Appendix A
Cultural Resource Consultation

Appendix A contains:

- USACE Consultation Letter to Pueblo of Santa Ana Tribal Historic Preservation Office with THPO Concurrence and Enclosures

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

February 23, 2015

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

Dr. Phillip Shelley
Tribal Historic Preservation Officer
Pueblo of Santa Ana
2 Dove Road
Santa Ana Pueblo, New Mexico 87004

Dear Dr. Shelley:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, in consultation and coordination with the Pueblo of Santa Ana (Pueblo), is continuing our 54 U.S.C. § 306108 ("Section 106") consultation regarding the Tamaya Drainage Project, located on lands within the Pueblo of Santa Ana Reservation, Sandoval County, New Mexico. An Environmental Assessment was prepared for the Tamaya Drainage Project in April 2013 (http://www.spa.usace.army.mil/Missions/Environmental/EnvironmentalComplianceDocuments/EnvironmentalAssessmentsFONSI.aspx). The Tamaya Drainage Project requires wetland mitigation; due to potential problems with the originally proposed wetland mitigation site located near the Jemez Weir, the Pueblo and Corps have agreed to a new location further to the west and north of U.S. Highway 550. The Corps is the lead Federal agency for the proposed rehabilitation project and for consultation purposes under 54 U.S.C. § 306108 ("Section 106") of the National Historic Preservation Act of 1966 (16 U.S.C. § 470 et seq. re-designated as 54 U.S.C. § 300101 et seq. on December 19, 2014). This consultation is in regard to the newly proposed wetland mitigation site and will be used in the preparation of a Supplemental Environmental Assessment for the project.

Pursuant to 36 CFR 800.2, consulting parties in the Section 106 process for the Tamaya Drainage Project and the new wetland mitigation pond project area include the Corps, your office, and the U.S. Bureau of Indian Affairs. Since the project is located entirely within Pueblo lands, scoping letters were not sent to other tribes.

The newly proposed wetland mitigation site is located on Pueblo lands northwest of the Pueblo's ancestral village of Tamaya, on the south side of the Jemez River and north of U.S. Highway 550. The Project area is located within the south 1/2 of Section 7 and the north 1/2 of Section 18, Township 14 North, Range 3 East of the New Mexico Prime Meridian, as shown on USGS 7.5-Minute quadrangle map: Bernalillo NW (35106-d6; Enclosure 1). Pursuant to 36 CFR 800.4, the Area of Potential Effects (APE) include the existing earthen, two-track access road; an area around an existing water well; the proposed alignment of the waterline that will be along the access road; and the location proposed for the 2.0-acre wetland mitigation pond, all

covering an area of approximately 3.0 acres. The proposed location for the wetland mitigation pond is in an upland area and would utilize the Pueblo's existing water well to provide water to the new pond as mitigation for the removal of wetland habitat that currently exists immediately adjacent to the village of Tamaya. Small staging areas will be located adjacent to the existing well and proposed pond. The Pueblo is in agreement with the use of these areas for the project.

On December 10, 2013, a Corps archaeologist conducted at literature search and review of the New Mexico Cultural Resources Inventory System database and map server (Enclosure 4; FOR OFFICIAL USE ONLY). Several archaeological surveys have been conducted in the vicinity of the proposed wetland mitigation pond project area. These include the survey for the U.S. Highway 550 right-of-way, and surveys sponsored by the U.S. Bureau of Land Management and Bureau of Indian Affairs for the alignments of utility pipelines that cross Pueblo lands (NMCRIS No's. 58, 48964, 52635, 55159, and 71831). Two archaeological sites are near the project area: the LA116084 prehistoric archaeological site is reported to occur near the mitigation site's access road and the old 1920s-1940s railroad grade of the historic, abandoned Santa Fe Northwestern Railway (LA138836) is located near the proposed mitigation pond. Searches of the State Register of Cultural Properties, National Register of Historic Places, and the NMCRIS database found that there are no other historic properties reported to occur within or immediately adjacent to the project area.

The LA116084 site, located near the access road, is reported to be a small prehistoric lithic scatter that consists of lithic debitage from stone tool manufacturing and fire-cracked rock. The site has partially been disturbed in the past and no eligibility determinations have been made. The Corps would make no modifications to the access road near this location and therefore, is of the opinion that use of the access road to access the project area would result in no adverse effect to the LA116084 site. The Corps is seeking your concurrence with our determination.

The north side of the proposed mitigation pond will be constructed near the south side of the old 1920s-1940s railroad grade (LA138836) of the historic, abandoned Santa Fe Northwestern Railway (SFNW), a branch line of the Atchison, Topeka, and Santa Fe (AT&SF) Railroad (Glover 1990; Myrick 1970:175-176). Several segments of the old SFNW railroad grade have been previously recorded with site numbers including LA57408, LA74777, LA78691, LA109131, as well as LA138836, the location where the Jemez Weir access road crosses the grade (Everhart 2001). Previous consultation on other Pueblo projects between Pueblo of Santa Ana tribal representatives, the Pueblo's Department of Natural Resources, Earth Analytic Inc. (a cultural resources contractor to the Pueblo) and the Corps has determined that the Pueblo of Santa Ana has no concerns regarding the old railroad grade (Enclosures 2 and 3). The Pueblo of Santa Ana has sparingly and traditionally utilized portions of old railroad grade as an access road since the railroad was abandoned in the early 1940s. By "old railroad grade," we mean the previously disturbed area that includes the old railroad grade and its service road. The Pueblo uses this old grade/service road for activities such as monitoring cattle and reservation property. The Corps has been using the archaeological site number LA138836 to represent the entire railroad grade alignment that is located within the Pueblo of Santa Ana Reservation.

The construction of the proposed mitigation pond requires excavation and construction of a berm to enclose the new wetland pond at a location a short distance south of the LA138836

railroad grade. An existing pipe located nearby that drains storm water flows from the south side of the railroad grade, under the LA138836 railroad grade, to a detention basin on the north side of the railroad grade needs to be replaced. The proposed project calls for the installation of a new 8-inch corrugated metal pipe with a round dome inlet. The Corps is of the opinion that construction of the proposed wetland mitigation pond and installation of the new pipe would result in no adverse effect to the historic railroad grade and associated detention pond. The Corps is seeking your concurrence with our determination.

On January 22, 2014, the Corps met with Pueblo representatives including your office to conduct a site visit of the new wetland mitigation pond project area. Your office indicated that you had previously conducted an archaeological survey of the proposed project area and that your survey did not document any new historic properties or previously recorded sites. At that time, your office was also of the opinion that use of the access road to access to the project area would result in no adverse effect to the LA116084 site and that construction of the pond and installation of the culvert would result in no adverse effect to the LA138836 railroad grade and associated detention pond. During project planning, consultation with your office indicated that no traditional cultural properties would be affected by the project.

In summary, the Corps is seeking your concurrence with our determinations that use of the existing access road that is adjacent to the LA116084 lithic site and that construction of the wetland pond adjacent to and installation of the new culvert under the historic LA138836 railroad grade would result in No Adverse Effect to Historic Properties. There would also be no effect to other historic properties or traditional cultural properties that occur on Pueblo of Santa Ana lands.

If you have any questions or require additional information regarding the proposed Tamaya Drainage Project's wetland mitigation pond, please contact Mr. Gregory D. Everhart, Archaeologist, at (505) 342-3352 or by email at gregory.d.everhart@usace.army.mil or me at (505) 342-3281 or by email at julie.alcon@usace.army.mil. You may also provide comments to the above address.

Sincerely,

Julie Alcon
Chief, Environmental Resources Section

Enclosures

Concur _____ 2/25/15
Dr. Phillip Shelley — Date
Tribal Historic Preservation Officer
Pueblo of Santa Ana

Copy Furnished w/Enclosures:

Honorable Lawrence Montoya
Governor, Pueblo of Santa Ana
2 Dove Road
Santa Ana Pueblo, New Mexico 87004

Dr. Bruce Harrill
Regional Archaeologist
U.S. Bureau of Indian Affairs
Southwest Regional Office
1001 Indian School Road NW
Albuquerque, New Mexico 87104

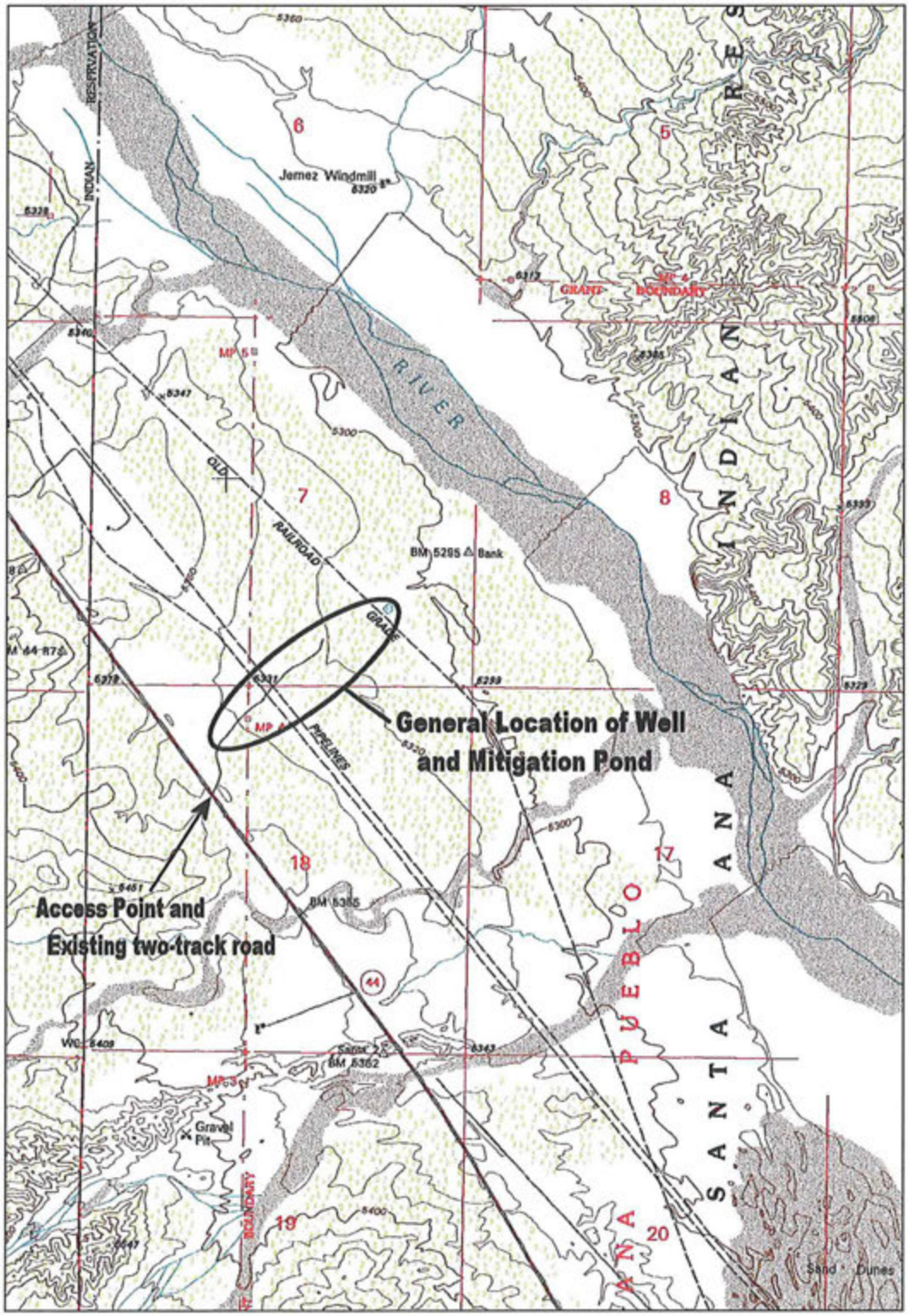
References

Everhart, Gregory D.
2001 **A Cultural Resources Inventory of 29.2 Acres for Riparian and Wetland Restoration, Pueblo of Santa Ana Reservation, New Mexico**. Corps Report No. COE-2001-03 (NMCRIS No. 74826). U.S. Army Corps of Engineers, Albuquerque District, Albuquerque.

Glover, Vernon J.
1990 **Jemez Mountains Railroads: Santa Fe National Forest, New Mexico**. Historical Society of New Mexico. Santa Fe.

Myrick, David F.
1970 **New Mexico's Railroads: An Historical Survey**. Colorado Railroad Museum, Golden, Colorado, pp.175-176.

Enclosure 1: Tamaya Drainage Project: General location of the well and upland mitigation pond project area; adapted from USGS 7.5-Minute quadrangle map: Bernalillo NW (35106-d6).



Enclosure 2: Pueblo of Santa Ana letter to SHPO (HPD Consultation No. 63237), Re: avoidance of sites for fenceline construction project and the old SFNW railroad grade (LA78691 / LA138836), dated September 12, 2001, with February 7, 2003 SHPO response.

SANTA ANA PUEBLO
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Office of the:
Governor
Lt. Governor
Secretary

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Mr. Elmo Baca
State Historic Preservation Officer
New Mexico State Historic Preservation Bureau
228 East Palace Avenue, Room 101
Santa Fe, New Mexico 87503

63237

September 12, 2001

Dear Mr. Baca:

Please find enclosed a final report and site records for a cultural resources assessment survey conducted by archaeologists from Earth Analytic, Inc. on lands within the Pueb of Santa Ana Reservation. The report is entitled **A Cultural Resources Assessment of Areas to be Impacted by the Rio Jemez WHIP Project at the Pueblo of Santa Ana, Bernalillo County, New Mexico**, and was written by William Penner, Brenda Baletti, Berenika Byszewski, and Wetherbee Dorshow. The survey was requested by the Pueblo of Santa Ana's Department of Natural Resources, working in cooperation with the US Army Corps of Engineers Albuquerque District, pursuant to Federal regulations requiring cultural resource studies for federally funded large-scale projects.

The survey area consists of four fence line segments with a combined length of approximately 11.78 miles (18.97 km) in length, and 40 feet (12.2m) in width, a 0.2 acre parcel slated for a proposed water catchment, and a 1.14 mile (1.84 km) road segment, 15 feet (4.6m) in width, connecting the latter with an existing road. The entire study area was subjected to a 100-percent-coverage cultural resources inventory survey, resulting in the identification of 19 archaeological sites and 36 isolated occurrences. The field designations and Laboratory of Anthropology identification numbers for the nineteen sites are as follows: EA 41.01 (LA133478), EA 41.02 (LA133488), EA 41.03 (LA133489), EA 41.04 (LA78691), EA 41.05 (LA133492), EA 41.06 (LA133493), EA 41.07 (LA133494), EA 41.08 (LA133495), EA 41.09 (LA133496), EA 41.10 (LA133497), EA 41.11 (LA133498), EA 41.12 (LA133499), EA 41.13 (LA133500), EA 41.14 (LA133501), EA 41.15 (LA133502), EA 41.16 (LA133503), EA 41.17 (LA133504), EA 41.18 (LA133505), EA 41.19 (LA133506).

Based on a formal agreement between Earth Analytic, Inc. and the Pueblo of Santa Ana, all but one of the 19 sites will be completely avoided during project construction activities. The one exception is an historic railroad grade (EA 41.04 [LA78691]), which

Enclosure 2: continued, page 2 of 2.

previously was determined ineligible to the State Register of Cultural Properties and the National Register of Historic Places by the New Mexico State Historic Preservation office.

On August 23, 2001, representatives from (1) the US Army Corp of Engineers, Albuquerque District, (2) the Pueblo of Santa Ana Department of Natural Resources and (3) Earth Analytic, Inc. met to discuss the survey results and treatment recommendations. Based on this meeting and subsequent review of maps and a survey summary letter report by Ron Kneebone and archaeologists from the Corps of Engineers Albuquerque District, the Corps concurs with Earth Analytic. Inc.'s treatment recommendations for all project sites.

If you have any questions or require additional information please contact Jonathan Cote or Glenn Harper at the Pueblo of Santa Ana's Department of Natural Resources at 867-0615 or 867-1263. Thank you for your time and consideration.

Sincerely,

Roy Montoya
Tribal Administrator
Pueblo of Santa Ana

Concur with recommendation of
eligibility and/or effects as proposed.

Gwynette Duncan for
State Historic Preservation Officer
2/7/03

WE CONCUR WITH ALL ELIGIBILITY RECOMMENDATIONS EXCEPT LA 78691. THE RAILROAD, AS A WHOLE, IS PROBABLY ELIGIBLE, BUT THE PORTION WITHIN YOUR PROJECT AREA APPEARS TO BE NON-CONTRIBUTING DUE TO ITS LOSS OF INTEGRITY. PLEASE KEEP IN MIND THAT REPORTS INITIATED BY THE SECTION 106 PROCESS, SUCH AS THIS REPORT, NEED TO BE SUBMITTED TO OUR OFFICE BY THE LEAD FEDERAL AGENCY - IN THIS CASE THE CORPS OF ENGINEERS. THANK YOU FOR ALLOWING US THE OPPORTUNITY TO COMMENT.

Enclosure 3: Corps Section 106 consultation letter to SHPO, Re: Jemez Weir and Access Road and the old SFNW railroad grade (LA138836), dated July 21, 2003.

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
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Reply to Attention of:

July 21, 2003

Engineering and Construction Division
Environmental Resources Branch

Ms. Katherine Slick
State Historic Preservation Officer
New Mexico Historic Preservation Division
228 East Palace Avenue, Room 320
Santa Fe, New Mexico 87501

Dear Ms. Slick:

Pursuant to 36 CFR Part 800, the U.S. Army Corps of Engineers (Corps), Albuquerque District, in cooperation with the Pueblo of Santa Ana, is seeking your concurrence in our determination of "No Adverse Effect to Historic Properties" for the Rio Jemez Weir and Access Road Project located on the Pueblo of Santa Ana Reservation, Sandoval County, New Mexico. The project proposes to construct a weir across the Rio Jemez at the upstream end of the sediment pool at Jemez Canyon Dam and Reservoir to prevent erosion from proceeding up the Rio Jemez. The proposed project also provides for improvements to an existing access road that include gravel surfacing, straightening of sharp corners and grading to level high-low areas. The access road proceeds from U.S. Highway 550 to the weir construction site and two staging areas. This is one of a series of restoration projects being funded by the Corps that is the result of the partial evacuation of reservoir water at Jemez Canyon Dam in September 2000 (see enclosed Corps letter dated September 15, 2000 [NMHPD No. 060531]), and to the complete evacuation of stored reservoir water in the late summer and fall of 2001.

The Pueblo of Santa Ana contracted with Earth Analytic, Inc. of Santa Fe to perform the cultural resources survey and limited archaeological testing. The Rio Jemez Weir and Access Road Project's cultural resources report is entitled, **"A Cultural Resources Assessment of Approximately 70 Acres for the Weir and Access Road at the Pueblo of Santa Ana, Sandoval County, New Mexico,"** (Penner, Duncan, Byszewski, and Dorshow 2003 [Earth Analytic Report No. EA66.01; NMCRIS Number 79981]). Also enclosed is Corps Report No. COE-2003-05, that summarizes the cultural survey activities and the related reports pertaining to the projects being planned at the Pueblo of Santa Ana. Consultation regarding other proposed projects and their corresponding cultural resources reports that are related to the reservoir draw down will be transmitted to your office in the near future.

Enclosure 3: continued, page 2 of 5.

The Rio Jemez Weir and Access Road Project's cultural resources report covers the weir alignment, access road and staging areas for a total of 28.5 hectares (70.46 acres). During the survey, four archaeological sites were discovered within the alignment of the existing road (LA137047, LA137048, LA137049, LA137050) and one archaeological site (LA137046) was discovered near the southern end of the newly proposed weir alignment. Since the existing road crosses the four archaeological sites, limited archaeological testing was conducted at all four sites to determine their nature and extent. In consultation with the Pueblo of Santa Ana, it was determined that rather than realigning the road (to bypass the four sites) and risk the possibility of discovering other cultural resources, the most practical solution would be to utilize the existing access road that has been in use for many years, and cover the four sites with 18 to 24 inches of clear earthen fill material to protect the sites. During project construction, the road will be rehabilitated to an all-weather access road with road surfacing materials being placed over the clean, protecting fill material.

In consultation with the Pueblo of Santa Ana, artifacts that were discovered within the road construction area were collected, analyzed, and were reburied at a known location within the confines of the site but outside of the road right-of-way. Artifacts and cultural manifestations observed at the four sites are similar and include chipped-stone, ceramics, ground-stone, and charcoal stain features. The cultural resources survey and limited testing conducted between July 7 and October 2, 2002, covered 100 percent of the proposed construction area and access right-of-way.

Subsequent to the discovery of the LA137046 site near the southern end of the proposed weir, Corps engineers redesigned the proposed weir resulting in a slight realignment, moving the southern one-half of the proposed weir further downstream away from LA137046.

Prior to the survey, Earth Analytic conducted a search of the New Mexico Historic Preservation Division, Archeological Records Management Section's database, and found that numerous archaeological sites occur on Pueblo of Santa Ana lands, and that several recorded sites are located near the project area. In the project area, the access road crosses the old historic 1920's-1940's Santa Fe Northwestern Railroad grade. Earth Analytic reported a small segment of the railroad grade as LA138836 (Field Site No. EA41.04). Other segments of the old railroad grade have been previously recorded as LA57408, LA78691, LA74777 and LA109131, and have previously been assessed and recommended as not eligible. The existing road crosses LA138836 at approximately a right angle. Consultation between Tribal

Enclosure 3: continued, page 3 of 5.

representatives of the Pueblo of Santa Ana, Department of Natural Resources, and Earth Analytic determined that the Pueblo of Santa Ana has no concerns regarding the old railroad grade (see enclosed Santa Ana Pueblo letter dated September 12, 2001 [NMHPD Correspondence No. 63237]). The Pueblo of Santa Ana has sparingly and traditionally utilized portions of old railroad grade as an access road since the railroad was abandoned in the early 1940's. By "old railroad grade," we mean the previously disturbed area that includes the old railroad grade and it's service road. The Pueblo uses this old grade/service road for activities such as monitoring cattle and reservation property. The old grade/service road (LA138836) would not be used for any of the proposed Corps projects. However, the Corps plans to utilize and rehabilitate the existing road that crosses the old railroad grade.

None of the other previously recorded sites would be impacted by the proposed project. Searches of the State Register of Cultural Properties and National Register of Historic Places found that there are no known historic properties reported to occur within or immediately adjacent to the project area. During project planning, consultation with Pueblo of Santa Ana Tribal representatives indicated that no traditional cultural properties would be affected by the project.

Earth Analytic recommended that sites LA137046, LA137047, LA137049, and LA137050 are eligible for inclusion to both the State and National Registers and that LA137048 was potentially eligible. The Corps agrees with Earth Analytic's eligibility recommendations for these sites.

During engineering design work on the Jemez Weir Access Road, it was determined that in several locations, eroding arroyos may threaten the road in the near future and therefore erosion control measures should be planned for. When the proposed locations for erosion control features were determined, Earth Analytic conducted a cultural resources survey of three areas, as well as an area where the road alignment was to be slightly realigned. The survey was conducted on April 16, 2003, covering a total of 20.7 hectares (51 acres). The cultural resources report is entitled, **"Cultural Resources Assessment of Proposed Erosion Control Measures for the 2003 Rio Jemez Weir Access Road Project, An Addendum to: A Cultural Resources Assessment of Approximately 70 Acres for the Weir and Access Road at the Pueblo of Santa Ana, Sandoval County, New Mexico,"** (Byszewski 2003 [Earth Analytic Report EA97; NMCRIS No. 83217]). During the survey, one archaeological site was discovered, LA139126; a lithic and ceramic artifact scatter with two thermal stain features.

Enclosure 3: continued, page 4 of 5.

The site has been significantly affected by surface water erosion with Earth Analytic estimating that only 30 percent of the site remains intact. The proposed erosion control structure for the primary arroyo in this area would be located about ten meters outside of the site boundary as defined by Earth Analytic. Pueblo of Santa Ana Tribal representatives originally had concerns and therefore visited the site; however, they determined that access to and from the location and the proposed installation of the erosion control structure, sheet piling to be driven into place with wire-wrapped, rock filled gabion baskets placed immediately downstream of the sheet piling, would not affect the archaeological site.

Earth Analytic recommended that LA139126 was potentially eligible for nomination to the State and National Registers. The Corps agrees that the site is potentially eligible and the Corps is of the opinion that installation of the proposed erosion control features would have no effect on the LA139126 site.

Archaeological monitoring will be conducted during all construction activities that occur in the vicinity of archaeological sites. Based on the information provided in Earth Analytic's reports and summarized above, the Corps is of the opinion that there would be "No Adverse Effect to Historic Properties" by the proposed project. Should previously unknown artifacts or cultural resource manifestations be encountered during construction, work would cease in the immediate vicinity of the resource, a determination of significance made, and a mitigation plan formulated in consultation with the Pueblo of Santa Ana and with your office pursuant to 36 CFR 800.11.

If you have any questions or require additional information, please contact Mr. Gregory Everhart, Archaeologist, at (505) 342-3352 or Dr. John D. Schelberg, Archaeologist, at (505) 342-3359.

Sincerely,

Julie A. Hall
Chief, Environmental Resources Branch

_____ I CONCUR _____

Date

KATHERINE SLICK
NEW MEXICO STATE HISTORIC
PRESERVATION OFFICER

Enclosures

Enclosure 3: continued, page 5 of 5.

-4-

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Appendix B
Clean Water Act Section 404 compliance

Appendix B contains:

- Wetland Mitigation Plan
- 404(b)(1) Analysis
- Water Quality Certification

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Mitigation Plan for the Tamaya Drainage Project, Sandoval County, New Mexico

Prepared by
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, New Mexico 87109

April, 2012- REVISED February, 2015

US Army Corps of Engineers®
Albuquerque District

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Distribution

This Revised Mitigation Plan is being distributed as part of the Supplemental Environmental Assessment (SEA) for the Tamaya Drainage Project in compliance with the National Environmental Policy Act (NEPA). The complete Distribution List appears in the SEA. This Mitigation Plan has been prepared in coordination and consultation with the Pueblo of Santa Ana, and distributed as follows:

Pueblo of Santa Ana Natural Resources Department

Pueblo of Santa Ana Tribal Historic Preservation Office

Pueblo of Santa Ana Office of the Governor

USACE, Albuquerque District Regulatory Program

Bureau of Indian Affairs

USFWS, New Mexico Ecological Services Field Office

USEPA

USDA NRCS

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1. Brief description of overall project:

In April 2013, the U.S. Army Corps of Engineers (USACE), Albuquerque District, completed an Implementation Report with Integrated Environmental Assessment (IR/EA) for the Tamaya Drainage Project in compliance with the National Environmental Policy Act (NEPA). That document, which includes the original wetland mitigation plan as Appendix B, is available at: http://www.spa.usace.army.mil/Missions/Environmental/EnvironmentalComplianceDocuments/EnvironmentalAssessmentsFONSI.aspx. Since the IR/EA was completed, it has become evident that the originally proposed wetland mitigation plan is technically infeasible. Therefore, this revised wetland mitigation plan has been prepared along with a Supplemental Environmental Assessment (SEA).

The Tamaya Drainage Project is proposed by USACE to provide a solution to the ponding of water within the Santa Ana Pueblo levee adjacent to the historic village of Tamaya. The proposed drainage project would fill the ponded area, which has developed into a wetland over the years. The purpose of this mitigation plan is to identify a mitigation alternative for the filled wetland that is technically feasible, economically practicable, environmentally sound, and acceptable to the Pueblo. The Pueblo of Santa Ana supports the proposed drainage project and this proposed mitigation plan to eliminate the nuisance and hazard of standing water adjacent to Tamaya Village and to compensate for unavoidable loss of aquatic resources when the pond is filled.

1.1. History:

During the design of Jemez Canyon Dam it was determined that Tamaya Village would be vulnerable to inundation during a large flood event or periods of high pool stages in Jemez Canyon Reservoir. The Santa Ana Pueblo levee was constructed around the village to prevent potential flooding. Since the levee was completed in 1954, seepage and elevated groundwater levels on the landward side of the levee have created a permanent wetland (pond) in close proximity to the village. Since the levee acts as a barrier, the pond does not drain naturally. The pond is considered to be an undesirable feature by the Pueblo due to stagnant water, unpleasant smells associated with anaerobic conditions, breeding mosquitoes, and the presence of a potential safety hazard adjacent to the historic village. An existing pump system is used as needed to drain the pond to prevent water from encroaching on structures within the village, during flood events, or at the request of the Pueblo. Also at the request of the Pueblo, spraying to control mosquitoes is done before important cultural events are held at Tamaya Village. The Pueblo has long desired a permanent and lower-maintenance solution to these issues. The USACE proposes to fill the pond using native material derived from either the excavated mitigation area, or sediments previously removed from the Rio Grande and stockpiled near the reservoir. The filled pond area would be planted with native shrubs and grasses to provide riparian habitat and an aesthetically pleasing area adjacent to the village.

1.2. Description of Mitigation Area:

A. Wetland Creation

The proposed compensatory mitigation would have two components, wetland creation and preservation. The first component wound entail the creation of a new 2-acre wetland in an upland

site, 3.1 miles upstream from Tamaya Village and pond (the impact site). Figure 1 shows the spatial relationship of these areas. The created wetland mitigation site would be located approximately 0.75 mile from the Jemez River in an area that is currently sparsely vegetated with native grasses and shrubs. The mitigation wetland would be created by excavating approximately 4 feet and lining the depression with a bentonite or geosynthetic clay liner (GCL) to obtain a depth of 3 feet in the deepest part of the wetland. An existing well would supply permanent water. The created wetland would be planted with species that occur in the impact area to create a similar plant community, with the addition of other species as suitable and available. Because of its location far from developed areas, it would provide a water source and habitat for wildlife that would not be subject to disturbance. Although spatially disjunct from the Jemez River riparian corridor and floodplain, the mitigation site would nevertheless be a valuable water source for larger animals and birds. It would provide a source of permanent water in this intermittent river system and would encourage game animals to utilize rangeland away from the riparian corridor, contributing to more effective game management for the Pueblo. The sides of the excavation would be sloped gently (10:1) to allow easy access to water for all types of wildlife. Because the Jemez River is intermittent in this reach, the permanent water source would be of great value to wildlife.

B. Herbaceous Wetland Preservation

The second component of the proposed mitigation is the preservation of 13.2 acres of wet sedge meadow on the right bank of the Jemez River, across the river from Tamaya Village. The sedge meadow is an emergent wetland community with saturated soils at a shallow depth (2” to 9” to groundwater on 3/23/12). Preservation would entail control of any encroaching invasive species, particularly salt cedar, and agreement by the Pueblo to leave the meadow in its current state.

The herbaceous wetland plant communities that have been mapped at this location in the past include:

Pre-weir map (ca. 2003)

ID	Vegetation Type	Acres
0	cattail strip on right bank	2.4
2	wet (sedge) meadow	26.1
3	wet meadow- downstream 1	5.4
4	wet meadow- downstream 2	9.4
Total right bank herbaceous wetlands at or near current sedge meadow		**43.3**

2005 map by New Mexico Natural Heritage Program (NMNHP)

ID	NMNHP Class	Acres
2	Threesquare Bulrush-Inland Saltgrass	11.4
3	Threesquare Bulrush - Common Spikerush	6.1
5	Inland Saltgrass Monotype	3.2
6	Common Spikerush - Juncus - Yerba Mansa	23.5
13	Narrowleaf cattail	1.7
Total right bank herbaceous wetland at current sedge meadow		**45.9**

In March 2012, Corps biologists delineated a wet meadow of approximately 64 acres in this area (see Figure 1 and Figure 3). The 2003 and 2005 vegetation maps included a patch of saltcedar-inland saltgrass community in the area that is currently wet meadow. Saltcedar is no longer a dominant species at this location due to removal efforts by the Pueblo of Santa Ana. This accounts for much of the difference in size of the herbaceous wetlands at this site. However, it is also possible that aggradation and a local rise in water table have increased the wetland acreage here. The pre-weir vegetation map considered part of the current wet meadow as upland.

