SAN ANTONIO MISSIONS
NATIONAL HISTORICAL PARK
San Antonio, Texas

GRIST MILL

HISTORIC STRUCTURE REPORT
MISSION SAN JOSÉ

NATIONAL PARK SERVICE • INTERMOUNTAIN REGION

GRIST MILL
Historic Structure Report

Cover Illustration: ca. 1939. Mill drawing by Ernst Schuchard.
Courtesy of the Daughters of the Republic of Texas Library, San Antonio, Texas.

San Antonio Missions
National Historical Park
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GRIST MILL
Historic Structure Report

Mission San José

Prepared by
San Antonio Missions National Historical Park
Division of Professional Services

Funding Provided by
Los Compadres de San Antonio Missions NHP

October 1997

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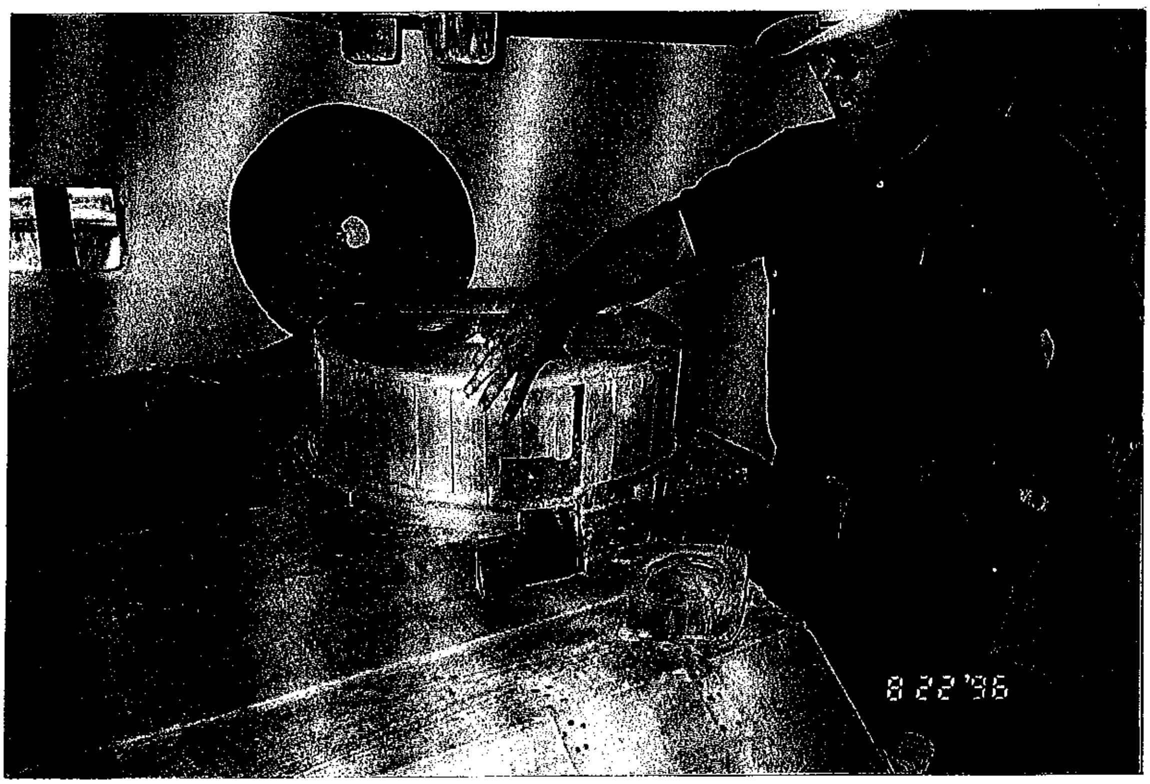

Earl Porter explaining the workings of the restored Truchas Mill at Las Golondrinas.
La Cienega, New Mexico. August 22, 1996. Photo by the authors.

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**Appendices E, F, and G courtesy of the Daughters of the Republic of Texas Library.*

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Credits for the many photographs and illustrations provided by the above entities may be found beginning on page 8-1.

Introduction

Mission San José y San Miguel de Aguayo, commonly known as Mission San José, is the only one of San Antonio's missions to be founded originally on the banks of the river of the same name. This mission community grew to one of such formidability and grandeur that it caused comment among early visitors.[1] Despite the fact that the missions were to serve as vehicles for acculturation of native populations to the Spanish way of life, it was not until the end of the mission period in Texas that the Indian neophytes accepted wheat based products and farmlands were opened to its cultivation and a mill constructed.[2] The move toward wheat product consumption almost the equal to that of maize was symbolic of the painstakingly slow but final acculturation of the Indians of the missions to Spanish life.[3] However, the horizontal mill constructed at San José to process this wheat had a short life. During the period beginning ten years after its construction, when political unrest and the breakdown of law and order signaled the end of Spanish rule, the mill, once touted as being the only flour mill in Texas, was destroyed.[4] No documented mention of a mill occurs in conjunction with San José after 1815. The ground level structure of the mill disappeared, however the wheel chamber and the wheel itself became buried under debris which accumulated over the succeeding one hundred years.

In the 1930s, during the period of restoration of the mission complex, workmen cleaning the *acequia*, or irrigation ditch, outside the walls came upon what at first appeared to be a tunnel. Further excavation proved that instead it was a vault with a floor of flagstone containing fragments of the horizontal mill wheel.[5] Extensive research in Mexico, New Mexico, and California by Ernst Schuchard, an engineer at Pioneer Flour Mills in San Antonio who led the work on the restoration of the mill, produced the structure visible today.[6]

Over the years since the restoration of the structures at Mission San José, almost continual maintenance and stabilization has been carried out to preserve them from once again falling into decay. Following the establishment of San Antonio Missions National Historical Park by Public Law, 92 Stat. 3635, P.L. 95-629 in 1978, incorporating four major mission sites, including Mission San José and related properties, a National Register of Historic Places Nomination Form

[1]Fray Juan Augustín de Morfi, *Viaje de Indios y Diario del Nuevo Mexico*, intro., annotat., biblio., Vito Alessio Robles, (Mexico: Antigua Libreria Robredo de José Porua e Hijos, 1935), 226-227.

[2]Anonymous, "Estado de las misiones," [ca. 1794-1796] Archives of the College of Zacatecas (ACZ), Roll 1, frames 0846-0849.

[3]"Lista de las Raciones dadas alos Yndios del Pueblo de S.^{or} S.^{n} Josse. desde 1.^{o} de Octubre de 1794 hasta 3 de Dre. del mismo," Bexar Archives Microfilm, Roll 25, frames 0053-0068.

[4]"Estado de las misiones" [ca. 1794-1796], ACZ, Roll 1, frame 0848.

[5]"Mission San Jose Excavators Unearth Mysterious Room, Tunnel and Pit. . .," *San Antonio Express*, Sunday, 19 March, 1933; Ernst Schuchard, "The Old Mill at San Jose Mission," July, 1936, Typescript, *Schuchard Collection*, San José Mill, Daughters of the Republic of Texas Library, File V.

[6]Ernst Schuchard, "The Old Mill at San Jose Mission."

was executed. In it the primary period of significance for all sites in the park was established: "The San Antonio missions were a major part of the Spanish colonial system for the establishment and management of its defensive and settlement frontier in the American Southwest."[7] This period of significance, as evidenced by the outline of the history of the mill above, is applicable to this structure. Its construction late in the Spanish colonial period signaled the end of the mission era with the acceptance of wheat, the staff of life of European culture, as a mainstay of the native diet. In 1778, orders had been issued that wheat be cultivated at the missions. Inventories and reports previous to that time to circa 1794, when the mill was constructed never record the cultivation of wheat nor the presence of a mill. Construction of the mill is linked to its eventual cultivation.[8]

A secondary period of significance, but one of importance to the continuing story of the missions, is that of the 1920s and 1930s, the time of renewed interest in the historic importance of the missions symbolized by the large-scale restoration and reconstruction at Mission San José, including the mill. Signaled by the purchase of the granary at San José in the 1920s by the newly formed San Antonio Conservation Society, an awareness of the value and significance of the mission sites and the need to save them from oblivion became a topic of interest to the general public and to interested conservators alike. Eventually, one of the interested parties was the Federal Government.[9]

Ernst Schuchard, the engineer most directly involved in the restoration and reconstruction of the mill, had most likely carried out this project with the intent of having it operational. Evidence so far indicates a "trial run" was performed at the mill and a later one carried out at Pioneer Mills, Schuchard's employer, with an intricately constructed working model. Whether the test at the mill site utilized water is not clear, given currently available documentation.[10] However, it is apparent that having the mill running as an educative interpretive tool, was visualized as early as the 1930s restoration.

In 1982, a General Management Plan (GMP) was developed for San Antonio Missions National Historical Park. Such planning documents required for all national parks are developed early on in the park's existence. The GMP developed for this park was in response "to the establishing legislation's requirement that a 'final master plan' be submitted to Congress 'indicating (A) the facilities needed to accommodate the health, safety, and interpretive needs of the visiting public; (B) the location and estimated cost of all facilities; and (C) the projected need for any additional facilities within the park.'"[11] When discussing the "Interpretive

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[7] James E. Ivey and Marlys Bush Thurber, "National Register of Historic Places, Inventory-Nomination Form," (United States Department of the Interior, National Park Service), February, 1983, 2.

[8] See the discussion of this in the "Chronology of Development and Use," 2-1 to 2-5.

[9] For a detailed discussion see the "Chronology of Development and Use," 2-11 to 2-15.

[10] For discussion of this, see "Chronology of Development and Use--Making the Mill Run," 2-16.

[11] U.S. Department of the Interior, National Park Service (NPS), Southwest Regional Office, *General Management Plan/Development Concept Plan--San Antonio Missions National Historical Park* (July, 1982), 3.

Experience" with regard to Mission San José, the primary park interpretive theme of "**The Historical Significance of the San Antonio Missions on the Texas/Coahuila Frontier during the Spanish Colonial Period**" is supported by two site specific mission themes: "(1) The Mission as a Social Center and (2) The Protective Character of the Mission." This is to promote an experience in which "visitors should leave San José not only with increased knowledge of Spanish policies and social practices among the Indian groups but also with a greater understanding of the Indian cultures along the San Antonio River. . .In addition, secondary themes related to Mission San José's resources and historical development. . ." The structures are to be utilized to give the visitor a visual experience of these interpretive values. One of these "Supportive Resources for Interpretation" listed is the mill.[12] The mill, as an element of mission life in the Spanish colonial period, along with the planned Spanish Colonial Demonstration Farm at Mission San Juan, and the soon to be developed newly acquired Mission Espada ranch site of Rancho de las Cabras near Floresville, Texas, will become active, living components effectively carrying out the park's overall interpretive theme.

As part of the planning process to achieve such development of the mill as outlined in NPS-28 **Cultural Resource Management Guideline of the National Park Service**, current research and documentation has produced this Historic Structure Report (HSR). A report such as this contains:

- an **executive summary** giving a concise account of research done to produce the HSR, major research findings, major issues identified in the task directive, and recommendations for treatment and use;

- **administrative data**, containing the names, numbers, and locational data used to refer to the historic structure, proposed treatment of the structure including the source document, related studies, cultural resource data including the date listed in the National Register, period of significance, and context of significance, and recommendations for documentation, cataloging, and storage of materials generated by the HSR;

- **developmental history** including historical background and context describing the people and events associated with the structure, a chronology of development and use discussing the physical construction, modification, and use of the structure, a physical description of all features, materials, and spaces according to age, significance, and condition;

- **treatment and use** discussing and analyzing the ultimate treatment and use of the structure, requirements for treatment outlining the applicable laws, regulations, and functional requirements, and alternatives for treatment, presenting and evaluating alternative approaches to realization of the ultimate treatment.[13]

As a result of the research carried out in preparation for this report, it was discovered that the

[12]*General Management Plan/Development Concept Plan*, 41, 44.

[13]*NPS-28--Cultural Resource Management Guideline*, 124.

planned use of the mill as a working interpretive element occurred as early as the 1930s. This information was not available at the time of the writing of the draft of the parkwide HSR and therefore only cyclical maintenance was recommended.[14] The current proposed plan to make the mill operational will become a fulfillment of the original intent of the 1930s reconstruction.

Los Compadres de San Antonio Missions National Historical Park, the park's friends group, has consistently committed itself to providing funding for projects which not only aid in the conservation and preservation of park historic structures, but enable the park to carry out the proposed planning and developmental elements of the General Management Plan/Development Concept Plan in fulfillment of the park's Mission Statement to . . . "preserve, restore and protect in perpetuity the resources of San Antonio Missions National Historical Park". . . and . . . "provide for the public a greater understanding and appreciation of the Spanish colonial influence in the New World through interpretation of the historical and architectural values of the San Antonio missions." With the support of Los Compadres funds will be generated to carry out the proposed project to make the mill operational as well as to provide for a docent program which will enable interpretive programs linking it with other park elements such as the Spanish Colonial Demonstration Farm to be developed at Mission San Juan and Rancho de las Cabras at Floresville, Texas, the ranch for Mission Espada. Such a project will enable the visitor not only to be informed but to experience one of the key elements of life in San Antonio's missions in the eighteenth century.

The following report will expand upon the elements outlined and introduced above and will showcase the proposed mill preservation/restoration/rehabilitation project in the context of its significance to the overall preservation and interpretation of San Antonio Missions National Historical Park, the single largest Spanish Colonial Heritage Site in the continental United States.

[14]Marlys Bush Thurber, Santiago Escobedo, Tom Ireland and James E. Ivey, *Of Various Magnificence--The Architectural History of the San Antonio Missions in the Colonial Period and the Nineteenth Century.* In Two Volumes, Vol. I (Santa Fe, New Mexico: National Park Service, Southwest Regional Office, Southwest Cultural Resources Center, Professional Papers No. 11, 1993), 382-383.

Executive Summary

A. Research

1. Background information, especially in relation to the historic origins of horizontal mills, was adapted from an earlier preliminary study done for the mill at Mission San José carried out by park staff in 1990. This work has now been expanded upon by the authors: Rosalind Z. Rock, Ph.D., park historian; and Mark A. Chavez, R.A., Chief, Division of Professional Services at San Antonio Missions National Historical Park.

2. Key original Spanish colonial documents, such as reports and inventories found transcribed and translated in a compilation entitled *The San José Papers* were examined, and in several significant cases, were partially retranslated. Also, original documents not previously transcribed or translated were prepared in this manner and analyzed. These included previously unconsulted reports written in the 1700s of the condition of the missions by Spanish civil authorities known as "El estado de las misiones" ("The State of the Missions"), a census, and a ration list.

3. Associated structures or ruins bordering on the mill site were examined historically as well. An archeology report and annual reports by the National Park Service in fulfillment of its role as consultant and overseer for compliance with regulations pertaining to National Historic Sites were referenced.

4. For information and imagery concerning the 1920s and 1930s restoration of the mission site, especially focusing on the mill, the papers of Ernst Schuchard, an engineer in the employ of Erhart Guenther of Pioneer Mills and the chief engineer involved with the mill restoration project, were examined. Drafts of reports and articles as well as his notes recording a trial run of the mill contributed to the study.

5. Vintage newspaper articles on the restoration's progress, including now historic photographs, reflect the public's perspective of the project. They also reveal that at the time of the initial discovery of the mill ruins, it was believed to be the entrance to a legendary tunnel thought to have been constructed connecting missions to act as a means of escape from hostile attack.

6. Further examination was made of various miscellaneous documents relating to the mill to be found at the San Antonio Conservation Society Library as well as at the Daughters of the Republic of Texas (DRT) Library in the Schuchard Collection, and at the University of Texas at Austin's Architecture Library Archives Collection, especially the notes and drawings of Harvey Smith, the key architect employed by the Federal Government on the San José restoration project.

7. The draft of a major two volume architectural history / historic structures report of San Antonio Missions National Historical Park, entitled *Of Various Magnificence* was utilized as well.

8. A field trip by the researchers to Rancho de las Golondrinas, located just south of Santa Fe, New Mexico to view several reconstructed horizontal water wheel mills located at this living history museum site was quite profitable. Photographs were taken and a videotape made while observing the working of an operational mill on the premises in the company of the engineer who reassembled the mills moved from other sites to the rancho and was able to render one of them operational. The ensuing interview information was incorporated in the report.

9. Published works such as editions of travelers' reports of Texas in the early to mid-19th century were examined for any mention of the mill as extant and functioning.

All of these materials, along with photographic images and drawings from the Schuchard Collection, as well as from the park's archive were utilized in producing the final product.

B. Major Research Findings

1. As a result of the discovery of previously unreferenced information in the Spanish colonial record, a more specific date of the construction of the original mill was established. Previous dates ranged from the 1740s to 1789 or 1790. From civil documents such as that describing "the state of the missions," it was definitely established that: 1) the mill was originally exclusively used for grinding wheat; 2) it was not built until wheat was cultivated at the mission which occurred at approximately the same time; 3) it was referred to as the only flour mill in Texas; 4) a comparative analysis of the list for the wheat ration for Indians at Mission San José, and the census taken most closely in date to the ration list, produced ethnographic finds that acculturation had advanced to the point that natives who once rejected wheat-based products in their diet now accepted them fully to the extent that their wheat rations almost equaled that for maize.

2. Many traditionally accepted elements of the history of events surrounding the mill's construction and destruction have been called into question. Previously, the relation of the destruction of the mill by attacking enemy Indians as described in a historical novel had been accepted as factual. Discrepancies and artistic license have been realized as setting limitations and caution in continued reliance on the novel *Daughter of Tehuan* as a legitimate historic resource.

3. Interpretation of the mill as having been built to grind maize was found to be incorrect, yet this was perpetuated by those involved in the restoration process.

4. The mill's reconstruction in the 1930s was based heavily on findings by Ernst Schuchard in his travels to observe similar mills in California, New Mexico, and Mexico.

5. There are gaps in the record of the reconstructed mill and discrepancies between the final construction and the plans which were based on Schuchard's research. Questions arise to which no answers appear at this time. For instance, there is no evidence that water was ever reintroduced into the *acequia madre* to power the mill for a trial run, or

more importantly, whether it was run at all.

6. As is pointed out in Chapter 2, the only restoration drawings which have surfaced do not match the extant interior configuration of the milling equipment. Findings in the fall of 1996 lead us to believe that the mill was never intended to grind grist, but was constructed as a semi-static display. Photographic research has disclosed that additional changes were made to aspects of the milling apparatus for which no records can be found. Suspicions have been raised by contemporary photographs appearing in newspapers after the restoration showing a man taking what appears to be flour from the hopper by the millstone. These questions, as well as whereabouts of the final plans used for the mill's actual reconstruction, all pose interesting challenges for further investigation.

C. Recommendations for Treatment or Use.

The efforts of Harvey Smith, Ernst Schuchard, the Colonial Dames of America, Pioneer Flour Mills and many other benefactors and craftspeople culminated in the restoration of the mill sometime in 1937. Following that, Schuchard conducted additional tests at Pioneer Flour Mills and at San José on September 17, 1939. The primary objective of this Historic Structure Report is to facilitate the development of a plan for rehabilitation of the San José mill to the basic configuration as that achieved in the late 1930s. The end result will enhance this 1930s restoration by having the mill fully operational for the purpose of living history demonstrations, and for the education of the public as to the strong communal activities which produced food for the mission population. Tied in with the development of a Spanish colonial demonstration farm at Mission San Juan Capistrano and the site of Mission San Francisco de la Espada's ranch, Rancho de las Cabras, in the near future, visitors to the park will be able to step back in time, observe and experience first hand what life was like at the missions during their heyday and the important role the missions played in the economic development of the frontier of northern New Spain.

Since the mill is stable structurally, requiring minor preservation treatment, the major focus will be to rehabilitate and/or replicate those elements of the milling apparatus found to be in serious disrepair at the time this report was being prepared. These elements include the waterwheel, main shaft, mill stones, and their associated components. As well, since the *acequia madre* for Mission San José has been severed from its source, and only a small remnant remains (that which passes in front of the mill), this report will explore methods for returning water to the acequia for the running of the mill. Minor alterations to a true rehabilitation are discussed in Chapter 6, Alternatives for Treatment.

Administrative Data

A. Locational Data

1. The grist mill at Mission San José is located outside the walls on the north side of the mission. It is situated in N.C.B. 7659, Segment 102, San Antonio, Texas and is an element of a largely reconstructed Spanish colonial mission site incorporated within San Antonio Missions National Historical Park.

2. The Mill and Millrace are designated List of Classified Structures (LCS) number 225. Associated sites/structures in the immediate vicinity of the mill and mentioned in this report are the Lime Kilns (LCS 226), Vat (LCS 227), and San José Acequia Madre (LCS 229).

B. Proposed Treatment

1. In the historical discussion of the mill contained in this Historic Structure Report, proposed treatment for the grist mill at Mission San José is the "rehabilitation. . . with the end [result] of having it operational for the purpose of living history demonstrations."

2. As outlined in the park's General Management Plan (GMP) as part of implementation of Mission San José's role in carrying out the primary theme of San Antonio Missions National Historical Park (**The Historical Significance of the San Antonio Missions on the Texas/Coahuila Frontier during the Spanish Colonial Period.**) through its individual site theme of **The Mission as a Social Center**, the grist mill is included as a supportive resource for interpretation.

3. The 80% draft of the comprehensive, park-wide historic structures report, entitled "Of Various Magnificence," Volume 2, page 383 stresses the National Historical Register findings for the "Mill and Millrace" as being designated Significance Level II ("High significance, allowing only minimal alteration") with treatment listed as "Preservation through cyclic maintenance." Refer to Chapter 4, Ultimate Treatment and Use, for guidelines which apply.

C. Related Studies

The grist mill has been mentioned in many historical documents, inventories, and studies, however it was focused upon in detail only relatively recently in several key studies:

1. Marlys Bush Thurber, Santiago Escobedo, Tom Ireland, James E. Ivey. "Of Various Magnificence--The Architectural History of the San Antonio Missions in the Colonial Period and the Nineteenth Century." Arthur Gomez, Ph.D., editor. In two volumes. Santa Fe, New Mexico: National Park Service, Southwest Regional Office, Southwest Cultural Resources Center. Professional Papers, No. 11, 1993 [80% draft].

2. San Antonio Missions National Historical Park Staff. "San José Grist Mill." Funded

by: Los Compadres de San Antonio, San Antonio Missions National Historical Park, FY 1989, completed January, 1993.

D. Cultural Resource Data

1. Along with the other missions included in San Antonio Missions National Historical Park, San José has several periods of significance. The primary period of significance is the eighteenth century when, as stated in the National Register of Historic Places Nomination: "The San Antonio missions were a major part of the Spanish colonial system for the establishment and management of its defensive and settlement frontier in the American Southwest."[1]

2. Despite periods in their history in which the missions were in decay, they were almost continuously occupied, their farmlands and structures being put to use. The secondary period of significance for the missions, in particular San José and specifically the mill, was the early twentieth century through the 1920s and 1930s when the site was largely reconstructed.

3. Over the centuries, a multiplicity of architects (in the eighteenth century, master masons) and builders were involved in the construction, renovation, and reconstruction of the structures at the site. No one person or persons is known to have actually carried out the original construction of the mill. The missionary resident at Mission San José at the time, Fray José Manuel Pedrajo, is believed to have overseen the mill's construction. In the 1930s Ernst Schuchard, an engineer in the employ of Pioneer Mills in San Antonio, was given the task of researching, and planning for the mill's reconstruction. Harvey P. Smith, the local architect who had the general oversight of the planning and reconstruction of Mission San José, was also tasked with carrying out the reconstruction project for the Federal Government.

4. Mission San José began to be surveyed in the Spanish colonial period. Record of one such survey appears in the *Inventario de la Misión de Señor San Josef* carried out by Fray Josef Augustín Mariano Falcon, and Fray Josef María Salas in 1785. It was found in the Old Spanish Missions Historical Research Library, Our Lady of the Lake University, San Antonio, Texas. Microfilm roll 8, frames 5261-5279.

E. Recommendations for Documentation, Cataloging, and Storage of Materials

1. All documents, photographs, drawings, illustrations and other images generated by the Historic Structure Report and not obtained from the park's existing collection will be processed into the park's Research Library and Media Center upon the completion of the report.

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[1]James E. Ivey and Marlys Bush Thurber, "National Register of Historic Places, Inventory - Nomination Form," (United States Department of the Interior, National Park Service), February 1983, 2. See Appendix A for excerpts from the entire form.

2. Methodology in place for routine acquisition, accession, and storage will be applied.

3. All documents, images, and other materials utilized by the researchers for this report that were found in the park's Research Library and Media Center will be returned to the collection.

1 HISTORICAL BACKGROUND AND CONTEXT

Historical Background and Context

A. Introduction

San Antonio Missions National Historical Park was established by Public Law, 92 Stat. 3635, P.L. 95-629, approved November 10, 1978. Preserved inside the park's boundaries is the largest concentration of Spanish Colonial resources in the United States. Among the sites included in the park is that of Mission San José y San Miguel de Aguayo, commonly known as Mission San José. Founded in 1720, it was the only one of the missions near what is today the city of San Antonio, Texas that was originally founded on the river of the same name. The others, including San Antonio de Valero, now known as the Alamo, were transferred from elsewhere to their present sites.

Eventually a formidable complex of stone structures within a walled compound, Mission San José at its height was renowned by those who viewed it for its beautiful church and its defensive capabilities. After secularization of the missions in the late eighteenth and early nineteenth centuries, the structures at the mission fell into disrepair and ruin. Several attempts were made over the years at conservation and restoration, however it was not until the 1920s and the efforts of the San Antonio Conservation Society that these activities began in earnest. In the 1930s, the society, the diocese, city, state, and county agencies, with the help of various federal projects, carried out restoration of San José's structures to a large part of their former glory. Included in that restoration was the reconstruction of the mission's grist mill located outside the compound walls north of the church.

Almost continual repair and rehabilitation work has been carried out since then, peaking in the 1960s. This patch work of material and masonry skill level presents interesting and unique challenges for today's preservation and stabilization professionals. Among the intriguing preservation issues is the overlay of historical significance with the passage of time of the efforts of the Civil Works Administration and the Works Progress Administration in the 1930s and 1940s.

The horizontal wheel mill at Mission San José, originally built at the end of the mission period, has little documentation and even less attention from historians. It, along with other structures of significance in the park, are in need of additional research to aid in their rehabilitation. It is planned that the mill be restored to operation, much as it was in the late 1930s, enabling it to be run several times a year. Thus, increased knowledge will not only aid in this endeavor but improve interpretation of a significant remnant of the goal of self sufficiency in mission life.

San Antonio Missions National Historical Park has as its stated mission to not only ". . . preserve, restore, and protect in perpetuity the resources. . . " of the park, but to ". . . provide for the public a greater understanding and appreciation of the Spanish Colonial influence in the New World through interpretation of the historical and architectural values. . .".

The educational role is carried out by uniformed employees and volunteers. The wayside exhibit panels, site exhibits, slide shows, and videos at each site, as well as the movie, fiber optic map, and museum exhibits at the park's new visitors center, all combine to deliver to the public interpretive information concerning the history and significance of the missions over time.

As part of the overall interpretive effort and fulfillment of the park's mission to inform and educate the public as to the purpose of the missions and their influence, the restored mill at San José plays an important role. An operating mill will provide an opportunity for active interpretation of an important element of the mission's agriculturally based economy.

The primary objective of this Historic Structure Report is to facilitate the development of a plan for rehabilitation of the horizontal water wheel grist mill at Mission San José. The end result would have it operational for the purpose of living history demonstrations led by docents of the park's friends group Los Compadres de San Antonio Missions National Historical Park (Los Compadres) for the education of the public. Emphasis would be placed on the strong communal activities which produced food for the mission population. If feasible, items produced by Mill operation would be offered for sale.

Therefore, those compiling this study utilized both primary and secondary documentation to examine the historical significance and the existing conditions of the mill with the end in mind of providing information which will not only aid in the rehabilitation of the mill and adjunct resources such as the *acequia madre*, or main irrigation ditch, to the end of making it operational, but provide the basis for further research for increased knowledge of the mill for purposes of future preservation, restoration, and interpretation.

In 1990 a preliminary study entitled "San José Grist Mill" was produced by park staff and others through the generous funding of Los Compadres. The basic information on the history and origin of horizontal mills gathered for that report is reproduced here in part. Wording and citations, with minor editorial changes, are reproduced as they appeared in the study; additional references and citations have been included. New and additional information concerning the history of the San José mill itself was provided by current park staff in preparation of this historic structure report and appears in Chapter 2, Chronology of Development and Use, and is subdivided into three phases: Phase I--Spanish Colonial Construction, Phase II--Rediscovery and Reconstruction, and Phase III--Recent Rehabilitation. This effort has been made possible by the continued generosity of Los Compadres.

