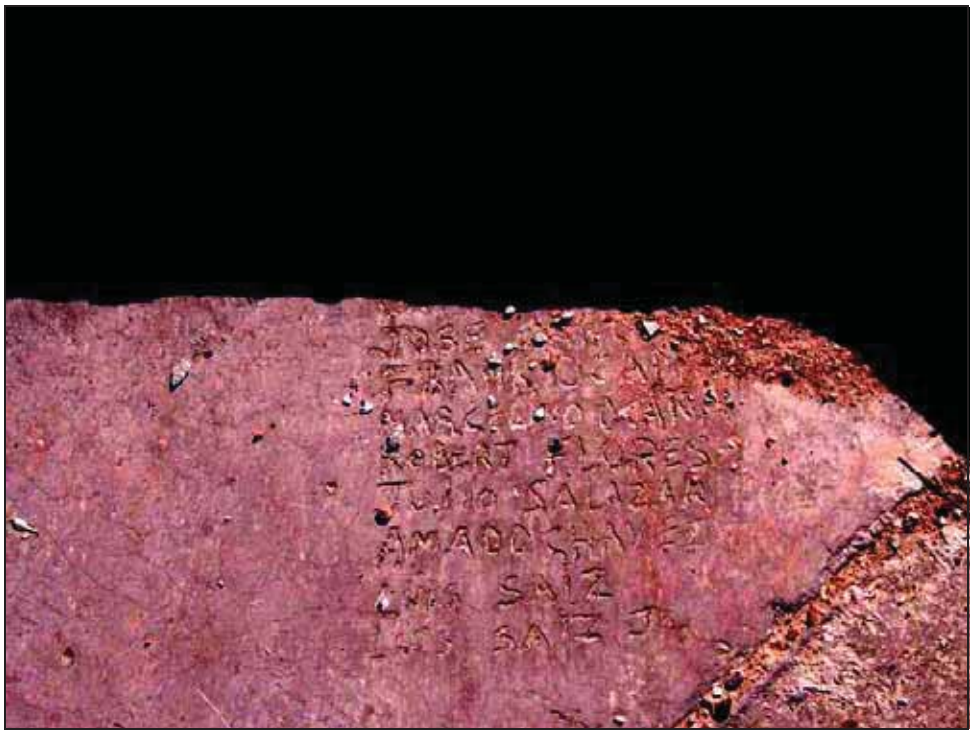

Figure 4.24. Inscription in concrete slab near southern spillway edge, listing names of acequia association members. Date inscribed is June 1957.

It is therefore clear that the spillway dates to at least 1957. Other portions of the spillway, namely the concrete that forms the interior portion of the "L" shape (that is, the concrete forming the north and east boundaries of the current spillway, immediately adjacent to the bare bedrock to the north), appear to be the most recent. In fact, the construction sequence of the elements of the spillway can be grossly determined by observing differences in surface wear, as well as observing abutment relationships (i.e. the fact that much of the "interior of the L" conforms to the adjacent, earlier concrete slabs, showing that it was poured after these were already in place); this will be discussed further below, after a brief description of the wall segments forming the northern portion of the spillway.

4.1.1.1.2.1.2. Northern Portion of Spillway

The northern portion of the spillway is dominated by a wall, supported by smaller reinforcing walls, and an adjoining gabion basket and wall. It appears that these served to channel water westward before returning to the Agua Negra channel, directing it away from the base of the diversion structure that would have been present immediately to the north of the spillway. While the entire spillway complex appears at first glance to be made of concrete, this is not the case; the main northern wall, oriented roughly east to west, is actually a masonry wall (Figure 4.25) made of the same tabular sandstone as the other major parts of the diversion complex, including the masonry diversion wall that once formed a central part of the diversion dam, noted above and described below. This wall is thus probably an original element of the diversion complex, and likely dates to the original 1940s construction.

Figure 4.25. Eastern portion of northern spillway wall, showing original sandstone masonry visible under fragmented concrete plaster. Folding ruler at top left is one meter in length.

As the photograph in Figure 4.25 shows, this masonry wall was later plastered over with concrete; the masonry itself is only visible on the northern face of the wall at its far western end, where it is nearest to the remnants of the masonry diversion wall. The concrete used to cover the masonry wall was reinforced by an irregular array of wire segments, which still protrude from the wall surface, as seen in Figure 4.26.

Figure 4.26. Southern face of the masonry spillway wall, facing north, showing wire used to reinforce concrete plastering covering wall face. Note also multiple patching / plastering events visible on this wall face.

It is unclear whether the entire length of this spillway wall is still made of masonry, or whether some of the eastern portions of the wall were replaced entirely by or extended with concrete. Near the eastern end of this wall, the concrete plaster on the southern face of the wall is fragmented, revealing a different and distinct concrete surface beneath (Figure 4.27). This concrete is of a different color, and preserves a distinct wood-grain pattern resulting from the use of wooden, possibly plywood, forms when the concrete was poured. It is therefore possible that the eastern end of this wall is entirely made of concrete; this is inconclusive, however, as earlier attempts to reinforce the wall with concrete could have resulted in the same patterning.

Adjoining the eastern end of this original wall is another wall that extends to the northeast, and which abuts a gabion basket structure oriented the same way (Figure 4.28, Figure 4.29; see again Figure 4.18). This wall abuts and therefore postdates the earlier wall, and appears to be quite recent; an inscription in the concrete surface of this wall reads "1997 JERRY JARAMILLO ANTON CHICO." While this might only date the plastering of the wall, the condition of the wall and gabion are such that this likely dates their construction.

Figure 4.27. Close-up of hole in concrete plaster, showing different concrete surface underneath.

Figure 4.28. End-on view of masonry/concrete spillway wall, facing west, showing wall with gabion in foreground.

Figure 4.29. View of wall at north end of spillway, with gabion in background.

On the northern side of the masonry/concrete spillway wall, there are three small concrete support walls oriented perpendicular to the main wall, and reinforced with smaller concrete bracing elements oriented parallel to and abutting the main wall (Figure 4.29; see also Figure 4.18 and Figure 4.20). These rest on two separate concrete slabs, one of which (the eastern one) appears to be older than the other. Based on abutment and superposition relationships, the construction sequence appears to be: (1) masonry/concrete wall; (2) horizontal slabs; (3) vertical/perpendicular reinforcement walls; and (4) parallel

bracing walls. The time between these construction episodes is unclear; however, it appears that the original construction of the masonry wall likely predated the construction of the other elements by some time, as they are of substantially dissimilar construction. The reinforcement walls and bracing elements may very well have coincided with the original addition of concrete plaster to the masonry wall, however, as wood grain patterns of the type seen in Figure 4.27 are highly visible on almost all surfaces of these later support elements.

Just north of the spillway, driven into the exposed bedrock, are four metal loops of undetermined function (Figure 4.30; see Figure 4.18 for locations).

Figure 4.30. Metal rebar loop driven into bedrock adjacent to spillway structure.

Immediately adjoining the southwest corner of the spillway is a metal outfall gate (appearing before the headgate) allowing water to be released back into the river before entering the headgate. This gate is a welded steel frame with a sliding metal gate, controlled with a screw-type mechanism operated via a metal wheel mounted parallel to the ground (Figure 4.31). This gate is of similar construction to the acequia's headgate, described later in this chapter.

Figure 4.31. Sliding metal outfall gate with screw-type mechanism, situated at eastern end of spillway.

4.1.1.1.2.2. Masonry Diversion Wall Segment

While the masonry diversion wall (noted above in the description of the area north of the river) is not properly part of the spillway, it does connect to it and will be briefly described here. A segment of this wall, which once traversed the river channel as part of the diversion structure itself, remains on the very edge of the southern bank of the river, and adjoins the spillway at the spillway's northwest corner (Figure 4.18). The wall is of tabular sandstone masonry, the same type as both the northern segment of the same wall, and the same as the northern spillway wall (Figure 4.32). Immediately to the east of this wall segment is a concrete-capped clump of masonry that once formed part of the diversion's eastern face; this remains in place due to the adhesion of the concrete to the bedrock. These elements will be described in further detail below, in the description of the diversion.

Figure 4.32. Segment of masonry diversion wall adjacent to northwestern corner of spillway.

4.1.1.1.2.2.1. Approximate Construction Sequence for Spillway Elements

Now that the elements of the spillway have been described individually, it is possible to discuss the general sequence of construction for those elements. Abutment relationships allow the relative construction sequences for several portions to be determined, but it is not possible to determine the precise relative sequences for all portions. The following two figures will present first the overall relative sequence for the spillway as a whole, with the exception of the supports for the northern wall, and the second shows the sequence for the wall and supports.

Figure 4.33 shows the relative sequence for the overall spillway and nearby structures. The northern spillway wall and the adjacent masonry diversion wall appear to be the earliest portions of the complex, and are assumed to date to the dam's 1940s construction. After these, the next oldest portions appear to be the flat concrete slabs forming much of the spillway, and including the slab with the 1957 date described above; the concrete cap on the masonry armoring the diversion face is here termed of "early / middle" age, given that it likely post-dates the masonry wall, but it is not clear by how long. The late portions of the complex appear to be a concrete patch extending along the southern edge of the spillway, as well as the large strip of concrete forming the northern and eastern margins of the spillway itself (not including the northern spillway wall and gabion). In addition, the gabion adjoining the northern spillway wall appears to be the latest addition to the spillway.

Figure 4.34 shows the relative construction sequence for the northern spillway wall based on abutment relationships. The wall itself was constructed first, followed by the flat concrete slabs. Upon these slabs were constructed the three vertical/perpendicular reinforcement walls, and the bracing elements between them were constructed last.