2. Objectives

The objectives of this wetland mitigation plan are:

A) To construct and establish a wetland of similar structure and function to the resource that will be lost, the Tamaya Village pond. The mitigation wetland would be in-kind (replacement of the same wetland type) and on-site (in the same segment of the Jemez River as the impact site).

B) To preserve the wet meadow in its current state, managing the meadow to keep invasive saltcedar out and maintain the meadow as herbaceous wetland.

The Tamaya drainage project impacts are not within the service area of an approved mitigation bank or in-lieu-fee program; therefore, appropriate credits are not available for purchase. Compensatory mitigation will be accomplished by the USACE as described in this plan.

2.1. Description of Impact Site (Tamaya Pond).

Wetland delineation of the pond was performed by Corps biologists and Regulatory personnel twice. In 2002, the wetland area was delineated as 2.5 acres. In July 2011, the wetland was delineated as 3.3 acres. Wetland determinations and field forms are provided in Enclosure A. The impact area can be classified under the Cowardin system as a Palustrine emergent wetland. Part of the area is permanently flooded; however, the area of water fluctuates due to water management (pumping) as described above. Plants observed at the pond are reported in Table 1. The central area of the wetland is a cattail (*Typha*) community with a mix of cattail and approximately 40% open water. The wet edges and shallow water that ring the pond support bulrushes, spikerushes, Baltic rush, and yerba mansa. Wetland functions of the pond, as described in the Mitigation Ratio Checklist (Enclosure B) include surface water storage, dissipation of energy from runoff, cycling of nutrients, removal of elements and compounds, retention of particulates, and maintenance of plant and animal communities.

2.2. Mitigation Ratio

A mitigation ratio of 1.2:1 for the constructed wetland and 8:1 for the preservation of the wet meadow was derived using the USACE, South Pacific Division Regulatory Program checklist (Enclosure B). Using this ratio and mitigating for half the acreage with each method, the required mitigation area for the 3.3 acre impact site is a 1.98-acre constructed wetland plus 13.2 acres of wet meadow preserved. Table 2 summarizes the characteristics of the impact and mitigation areas.

2.3. Description of Mitigation Site

The mitigation site footprint has been planned to avoid impact to native vegetation and to take advantage of an existing well and railroad grade berm (see Figure 2). The existing well, known as the Zia boundary well, has been previously tested and demonstrated to have suitable water quality and quantity (see Groundwater Quality in the SEA, section 3.1.3.4).

Prior to selection of the recommended mitigation area, several other mitigation alternatives were considered and rejected due to technical infeasibility or prohibitive expense. The mitigation proposal that was analyzed in the original Environmental Assessment (USACE 2013) would have created a groundwater-fed wetland at the Jemez weir. However, in September 2013 the weir was damaged by a storm event, the third failure since its construction. USACE is currently designing a long-term solution to prevent channel incision and protect the riparian habitat upstream of the weir; until this solution is implemented, the area remains unstable and unsuitable for a constructed permanent wetland. Other in-kind mitigation alternatives considered but rejected included re-excavating the existing dry swale at the Jemez weir or establishing wetlands on the Rio Grande (off-site). A mitigation approach relying exclusively on wetland creation was proposed but rejected because the cost of the excavation required for a wetland this large would be prohibitive (see 6.2 Cost Effectiveness and Incremental Cost Analysis . An out-of-kind alternative, rehabilitation of areas of the wet meadow that still contain invasive saltcedar, was rejected due to its large mitigation ratio, which would have required a project area larger than the available habitat. None of these alternatives were determined to be viable or cost-effective, per correspondence between USACE and the Pueblo.

Table 1: Tamaya Pond plant species and indicator status

Scientific name	Common names	Origin	Wetland indicator status
Anemopsis californica	yerba mansa	Native	OBL
Typha domingensis	cattail	Native	OBL
Juncus arcticus var. balticus	baltic rush	Native	OBL
Eleocharis sp	spikerush	Native	OBL
Schoenoplectus pungens	common threesquare bulrush	Native	OBL
Muhlenbergia asperifolia	scratchgrass/ alkali muhly	Native	FACW-
Hordeum jubatum	foxtail barley	Native	FACW-
Elaeagnus angustifolia	Russian olive	Introduced	FACW-
Populus deltoides ssp. wislizenii	Rio Grande cottonwood	Native	FACW-
Tamarix sp.	saltcedar/ tamarisk	Introduced	NI
Sphaerophysa salsula	Swainsonpea	Introduced	NI
Xanthium strumarium	cocklebur	Introduced	NI
Melilotus alba	white sweet clover	Introduced	FACU
Distichlis spicata	inland saltgrass	Native	FACW

Table 2: Sedge meadow plant species and indicator status

Distichlis spicata	inland saltgrass	Native	FAC
Eleocharis sp	spikerush	Native	OBL
Juncuc arcticus var. balticus	baltic rush	Native	FACW
Schoenoplectus pungens	common threesquare bulrush	Native	OBL
Typha sp	cattail	Native	OBL
Tamarix sp.	saltcedar/ tamarisk	Introduced	NI
Anemopsis californica	yerba mansa	Native	OBL
Triglochin maritima	Seaside arrowgrass	Native	OBL

Table 3: Impact and Mitigation Area Comparison

Site	Before (existing) or after (proposed)?	Area non-wetland WoUS	Area wetland WoUS	Buffer	Non-aquatic mitigation (acres)	Hydrologic regime/ source	Vegetation type	Habitat type	Mitigation type	Cowardin system and classification
Impact	Before	0	3.3 ac	n/a	n/a	Ground-water	Cattail-bulrush-	pond	-	Palustrine emergent
Creation	After	0	1.98 ac	n/a	n/a	Pumped Ground-water	Cattail-bulrush	pond	Establish-ment	Palustrine emergent
Preservation	After	0	64 ac; 13.2 ac used for mitigation	n/a	n/a	Ground-water	Spikerush-saltgrass-bulrush	Wet meadow	Preser-vation	Palustrine emergent

Figure 1: Location of impact and mitigation areas

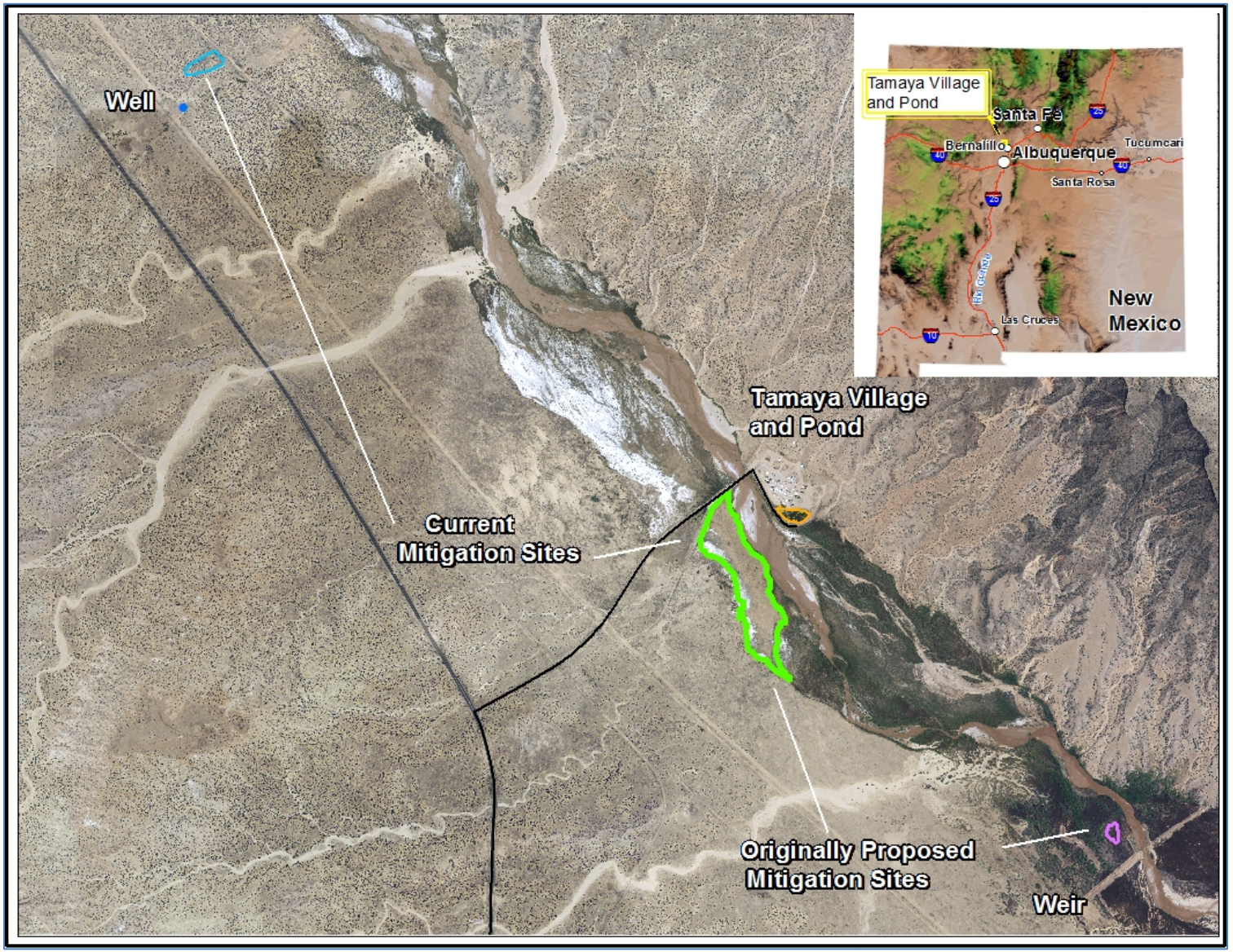


Figure 2: Created Wetland Mitigation Area

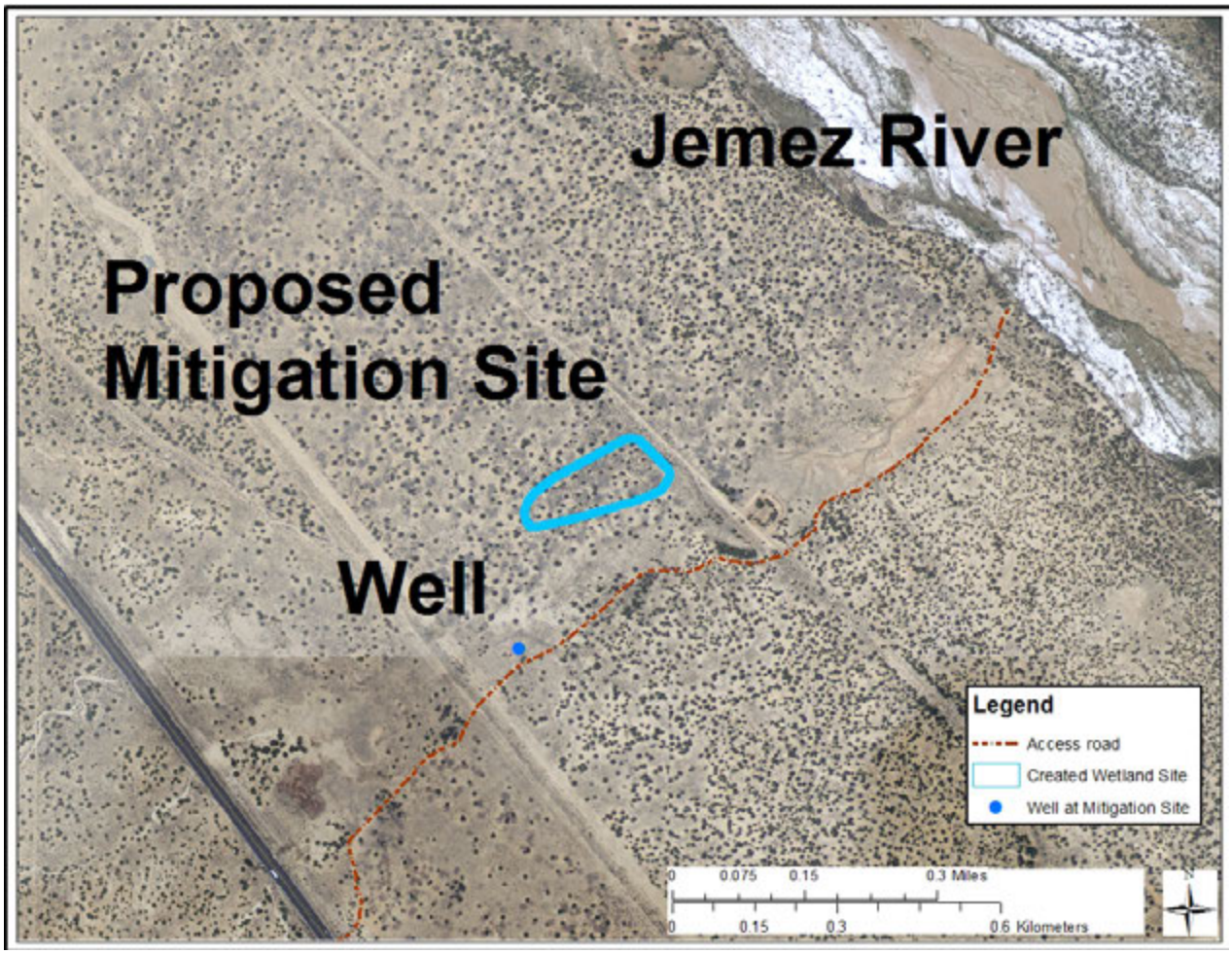


Figure 3: Wetland Preservation Mitigation area (wet meadow)

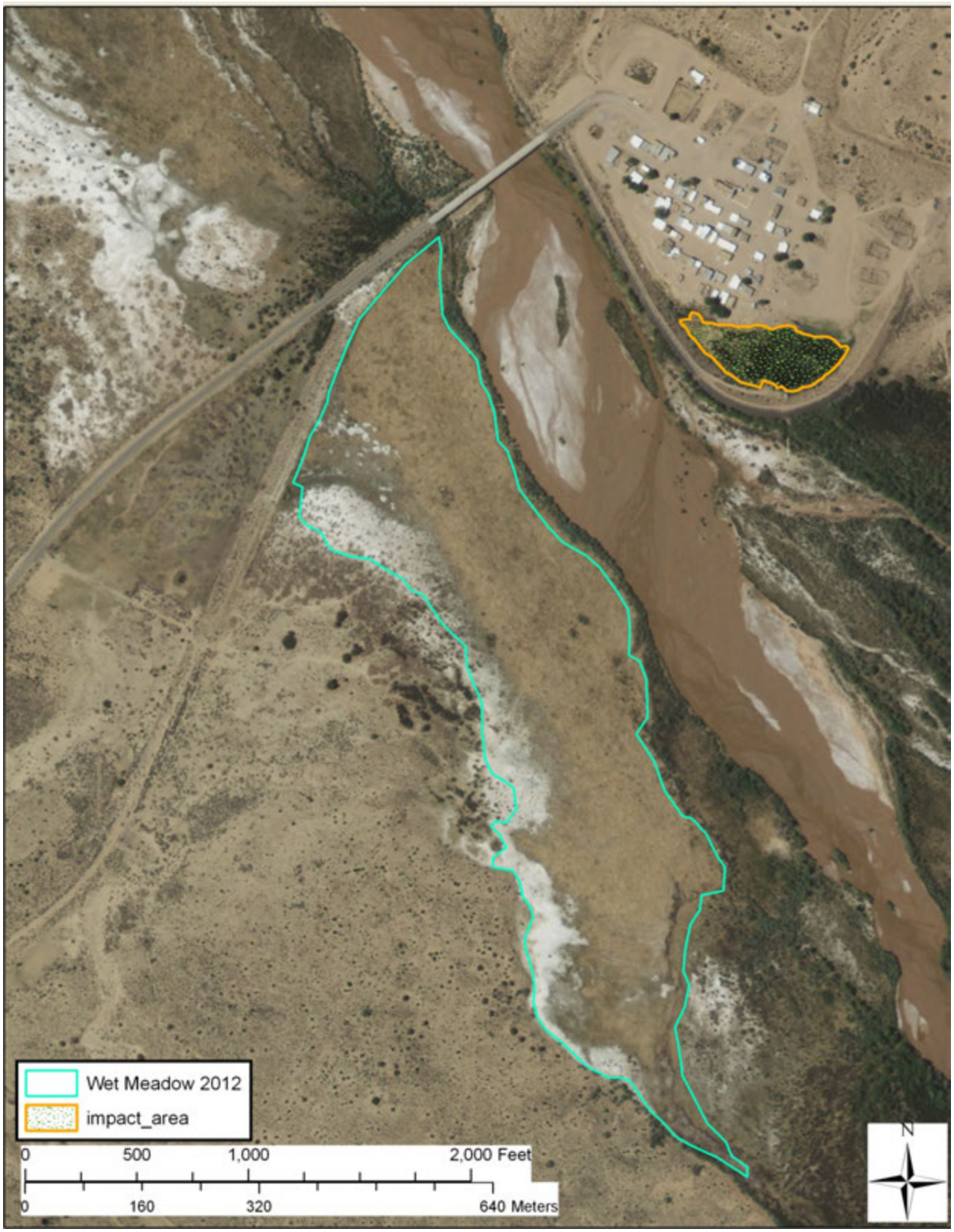
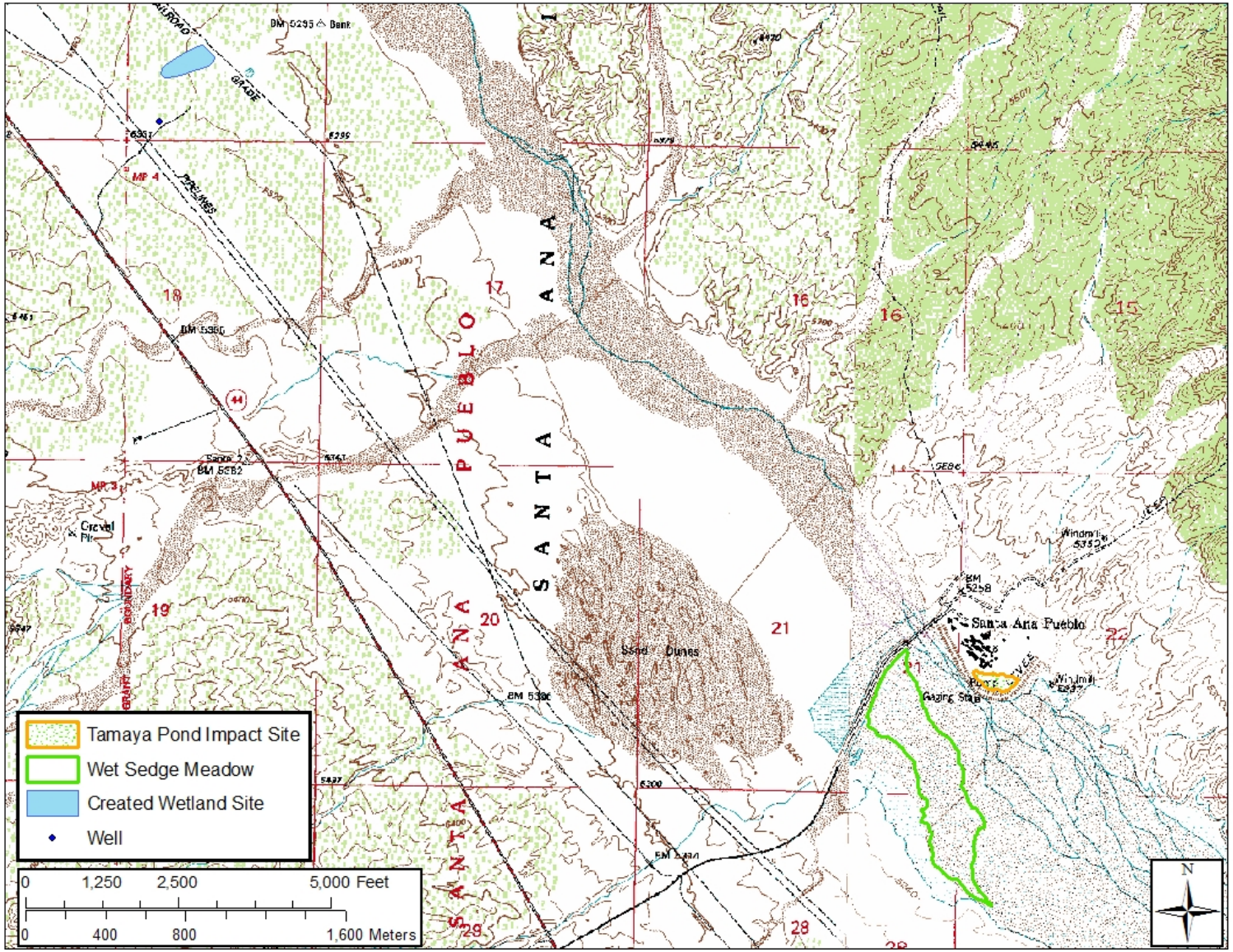


Figure 4: Impact and Mitigation Areas Topographic Map



3 Description of site selection criteria

3.1 Watershed Overview:

The proposed location of mitigation sites are along the Jemez River. The wetland creation site is 3.1 miles upstream from the impact site. This is considered an "on-site" mitigation because the mitigation site is in the same watershed and river segment as the impact site. The preservation area is directly across the river from Tamaya Village and the impact site. The watershed is primarily undeveloped. All land within the project area belongs to the Pueblo of Santa Ana. Tamaya Village land use is residential and ceremonial. The surrounding land is managed primarily for wildlife, with some grazing. At Zia Pueblo, approximately 9 river miles upstream from Tamaya Village, agricultural land use is important in the historic floodplain, although the surrounding upland landscape is still native vegetation. Agriculture is also an important land use in the small community of San Ysidro, located about five miles upstream from Zia Pueblo at the confluence of the Jemez River and the Rio Salado, and another five miles upstream at Jemez Pueblo. Apart from these small communities and their surrounding agricultural areas, the watershed is undeveloped or lightly developed.

Tamarisk or saltcedar (*Tamarix* sp.) is found throughout the lower Jemez River watershed from Jemez Pueblo downstream to the confluence with the Rio Grande. The saltcedar leaf beetle (*Diorhabda* sp.) has come into the area and is defoliating the saltcedar, beginning in 2011 at Jemez Canyon Reservoir and expanding its area in 2012 as far upstream as Jemez Pueblo. Tamarisk is present at both the impact and the wet meadow preservation areas. The mitigation wetland creation site does not have tamarisk, although there is tamarisk nearby in the small pond located east of the old railroad grade.

3.2 Landscape Setting and Position:

The following information is quoted from the Jemez Watershed Restoration Action Strategy (Jemez Watershed Group 2005). The Jemez River watershed is defined as Hydrologic Unit Area (HUA) #13020202. The contributing watershed to the Jemez River is approximately 1,034 square miles and the total length of the Jemez River is approximately 65 miles to its confluence with the Rio Grande. The watershed is dominated by both forest and rangeland on mostly USDA Forest Service, Tribal, and private land. The Jemez watershed is almost entirely in Sandoval County. It includes the villages of San Ysidro, Jemez Springs, unincorporated areas surrounding them, as well as the Pueblos of Zia, Jemez, and some Santa Ana tribal lands.

The Jemez River watershed divide is over 10,600 feet in elevation, dropping to about 5,100 feet at the Jemez Canyon Dam (Massong, 2008). Hydrologic characteristics of the watershed are described in detail in Section 2.4 of the Implementation Report and Environmental Assessment (IR/EA; USACE 2013). Due to irrigation water withdrawals, the Jemez River below San Ysidro is intermittent. The primary ecological needs in the lower Jemez watershed are restoring native riparian species and providing permanent water sources for wildlife.

The mitigation site is located in an upland because locating close to the river channel proved to be technically infeasible due to the dynamic, unstable nature of the sand-bed river and the failure of the Jemez weir. Connectivity with the riparian corridor is moderate. The distance from the mitigation site to the river is 700m and the intervening landscape is undeveloped with no

obstacles to wildlife movement. . All lands surrounding the mitigation site are undeveloped and managed for wildlife. Therefore, there is no need for a buffer.

3.3 Site-specific information:

All lands associated with the Jemez Canyon Dam and Reservoir Project (about 6,711 acres), including all lands within the project impact and mitigation areas, are held either in trust by the United States for the benefit and use of the Pueblo of Santa Ana, a federally recognized Native American Tribe, or by the Pueblo in restricted fee title. There is no potential for any change in ownership in the foreseeable future.

The Department of the Army and the Pueblo signed a Memorandum of Understanding in 1952 which established a perpetual right and privilege for the construction, operation, and maintenance of the Jemez Canyon Dam and Reservoir Project, including the Santa Ana Pueblo levee, which created the wetland at the impact site.

Hydrologic inputs for the created wetland will be from pumped well water. . A water right is not needed to implement the mitigation project. Significant hydrologic changes are not anticipated due to the site's upland location.

Existing habitat in the footprint of the created wetland consists of sparse native vegetation including scattered one-seed junper (*Juniperus monosperma*), cholla (*Cylindropuntia imbricata*), fourwing saltbush (*Atriplex canescens*), wolfberry (*Lycium pallidum*), and grasses such as alkali sacaton (*Sporobolus airoides*) and galleta (*Pleuraphis jamesii*). The small intermittent pond north of the railroad grade is surrounded by saltcedar and juniper.

The preservation site is a groundwater-fed wet meadow. Vegetation along the upslope side is primarily saltgrass with increasing cover of Baltic rush and bulrush towards the river. This community grades into an almost pure stand of spikerush in the areas with shallowest groundwater. The saltgrass portion of the meadow has been cleared of saltcedar by the Pueblo. In March 2012, the soil was moist even in areas with prominent salt crust.

4 Baseline information

4.1 Historic and existing plant communities

The Tamaya Village pond (impact site) prior to construction of the Jemez Canyon Dam and Santa Ana Pueblo levee was part of the Jemez River floodplain and was sparsely vegetated or unvegetated due to the flashy, dynamic nature of the sand bed river. Since construction of the levee, the site has come to support a wetland plant community dominated by cattail (*Typha domingensis*) throughout the deeper, frequently-inundated areas. The cattails provide dense cover; open water covers approximately 25% of the site. A variety of wetland species grow on the margins of the pond in the transition from wetland to upland, including: saltgrass (*Distichlis spicata*), alkali muhly (*Muhlenbergia asperifolia*), Yerba mansa (*Anemopsis californica*), threesquare bulrush (*Schoenoplectuss pungens*.), spikerush (*Eleocharis* spp.), knotweed (*Polygonum* sp.), alkali yellowtops (*Flaveria campestris)*, annual rabbitfoot grass (non-native) (*Polypogon monspeliensis*) and foxtail barley (*Hordeum jubatum*). Woody species along the

levee side of the pond included Russian olive (*Elaeagnus angustifolia*) and tamarisk (*Tamarix* sp.), which are exotic, invasive species.

4.2 Historic and existing hydrology

USACE modeled groundwater hydrology in the Tamaya Pond area as part of the drainage project planning process and determined that the pond is primarily fed by groundwater (USACE 2012). The impact site also collects surface runoff from Tamaya Village. The levee prevents this runoff from draining, so the water level is managed by pumping as needed. Details regarding site hydrology are presented in the Hydrology section and Appendix C of the IR/EA (USACE 2013).

The mitigation wetland would be constructed in an upland site with water supplied by an existing well. USACE conducted a pump test and determined that the well is capable of providing an adequate water supply for the proposed mitigation site.

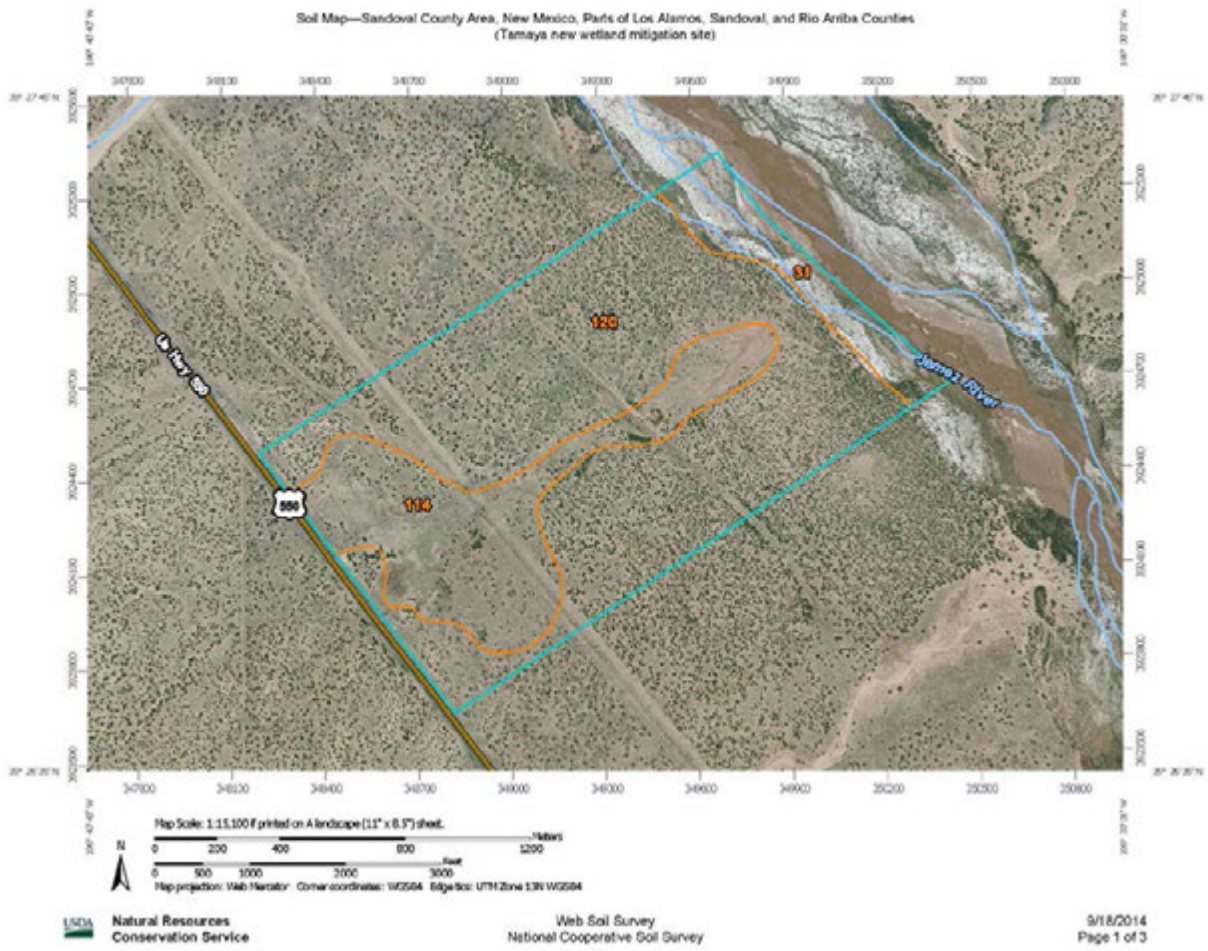
Soil conditions at the site are described in the IR/EA and Supplemental EA. Tamaya Village and most of the impact site pond fall within the Harvey-Cascajo soil map unit. The levee and lower edge of the pond are mapped within Riverwash. Observations from the wetland delineation indicate that hydric soils have developed in the pond. Harvey-Cascajo is not a hydric soil unit; however, the soil map resolution is not detailed enough to show the hydric soil at the wetland. Riverwash soils are classified as hydric. Soils at the wet meadow are in the Trail loamy sand map unit. These soils are derived from eolian deposits over stream alluvium and are not classified as hydric; however, delineation identified hydric soils on site.