B. Brief History of Mills

The Thessalonican poet Antipater made one of the earliest references to a water driven mill (in Greece), circa 85 BC, in a poem:

> Cease your work, you maidens who labored at the mill. Sleep now, and let the birds sing to the rosy morn. Ceres has commanded the water nymphs to do your work; obedient to her call they throw themselves onto the whirling spokes, force round the shaft, and thus the heavy mill.[1]

A number of theories have been suggested as to when and where the water wheel mill was invented. "The first waterpowered mill was known as both the 'Greek' and the 'Norse' mill and as if this were not confusing enough, there is some evidence indicating that it did not originate in either Greece or Scandinavia but rather in Asia Minor. . . . The wheel of the 'Greek' type found in warmer climates has spoon-shaped blades [Figure 1-1]. The blades of the 'Norse' type wheel were straight and inclined at an angle to facilitate ice removal."[2] [see Figure 1-2]. "In Northern and Western Europe, and in Asia, the primitive mill, with its horizontal water-wheel of Greek type, has been in general use from prehistoric times, and in some places survives still. Ordinarily it is known as the Norse or Northern mill ... The [Norse] mill had early become established in Britain,"[3] but no remaining evidence can be found in England.

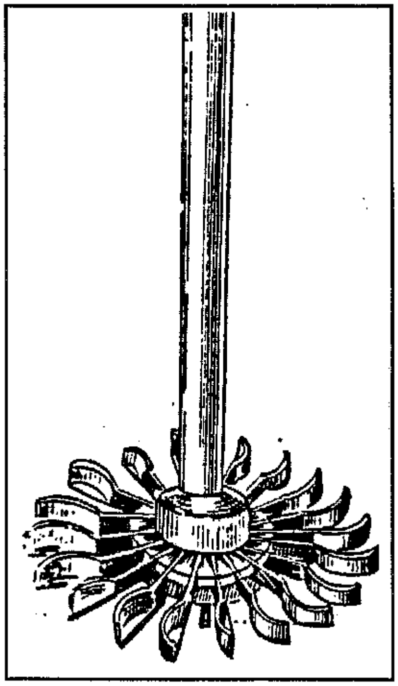

Figure 1-1 Example of a "Greek" horizontal water wheel.

Its use was popular in Ireland and Scotland, and relics of horizontal watermills discovered in the mid-1800s, as well as writings dating to the fifteenth century in Ireland "established the fact that Norse horizontal mills have extensively been in use there from . . . the seventh to the eleventh century. In Scotland the mill has long been known under the designation Norse mill. In the islands of Colonsay and Oronsay the small meal mills built across streams, and now driven by ordinary vertical wheels, were anciently worked by horizontal Norse wheels ..."[3]

Although these horizontal water wheel mills were not confined to Norway, the term "Norse" has been used extensively in milling genre and has become recognized nomenclature. Since Norsemen had introduced this type of mill wherever they penetrated in their excursions, from

[1] John Storck and Walter D. Teague, *Flour for Man's Bread* (Minneapolis: University of Minnesota Press, 1952), 97.

[2] Charles Howell and Allan Keller, Allan, *The Mill at Philipsburg Manor Upper Mills and A Brief History of Milling* (Sleepy Hollow Restorations, New York, 1977, 22.

[3] Richard Bennet and John Elton, *History of Corn Milling*, Vol. II, Watermills and Windmills. (London: Simpkin, Marshall and Company Ltd., 1899), 2:12-16.

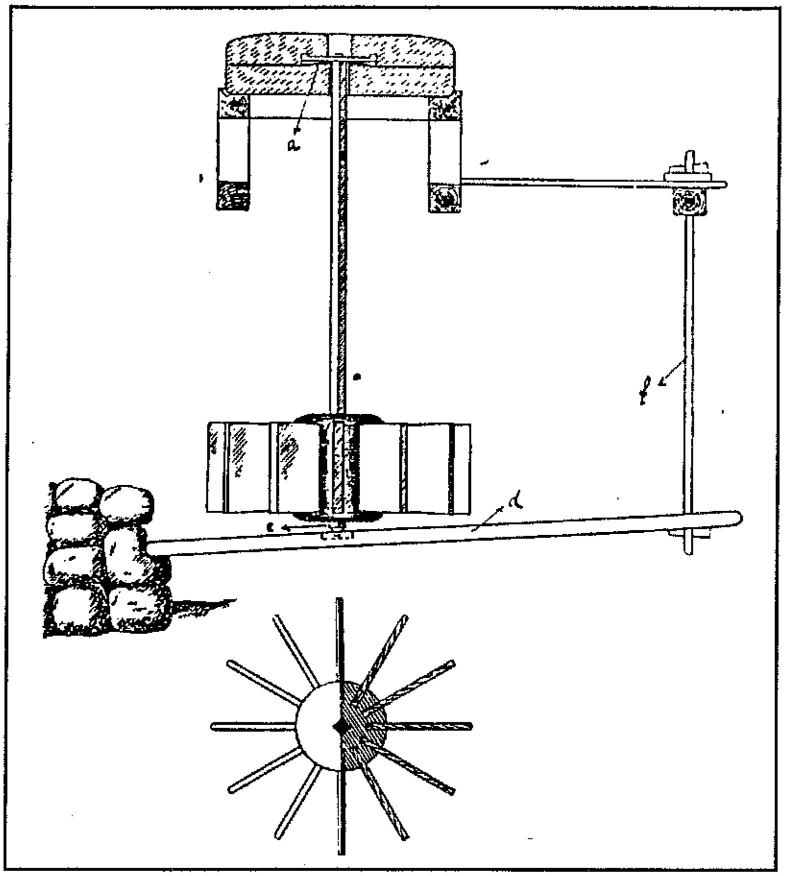

Figure 1-2 Example of a "Norse" horizontal water wheel.

Norway to Ireland, this led some nineteenth century antiquarians to believe this mill had originated in Scandinavia which resulted in the designation.[4]

The term which had been used for the human- or cattle-powered grinding "machines"--mills--by the Greeks was applied to the new water-power machine, and in due course the Romans termed it "mola," distinguishing it from all other mills ". . . by the distinctive name *mola aquaria*, its subsequent title for many centuries throughout Europe." The designation "mola" is considered by some linguists to be older than Greek or Latin, and to be derived from the mystic Aryan language of Central Asia, roughly dating the term to ancient Nordic times.[5]

Placing the water wheel horizontally in a stream, the mill was of simple construction and operation. The water wheel, shaft, and upper stone worked as a unit and turned together at the same speed. Still, it was a major discovery and, though slow and permitting only small-scale operations, became popular in many parts of the world.[6] Again, it could have begun in the hilly region of the Near East, from where it spread westward and eastward. It was certainly known in early Greece. Also, Strabo refers to a mill of this type [at Cabeira in Pontus, 65 B.C.] owned by Mithradates King of Pontus. It was in Denmark by the birth of Christ and became very popular until the late Middle Ages. This type of mill was used in Rome during the time of Pliny. It was known in France and Germany in the fifteenth century leading to the justifiable supposition that crusaders brought this type of milling knowledge with them upon their return

[4]Storck and Teague, *Flour for Man's Bread*, 97.

[5]Bennet and Elton, *History of Corn Milling*, 2:1.

[6]Jerry Apps and Allen Strang, *Mills of Wisconsin and the Midwest* (Madison, Wisconsin: Tamarack Press, 1980), 20.

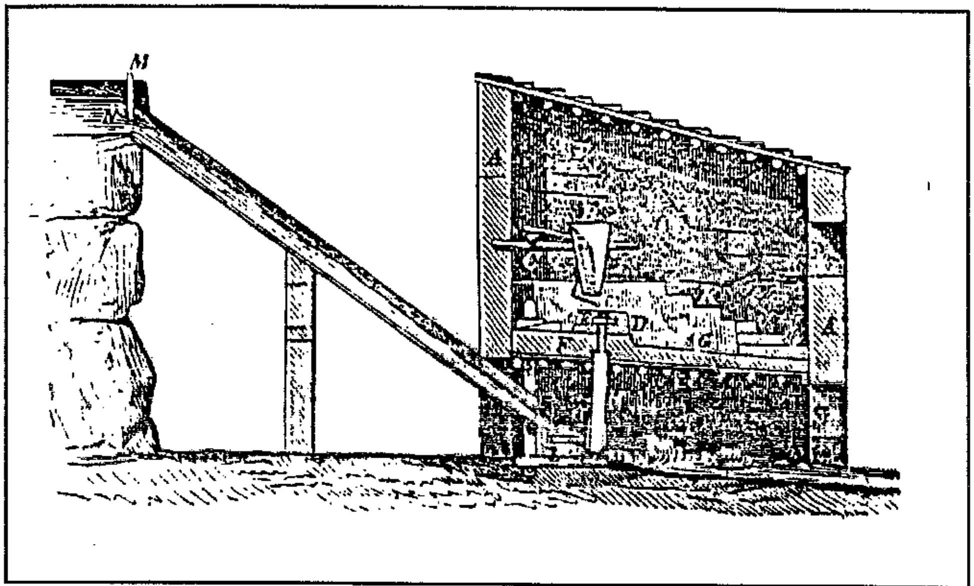

Figure 1-3 "A drawing of an Arabian water-mill made at Roulet's by a captain of the French artillery soon after the taking of Constantinople by the French [in the early 16th century]."

to Europe in the thirteenth century (see Figure 1-3).[7] The horizontal water wheel mill was seen in the Holy Land in 1668. It had been used in Wales, Ireland, Scotland, Faeroe and Shetland Islands (see Figure 1-4), Norway, Romania, France, China, the United States, and in other countries. An interesting description of this type of mill in operation is found in *The History of Corn Milling* by Richard Bennet and John Elton published in 1899. It was found by them in an article by W. Marriage appearing in the magazine *Milling*:

> The Norwegian mill bears a striking resemblance to the mills one sees in the Carpathians, and I should think that the mills of Norway and Roumania are almost identical in the method of working. A wooden upright shaft has a home-made turbine at the foot, and drives a single pair of stones. Above the stones are a large hopper and the usual feeding arrangements, shaking into the eye of the stone a few--very few--grains of maize, the meal after grinding dropping into a bin. The mill is started by shifting the wooden flume conveying the water of the mountain stream on to the wheel. I saw several of these mills at work with no attendant. They are perfect examples of automatic mills, and the working expenses are reduced to a minimum. The owner brings a supply of grain, fills the hopper, sets the mill going, locks the door, and does not need to return for a day or two. They run by themselves without employees.[8]

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[7]Peter A. Kozmin, *Flour Milling*, trans. M. Flakner and T. Fjelstrup (New York: Van Nostrand Co., 1920), 22.

[8]Bennet and Elton, *History of Corn Milling*, 2:24.

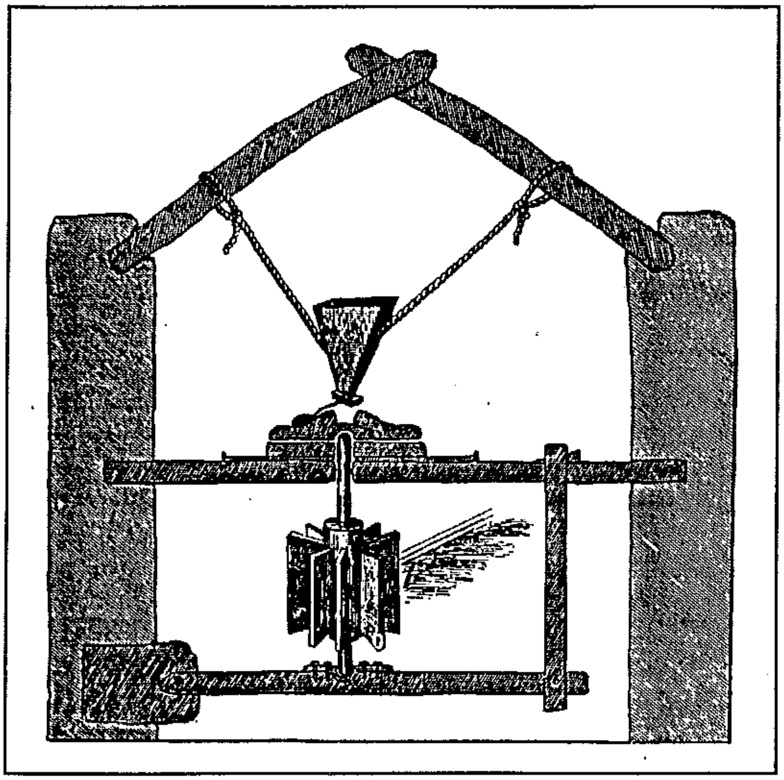


Figure 1-4 "Norse Mill as existing in the Shetland islands in 1880." Courtesy of the Bucks County Historical Society.

The mill doubtless reached California and Texas through Spain and Mexico. "Gristmills with horizontal water wheels were common in the Spanish realm, thereby providing an adequate technological reservoir for their diffusion into New Mexico. Townsend's *Travels*, published in London in 1791, indicated that such mills were functioning in eighteenth century Spain . . .. These mills were associated with peasant cultivation of small grains in the New World. They were accepted in Peru, Bolivia, and Ecuador during the sixteenth century, and in much of Spanish America by the early seventeenth century."[9]

Simple water wheel mills were found in mountainous regions in almost all lands where the population was not able to obtain expensive mechanical equipment nor the expertise to build and operate them. These were used in both the northern and southern Appalachian regions.[10]

In certain mountainous areas of the eastern United States the horizontal wheel had been referred to as the "tub" mill due to the tub shape of the water wheel. Since the millstone, shaft, and water wheel act as one unit, there is a need to obtain velocity with the millstone. Thus, the water wheel must remain small which results in the water not working to its utmost proficiency. The advantages of the horizontal water wheel are its simplicity and low cost. The parts are few and have little friction. And if constructed well, "will not get out of order in a long time."[11]

Another facet in the mystique of this type of water wheel is whether it turns clockwise or counterclockwise. Wheels found in Arabic countries, Spain, Portugal, Mexico, and Spanish

[9]Charles F. Gritzner, "Hispano Gristmills in New Mexico," *Annals of the Association of American Geographers*, Vol. 64, No. 4, December 1974: 520-521.

[10]Russell H. Anderson, to Ernst Schuchard, 29 May 1935, Schuchard Collection, Daughters of the Republic of Texas Library, San Antonio, Texas; C. Singer, E.J. Holmyard, A.R. Hall, T.I. Williams, eds., *A History of Technology* (New York and London: Oxford University Press, 1956), 594; Kozmin, *Flour Milling*, 22.

[11]Oliver Evans, *The Young Mill-wright and Miller's Guide* (Philadelphia: Oliver Evans, 1795), 2:1:13.

colonial settlements in what is now the United States turn counterclockwise. Water wheels of other regions, such as Wales, Ireland, Scotland, Faeroe and Shetland Islands, Norway, Romania, France, China, and those in the northeast and eastern United States, turn clockwise. This characteristic helps in distinguishing the paths of its spread through different original sources.

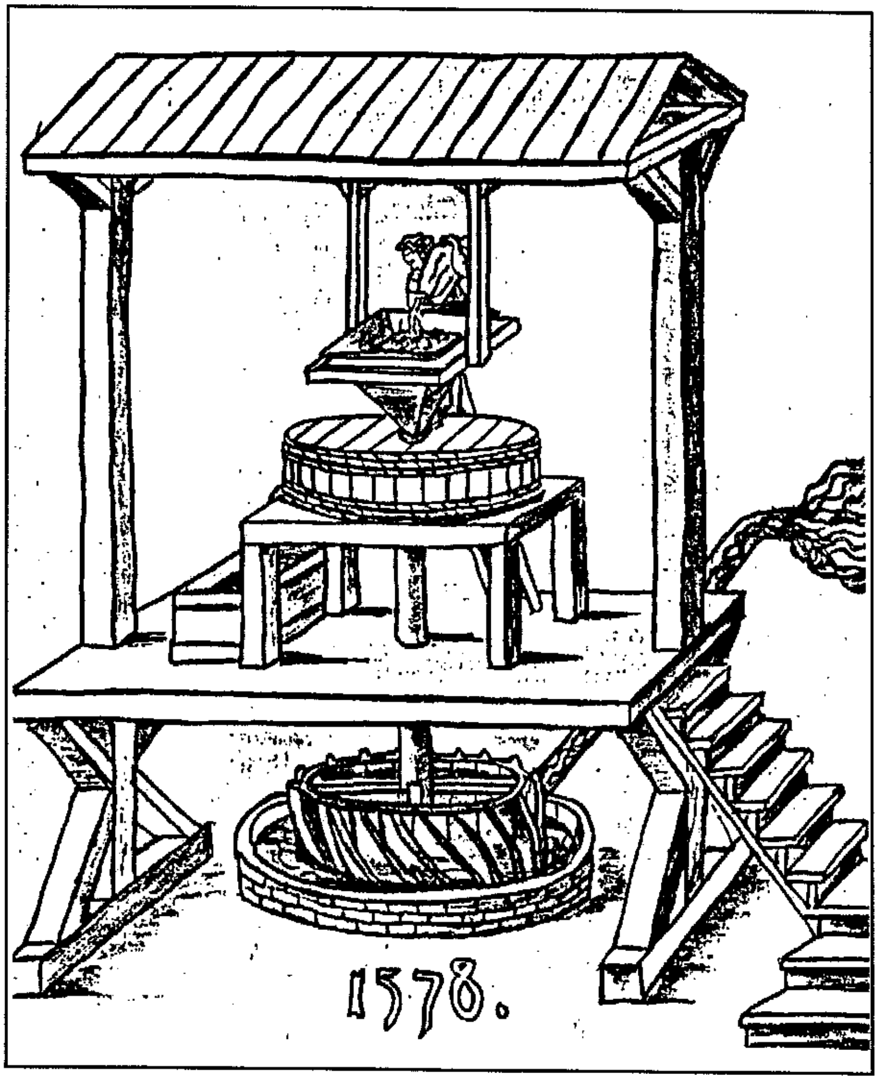


Figure 1-5 "Representation of a Norse Mill as used in the South of France in 1578, from *Theatre des Instrumens Mathematiques*, etc. by Jaques Besson, Lyons, 1578." Courtesy of the Bucks County Historical Society.

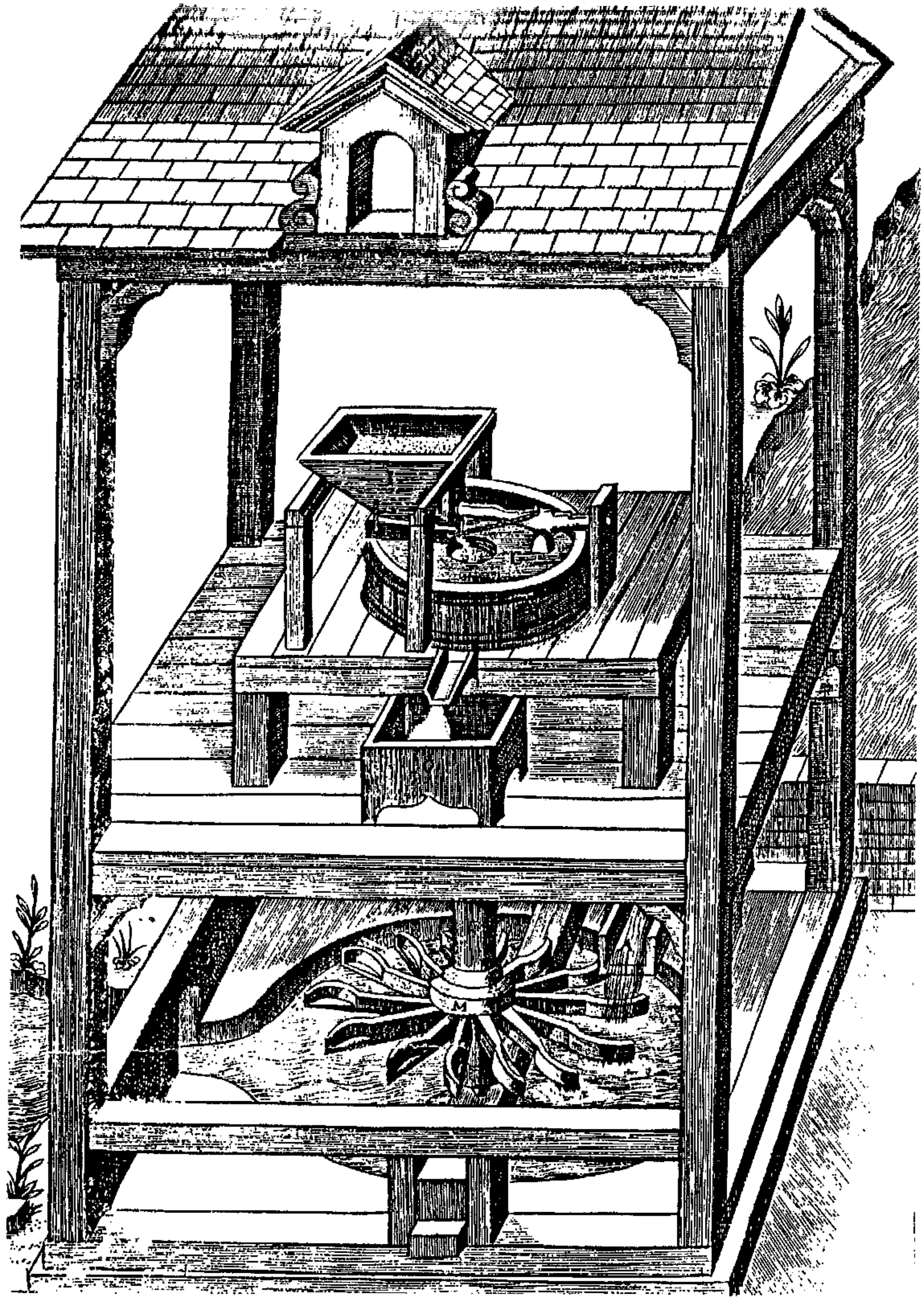


Figure 1-6 Illustration of "another kind of mill, very simple and easy," from Chapter 14 of Martha Teach Gnudi's *The Various and Ingenious Machines of Agostino Ramelli, A Classic Sixteenth Illustrated Treatise on Technology*. Courtesy of Dover Publications, Inc., New York, 1987.

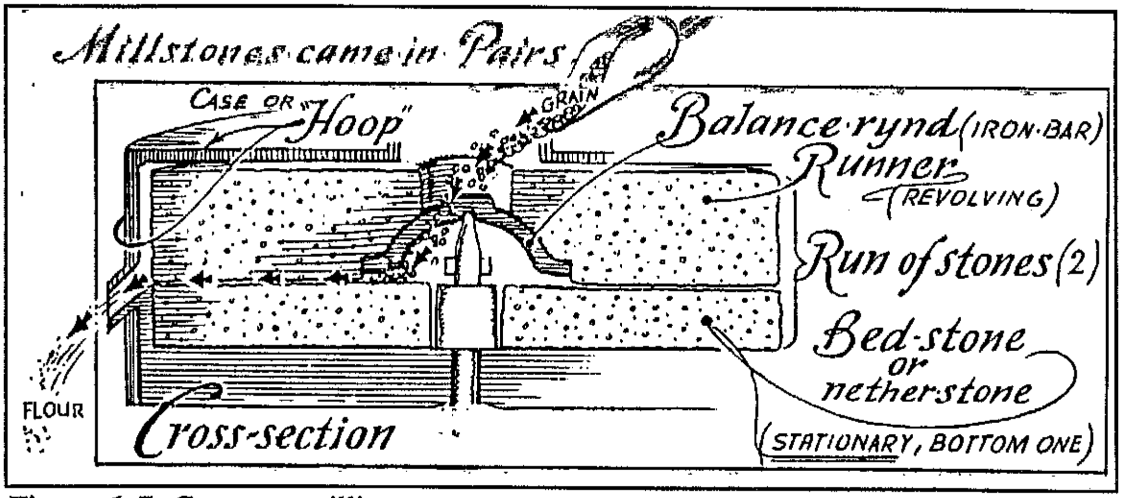


Figure 1-7 Common milling terms.

C. Horizontal Water Wheel Mills in the United States

Spanish colonial mills in what is now the United States are a rare resource. New Mexico had the earliest such mills. At the beginning of the twentieth century one hundred working horizonal mills could still be found there. Today very few are being preserved. The earliest description of a New Mexican gristmill appears in the 1601 report of Don Juan Oñate, Governor and Captain General of the Provinces of New Mexico, "Our wheat has been sown and harvested, and it does extremely well in that land. . . A flour mill has already been erected. More than 1,500 *fanegas* of wheat were gathered this year, and there remain to be harvested more than another three thousand." (Hammond and Rey 1958: 619). For an excellent synopsis of New Mexico mills construction and operation by Charles Gritzner, please see Appendix B.

Rancho de las Golondrinas, a living history museum at La Cienega, New Mexico, south of Santa Fe, has three horizontal wheel mills. Each was disassembled and moved from its original location and reassembled. One mill (the Truchas mill, described below) has been restored to full operation and is used to grind wheat, corn, and chilies several times throughout the year.

Other similar mills were found across the United States. A second of several Norse mills, apparently built in the 1850s, and visited by Mr. Horace Mann in October, 1917 while in the Big Smokys [*sic*] near Forster's Creek (Figure 1-8) was described in detail and included components such as the bridge tree, one end of which was "mortised and pegged into the . . . frame work surrounding the mill stones, and the other end laid free on the ground with a lighter rod [tram rod] fastened to it." Mann also described a "forebay," a "rough trough open on top about two feet in diameter" running level to the stream, and supported on a trestle. The end of this forebay narrowed to a flume about one foot square, and then turned downward sharply at about 45 degrees before striking the water wheel. Rather than wedges, the tram rod was raised or lowered by means of a screw wheel. Mann noted, "A curious point characteristic of the

Figure 1-8 Norse Mill moved from Madison County, North Carolina to the Bucks County Historical Society museum. Courtesy of the Bucks County Historical Society.

Norse Mill as distinguished from the common gristmill might be noted here in the fact that when the bridge-tree is raised by means of this lighter rod not only the upper mill stone but the water wheel itself goes up with it." He also recorded that, "The 'eye' of the lower mill stone through which the spindle passes, was filled with a block of soft wood, hewn to fit and then driven into the 'eye' until tight. A hole was bored in the wooden block for the spindle to pass through forming a bearing in the nature of a bush as found in the modern gristmill of Bucks county. This wooden bearing prevented the leakage of meal around the spindle."[12] These details all or in part, exist with the restored apparatus at San José (see Chapter 3).

Dr. Henry Mercer reported visiting with John Muir who reportedly "found about twenty corn gristmills in southeastern Tennessee" in 1867 whose details matched those of the Norse mill. He notes, in comparing one of these mills to the Shetland mill described and illustrated in *The Past and Present* by Mitchell Edinburgh published in 1880 (Figure 1-4): "... first the bridge-tree in the Shetland mill was worked by a wooden wedge, here [in Tennessee] by an iron screw. Second the Shetland damsel is a stone tied to a string, which dragging upon the revolving surface of the upper mill stone shakes the 'shoe' or feeder, while in this case the damsel is a vertical wooden staff projecting from the top of the spindle so as to agitate the shoe with its corrugations as it revolves. Third, the Shetland hopper is swung from the roof by four ropes, here it rests on the usual hopper 'bench' or stand. Fourth, our mill-stones are boxed in with the usual 'hoop' and 'guard.' The Shetland stones run free. Fifth, the wooden paddles of the Shetland water wheel are set, not spirally or obliquely, but vertically against the shaft and are not enclosed in the circumference of the wheel. . . . But these differences are not fundamental, and the unmistakable point of similarity is the fact that the mill-stones in the Shetland and American instances are set on the

[12]Horace M. Mann, *Gristmills of an Ancient Type Known as Norse Mills* (Doylestown, Pennsylvania, *The Bucks County Historical Society Papers*, Vol. V, Doylestown Meeting, January 19, 1918), 72-74.

vertical shaft of the water-wheel itself and turn directly with it."[13]

Several missions in California had horizontal water wheel mills. San Luis Obispo, San Gabriel, San José, Santa Inés, Santa Cruz, and Santa Bárbara missions had mills.[14] The gristmill at Mission San Gabriel in southern California was a horizontal water wheel mill, dated from 1810. This particular mill was functioning in 1817.[15] Most of these mills have disappeared and no records to date have been found concerning them. One exception is the mill at Mission San Antonio de Padua. Under a grant from the Texas Historical Commission in August of 1971, Father Balthasar Janacek, then with St. Lawrence Church and Director of the Catholic Missions of San Antonio; Sister Mary Christine Morkovsky; Texas Parks and Wildlife (TPW) San José Mission State Park Superintendent Pete DeVries; and TPW Exhibit Planner (at Mission San José) Anne Fox travelled to California to visit and research the twenty-one California missions. Mission San Antonio de Padua (built in 1806[16]) revealed a great find: a grist mill with a fore-bay, wooden hopper similar to the replica built in the 1930s at San José, and a once operational horizontal water wheel (see Figures 1-9 through 1-12). While the mill still stands, the millstone is broken and with the extreme difficulty of obtaining water to run it, there are no plans to restore the mill.[17]

[13]Dr. Henry C. Mercer, *Notes on the Norse Mill* (Doylestown, Pennsylvania, *The Bucks County Historical Society Papers*, Vol. V, Doylestown Meeting, January 19, 1918), 76-78.