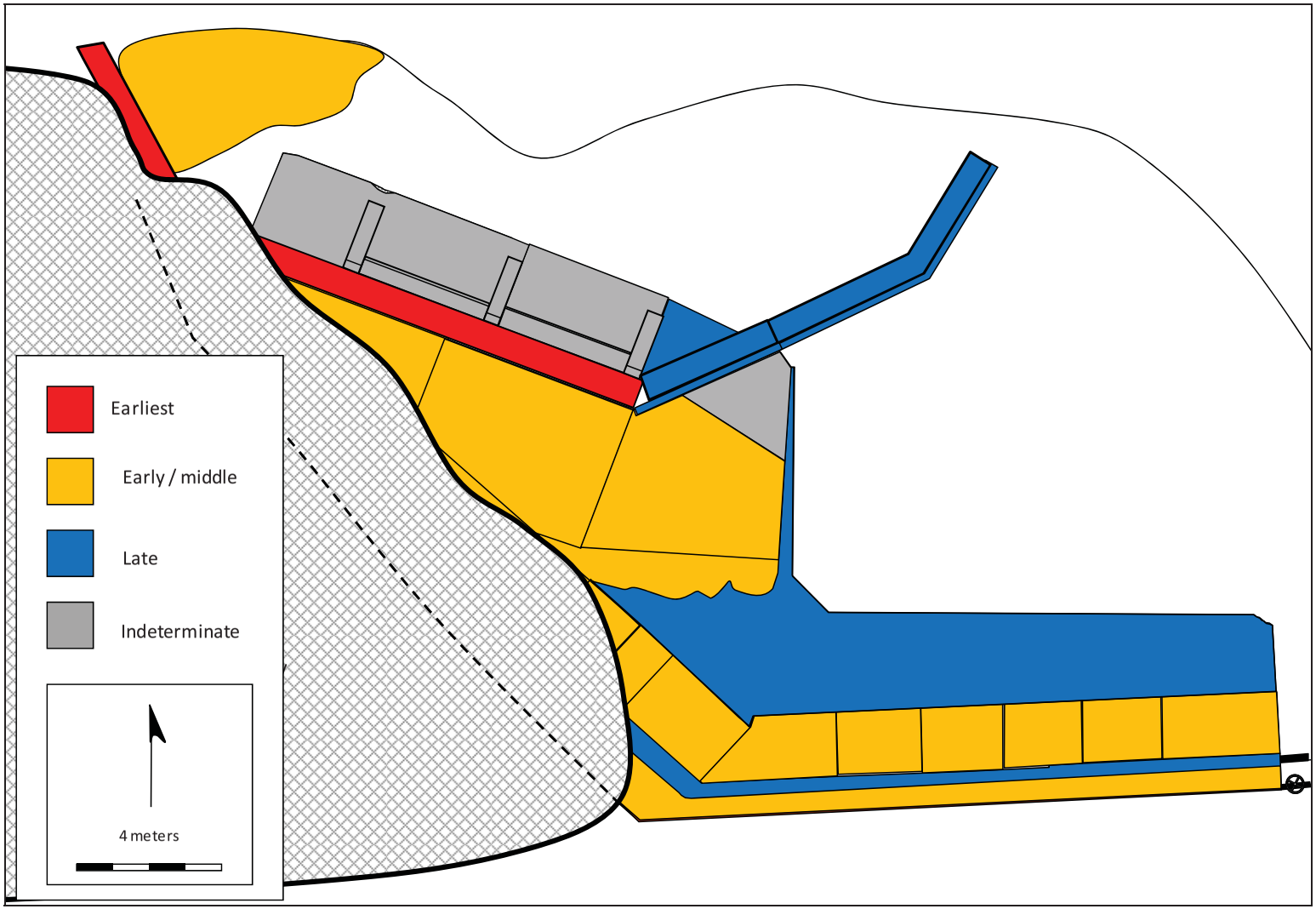

Figure 4.33. Schematic diagram of spillway, showing approximate relative ages of elements.

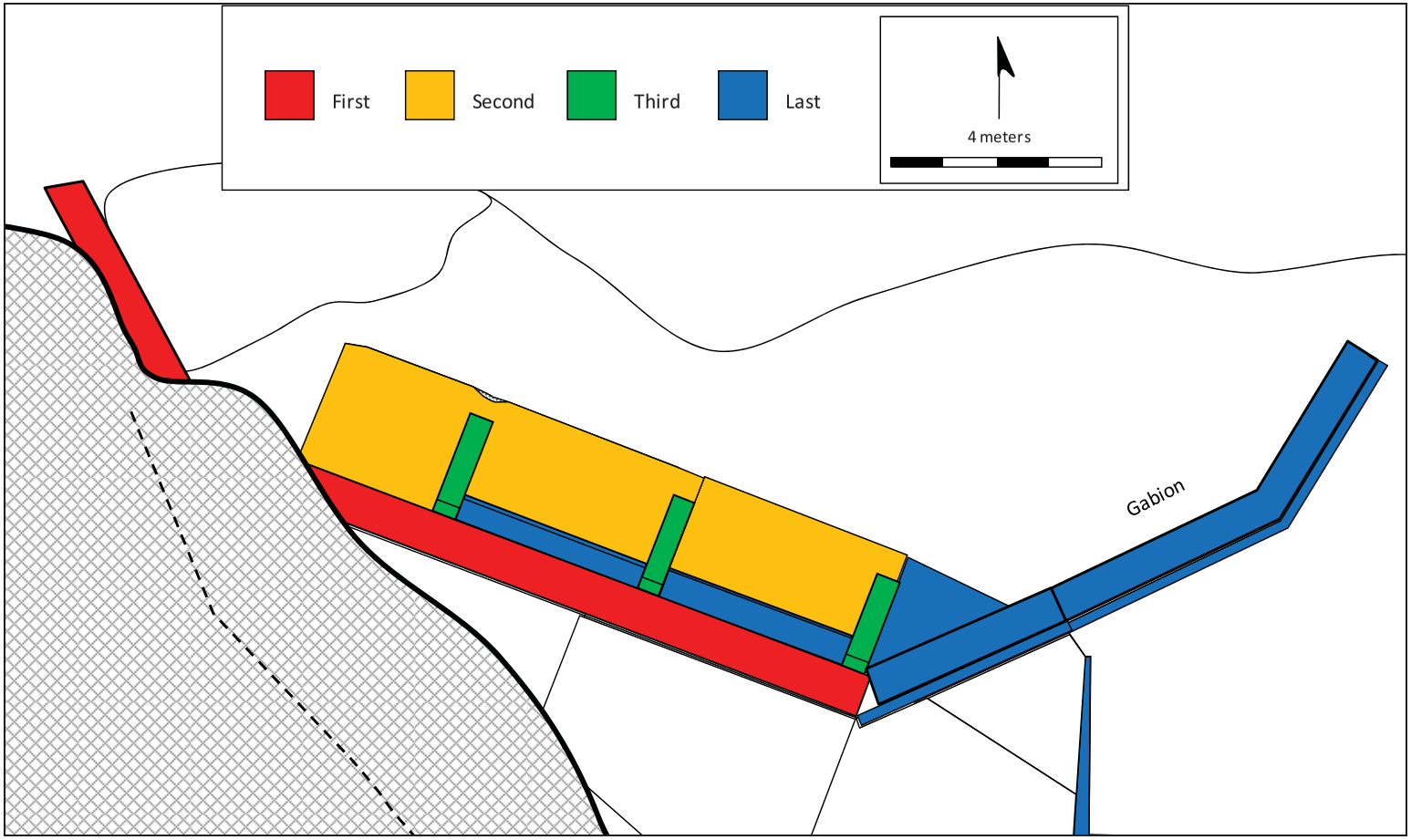

Figure 4.34. Schematic diagram of spillway walls only, showing relative construction sequence based on abutment relationships.

4.1.1.1.2.3. Headgate

The headgate feature consists of a concrete wall oriented approximately northwest to southeast; a gabion extending from the wall's northern end toward the northeast; a welded metal frame with sliding metal gate on the west side of the wall, and two smaller concrete walls on the eastern side of the wall, leading directly into the acequia itself (Figure 4.36). This headgate and associated features will be left intact by the current project.

The headgate is set into a concrete wall that appears to have been built in at least two episodes, as evidenced by the different types of concrete visible on the faces of the wall (Figure 4.35). This wall is 25 centimeters thick at all points, and measures approximately 9.5 meters in length and between 195 and 225 centimeters high. The headgate assembly itself is a welded metal frame measuring 120 centimeters in width, and supports a sliding metal gate operated via a screw-type mechanism operated with a metal wheel. At the wall's southern end, there is a wider concrete pad set into the ground approximately 180 cm in length (Figure 4.36, Figure 4.37).

Immediately in front of the headgate is a large grating made up of 13 welded metal pipes (each pipe two inches in diameter), which served to block large debris from entering the acequia (Figure 4.35, Figure 4.36). This grating is approximately triangular in cross-section, with a base measuring approximately 2 meters in length and a height of approximately 60 centimeters.

Figure 4.35. View of headgate, facing east.