The primary soil types in the proposed mitigation area are the Pinavetes loamy sand and the Zia-San Mateo Association (Figure 5). Pinavetes loamy sand occurs on valley side slopes and originates from eolian deposits derived from sandstone. It is moderately alkaline with calcium carbonate content of up to five percent, and nonsaline. Available water storage is very low.

The Zia-San Mateo Association occupies the gently sloped drainage that runs through the area. Within this association, Zia soil occurs on footslopes and consists of eolian deposits over fan alluvium derived from sandstone. These fine sandy loam soils are moderately alkaline, with a calcium carbonate content of up to 10% for San Mateo and 15% for Zia soils. San Mateo soils are derived from stream alluvium from sandstone and shale and are slightly to strongly saline. Available water storage is high in San Mateo and moderate in Zia soils. San Mateo soils are in the Swale ecological site, whereas Zia is in the Sandy ecological site.

Geotechnical soil borings were preformed in the proposed mitigation area in 2014. Boring logs are included in Appendix C of the SEA. No soil layers were encountered that would preclude construction of a wetland.

Figure 5: Soil Map of Proposed Mitigation Site



Soil Map—Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

Tamaya new wetland mitigation site

Map Unit Legend

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties (NM656)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
31	Riverwash	38.4	8.3%
114	Zia-San Mateo association, 0 to 9 percent slopes	114.4	24.8%
120	Pinavetes loamy sand, 3 to 5 percent slopes	307.9	66.8%
Totals for Area of Interest		**460.7**	**100.0%**

4.3 Geomorphology, Sediment and Geology

The Jemez River from above the weir upstream to its confluence with the Rio Salado has a broad sandy channel with a very shallow braided flow pattern. Review of historic aerial photos shows shifts in the active channel (within the floodplain); however, there has been little change in the active floodplain (see Figure 6 and Figure 7). As described in the IR/EA, the Jemez River channel near Tamaya Village is perched with a limited carrying capacity within the active channel. Conditions within the river channel near and upstream of the village indicate channel instabilities. Evaluation of sediment range data indicate that the mean active elevations have generally fluctuated both up and down. In the vicinity of the village and wet meadow, a modest aggradational trend is suggested at one of the four rangelines examined. A description of geology is included in the IR/EA. No formations are present which would limit restoration activities.

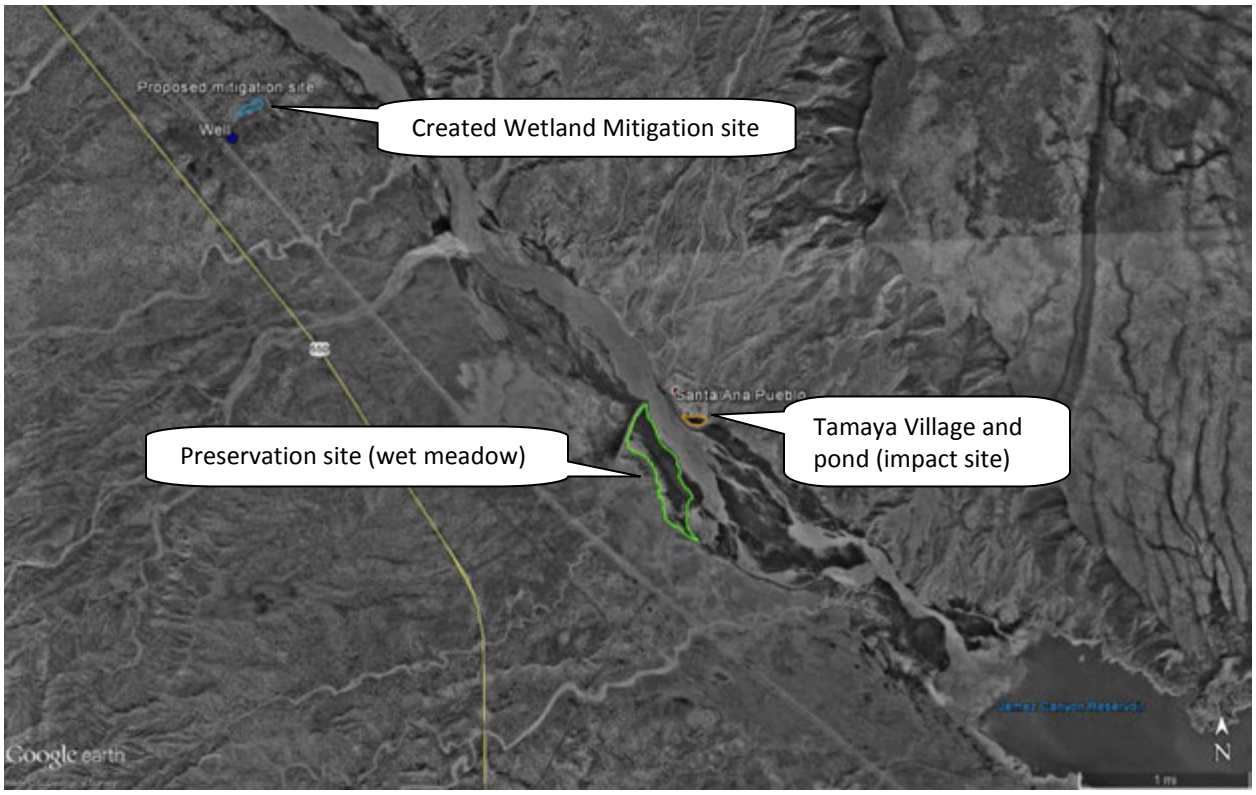


Figure 6: 1996 aerial photo of project area

Figure 7: 2011 aerial photo of project area

4.4 Species of concern

As described in the IR/EA, there are no federal or state threatened or endangered species present at the created wetland mitigation site. The Southwestern Willow Flycatcher may occur in a variety of riparian habitat types along the Jemez River during spring or fall migration periods. However, suitable habitat is not present at Tamaya Pond, the sedge meadow (preservation site) or in the upland area of the created wetland. The Pueblo of Santa Ana conducts surveys of the Jemez River riparian area and has documented areas that are used by flycatchers. The mitigation site is located in an upland, outside the riparian area and does not contain suitable habitat.

As stated in the IR/EA, surveys for the endangered species, New Mexico meadow jumping mouse, will be conducted during the design phase of the project. Jumping mouse is unlikely to occur at the pond but may occur at the wet meadow preservation site. No construction would occur at the preservation site and there would be no effect to jumping mouse; however, a baseline would be needed to inform management of the preservation area. If this species is detected, consultation with the USFWS would be initiated.

5. Mitigation work plan

5.1 Construction Methods

The created wetland would be constructed by clearing and grubbing to remove the existing sparse vegetation, excavating the pond and installing a bentonite or GCL liner. A solar powered pump would be installed at the well and a pipe would be trenched in from the well to the mitigation pond. . The proposed grading and elevations would follow the design drawings as shown in Erosion control measures would include using geotextile on slopes steeper than 1:4 and planting and reseeding with native species. Because the project is over one acre in size, a Stormwater Pollution Prevention Plan (SWPPP) under the US Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) permit program would be required.

5.2 Implementation Schedule

The project would take place in 2015-2016, outside the nesting season, dependent on availability of funds. The mitigation wetland would be excavated prior to beginning the fill project.

The proposed sequence of work is as follows:

1- prepare access as needed;
2- removevegetation;
3- excavate mitigation wetland;
4- stabilize slopes with geotextile as needed;
5- dewater pond (impact site);
6-dig and transplant material to mitigation site;
7- planting of nursery stock and seeding in and around mitigation site;
8- fill impact site
9- revegetate impact site

The project may be phased if sufficient funding is not allocated for the entire project. In this case, the mitigation wetland would be created prior to filling the impact site. .

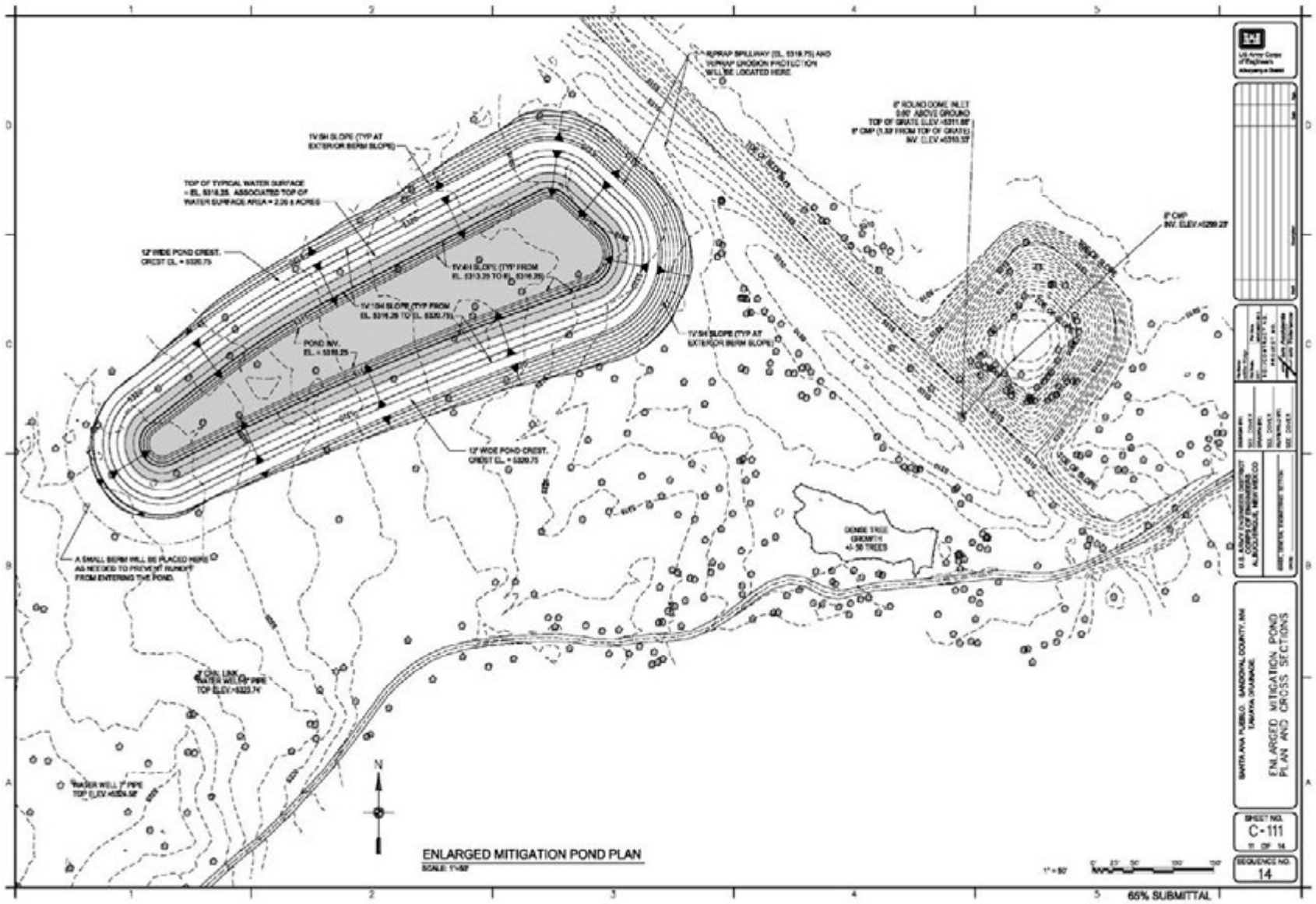


Figure 8: Mitigation Wetland Design

5.3 Methods for establishing the desired plant community

Wetland plants would be transplanted from the impact site to the mitigation site using a front-end loader to cut blocks of sod or similar mechanized digging. Nursery-grown plants would be used to supplement the wild material. Bulrushes would be transplanted by rhizomes obtained from the impact site. Riparian shrubs from nursery stock would be planted using long-stem transplants with the root systems placed into the capillary fringe. Willow cuttings would be planted at the edge of the moist soil. Similar riparian shrubs would be planted at the impact site. Portions of the site that have elevations too high above groundwater for riparian plantings will be seeded to native grasses, per Table 4 below.

Table 4: Plant species proposed for constructed wetland mitigation and indicator status

Scientific name	Common names	Wetland indicator status
Anemopsis californica	yerba mansa	OBL
Eleocharis rostellata	spikerush	OBL
Juncuc arcticus var. *balticus*	baltic rush	OBL
Muhlenbergia asperifolia	scratchgrass/ alkalai muhly	FACW
Schoenoplectus pungens	common threesquare bulrush	OBL
Bolboschoenus maritimus	cosmopolitan bulrush	OBL
Hordeum jubatum	foxtail barley	FAC
Distichlis spicata	inland saltgrass	FAC
Salix exigua	coyote willow	FACW
Shrubs for edge of wetland:		
Rhus aromatica subsp. *trilobata*	Three-leaved sumac	FACU
Ribes aureum	Golden currant	FAC
Forestiera pubescens	New Mexico Olive	FACU
Lycium torreyi	Wolfberry	FAC
Baccharis salicina	Baccharis / seepwillow	FACW
Grasses for slopes outside wetland:		
Sporobolus airoides	Alkali sacaton	FAC
Sporobolus cryptandrus	Sand dropseed	FACU
Sporobolus flexuosus	Mesa dropseed	FACU
Sporobolus contractus	Spike dropseed	-
Achnatherum hymenoides	Indian ricegrass	UPL
Pleuraphis jamesii	Galleta	-
Elymus elymoides	bottlebrush squirreltail	FACU

5.4 Invasive species control

Saltcedar -invasion would be monitored and the need for control would be evaluated annually, along with the presence of the *Diorhabda* beetle. If beetle defoliation does not keep tamarisk within acceptable levels, invasion would be controlled using selective methods such as cut-stump herbicide treatment.

Best Management Practices that would be followed during construction to prevent the introduction of invasive species include:

- 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.
- Equipment that was previously used in a waterway or wetland would be disinfected to prevent spread of aquatic disease organisms such as chytrid fungus. Disinfection water shall be contained in a tank or approved off-site facility and shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants. Waste water would be disposed following all federal, state, and local regulations.
- Weeds and salt cedar sprouts would be controlled during the construction period and as a component of maintenance and management of the created wetland mitigation site.

5.5 Avoidance measures:

To avoid take of migratory birds or their nests or eggs, all vegetation clearing would take place outside the nesting season. There are no aquatic resources or other sensitive resources within the mitigation site footprint.

6. Budget and Cost Effectiveness/Incremental Cost Analysis

6.1 Budget for preferred mitigation alternative

The preferred mitigation alternative was proposed following a lengthy process in which several alternatives were evaluated. Budgets were developed for the following:

- Created wetlands to mitigate the entire acreage of impact
- Created wetland to mitigate half the impact acreage at the Jemez Weir location: several options, as described in 6.2 Cost Effectiveness and Incremental Cost Analysis.
- Created wetland to mitigate half the impact acreage in the currently preferred upland, upstream location

6.1.1 Created wetlands to mitigate the entire acreage of impact

The initial estimated budget for mitigation by creating wetlands near the Jemez weir to mitigate for the entire acreage of impact was as follows:

Item	Cost
Clearing and Grubbing	24,888.31
Construct Temporary Access Roadway	18,967.60
Wetland Excavation	408,042.94
Dewatering during Excavation below Groundwater	17,945.63
Hauling to berm	22,704.88
Hauling to spoil area	520,689.57
Place & Compact Berm	31,803.06
Temporary Fencing	17,393.25
Seeding	5,054.18
Plantings, including transplanting	245,862.42
Total---	1,313,351.84

6.1.2 Created wetland to mitigate half the acreage of impact at weir

Due to the expense of mitigating the impact exclusively by creating wetlands, the preferred plan for mitigation using a combination of wetland creation and preservation was proposed. The budget for the weir site originally proposed in the IR/EA was as follows:

Item	Cost
Clearing and Grubbing	12,444.16
Construct Temporary Access Roadway	18,967.60
Wetland Excavation	260,453.35
Dewatering during Excavation below Groundwater	12,053.15
Place & Compact Berm	20,695.55
Temporary Fencing	8,696.62
Seeding	3,032.51
Plantings, including transplanting	122,644.78
Total---	458,987.72

6.1.3 Created wetland to mitigate half the acreage of impact at preferred upland site

The weir site has been eliminated due to technical considerations. Cost for the currently proposed upland mitigation site is as follows:

Item	Cost
Clearing and Grubbing	15,479.36
Haul Road Improvements	22,646.98
Wetland Excavation	204,734.80
Over excavation	29,253.01
GCL Layer	176,555.11
Place and Compact Backfill	24,391.02
Hauling to Berm	11,475.04
Place & Compact Berm	30,410.56
Temporary Fencing	21,427.77
Seeding	6,536.23
Plantings, including transplanting	236,801.03
Solar Powered Pump	**40,863.80**
Total---	1,048,901.40

Note: from cost summary 12/12/2013 (print date 1/9/2014)

6.2 Cost Effectiveness and Incremental Cost Analysis

Corps regulations (ER 1105-2-100, Appendix C) require completion of an incremental cost analysis (ICA) for mitigation plans to demonstrate that the most cost effective mitigation measure(s) has been selected. Mitigation analysis shall be presented in an analytical framework commensurate with other project benefits and costs. The least cost mitigation plan that provides full mitigation of losses specified in mitigation planning objectives, and which is unconstrained except for required legal and technical constraints, shall always be identified and displayed

The following mitigation alternatives were analyzed initially for the Tamaya Drainage project:

A. 4 Acre Wetland in Original Location at Jemez Weir	1,313,351.84
B. 5 Acre Wetland in Original Location at Jemez Weir	1,668,177.45
C. 6 Acre Wetland in Original Location at Jemez Weir	2,040,451.57
D. 4 Acre Wetland near Jemez Weir, Farther From River	1,590,741.21
E. 4 Acre Wetland, upland location supplied with pumped water	1,719,040.73
F. 4 Acre Wetland at Jemez Weir, Closer to River	1,173,777.50

Alternative F, a 4-acre wetland constructed closer to the river, was the least cost of the initial alternatives because a location in closer proximity to the river channel would require less excavation to reach groundwater. On preliminary CE/ICA analysis, this was the lowest-cost Best Buy plan. However, this alternative was determined by the PDT to be technically infeasible because its proximity to the river would entail unacceptable risk both to the mitigation feature and to the weir during expected high flows.

For a second round of CE/ICA, Alternative F was excluded from analysis. Alternatives A, B, and C were determined to be Best Buy plans. Alternative A was selected as the lowest-cost plan that met mitigation requirements.

Table 5: CE/ICA results including Plan F

Name	Cost	Output (acres)	Cost Effective?
No Action	0	0	Best Buy
A	1313351	4	No
B	1668177	5	Yes
C	2040452	6	Best Buy
D	1590741	4	No
E	1719041	4	No
F	1173778	4	Best Buy

Figure 9: CE/ICA results including Plan F

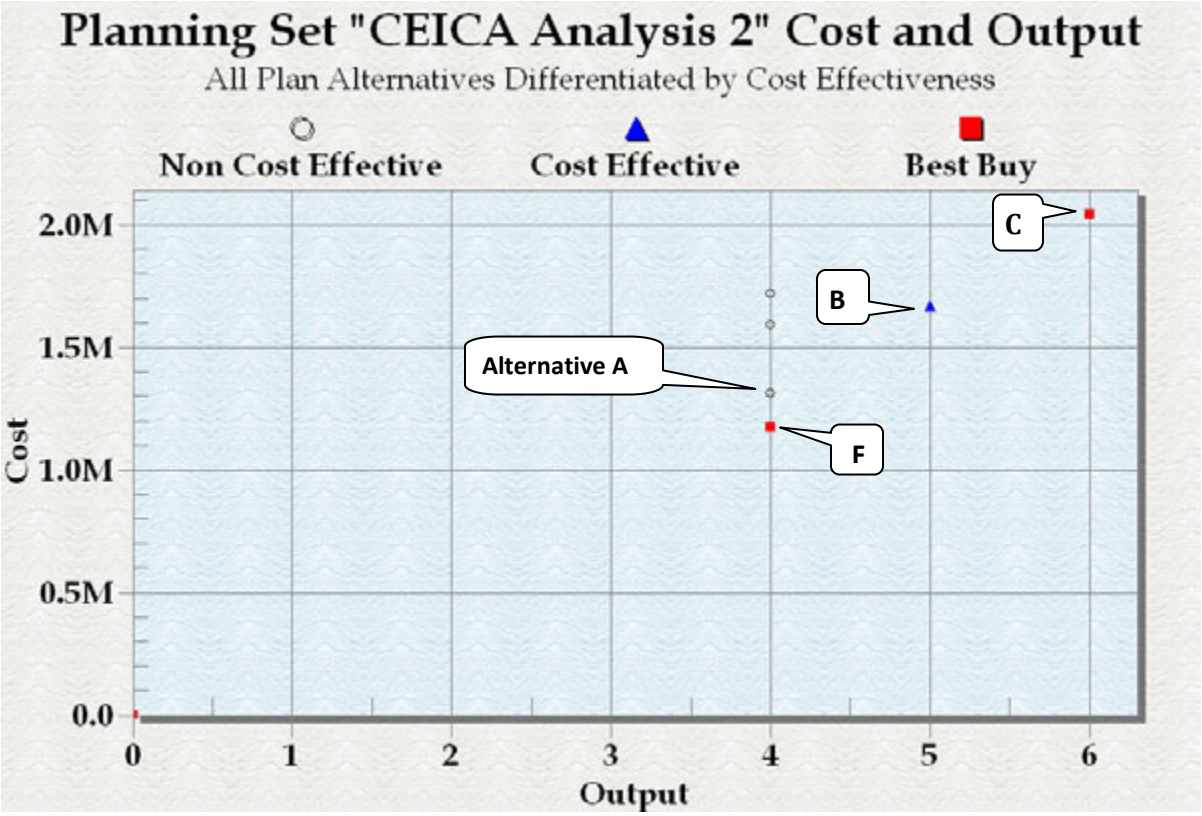
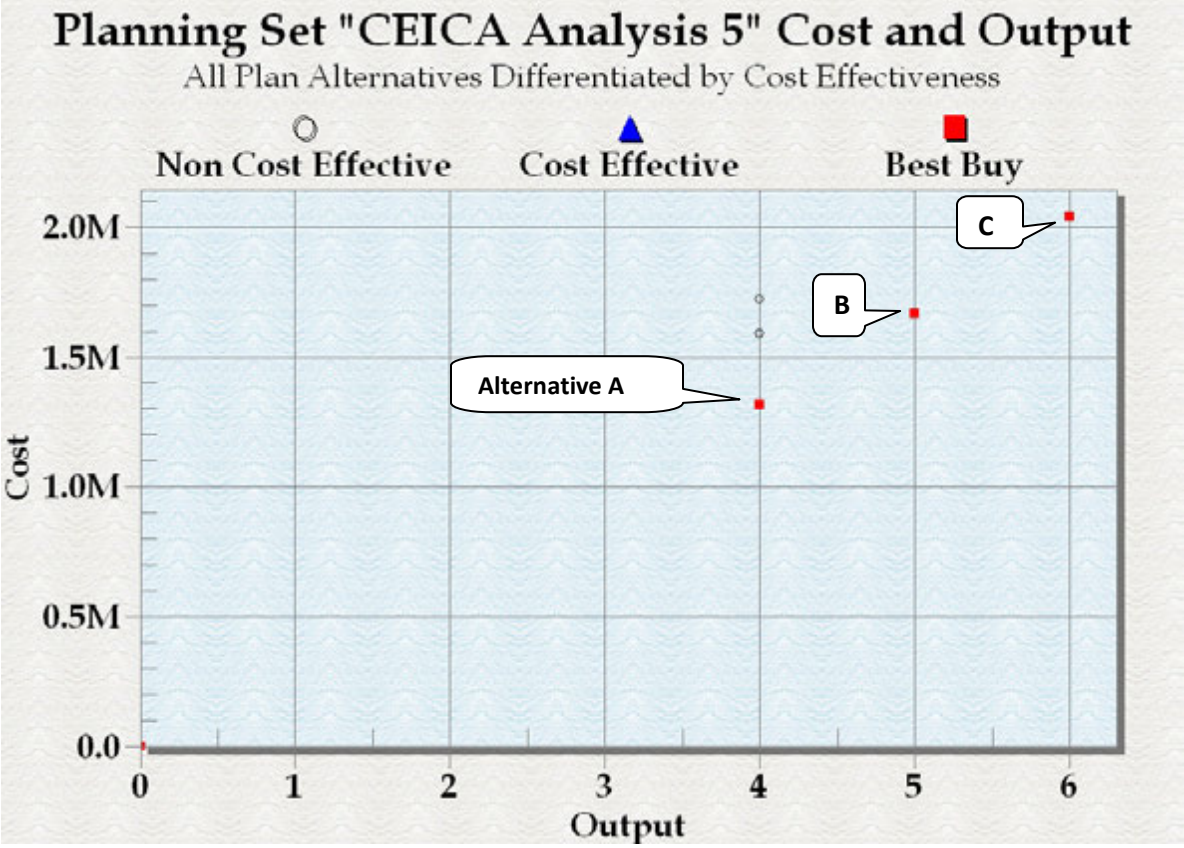


Table 6: CE/ICA results without Plan F

Name	Cost	Output (acres)	Cost Effective?
No Action	0	0	Best Buy
A	1313351	4	Best Buy
B	1668177	5	Best Buy
C	2040452	6	Best Buy
D	1590741	4	No
E	1719041	4	No

Figure 10: CE/ICA results without Plan F



Based on the CE/ICA results above, Plan A was selected for implementation. However, due to the high estimated construction cost of creating a wetland for mitigation, options for decreasing the amount of created wetland were discussed with the USACE Regulatory Division. Prior to the construction of the Jemez weir, USACE's Environmental Assessment contained the statement:

> "The proposed action [construction of the weir] is related to mitigation for the evacuation of the Jemez Canyon Reservoir sediment pool and to the future action of draining the Tamaya Pond (inadvertently created from past levee construction)…" (USACE, 2003).

The weir EA did not, however, analyze wetland functions of the pond or allocate wetland acreage preserved to mitigation for the pond vs. the delta riparian vegetation. For the present

analysis, only similar wetland types in proximity to the pond were considered. As described in Section 1.2B, herbaceous wetlands were mapped in about 2003 and 2005. The sedge meadow appears to have increased in size by approximately 14 acres. Preservation of this increase would mitigate for half the wetland impact (13.2 acres to mitigate for 1.65 acres, or half the pond, at a ratio of 8:1).

Because permanent water sources are rare in the Jemez River watershed below the confluence with the Rio Salado, it was determined that the remaining 1.65 acres of impact would be mitigated by constructing an in-kind wetland pond. The preservation portion of the mitigation may not be increased or decreased due to Regulatory requirements; therefore, CE/ICA is not required for this part of the mitigation.

7. Maintenance Plan

The mitigation wetland is designed to require little maintenance. The wetland would be constructed away from local surface water flow paths and would have a berm to deflect surface flows, preventing sediment from being carried into the wetland basin. Because the wetland's source of water is groundwater, regular maintenance of the pump would be required and would be performed per manufacturer's instructions. The solar panels would require inspection and cleaning approximately quarterly to remove surface dust that would otherwise impede efficiency. Maintenance requirements will be included in the project O&M Manual. Other maintenance is expected to be minimal, consisting mainly of control of invasive species, and should decrease each year. A major surface runoff event is unlikely to inundate the mitigation area, but should this occur, the need for silt removal would be evaluated after such an event.

The need for management of vegetation, such as replacing dead plants or removal of saltcedar, other invasive plants, or excessive cattail growth, would be evaluated at each monitoring visit. After the initial 3- to 5-year monitoring during the establishment period, inspection and monitoring would be conducted annually.

8. Ecological performance standards

The success of mitigation activities for the Tamaya Drainage Project will be determined by successful creation of wetland hydrology, survival and growth of planted riparian and wetland vegetation, the presence of wetland indicators, and the use of the mitigation area by wildlife. Performance criteria are included in Enclosure D. Criteria should be met within the 3-5 year monitoring period. If not, adaptive management measures would be implemented and monitoring continued until criteria are met.

Riparian shrub plantings: The objective for this project is a mean survival rate of 80% for the riparian shrub planting areas for five years following planting. Shrubs should show an increase in height or canopy spread each year until reaching mature size.

Wetland (Hydrophytic) plants: Native wetland plant species diversity should be equal to or greater than the number of species planted. Cover by obligate or facultative wetland plants (OBL or FACW) should reach 80% in the shallow water zone (moist soil to 1 ft. deep) by the end of the 3-5 year monitoring period. The overall cover of bulrushes and cattails in deeper water areas (1-3ft) should be at least 20%, with cattail cover not more than 60%.

Wetland hydrology: The mitigation wetland should contain standing water or other indicators of wetland hydrology. Under normal circumstances, the depth of standing water in the center of the wetland should be at least one foot and should not exceed three feet. The outer perimeter of the wetland should have groundwater no deeper than one foot below ground. Should the proper water levels fail to be maintained, the well, pump, power supply and water control (float valve) would be examined and the need for adjustment would be determined. The adaptive management plan would be implemented as needed.

Hydric Soils: Hydric soil indicators require time to develop. By the end of the monitoring period, soils in the wetland should show evidence of permanent saturation or other hydric indicators.

Native Species: Native species should dominate vegetative cover. The relative percent cover by exotic species should decline over time and should be less than 15% by the end of the 3-5 year monitoring period.

Wildlife: The site should show evidence of wildlife use including at least three of the following: Evidence of large mammal use (tracks, scat, grazing/browsing); visual or auditory observations of riparian birds or waterfowl during site visits; presence of aquatic herptiles (turtles, native frogs, or salamanders); presence of wetland or aquatic invertebrates such as dragonflies.

9. Monitoring requirements

Monitoring will be scheduled as follows:

- during the excavation and planting of the mitigation area during implementation
- three times per year (spring, summer and fall) in the first two years post-construction
- annually thereafter until success criteria have been met and it has been determined that the wetland is functioning as intended.

The presence of surface water will be assessed visually. Extent of surface water, vegetative cover by native and non-native species, saltcedar invasion, and any geomorphic changes such as silt deposition will be noted. Additionally, vegetation will be monitored and wildlife observations will be noted as per appropriate sections of the field data forms (Enclosure C).

9.1 Vegetation monitoring:

Following construction, the wetland perimeter would be mapped using handheld GPS. The perimeter of the wetland would be stratified into five segments. Five permanent points would be selected at each mitigation wetland cell. At the filled pond, five monitoring points would be established using a stratified random sample (Figure 10). This would ensure that sample points are distributed throughout wetland border or filled pond area. Monitoring points would be positioned along the wetland edge at the time planting is complete and marked with rebar. This would allow ready assessment of surface water conditions and whether water is rising or receding over time.

At each sample point, photos would be taken in four directions. A 1-m radius circular plot would be used to evaluate herbaceous vegetation (Figure 11). Species, percent cover, and wetland indicator values would be recorded at each monitoring point. An additional circular plot would be established in the upland zone outside the shrub planting area to record grass species and percent cover.

A 10-m^2 rectangular plot with its short axis centered on the monitoring point would extend 4m to the approximate edge of the shrub planting area. Size will be adjusted if needed to obtain more individual shrubs for monitoring. Shrub percent survival, height or canopy spread will be recorded.