[14]Edith Buckland Webb, *Indian Life at the Old Missions* (Lincoln, Nebraska: University of Nebraska Press, 1952), 154-158.

[15]Frederic J. Dennis, "The Old Mill Reveals a Secret," *California Arts and Architecture*, February 1931: 28-29.

[16]Webb, *Indian Life at the Old Missions*, 154.

[17]These mills are briefly discussed in: James C. Williams, "Civil Engineering on the Spanish Frontier: Alta California Water Systems" (California History Center, Cupertino, California, Manuscript, N.D.). Interview with Priest at Mission San Antonio de Padua, 20 July 1990.

Figure 1-9 August 1971. Looking across the forebay at Mission San Antonio de Padua in California. Note the similarity to this photograph and Figure 3-159 (San José's forebay after the sluice had been cleaned out in December 1996).

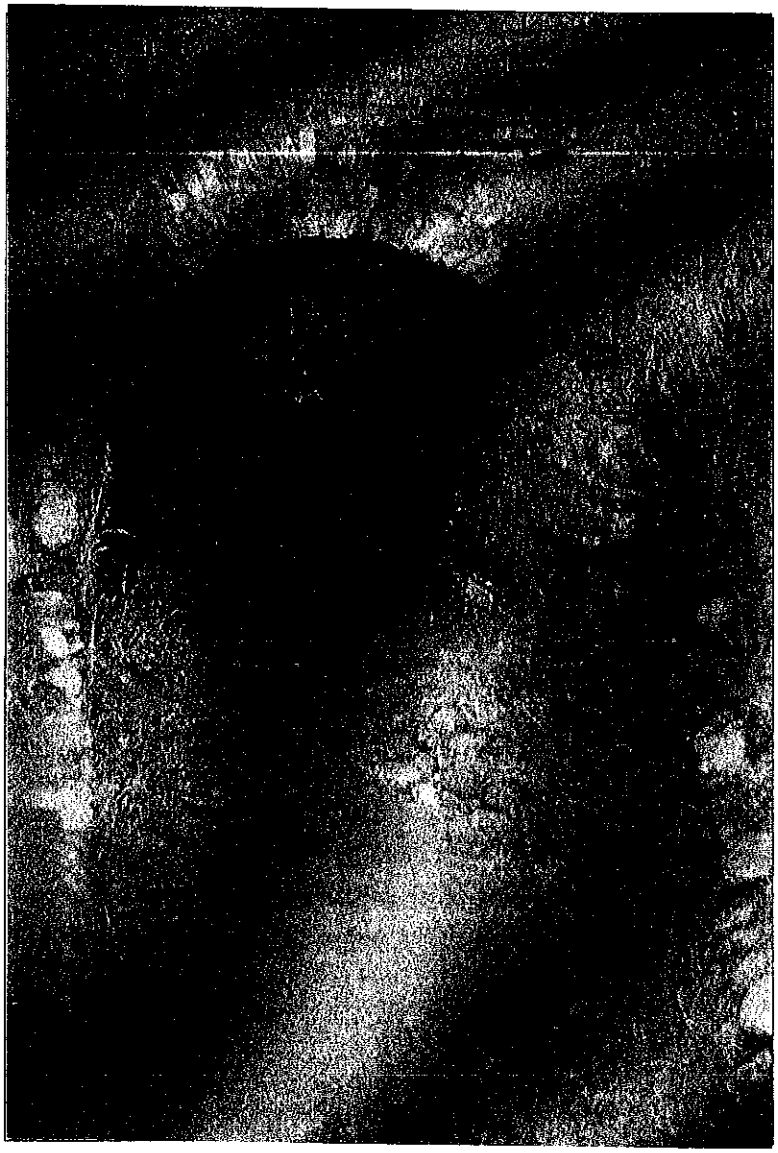
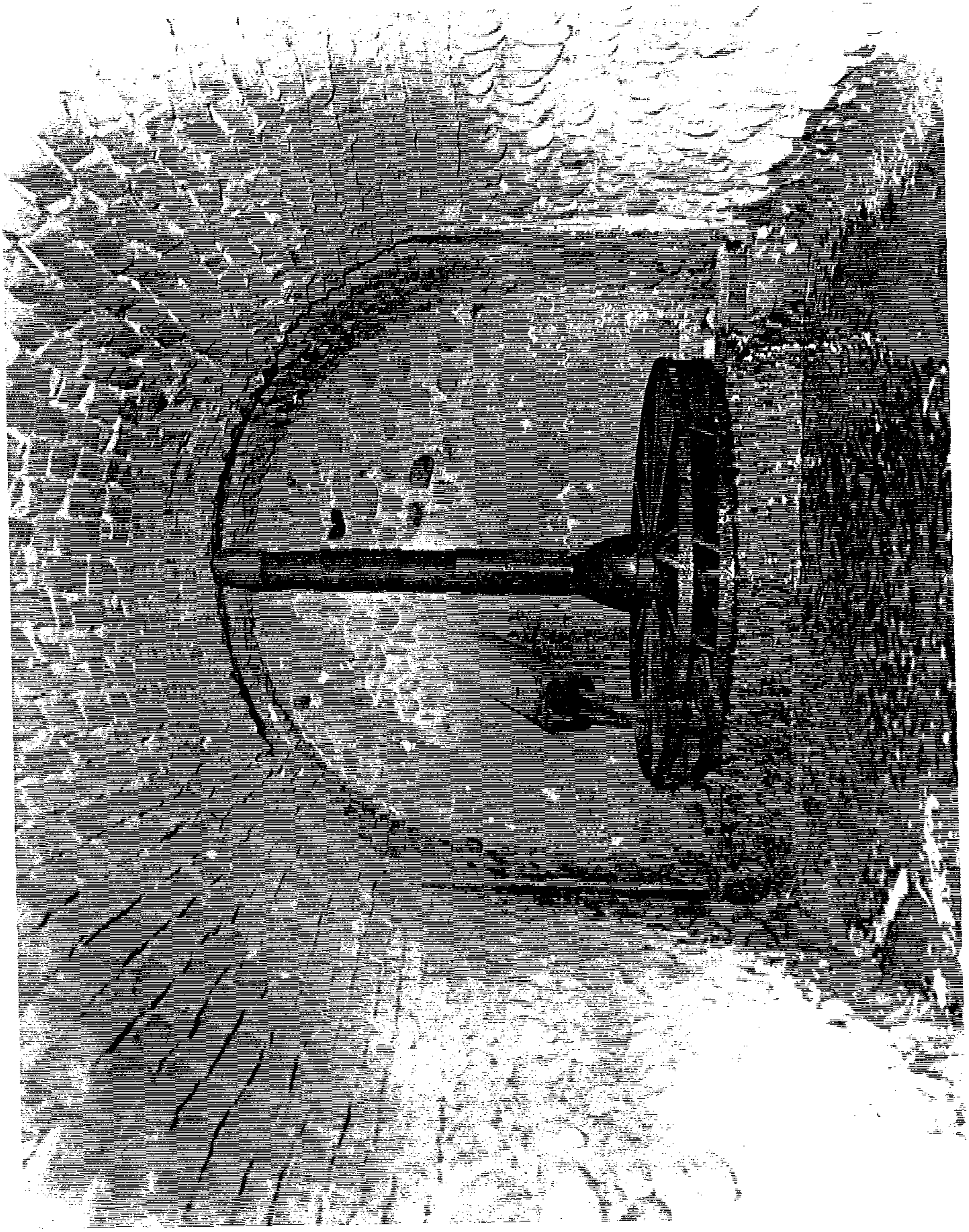


Figure 1-10 August 1971. The wheel room of the mill at Mission San Antonio de Padua in California. Note the striking similarities to what was found at San José in 1996: The two wall notches for the tram rods, the construction of the wheel--particularly the wheel blades and enclosing metal bands, the arched masonry vault, and the square wooden water chute from the forebay. The California missions succeeded the San Antonio missions, however.

Figure 1-11 August 1971. Upper millstone, wooden hopper, and hopper frame from the San Antonio de Padua mill. The construction of the hopper is very similar to the San José mill, as is the presence of the iron band which can be seen around the lower stone.

Figure 1-12 (Facing Page) Date unknown. Shot of the San Antonio de Padua wheel room with water running through the chute onto the wheel. Courtesy of Mission San Antonio de Padua.



Santa Bárbara's horizontal water wheel mill is described in detail by Edith Webb in *Indian Life at the Old Missions*. It incorporated components similar to horizontal wheel mills of this era, and to those observed or researched for this report, one exception being the wheel:

> The millwheel, probably six feet in diameter, was of very simple construction. If built like that one at San Antonio [de Padua, See Figure 1-13], it was composed of two wooden circles, or rims--one large and one small--several spokes, and a number of vanes formed as "slightly concave spoons." There was no hub as we know it. The short spokes were mortised directly into the shaft. The other ends of the spokes were attached to or mortised into the small, inner circle. The vanes were tenoned and mortised in between the inner circle and the outer rim. They were set at a slant to receive the full force of the spouting water. The wooden rims were about nine inches deep and three inches thick.[18]

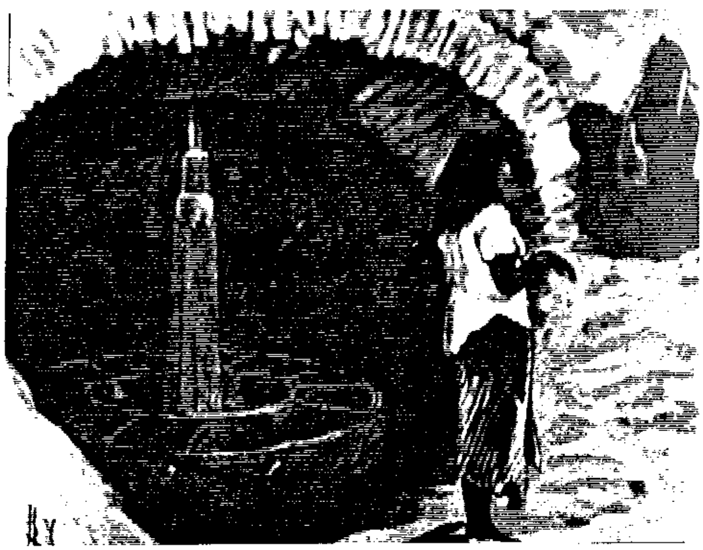


Figure 1-13 Artist's rendition of the millwheel formerly at Mission San Antonio de Padua in California. Reproduced from *Indian Life at the Old Missions* by Edith Buckland Webb, by permission of the University of Nebraska Press. Copyright 1952 by the heirs of Edith Buckland Webb.

Another exception was the bearing for the wheel shaft - which was reported to be "a stone block eight or ten inches high and twenty to twenty-four inches square, set on the floor of the wheel chamber."[19] Webb reports, "It seems certain that the mission mills were not capable of adjustment for the grinding of both grains. . . . There is, in fact, nothing in the history of these mills to indicate that either stones or wheels were raised or lowered by any other mechanical device."[20]

However, later, Webb states, "It is in San Antonio's wheel-room that we see evidence of the Spanish version of the 'bridge-tree.'"[21] Varying details between this California mission and the 1930s San José restoration--particularly the details at the top of the iron shaft which

[18]Webb, *Indian Life at the Old Missions*, 160.

[19]Webb, *Indian Life at the Old Missions*, 160.

[20]Webb, *Indian Life at the Old Missions*, 160.

[21]Webb, *Indian Life at the Old Missions*, 162.

protrudes through both stones--provide plausible evidence for another means of adjustment. From Webb's description, the rynd (which catches on and turns the upper stone), was bolted to the iron rod at Santa Bárbara's mill, and by moving the rynd up or down along the rod (if that was possible), then minute adjustments could be made. The rynd is welded to the center rod at San José (see Figure 3-104). Other differences exist in small details at and around the two stones and their assembly with adjoining elements. No evidence of hoppers or their appurtenant features were located for any of the California missions.

The faces of "running" stones and a few of the "bedstones" were dressed, or assembled with grooves cut into them. "These grooves are known as 'furrows' and the spaces between the furrows are called 'lands.' [See Figure 1-14] The lands are the true grinding surfaces."[22] Prof. B.W. Dedrick offers a more detailed explanation of the grooving of stones: "The furrows answer a threefold purpose--that of distribution, ventilation and cutting or breaking, or preparatory grinding."[23]

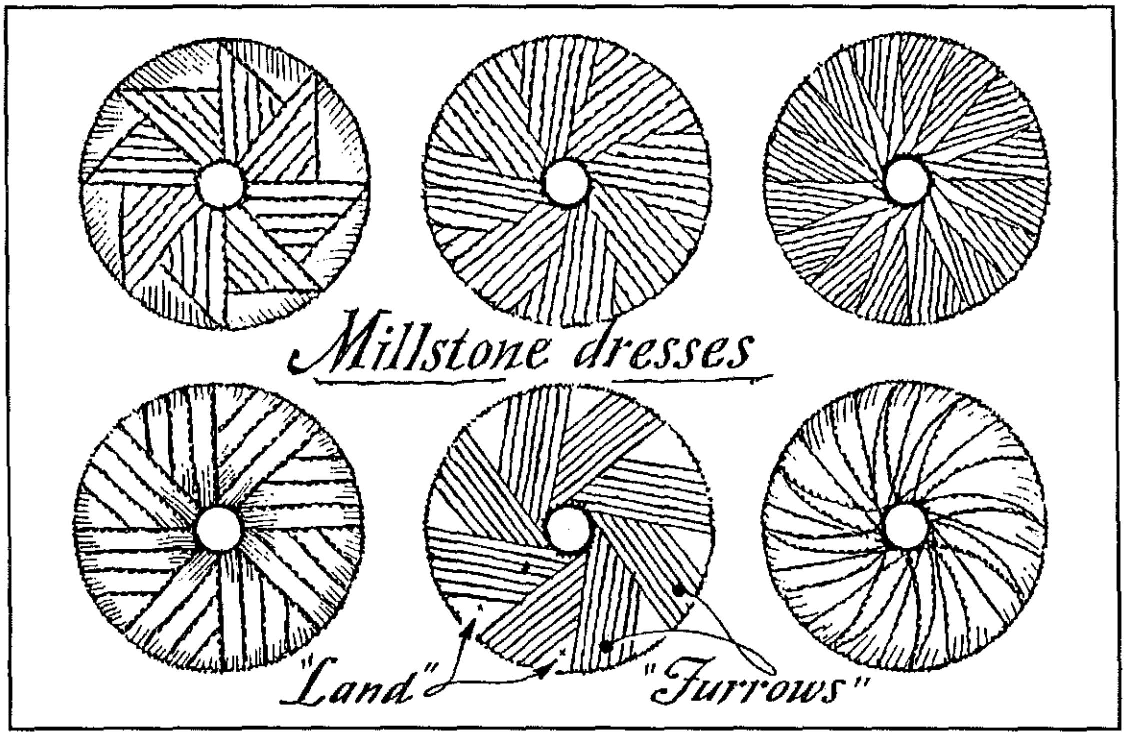


Figure 1-14 Millstone "dresses."

Without the furrows, some crushing and breaking of the grist would occur, and to some extent discharge, but the closer the stones were (for finer grinding) the more difficult the discharge would be, plus the grain would heat, and with moisture, would become like paste. One of the most important tasks for a good miller, therefore, was to keep his stones "well-dressed." The grooving of the stone involved taking a circle a quarter of the distance across from the center

[22]Webb, *Indian Life at the Old Missions*, 163.

[23]Webb, *Indian Life at the Old Missions*, 163.

out towards the outside and from that inner circle taking tangential grooves to the outer face of the stone. The type of stone itself with all of the holes in it also provides additional cutting edges. The tangential grooves themselves forced the grain to the outer edges of the stones, keeping it moving away from the center of the stones as it's fed in.[24]

D. The Restoration of the Truchas Mill at Rancho de Las Golondrinas

Ernst Schuchard, a Pioneer Flour Mills engineer, assisted architect Harvey Smith who was retained by the WPA, with the restoration of the San José gristmill in the 1930s. In particular Schuchard recreated the detailed milling apparatus which was totally missing when the site was excavated in 1933-34. Mr. Schuchard kept detailed notes associated with his research into mills of all types, including horizontal water wheel mills; his travels and correspondence were extensive. His personal collection is now in safekeeping at the Daughters of the Republic of Texas Library in San Antonio. Missing to date from both Harvey Smith's records, and the archives of Schuchard is one key piece of information: the drawing or drawings and/or notes used to restore the milling room, its surrounding four walls, and the milling equipment within. As this report details in Part 2, the only drawings with this detail which exist are Harvey Smith's "Reconstruction Plan of the Mill for Mission San José de Aguayo," and his "Alterations and Additions to the Mission San José de Aguayo" drawings, both completed for the Texas Civil Works Administration (see Figures 2-37 and 2-38). The former drawing is not dated. Unfortunately, the actual restoration did not follow either of these drawings, and the restoration drawings used to recreate the mill as we see it today and detailed mechanical renderings have not been located as yet. Although the building proper exists much as it did after the 1930s restoration, and with scant or conflicting research data, park management has been left without the very detailed information necessary to rehabilitate the milling apparatus and replace those elements necessary to have the mill operate once again. Therefore, the trip the researchers of this report made to Rancho de las Golondrinas in August of 1996, during which a very intensive tour was given them by Earl Porter, has provided much needed information, without which many technical and historical questions would go unanswered, and the rehabilitation of the San José mill would have been very difficult, if not impossible.

During the initial research preparation for this report, park historian Dr. Rosalind Rock contacted a colleague, archeologist and historian Dr. Frank Wozniak, who had previously participated in a project in northern New Mexico connected with the construction of a new dam. His project report mentioned the existence of historic mills in the area. After contacting him, Dr. Rock learned that the mills in question were vertical water wheel mills versus the horizontal mills analogous to that at San José. However, Dr. Wozniak did refer her to the director of the Museum of New Mexico, Dr. Tom Chavez, who provided the lead to Rancho de las Golondrinas (Las Golondrinas) near Santa Fe. She then contacted the director of Golondrinas, George Paloheimo, who led us to perhaps one of the greatest "finds" during our research for this report, retired engineer Earl Porter who volunteers at the rancho.

Earl Porter was raised on a farm and ranch near Tucumcari, New Mexico, and graduated from

[24]Interview with Earl Porter, August 22, 1996.

New Mexico State University with a degree in Chemical Engineering. He made his career in the nuclear power industry and in 1975 founded CHAMPS SOFTWARE INC. that specialized in factory inventory and maintenance systems. In 1989, Mr. Porter retired from daily participation in the company and returned, along with his wife Nancy, to his native New Mexico.

Earl soon discovered El Rancho de las Golondrinas, the living history museum southwest of Santa Fe. Succumbing to his lifelong fascination with primitive technology, he volunteered to act as the museum's resident engineer and historic building preservationist. His first task was to "fix" an old Spanish Colonial flour mill so that it could be used for demonstrations at the museum. After months of research, and 3000 man-hours of work, the little Spanish mill (Truchas) was restored and now is the only functional mill of its type in the U.S. In the process of researching and working on that mill, Mr. Porter developed a passion for flour mills and the history of milling in New Mexico.

Today Mr. Porter sits on the board of directors of El Rancho de las Golondrinas and serves as a member of the Engineering Academy (advisory board) of the Chemical Engineering Department at New Mexico State University. Most of his free time is spent researching and chasing after the old grist mills of New Mexico. To date Earl has discovered evidence for over 450 historic mills in New Mexico, and in his many travels through the New Mexico countrysides, has located ruins of around sixty mills.

MOLINO BARELA de TRUCHAS

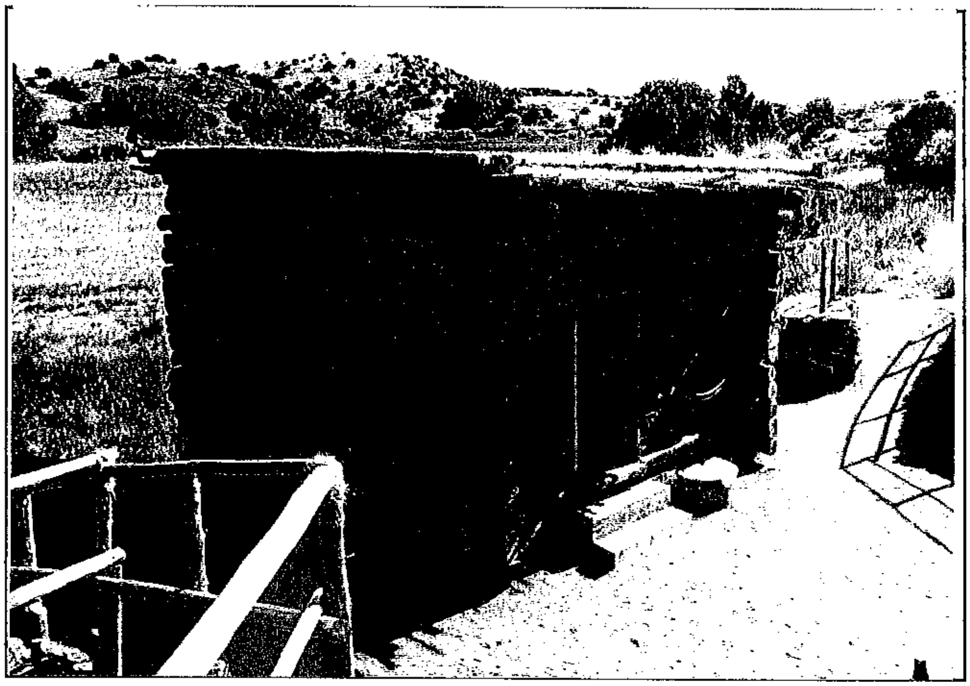
by Earl Porter
November 17, 1994

The Molino Barela de Truchas (Barela's mill at Truchas) was originally built in 1873, supposedly by José de la Luz Barela. The original date has been confirmed as 1873 by tree ring analysis of the logs in the structure. However, José de la Luz Barela is probably not the original builder. Census records for 1880 indicate that José was born in 1862 and hence would have only been eleven years old at the time of the mills confirmed construction. If José de la Luz Barela was not the original builder of the mill, then there is a strong probability that the builder was his father, Desidario Barela. In any event, it is certain that José operated the mill from early manhood until his death in 1923. Upon his death, the mill and surrounding property passed to José's widow, Isadora and soon thereafter to their son, Pedro Barela. Pedro was born in 1896 and operated the mill from 1923 until sometime in the early 1940's. At that time, the combined effects of the depression, the Government WPA activities in the Truchas area, the return of village sons from the war, and Pedro's ill health conspired to eliminate the demand for locally milled flour and force the closure of the mill. It is reported that Pedro would, however, continue to mill small quantities of flour and corn meal from time to time for personal consumption up until mid 1950's. Most of Pedro's land holdings in the upper Truchas Creek area were sold to his nephew, Raymond Barela (son of Pedro's brother, Ramos) in the 1950's. Raymond never operated the mill and there is no evidence that the mill ever operated beyond the mid 1950's, under the hand of Pedro Barela.

In 1969 Barela's mill was purchased from Raymond Barela by Y. A. Paloheimo for $300.00. In Paloheimo was the founder of the living history museum, El Rancho de las Golondrinas near Santa Fe, New Mexico and acquired the mill for relocation to the museum grounds as an exhibit of Spanish colonial engineering and ingenuity. The mill, consisting of a small log building containing milling machinery and a horizontal water wheel, was disassembled into individual logs and components, and trucked 60 miles from Truchas to its new home on the museum property near the village of La Cienega, 11 miles southwest of Santa Fe. There the mill was reassembled on the banks of the La Cienega Acequia Madre and a new set of diversion gates and flumes was constructed to divert water from the acequia madre, through the log flumes (Canova), onto the water wheel and then back to the acequia. The mill operated occasionally during the summer months as an interpretive exhibit at the museum for several years until lack of maintenance and unstable footings made the mill inoperable in the late 1970's. The mill sat as a static exhibit until 1989. At that time a recently recruited museum volunteer undertook the restoration of the mill. Between November, 1989 and June, 1992 the mill was completely restored and from then until the present operates most weekends as an important part of the living history concept of the museum at El Rancho de las Golondrinas.

The original mill was built of locally hewn logs about 3 miles East of the main village of Truchas, directly on the North bank of the Truchas Creek. The mill was fed by a dedicated ditch that took water from the creek about 200 yards upstream from the mill site. The ditch brought water to the mill and emptied into an inclined open canova "head race" that directed the fast moving water onto the blades of the traditional Spanish colonial horizontal water wheel.

The wheel is 32" in diameter and turns with a natural speed of 69 rpm. [This speed is relatively constant and is a function of the diameter of the wheel and the velocity of the impacting water. This "natural speed" is unique for each mill's particular configuration and is much more dependent on the fall of the water than on the quantity of water hitting the wheel]. The available fall at the mills museum site is very close to the fall at the original location, so that RPMs are very close to the original design. The log-crib mill building measures 11' by 16' interior and contains one pair (1 run) of 26" diameter vesicular basalt (local lava rock) mill stones. The mill also is equipped with a sifter (bolter) that is powered by a crank arm and belt drive from the main shaft. Total milling capacity is approximately 300# of grain per day.



A view of the restored Truchas Mill at Las Golondrinas.
June 1992. Photo by Earl Porter

Figures 1-15 through 1-40 which follow are copies of those which Mr. Porter generously shared with us from his private collection. These document a portion of the restoration of the Truchas mill. We concentrated on the milling apparatus primarily, including the assembly from the bridge tree to the milling stones, since it was these details which we were not able to discern from our historical research or from onsite data obtained in 1996 at the San José mill. Figures 1-41 through 1-86 document the authors' investigation of the Truchas mill in August of 1996.

Since the building construction and method for getting water to and from the mill are very different between the Truchas and San José mills, our focus was on the above milling apparatus.

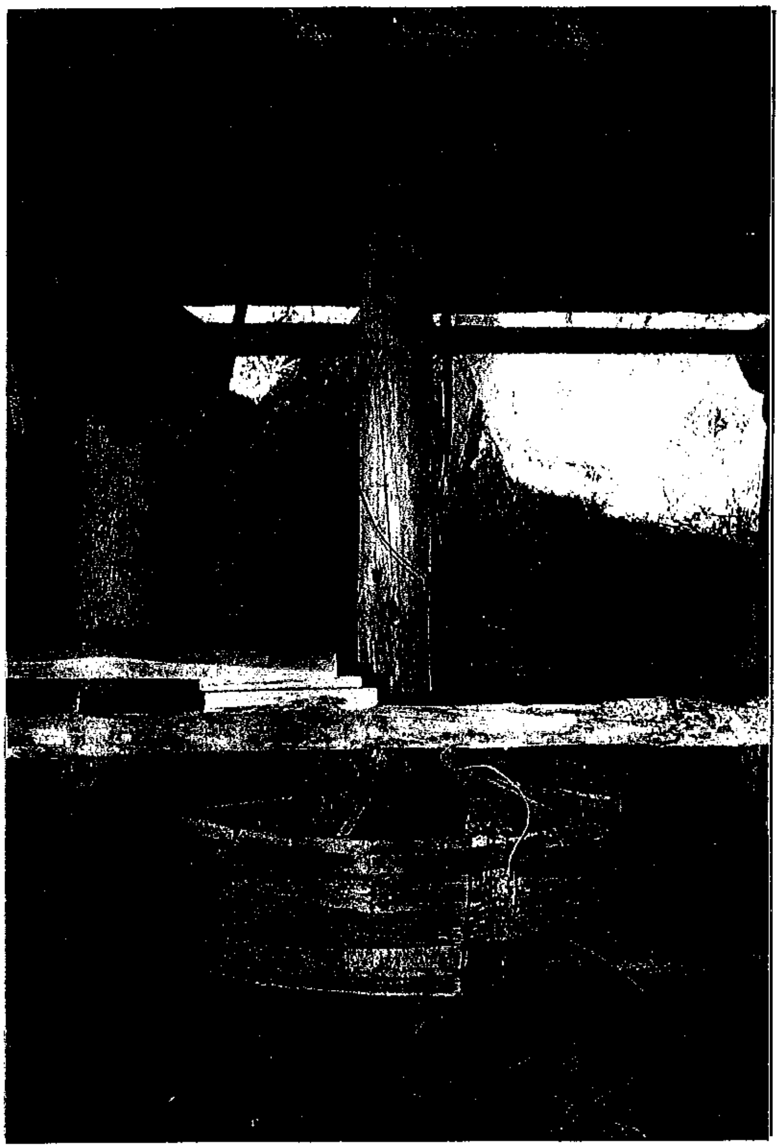


Figure 1-15 November 1990. Truchas mill during initial investigations (prior to relocation to El Rancho de las Golondrinas, and subsequent restoration). Lower wheel room showing an historic water wheel, and all other assemblies as found. Truchas, New Mexico.