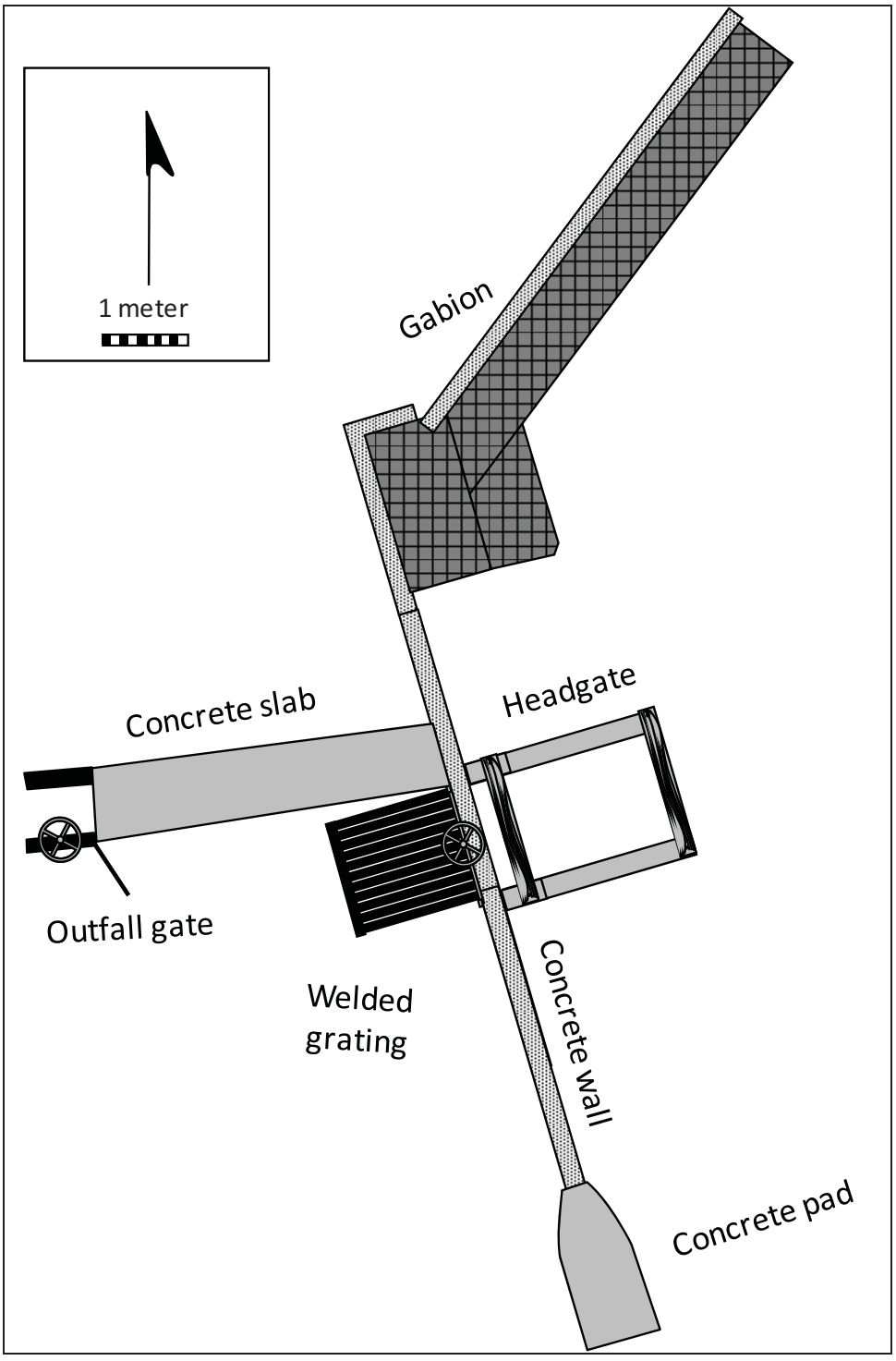

Figure 4.36. Diagram of headgate and associated features.

Figure 4.37. View of the headgate structure from the south, showing concrete wall and gabion.

The eastern side of the wall contains two smaller concrete walls perpendicular to the main wall and flanking the gate opening as the water enters the acequia (Figure 4.38, Figure 4.39). These walls are approximately 20 centimeters thick, and are approximately 230 centimeters long at the base. They are trapezoidal in cross-section, tapering at the top to a length of 51 centimeters. (see Figure 4.37).

Adjoining this concrete wall at its northern end is a gabion and associated wall, which extend at an angle toward the northeast (Figure 4.36, Figure 4.37, and Figure 4.40). The gabion is approximately seven meters long and 80 centimeters wide, and matches the gabion adjacent to the spillway wall in form and construction. A date inscribed on the exterior of the concrete wall associated with the gabion reads:

6-97
Ruben Saiz
Mario Saiz
Joe Saiz

Given the 1997 date and the similarity of construction, it is likely that this gabion and the spillway gabion were constructed at approximately the same time.

Figure 4.38. Headgate, facing east.

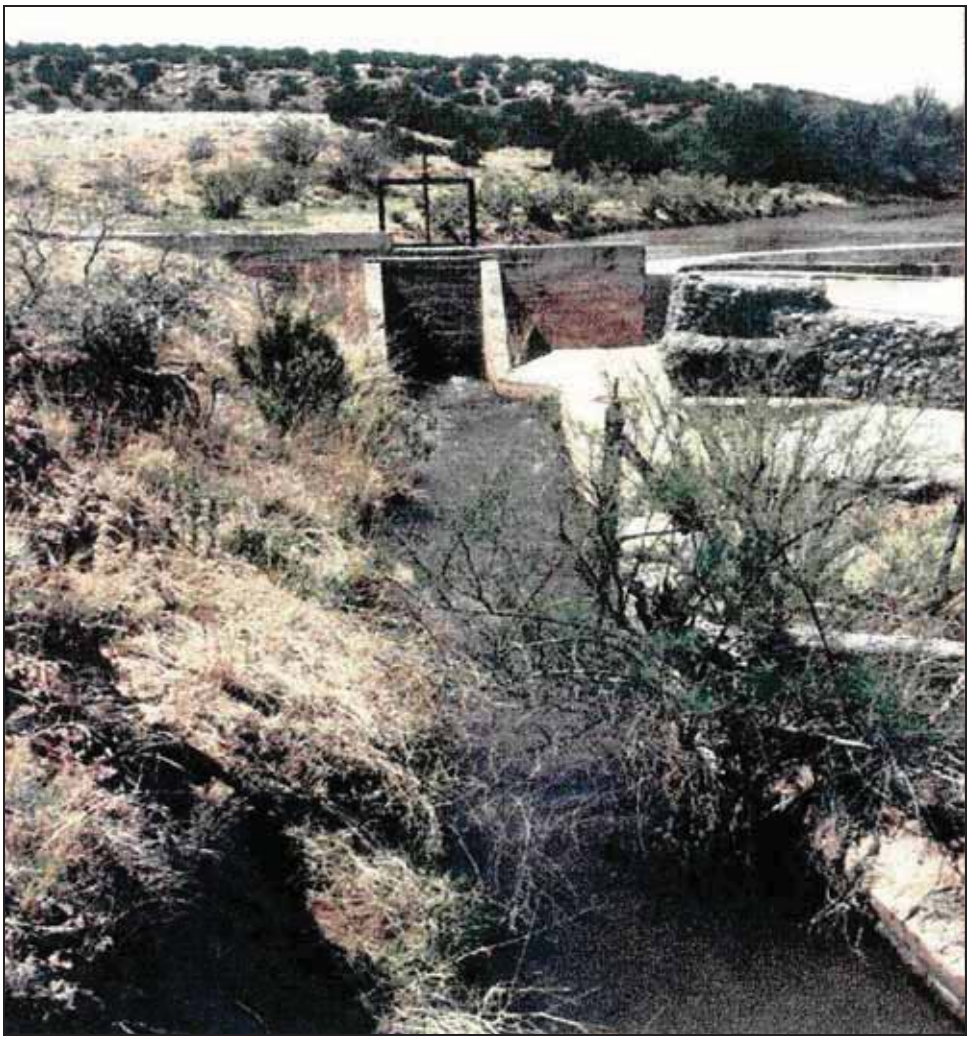

Figure 4.39. Headgate and acequia before breach, facing west. (Photograph courtesy of the West Puerto de Luna Acequia Association).

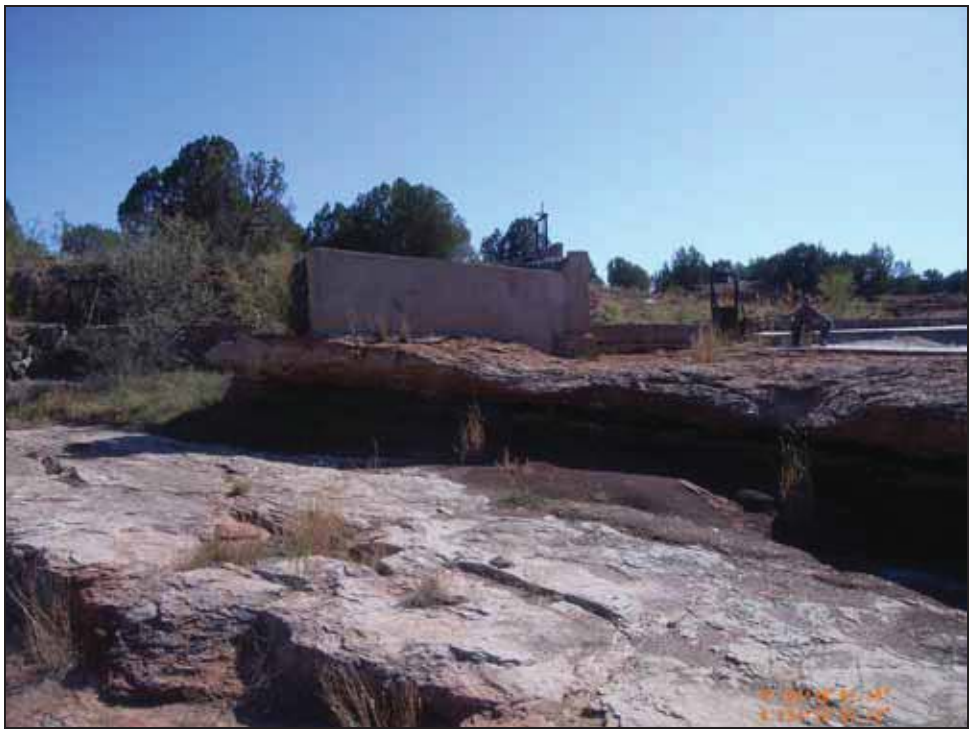

Figure 4.40. View of headgate and gabion, facing south.

Figure 4.41. Inscription on outer wall of gabion, showing construction date of "6-97."

4.1.1.1.3. Remnants of Diversion Dam

According to the West Puerto de Luna Acequia Association (pers. comm.), the diversion itself, called the WPDL-Giddings Diversion Dam, is a large berm originally built across the Agua Negra river channel in 1894. It was a rock-and-brush structure that functioned for approximately 48 years until it was completely destroyed by massive flooding in 1942. After this, the diversion was rebuilt, again as a rock-and-brush mounded berm; it is this rebuilt dam that was breached again in 2005 and 2006, the remains of which are described in this section.

The 2006 breach exposed a full cross-sectional profile of the diversion, visible facing the north shore of the current river channel. Further, structures associated with the top of the diversion are also visible in profile facing the south shore of the river channel. Each of these profiles is described in detail below.