At each monitoring visit, a general walk-through will be done through each mitigation area to observe potential problem spots, weeds, and invasive species. Any weeds or invasive species will be qualitatively noted and described. General photos of the areas will be taken and described. Example field monitoring data sheets are included as Enclosure A.

9.2 Anticipated Cost of Monitoring and Reporting Activities

It is estimated that annual monitoring and reporting activities for the mitigation project associated with the Tamaya Drainage Project will be approximately $10,000. This assumes three weeks total of field monitoring, data analysis, and reporting time for one biologist. Costs incurred for replanting wetland and riparian species or treating invasive species are not included in this estimate.

Figure 11: Vegetation Monitoring Point Layout (example).

Actual points will be determined following construction and wetland mapping.

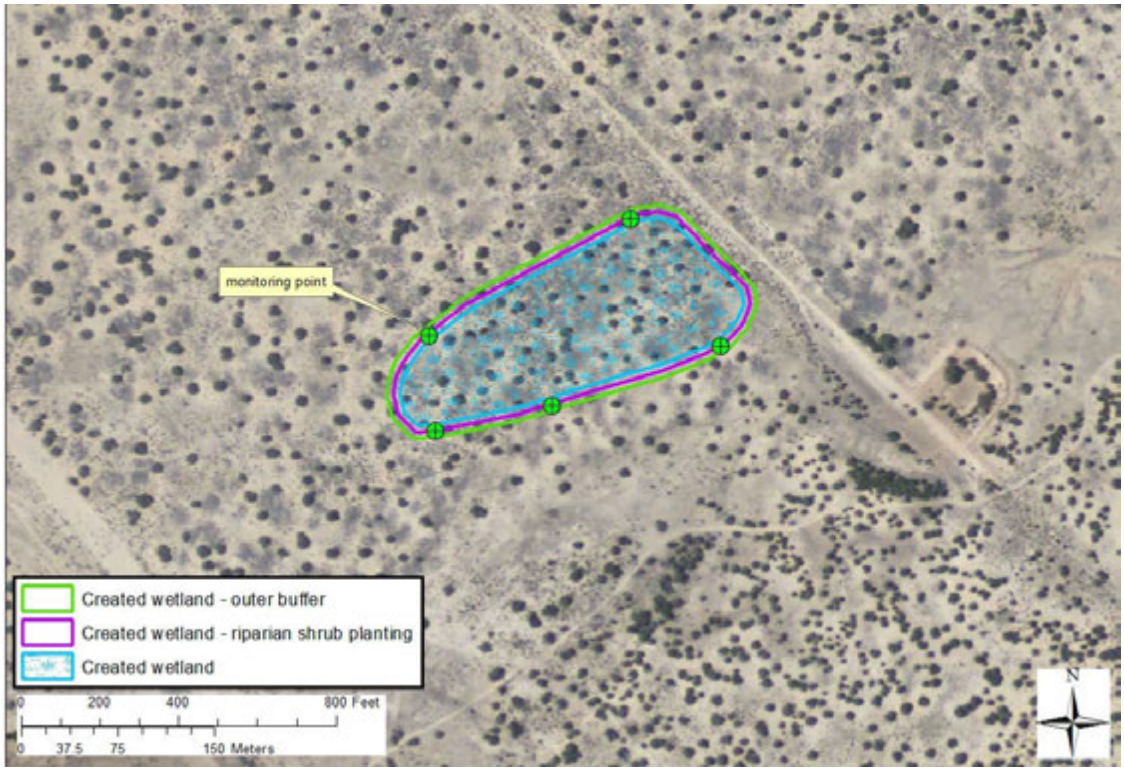
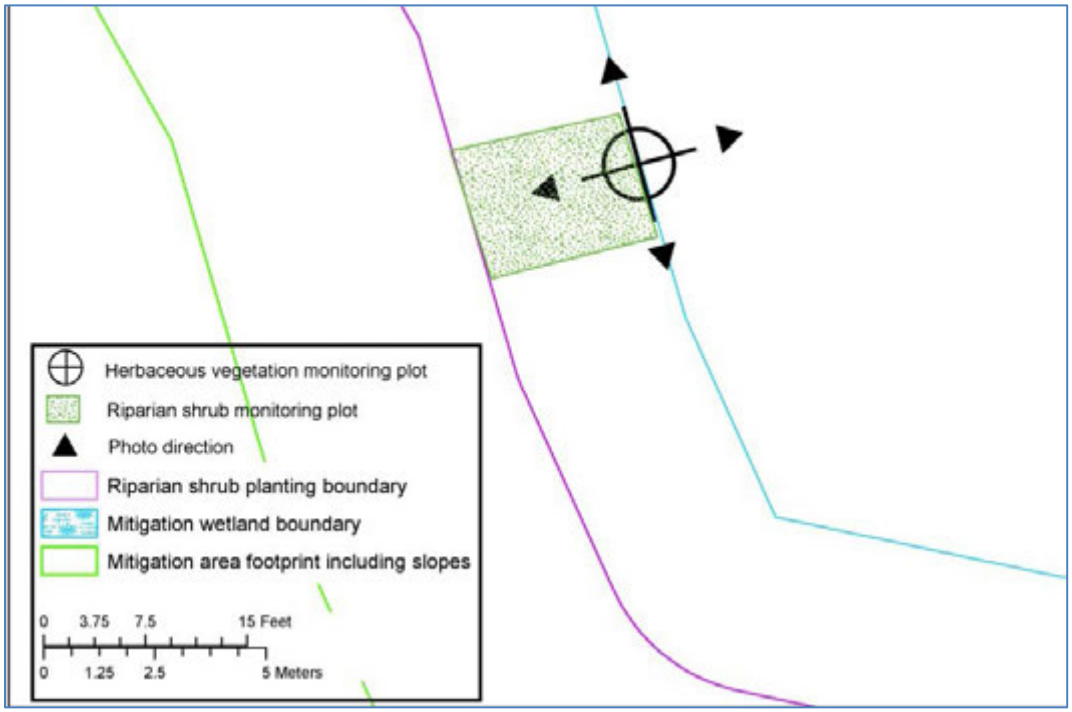


Figure 12: Monitoring Point Detail



10. Long-Term Management Plan

Long-term management of the mitigation wetland would become part of the Jemez Canyon Dam project's O&M operations. Inspection and qualitative monitoring would be conducted annually by a qualified biologist. Inspection of the hydrologic controls would occur along with required maintenance of the pump performed by USACE personnel. The presence of surface water would be assessed visually. When there is concern that a significant change may have occurred, the wetland perimeter would be mapped using a handheld GPS receiver. The extent of surface water, vegetative cover by native and non-native species, saltcedar invasion, and any geomorphic changes such as silt deposition will be noted.

Funding for routine inspection and adaptive management would be obtained from the Operations budget each year.

11. Adaptive Management Plan

Adaptive management is a systematic approach for improving resource management by learning from management outcomes. It promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process (Williams, Szaro, and Shapiro. 2009).

Monitoring and reporting activities will inform USACE and the Pueblo of Santa Ana whether or not mitigation activities have been successful to date and whether a change in management is needed. Adaptive management measures for the mitigation wetland could include, but are not limited to:

- Re-grading or removing sediment from part or all of the created wetland site if the mitigation wetland becomes filled with sediment deposits. There may be a trade-off between keeping the existing wetland vegetation and needing to remove sediment. Re-grading of wetland, if needed, would be based on as-built plans submitted by the contractor just after excavation of the mitigation area to ensure grading has been performed per contracting plans.
- Maintaining the berm, possibly by adding sediment removed from the created wetland.
- Replanting or reseeding part of the created wetland site to improve species cover or diversity, or to re-establish vegetation after a major flood event or re-grading/sediment removal.
- Invasive species control at the created wetland or preservation sites.
- Installation of new or replacement fencing;
- Soil testing or amendment, if soils are an issue for plant growth in the created wetland.

Should the ecological performance standards not be met during any given year, the reasons for failure to meet standards will be evaluated and appropriate management actions taken. Each year, USACE in consultation with the Pueblo of Santa Ana will investigate why plantings were

not successful, what could be done differently to improve success rates, what environmental factors could be contributing to a decline in success, whether there have been unacceptable structural changes such as sediment accumulation, and what actions are recommended to improve success or remedy an unacceptable situation. For example, if plantings fail, the cause would be evaluated before planting new plants to replace those that die. Did the depth to water table change so the plants' roots failed to reach water? Was herbivory or disease a factor? Was the soil too saline or otherwise unsuitable? Any replacement plants will be monitored for the duration of the monitoring period.

References

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U.S. Army Corps of Engineers (USACE). 2013. Implementation Report with Integrated Environmental Assessment. U.S. Army Corps of Engineers Albuquerque District, Albuquerque, New Mexico. April 2013.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

Enclosures

Enclosure A: Wetland Delineation Field Forms and Map

Enclosure B: Mitigation Ratio Setting Checklist

Enclosure C: Monitoring Data Sheets

Enclosure D: Ecological Performance Criteria

Enclosure A: Wetland Delineation Field Forms and Map

2002 Wetland Delineation

2011 Wetland Delineation

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Tamaya Applicant/Owner: Santa Ana Pueblo Investigator: Ernie Galvate / Patty Phillips	Date: July 2, 2002 County: Sandoval State: New Mexico
Do Normal Circumstances exist on the site? Yes (No) Is the site significantly disturbed (Atypical Situation)? (Yes) No Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Typha latifolia		OBL	9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: Cattail Marsh Drought year

HYDROLOGY

___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other ✓ No Recorded Data Available	Wetland Hydrology Indicators: Primary Indicators: ✓ Inundated ✓ Saturated in Upper 12 Inches ___ Water Marks ___ Drift Lines ___ Sediment Deposits ___ Drainage Patterns in Wetlands Secondary Indicators (2 or more required): ___ Oxidized Root Channels in Upper 12 Inches ___ Water-Stained Leaves ___ Local Soil Survey Data ___ FAC-Neutral Test ___ Other (Explain in Remarks)
Field Observations: Depth of Surface Water: — (in.) Depth to Free Water in Pit: 8 (in.) Depth to Saturated Soil: 1 (in.)	

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Field Observations
Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10YR 3/2	N/A	N/A	Sandy
6+		10yr 4/2	N/A		Sandy

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

Is this Sampling Point Within a Wetland? (Circle) (Yes) No

Remarks:

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Tamaya Applicant/Owner: Santa Ana Pueblo Investigator: Ernie Gahnke, Patty Phillips	Date: July 2, 2002 County: Sandoval State: New Mexico
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Scirpus americana		OBL	9.		
2. Distichlis spicata		NI	10.		
3. ~~Rabbitfoot~~ Polypogon monspeliensis		FACW	11.		
4. ~~Inland Rhynchospora~~			12.		
5. Yerba mansa Anemopsis		OBL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-).

Remarks: Area dominated by Scirpus

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
__✓__ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: 0 (in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
__✓__ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____
Field Observations
Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	—	10yr 4/1	N/A	N/A	coarse sandy

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
✓ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

(Circle)
Is this Sampling Point Within a Wetland? (Yes) No

Remarks: Area pond formed by levee
1953 - 1954 - levee construction

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Tamaya Applicant/Owner: Santa Ana Pueblo Investigator: Ernie Jahnke, Patty Phillips	Date: July 2, 2002 County: Sandoval State: New Mexico
Do Normal Circumstances exist on the site? Yes (No) Is the site significantly disturbed (Atypical Situation)? (Yes) No Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: ____ Transect ID: ____ Plot ID: ____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. ~~Lactuca~~ Yerba Mansa		OBL	9.		
2. Distichlis spicata		NI	10.		
3. Scirpus ~~americanus~~ Pungens		OBL	11.		
4. Hordeum jubatum		FACW-	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-).

Remarks: Yerba Mansa (Anemopsis californica) Community

HYDROLOGY

___ Recorded Data (Describe in Remarks): ___ Stream, Lake, or Tide Gauge ___ Aerial Photographs ___ Other ✓ No Recorded Data Available	Wetland Hydrology Indicators: Primary Indicators: ___ Inundated ✓ Saturated in Upper 12 Inches ___ Water Marks ___ Drift Lines ___ Sediment Deposits ___ Drainage Patterns in Wetlands Secondary Indicators (2 or more required): ___ Oxidized Root Channels in Upper 12 Inches ___ Water-Stained Leaves ___ Local Soil Survey Data ___ FAC-Neutral Test ___ Other (Explain in Remarks)
Field Observations: Depth of Surface Water: 0 (in.) Depth to Free Water in Pit: 0 (in.) Depth to Saturated Soil: 0 (in.)	

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____

Field Observations
Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3½		10yr 2/1			sandy loam
~~3½-6½~~		10yr 3/2			fine sand

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ✓ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: redox features present

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No (Circle)	(Circle)
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	Is this Sampling Point Within a Wetland? (Yes) No

Remarks:

Approved by HQUSACE 3/92

T 1

WETLAND DETERMINATION DATA FORM -- Arid West Region

Project/Site: Tamaya Pond City/County: Sandoval County Sampling Date: 28 Jul 11
Applicant/Owner: Santa Ana Pueblo State: NM Sampling Point: T 1
Investigator(s): Eddie Paulsgrove Section, Township, Range:
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): 0
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___
Is the Sampled Area within a Wetland? Yes X

Remarks: Drought season

Sect: 22
Township: 14N
Range 3E
35.4261
-106.617
2003-00207

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1. Typha domingensis			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ___ (A)
Total Number of Dominant Species Across All Strata: ___ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ___ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

US Army Corps of Engineers Arid West – Version 2.0

T 1

Sampling Point: ______

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3	97	10YR 6/8	3	CS/C	PL/M	Sandy	8% organic – [illegible]
4-14	2.5Y 3/3	65	10YR 4/2	35	D	M	Sandy	matrix ... [illegible]
								[illegible] sandy [illegible]
14-	cobble material (angular)							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (LRR C)
___ 1 cm Muck (A9) (LRR D)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (LRR C)
___ 2 cm Muck (A10) (LRR B)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes ____ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
X Water Marks (B1) (Nonriverine)
X Sediment Deposits (B2) (Nonriverine)
___ Drift Deposits (B3) (Nonriverine)
X Surface Soil Cracks (B6)
X Inundation Visible on Aerial Imagery (B7)
X Water-Stained Leaves (B9)

___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
X Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

X Water Marks (B1) (Riverine)
X Sediment Deposits (B2) (Riverine)
___ Drift Deposits (B3) (Riverine)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:
Surface Water Present? Yes ____ No ____ Depth (inches): ______
Water Table Present? Yes ____ No ____ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): < 17 in

Wetland Hydrology Present? Yes ____ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Tamaya T-2 City/County: Sandoval County Sampling Date: 28 July 11
Applicant/Owner: Santa Ana Pueblo State: NM Sampling Point: ST T2
Investigator(s): Eddie Paulsgrove Section, Township, Range:
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): 5
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes Y No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes Y No ____	
Wetland Hydrology Present?	? Yes ____ No X	

Remarks: Need to check aerial photos for inundation – For now calling this a transitum zone just outside wetland boundary.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: 1 m x 2m)			
1. Juncus balticus	65	Y	OBL
2. Scirpus pungens	30	Y	OBL
3. Muhlenbergia asperifolia	10	N	FACW
4. Polygonum amphibium	5	N	OBL
5. Distichlis spicata	3	N	FACW
6. Xanthium strumarium	2	N	N1
7. Sporobolus cuspidatus	2	N	N1
8. Melilotus officinalis	2	N	N1
	115 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

ST 23 = 57.5
20% = 23

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)
Total Number of Dominant Species Across All Strata: ____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

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SOIL

Sampling Point ______

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1.5	10YR 2/2	80	roots - no redox features				sandy [illegible]	dense roots
1.5-[illegible]	10YR 5/4	80	10YR 6/8	20	CS	M	loam	moist w/gravel
6 [illegible]								m
12-	14-14 in T1							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5) (**LRR C**)
- __ 1 cm Muck (A9) (**LRR D**)
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- __ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Loamy Mucky Mineral (F1)
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)
- __ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- __ 1 cm Muck (A9) (**LRR C**)
- __ 2 cm Muck (A10) (**LRR B**)
- __ Reduced Vertic (F18)
- __ Red Parent Material (TF2)
- __ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- __ Surface Water (A1)
- __ High Water Table (A2)
- __ Saturation (A3)
- __ Water Marks (B1) (**Nonriverine**)
- __ Sediment Deposits (B2) (**Nonriverine**)
- __ Drift Deposits (B3) (**Nonriverine**)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Water-Stained Leaves (B9)
- __ Salt Crust (B11)
- __ Biotic Crust (B12)
- __ Aquatic Invertebrates (B13)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Thin Muck Surface (C7)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water Marks (B1) (**Riverine**)
- __ Sediment Deposits (B2) (**Riverine**)
- __ Drift Deposits (B3) (**Riverine**)
- __ Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______

Water Table Present? Yes ____ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Tamaya Pond City/County: Sandoval County Sampling Date: 28 July 2014
Applicant/Owner: Santa Ana Pueblo State: NM Sampling Point: T3
Investigator(s): Eddie Paulsgrove Section, Township, Range:
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
Are Vegetation ___, Soil X, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Negative test hole. area has had sufficient moisture for wetland plants but has not developed wetland soil.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ___)			
1. Muhlenbergia asperifolia	25	Y	FACW
2. Polypogon monspeliensis	20	Y	FACW
3. Typha domingensis	15		OBL
4. Juncus balticus	10		OBL
5. Scirpus pungens	5		OBL
6.			
7.			
8.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: ___)	50% = 40 % Cover		
1.	20% = 16 % Cover		
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ___ (A)
Total Number of Dominant Species Across All Strata: ___ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ___ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

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SOIL Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1"	10YR 4/3	90	none				sand	sandy, dry 10% gravel
1"-6"	10YR 3/3	90	none				fine sand with some coarse sand	10% gravel
6"-12"							~~coarse sand~~ loose moist	sandy gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.) None

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks: Dead hydrophytic vegetation - dominated by FACW

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply) none except dead hydro. vegetation

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches) _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Tamaya Pond City/County: Sandoval County Sampling Date: 21 JUL 11
Applicant/Owner: Santa Ana Pueblo State: NM Sampling Point: T5
Investigator(s): Eddie Paulsgrove Section, Township, Range:
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ___ No X
Are Vegetation ___, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X	No ___	
Wetland Hydrology Present?	Yes X	No ___	

Remarks: Extended Drought; surface water ponded, being pumped beneath level.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	___ = Total Cover		
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
	___ = Total Cover		
Herb Stratum (Plot size: 2 x 2m)			
1. Scirpus pungens	75	Y	
2. Juncus balticus	25		
3. Bidens or Flaveria sp.	20		
4. Mullenbergia asperifolia	20		
5. Polygonum	5		
6. Grass sp. 2 (w Need)	5		
7.			
8.			
	150 = Total Cover		
Woody Vine Stratum (Plot size: ___)			
1.	50% = 75		
2.			
	___ = Total Cover		

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ___ (A)
Total Number of Dominant Species Across All Strata: ___ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ___ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:
___ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ___

Remarks:

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SOIL

Sampling Point: 1-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	70					Clay	silty, 30% veg
2-9	10YR 4/2	90					fine sand, some silt	10% veg
9-16	10YR 4/2	85					Sand, coarse, 15% gravel	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ___

Remarks: Somewhat problematic, (sand content), 6 inches (sulfic odor starts)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): _____

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problem soil, not a lot of surface visibility

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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Tamaya Pond City/County: Sandoval County Sampling Date: 28 July 11
Applicant/Owner: Santa Ana Pueblo State: NM Sampling Point: T4
Investigator(s): Eddie Paulsgrove Section, Township, Range:
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%):
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland?	Yes X No ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: 22" below surface - wet blackened gravel (w/ organic matter) Litter - stems of dead Scirpus — covering ground Drought

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Scirpus acutus	30	Y	OBL
2. Xanthium strumarium	20	Y	NI
3. Polygonum monspeliensis	41		
4. Muhlenbergia asperifolia	5		FACW
5.			
6.			
7.			
8.			
	55 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)
Total Number of Dominant Species Across All Strata: ____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
__ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

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Sampling Point: _____

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1'	10YR 4/3	90					Sandy, fine	10% root, dry
1-22	10YR 4/3	95%					Sand, coarse	5% gravel
22-	7.5YR 2/0	95%					gravel, blackish	5% organics

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks: concave, red parent, problematic sandy soils, level toe slop

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- X Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Concave setting, w/ level toe slope, problematic sandy soils w/ red parent material

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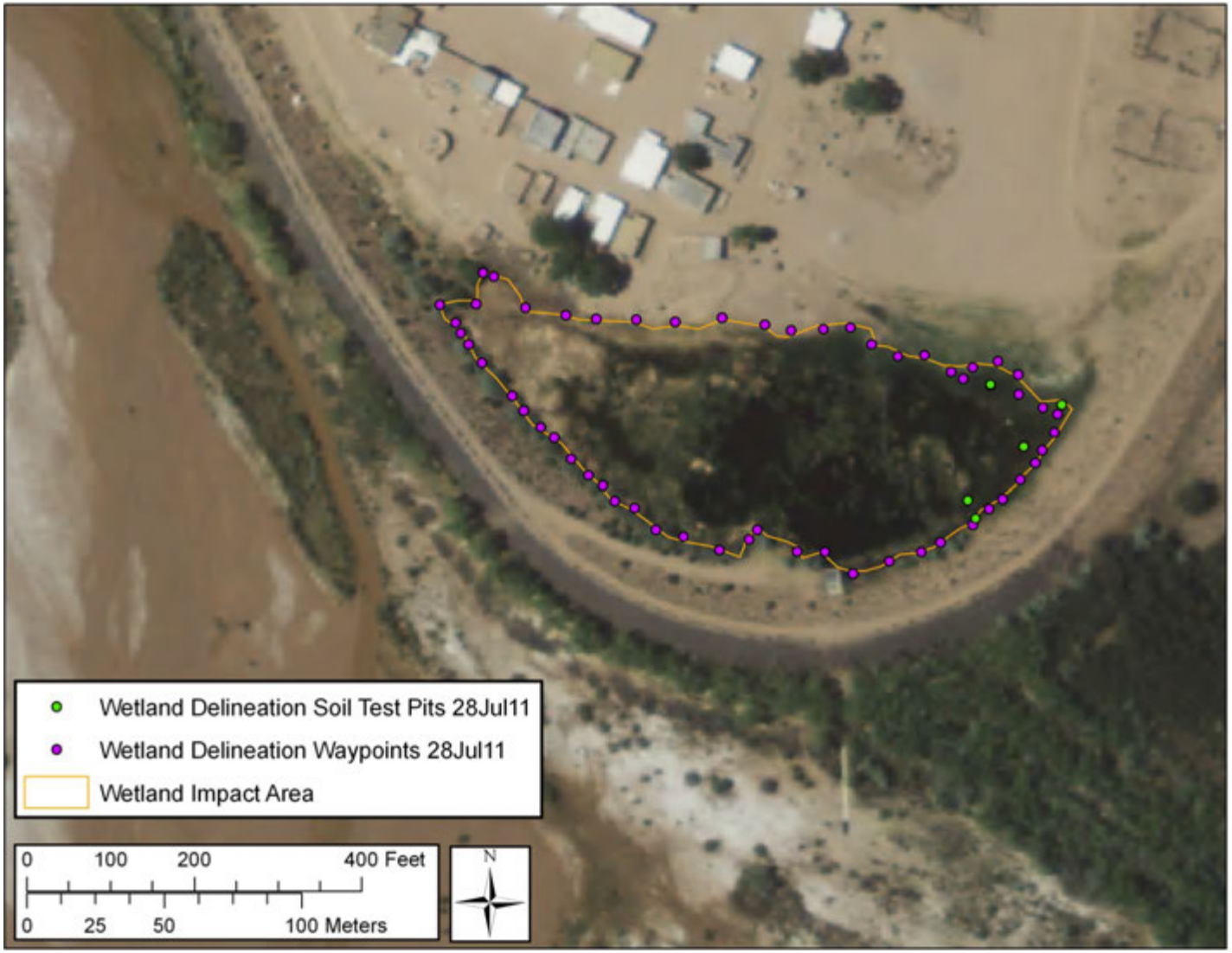
Tamaya Pond Wetland Delineation Map, 28 July 2011



Enclosure B: Wetland Mitigation Ratio Determination

SPD mitigation ratio setting checklist

<table>
<tr><td>1</td><td colspan="4">Date: ___25 Sept 2012_____ Corps file no.: _____ Project Manager: __D. Price_____

Impact site name: ____ Tamaya Pond ____ ORM impact resource type: _____
Impact Cowardin or HGM type: ___ P EM _____ Impact area (acres): ___3.3_____ Impact distance (linear feet): _____</td></tr>
<tr><td></td><td>P EM = Palustrine, emergent wetland, persistent, permanently (interior) to semipermanently (periphery) flooded, impounded. NOTE: wetland created by levee; water levels manipulated by pumping. Perennial, obligate wetland vegetation is present in deeper interior zone whereas periphery has mix of obligate and facultative species.</td><td>Column A:
Mitigation site name: __Sedge Meadow__
Mitigation type: Compensatory Mitigation; Preservation, on-site, out of kind
Resource type: _Wet sedge meadow_
Cowardin/HGM type: _ Palustrine persistent emergent, seasonally/ intermittently flooded _</td><td>Column B (optional):
Mitigation site name: _ New wetland pond excavated to groundwater
Mitigation type: Compensatory Mitigation, on site, in kind _
Resource type: Emergent wetland
Cowardin/HGM type: Palustrine persistent emergent, permanently to semipermanently flooded</td><td></td></tr>
</table>

2	**QUALITATIVE impact-mitigation comparison:** Has a Corps-approved functional/condition assessment been obtained? If not, complete step 2; otherwise, complete step 3. Yes ☐ No ☒ a. Short/long-term surface water storage b. Subsurface water storage c. Moderation groundwater flow/discharge d. Dissipation of energy e. Cycling of nutrients f. Removal of elements and compounds g. Retention of particulates h. Export of organic carbon i. Maintenance of plant and animal communities	Note: steps 2 and 3 are mutually exclusive. If step 2 is used, then complete the rest of the checklist (steps 4-10). Starting ratio: 1:1 Ratio adjustment: _+5__ Baseline ratio: _6:1_ PM justification: **a: +0** Surface water storage in mitigation area is by overbanking and is transient in nature, whereas surface water storage at impact site is semi-permanent. However, impact site has managed hydrology (impounded; pumped to draw down water). **b and c:** 0. Soils at both sites are sandy alluvium and both sites are similarly able to store subsurface water and moderate groundwater flow. **d: +1** Both sites would dissipate energy, but under different circumstances. Mitigation site is connected to river channel and able to dissipate energy from high flows, whereas impact site dissipates energy from storm flows through the village. **e: +1.** Impact site likely performs more nutrient cycling due to permanent surface water and concentration of wildlife. **f: +3.** Impact site likely removes compounds from surface runoff in vicinity of Tamaya Pueblo. Mitigation site is not positioned to perform this function. **g & h: 0.** Both sites able to retain particulates and export carbon. **i: +0.** Although qualitatively different, both sites maintain native plant communities that in turn support wildlife. Permanent water makes impact site valuable; however, this value is detracted from by the proximity to human habitation, grazing, burning, trash, and invasives.	Starting ratio: 1:1 Ratio adjustment: _-0.5_ Baseline ratio: _0.5:1_ PM justification: This wetland would be excavated to a depth such that groundwater would be present year-round. It is expected that this created wetland will function very similarly to the impacted site. Stressors (managed hydrology, human impacts) present at impact site **a: -0.5** Surface water storage potential at mitigation site is potentially greater than impact site because it is connected to the floodplain. Impact site has managed hydrology (impounded; pumped to draw down water). **b and c: 0.** Soils at both sites are sandy alluvium and both sites are similarly able to store subsurface water and moderate groundwater flow. Groundwater flow would not change significantly due to excavation for mitigation site. Impact area would lose some water storage capacity but due to sandy fill would still retain some ability to store water. **d: 0.** **e: 0** Mitigation area would have similar vegetation and similar ability to cycle nutrients as impact area. **f: +0.5** (would remove compounds, but not from water near inhabited area) **g, h: 0** **i: -0.5.** The constructed wetland would have greater wildlife benefits than the impact area because it would not be adjacent to an inhabited area. The impact site is subject to grazing, trash, and unplanned burning. It also has invasive species that are not being managed.	

3	**QUANTITATIVE impact-mitigation comparison:** Use step 3 if a Corps-approved functional/condition assessment has been obtained. Use Before-After-Mitigation-Impact (BAMI) spreadsheet (attachment 12501.4) (if a district-approved functional/condition method is not available, use step 2 instead). See example in attachment 12501.2.	Note: steps 2 and 3 are mutually exclusive. If step 3 is used, steps 3 and 5 may also be mutually exclusive. If a functional/ condition assessment method is used that explicitly accounts for area (such as HGM), steps 3 and 5 are mutually exclusive; however, if a method is used that does *not* explicitly account for area (such as CRAM), then both steps should be used. Complete the rest of the checklist (steps 4-10 or steps 4 and 6-10, as appropriate). Baseline ratio from BAMI procedure (attached): __:__	Baseline ratio from BAMI procedure (attached): __:__	
4	**Mitigation site location:**	Ratio adjustment: +0 PM justification: Mitigation site is in same segment of the Rio Jemez.	Ratio adjustment:+0 PM justification: Mitigation site is in same segment of the Rio Jemez.	
5	**Net loss of aquatic resource surface area:**	Ratio adjustment: **+1** PM justification: Preservation	Ratio adjustment: +0 PM justification: Establishment (creating new wetland habitat)	
6	**Type conversion:**	Ratio adjustment: **+1** PM justification: Mitigation area is a different habitat type from impact site. Both are rare habitat types in the watershed; however, presence of permanent water in a seasonally dry watershed gives the impact area higher value.	Ratio adjustment: +0 PM justification: This created wetland habitat would be designed to be very similar to the impacted site; emergent vegetation with a shrub fringe.	
7	**Risk and uncertainty:**	Ratio adjustment: **+0** PM justification: **(+0.5)** Likely need for long-term maintenance - exotic species (Tamarisk) removal. Pueblo of Santa Ana has already accomplished extensive Tamarisk control at this site. (- 0.5) Impact site is a public health risk due to proximity to human habitation, presence of mosquitoes and offensive odors associated with stagnant water.	Ratio adjustment: **0** PM justification: **(+0.5)** Mitigation site did not formerly support targeted aquatic resources; possible need for long-term maintenance including exotic species removal or removing sediment. (- 0.5) Impact site is a public health risk due to proximity to human habitation, presence of mosquitoes and offensive odors associated with stagnant water.	

8	**Temporal loss:**	Ratio adjustment: +0 PM justification: Herbaceous wetland already exists; benefits are immediate.	Ratio adjustment: +0.5 PM justification: Construction of wetland would occur concurrently with impact; however, time would be required for vegetation (shrubs and herbaceous) to become established. Using +0.5 because - most of the vegetation will be herbaceous and willows from whips, which establish quickly. - vegetation and soil will be transplanted from impact site, and would rapidly establish the new wetland community..	
9	**Final mitigation ratio(s):**	Column A: 1. Baseline ratio from step 2 or 3 = _6:1_ 2. Total adjustments = _+2_ 3. Final ratio: **_8 : 1__** Proposed impact (total): _1.65acre (note—half of the 3.3-acre impact site) ___ linear feet to Resource type: _cattail-bulrush pond___ Cowardin or HGM: _ emergent wetland, permanently/semipermanently flooded _ Required mitigation: _26.4_ acre ___ linear feet of Mitigation type: _preservation, on-site, out-of-kind____ Resource type: _sedge meadow _____ Cowardin or HGM: _ emergent wetland , seasonally/ intermittently flooded_	Column B: 1. Baseline ratio from step 2 or 3 = **0.5:1** 2. Total adjustments = +0.5 3. Final ratio: _1 : 1_ Remaining impact: __1.65acre (note—half of the 3.3-acre impact site) Required mitigation: _1.65_ acre ___ linear feet of Mitigation type: _establishment, on-site, in-kind_ Resource type: cattail-bulrush pond__ Cowardin or HGM: _ emergent wetland, permanently/ semipermanently flooded Additional PM comments: This situation is unusual because USACE is mitigating for past federal actions that impact the Pueblo of Santa Ana and Tamaya Village.	