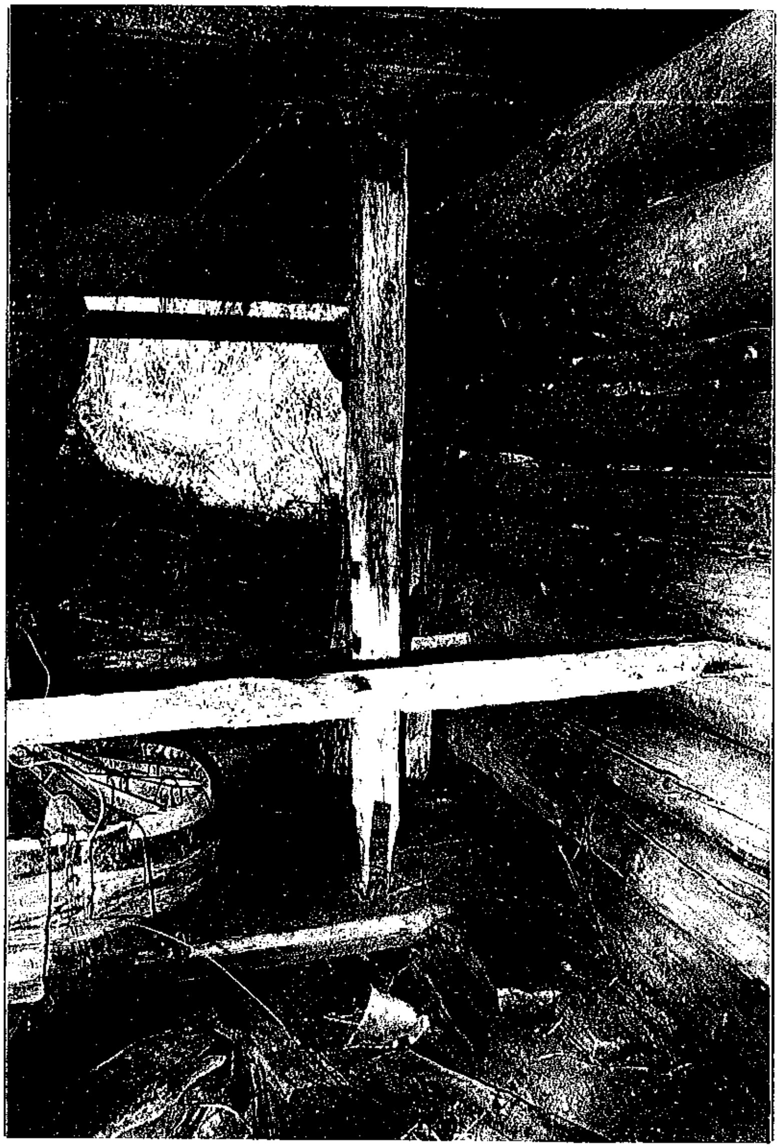


Figure 1-16 November 1990. Truchas mill during initial investigations (prior to relocation to El Rancho de las Golondrinas, and subsequent restoration). Lower wheel room: Detail of tram rod and its connection to the bridge tree. Truchas, New Mexico.

Figure 1-17 November 1990. Truchas mill during initial investigations. Lower wheel room: Detail of previous wheel (note grooved wood band). Truchas, New Mexico.

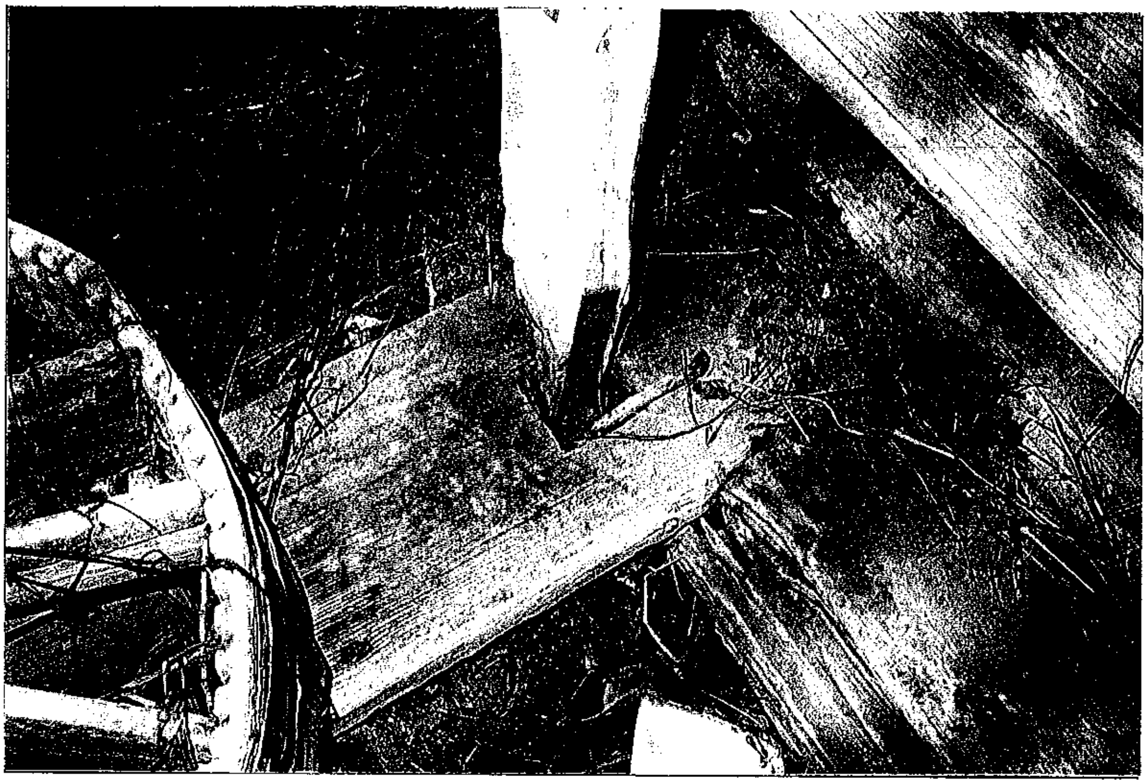


Figure 1-18 November 1990. Truchas mill during initial investigations. Lower wheel room: Detail of previous wheel, tram rod and bridge tree. Truchas, New Mexico.

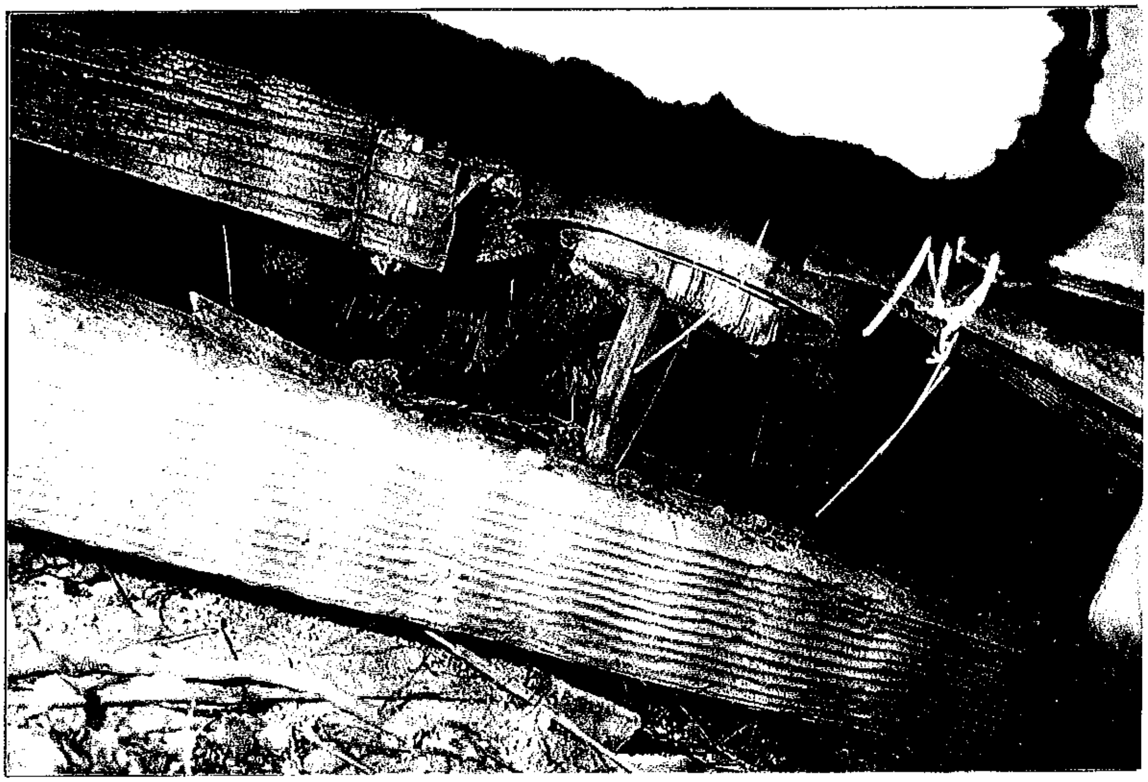


Figure 1-19 November 1990. Truchas mill during initial investigations. Lower wheel room: Detail of previous bridge tree, bottom of main shaft, and thrust bearing. Truchas, New Mexico.

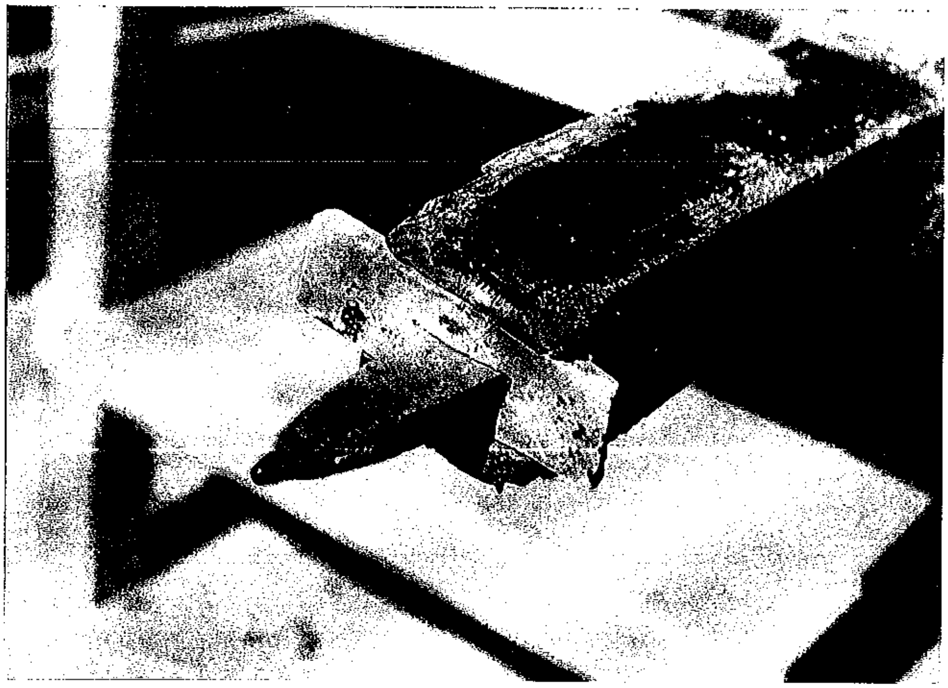


Figure 1-22
Fall 1990
Detail of historic metal pivot point which has been re-inserted into the bottom of the epoxy-stabilized historic main shaft. El Rancho de las Golondrinas, Santa Fe, New Mexico.

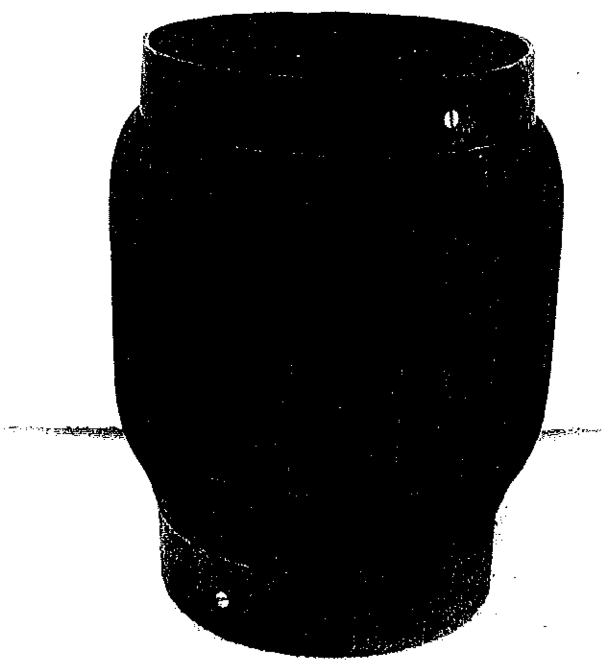


Figure 1-23
Fall 1990
Detail of replacement wagon wheel hub. "Recycled" wagon wheel hubs became convenient replacements for new or rebuilt water wheels in New Mexico mills. El Rancho de las Golondrinas, Santa Fe, New Mexico.

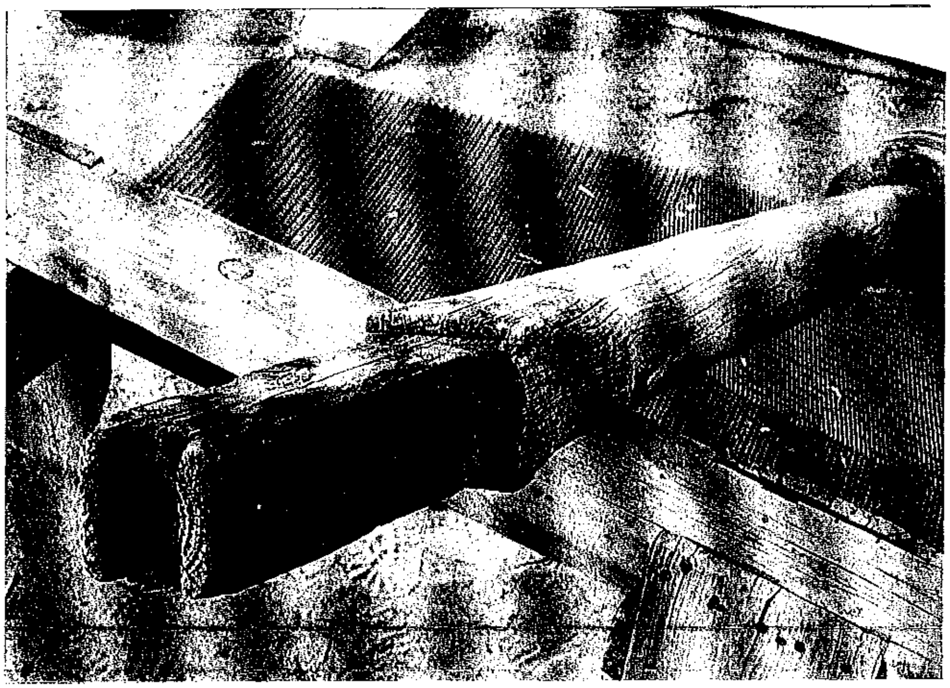


Figure 1-20 Fall 1990. Detail of main shaft removed from Truchas mill during initial investigations. Note the deterioration of the shaft at the bottom at the location of the thrust bearing. El Rancho de las Golondrinas, Santa Fe, New Mexico.

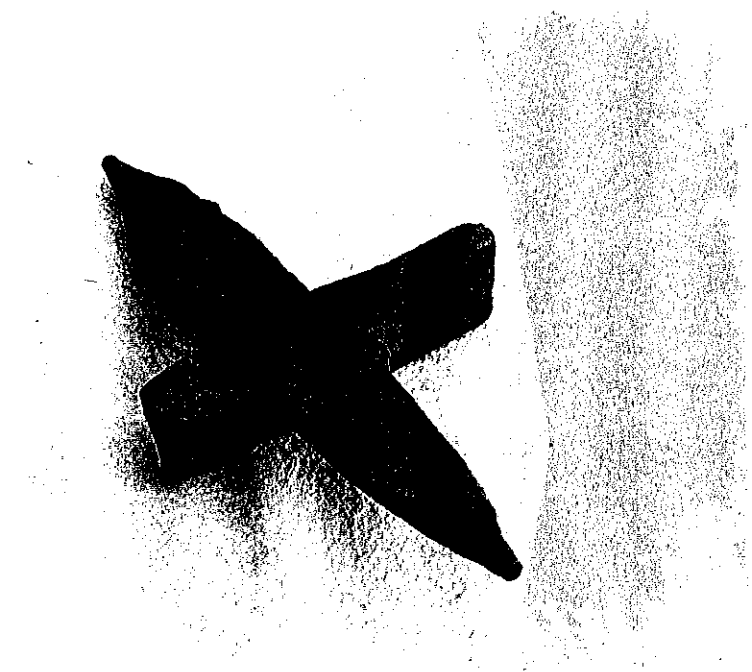


Figure 1-21 Fall 1990. Detail of historic metal pivot point (which is inserted into the bottom of the main shaft). El Rancho de las Golondrinas, Santa Fe, New Mexico.

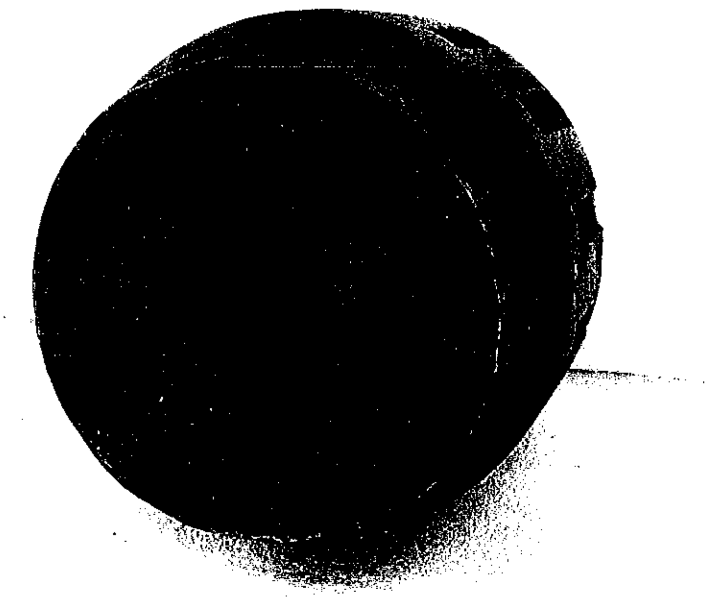


Figure 1-24 Fall 1990. Detail of top of replacement water wheel hub. The hub has been shaped to accept the historic main shaft. El Rancho de las Golondrinas, Santa Fe, New Mexico.

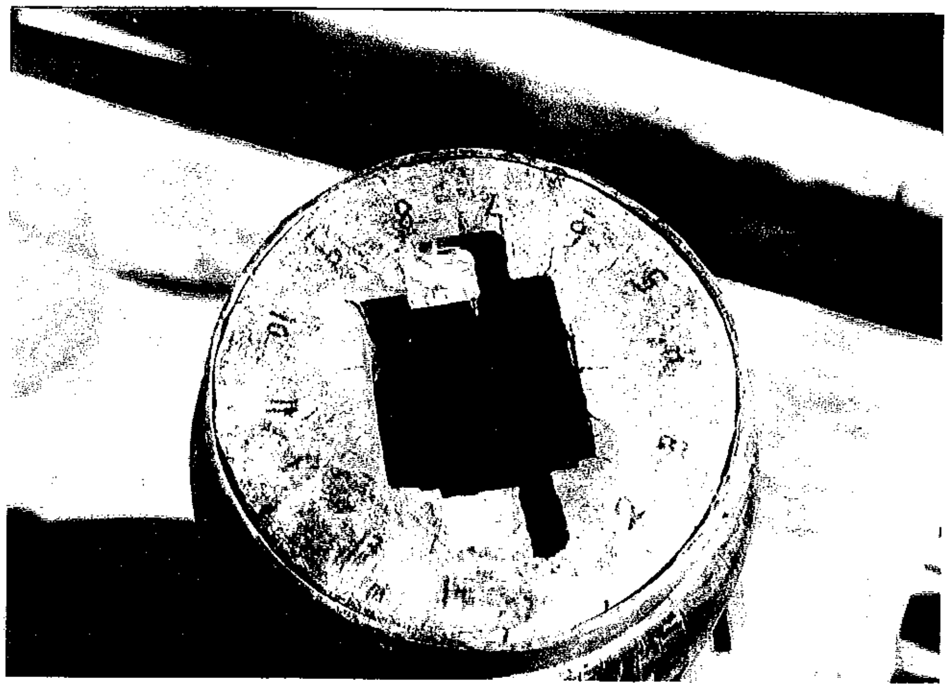


Figure 1-25 Fall 1990. Detail of bottom of replacement water wheel hub. The hub has been notched to accept the horizontal plate from the pivot point. El Rancho de las Golondrinas, Santa Fe, New Mexico.

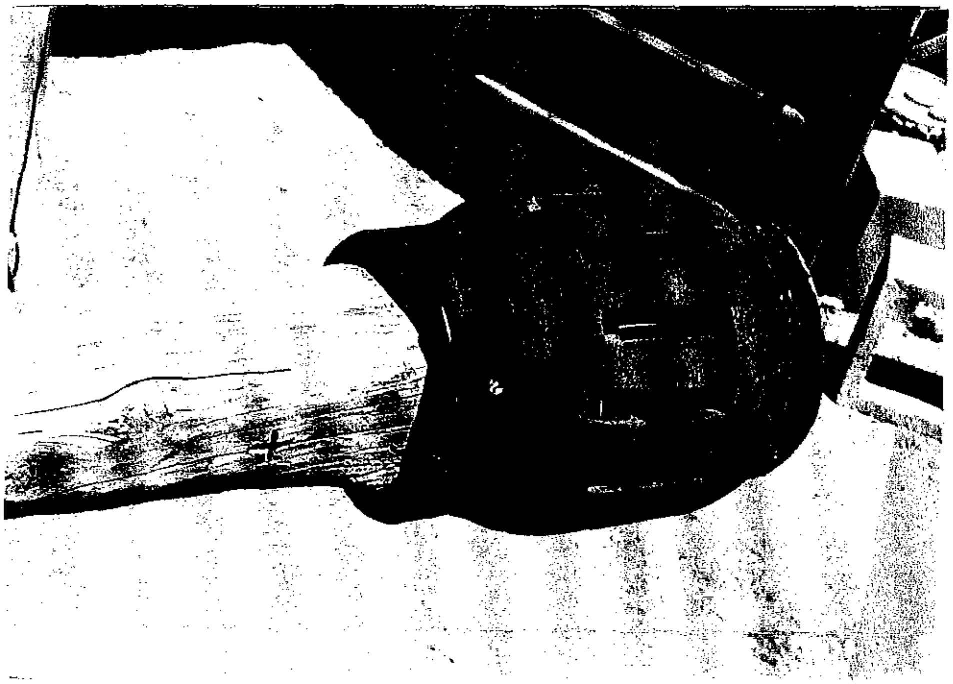


Figure 1-26 Fall 1990. Detail of bottom of replacement water wheel hub. The stabilized main shaft has been inserted into the new hub. El Rancho de las Golondrinas, Santa Fe, New Mexico.

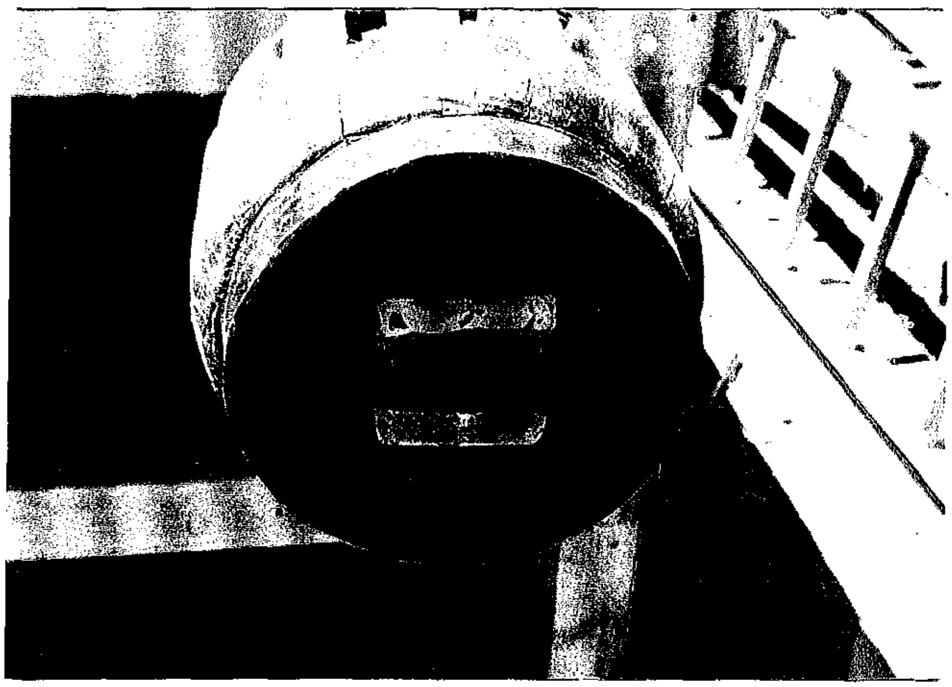


Figure 1-27 Fall 1990. Detail of bottom of replacement water wheel hub and stabilized main shaft. El Rancho de las Golondrinas, Santa Fe, New Mexico.

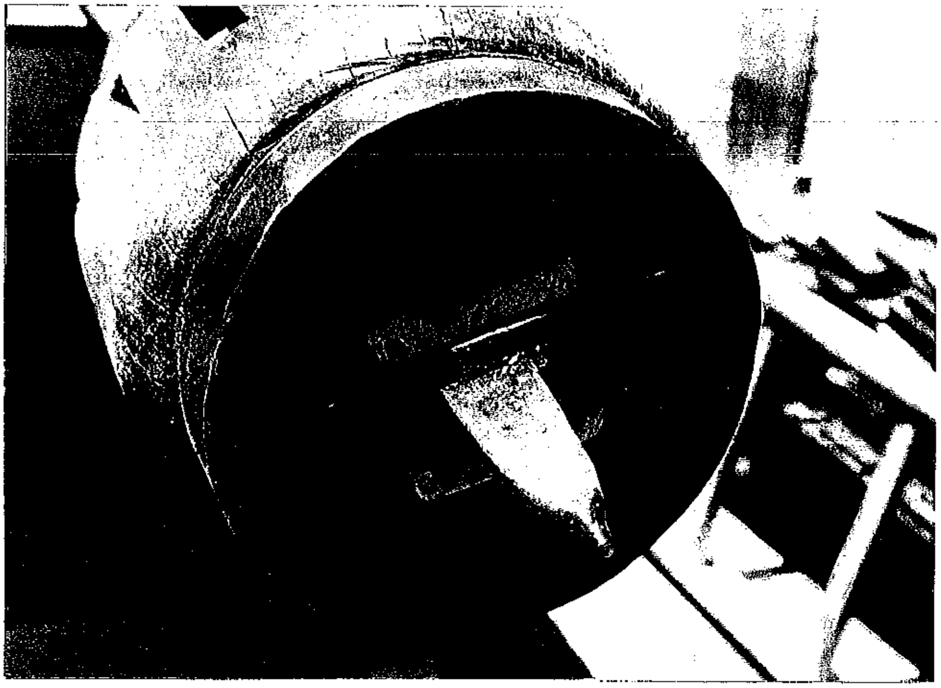


Figure 1-28
Fall 1990
Detail of bottom of replacement water wheel hub/stabilized main shaft assembly with historic pivot pin. El Rancho de las Golondrinas, Santa Fe, New Mexico.