Figure 4.42. Overview of diversion complex, facing west.

4.1.1.1.3.1. North Profile

The diversion is a brush-and-rubble structure measuring approximately seven meters in height. The remaining portion measures approximately eight meters wide at the top and sixteen meters wide at the base. According to members of the acequia association, the structure was constructed of successive layers of brush and rock, with these layers alternating. At first, the diversion was highly porous, allowing abundant water to pass through the gaps and interstices within the structure. However, the porous structure served to reduce the water's velocity enough that it dropped its suspended sediments,

with the result that sand and silt completely filled in the rock and brush matrix, making it water-tight.

This brush and rubble construction is easily visible in the northern cross-section of the diversion as it exists now. As shown in Figure 4.43, Figure 4.44, and Figure 4.45, the bottom layer is dominated by brush, while upper layers are more dominated by rock. The photograph in this figure reveals stratigraphy showing the successive layers of large rock and smaller material including brush. Indeed, the contrast between the brush-dominated base layer and the upper layers is striking (Figure 4.44); it is even possible that this bottom layer may be a remnant of a separate and earlier construction event, perhaps even being a remaining portion of the earlier nineteenth-century dam.

Also visible in these photographs is a large masonry wall that extends from the top of the brush layer (again, perhaps supporting the hypothesis that this is from an earlier construction event) to the top of the diversion itself. This wall appears to form the diversion's primary eastern face, although this is itself covered with more sediment and an extensive armoring layer of sandstone rubble of the same type used to construct the other walls throughout the diversion complex.

In addition to the original diversion itself, the current cross-section also shows that abundant sediment accumulated behind the dam (i.e. west of it) to such an extent that ground surface was effectively raised to the height of the dam for a distance of some 80 meters upstream. A generalized representation of the stratigraphy of the diversion dam is presented in Figure 4.46.

Figure 4.43. Northern cross-section of diversion dam, showing successive layers of rock and brush, facing northwest.

Figure 4.44. View of the northern cross-section of the diversion, showing base brush-dominated layer and multiple overlying layers of rock and brush.

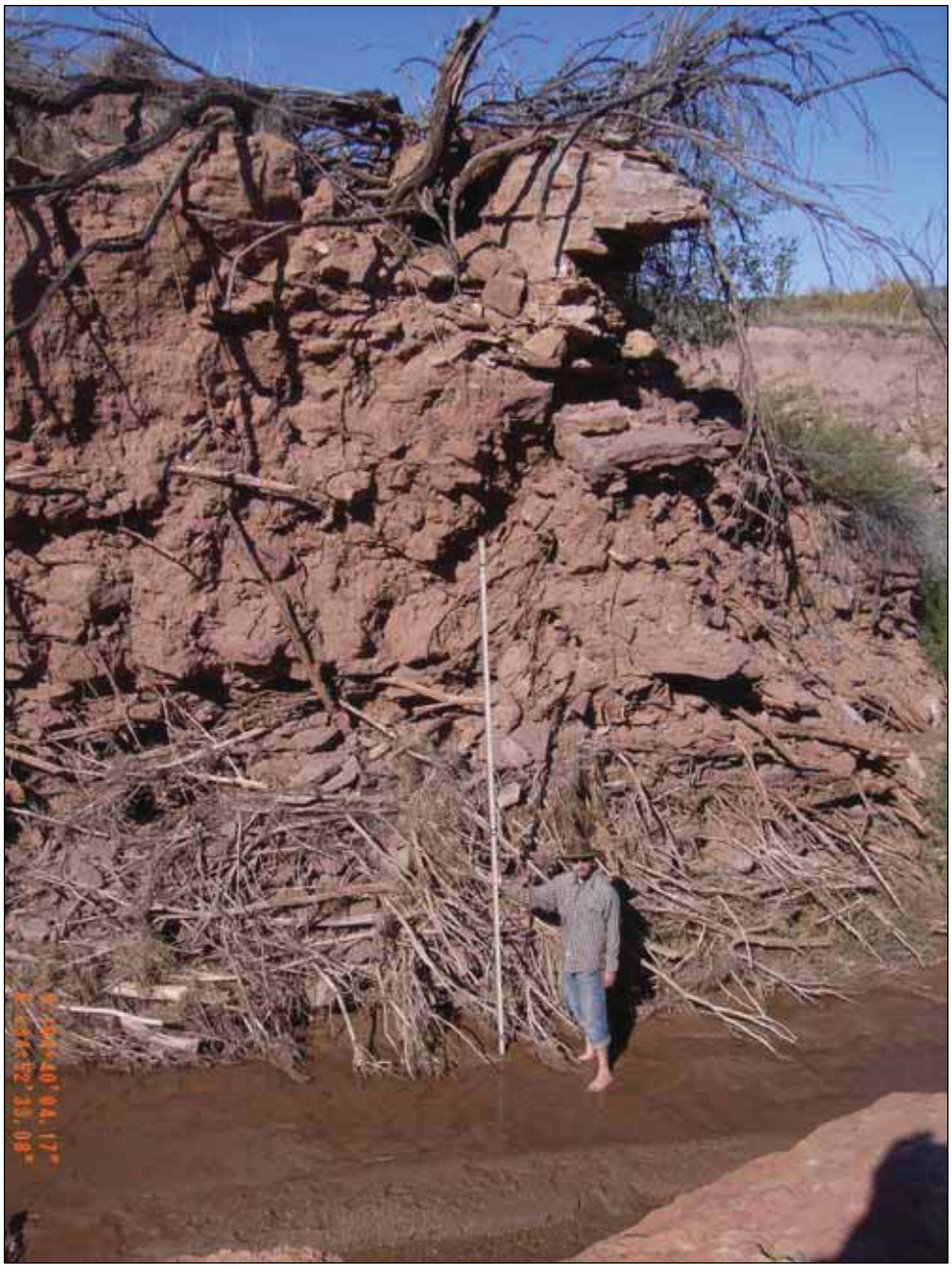

Figure 4.45. Another view of the northern cross-section of the diversion dam, facing northeast. Note remnants of masonry wall visible in cross-section.

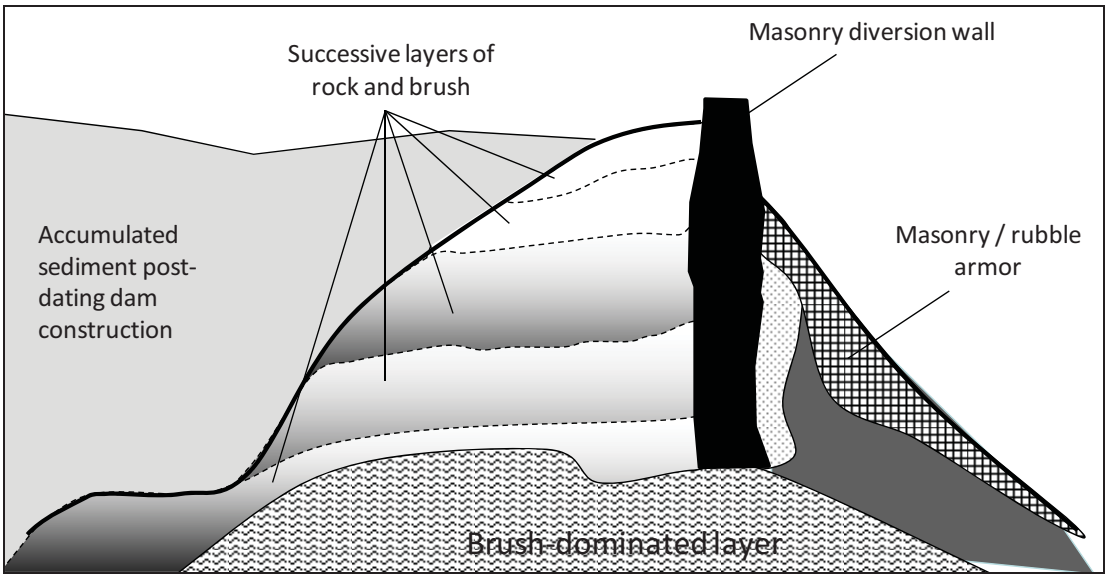

Figure 4.46. Generalized cross-section of diversion dam (facing north), showing primary stratigraphy, as well as the masonry diversion wall and rubble armoring on the diversion's eastern face.

4.1.1.1.3.1.1. Masonry Diversion Wall

The wall that remains as short segments on the north and south sides of the river once traversed the channel as a primary portion of the diversion dam. It is constructed of large pieces of tabular sandstone (visible in cross-section in Figure 4.45), with larger pieces occurring in the parts of the wall that are within the diversion, and somewhat smaller ones being found along the top. As it is visible from the top of the diversion, it is clear that the masonry wall segments at north and south are aligned with one another and once formed parts of the same wall (see Figure 4.47). The wall appears to have been built at the same time as the current diversion, as it appears to be footed on top of the bottom brush-dominated base layer (Figure 4.46). At its northern end, the wall is capped with concrete (Figure 4.48), and contains areas on the western face where the faces are inconsistently plastered or surfaced with concrete (Figure 4.49). On the western face, only approximately one meter or less of the wall is exposed above the ground surface of the dam top.

On the eastern face, more of this wall is exposed (Figure 4.50) ranging from approximately two to three meters, with no evident concrete plastering. Some concrete mortar is visible between the stones on this face, however. In its current state, the top of this wall extends out over the breach due to the presence of the capping layer of concrete over the top of the wall (Figure 4.51, Figure 4.52).

Figure 4.47. The alignment of both extant segments of masonry diversion wall are visible here, facing south across the river channel. The northern segment is in foreground.

Figure 4.48. Northern segment of masonry diversion wall that once traversed the channel, facing east.

Figure 4.49. Close-up of masonry wall, showing concrete plastering, facing east.

Figure 4.50. Northern segment of masonry diversion wall, facing west.

Figure 4.51. Northern segment of masonry diversion wall, facing west, showing remnant portion overhanging the breached diversion.