10	**Final compensatory mitigation requirements:**	PM summary: Proposed mitigation is a combination of establishment and preservation. Sufficient acreage exists to mitigate entirely with preservation; however, this would not replace the permanent water source that is an important resource in the watershed. Therefore, half the acreage will be mitigated by establishing a permanent emergent wetland with ~25% open water for wildlife. The remainder will be mitigated by preservation of the wet sedge meadow , including maintenance removal of saltcedar as required. Establishment of in-kind, on-site, permanently flooded emergent wetland : 1.65 acre Preservation of wet sedge meadow, including ongoing saltcedar control: 13.2 acres

Enclosure C: Data Forms

Project-Specific Monitoring Data Forms

- Cottonwood and shrub monitoring (filled pond and mitigation area slopes)
- Herbaceous species monitoring (created wetland, including grasses on slopes, and preservation area)

Cottonwood and Riparian Shrub Monitoring Field Data
Tamaya Drainage Wetland Mitigation Project

Planting Location (select one):	Sample Unit (select one):	Field Crew:	Date:	Time:
☐ Tamaya Village	☐ 1 ☐ 4			
☐ Mitigation Created Wetland	☐ 2 ☐ 5			
	☐ 3			

Photo Log (note photo numbers, directions and descriptions here):

1

2

3

4

Plant ID refers to the unique number on each tree tag.

Plant Condition is healthy, stressed, or dead.

DBH is the diameter of the tree at 1.4 m from the ground.

Shrub height to nearest 0.1m if below 2m, then to nearest 0.5m

Plant ID	Plant Condition	DBH (trees) / Height (shrubs)	Comments

Are weeds or invasive species present? ☐ Yes ☐ No

If so, what species?

Estimated percent cover: ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Wildlife Observations:

Signs of mammal use present? ☐ Yes ☐ No

If so, what signs observed?

Riparian Birds present? ☐ Yes ☐ No

If so, what species?

Waterfowl present? ☐ Yes ☐ No

If so, what species?

Aquatic Herptiles present? ☐ Yes ☐ No

If so, what species?

Aquatic Invertebrates present? ☐ Yes ☐ No

If so, what taxa?

General comments, notes, site descriptions.

Herbaceous Species Monitoring Field Data
Tamaya Drainage Wetland Mitigation Project

Planting Location (select one):	Sample Unit (select one):	Field Crew:	Date:	Time:
☐ Tamaya Village ☐ Mitigation Created Wetland ☐ Mitigation Preservation Area (Wet Meadow)	☐ 1 ☐ 4 ☐ 2 ☐ 5 ☐ 3			

Photo Log (note photo numbers, directions and descriptions here):

1

2

3

4

Genus-species	Common name	Cover %	Wetland Indicator Status and Comments

Percent cover in general area: ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%			
Are weeds or invasive species present? ☐ Yes ☐ No If so, what species? Estimated percent cover: ☐ 0-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%			
Wetland Indicator Observations: Hydric soil indicators present? ☐ Yes ☐ No If so, what indicators observed? Wetland hydrology indicators present? ☐ Yes ☐ No If so, what indicators observed?			
Wildlife Observations: Signs of mammal use present? ☐ Yes ☐ No If so, what signs observed? Riparian Birds present? ☐ Yes ☐ No If so, what species? Waterfowl present? ☐ Yes ☐ No If so, what species? Aquatic Herptiles present? ☐ Yes ☐ No If so, what species? Aquatic Invertebrates present? ☐ Yes ☐ No If so, what taxa?			
General comments, notes, sites descriptions.			

Enclosure D: Ecological Performance Standards

Worksheet for SPD Uniform Performance Standards for Compensatory Mitigation Requirements

1	Date: 2015-01-30 DA no.:n/a Project manager: D. Price	Mitigation site name: Zia boundary well wetland pond Cowardin/HGM type: Palustrine emergent wetland Habitat type: Site coordinates: UTM 13N: E 349175, N 3924625	Reference site name: Tamaya Pond Site coordinates: UTM 13N: E 353215, N 3921535
2	Mitigation objective(s) to improve: [x] habitat conservation/biodiversity; [ ] water storage/flow attenuation; [ ] water quality; [ ] target population of special status biota; [ ] specific aquatic resource function(s); [ ] other:		
3	Mitigation type (select one): [ ] re-establishment; [x] establishment; [ ] rehabilitation; [ ] enhancement		
	If enhancement, indicate function(s) to be increased: function 1: function 2 (if applicable): function 3 (if applicable):		
4	Primary type(s) of site treatment: [x] introduction of plant materials; [ ] invasive species control; [x] hydrological manipulation; [x] topographic/substrate manipulation		
5	Aquatic resource type (select one): [ ] riverine; [x] depressional wetland; [ ] tidal wetland; [ ] slope wetland; [ ] other:		
6	Performance standard categories (select all that apply): [x] physical; [x] hydrologic; [x] fauna; [x] flora; [ ] water quality (ecological)		
7	Using selections from 2-6 above, insert applicable performance standards and targets from .12505.1-SPD Table of Uniform Performance Standards for Compensatory Mitigation Requirements into worksheet rows below. Add or remove rows for any category, as needed.		

Number/Categories:	Performance Standards:	Targets ("R" indicates reference):				
Physical-1	Ensure the buffer adjacent to aquatic resource habitat in the mitigation site is dominated by native vegetation and has undisturbed soils. Specifically: a) By end of year 5, at least 30% canopy cover by native vegetation; b) Undisturbed soils shall be demonstrated throughout buffer. NOTE: "Buffer" for this criterion is the slopes adjacent to the mitigation wetland that were disturbed by construction. This criterion measures success of revegetation.	Year 1:	Year 2:	Year 3:	Year 4:	Year 5:

Physical-2	USACE shall ensure the mitigation site provides diverse physical features or surfaces contributing to depressional wetland habitat function. Specifically: a. At completion of construction (year N), mitigation site will provide starting material for all four structural patch types. b. By year N+ 2, the site must contain 3 or more of the number of structural patch types found at the selected reference site. c. By year N+ 5, the site must contain 4 or more of the number of structural patch types found at the selected reference site. If this does not occur, adaptive management will be implemented. NOTE: Structural types at reference (impact) site are: 1) Open water; 2) tall emergent vegetation (cattails, bulrushes); 3) short emergent vegetation (sedges, rushes); 4) riparian/moist soil grasses and forbs; 5) riparian woody vegetation.					
Hydrologic -1	Duration of Surface Inundation/Saturation - Ensure at least 1.5 acres of the 2- acre mitigation site have surface inundation and remaining area has saturated soil on monitoring visits during dry season. If this is not true in any year, the well and pump will be investigated and adjusted or repaired.					
Hydrologic -2	Ensure persistent inflow for 100% of the growing season. Pueblo of Santa Ana will notify USACE if the pump is not working at any time.					
Hydrologic -3	Ensure outflow from wetland exits spillway as designed with no erosive channelized flow. USACE will check spillway at each monitoring visit. Pueblo of Santa Ana or USACE will check site after storm events.					
Fauna-1	Demonstrate wildlife use including at least three of the following: Evidence of large mammal use (tracks, scat, grazing/browsing); observations of riparian birds or waterfowl during site visits; presence of aquatic herptiles (turtles, native frogs, or salamanders); presence of wetland or aquatic invertebrates such as dragonflies.					
Flora-1	Survivorship Ensure 80% survivorship of shrub container plants are met.					
Flora -2	Survivorship Ensure 80% survivorship of transplanted wetland plants are met.					
WQ-1	Optional: sample aquatic invertebrates					

Section 404 (b) (1) Evaluation – Tamaya Drainage Project

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Section 404 (b) (1) Evaluation – Tamaya Drainage Project

I. Project Description

The Tamaya Drainage Project is proposed by the U.S. Army Corps of Engineers (USACE), Albuquerque District, to eliminate the ponding of water within the Santa Ana Pueblo protection works (levee) adjacent to the historic village of Tamaya. The proposed action would fill the ponded area, which has developed into a wetland over the years. Mitigation for the loss of this 3.3-acre wetland is proposed to consist of creation of a 2- acre permanent wetland and preservation of 13.2 acres of wet meadow. A mitigation plan has been formulated and is included in Appendix B of the Supplemental Environmental Assessment (SEA) for the project.

a. Location

The proposed action area is located in Sandoval County, New Mexico on Pueblo of Santa Ana trust lands (Figure 1). The action area includes the pond, levee, access road (BIA Route 74) and two mitigation areas: 1) the wet meadow preservation area located on the right bank of the Jemez River, across the river from Tamaya Village, and 2) the created wetland mitigation site, located in an upland site 3.1 miles upstream from the village. The pond is located at approximate coordinates 35°25'35"N, 106°37'00"W and the created wetland mitigation site is located at approximate coordinates 35°27'14"N, 106°39'42"W (Figure 1).

b. General Description

The pond (impact site) would be filled to approximate elevation 5233' using 32,000 cubic yards of fill material from two potential sources: 1) sediment excavated from the mitigation wetland creation site and 2) sediment that was previously removed from the Rio Grande as part of a Section 1135 ecosystem restoration project and has been stored near the Jemez Canyon Dan spillway. The fill would be sloped to 0.8%. A correspondingly sloped passive groundwater collecting network and drainage pipe would be installed to direct subsurface flow to a central vault for active pumping for management of excess surface water or groundwater. The fill elevation and haul route would be adjusted as needed to avoid cultural resources.

c. Authority and Purpose

Authorization

The U.S. Army Corps of Engineers, Albuquerque District (USACE), in cooperation with and at the request of the Pueblo of Santa Ana (Pueblo), would conduct the proposed action under its Operations authority for the Jemez Canyon Dam and Reservoir Project (JCDR). Detailed information about the history and authorized purposed of the JCDR is provided in the Implementation Report with Integrated Environmental Assessment (IR/EA) (USACE 2013)[1], Section 1.

[1] U.S. Army Corps of Engineers (USACE). 2013. Final Implementation Report with Integrated Environmental Assessment for the Tamaya Drainage Project, Sandoval County, New Mexico. Available at:

Purpose and Need

The fundamental purpose of the project is human health and safety. The pond is considered to be an undesirable feature by the Pueblo due to stagnant water, unpleasant smells associated with anaerobic conditions, breeding mosquitoes, and the presence of a potential safety hazard adjacent to the historic village. The Pueblo has long sought a remedy for these issues. A detailed history is provided in the Environmental Assessment.

Based on these problems, a number of key purpose and needs of the Proposed Action were developed and include:

- Eliminate breeding area for disease-carrying mosquitoes
- Eliminate drowning hazard adjacent to village
- Preserve cultural and historical resources
- Improve aesthetics by replacing stagnant, anaerobic water with native riparian vegetation and grasses
- Provide, through the creation of a mitigation wetland, a water source for wildlife in a location removed from human use
- Reduce populations of invasive plants, such as saltcedar
- Provide pedestrian access from Tamaya Village to the river
- Protect and manage the wet meadow to prevent further invasion of saltcedar.
- Develop and implement a long-term monitoring and adaptive managment plan.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material (grain size, soil type)

Fill material would originate from two sources. First, excavated soils from the created wetland would be used to the extent practicable. The created wetland site is situated within the Pinavetes loamy sand soil map unit. Pinavetes loamy sand formed from eolian deposits derived from sandstone. This excessively drained, sandy soil is nonsaline with only five percent of calcium carbonate.

The second source of fill would be sediments excavated form the Santa Ana Section 1135 Ecosystem Restoration Project on the Rio Grande. This material has a hydraulic conductivity value of a well to poorly sorted sand (26 and 62 feet/day respectively). It has been tested and found to be free of contaminants or toxic substances (see Appendix E of the IR/EA; USACE 2013).

(2) Quantity of Material (cu. yds.)

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http://www.spa.usace.army.mil/Missions/Environmental/EnvironmentalComplianceDocuments/EnvironmentalAssessmentsFONSI.aspx .

The approximate quantify of material to be removed from the mitigation site would be 28, 233 cubic yards. The quantity needed to fill the pond is approximately 32,000 cubic yards. .

(3) Source of Material

See above.

e. Description of the Proposed Discharge Site(s)

(1) Location (map) See Figure 1.
(2) Size: 3.3 acres
(3) Type of Site: confined by levee and adjacent high ground
(4) Type(s) of Habitat: Palustrine emergent wetland with managed hydrology (water level controlled by pumping).
(5) Timing and Duration of Discharge
Construction would occur outside the migratory bird nesting season. Approximately 50 days of hauling and placing fill would be required.

f. Description of Disposal Method (hydraulic, drag line, etc.)

This material would be removed from the mitigation site by excavator and trucked to the pond site. Excess material is not expected; however, if there is excess, it would be hauled off site and deposited at an approved upland location.

II. Factual Determination

There would be permanent loss of 3.3-acres of wetland. This loss would be mitigated by creation of a 2-acre wetland with similar structure and function, as well as preservation of 13.2 acres of wet meadow.

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope – Substrate elevation at the pond (impact site) is 5230-5240'. The pond would be filled to approximate elevation 5233'. The fill would not be of uniform elevation but would be sloped towards a groundwater collection sump. The elevation at the mitigation site is approximately 5320'. The mitigation wetland would be created by excavating approximately 4 feet and lining the depression with a bentonite or geosynthetic clay liner (GCL) to obtain a depth of 3 feet in the deepest part of the wetland.

(2) Sediment Type – Sediments to be excavated from the mitigation site and used in filling the pond are those described in d(1). Existing sediments in the impact site vary, with sandy material at the edges and fine-grained mucky material in the permanently flooded cattail part of the wetland.

(3) Dredged/Fill Material Movement - Material excavated from the mitigation site would be removed by an excavator and placed directly into a dump truck to be

used in filling the pond. Material from the sediments stockpile near the Jemez Canyon Dam spillway would be loaded into trucks and transported to the impact site. Approximately 5,000 square feet of soil and sediment from the edges of the impact site would be moved to the mitigation site when transplanting wetland plants.

(4) Physical Effects on Benthos (burial, changes in sediment type, etc.) – Benthos that currently exists at the pond would buried. Some of the organisms would be salvaged along with plant material that would be removed for transplanting. Creation of the mitigation wetland would provide a substrate for colonization by similar benthic organisms.

(5) Other Effects – Mosquitofish (*Gambusia affinis*) that were previously introduced into the pond would be affected by filling the pond. These fish are not native to the Jemez River. Tiger salamanders *(Ambystoma tigrinum)* would also be affected. This is an unavoidable impact. Due to the mucky substrate it would be very difficult to capture them for salvage. Salamanders colonized the pond naturally without human assistance, and are also expected to colonize the mitigation wetland in time.

(6) Actions Taken to Minimize Impacts –

- A wetland mitigation plan has been formulated and is included in Appendix B to the SEA.
- Construction would take place outside the migratory bird nesting season
- Sediment and erosion controls would be implemented during the construction period and before the created wetland slopes or banks are permanently stabilized. A Storm Water Pollution Prevention Plan is required for this action.
- All fuels and lubricants would be stored outside of the 100-year floodplain of the Jemez River and construction equipment would be inspected daily and monitored during operation to prevent leaking fuels or lubricants from entering surface water.
- 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 species. Equipment that was previously used in a waterway or wetland would be disinfected to prevent spread of aquatic disease organisms such as chytrid fungus. Disinfection water shall be contained in a tank or approved off-site facility and shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants.
- Following construction, the soil at the filled pond site would be stabilized and revegetated with appropriate native plant species including riparian grasses, shrubs and trees. The wetland mitigation site would be planted to wetland species and riparian shrubs. Grasses would be planted in the upland disturbed areas surrounding the mitigation wetland.

b. Water Circulation, Fluctuation and Salinity Determinations

There would be no impact to the water within the channel of the Jemez River. Water within the pond would be eliminated. The created wetland would be filled with pumped groundwater supplied from an existing well. The water has been tested and is nonsaline and free of contaminants.

(1) Water – The pond (impact) site where water currently exists would be filled and drained. The mitigation site, which is currently dry, would be filled with pumped groundwater. There would be no change to the wet meadow preservation area. Normally this site has saturated soil but no surface water. Water levels at the mitigation site would be monitored visually, as surface water is expected to be present year-round. If the water level in the mitigation wetland drops below the surface, the rate of pumping would be increased and the Adaptive Management Plan would be implemented (see Mitigation Plan). No changes in the following water quality parameters are expected, unless noted below:
   (a) Salinity
   (b) Water Chemistry (Ph, etc.)
   (c) Clarity
   (d) Color
   (e) Odor – The odors associated with stagnant water at the pond (impact site) would be eliminated.
   (f) Taste
   (g) Dissolved Gas Levels – DO levels may change over time in the created wetland as the vegetation and biota develop.
   (h) Nutrients – Nutrient levels may change over time in the created wetland.
   (i) Eutrophication – Eutrophication would be monitored at the created wetland.
   (j) Others as Appropriate

(2) Current Patterns and Circulation – Does not apply, except as noted. There is no circulation of water at the pond, nor would there be at the mitigation site; both are fed by groundwater.

   (a) Current Patterns and Flow –.
   (b) Velocity –.
   (c) Stratification –.
   (d) Hydrologic Regime – Hydrologic regime at the pond (impact site) is currently manipulated but there is permanent water in parts of the pond. Hydrologic regime of the created wetland would be a permanent wetland.

(3) Normal Water Level Fluctuations (tides, river stage, etc.) - There is no normal fluctuation at the pond because the water level is manipulated by pumping. The created wetland similarly would have only minimal fluctuation.

(4) Salinity Gradients – NA.

(5) Actions That Will be taken to minimize impacts:
   - Presence of surface water would be monitored after the mitigation wetland is complete.

- Sediment and erosion controls would be used during the construction period and before wetland banks are permanently stabilized, as described above under a(6).

c. Suspended Particulate/Turbidity Determinations

For the following discussion, only the created wetland mitigation site was considered. Because the pond will be filled, the following parameters would not be relevant to the impact site. For example, after the pond is filled there would be no turbidity because there would be no water.

(1) Expected changes in suspended particulates and turbidity levels in vicinity of disposal site – Suspended particulates and turbidity at the created wetland would be present after construction but are expected to decrease over time as the wetland develops.

(2) Effects –The above would not have significant effects to biota since organisms that are suited to the site conditions would colonize the created wetland.

(a) Light Penetration – Light penetration would increase following constuction as the banks stabilize and turbidity decreases, but may decrease over time as the wetland develops and fills with organisms.

(b) Dissolved Oxygen – Dissolved oxygen (DO) would likely be low initially since the water source is groundwater. As wetland plants develop, DO levels are expected to improve.

(c) Toxic Metals and Organics – Toxic metals and organics are not anticipated to occur. The Rio Grande sediment to be used in filling the pond has been tested (see Appendix E). Only those constituents naturally present in the existing soils would occur at the created wetland.

(d) Pathogens – NA.

(e) Aesthetics – Aesthetics would be altered for a short time during construction. Aesthetics at the pond would improve as stagnant water is eliminated. Aesthetics at the mitigation site would improve as sparse scrub vegetation would be replaced with a diverse wetland.

(f) Others as Appropriate

(3) Effects on Biota – Macroinvertebrates, microinvertebrates, amphibious and/or fish species would be affected by filing the pond. Until the created wetland is fully developed and functional, the following factors would be temporarily be affected:
(a) Primary Production, Photosynthesis
(b) Suspension/Filter Feeders

(c) Sight Feeders

(4) Actions taken to minimize impacts: See actions listed under Section II.a(6).

d. Contaminant Determinations - Contaminants would not be increased due to construction of this project. Sediments used for fill would originate either from the same river segment, or from the previously-tested Rio Grande sediments. Therefore, the required determinations pertaining to the presence and effects of contaminants can be made without additional testing.

e. Aquatic Ecosystem and Organism Determinations - Since there is no anticipated addition of contaminants due to construction, the following would not be affected by construction of the project due to contaminants.

(1) Plankton
(2) Benthos
(3) Nekton
(4) Aquatic Food Web
(5) Special Aquatic Sites
    (a) Sanctuaries and Refuges – Not applicable.
    (b) Wetlands – As described, a wetland would be filled and mitigated. Refer to the mitigation plan.
    (c) Mud Flats – Not applicable.
    (d) Vegetated Shallows - Not applicable.
    (e) Coral Reefs – Not applicable.
    (f) Riffle and Pool Complexes – Not applicable.

(6) Threatened and Endangered Species - Refer to Section 5.2.3 of the IR/EA and Section 3.3.3 of the SEA. The USACE has determined that there would be no effect to listed species or critical habitat due to the proposed action.

(7) Other Wildlife – As stated in Section 5.2.2 of the IR/EA, the proposed action would result in unavoidable short-term impacts to wildlife. During construction, waterfowl and riparian birds would be displaced. Non-native aquatic animals inhabiting the pond (mosquito fish and bullfrogs) would perish. Native tiger salamanders are expected to colonize the mitigation wetland following construction.

(8) Actions to Minimize Impacts – See actions listed under Section II.a(6). Actions to minimize impacts as described in the IR/EA and SEA would be implemented, including the following:
- Construction would take place outside the migratory bird nesting season
- All fuels and lubricants would be stored outside of the 100-year floodplain of the Jemez River and construction equipment would be inspected daily and monitored during operation to prevent leaking fuels or lubricants from entering surface water.

- 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 species.
- Following construction, the soil at the filled pond site would be stabilized and revegetated with appropriate native plant species including riparian grasses, shrubs and trees. The wetland mitigation site would be planted to wetland species and riparian shrubs. Grasses would be planted in the upland disturbed areas surrounding the mitigation wetland.

f. Proposed Disposal Site Determinations – It is anticipated that all excavated material would be used for placement of fill. If this is not practicable, an upland disposal site would be identified.

(1) Mixing Zone Determination – Not applicable.

(2) Determination of compliance with applicable water quality standards –The Environmental Protection Agency (EPA) administers Section 401 Water Quality Certification (WQC) for tribes that do not have water quality certifying authority, including the Pueblo of Santa Ana. The EPA reviewed the Draft Environmental Assessment in March 2013 and issued a Section 401 Water Quality Certification, which appears in Appendix B of the IR/EA. The Draft Supplemental Environmental Assessment and this 404(b)(1) analysis are being provided to the EPA with a request for review.

(3) Potential effects on human use characteristic – Human use would be improved by the proposed project.

(a) Municipal and private water supply – The proposed project is not within or adjacent to municipal or private water supplies.

(b) Recreational and commercial fisheries - Not applicable.

(c) Water related recreation – No recreational resources would be affected by the proposed project.

(d) Aesthetics – There would be short-term effects during construction. As discussed above, aesthetics would improve in the long term when stagnant water is eliminated from the vicinity of Tamaya Village.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and similar preserves – The proposed project is not within any such areas.

g. Determination of Cumulative Effects on the Aquatic Ecosystem – Cumulative effects on the ecosystem would be minimal to beneficial over the long term due to implementation of the mitigation and monitoring plan.

h. Determination of Secondary Effects on the Aquatic Ecosystem - Secondary effects would be minimal and are expected to be beneficial. .

III. Findings of Compliance or Non-Compliance with the restrictions on discharge

a. Adaptation of the Section 404(b) (1) Guidelines to this Evaluation – Not applicable (the guidelines were followed without adaptation).

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge site which would have less adverse impact on the aquatic ecosystem

There is no feasible alternative that would accomplish the project purpose. Alternatives that have been analyzed are presented in Section 4 of the IR/EA.

c. Compliance with applicable state water quality standards

The proposed action is on Tribal land and is not within state jurisdiction. Concurrence (and a 401 water quality certificate, if required) from the USEPA would be obtained prior to start of construction.

d. Compliance with applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act

Not applicable.

e. Compliance with Endangered Species Act of 1973

The proposed project is in compliance with the Endangered Species Act of 1973. Effects on listed species have been determined and are discussed in Section 5.2.3 of the IR/EA and Section 3.3.3 of the SEA. A Biological Assessment requesting concurrence would be submitted to the U.S. Fish and Wildlife Service, if required.

f. Compliance with specified protection measures for marine sanctuaries designated by the Marine Protection, Research and Sanctuaries Act of 1972

Not applicable.

g. Evaluation of Extent of Degradation of the Waters of the United States

(1) Significant adverse effects on human health and welfare – No significant adverse effects on human health or welfare would occur due to the proposed project.

(a) Municipal and private water supplies – No effect to municipal or private water supplies would occur from the proposed project.

(b) Recreation and commercial fisheries – No effect to recreation or commercial fisheries would occur from the proposed project.

(c) Plankton – Plankton would not be affected by the proposed project.

(d) Fish – Only non-native fish species would be affected.

(e) Shellfish – Shellfish would not be affected by the proposed project.

(f) Wildlife – Only short-term affects to wildlife would occur during construction. There would be a long-term benefit because a water source that is not adjacent to human habitation would be created.

(g) Special Aquatic sites – No applicable.

(2) Significant adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems – There would be temporary adverse effects on life stages of aquatic life and other wildlife dependent on aquatic ecosystems until the mitigation site is fully developed.

(3) Significant adverse effects on aquatic ecosystem diversity, productivity and stability - There would be temporary adverse effects on aquatic ecosystem diversity, productivity and stability.

(4) Significant adverse effects on recreational, aesthetic, and economic values - There would not be significant adverse effects on recreational, aesthetic, and economic values.

h. Appropriate and practicable steps taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem – All of the actions to minimize potential adverse impacts of the proposed project as listed above include:

- A wetland mitigation plan has been formulated and is included in this Appendix to the SEA.
- Construction would take place outside the migratory bird nesting season
- Measures to be taken to avoid any sensitive resources within the mitigation site would include flagging and fencing to keep equipment out of sensitive areas. (No sensitive areas have been identified to date.)
- Sediment and erosion controls would be during the construction period and before the created wetland slopes or banks are permanently stabilized. A Storm-Water Pollution Prevention Plan is required is required for this action.
- All fuels and lubricants would be stored outside of the 100-year floodplain of the Jemez River and construction equipment would be inspected daily and

monitored during operation to prevent leaking fuels or lubricants from entering surface water.

- 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 species. Equipment that was previously used in a waterway or wetland would be disinfected to prevent spread of aquatic disease organisms such as chytrid fungus. Disinfection water shall be contained in a tank or approved off-site facility and shall not be allowed to enter water ways or to be discharged prior to being treated to remove pollutants.
- Following construction, the soil at the filled pond site would be stabilized and revegetated with appropriate native plant species including riparian grasses, shrubs and trees. The wetland mitigation site would be planted to wetland species and riparian shrubs. Grasses would be planted in the upland disturbed areas surrounding the mitigation wetland.

(Removed duplicate provisions)

i. On the basis of the guidelines, the proposed disposal site(s) for the discharge of dredged or fill material is:

(2) Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem.

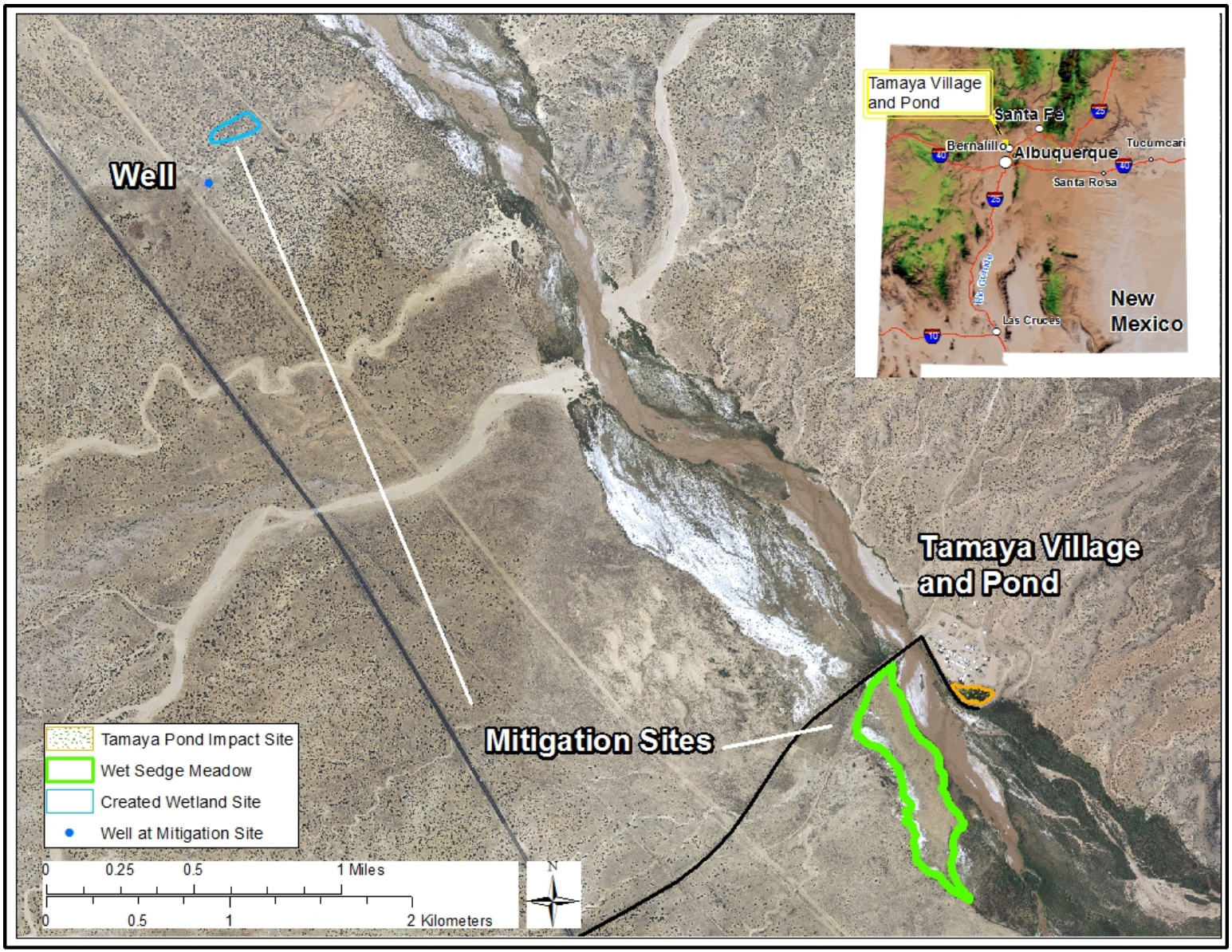

Figure 1: Location of impact and mitigation areas

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

MAR 11 2010

Julie Alcon
Chief, Environmental Resources Section
Albuquerque District Corps of Engineers
4101 Jefferson Plaza NE
Albuquerque, NM 87109-3435

RE: Clean Water Act §401 Water Quality Certification for Pueblo of Santa Ana, Tamaya Drainage Project, Sandoval County, New Mexico

Dear Ms. Alcon:

The Wetlands Section of the Environmental Protection Agency, Region 6 (EPA) has reviewed the authorization documentation for the project indicated above under §404 and §401 of the federal Clean Water Act. The project involves pond modification and mitigation near the Tamaya Village. The U.S. Army Corps of Engineers (USACE) is conducting the action under its Operations Authority for the Jemez Canyon Dam and Reservoir Project.