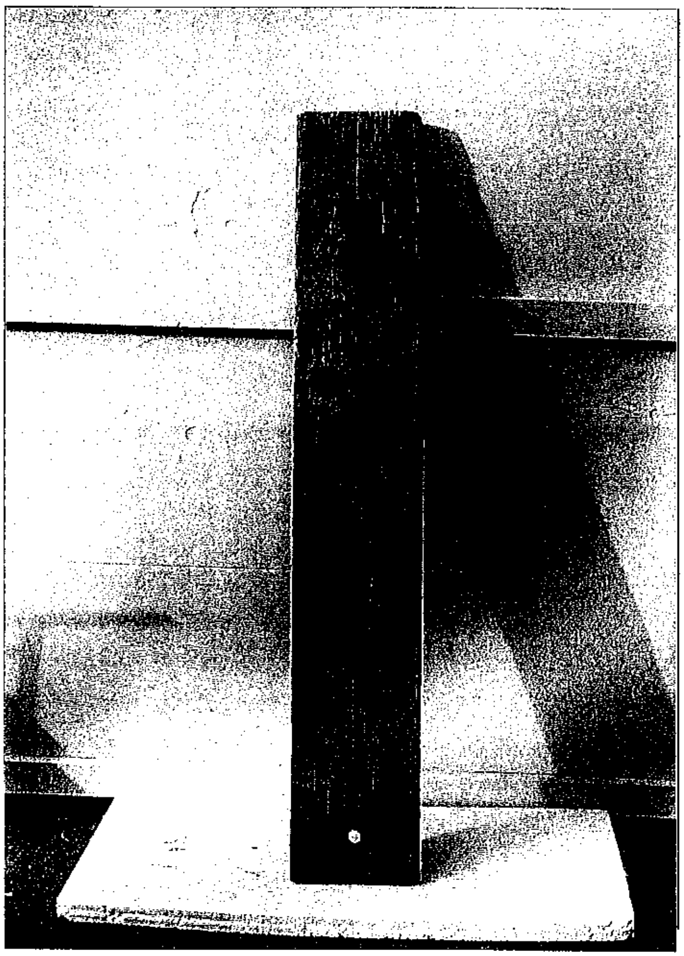


Figure 1-29
Fall 1990
Detail of historic bridge tree (from Truchas mill). The tree was pinned with a spike or peg (location at bottom of photo). At the center of the tree the thrust bearing plate can be seen, notched into the top of the tree. At the top of the photo is the notch for the tram rod. El Rancho de las Golondrinas, Santa Fe, New Mexico.

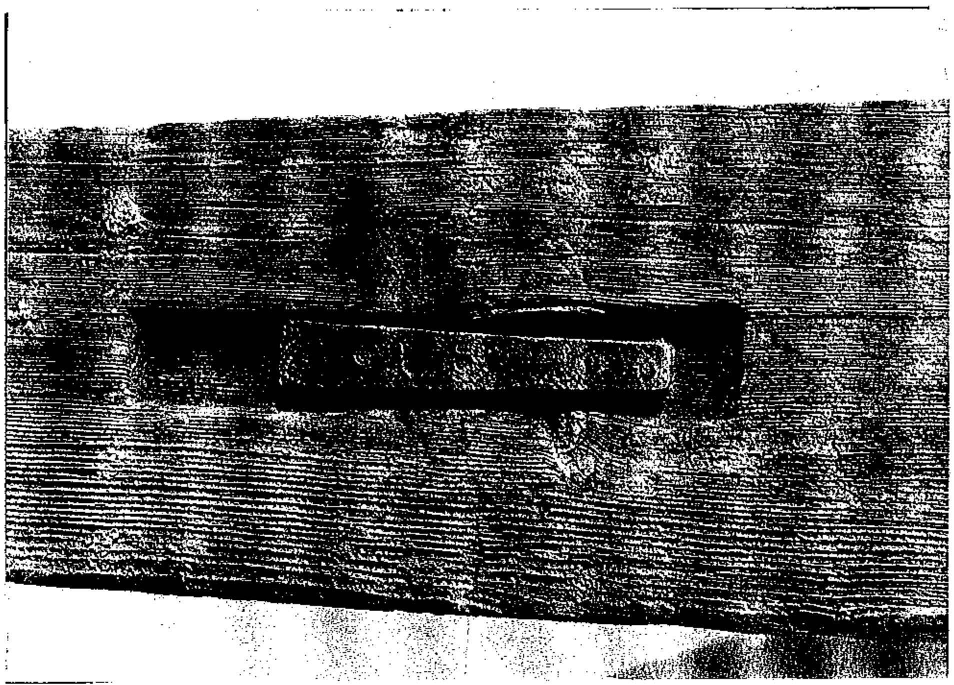


Figure 1-30 Spring 1991. Historic bridge tree (from Truchas mill). Detail of the historic wrought iron thrust bearing plate, notched into the top of the tree. A couple of indentations can be seen indicating that the pivot point (bearing) had been moved a couple of times. Also, this was not the original thrust bearing plate, as the notch was somewhat larger. El Rancho de las Golondrinas, Santa Fe, New Mexico.

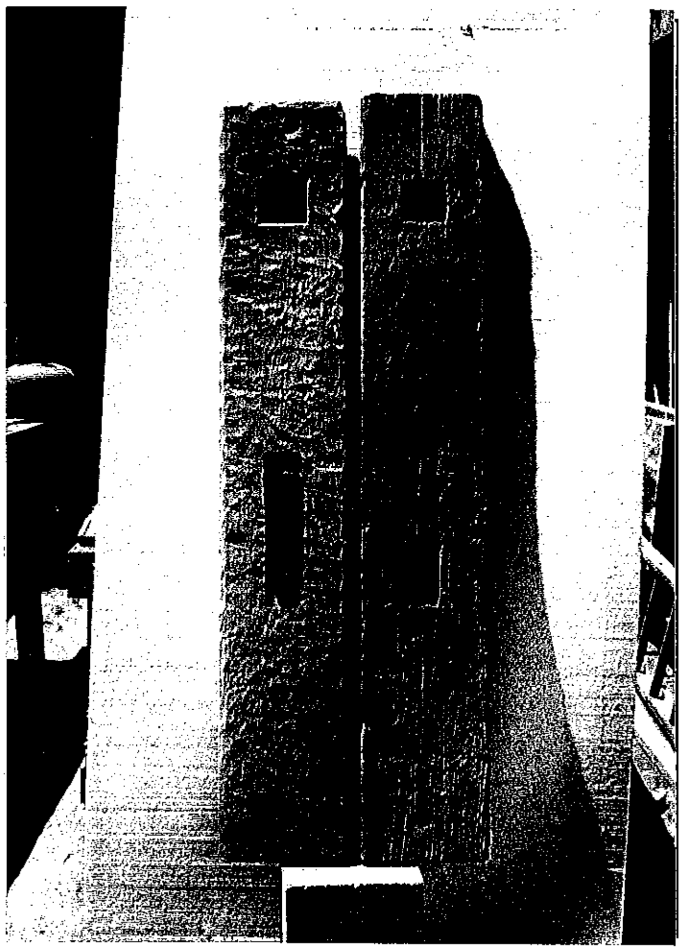


Figure 1-31 Spring 1991. Juxtaposition between the historic bridge tree (at the right) and the re-fabricated tree. The new bridge tree has been carefully tooled to resemble the historic tree. El Rancho de las Golondrinas, Santa Fe, New Mexico.

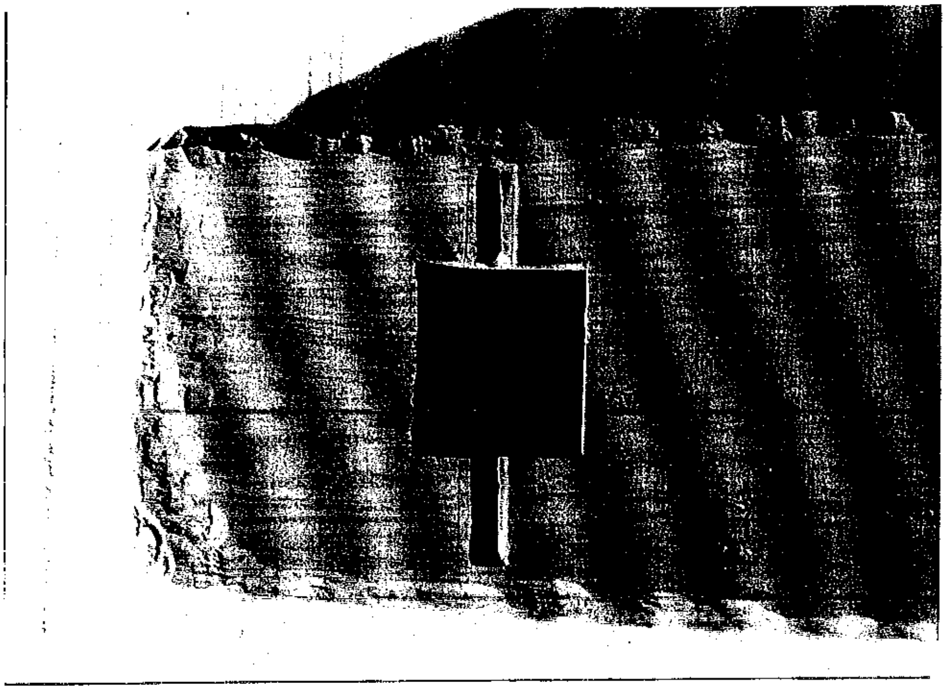


Figure 1-32 Spring 1991. Detail of re-fabricated bridge tree, near the tram rod notch (bottom view). Note the tooling of the edges of the wood. El Rancho de las Golondrinas, Santa Fe, New Mexico.

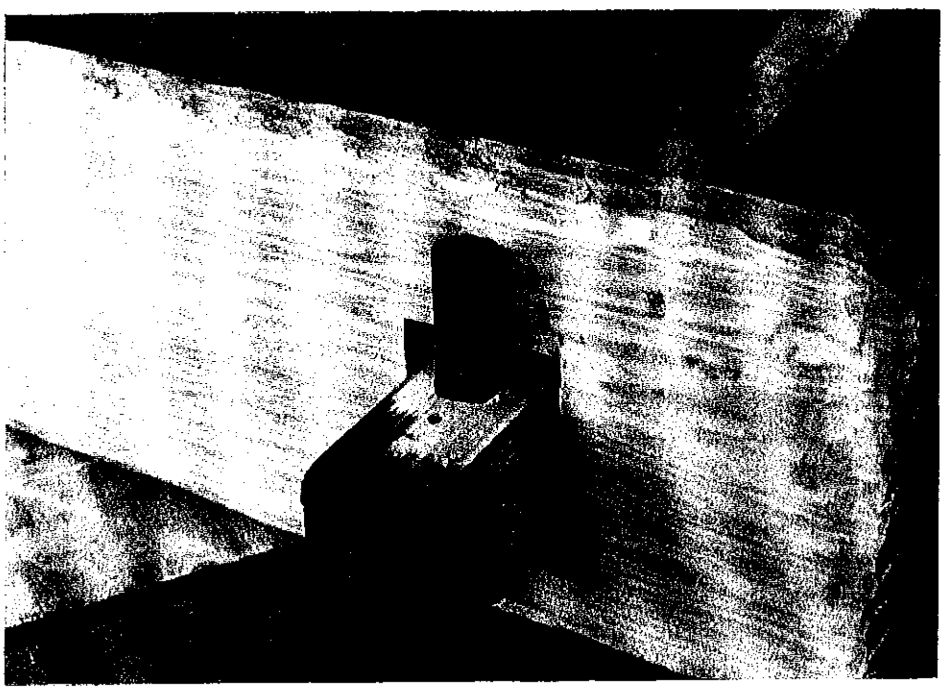


Figure 1-33 Spring 1991. Detail of re-fabricated bridge tree, near the tram rod notch (bottom view), with the re-fabricated tram rod in place. El Rancho de las Golondrinas, Santa Fe, New Mexico.

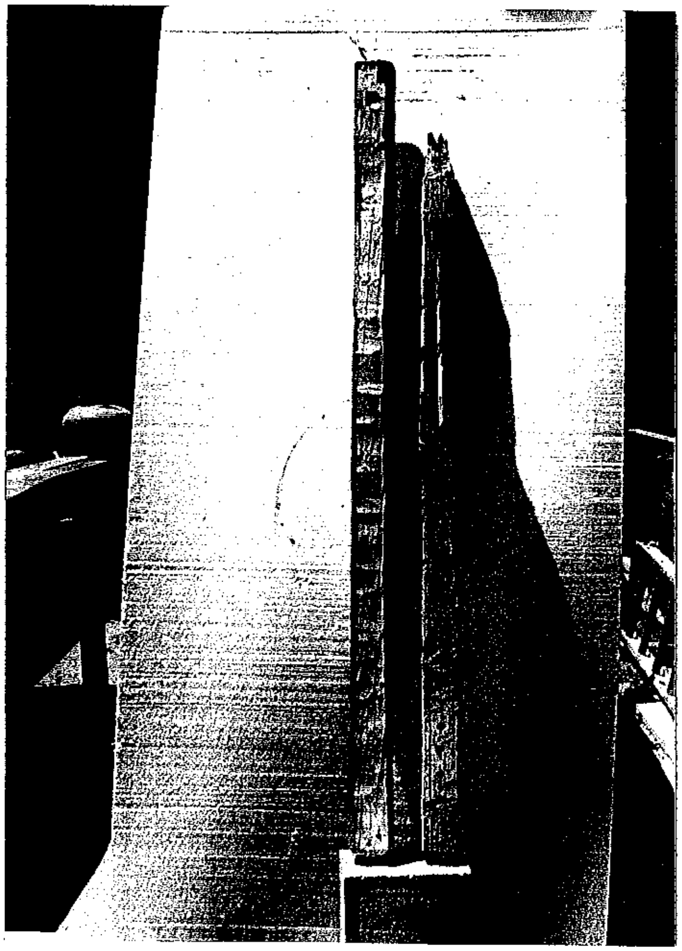


Figure 1-34 Spring 1991. Juxtaposition between the historic tram rod (at the right) and the re-fabricated tram rod (left). The new tram rod has been tooled to resemble the historic pole; and has been treated with wood preservatives and drilled to the same configuration as the historic pole. El Rancho de las Golondrinas, Santa Fe, New Mexico.

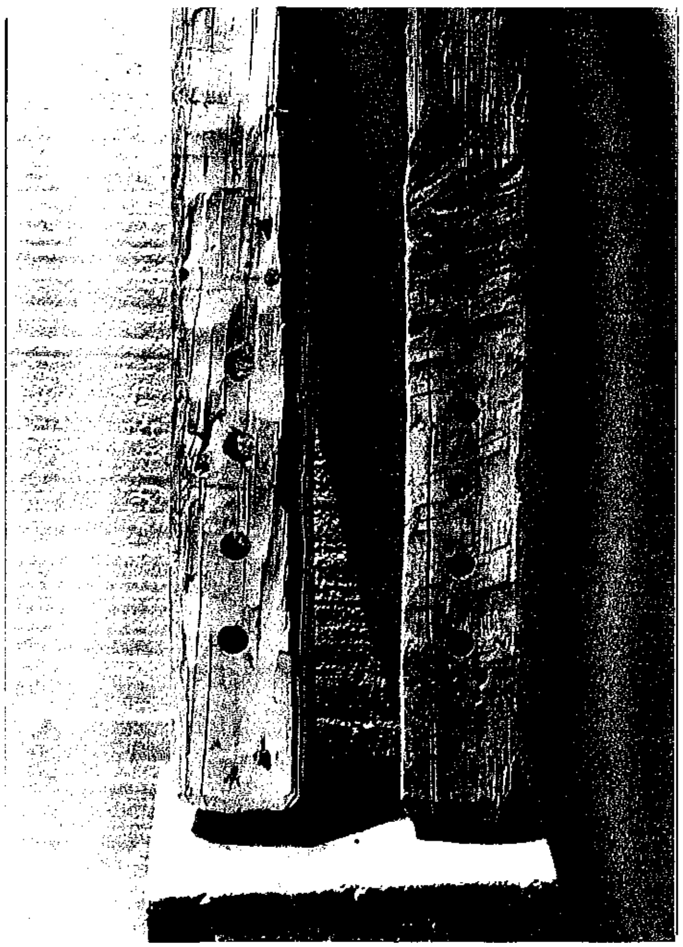


Figure 1-35 Spring 1991. Detail of upper section of the historic tram rod (right) and the re-fabricated tram rod (left). The new tram rod has been tooled to resemble the historic tram rod; and has been treated with wood preservatives and drilled to the same configuration as the historic tram rod. El Rancho de las Golondrinas, Santa Fe, New Mexico.

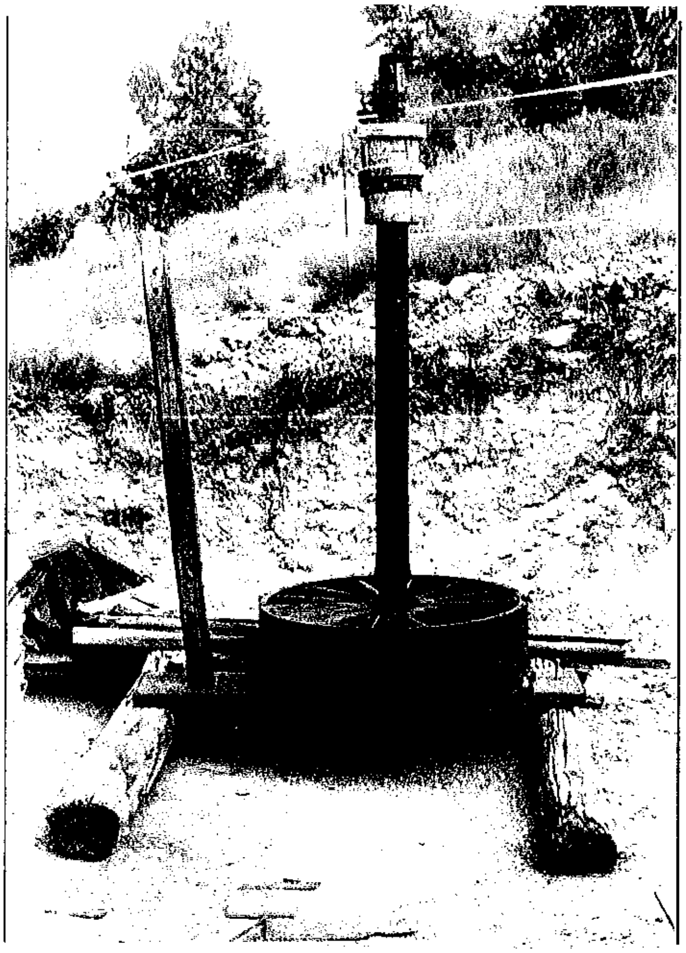


Figure 1-36
March 1991
The completed (re-fabricated) wheel and associated assemblies for the Truchas mill. El Rancho de las Golondrinas, Santa Fe, New Mexico.

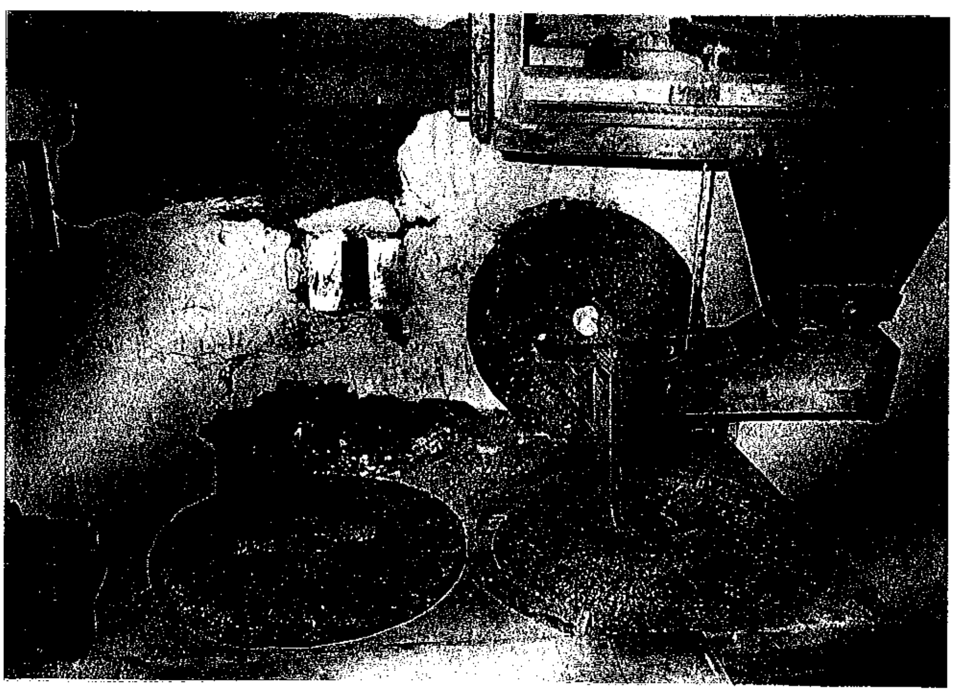


Figure 1-37
Fall 1990
Interior details from the Truchas mill prior to moving and stabilization

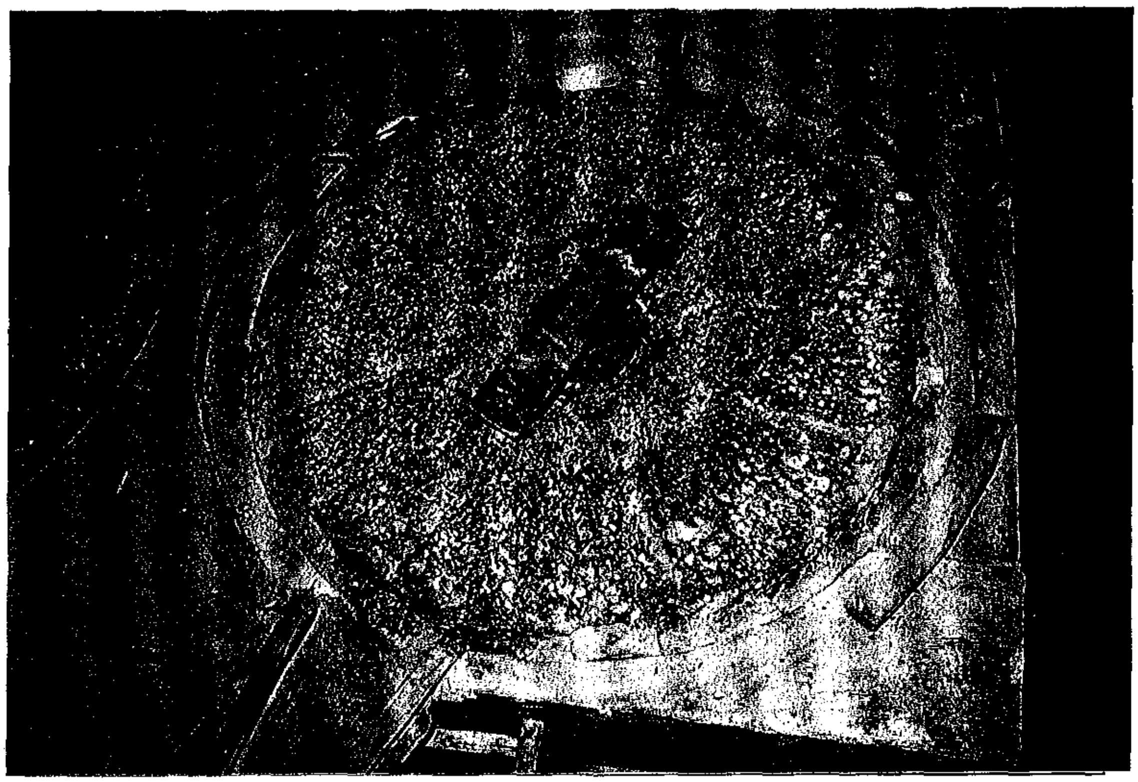


Figure 1-38 Fall 1990. Detail of the top mill stone and wooden table from the Truchas mill prior to moving and stabilization.

Figure 1-39 Spring 1991 The completed wheel assembly in place for operation of the restored Truchas mill (the mill ran for the first time in a restored state in June 1991). The diverter board can be seen at the left of the photograph; and the two pulleys which control the diverter board can also be seen at the left and right centers of the photograph. El Rancho de las Golondrinas, Santa Fe, New Mexico.

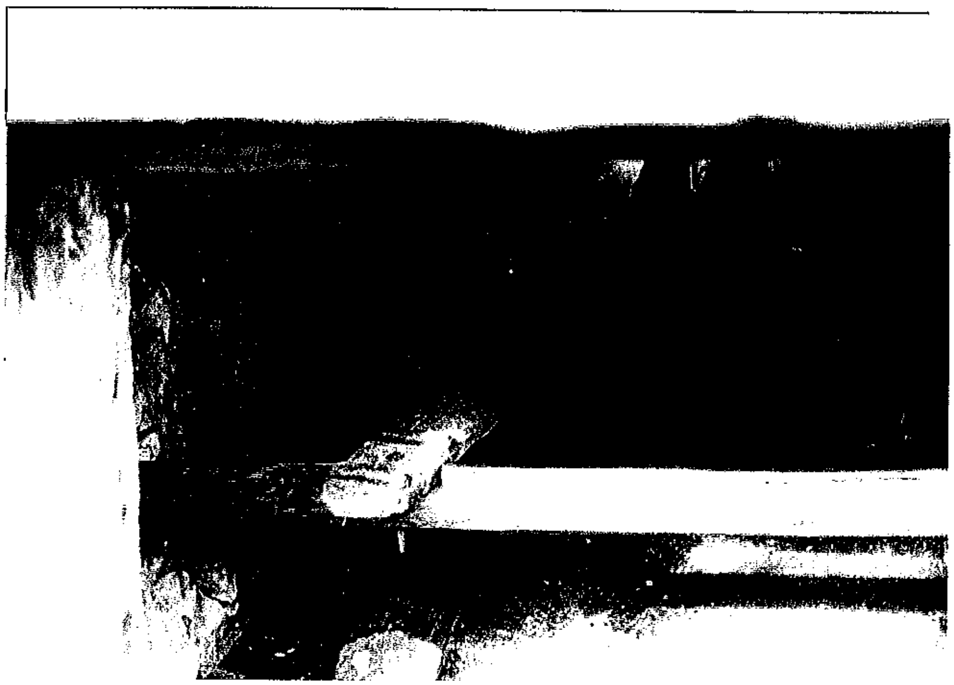


Figure 1-40 Spring 1991. The completed wheel assembly in place for operation of the restored Truchas mill. The diverter board (and its support log) can be seen at the left of the photograph. El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-41 August 22, 1996. Water has been introduced into the acequia and wooden aqueduct for a demonstration. Here it is being diverted via the diverter board, away from the wheel (the "on-off" water control for the restored Truchas mill). One of the two pulleys which control the diverter board can also be seen at the left center of the photograph. El Rancho de las Golondrinas, Santa Fe, New Mexico.

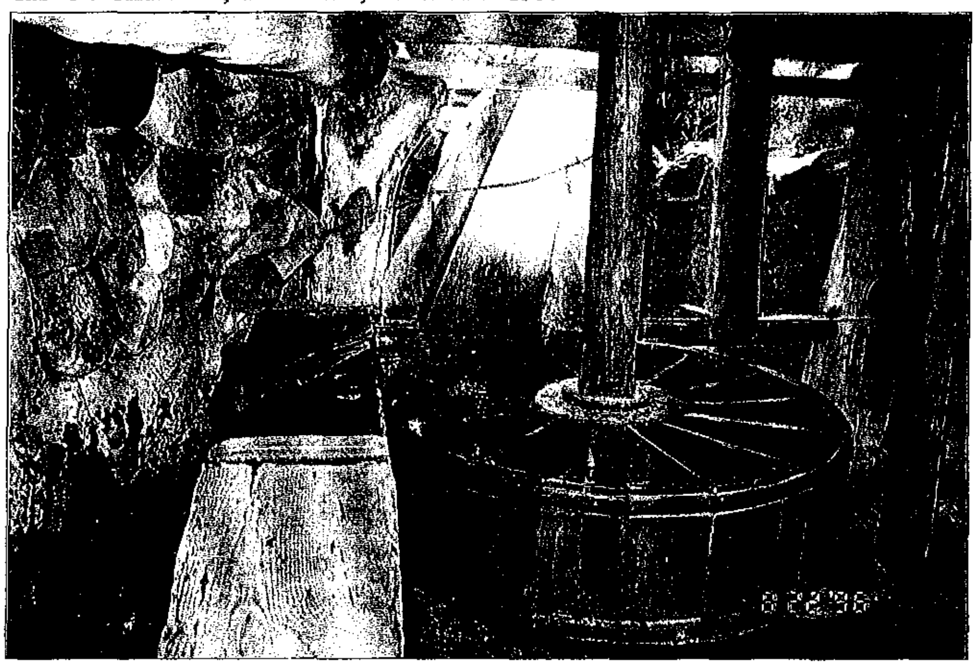


Figure 1-42 August 22, 1996. Water has been diverted to the wheel for the demonstration. El Rancho de las Golondrinas, Santa Fe, New Mexico.