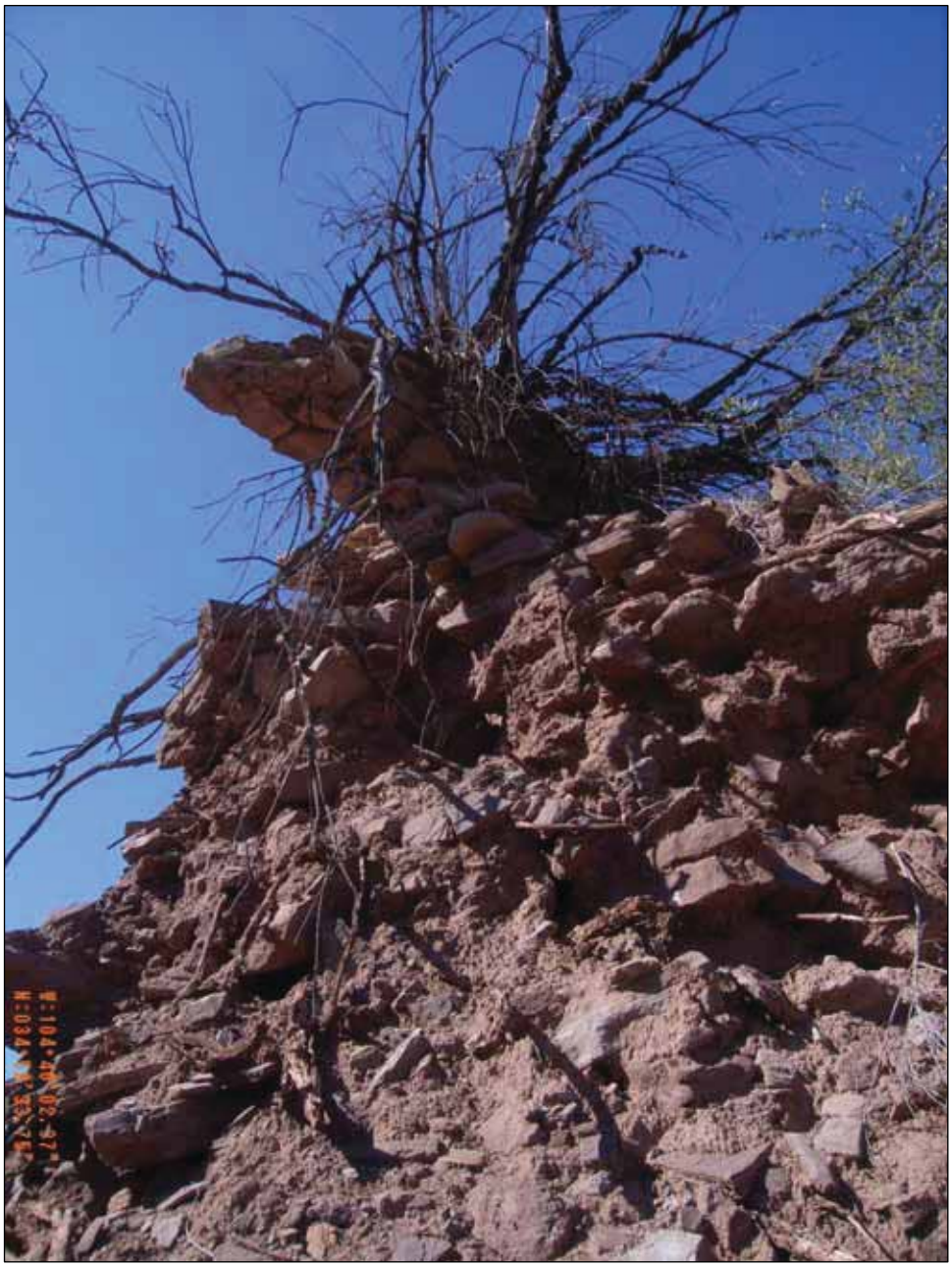

Figure 4.52. Northern segment of masonry diversion wall, from below and facing northwest, showing overhanging remnant.

As noted above in Figure 4.46, the eastern face of this masonry wall is obscured by additional sediment, which is in turn heavily armored with medium to large tabular sandstone rubble of t he same type that was presumably also used to armor the northern bank of the river, and described earlier in this chapter. On the eastern face, only two to three vertical meters of wall are visible before disappearing behind this less-organized armoring rubble (Figure 4.53).

Figure 4.53. Base of masonry diversion wall, facing west, showing transition to rubble bank armoring.

4.1.1.1.3.2. South Profile

Much less of the diversion is visible in the southern profile. All of the rock and brush that formed the core of the diversion dam is now gone, revealing only large layers of sandstone bedrock, upon which are situated a small portion of the masonry diversion wall, and an agglomeration of tabular sandstone capped with concrete that is presumably a continuation of the rubble bank armoring seen on the northern side of the river. The primary difference appears to be that this was capped with concrete and may have contained some additional mortar, which have allowed it to remain in place – indeed, hanging precariously over the river channel with little support from beneath (Figure 4.54). The construction of the masonry diversion wall on the southern side of the river appears consistent with that on the northern side: tabular sandstone masonry capped with concrete, and with some concrete mortar. A schematic cross-section of what remains of the diversion on this side of the river is presented in Figure 4.54.

Figure 4.54. Remnants of masonry diversion wall and concrete-capped sandstone as viewed from the north side of the river, facing south.

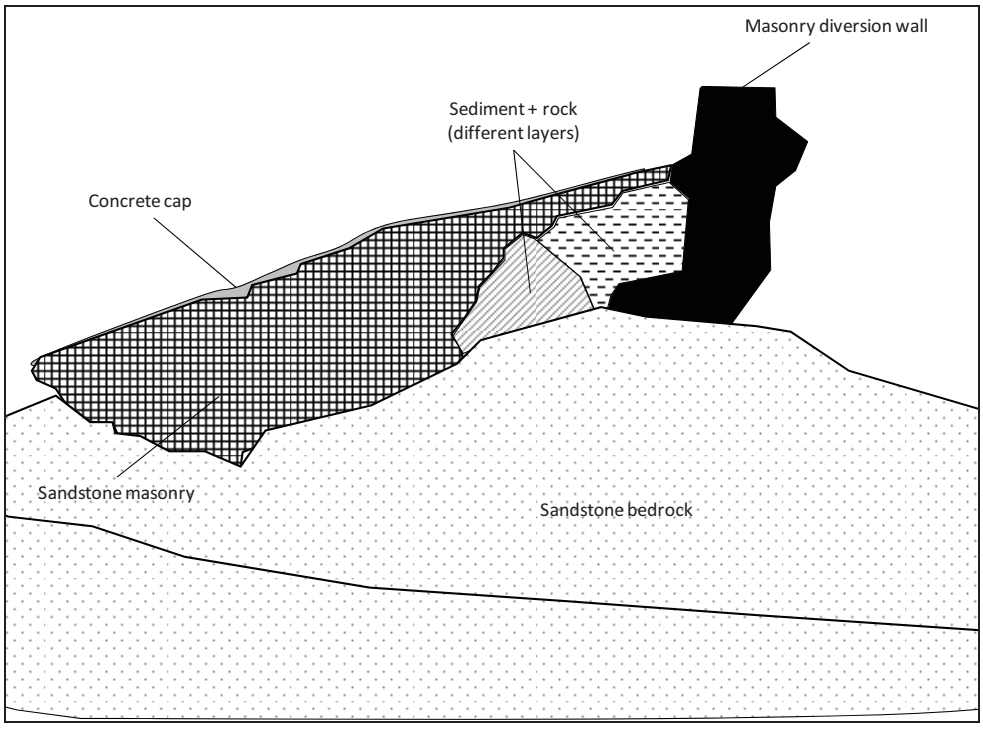

Figure 4.55. Schematic cross-section of southern portion of diversion wall and concrete-capped sandstone, with stratigraphy.

4.1.1.2. The Diversion Complex Before the Breach

Now, having described the extant components of the diversion complex above, it is now possible to discuss the likely pre-breach configuration of the diversion complex. In sum, the diversion complex consisted of a large rock-and-brush diversion dam which included a sandstone masonry wall near its eastern face. On the north, a long earthen berm with masonry retaining walls extended to the northwest to channel water during high-flow events. The diversion was armored on its eastern face by a deep and extensive covering of sandstone, likely arranged in an organized fashion (i.e. coursed and stacked where possible), and was capped with concrete on at least its southern end. This armoring extended around to the north, protecting the steep north bank of the river from erosion as well. Figure 4.56 presents an approximate picture of the relative locations and extents of the masonry diversion wall (blue) and the armored surface of the dam's eastern face (orange). (Note that the extent of the sandstone bedrock has changed since before the breach; the bedrock once extended further out into what is now the river channel; compare the photo in Figure 4.56 with that in Figure 4.17).

Figure 4.56. Approximate extrapolated positions of bedrock (dotted line), masonry wall (blue), and rubble armoring (orange).

The diversion raised the water level and channeled the river's water over the south bank of the river to the spillway structure, which directed the water to the headgate. All excess water flowed over the largely concrete spillway, then discharged over several layers of sandstone bedrock before finally rejoining the natural channel of the Rio Agua Negra.

Further, extensive sedimentation had built up behind the dam such that, by 1997, the effective width of the diversion was some 80 meters wider than the original rock-and-brush structure. This is evident both by observing the current cross-section of the northern bank (see again Figure 4.46), and by examining an aerial photograph of the project area from 1997, before the dam was breached. This photograph, obtained via Google Earth Pro, shows the area currently occupied by the river channel west of the diversion to be heavily vegetated, while the water from the river departs from its present channel approximately 80 meters to the west of the diversion's location (Figure 4.57).

Figure 4.57. Aerial imagery of diversion complex dated May, 1997, showing location and shape of waterway leading to spillway and headgate. Imagery produced by U.S. Geological Survey and retrieved from Google Earth Pro (copyright 2009 Google and Europa Technologies).

Figure 4.58 represents our best understanding and reconstruction of the complex's pre-breach state, based on information from the above aerial photograph combined with the detailed examination of the remaining portions of the diversion complex presented in this chapter.