EPA understands that a wetland area will be filled to address health, safety and aesthetic concerns, and that mitigation for unavoidable impacts has been proposed. At this time, the Pueblo of Santa Ana has not adopted water quality standards under the federal Clean Water Act. Water quality standards have been adopted by the state of New Mexico, which apply to nearby areas within this watershed. Although the state's standards do not apply to Pueblo of Santa Ana waters, these standards can provide a technical basis for evaluation of potential projects. To see the complete list of state water quality standards, please refer to the *State of New Mexico Standards for Interstate and Intrastate Surface Waters,* adopted by the New Mexico Water Quality Control Commission (Title 20, Chapter 6. Part 4 of the New Mexico Administrative Code). These standards are available at the following address: http://www.nmenv.state.nm.us/swqb/Standards/index.html.

EPA has coordinated with Pueblo of Santa Ana to determine the appropriateness of the following requirements for certification of this project. The Tribal staff concurred with EPA's approach for §401 certification of the project.

Section 401 Water Quality Certification with Conditions:

Pursuant to §404 of the Clean Water Act, EPA hereby issues §401 Water Quality Certification for this project. This certification is subject to conditions to ensure that the project will comply with water quality standards and the Antidegradation Policy.

Therefore, this Certification is not valid unless the following conditions are adhered to:

1. The Corps has prepared a list of steps to follow to minimize potential adverse impacts associated with this project. Located in the draft Environmental Assessment for the project, Appendix B, Clean Water Act Section 404 Compliance, III.h. Appropriate and practicable steps taken to minimize potential impacts of the discharge on the aquatic ecosystem. That list is incorporated herein in its entirety.

2. Prior to commencement of the project, the Corps shall contact the Pueblo of Santa Ana to obtain a list of emergency response personnel. The Corps shall provide this list to all project specific staff, contractors and subcontractors.

3. The Corps shall notify the Pueblo emergency response personnel of any accidental discharges, or any significant problems with or changes to the project plans that may affect water quality. This applies to both the pond modification and mitigation portions of the project.

A copy of this §401 certification must be kept at the project site during all phases of construction. All contractors involved in this project must be provided a copy of this certification and made aware of the conditions prior to starting construction.

EPA reserves the right to amend or revoke this §401 certification at any time to ensure compliance with water quality standards. If you have any questions regarding this §401 Water Quality Certification please feel free to contact Tom Nystrom of my staff at (214) 665-8331. Thank you for your cooperation in maintaining the water quality of the Pueblo of Santa Ana.

Sincerely,

Jane B. Watson

Jane B. Watson, PhD.
Associate Director
Ecosystems Protection Branch

cc: Mr. Alan Hatch, Director
Department of Natural Resources
Pueblo of Santa Ana
2 Dove Rd.
Santa Ana Pueblo, NM 87004

Appendix C
Technical Design Considerations

Appendix C contains:

1. Surface water hydrology
2. Geotechnical boring logs
3. Tamaya Mitigation Pond Water Supply Requirement Estimates
4. Pump Size Calculation
5. Zia Boundary Well 2014 Step Test Results
6. Zia Boundary Well Development, Camera Survey and Capacity Test Report
7. Zia Boundary Well 1986 Pump Test and 2004-09 Depth to Water Data

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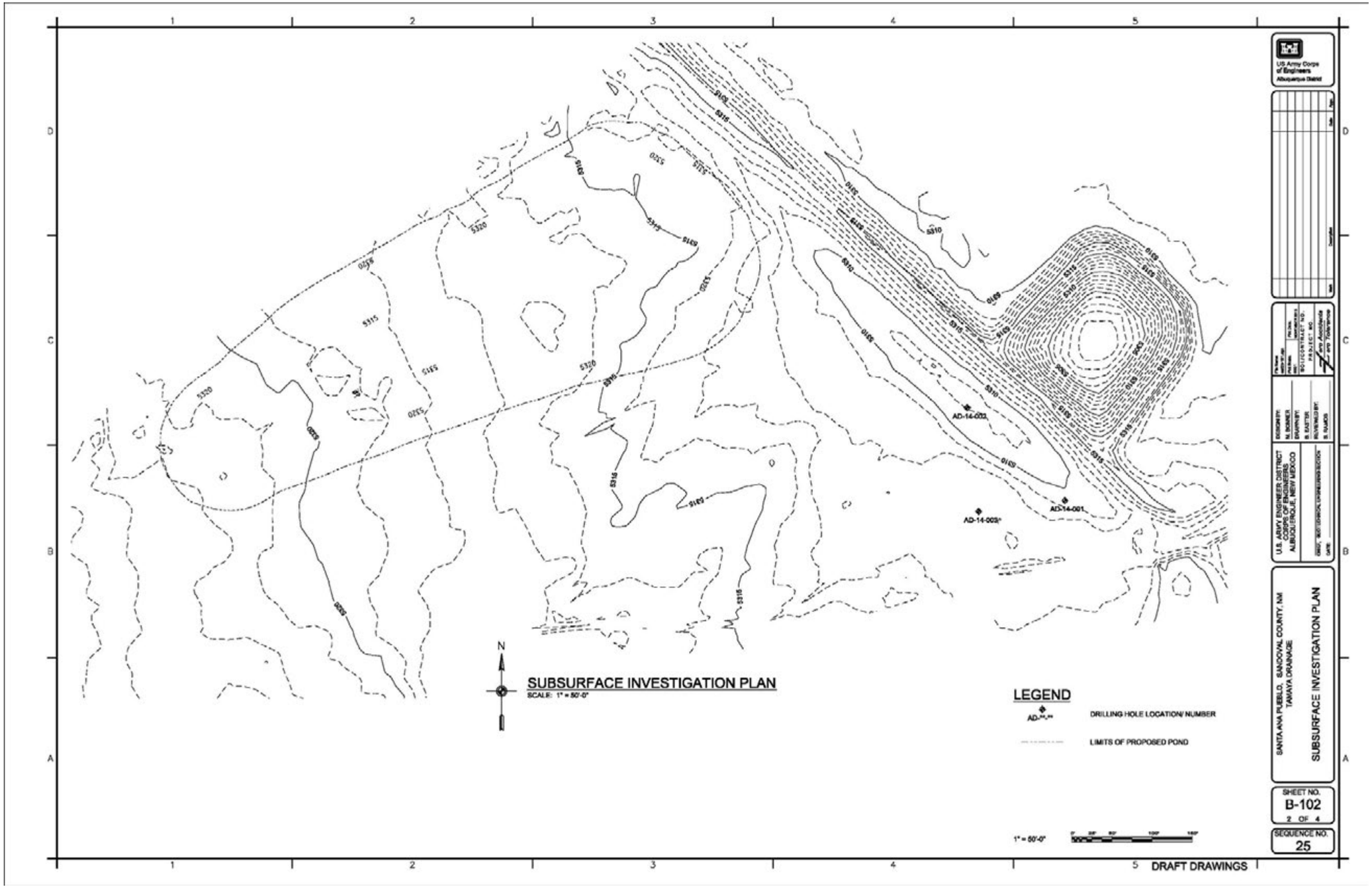
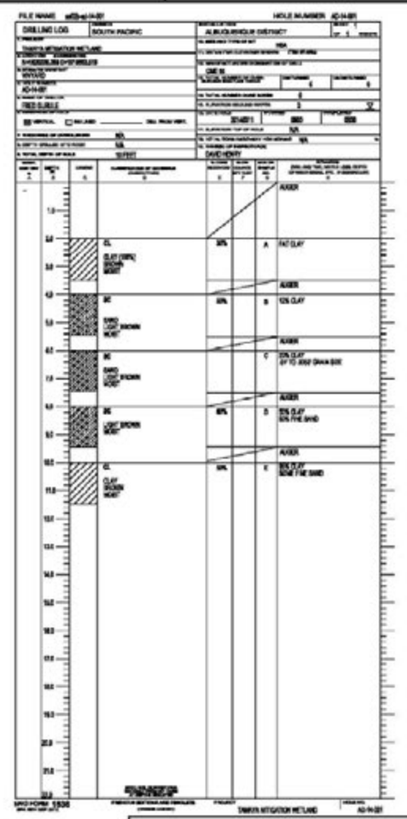
1. Surface Water Hydrology

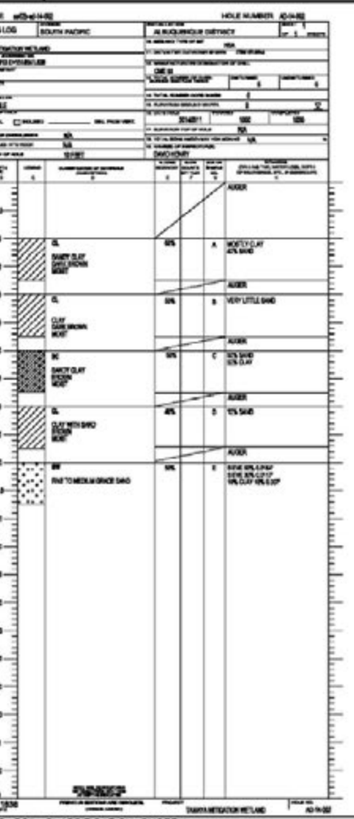
The created wetland mitigation site is located outside the floodplain of the Jemez River. Surface water in the area of the mitigation site is present only as runoff after heavy rains. The majority of the runoff that passes adjacent to the mitigation site comes from a 400 acre watershed southwest of Highway 550. Using the Rational Method, the 100-year storm was determined to pass an estimated 500 to 600 cfs under the highway in a series of four sets of culverts. The flow paths on the downstream side of these culverts are weakly defined and meander north and east. However, much of the flow converges just to the north of the well site where it splits again with some of the flow crossing the access road to the east and some continuing north adjacent to the mitigation site. A FLO-2D model shows that after all the flow paths diverge and reconverge, the flow path that passes along the southeast side of the proposed wetland pond will convey approximately 150 to 200 cfs (100-year) with depths less than one foot and velocities of 2 feet per second or less. The wetland pond is situated to avoid this flow path and the ponded area adjacent to the railroad grade. Surface runoff needs to be prevented from flowing into the created wetland because the sediment transported with runoff would fill the wetland, and flowing water could damage the pond structure (refer to Figure 3 of the SEA for topography).

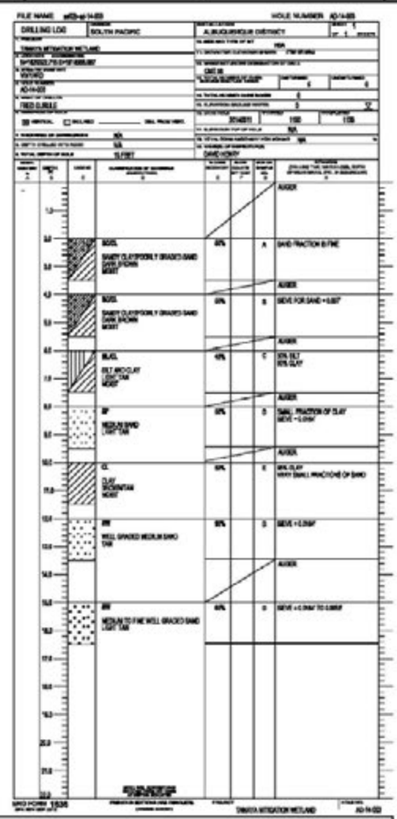
2. Geotechnical Boring Logs

A subsurface investigation for the mitigation site was conducted on March 3, 2014. The investigation was in the general area proposed for the mitigation pond, although the specific footprint subsequently shifted. The primary concern addressed by the boring was ensuring that the proposed site would not be sitting on top of a large lens of gravel, which would be unsuitable for wetland development. Based on these results, we do not expect to encounter any such layers at the current location.


AD-14-002
AD-14-003
AD-14-001
SUBSURFACE INVESTIGATION PLAN
SCALE: 1" = 50'-0"
N
LEGEND
DRILLING HOLE LOCATION/ NUMBER
LIMITS OF PROPOSED POND
1" = 50'-0"
US Army Corps of Engineers
Albuquerque District
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO
SANTA ANA PUEBLO, SANDOVAL COUNTY, NM
TAMAYA DRAINAGE
SUBSURFACE INVESTIGATION PLAN
SHEET NO.
B-102
2 OF 4
SEQUENCE NO.
25
DRAFT DRAWINGS







GENERAL NOTES

1. SEE SHEET B-102 FOR DRILLING HOLE LOCATIONS.

THE UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				GROUP SYMBOL	CLASSIFICATION
COARSE GRAINED SOILS: MORE THAN 50% OF MATERIAL IS LARGER THAN No. 200 SIEVE SIZE	GRAVELS: MORE THAN 50% OF COARSE PART IS LARGER THAN THE No. 4 SIEVE	CLEAN GRAVELS: LESS THAN 5% FINES: LESS THAN No. 200 SIEVE		GW	WELL GRADED GRAVEL, WELL GRADED GRAVEL WITH SAND
				GP	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVEL WITH FINES: MORE THAN 12% FINES: MORE THAN No. 200 SIEVE	PI<4	GM	SILTY GRAVEL, SILTY GRAVEL WITH SAND
			PI>7	GC	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
	SANDS: MORE THAN 50% OF COARSE PART IS SMALLER THAN THE No. 4 SIEVE	CLEAN SANDS: LESS THAN 5% FINES: LESS THAN No. 200 SIEVE		SW	WELL GRADED SAND, WELL GRADED SAND WITH GRAVEL
				SP	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SAND WITH FINES: MORE THAN 12% FINES: MORE THAN No. 200 SIEVE	PI<5	SM	SILTY SAND, SILTY SAND WITH GRAVEL
			PI>7	SC	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
FINE GRAINED SOILS: 50% OR MORE OF MATERIAL IS SMALLER THAN No. 200 SIEVE SIZE	SILTS & CLAYS: LIQUID LIMIT LESS THAN 50	PI - BELOW A - LINE		ML	SILT, SILT WITH SAND, SILT WITH GRAVEL, SANDY SILT, SANDY SILT WITH GRAVEL, GRAVELLY SILT, GRAVELLY SILT WITH SAND
		PI - ABOVE A - LINE		CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL, SANDY LEAN CLAY, SANDY LEAN CLAY WITH GRAVEL, GRAVELLY LEAN CLAY, GRAVELLY LEAN CLAY WITH SAND
				OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, SANDY ORGANIC CLAY, SANDY ORGANIC CLAY WITH GRAVEL, GRAVELLY ORGANIC CLAY, GRAVELLY ORGANIC CLAY WITH SAND, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL, SANDY ORGANIC SILT, SANDY ORGANIC SILT WITH GRAVEL, GRAVELLY ORGANIC SILT, GRAVELLY ORGANIC SILT WITH SAND
	SILTS & CLAYS: LIQUID LIMIT GREATER THAN 50	PI - BELOW A - LINE		MH	ELASTIC SILT, ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL, SANDY ELASTIC SILT, SANDY ELASTIC SILT WITH GRAVEL, GRAVELLY ELASTIC SILT WITH SAND
		PI - ABOVE A - LINE		CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL, SANDY FAT CLAY, SANDY FAT CLAY WITH GRAVEL, GRAVELLY FAT CLAY, GRAVELLY FAT CLAY WITH SAND
				OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, SANDY ORGANIC CLAY, SANDY ORGANIC CLAY WITH GRAVEL, GRAVELLY ORGANIC CLAY, GRAVELLY ORGANIC CLAY WITH SAND, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL, SANDY ORGANIC SILT, SANDY ORGANIC SILT WITH GRAVEL, GRAVELLY ORGANIC SILT, GRAVELLY ORGANIC SILT WITH SAND
HIGHLY ORGANIC SOILS				PT	PEAT

US Army Corps of Engineers
Albuquerque District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGN BY: M. BONNER
DRAWN BY: S. EASTER
REVIEWED BY: S. SIMMONS

SANTA ANA PUEBLO, SANDOVAL COUNTY, NM
TAMAYA DRAINAGE

DRILLING LOGS

SHEET NO. B-701
4 OF 4

SEQUENCE NO. 27

DRAFT DRAWINGS

3. Tamaya Mitigation Pond Water Supply Requirement Estimates

VOLUME

- Pond Area = 2.0 Acres = 87,120 Square Feet (ft^2)
- Estimated depth = 5 Feet (ft)
- Estimated volume = 435,600 Cubic Feet (ft^3) = 3,258,514 Gallons

DAILY WATER LOSSES

- Evaporation 0.40 in/day
- Plant Transpiration = 0.20 in/day
- Water loss through the liner = .0002 in/day
- Total Estimated loss = 0.4+.2+.0002 = .6002 inch/day = 0.050017 ft/day

PUMP SIZE CALCULATION EXAMPLE

- Daily Loss = (0.6002 inch/day) = 0.050017 ft/day x Pond Area = 87,120 ft^2 = 4357.5 ft^3 = 32,596 gallon/day = 22.6 gallons/minute (gpm)
- Head = 42 to 54 feet

WELL HYDRAULICS WITHOUT REHABILITATION

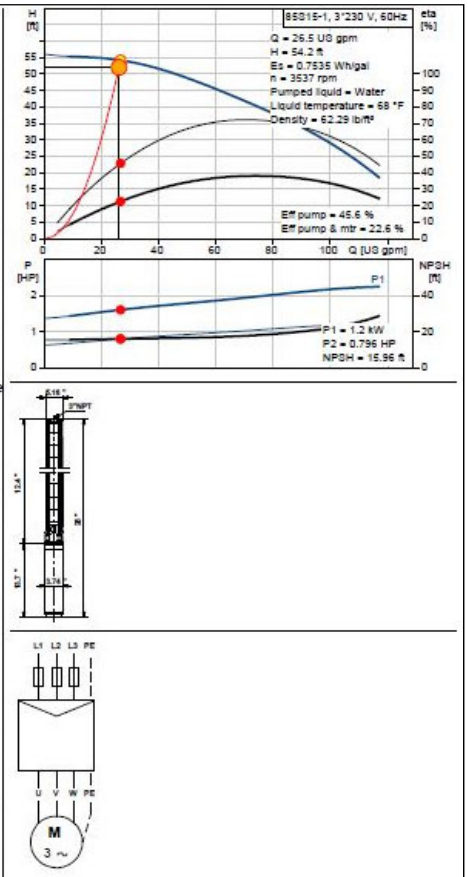
- 22.64 gpm pump at 53.7 ft pumping water level.

4. PUMP SIZE CALCULATION EXAMPLE

- Daily Loss = 4357.5 ft^3/day = 32,596.36 gallon/day = 22.64 gpm
- Estimated Total Head = Well Pumping Water Level = 53.7 ft
- See Hypothetical Curve and Horse Power Rating (below)

Example Pump (without well rehabilitation)

Description	Value
General information:	
Product name:	85S15-1
Position	
Product No.:	12B83001
EAN:	5700391308345
Price:	On request
Technical:	
Speed for pump data:	3450 rpm
Actual calculated flow:	26.5 US gpm
Flow range:	7.04 .. 117 US gpm
Max flow:	117 US gpm
Resulting head of the pump:	54.2 ft
Shaft seal for motor:	LIPSEAL
Approvals on nameplate:	CE,EAC,CSACOMP
Curve tolerance:	ISO 9906:2012 Grade 3B
Stages:	1
Model:	A
Valve:	pump with built-in non-return valve
Materials:	
Pump:	Stainless steel
	DIN W.-Nr. 1.4301
	AISI 304
Impeller:	Stainless steel
	DIN W.-Nr. 1.4301
	AISI 304
Motor:	Stainless steel
	DIN W.-Nr. 1.4301
	AISI 304
Installation:	
Maximum ambient pressure:	145 psi
Pump outlet:	3"NPT
Motor diameter:	4 inch
Liquid:	
Pumped liquid:	Water
Liquid temp:	68 °F
Density:	62.29 lb/ft³
Kinematic viscosity:	1 cSt
Electrical data:	
Motor type:	MS402
Rated power - P2:	1.5 HP
KVA code:	M
Main frequency:	60 Hz
Rated voltage:	3 x 230 V
Start. method:	direct-on-line
Starter:	0
Service factor:	1,30
Rated current:	7.3 A
Starting current:	40.3 A
Cos phi - power factor:	0,72
Rated speed:	3450 rpm
Axial load max:	772 lb
Motor efficiency at full load:	75,0 %



Evaporation Nomograph

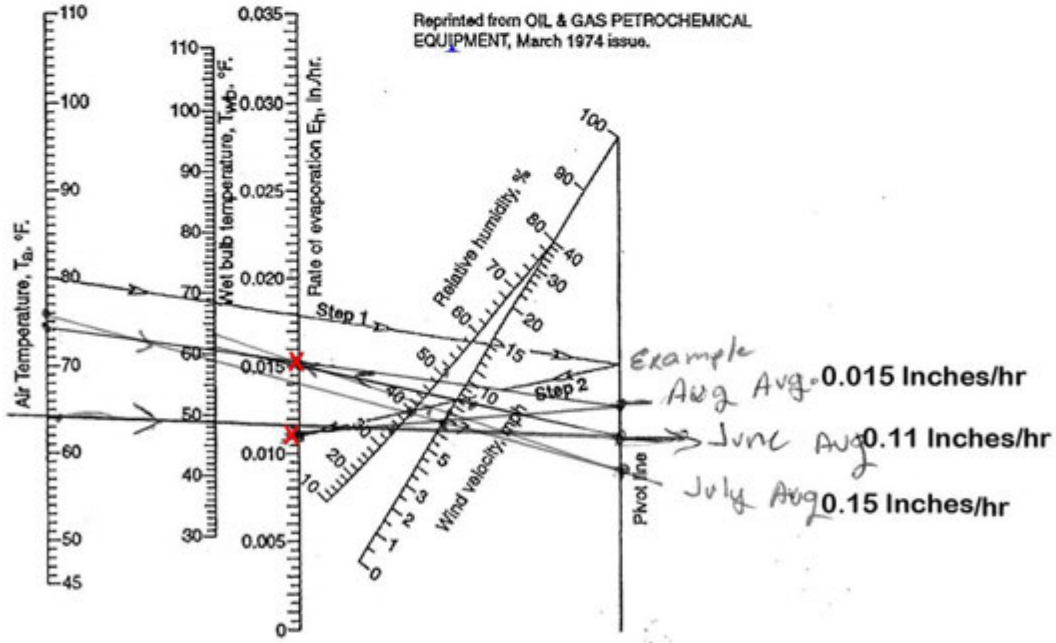
Data on evaporation from lakes and reservoirs are not extensive. But there are formulas by which it may be computed. One of these; by Fitzgerald, has the form, $E_h=(S-F)(1+v/2)/60$; where E_h = evaporation rate, in./hr.; S = vapor pressure of water at water temperature, in. Hg; F = vapor pressure existing in the air; and v = wind velocity, mph. Wind velocities are at the water surface and may be taken at one-half those recorded at an elevated station such as the Weather Bureau stations. For larger reservoirs, however, Weather Bureau values give results in close agreement with direct measurements.

An alternative and substantially equivalent formula is given by Fitzgerald in more usable terms. Somewhat simplified and transformed; it is: $E_h = 0.0002\ (T_a-T_{wb})(1+v/2)$; where T_a and T_{wb} are the air temperature and wet-bulb temperature, respectively. The monogram is based on the second formula. It includes the relative humidity for convenience.

Example. Assume the "normal" or long-term monthly temperature, relative humidity, and wind velocity for a certain location are 80° F., 58%, and 8 mph; what is the "normal" wet-bulb temperature, and what is the evaporation rate per hour and per month of 31 days?

Solution. Step 1, line 80°F. on T_a scale with 58% on R scale, extend to Pivot line and mark. Also read wet-bulb temperature as 69°F. where line crossed Twb scale. Step 2, from marked position Pivot line, connect with 8 mph on V scale, extend to E_h scale, and read evaporation rate as 0.011 in./hr. The evaporation rate per month = 0.011 x 24 x 31 = 8.184 in.

Reprinted from OIL & GAS PETROCHEMICAL EQUIPMENT, March 1974 issue.



B-1

5. ZIA BOUNDARY WELL – 2014 STEP TEST RESULTS

WELL ID:	Zia Boundary Well		STEP TEST RESULTS																										
PUMP TEST TYPE:	Step Drawdown/Capacity																												
CASING DIA:	8"																												
TOTAL DEPTH:	~400 feet																												
TEST DATE:	6/20/2014																												
STATIC WATER LEVEL:	32.54		Step 1 Specific Capacity (gpm/ft-s) =				0.97																						
PUMP DEPTH:	150' from top of casing		Step 2 Specific Capacity (gpm/ft-s) =				1.06																						
PUMP SIZE:	6"		Step 3 Specific Capacity (gpm/ft-s) =				1.17																						
DROP PIPE DIA:	2.5"					Mean =	1.07																						
DISCHARGE PIPE DIA:	4"																												

gpm = Gallons/Minute																													
ft-s = Drawdown in ft																													
PSI = Pressure/Square Inch																													
SC = Specific Capacity (gpm/ft-t)																													
DTW = Depth to Water (ft																													

Approximate Drawdown @ 22.6 gpm	SC = 1.07 gpm/ft-t Q= 22.64 gpm s = Q/SC = 23.4																												
Total Head = (s + initial DTW) = (21.16ft+32.54ft) = 53.7ft																													

Step 1									Step 2									Step 3								
Start Time	9:28am								Start Time:	11:57am								Start Time:	12:15pm							
Time (sec)	Time (min)	Time (min)	DTW (ft)	Q (gpm)	Drawdown (ft-s)	P (PSI)	Specific Capacity (gpm/ft-t)		Time (sec)	Time (min)	DTW (ft)	Q (gpm)	Drawdown (ft-s)	P (PSI)	Specific Capacity (gpm/ft-t)		Time (sec)	Time (min)	DTW (ft)	Q (gpm)	Drawdown (ft-s)	P (PSI)	Specific Capacity (gpm/ft-t)						
0	0		32.54	0	0	0	0		0	0	80.85	45	48.31	70	0.93		0	0	102.31	77	69.77	54	1.10						
30	0.5		ND	48	ND	84	ND		30	0.5	85.45	72	52.91	70	1.36		30	0.5	107.40	102	74.86	54	1.36						
60	1		ND	48	ND	84	ND		60	1	89.89	72	57.35	70	1.26		60	1	111.80	102	79.26	54	1.29						
90	1.5		84.70	48	52.16	84	0.92		120	2	95.50	72	62.96	70	1.14		90	1.5	115.30	102	82.76	54	1.23						
120	2		82.80	48	50.26	84	0.96		150	2.5	97.80	72	65.26	70	1.10		120	2	117.59	102	85.05	54	1.20						
150	2.5		82.02	48	49.48	84	0.97		180	3	99.32	72	66.78	70	1.08		150	2.5	119.40	102	86.86	54	1.17						
210	3.5		81.12	48	48.58	84	0.99		210	3.5	100.44	72	67.9	70	1.06		180	3	120.50	102	87.96	54	1.16						
270	4.5		80.08	48	47.54	84	1.01		240	4	101.20	72	68.66	70	1.05		210	3.5	121.30	102	88.76	54	1.15						
300	5		80.08	48	47.54	84	1.01		270	4.5	101.80	72	69.26	70	1.04		240	4	121.76	102	89.22	54	1.14						
360	6		80.82	48	48.28	84	0.99		300	5	102.20	72	69.66	70	1.03		270	4.5	122.05	102	89.51	54	1.14						
420	7		80.95	48	48.41	84	0.99		360	6	102.66	72	70.12	70	1.03		300	5	122.25	102	89.71	54	1.14						
480	8		81.20	48	48.66	84	0.99		420	7	102.48	72	69.94	70	1.03		360	6	122.40	102	89.86	54	1.14						
540	9		81.21	48	48.67	84	0.99		480	8	102.86	72	70.32	70	1.02		420	7	122.41	102	89.87	54	1.13						
600	10		81.41	48	48.87	84	0.98		540	9	102.80	72	70.26	70	1.02		480	8	122.45	102	89.91	54	1.13						
660	11		81.59	48	49.05	84	0.98		600	10	102.75	72	70.21	70	1.03		540	9	122.46	102	89.92	54	1.13						
720	12		81.76	48	49.22	84	0.98		660	11	102.65	72	70.11	70	1.03		600	10	122.32	102	89.78	54	1.14						
780	13		89.92	47	57.38	84	0.82		720	12	102.60	72	70.06	70	1.03		660	11	122.14	102	89.6	54	1.14						
840	14		82.10	47	49.56	84	0.95		780	13	102.51	72	69.97	70	1.03		720	12	121.99	102	89.45	54	1.14						
900	15		82.20	47	49.66	84	0.95		840	14	102.45	72	69.91	70	1.03		780	13	121.91	102	89.37	54	1.14						
960	16		82.31	47	49.77	84	0.94		900	15	102.35	73	69.81	70	1.05		840	14	121.81	102	89.27	54	1.14						
1020	17		82.31	47	49.77	84	0.94		960	16	102.36	73	69.82	70	1.05		900	15	121.79	102	89.25	54	1.14						
1080	18		82.39	47	49.85	84	0.94		1020	17	102.30	73	69.76	70	1.05		960	16	121.74	102	89.2	54	1.14						
1140	19		82.50	49	49.96	84	0.98		1080	18	102.40	73	69.86	70	1.04		1020	17	121.70	102	89.16	54	1.14						
1200	20		82.50	49	49.96	84	0.98		1140	19	102.44	73	69.9	70	1.04		1080	18	121.70	102	89.16	54	1.14						
2400	40		80.95	48	48.41	84	0.99		1200	20	102.56	73	70.02	70	1.04		1140	19	121.70	102	89.16	54	1.14						
3600	60		80.93	48	48.39	86	0.99		2400	40	102.51	73	69.97	70	1.04		1200	20	121.65	102	89.11	54	1.14						
4800	80		80.85	45	48.31	84	0.93		3600	60	107.70	76	75.16	70	1.01		2400	40	121.30	106	88.76	54	1.19						
6000	100		End of Step						4800	80	102.31	77	69.77	70	1.10		3600	60	120.87	108	88.33	54	1.22						
7200	120								6000	100			End of Step				4800	80	121.00	108	88.46	54	1.22						
									7200	120							6000	100			End of Step (t-decreasing)						
																	7200	120											

PSI is not valid - gate valves on the discharge line were "shut in" to adjust discharge, which artificially increased pressure at
ND = No Data (data point not measured)
NOTE: Discharge water was extremely dirty. Each increase in step caused more sediment to break loose. The well requires redevelopment or rehabilitation to increase S.C.

6. Zia Boundary Well Development, Camera Survey and Capacity Test Report

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HGS

Pueblo of Santa Ana Department of Natural Resources

Purchase Order No.: 15430
Zia Boundary Well
July – August 2015
Well Development, Camera Survey and Capacity Test

Report by:
Bill W. Whaley, Hydrogeologist, C.P.G

Well Development, Camera Survey and Capacity Test

Zia Boundary Well

July/August 2015

HydroGeologic Services, Inc. (HGS) performed a Well Video Survey, well development services, jetting services, intermittent pumping program, surging and baling of well, and a capacity test for the Pueblo of Santa Ana DNR Zia Boundary Well.

Included in the assessments are our daily logs, copies of the videos, and a disk without transducer readings and graphs.