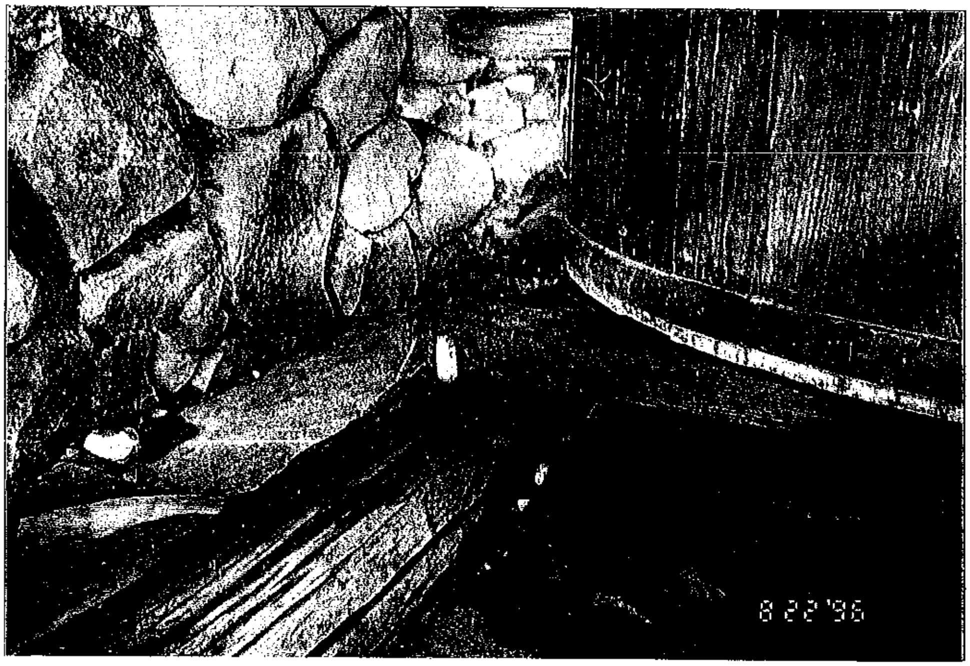


Figure 1-43 August 22, 1996. Detail of the bridge tree/support log connection - restored Truchas mill - wheel room. El Rancho de las Golondrinas, Santa Fe, New Mexico.

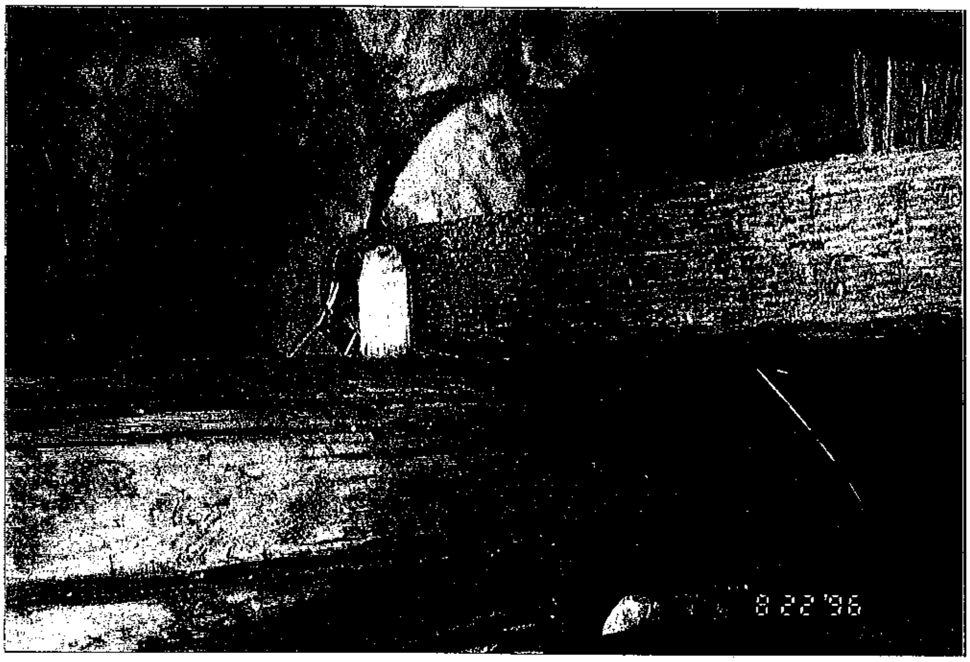


Figure 1-44 August 22, 1996. Detail of the bridge tree/support log connection - restored Truchas mill. The wooden peg holds the bridge tree from moving laterally across the support log. El Rancho de las Golondrinas, Santa Fe, New Mexico.

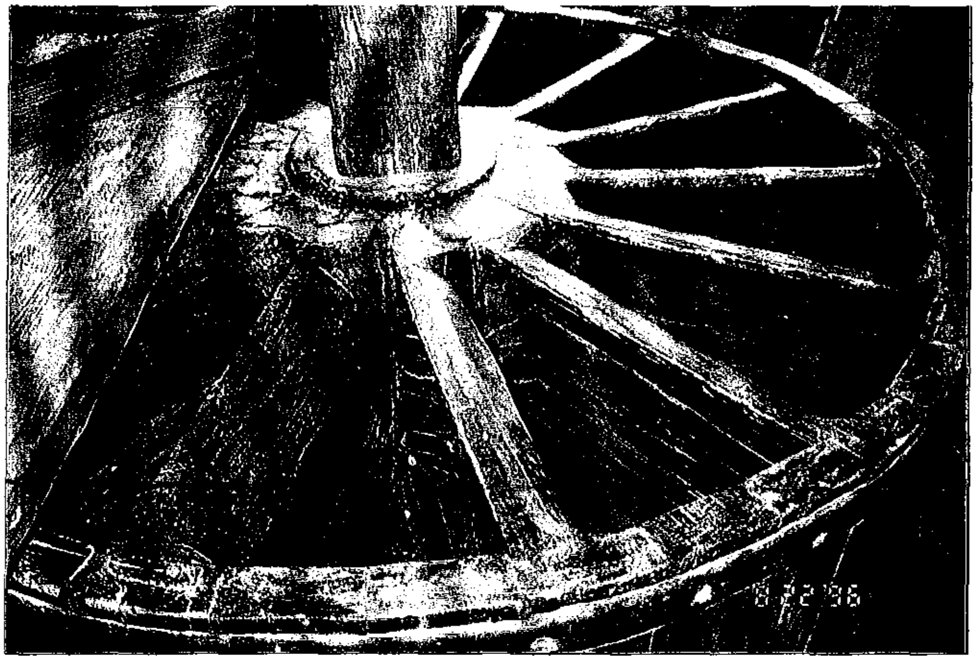


Figure 1-45 August 22, 1996. Re-fabricated water wheel detail. (Diverter board is at the left of the photograph). El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-46 August 22, 1996. Re-fabricated water wheel/bridge tree/tram rod detail. El Rancho de las Golondrinas, Santa Fe, New Mexico.

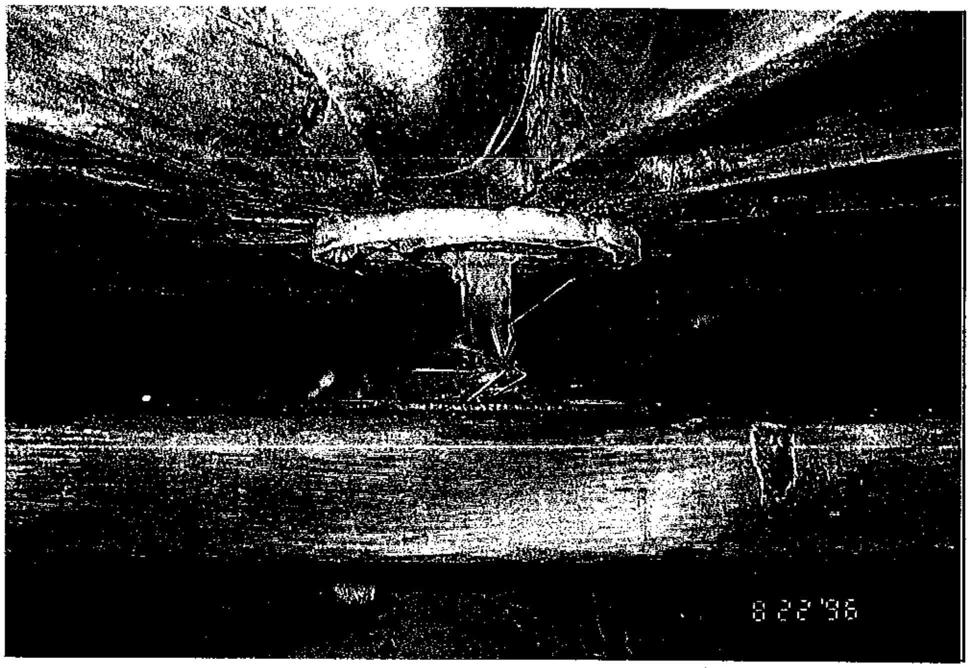


Figure 1-47 August 22, 1996. Detail of metal pivot point/thrust bearing at bridge tree. El Rancho de las Golondrinas, Santa Fe, New Mexico.

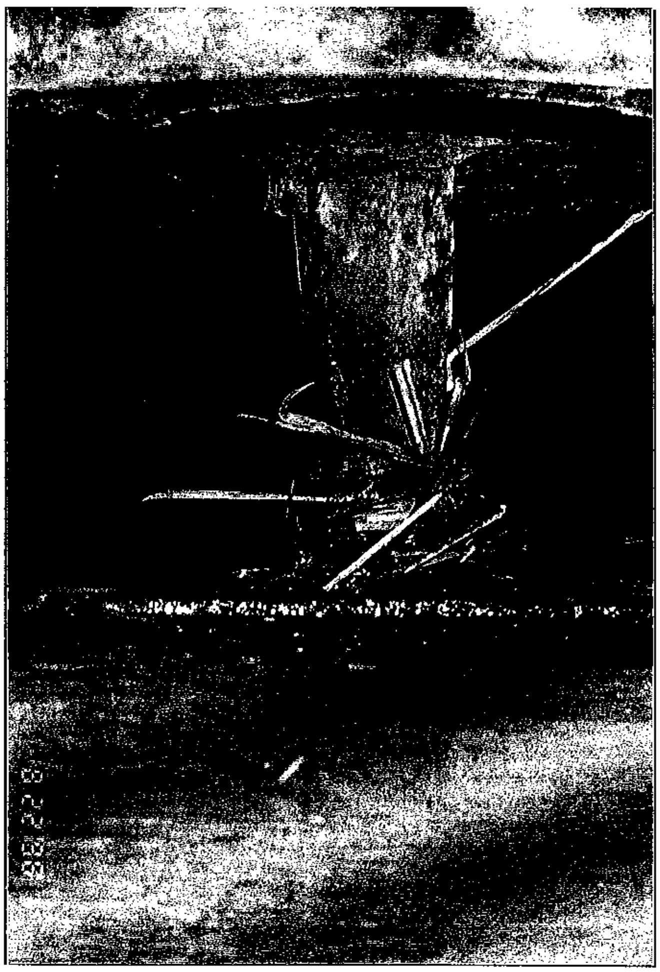


Figure 1-48 August 22, 1996. Detail of metal pivot point/thrust bearing at bridge tree. El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-49 August 22, 1996. Detail of pinned connection between the re-fabricated tram rod and bridge tree. El Rancho de las Golondrinas, Santa Fe, New Mexico.

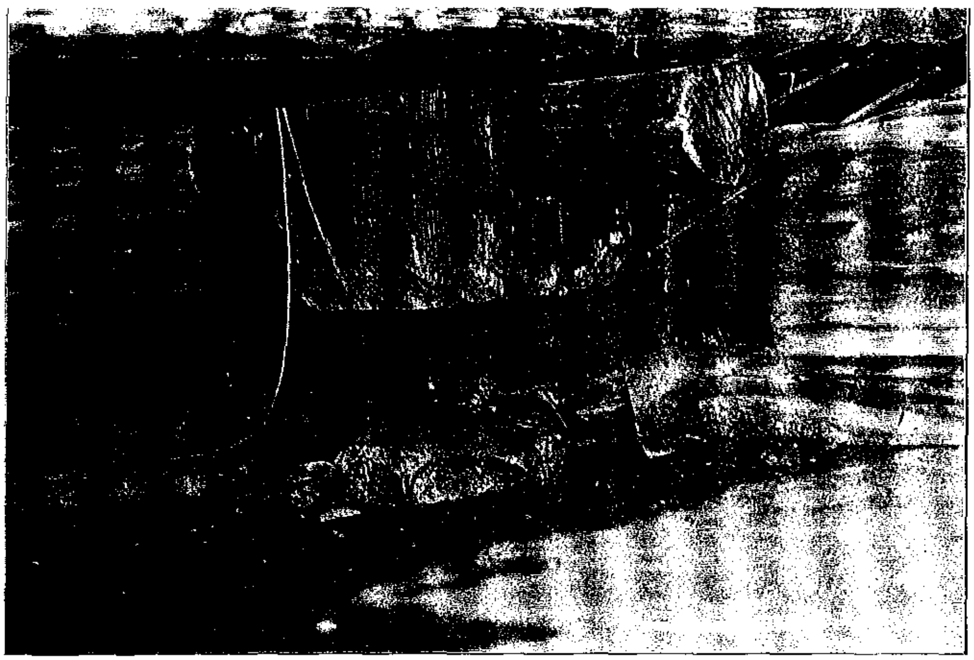


Figure 1-50 August 22, 1996. Enlarged detail of tram rod pin under bridge tree. El Rancho de las Golondrinas, Santa Fe, New Mexico.

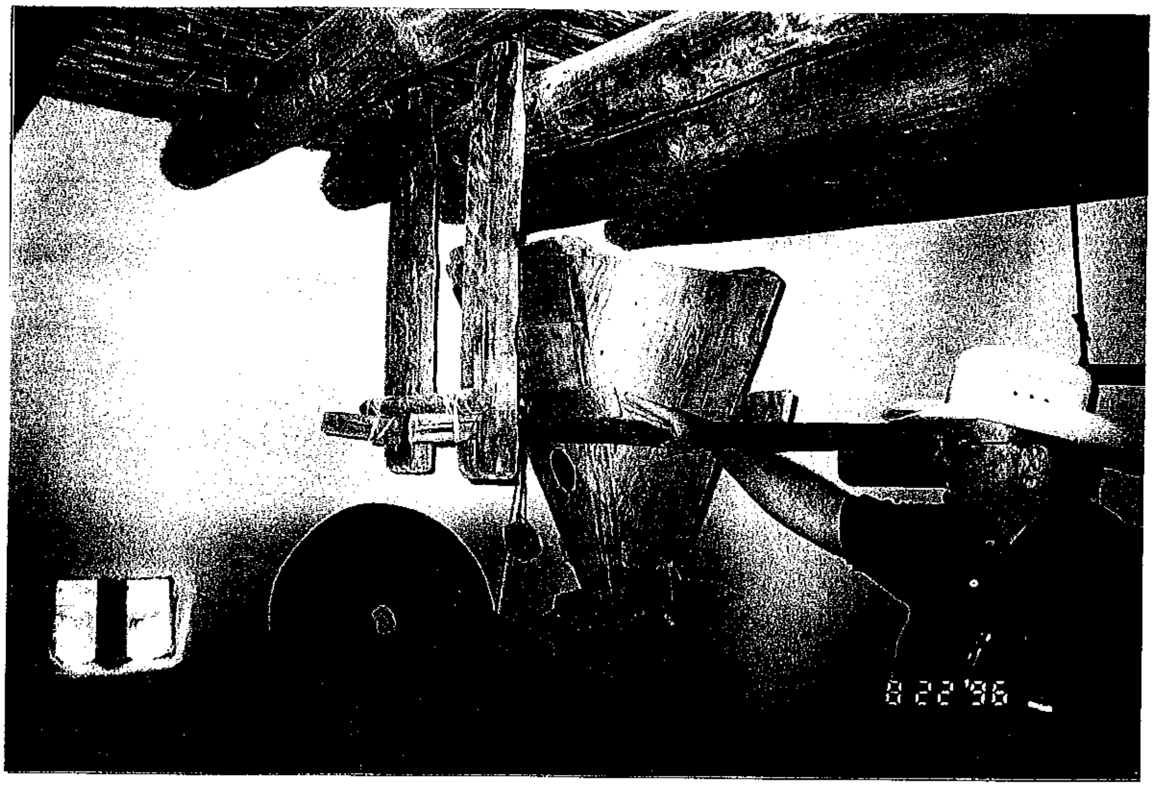


Figure 1-51 August 22, 1996. Interior detail of restored Truchas milling room. Earl is pointing out the grain/corn hopper which is suspended over the mill stones on a sliding wooden frame suspended from the ceiling. The photograph shows the position of the hopper during the milling operation (over the mill stones). The entire hopper assembly can be slid back (to the right in the photograph) out of the way for maintenance or changing of the mill stones. It is interesting to note that this assembly is what Harvey Smith portrayed in his restoration drawings for the San José mill (see Figures 2-37 and 2-38), clearly Smith and/or Schuchard visited New Mexico prior to researching the restoration of the San José mill.

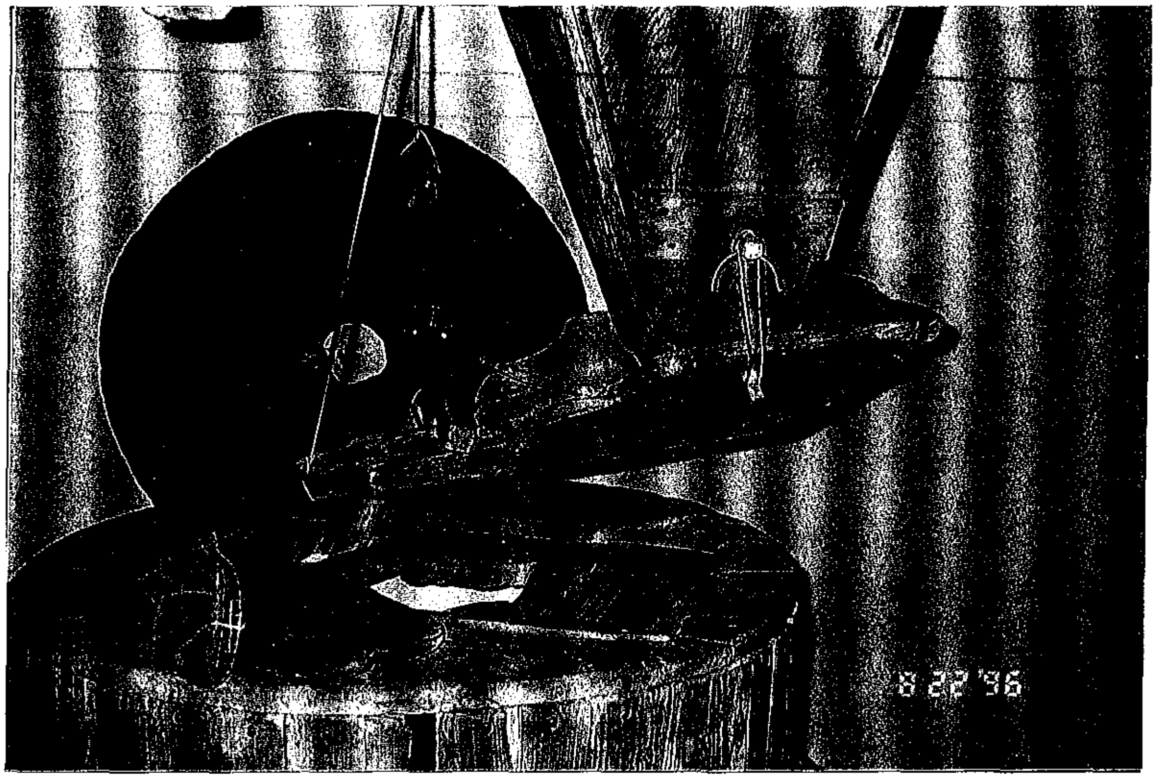


Figure 1-52 August 22, 1996. Detail of the lower part of the hopper, wooden casing, and grain/corn chute fabricated out of a denim pants leg (as was found historically). An additional top mill stone sits upright at the back of the photograph. El Rancho de las Golondrinas, Santa Fe, New Mexico.

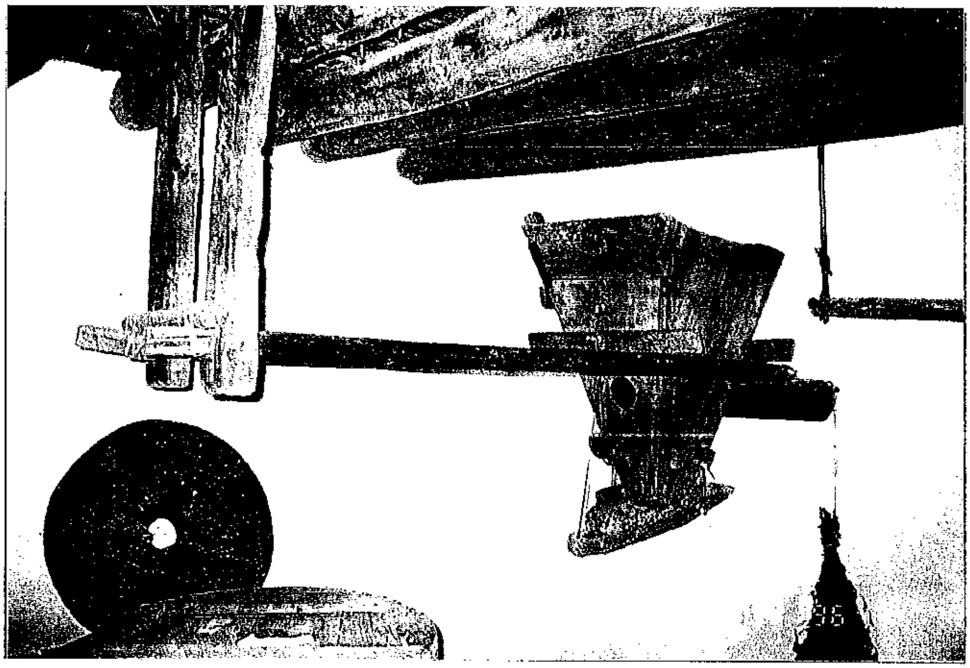


Figure 1-53 August 22, 1996. Detail of the hopper assembly which has been slid out of the way to get at the mill stones. El Rancho de las Golondrinas, Santa Fe, New Mexico.

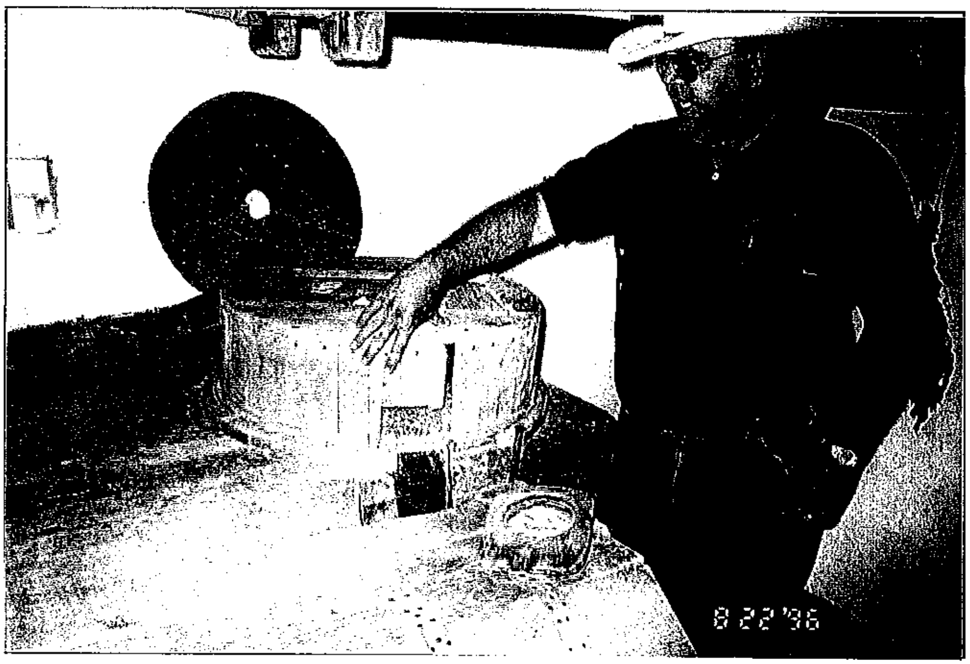


Figure 1-54 August 22, 1996. Earl Porter pointing out the wooden casing which sits atop the upper mill stone. The denim chute is inserted into the center hole of the casing to guide the grain or corn through the top stone into the space between the two stones. El Rancho de las Golondrinas, Santa Fe, New Mexico.

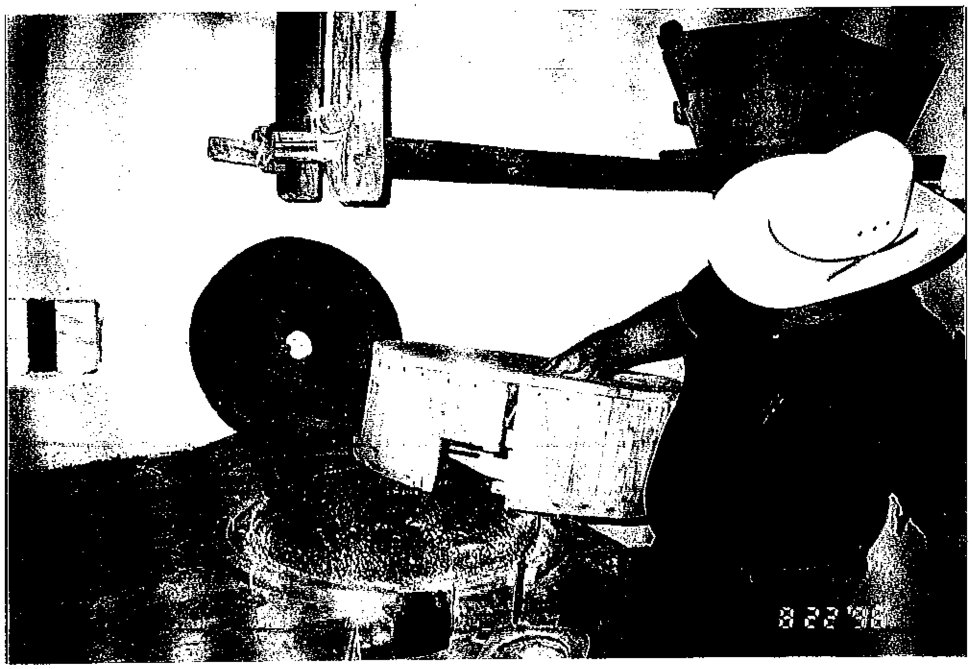


Figure 1-55 August 22, 1996. Earl is lifting the wooden casing off to expose the upper mill stone. El Rancho de las Golondrinas, Santa Fe, New Mexico.