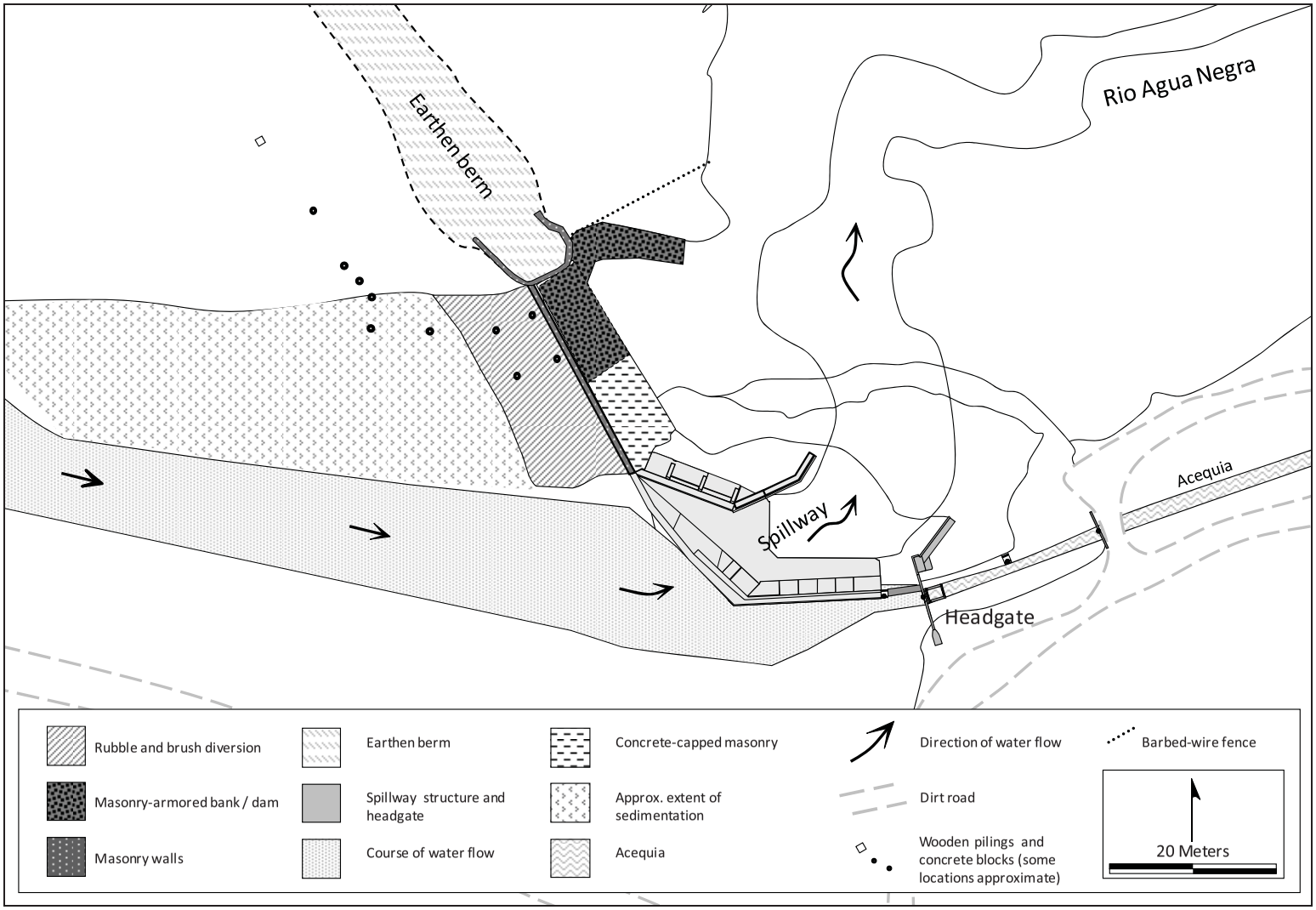

Figure 4.58. Map showing approximate extrapolated pre-breach configuration of diversion complex.

4.1.2. Description of Archaeological Sites

No new or previously recorded archaeological sites were encountered during this survey in the project area, other than the acequia itself, described above.

4.1.3. Description of Archaeological Sites not Relocated

No previously recorded archaeological sites were in the project Area of Potential Effect.

4.1.4. Description of Isolates

Seven IOs were encountered during survey. All seven IOs are located in the northeastern potential borrow area (see Figure 1.2 for the location of the borrow area, while confidential location of the IOs is presented in Appendix A, Table A.2 and Appendix A, Figure A.1). All IOs are lithic artifacts made from local materials. None are considered significant. Details on the IOs are presented in Figure 4.59 and Table 4.1. There are too few IOs to conduct a meaningful analysis.

Figure 4.59. Photographs of representative samples of the IOs. From top left to bottom right IO1, IO2, IO3, and IO4.

Table 4.1. Isolated Occurrences.

IO No.	Material	Type	Length (mm)	Width (mm)	Thickness (mm)
1	Chalcedony	Flake	21	18	3
2	Quartzite	Uniface	50	39	11
3a	Chert	Flake	13	11	3
3b	Chert	Flake	17	13	4
4	Quartzite	Flake	39	31	6
5	Quartzite	Flake	47	35	9
6	Chert	Flake	17	17	4
7	Quartzite	Flake	45	31	10

4.2. Interpretive Summary

In sum, the survey examined the portions of the West Puerto de Luna acequia that would be impacted by the proposed project. The survey identified no historic properties except for the acequia itself and seven isolated occurrences. However, only about seven acres were not previously disturbed due to construction (the diversion and staging area), a stock tank(northeastern borrow area), or use for a caliche source (western borrow area). Due to the limited survey area of undisturbed land, it is not surprising that only limited results were recovered. Outside of the acequia, there is insufficient information to form an interpretive summary of the prehistoric occupation of the area. The acequia and its history are detailed in Section 4.1.1.

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5. SUMMARY AND RECOMMENDATIONS

Lance Lundquist and Jonathan E. Van Hoose

5.1. Evaluation and Statement of Significance

The present survey examined the extent of the West Puerto de Luna acequia to be impacted by the proposed construction of a new replacement diversion structure, as well as use of the staging area and three proposed borrow areas. The project is on private land. To date, the Corps has received no indication of tribal concerns that would impact this project. No known Traditional Cultural Properties are known by the Corps to occur within the project area.

With the exception of seven Isolated Occurrences (IOs), a survey of the project area did not identify any historic properties aside from the acequia itself. The seven IOs consist of seven flakes and an informal uniface, all of local materials. The Corps considers none of the IOs to be significant and no further work is recommended for these IOs.

The Corps considers the Acequia to be eligible for listing on the National Register of Historic Places under Criterion (a) of 36 CFR 60.4, as irrigation features such as this one made possible the settling and farming of the area, and is thus associated with events that have made a significant contribution to the broad patterns of our history.

5.2. Effect Determination

Under 36 CFR 800.5, Assessment of Adverse Effects, examples are provided in subsection (2) and include seven examples of adverse effects to historic properties. As a construction project, this project has the potential to affect the West Puerto de Luna acequia. The criteria of adverse effect pursuant to the seven examples of types of adverse effects as listed in 36 CFR 800.5 (a)(2) are applied below.

(i) Physical destruction of or damage to all or part of the property;

The proposed project involves removing the remains of the failed diversion structure and its associated features, and replacing it with a new one in the same location as the failed dam. The Corps considers the failed diversion structure to lack integrity as a contributing element to the acequia system, as it was mostly washed out due to flooding in 2006.

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;

The Secretary of the Interior's Standards for the treatment of historic properties include four types of treatments: preservation, rehabilitation, restoration, and reconstruction (36

CFR 68; see also Weeks and Grimmer 1995). The Corps cannot rebuild the diversion structure to any of the Secretary's standards, as diversion structures of this size are regulated by the Office of the State Engineer Dam Safety Bureau and must meet current State standards for dam construction and safety.

(iii) Removal of the property from its historic location;

This category does not apply to this project. The acequia and the diversion will remain in their current locations.

(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

This project would change the physical features of the diversion structure. However, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. The current diversion structure lacks integrity and in its current condition is not a contributing element to the acequia's historic significance.

(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

This category does not apply to this project. The diversion structure sits on private land in a rural setting owned largely by a ranch that has granted access for this project. Any visual, atmospheric, or audible elements would be temporary during construction.

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

This category does not apply to this project.

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

This category does not apply to this project.

5.3. Summary and Recommendations

Without this project, this historic acequia cannot be used for its intended function, as water will not flow in the acequia without a new diversion structure; indeed, the acequia has not been able to function since the breach three years ago. The Corps cannot rehabilitate the diversion structure to any of the Secretary's standards, as diversion structures of this size are regulated by the Office of the State Engineer Dam Safety Bureau and must meet State standards for dam construction and safety. Therefore, this project would change the physical features of the previous diversion structure, although in its current condition, the diversion structure lacks integrity and cannot be considered a contributing element to the

acequia's historic significance. With the exception of the diversion structure and associated features, this project will not affect the acequia system.

Although the dam must be constructed to modern standards, the proposed dam would retain the same basic form, placement, and function, and would also be of earthern berm design. Included in the enclosed report is a detailed documentation of what remains of the existing diversion structure and associated structures, with the purpose of recording for historic research value. Given (1) the lack of integrity of the diversion structure; (2) the fact that it will be rebuilt in the same place using similar materials (i.e., relatively similar form, same function and alignment); (3) the fact that it will allow this historic property to function; and (4) provided the enclosed documentation of the failed diversion structure that serve to document its historic aspects, the Corps is of the opinion that the proposed project will have no adverse effect to the West Puerto de Luna acequia system or to other historic properties in the area. The Corps recommends the project be allowed to move forward.

Should previously undiscovered artifacts or features be discovered during construction, work will stop in the immediate vicinity of the find, a determination of significance made, and consultation would take place with the New Mexico State Historic Preservation Office and with Native American groups that may have concerns in the project area, to determine the best course of action.