Zia Boundary Well:

Well history:

Drilled 1985

8-inch Casing

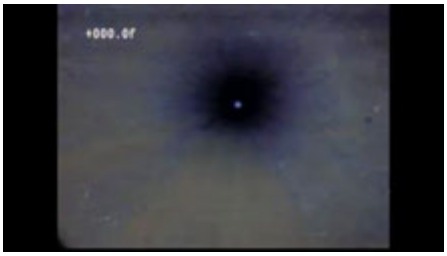
Total Depth 800-feet in 1985

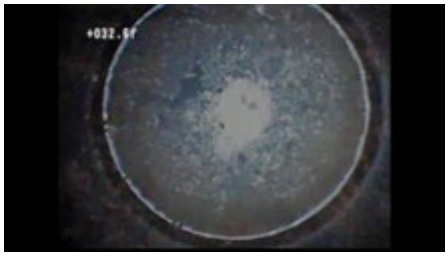
Total Depth August 2015 – 773-feet

Project Activity Time Line

- 7/14/2015 Video Well
- 7/16/2015: Set up Brush well with 3 brush, change to large brush.
- 7/17/2015: Bail well, get rust out, bailing pea gravel, and tag well @ 773'.
- 7/20/2015: Swab well; 8 - 5 gal. MGA, 8 – 5 gal. AE
- 7/21/2015: Pump well: Set 90 GPM pump on 2" galvanized with #8 wire@ 210', pump/off, set @ 420', pump/off Set @ 714', pump/off
- 7/22/2015: Start Pump/off, Pull Pump re-video well
- 7/29/2015: Set Jet Tool, Jet - 84' – 420', jet for 6.5 Hours
- 7/30/2015: Jet – 420' – 756' for 10 hours.
- 7/31/2015: Jet – Jet 756' – 420' for 5 hours.
- 8/4/2015: Set Pump to 420, set up discharge, pump and surge, well making lots of sand
- 8/5/2015: Start Pump @ 450 GPM, slow down to 320, @ 210-230 pumped a lot of sand, slow down to 150 WL come back up to 1315' in ½ hour. Pump and surge. Little to no sand when pumping 200 GPM or less 9 hours of pumping & surging.
- 8/6/2015: Pump and Surge – wide open making a lot of sand 9 hours of pumping and surging.
- 8/7/2015: Pump and Surge for 4 hours, remove pump
- 8/11/2015: Swab screen, bail bottom, swab screens, 6.5 hrs. of Swab and Bail
- 8/12/2015: Swab, swab on screen, 3.5 hrs. of Swab and Bail.
- 8/13/2015: Set up sounding tube, wire, make splice kit, set 25 HP 325 GPM pump with sounding tube to 420', set up discharge
- 8/17/2015: Set transducer, calibrate equipment, get static, step test 150, 200, 250, 300, 2 hrs. at each step.

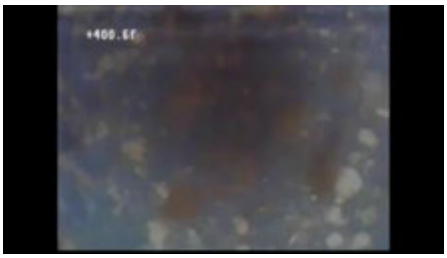
First Well Video – July 13, 2015


0.0 Ft Commence well Video


32.6 Ft Near Static WL

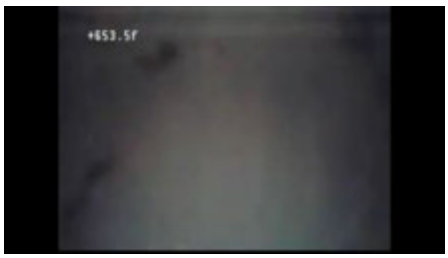

200.7 Ft after Well Rehab Build Up Removed


217.8 Screen Slot

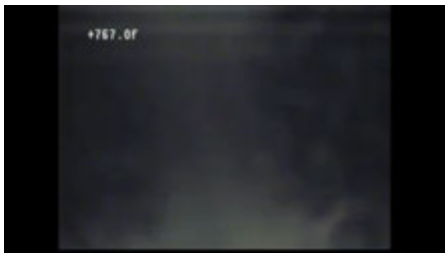

400.6 Ft Camera did not meet refusal


442.6 Ft Build up

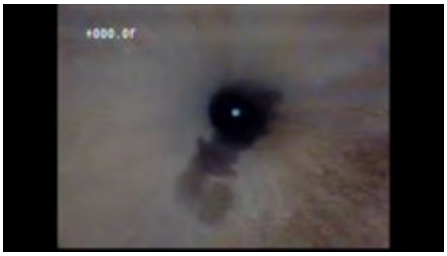

504.1 Ft Camera still moving to bottom


653.5 Ft Camera still moving to bottom

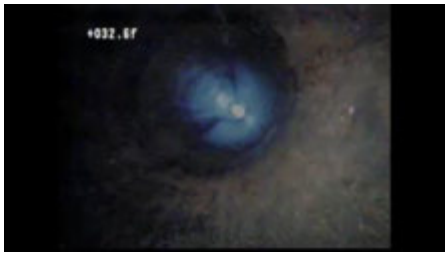

702.9 Ft Camera still moving to bottom


767.0 Ft Near Bottom of Well

Second Well Video (After Well Rehabilitation) – July 13, 2015



0.0 Ft Commence well Video

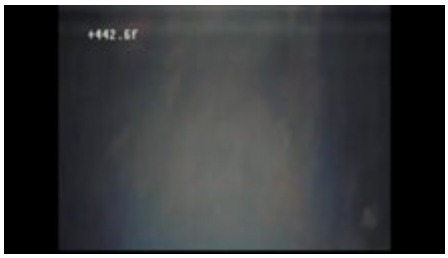


32.6 Ft Near Static WL

200.7 Ft after Well Rehab Build Up Removed

217.8 Screen Slot

400.6 Ft Camera did not meet refusal



442.6 Ft Build up has been removed

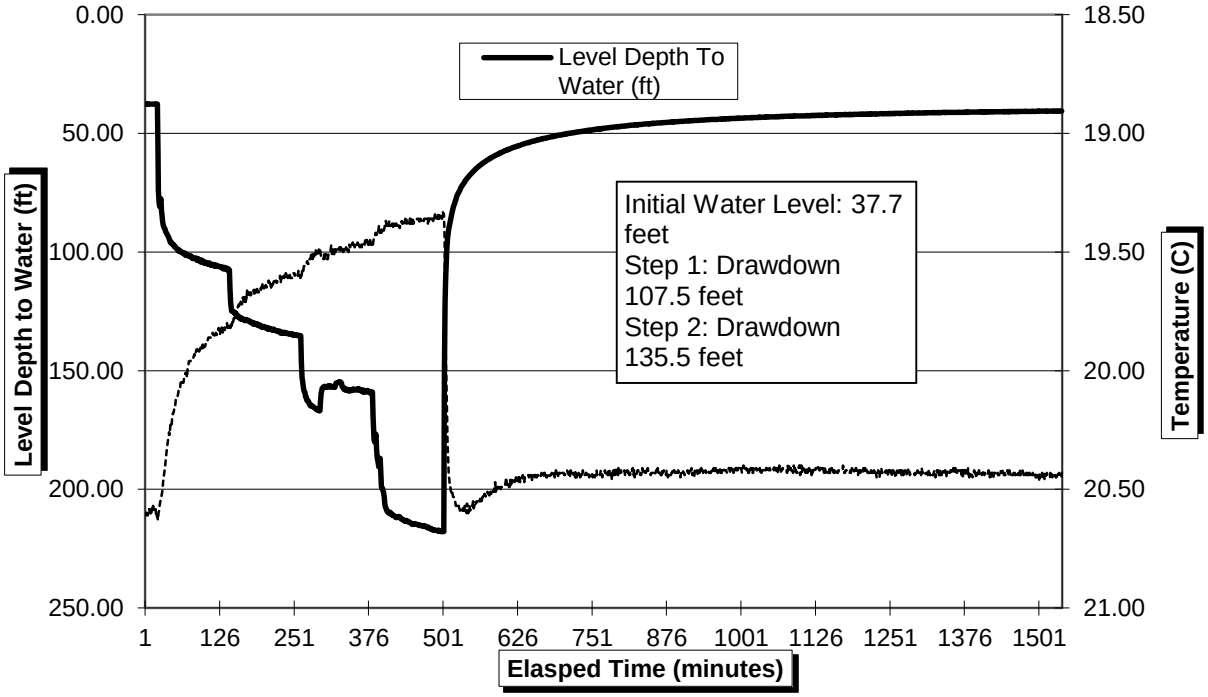
504.1 Ft Camera still moving to bottom

653.5 Ft Camera still moving to bottom

702.9 Ft Camera still moving to bottom

768.8 Ft Bottom of Well

A1278-A Santa Ana Pueblo
Zia Boundary Well 2 Hour Step Tests August 17, 2015
Flow Rates: 150/200/250/300 Gallons Per Minute



*Data Disk Attached

Water Quality Readings During Step Test

Meter	Time	pH	Temp °F	Conductivity mS/cm	DO Mg/L	Turbidity NTU
921700	08:30	7.91	70.2	0.819	0.52	>1100
923200	08:40	7.90	70.9	0.841	0.92	62.8
923900	08:45	7.93	70.9	0.844	1.52	28.0
926100	09:00	7.93	69.7	0.875	1.28	12.30
928300	09:15	7.93	72.1	0.888	1.85	13.2
930500	09:30	7.92	72.7	0.871	6.55	5.72
932700	09:45	7.92	72.4	0.889	1.47	4.87
934800	10:00	7.91	73.3	0.897	1.31	4.75
937000	10:15	7.90	75.4	0.899	3.30	5.04
939700	10:30	7.89	75.3	0.897	1.57	4.18
942700	10:45	7.87	76.2	0.916	1.56	21.6
945900	11:00	7.85	74.8	0.940	2.03	24.3
948700	11:15	7.80	76.7	0.945	7.81	25.3
951600	11:30	7.77	77.9	0.989	2.50	32.7
954500	11:45	7.76	77.3	1.070	4.61	18.7
957500	12:00	7.73	79.1	1.070	1.16	11.52
960400	12:15	7.75	76.7	1.100	7.31	7.81
963700	12:30	7.79	82.7	1.150	2.19	6.36
967500	12:45	7.71	83.8	1.150	2.25	46.8
971200	13:00	7.71	75.3	1.200	4.01	8.95
974900	13:15	7.68	83.1	1.250	2.46	8.53
978400	13:30	7.72	85.6	1.290	2.66	8.79
981900	13:45	7.70	83.8	1.260	3.86	4.16
958300	14:00	7.70	74.4	1.260	4.65	4.23
988800	14:15	7.62	73.7	1.270	8.38	3.97
992900	14:30	7.57	70.3	1.240	2.27	17
997200	14:45	7.56	70.2	1.290	1.72	24.7
100160	15:00	7.59	71.0	1.370	3.95	13.8
100570	15:15	7.62	69.6	1.380	2.61	13.1
101020	15:30	Lightning				
101460	15:45	7.62	70.01	1.370	8.69	20.5
101850	16:00	7.60	69.2	1.210	8.38	9.35

7. Zia Boundary Well 1986 Pump Test and 2004-09 Depth to Water Data

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TABLE IV-1.--List of aquifer well test sites evaluated for this study.

Test Name	Land Ownership	Location	Wells Tested		Type of Test	Source of Data
			Production	Observation		
Supply Site	Santa Ana	14.3.22.124	x	2	Production	Present study
Boundary	Santa Ana	14.3.7.300	x		Production	Metric Corp.
Boundary	Santa Ana	14.3.7.300		2	Slug	Present study
Boundary	Santa Ana	14.3.7.300	x	1	Production	Present study
Sec. 3 windmill	Santa Ana	14.3.3.434	x		Slug	Present study
Sec. 31 windmill	Santa Ana	14.3.31.200	x		Slug	Present study
Zia Test	Zia	14.2.27.211	x	1	Production	Present study
Zia (Metric)	Zia	15.2.28.400	x		Production	Metric Corp.
Zia Slugs	Zia	15.2.28.400		3	Slug	Present study
Jemez Village	Jemez	16.2.16.400	2	17	Production	BIA
Holy Ghost	Jemez	17.1W.10.241	x	1	Production	Present study

Zia Border

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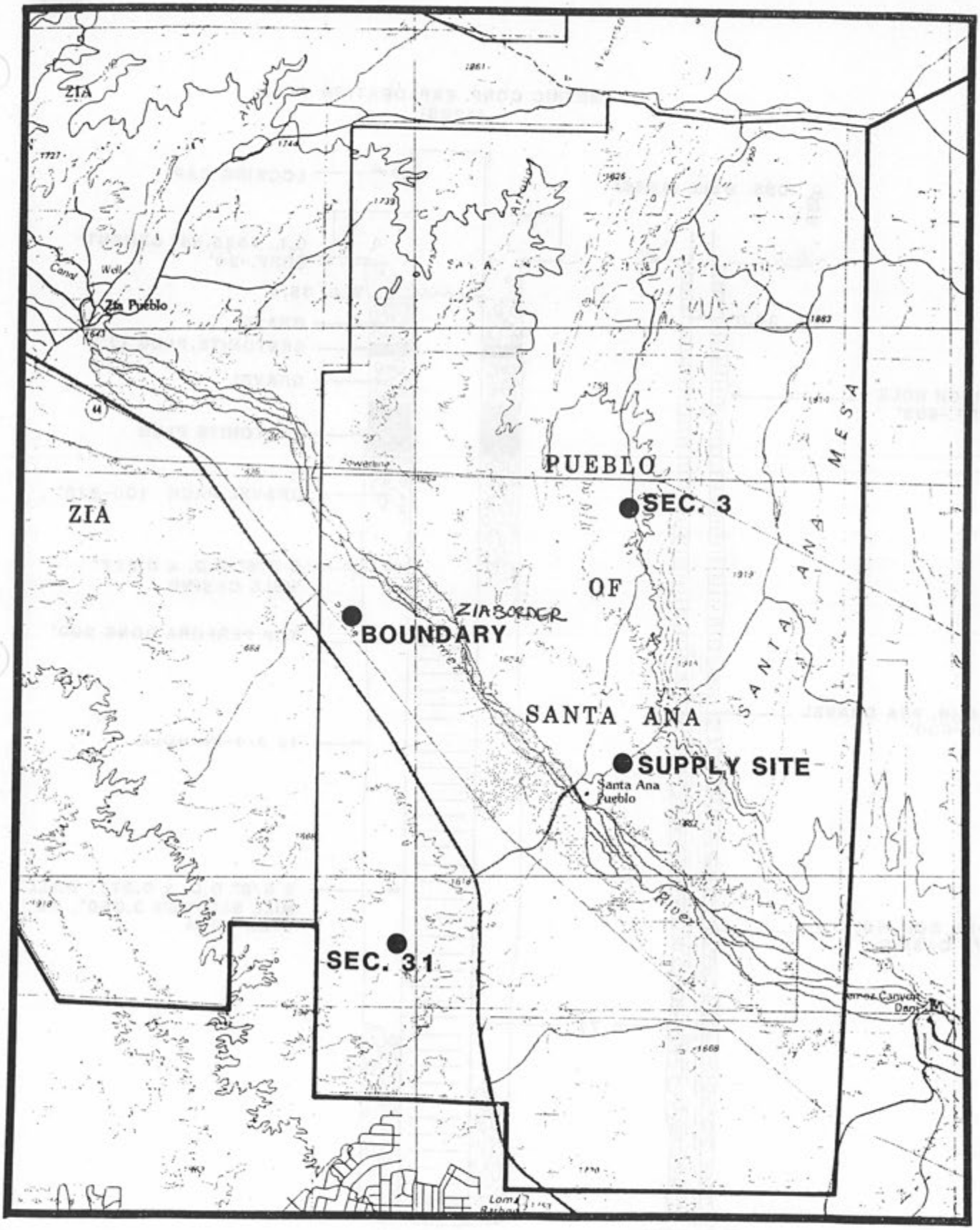
Pueblo Trust Lands of Jemez River Valley
BIA, Oct 1986
Louis L. Weller, Architects, P.
(PTLJP)

TABLE IV-2.--Test Results, Santa Ana Pueblo.

Well Name	Test Phase or Type	Radius (ft)	Transmissivity (ft^2/day)	Unit Hydraulic Conductivity (ft/day)	Storativity	Figure Number
SUPPLY SITE						
Production	drawdown	1	123	0.92		IV-6
	recovery	1	217	1.67		IV-7
RWP-2A	drawdown	51	102	.78	7.5×10^{-4}	IV-8
Observation	drawdown	67	2,140	16.5	1.6×10^{-3}	IV-9
BOUNDARY SITE						
Production	drawdown	1	471	0.94		IV-10
	recovery	1	496	.96		IV-11
	drawdown	1	490	.98		IV-14
	recovery	1	515	1.03		IV-15
Observation	drawdown	77	504	1.08	1.1×10^{-3}	IV-16
190-210 feet	slug		50.2	2.51		IV-18
472-492 feet	slug		20.5	1.02		IV-19
730-750 feet	slug		plugged			---
SECTION 3	slug		540	---		IV-20
SECTION 31	slug		450	22.5		IV-21



igure IV-3.--Map showing location of test sites at Santa Ana Pueblo.

Pueblo Trust Lands of the Jemez River Valley
BIA, OCT 1986
-Louis L. Weller, Architects, PC

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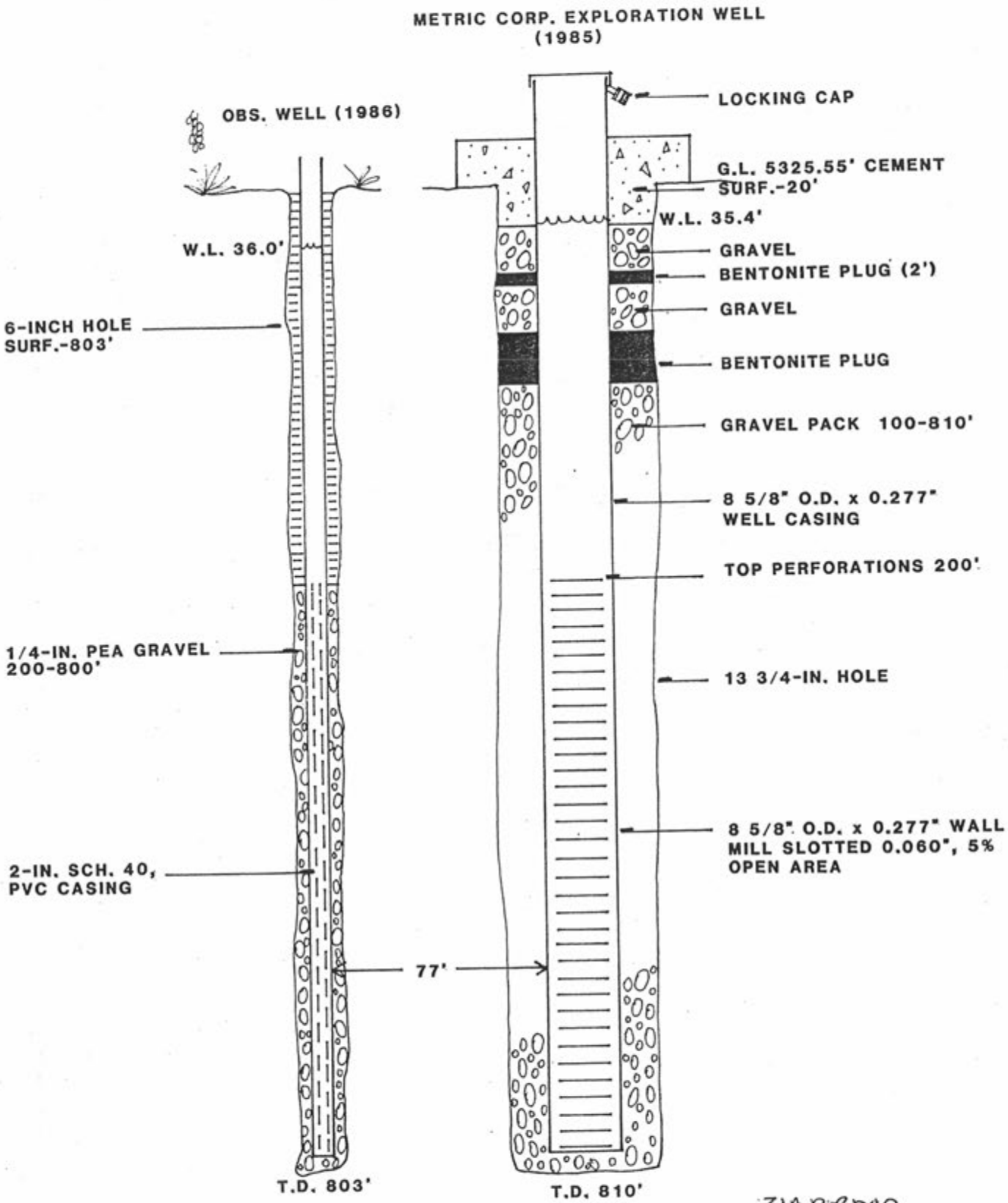

ZIA DARPER

Figure IV-13.--Diagram of wells at Santa Ana Boundary Site.

(PTLJR)

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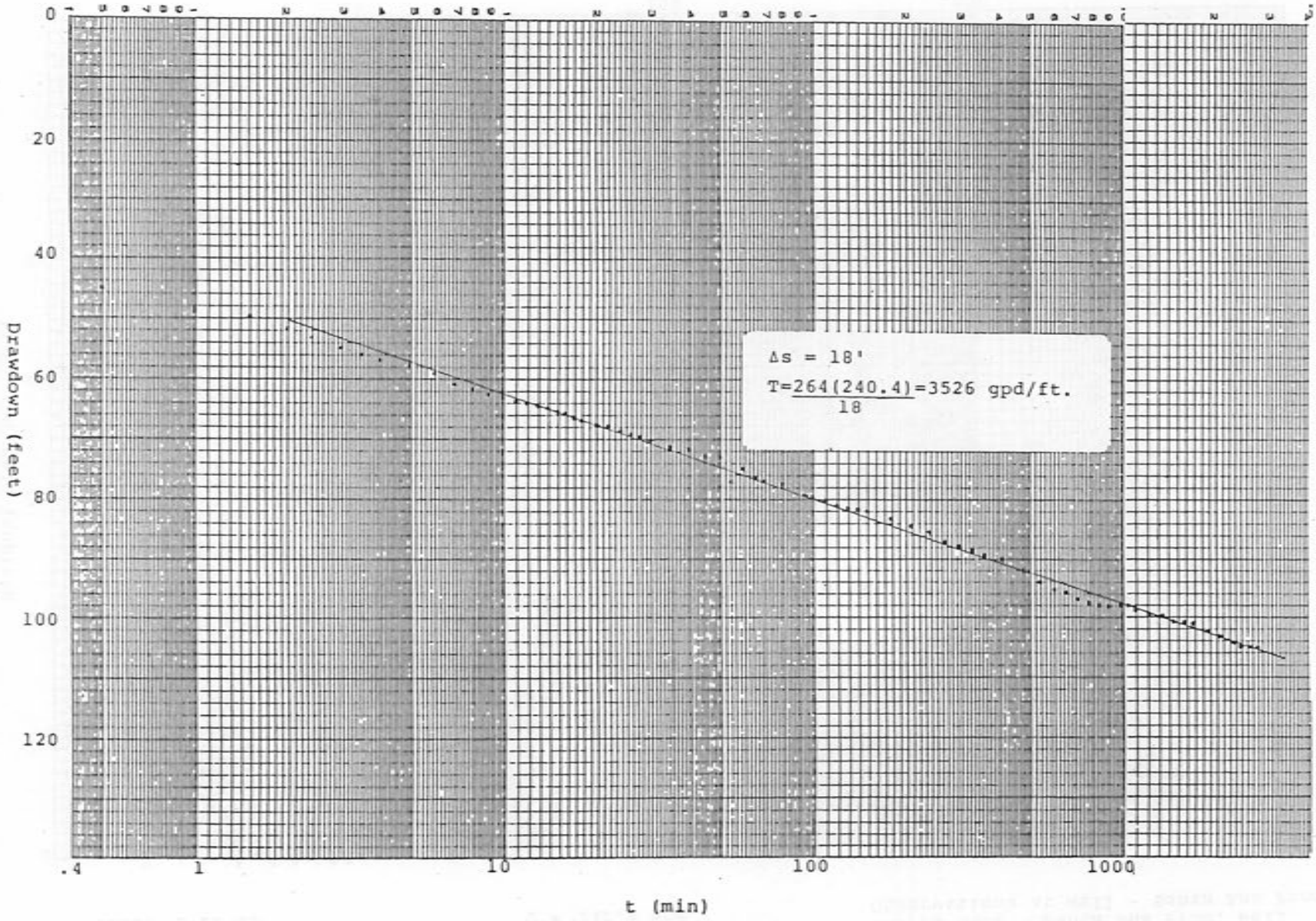


Figure IV-10.--Data plot of Santa Ana Boundary Site, after Metric Corporation.

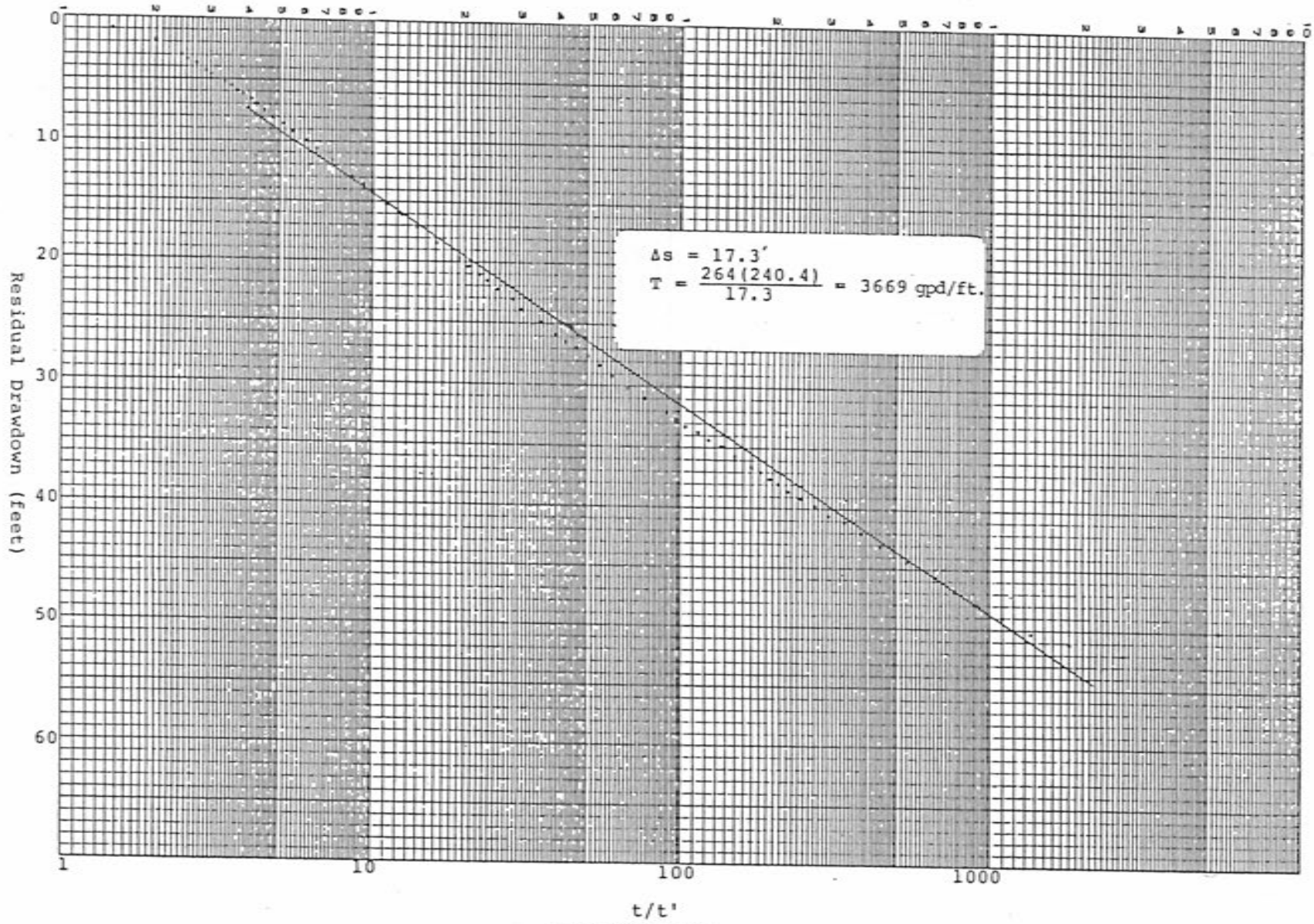


Figure IV-11.--Data plot of Santa Ana Boundary Observation Well, after Metric Corporation.

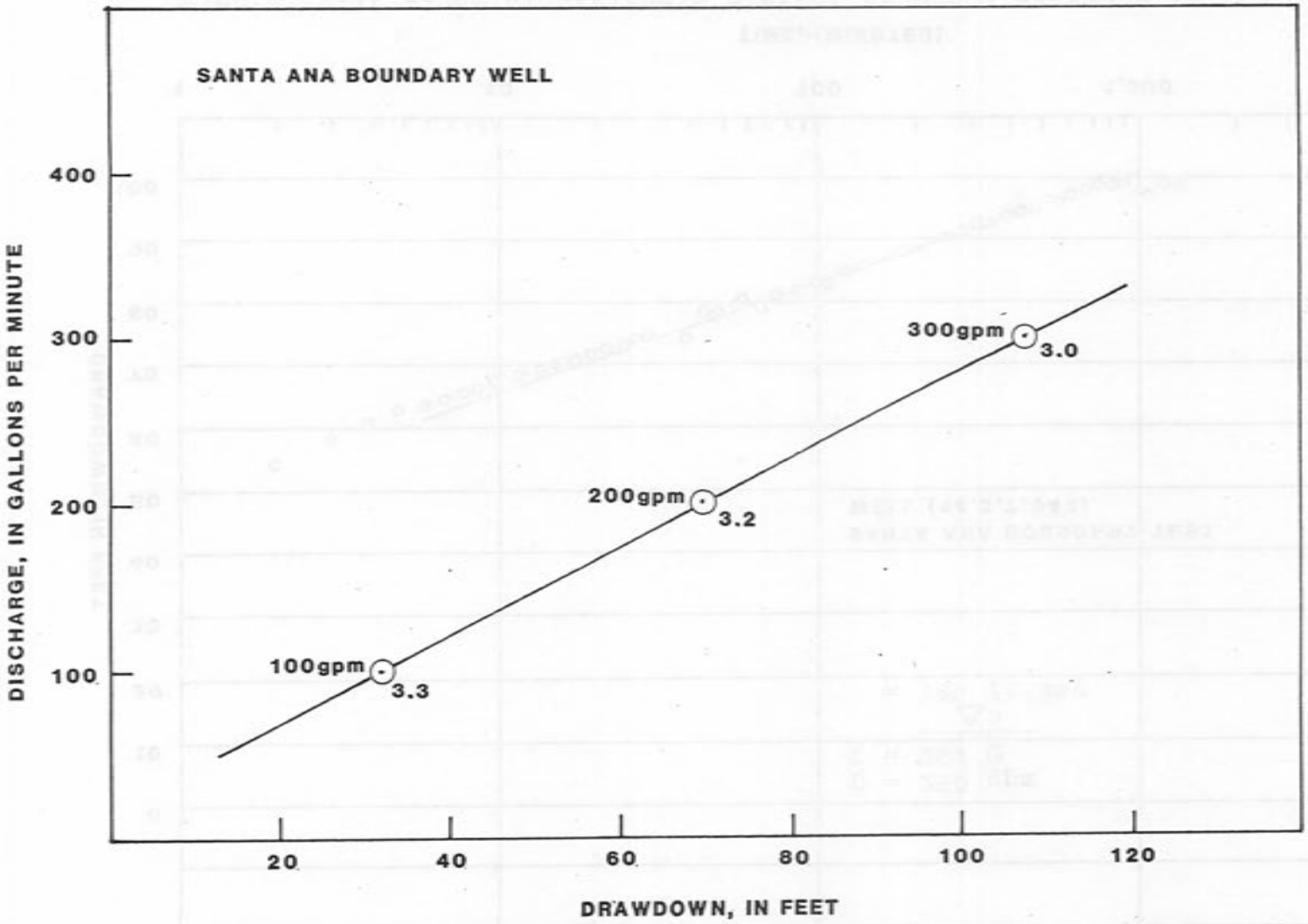


Figure IV-12.--Specific capacity curve for Santa Ana Boundary Well.