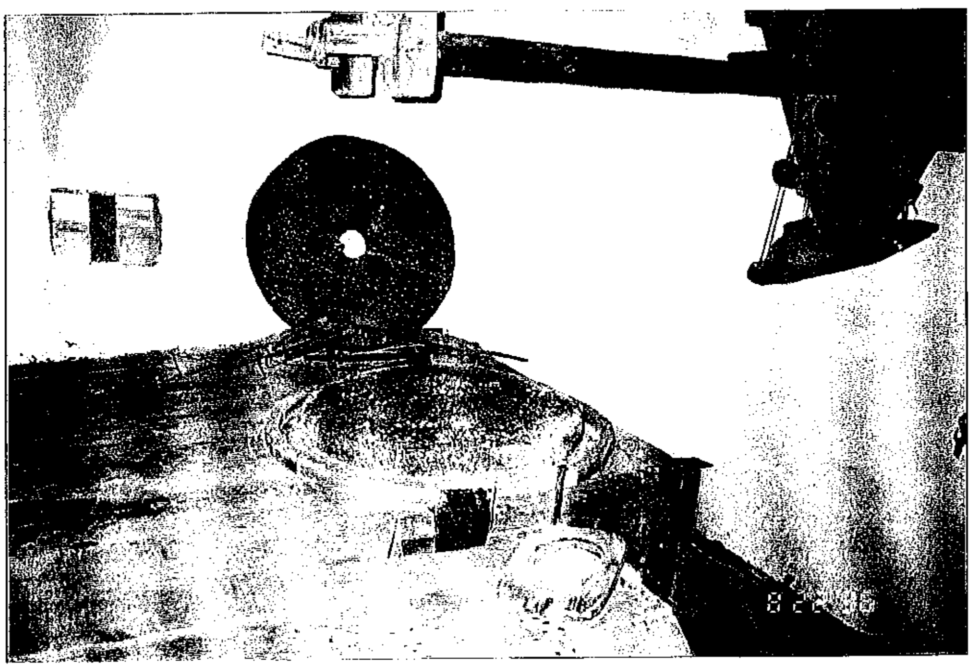


Figure 1-56 August 22, 1996. The upper stone is exposed. El Rancho de las Golondrinas, Santa Fe, New Mexico.

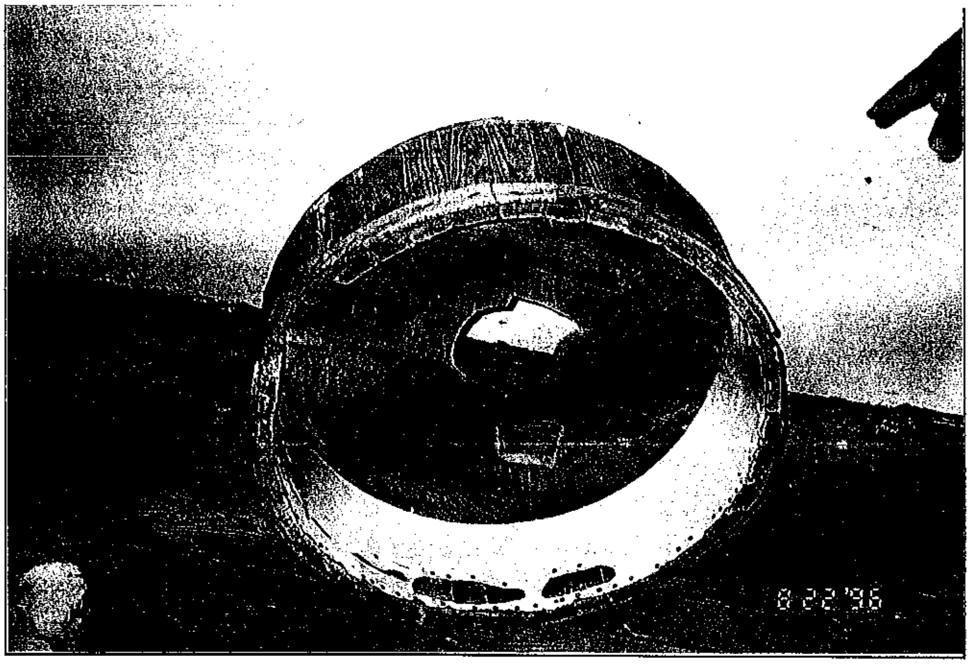


Figure 1-57 August 22, 1996. Detail of the historic wooden casing, also called a "vat" or "hoop," which is lined on the interior with sheet metal. El Rancho de las Golondrinas, Santa Fe, New Mexico.

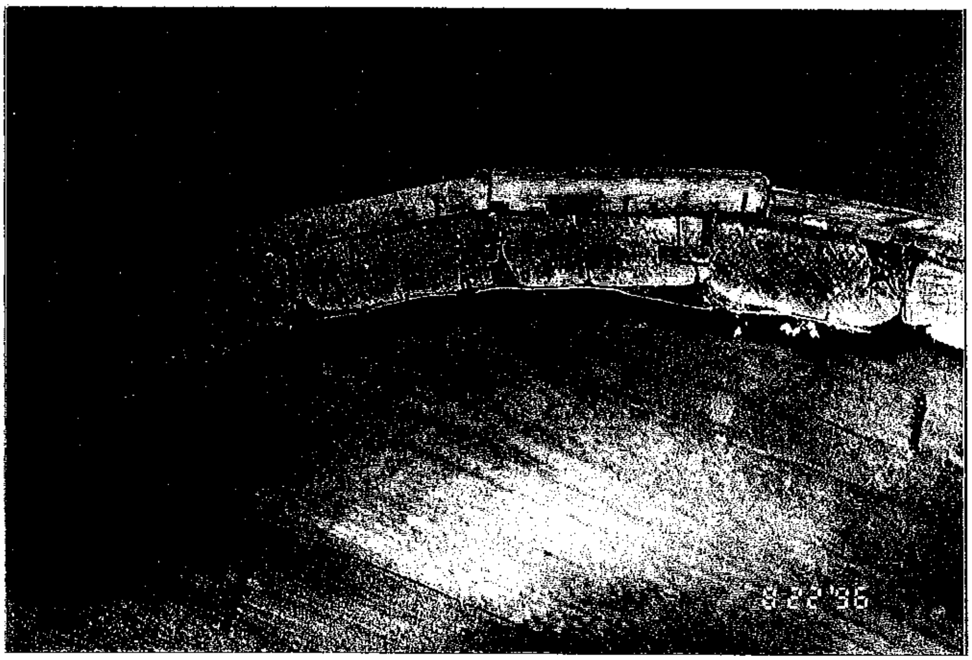


Figure 1-58 August 22, 1996. Detail (blow-up) of the construction of the historic wooden casing. Note the scored outer wooden band and tongue-and-groove design of the inner assembly. El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-59 August 22, 1996. Earl is lifting the upper stone revealing the larger (stationary) lower mill stone.

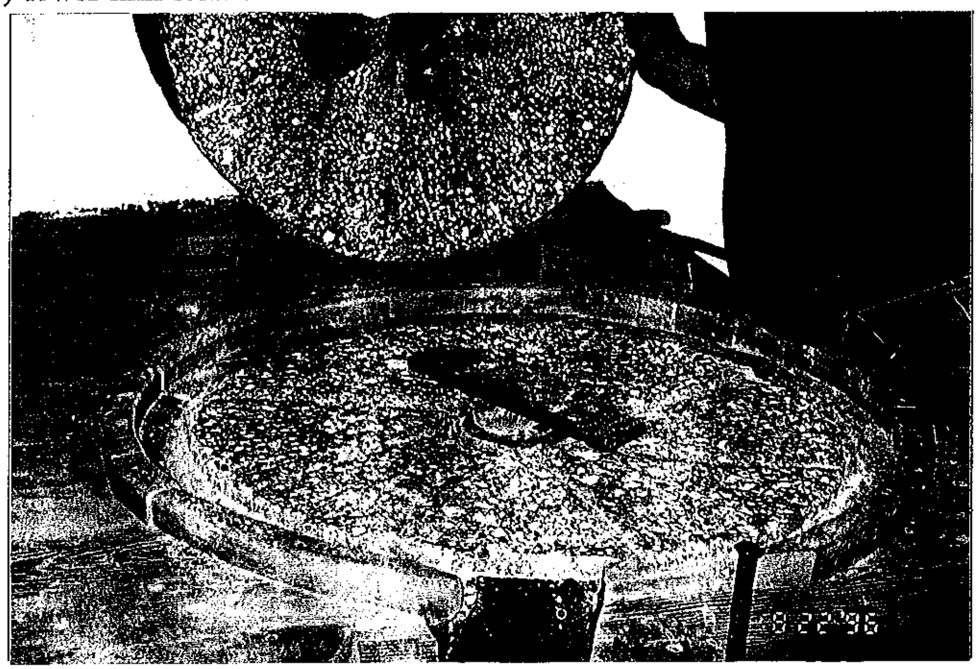


Figure 1-60 August 22, 1996. The lower stone has been exposed. Note the wooden rim attached to the top of the table to center the wooden casing. Note also the metal driver which sits onto the metal spindle or rod, driven into the top of the main shaft (see Figure 1-64). The driver sits into a notch carved into the bottom of the upper stone (see Figure 1-61). The metal pin comes up through holes in both stone, and through the connection between the metal driver and the notched upper stone, turns the upper stone.

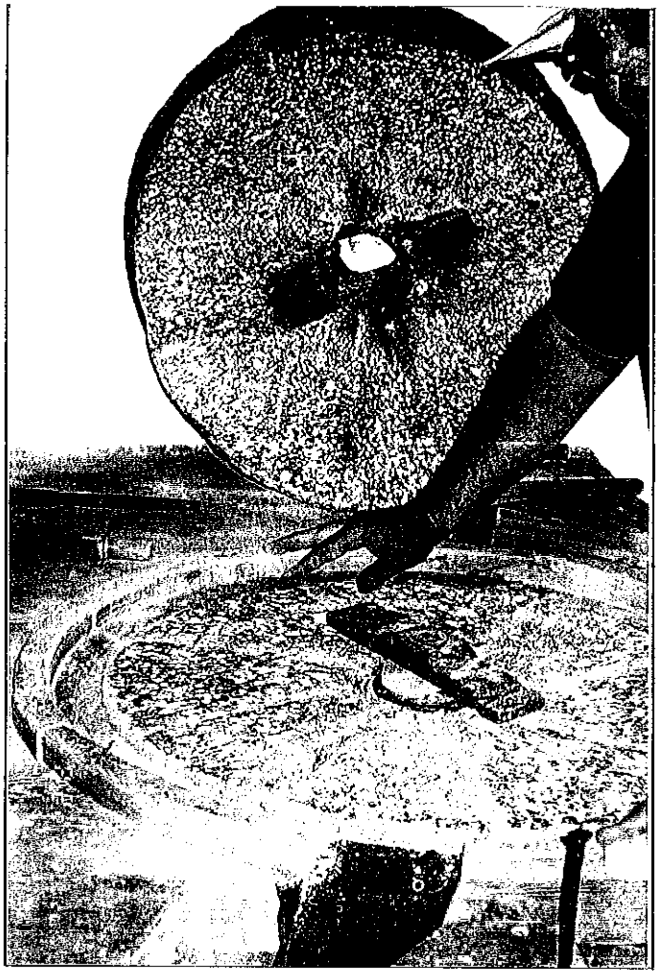


Figure 1-61
August 22, 1996
Detail of the lower stone and metal driver. Note the carved notch in the second upper stone which is sitting up against the wall. The wooden shaft which comes up from the basement ends about a foot from the top face of the bottom stone which is about 300 pounds and about 12 inches thick and is packed with adobe into the wooden table to keep it from moving. The top of the shaft has a metal rod driven into the top of it (Figure 1-64) which comes up through the bottom stone and a wooden plug driven into the center of the bottom stone. At the top of the plug is a leather collar (Figure 1-62) which acts like a cushion for the metal guide plate and top stone. An additional plastic collar (Figure 1-63) keeps the grain from falling down to the basement. The sheet metal chute which delivers ground meal to the sifting box (Figure 1-74) can be seen at the bottom center of the photograph.

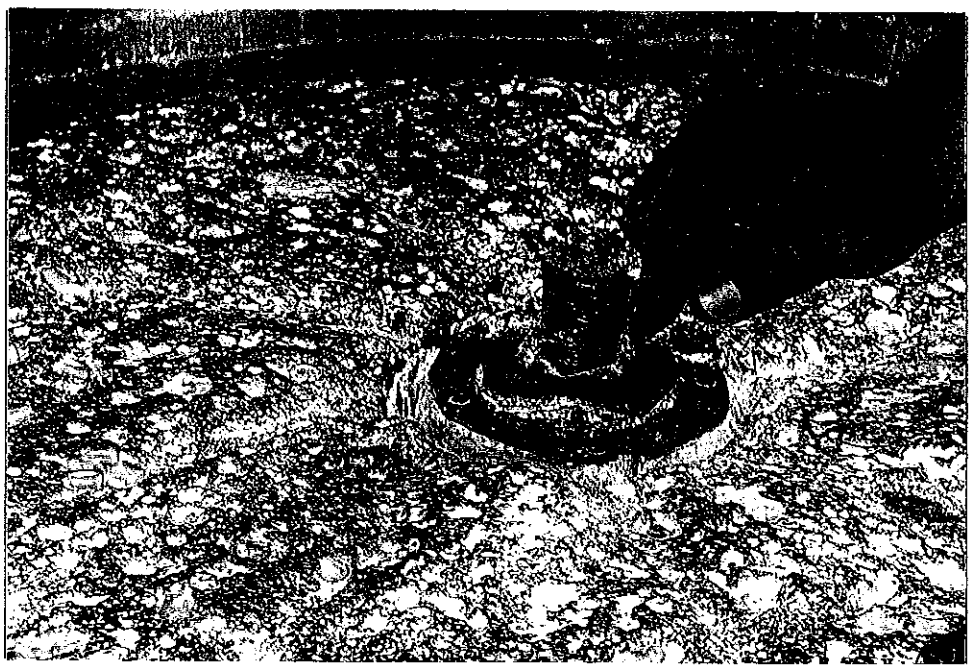


Figure 1-62
August 22, 1996
Detail of a thick leather collar over the metal shaft which keeps grain from falling down the shaft.

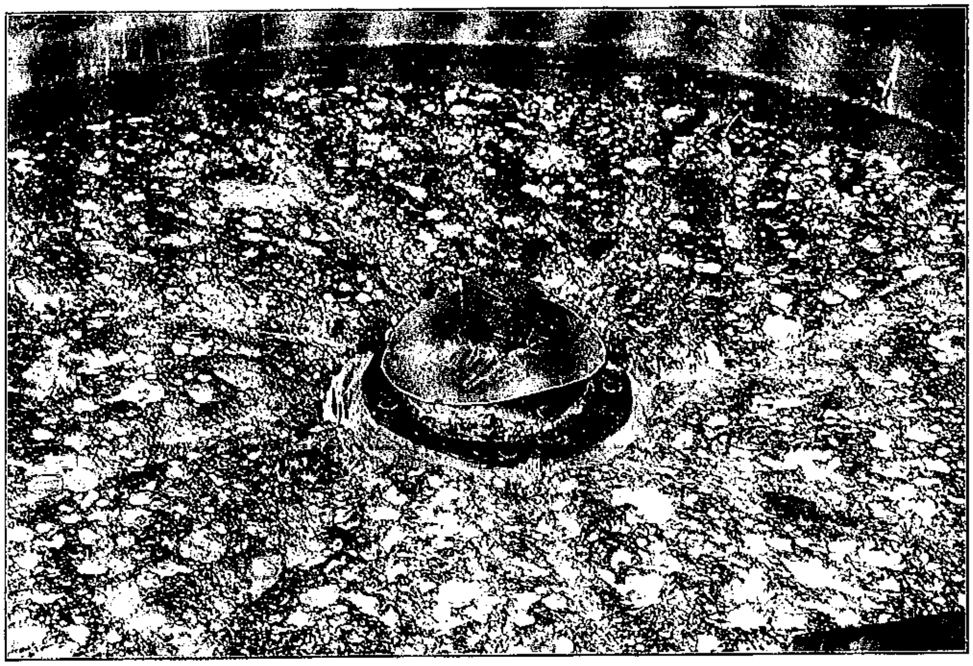


Figure 1-63
August 22, 1996
Detail of a plastic cut-out placed over the leather collar which, like the leather collar, acts as a cushion and keeps grain in place.

Figure 1-64
August 22, 1996
Detail of a second rod or spindle, which is inserted into the top of the main shaft. El Rancho de las Golondrinas, Santa Fe, New Mexico.

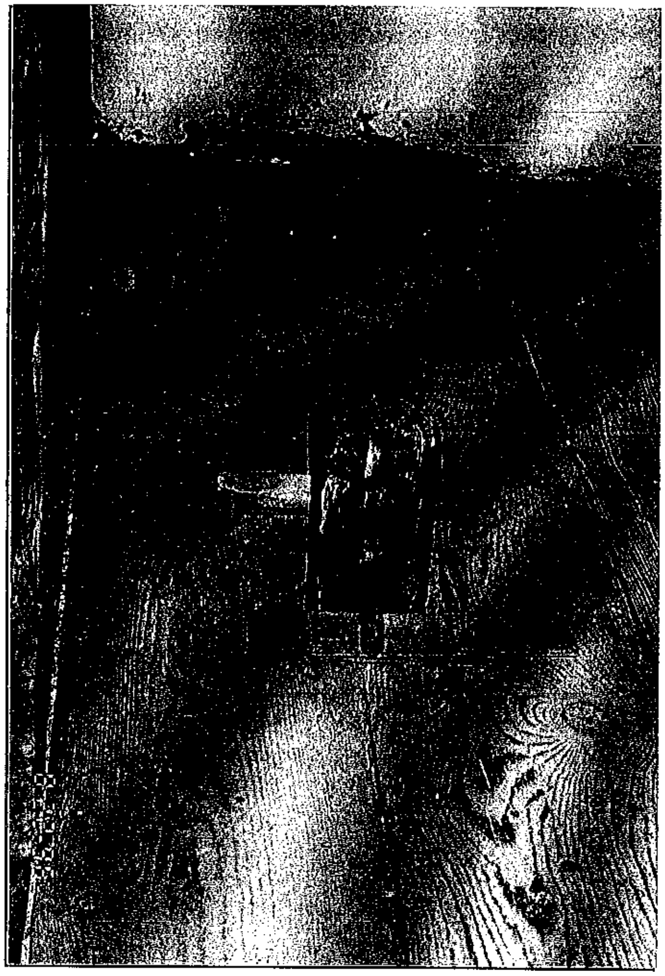


Figure 1-65
August 22, 1996
Shot of the upper part of the tram rod. Note the wooden pin under which wedges are driven which adjust the distance between the two stones. (The entire wheel/shaft/upper stone/bridge tree assembly is lifted by adjusting these wedges).

Figure 1-66
August 22, 1996
Detail of the terminus of the two rope pulleys on the floor of the restored milling room which control the sliding diverter board on the restored Truchas mill (see also Figures 1-41 and 1-42).

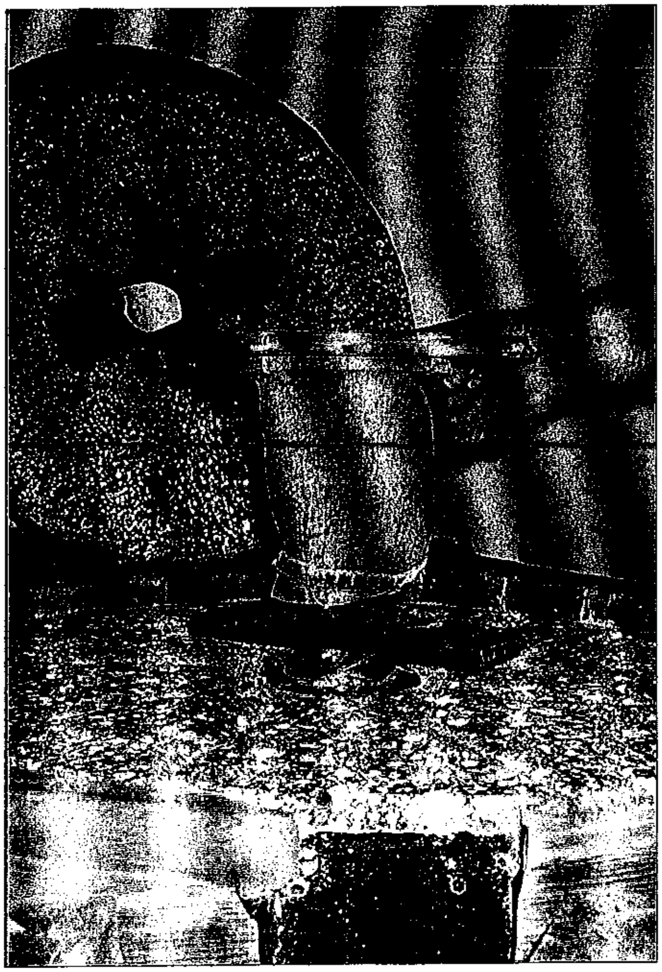


Figure 1-67
August 22, 1996
Detail of the grist chute fabricated out of a denim pants leg (as was found historically). This device sits on top of and into the top of the wooden casing (Figures 1-52 and 1-57) which surrounds the two stones and direct the grist through the top stone and in between the two stones to be ground.

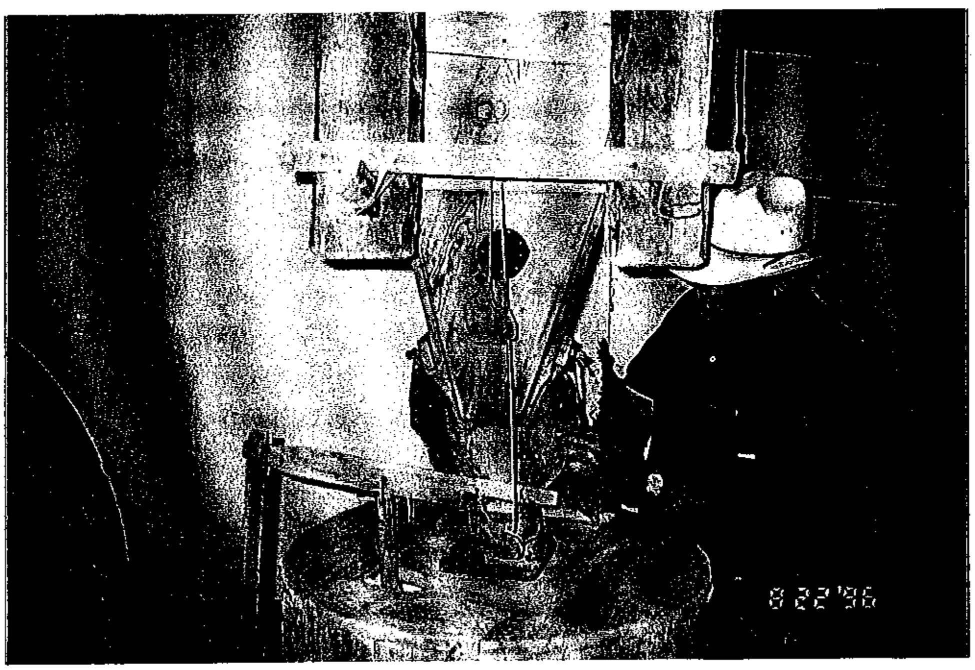


Figure 1-68
August 22, 1996
Earl Porter explains the operation of the assembly. The hopper has been slid back over the stone casing. See enlarged details and detailed descriptions of the various components of the hopper/chute arrangement in Figures 1-69 through 1-72.

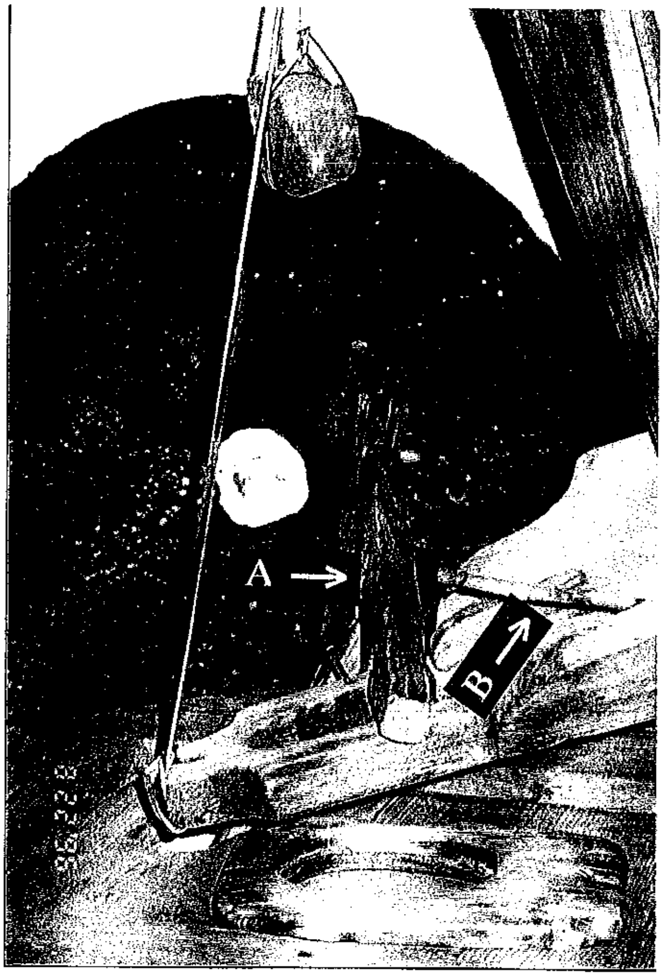


Figure 1-69
August 22, 1996
Detail of hopper/chute assembly. The wooden chute from the hopper is adjusted vertically via a stone weight tied to the wooden chute with a strip of raw hide. The "dancing damsel" ["A"] (see description in Figure 1-71), is also connected to a small wooden branch, "tarra billa" (bird's beak) ["B"], with a wire. This "bird's beak" (sharpened at the top) vibrates with the damsel and further loosens up the stream of grist coming down the wooden chute. The whole operation ensures a smooth, uninterrupted flow of grain or corn down the wooden chute and into the denim chute for grinding. With the exception of replacement pieces (i.e., new strips of rawhide), the entire operation has been reassembled as was discovered historically.

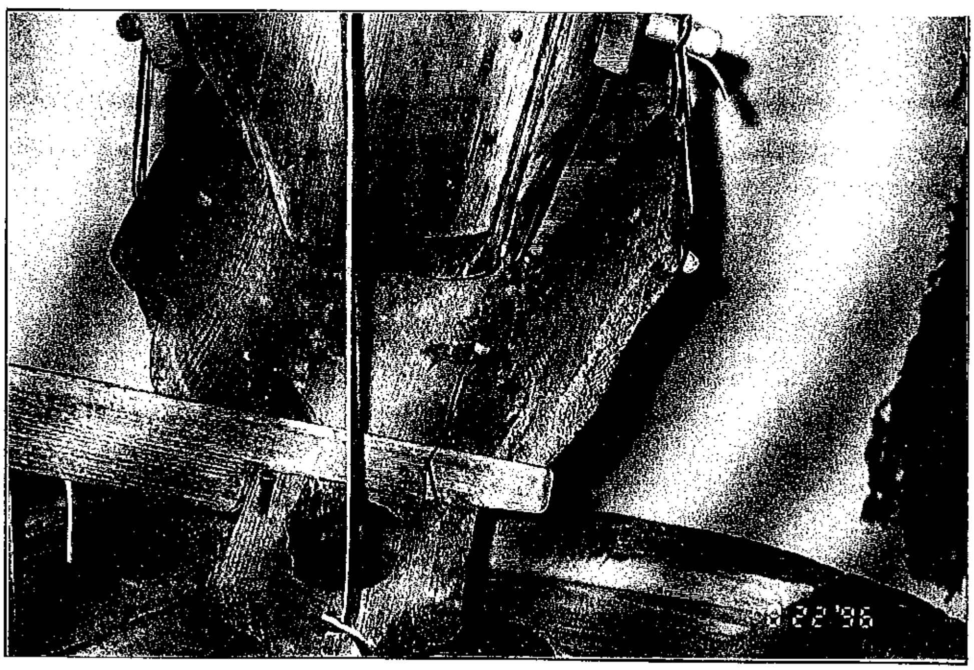


Figure 1-70
August 22, 1996
An enlarged, front-on view of the assembly as described in Figure 1-69.