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REFERENCES

Ackerly, Neal W.
1996 *A review of the historic significance and management recommendations for preserving New Mexico's acequia systems*. Report prepared by Dos Rios Consultants, Inc. for the New Mexico Historic Preservation Division, Santa Fe. http://www.nmacequiacommission.state.nm.us/Publications/nackerly_aceq_rpt96.pdf .

Baxter, John O.
1997 *Dividing New Mexico's Waters, 1700-1912*. University of New Mexico Press, Albuquerque.

Beachum, Larry
1982 William Becknell, Father of the Santa Fe Trade. *Southwestern Studies Monograph No. 68*. Texas Western Press, University of Texas at El Paso.

Boyle, Susan Calafate
1994 *Comerciantes, Arrieros, y Penones: The Hispanos and the Santa Fe Trade*. Professional Papers No. 54. Special History Study, Santa Fe National Historic Trail. Division of History, Southwest Cultural Resources Center, Southwest Regional Office, National Park Service, U.S. Department of the Interior. U.S. Government Printing Office, Washington, D.C.

Brown, David E.
1982 *Desert Plants: Biotic Communities of the American Southwest-United States and Mexico*. University of Arizona, Superior, Arizona.

Brown, David E. and C.H. Lowe.
1977 *Biotic Communities of the Southwest Map*. USDA Forest Service, Ft. Collins, Colorado.

Cabeza de Baca, Fabiola
1958 Puerto de Luna. In *New Mexico Magazine*. Volume 36, No. 10 (October). p.20, 42-43

Chávez, Fray Angélico
1955 Early Settlements in the Mora Valley. In *El Palacio*. Vol. 62, No. 11. Museum of New Mexico. Santa Fe. pp.318-323.

City-data.com
2009 Profiles- New Mexico Smaller Cities, Towns, and Villages (between 1000 and 6000 residents). http://www.city-data.com/city/Santa-Rosa-New-Mexico.html (accessed: 27 August 2009)

Clark, Ira G.
1987 *Water in New Mexico: A History of Its Management and Use*. University of New Mexico Press, Albuquerque.

Cordell, Linda S.
1997 *Archaeology of the Southwest*. Second Edition. Academic Press, Inc. San Diego.

1984 *Prehistory of the Southwest*. School of American Research. Academic Press, Inc. San Diego.

Coues, Elliot, Editor
1898 *The Journal of Jacob Fowler*. Ross and Haines, Minneapolis.

deBuys, Willaim
1985 *Enchantment and Exploitation: The Life and Hard Times of a New Mexico Mountain Range*. University of New Mexico Press. Albuquerque.

Emory, Lieutenant William H.
See U.S. Army Corps of Topographical Engineers.

Everhart, Gregory D.
2009 *A Cultural Resources Inventory of 7.8 Acres for an Acequia Rehabilitation Project on the East Puerto De Luna Community Ditch, Guadalupe County, New Mexico*. Report No. USACE-ABQ-2009-012 (NMCRIS Report No. 115353. Prepared for the U.S. Army Corps of Engineers, Albuquerque District, Albuquerque.

Frazer, Robert W.
1972 Purveyors of Flour to the Army: Department of New Mexico, 1849-1861. . In *New Mexico Historical Review*, Vol. 47, No. 3 (July). Albuquerque. p.213-238.

Flint, Richard and Shirley Cushing Flint
2002 Fort Union and the Economy of Northern New Mexico, 1860-1868. In *New Mexico Historical Review*, Vol. 77, No. 1 (Winter). Albuquerque. p. 27-55.

GAO, see U.S. General Accounting Office (GAO)

Goetz, Otto
1948 Santa Rosa, New Mexico. In *New Mexico Historical Review*. Vol. 23, No. 3; p165-176. Albuquerque.

Goodrich, James W.
1972 Revolt at Mora, 1847. In *New Mexico Historical Review*, Vol. 47, No. 1 (January). Albuquerque. p. 49-60.

Gregg, Josiah
1967 *The Commerce of the Prairies*. Milo Milton Quaife, Editor. A Bison Book, University of Nebraska Press, Lincoln.
1954 *The Commerce of the Prairies*. Max L. Moorhead, Editor. University of Oklahoma Press, Norman.

Gunnerson, James H.
1979 Southern Athapaskan Archeology. In *Handbook of North American Indians: Southwest*. Volume 9. Alfonso Ortiz, Editor. Smithsonian Institution, Washington, D.C. p.162-169.
1987 *Archaeology of the High Plains*. Cultural Resources Series No. 19. U.S. Bureau of Land Management, Colorado State Office, Denver.

Gunnerson, James H. and Dolores A. Gunnerson
1988 *Ethnohistory of the High Plains*. Cultural Resources Series No. 26. U.S. Bureau of Land Management, Colorado State Office, Denver.

Hofman, Jack L., Robert L Brooks, Joe S. Hays, Douglas W. Owsley, Richard L. Jantz, Murray K. Marks, and Mary H. Manhein
1989 *From Clovis to Comanchero: Archeological Overview of the Southern Great Plains*. Arkansas Archeological Survey Research Series No. 35. Prepared by the Oklahoma Archeological Survey of the University of Oklahoma and the Louisiana State University, with the Arkansas Archeological Survey. Submitted to the U.S. Army Corps of Engineers, Southwestern Division. Ft. Worth.

Horn, Calvin
1963 *New Mexico's Troubled Years: The Story of the Early Territorial Governors*. Horn & Wallace, Albuquerque.

Huckell, Bruce B.
1996 The Archaic Prehistory of the North American Southwest. In *Journal of World Prehistory*. Vol. 10, No. 3, pp. 305-373. Plenum Press. New York.

Irwin-Williams, Cynthia
1973 The Oshara Tradition: Origins of Anasazi Culture. In *Contributions in Anthropology* No. 5(1). Eastern New Mexico University, Portales, New Mexico.

Jelinek, Arthur J.
1967 *A Prehistoric Sequence in the Middle Pecos Valley, New Mexico*. Anthropological Papers, No. 31. Museum of Anthropology, University of Michigan. Ann Arbor.

Judge, W. James
1973 *PaleoIndian Occupation of the Central Rio Grande Valley in New Mexico*. University of New Mexico Press, Albuquerque.

Judge, W. James and Jerry Dawson
1972 PaleoIndian Settlement Technology in New Mexico. In *Science*, No. 176, p.1210-1216.

Julyan, Robert
1996 *Place Names of New Mexico*. University of New Mexico Press. Albuquerque.

Keleher, William A.
1984 *Maxwell Land Grant: A New Mexico Item*. University of New Mexico Press, Albuquerque.

Kenner, Charles L.
1994 *The Comanchero Frontier: A History of New Mexican-Plains Indian Relations*. University of Oklahoma Press, Norman. [Paperback 1994, original 1969].

Kessell, John L.
2002 *Spain in the Southwest: A Narrative History of Colonial New Mexico, Arizona, Texas, and California*. University of Oklahoma Press, Norman.
1979 *Kiva, Cross, and Crown: The Pecos Indians and New Mexico, 1540-1840*. U.S. Department of the Interior, National Park Service, Washington, D.C.

Knowlton, Clark S.
1980 The Mora Land Grant: A New Mexican Tragedy. In *Journal of the West*. Vol. 27, No. 3. p.59-73.

Lavender, David
1954 *Bent's Fort*. Doubleday, New York.
1992 Bent's Fort, Outpost of Manifest Destiny. In *The Santa Fe Trail, New Perspectives*. Colorado Historical Society, Denver. University Press of Colorado, Niwot.

Levine, Frances
1987 Historical Overview of the Upper Pecos River Basin. In *Archaeological Investigations at Los Esteros Reservoir, Northeastern New Mexico*. Ward, Schelberg, and Widdison, Editors.

Levine, Frances and Charles M. Mobley
1976 *Archaeological Resources at Los Esteros Lake, New Mexico*. Southern Methodist University, Institute for the Study of Earth and Man, Department of Anthropology. Contributions in Anthropology, (Report) No. 17. Dallas. Submitted to National Park Service, Southwest Region.

Loomis, Noel M. and Abraham P. Nasatir
1967 *Pedro Vial and the Roads to Santa Fe*. University of Oklahoma Press, Norman.

McClure, Charles R.
1973 The Texas-Santa Fe Expedition of 1841. In *New Mexico Historical Review*, Vol. 48, No. 1 (January). Albuquerque. p. 45-56.

Miller, Darlis A.
1989 *Soldiers and Settlers: Military Supply in the Southwest, 1861-1885*. University of New Mexico Press, Albuquerque.

Murphy, James W.
1972 The U.S. Army in Taos, 1847-1852. In *New Mexico Historical Review*, Vol. 47, No. 1 (January). Albuquerque. p. 33-48.

Myrick, David F.
1970 *New Mexico's Railroads: An Historical Survey*. Colorado Railroad Museum, Golden, Colorado.

New Mexico Bureau of Geology and Mineral Resources
2005 Geologic Map of New Mexico, 2003, Scale 1:500,000. Available at: http://geoinfo.nmt.edu/publications/maps/geologic/state/home.cfm#download

New Mexico Department of Game and Fish
2006 *Comprehensive Wildlife Conservation Strategy for New Mexico*. New Mexico Department of Game and Fish. Santa Fe, New Mexico. 526 pp + appendices. Available: http://fws-nmcfwru.nmsu.edu/cwcs/New_Mexico_CWCS.htm

New Mexico Department of Game and Fish
2009 New Mexico Species List/Species Account – BISON-M. http://www.bisonm.org (Accessed: 22 June 2009).

New Mexico Environmental Department Surface Water Quality Bureau
2005 Final Approved Total Maximum Daily Load (TMDL) for the Pecos Headwaters Watershed. Ft. Sumner Reservoir to Headwaters. Available: http://www.nmenv.state.nm.us/SWQB/Pecos/Upper/PecosHeadwatersTMDL.pdf

Nostrand, Richard L.
1992 *The Hispano Homeland*. University of Oklahoma Press. Norman.
1987 The Century of Hispano Expansion. In *New Mexico Historical Review*, Vol. 62, No. 4 (October). Albuquerque. p. 361-386.