(PTLJR)

ZIA BORDER

FINAL DRAFT

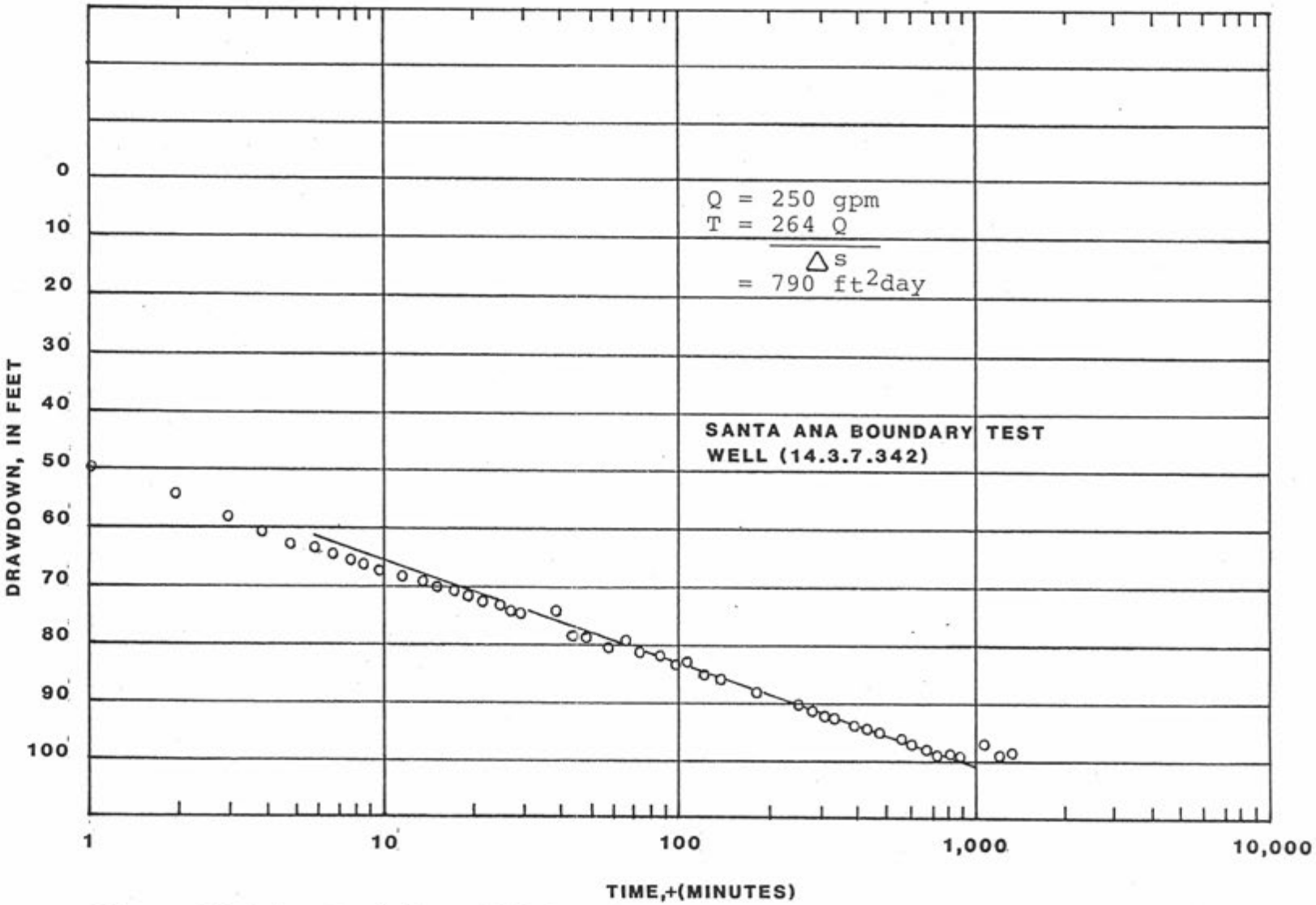
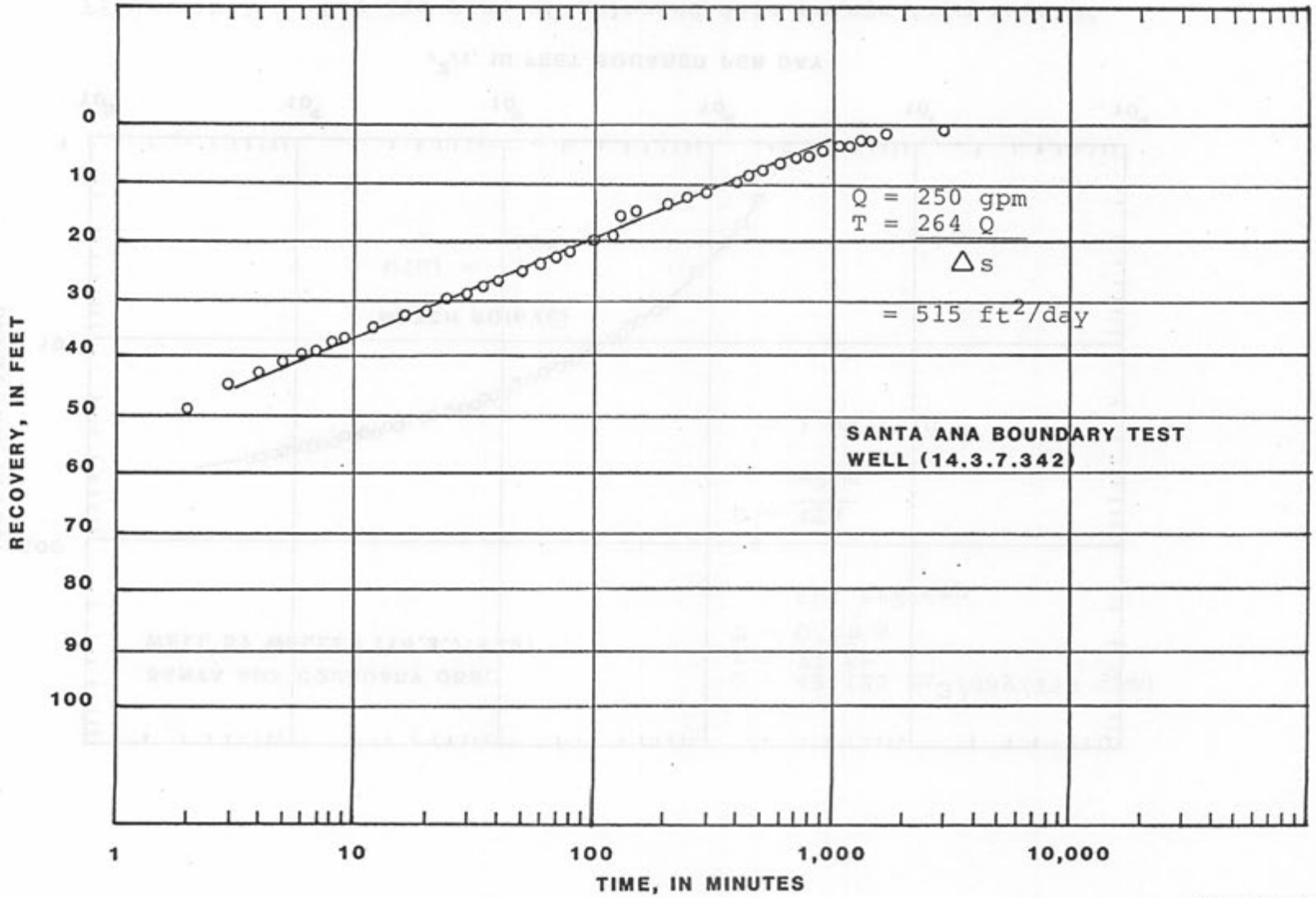


Figure IV-14.--Semi-logarithmic plot of drawdown measured in the Santa Ana Boundary Site Well originally installed by Metric Corporation.

ZH BORDER
(PTJLR)



Z/A BORDER

Figure IV-15.--Semi-logarithimic plot of recovery measured in the Santa Ana Boundary Site Well originally installed by Metric Corporation.

(PTJLR)

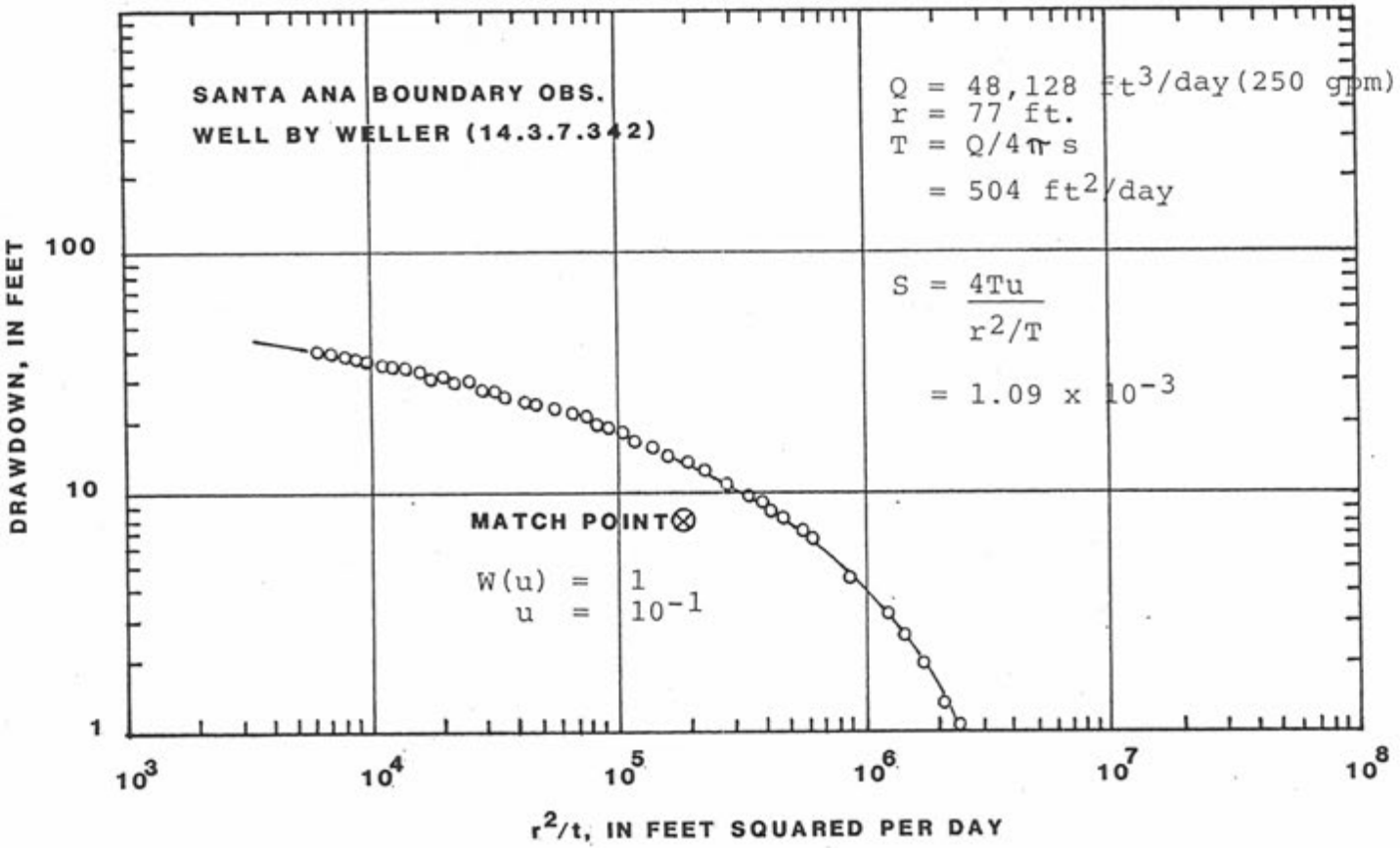
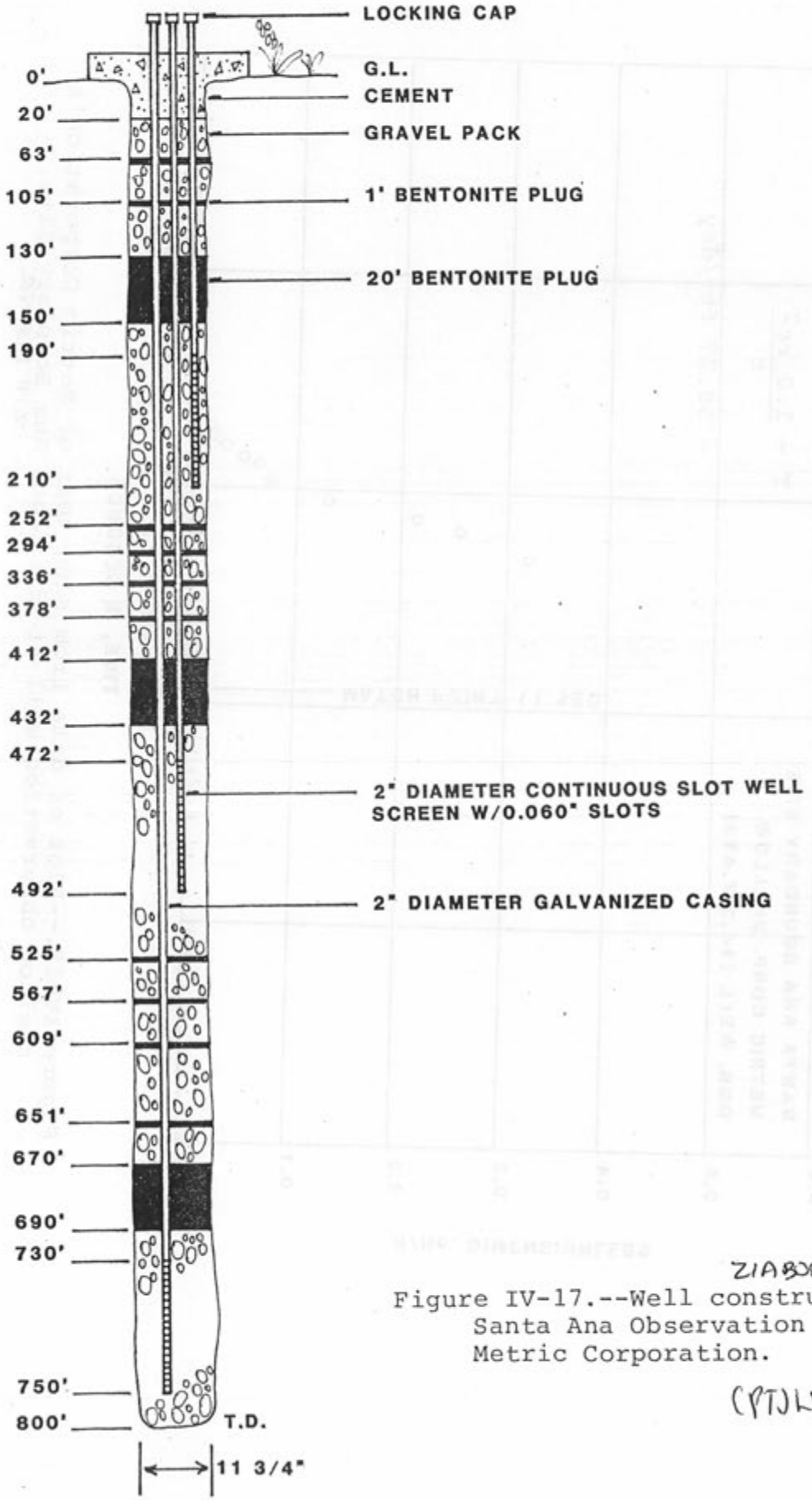


Figure IV.16.--Log-log plot of selected data points from test of observation well drilled near Santa Ana Boundary Site Well.

(PTJLR)



ZIABORDER

Figure IV-17.--Well construction diagram at Santa Ana Observation Well Nest, after Metric Corporation.

(PTJLR)

FINAL DRAFT

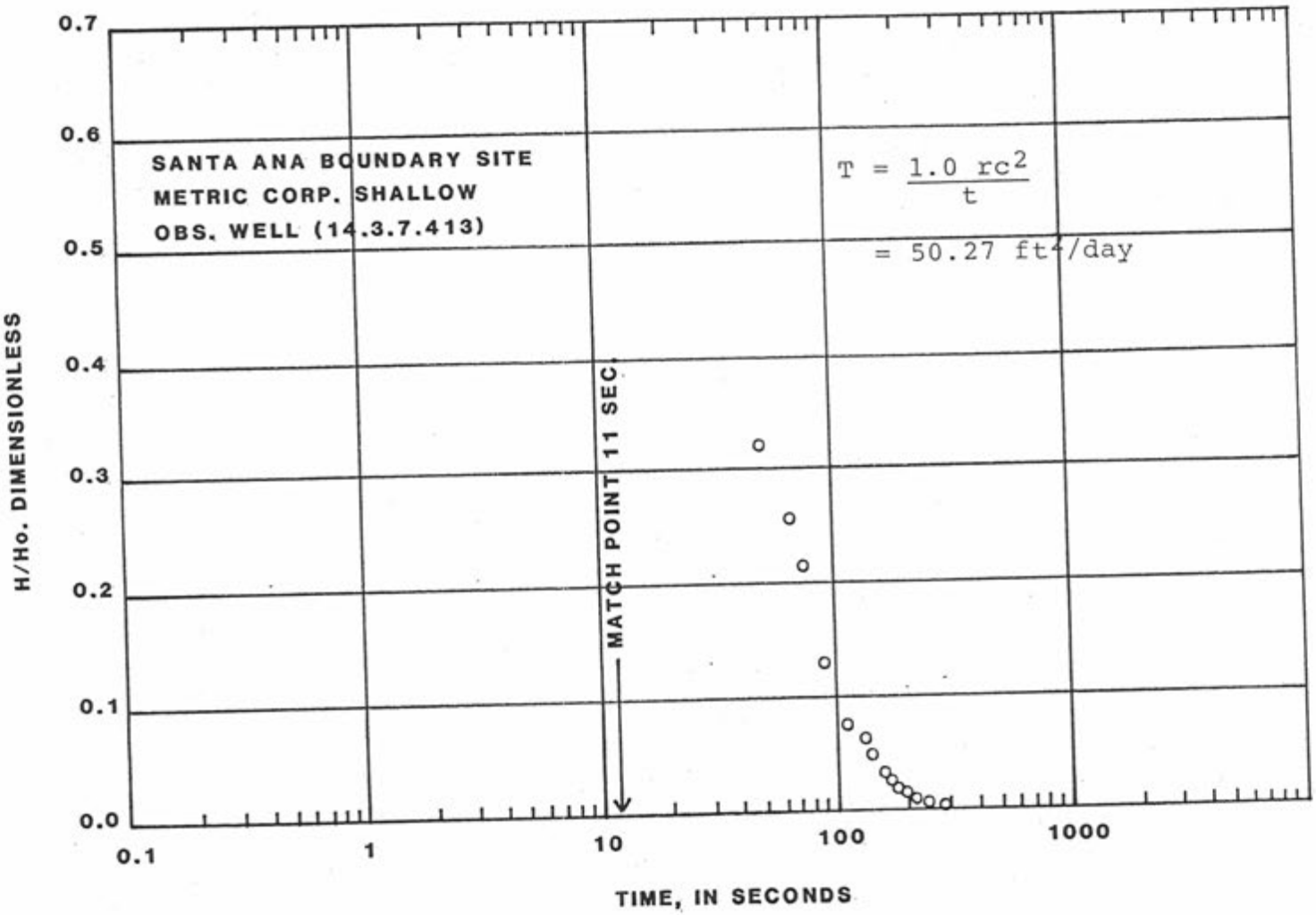


Figure IV-18.--Plot of data from slug test of Metric Corporation's shallow observation well at the Santa Ana Boundary Site.

ZIA BORDER

(PTJLR)

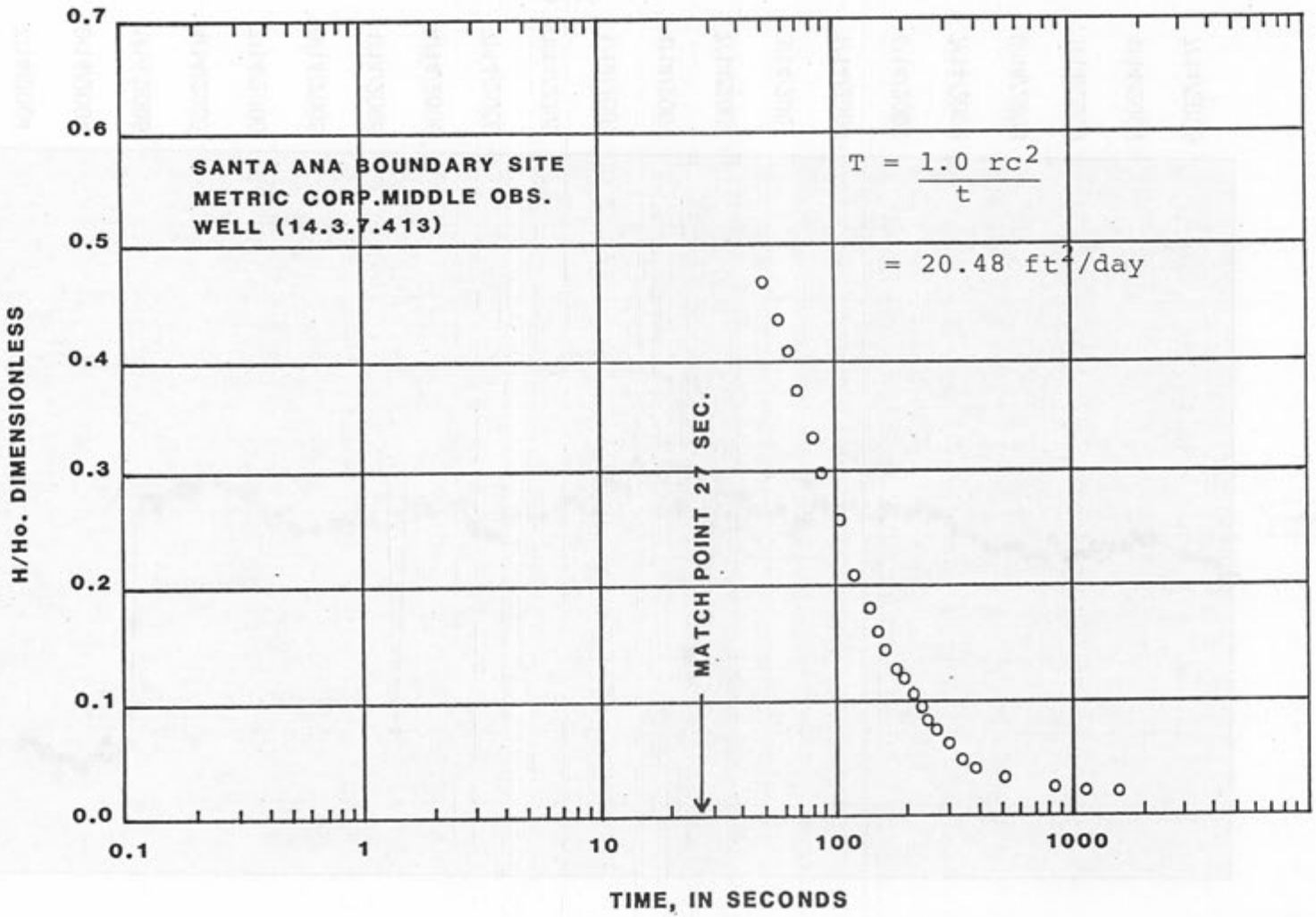


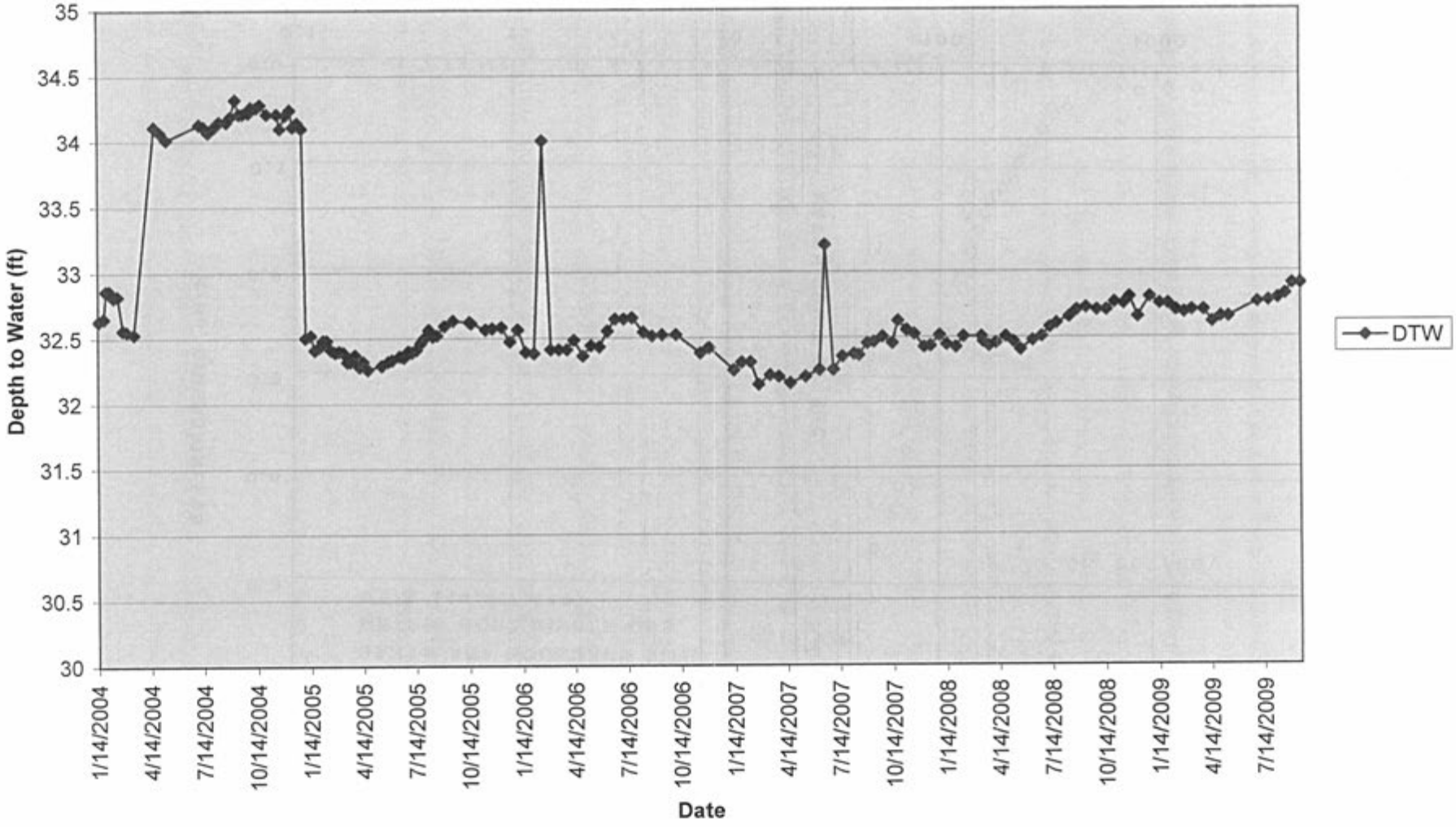
Figure IV-19.--Plot of data from slug tests of Metric Corporation's middle observation well at the Santa Ana Boundary Site.

ZIA BORDER

(PTJLR)

FINAL DRAFT

Depth to Water Zia Border 1 North (ZB1N)
2004-2009



ZB1N	DTW
1/14/2004	32.63
1/23/2004	32.65
1/27/2004	32.86
2/2/2004	32.86
2/9/2004	32.81
2/16/2004	32.82
2/25/2004	32.56
3/3/2004	32.55
3/15/2004	32.53
4/20/2004	34.11
4/30/2004	34.07
5/11/2004	34.01
7/7/2004	34.13
7/15/2004	34.11
7/22/2004	34.07
8/2/2004	34.11
8/11/2004	34.15
8/23/2004	34.15
8/30/2004	34.19
9/7/2004	34.32
9/14/2004	34.21
9/20/2004	34.21
9/30/2004	34.22
10/4/2004	34.26
10/14/2004	34.26
10/20/2004	34.28
11/1/2004	34.21
11/18/2004	34.21
11/23/2004	34.10
12/3/2004	34.20
12/10/2004	34.24
12/15/2004	34.11
12/23/2004	34.14
12/30/2004	34.10
1/5/2005	32.5
1/14/2005	32.52
1/21/2005	32.41
1/28/2005	32.43
2/4/2005	32.48
2/10/2005	32.48
2/18/2005	32.41
2/25/2005	32.39
3/4/2005	32.4

3/11/2005	32.39
3/18/2005	32.32
3/23/2005	32.32
3/31/2005	32.37
4/8/2005	32.28
4/14/2005	32.32
4/22/2005	32.26
5/16/2005	32.29
5/27/2005	32.32
6/3/2005	32.33
6/16/2005	32.36
6/23/2005	32.35
7/1/2005	32.4
7/7/2005	32.39
7/15/2005	32.41
7/22/2005	32.46
7/29/2005	32.5
8/5/2005	32.56
8/12/2005	32.51
8/19/2005	32.52
9/1/2005	32.59
9/16/2005	32.63
10/14/2005	32.62
10/17/2005	32.61
11/11/2005	32.56
11/22/2005	32.57
12/8/2005	32.58
12/23/2005	32.47
1/5/2006	32.56
1/19/2006	32.39
2/2/2006	32.38
2/17/2006	34.00
3/3/2006	32.41
3/17/2006	32.41
3/31/2006	32.41
4/12/2006	32.48
4/28/2006	32.36
5/12/2006	32.44
5/26/2006	32.43
6/9/2006	32.55
6/22/2006	32.64
7/7/2006	32.64
7/21/2006	32.65
8/10/2006	32.54

8/25/2006	32.51
9/11/2006	32.52
10/5/2006	32.52
11/16/2006	32.38
11/30/2006	32.42
1/11/2007	32.25
1/25/2007	32.31
2/9/2007	32.31
2/23/2007	32.14
3/15/2007	32.21
3/30/2007	32.20
4/19/2007	32.15
5/15/2007	32.20
6/8/2007	32.25
6/18/2007	33.20
7/2/2007	32.25
7/18/2007	32.35
8/7/2007	32.37
8/15/2007	32.36
8/30/2007	32.45
9/10/2007	32.46
9/25/2007	32.50
10/12/2007	32.45
10/22/2007	32.62
11/6/2007	32.55
11/19/2007	32.52
12/6/2007	32.42
12/17/2007	32.43
1/2/2008	32.51
1/14/2008	32.44
1/30/2008	32.42
2/12/2008	32.50
3/14/2008	32.50
3/17/2008	32.46
3/27/2008	32.43
4/8/2008	32.45
4/25/2008	32.50
5/8/2008	32.46
5/20/2008	32.40
6/10/2008	32.47
6/26/2008	32.50
7/10/2008	32.57
7/21/2008	32.60
8/12/2008	32.65