Nuttall, Zelia
1922 Royal Ordinances Concerning the Laying Out of New Towns. In *The Hispanic American Historical Review*. Vol. 5. Williams & Wilkins, Baltimore. p.249-254.

Pratt, Boyd C. and David H. Snow
1988 *The North Central Regional Overview: Strategies for the Comprehensive Survey of the Architectural and Historic Archaeological Resources of North Central New Mexico*. Volume 1. New Mexico Historic Preservation Division, Santa Fe.

Rivera, José A.
1998 *Acequia Culture: Water, Land, and Community in the Southwest*. University of New Mexico Press, Albuquerque.

Rodríguez, Sylvia
2006 *Acequia: Water Sharing, Sanctity, and Place*. School for Advanced Research Press, Santa Fe.

Schubert, Frank N.
1980 *Vanguard of Expansion: Army Engineers in the Trans-Mississippi West, 1819-1879*. Historical Division, Office of Administrative Services, Office of the Chief of Engineers, Department of the Army, Washington, D.C.

Sebastian, Lynne and Signa Larralde
1989 *Living on the Land: 11,000 Years of Human Occupation in Southeastern New Mexico*. Cultural Resources Series No. 6. Prepared for the Roswell District of the U.S. Bureau of Land Management, Santa Fe. Submitted by University of New Mexico, Office of Contract Archeology, Albuquerque.

Simmons, Marc
1988 *New Mexico: An Interpretive History*. University of New Mexico Press, Albuquerque.
1979 Settlement Patterns and Village Plans in Colonial New Mexico. In *New Spain's Far Northern Frontier*, David J. Weber, Editor. University of New Mexico Press, Albuquerque. p.99-115.

Simmons, Alan H., Ann Lucy Wiener Stodder, Douglas D. Dykeman, and Patricia A. Hicks
1989 *Human Adaptations and Cultural Change in the Greater Southwest: An Overview of Archeological Resources in the Basin and Range Province*. Arkansas Archeological Survey Research Series No. 32. Prepared by the Desert Research Institute, Quaternary Sciences Center, University of Nevada, Reno, and the Bureau of Anthropological Research University of Colorado, Boulder, with the Arkansas Archeological Survey, Fayetteville. Submitted to the U.S. Army Corps of Engineers, Southwestern Division. Ft. Worth.

Spielmann, Katherine, Editor
1991 *Farmers, Hunters, and Colonists: Interactions between the Southwest and the Southern Plains*. University of Arizona Press, Tucson.

Stuart, David E. and Rory P. Gauthier
1984 *Prehistoric New Mexico: Background for Survey*. State of New Mexico, Office of Cultural Affairs, Historic Preservation Division and the New Mexico Archeological Council. Santa Fe.

Thomas, Alfred Barnaby
1966 *After Coronado: Spanish Exploration Northeast of New Mexico, 1696-1727*. 2nd Edition. University of Oklahoma Press, Norman.

Thompson, Enid
1979 Life in an Adobe Castle, 1833-1849. In *Bent's Old Fort*. The State Historical Society of Colorado, Denver.

Thompson, Gerald
1976 *The Army and the Navajo: The Bosque Redondo Reservation Experiment, 1863-1868*. The University of Arizona Press, Tucson.

Twitchell, Ralph Emerson
1976 *The History of the Military Occupation of the Territory of New Mexico from 1846 to 1851*. Arno Press, New York.

U.S. Army Corps of Engineers
1996 *Final Environmental Assessment: Rehabilitation of Puerto De Luna East Side Ditch, Guadalupe County, New Mexico*. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico.
2000 *Final Environmental Assessment, Acequia Rehabilitation Program: Rehabilitation of an Irrigation Flume for the Puerto De Luna East Side Acequia, Guadalupe County, New Mexico*. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico.
2003 *Final Environmental Assessment: West Puerto de Luna Community Ditch Pipeline Rehabilitation, Guadalupe County, New Mexico*. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico.
2009 *Draft Environmental Assessment for the West Puerto de Luna Acequia Rehabilitation Project, Guadalupe County, New Mexico*. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico.

U.S. Army Corps of Topographical Engineers (Emory, Lieutenant William H.).
1951 *Lieutenant Emory Reports: A Reprint of Lieutenant W. H. Emory's Notes of a Military Reconnaissance.* Introduction and Notes by Ross Calvin. University of New Mexico Press, Albuquerque.

U.S. Department of Agriculture, Natural Resources Conservation Service
2009 Online Soil Survey for Guadalupe County. http://websoilsurvey.nrcs.usda.gov/app/ (Accessed: 10 April 2009).

U.S. General Accounting Office (GAO)
2001 *Treaty of Guadalupe Hidalgo: Definition and List of Community Land Grants in New Mexico*. Report to Congressional Requesters. GAO-01-951. Washington, D.C.

Utley, Robert M.
1962 *Fort Union National Monument*. Historical Handbook No. 35. U.S. Department of the Interior, National Park Service, Washington, D.C.

Van Ness, John R., Editor
1980 *Journal of the West*. Vol 19, No. 3.

Ward, Albert E., John D. Schelberg, and Jerold G. Widdison, editors.
1987 *Archaeological Investigations at Los Esteros Reservoir, Northeastern New Mexico. Contributions to Anthropological Studies No. 4*. Center of Anthropological Studies, Albuquerque. Prepared for the National Park Service, Southwest Regional Office, and the U.S. Army Corps of Engineers, Albuquerque District.

Weber, David J.
1992 *The Spanish Frontier in North America*. Yale University Press, New Haven.
1971 *The Taos Trappers: The Fur Trade in the Far Southwest, 1540-1846*. University of Oklahoma Press, Norman.

Wentworth, Edward Norris
1948 *America's Sheep Trails: History, Personalities*. Iowa State College Press, Ames.

Winter, Joe
1988 *Stone Circles, Ancient Forts, and Other Antiquities of the Dry Cimarron Valley: A Study of the Cimarron Seco Indians.* Lynne Sebastian and June-el Piper, Editors. New Mexico Historic Preservation Division, Santa Fe.

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APPENDIX A

CONFIDENTIAL SITE LOCATION DATA

— FOR OFFICIAL USE ONLY —

The public disclosure of the location of archaeological sites on state and private lands is prohibited by Section 18-6-11.1 NMSA 1978. Public disclosure of archaeological site locations is federally prohibited by 16 USC 470hh (36 CFR 296.18).

If the pages in this appendix are missing, then this copy was intended for public distribution.

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US Army Corps of Engineers
Albuquerque District
South Pacific Division

Appendix D
Public Review Comments

NEW MEXICO
ENVIRONMENT DEPARTMENT

Office of the Secretary

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RON CURRY
Secretary
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December 8, 2009

Ms. Sarah Beck
Environmental Resources Section
Department of Army
Albuquerque District, Corps of Engineers
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

RE: Review of Draft Environmental Assessment for West Puerto de Luna Acequia Renovation, Guadalupe County (NMED File No. 3095 ER)

Dear Ms. Beck:

Your letter regarding the above named project was received in the New Mexico Environment Department (NMED) and was sent to various Bureaus for review and comment. Comments were provided by the Ground Water Bureau, Surface Water Quality Bureau, and Air Quality Bureau and are as follows.

Ground Water Quality Bureau
GWQB staff reviewed the above-referenced document as requested, focusing specifically on the potential effect to ground water resources in the area of the proposed project.

The project description notes that a diversion dam was destroyed by flooding in 2006, leaving individuals without access to irrigation water. The renovation project will involve the construction of a new earthen dam.

It is unlikely that implementation of this project would have any adverse effect on ground water quality in the area: However, the project is likely to involve the use of heavy equipment. The use of heavy equipment could result in contaminant releases (e.g., fuel, hydraulic fluid, etc.) associated with equipment malfunctions. The GWQB advises all parties involved in the project to be aware of notification requirements for accidental discharges contained in 20.6.2.1203 NMAC. Compliance with the notification and response requirements will further ensure the protection of ground water quality in the vicinity of the project.

Air Quality Bureau
The Air Quality Bureau has evaluated the information submitted with respect to the proposed rehabilitation of West Puerto de Luna irrigation ditch systems in Guadalupe County, New Mexico. Guadalupe County, NM is currently considered to be in attainment with all New Mexico and National Ambient Air Quality Standards.

To ensure air quality standards are met, applicable local or county regulations requiring noise and/or dust control must be followed; if none are in effect, controlling construction-related air quality impacts during projects should be considered to reduce the impact of fugitive dust and/or noise on community members.

Potential exists for temporary increases in dust and emissions from earthmoving, construction equipment and other vehicles. However, the increases should not result in non-attainment of air quality standards. Dust control measures should be taken to minimize the release of particulates due to vehicular traffic, construction, drilling procedures and reclamation activities. Areas disturbed by the construction activities, within and adjacent to the project area should be reclaimed to avoid long-term problems with erosion and fugitive dust.

All asphalt, concrete, quarrying, crushing and screening facilities contracted in conjunction with the proposed project must have current and proper air quality permits. For more information on air quality permitting and modeling requirements, please refer to 20.2.72 NMAC.

If air quality permits are required for the proposed action, permits will need to be administered by the New Mexico Environment Department (NMED).

The project as proposed should not be anticipated to contribute negatively to air quality on a long-term basis.

Surface Water Quality Bureau
As indicated in the Draft Environmental Assessment (EA), storm-water discharges associated with construction are regulated under Section 402 of the Federal Clean Water Act (CWA; 33 U.S.C. 1251 *et seq.*) under the National Pollution Discharge Elimination System (NPDES). A Storm Water Pollution Prevention Plan (SWIPP) is thus required.

The EA also states this project falls under the Irrigation Exemption for provisions of Section 404 of the CWA (33 CFR 323.4) and therefore a 401 water quality certification is not required.

Best Management Practices to protect water quality will be contained within the SWIPP and these should mitigate potentially adverse impacts due to project implementation.

I apologize for the delay in responding to you and hope this information is helpful.

Sincerely,

Julie Roybal for
Georgia Cleverley
NMED File #3095