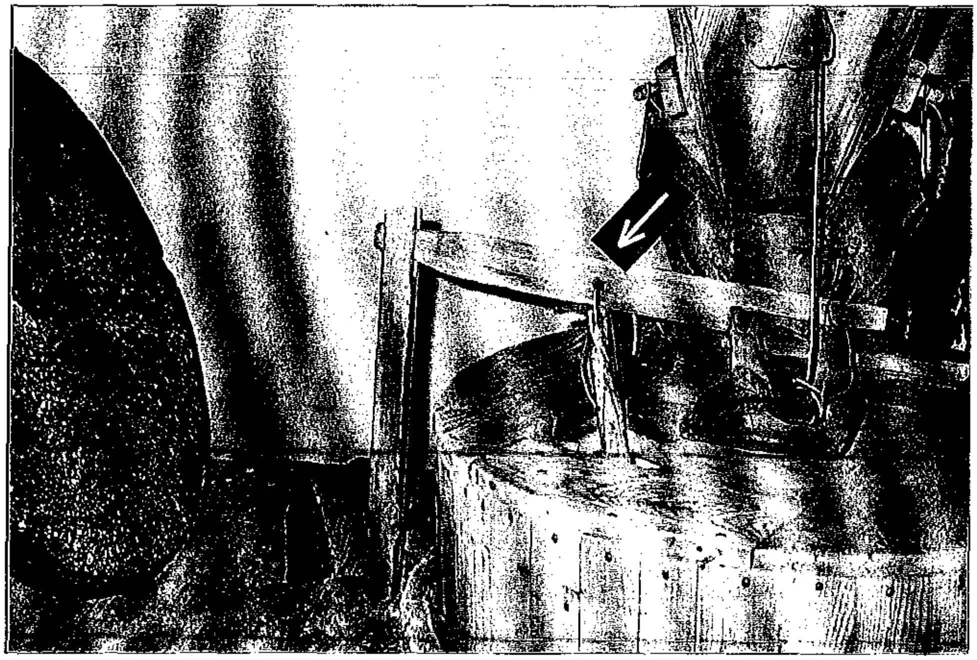


Figure 1-71 August 22, 1996. The "dancing damsel" (see arrow), which is inserted through the casing, rests on the table and is connected to the hopper/chute assembly and acts as a vibrating mechanism to keep the unground grist moving down the wooden chute from the hopper into the denim chute below. The small wooden dowel which is inserted through the casing sits atop the rotating top stone and as the stone rotates, it bounces along the rough surface, carrying that vibration to the wooden chute below the hopper.

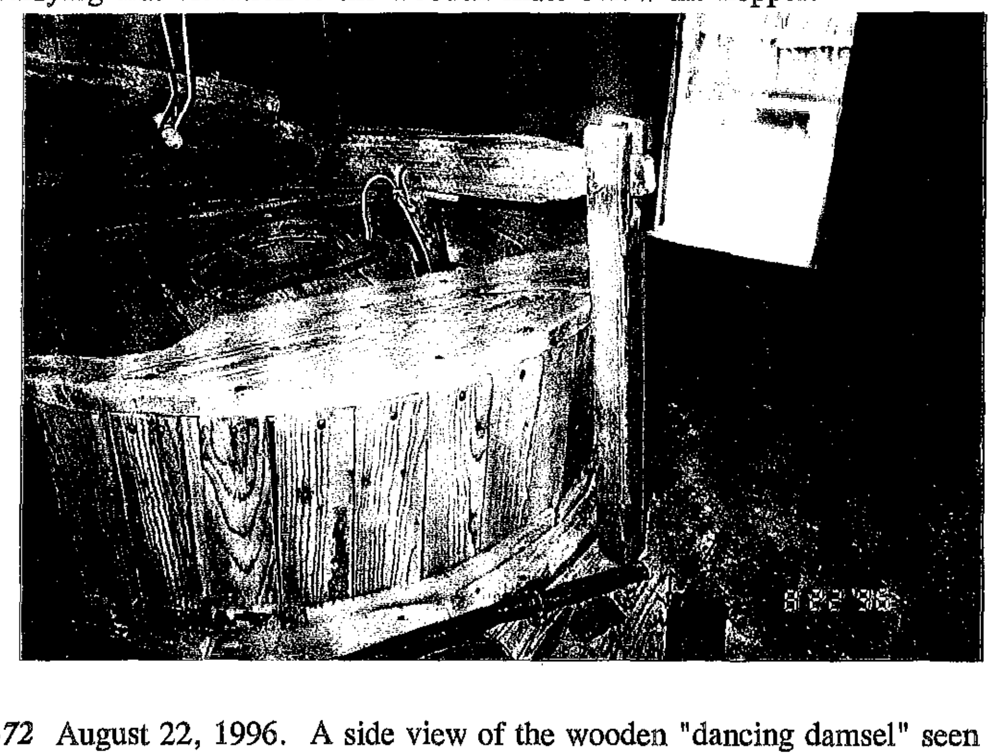


Figure 1-72 August 22, 1996. A side view of the wooden "dancing damsel" seen in Figure 1-71.

Figure 1-73
August 22, 1996
Detail of the sifting mechanism connected directly to the main shaft. (This assembly did not exist on the San José mill, and will not be explained further).

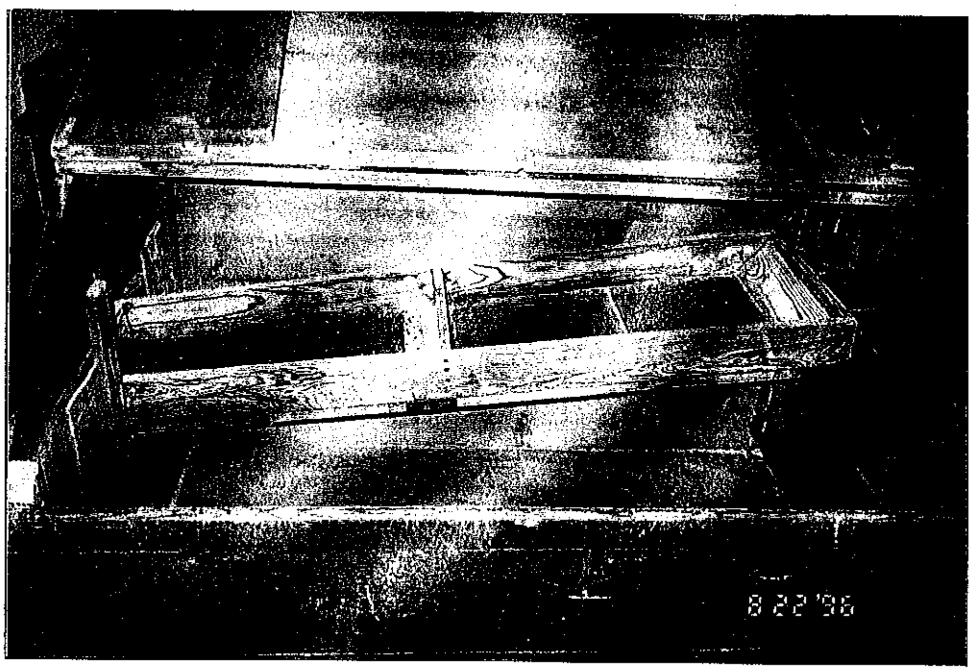


Figure 1-74
August 22, 1996
Detail of the shifting box. The ground meal exited the stones into this box and through various gradations of screens, was sifted through the action of the turning wheel.

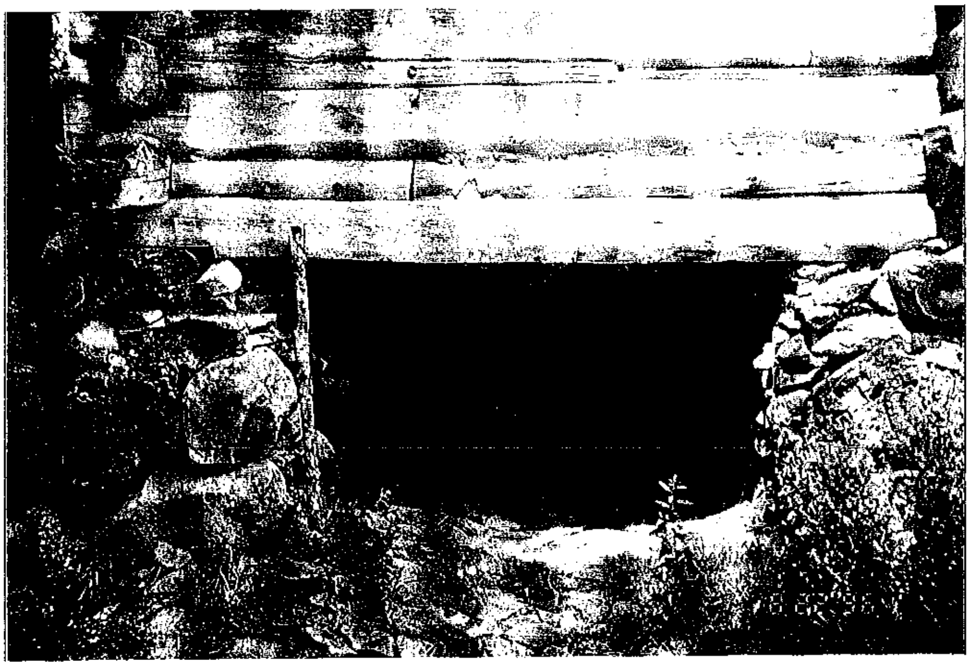


Figure 1-75 August 22, 1996. A second mill observed at El Rancho de las Golondrinas, Santa Fe, New Mexico. This mill has just started restoration and was viewed as comparison to the similarities between the various horizontal water wheel mills which Mr. Porter discovered and researched. This view is down toward the wheel room below the milling room.

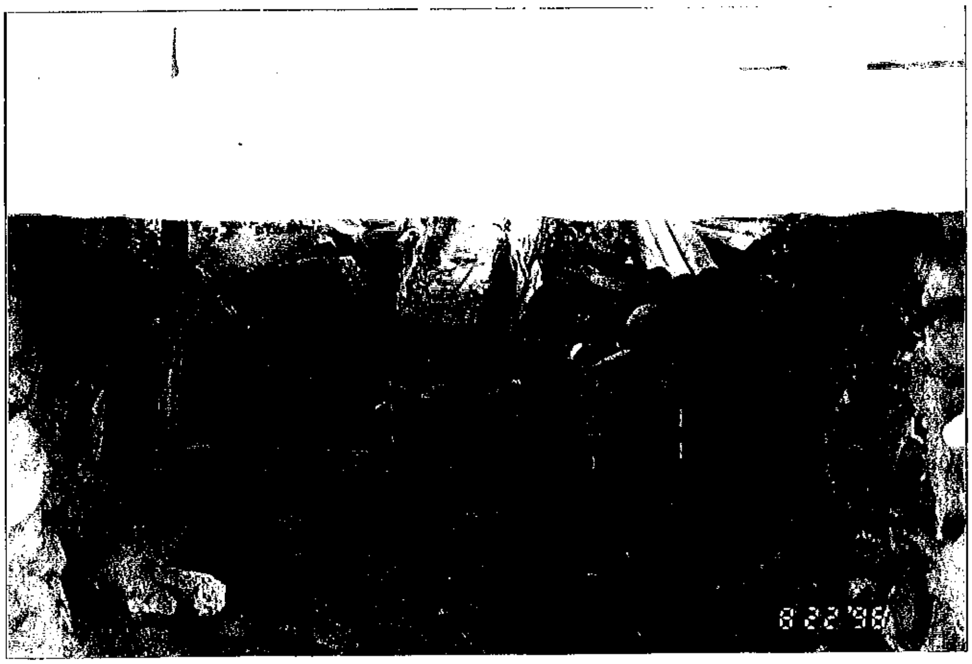


Figure 1-76 August 22, 1996. Wheel room of this second mill. The main water chute, wheel, and tram rod arrangement is opposite the Truchas mill (i.e., the tram rod and water chute are reversed).

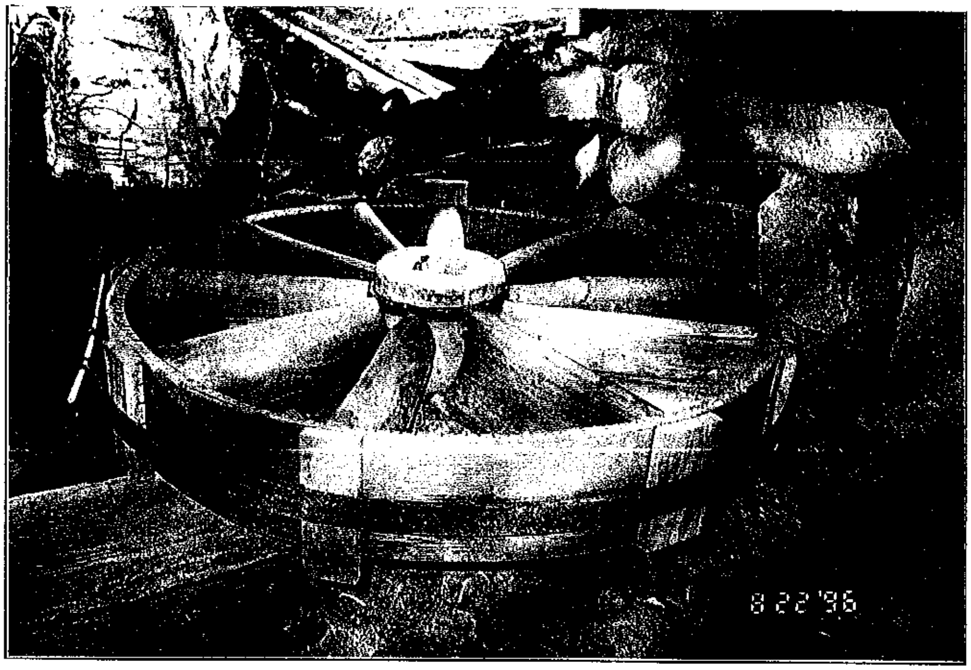


Figure 1-77
August 22, 1996
Detail of the wheel undergoing re-fabrication on the second mill. El Rancho de las Golondrinas, Santa Fe, New Mexico. Credit for this fine work goes to Manuel Lopez, a volunteer at las Golondrinas.

Figure 1-78
August 22, 1996
Detail of the tram rod on a third mill at El Rancho de las Golondrinas, Santa Fe, New Mexico. The bridge tree is embedded in the ground and the tram rod has been rehabilitated using metal straps and a metal pole at the top.

Figure 1-79 August 22, 1996. Detail of the thrust bearing plate on the bridge tree of the third mill. El Rancho de las Golondrinas, Santa Fe, New Mexico.

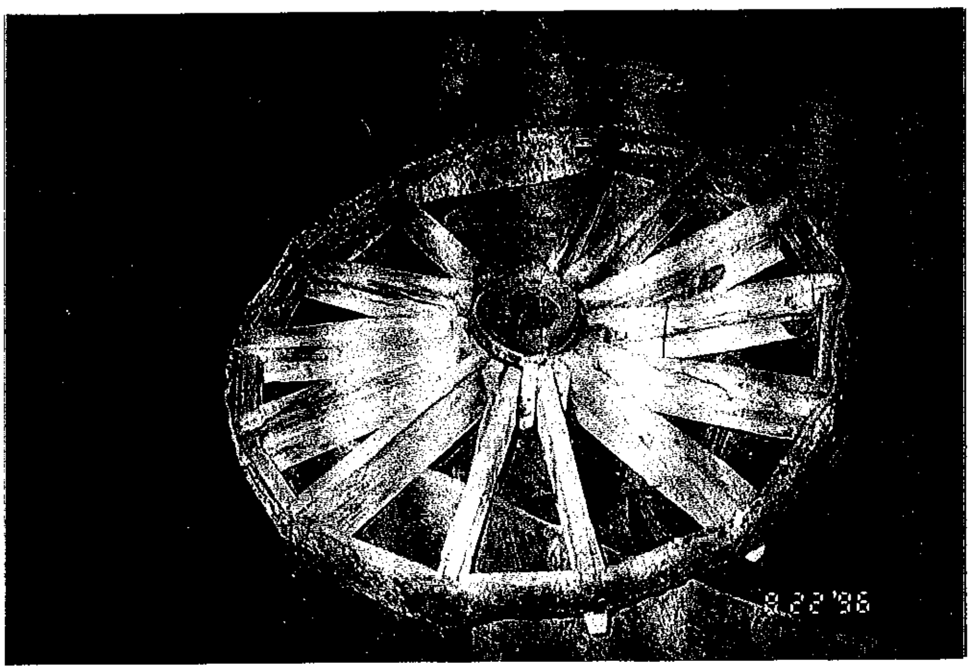


Figure 1-80 August 22, 1996. Historic water wheel in a fourth mill at El Rancho de las Golondrinas, Santa Fe, New Mexico. This wheel is perhaps one of the simplest we observed, and resembles a wagon wheel except for the larger blades for the water wheel.

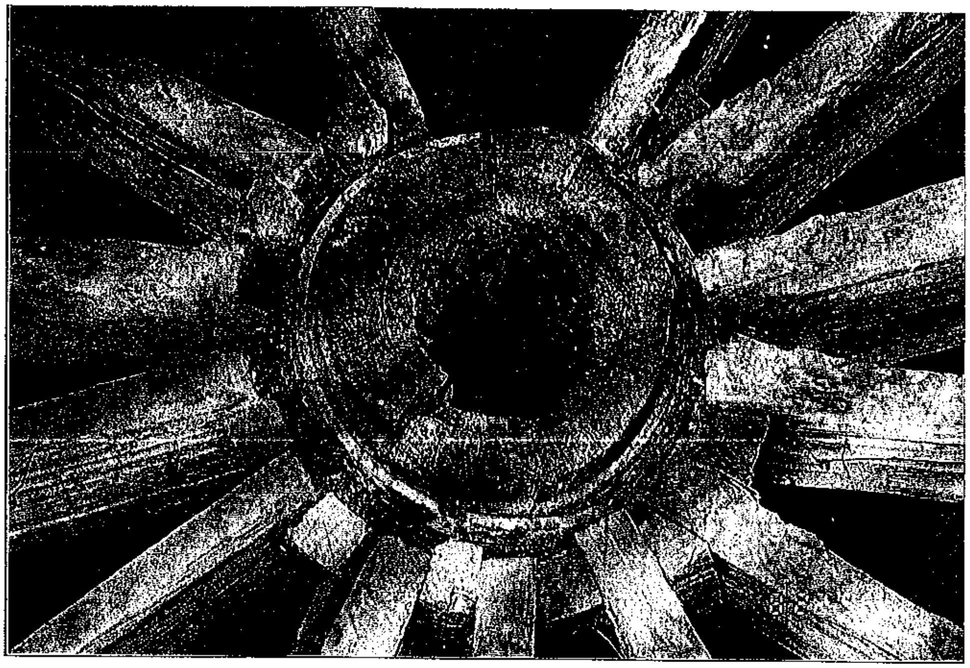


Figure 1-81 August 22, 1996. Enlarged detail of the hub of the wheel observed in Figure 1-80. El Rancho de las Golondrinas, Santa Fe, New Mexico.

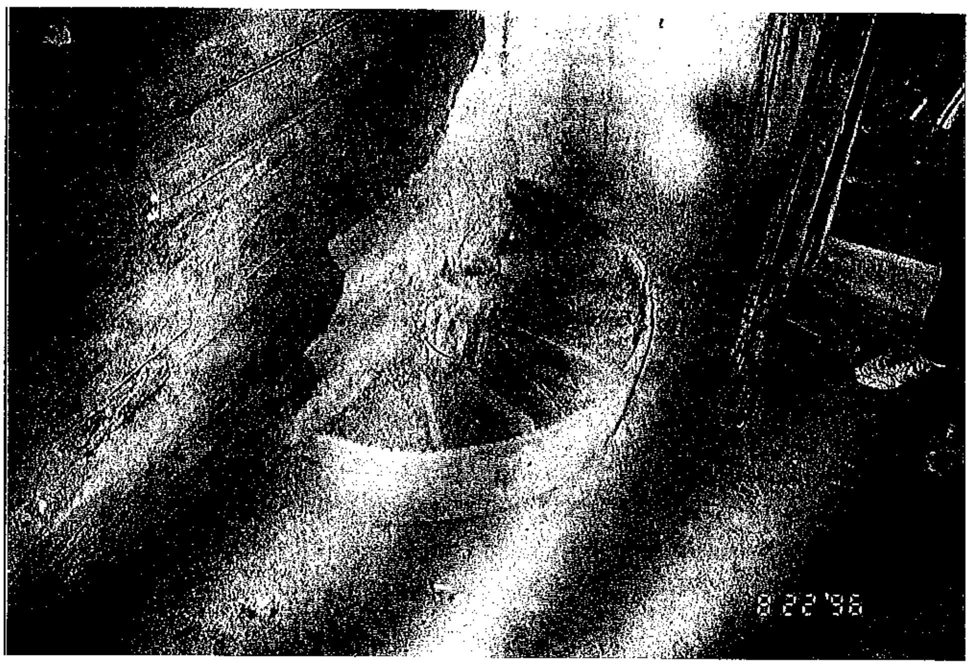


Figure 1-82 August 22, 1996. Detail of another historic water wheel in yet another unrestored mill at El Rancho de las Golondrinas, Santa Fe, New Mexico. Note the tooling of the wheel hub with slanted grooves, and the large wooden band at the perimeter.

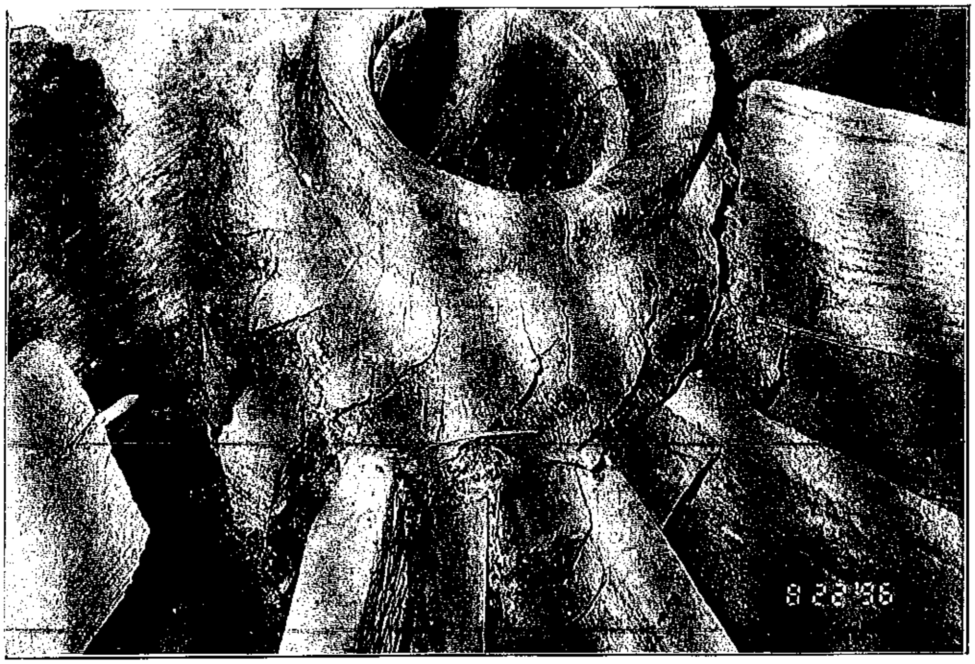


Figure 1-83
August 22, 1996
Enlarged detail of the hub of the wheel observed in Figure 1-82. El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-84
August 22, 1996
The interior of one of the un-restored mills. In the center of the photograph is the tram rod coming up from the lower wheel room. This mill is particularly significant since it is the only mill we observed at El Rancho de las Golondrinas with a hopper (seen at the lower left of the photograph) arrangement similar to that of the San José mill which was restored in the late 1930s by Schuchard and Smith. El Rancho de las Golondrinas, Santa Fe, New Mexico.

Figure 1-85
August 22, 1996
Close-up of the wooden table in this last mill we observed at El Rancho de las Golondrinas. El Rancho de las Golondrinas, Santa Fe, New Mexico.

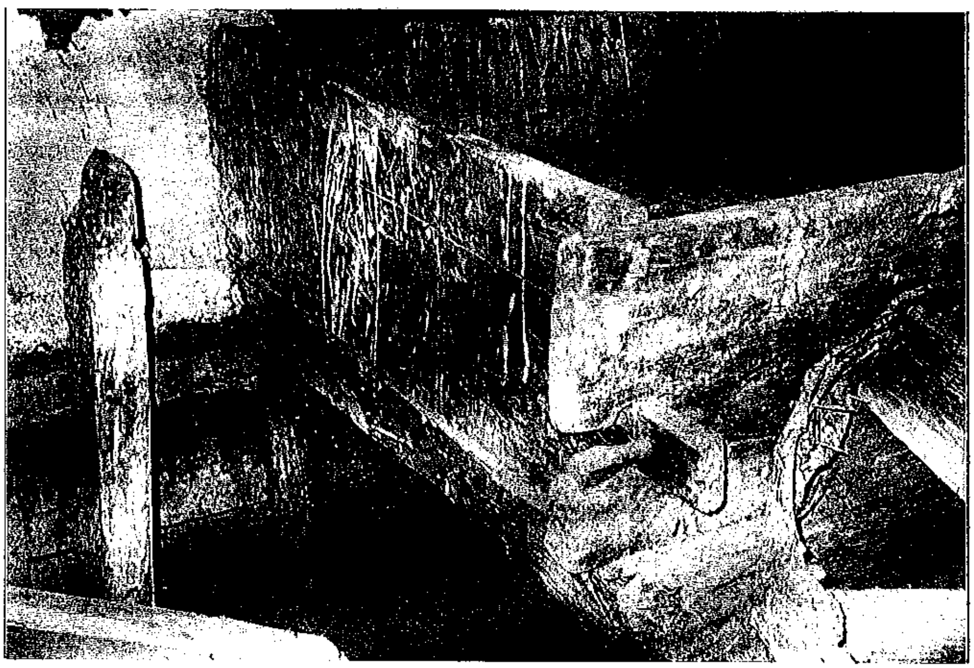


Figure 1-86
August 22, 1996
Detail of the wooden table seen in Figure 1-85. El Rancho de las Golondrinas, Santa Fe, New Mexico.

2 CHRONOLOGY OF DEVELOPMENT AND USE

Chronology of Development and Use

A. Phase I--Spanish Colonial Construction

On February 23, 1720, troops in a contingent led by Captain Juan Valdéz upon the orders of the Governor--the Marqués de San Miguel de Aguayo of the Province of Coahuila y Texas, took part in the siting and symbolic foundation ceremony for the mission of San José y San Miguel de Aguayo on the banks of the San Antonio River.[1] Several years later, after relocation at the present mission site, development of the community in all its facets began in earnest.[2]

As a community surrounded by wilderness remote from areas of supply, this frontier mission, like San Antonio de Valero before it and those earlier missions founded to the east, aimed at self sufficiency. This was especially true for food. Early on seed for crops and livestock to begin herds were brought north and east from the more settled areas into Texas. Use was made of the continual water supply from the River. A dam was constructed above stream which diverted some of its waters into an irrigation ditch or *acequia madre* which took the water downstream to the vicinity of the mission's farmlands (*labores*) and by means of a network of lateral ditches or *acequias* the mission fields and orchards were watered and crops flourished. Beans, squash, melons, and chilie were grown, but by far the largest and most important crops cultivated were maize and sugar cane.[3]

Wheat was not grown despite the order of Governor Domingo Cabello in 1778 to do so.[4] The native populations at the missions, including those at San José, had not progressed that far in the acculturation process to accepting a wheat based diet over maize. It was not until the missions were on the verge of secularization sixteen years later that wheat is recorded being

[1]*The San José Papers--The Primary Sources for the History of Mission San José y San Miguel de Aguayo from its Founding in 1720 to the Present*, Part I: 1719-1791, Fr. Benedict Leutenegger et. al. trans., Fr. Marion A. Habig, Comp. & Annot., (San Antonio, Texas: Old Spanish Missions Historical Research Library at San José Mission, 1978), 27-42; Fr. Marion A. Habig, *The Alamo Chain of Missions--A History of San Antonio's Five Old Missions* (Chicago: Franciscan Herald Press, 1976), 84-85.

[2]*San José Papers*, Part I, 95-101, 107-128, 129-137, 138-160.

[3]*Guidelines for a Texas Mission: Instructions for the Missionary of Mission Concepción in San Antonio*, in *Documents Relating to the Old Spanish Missions of Texas*, Vol. 1 (San Antonio, Texas: Old Spanish Missions Historical Research Library, Our Lady of the Lake University, 1994), 32-35; Rosalind Z. Rock, "Tiempo de la Siembra. . . Tiempo de la Fruta: Planting and Harvest Time--A Preliminary Study in Preparation for the Proposed Spanish Colonial Demonstration Farm," (San Antonio Missions National Historical Park, February, 1993); *San José Papers*, 2: 95-101, 107-128, 129-137, 138-160.

[4]Marlys Bush Thurber, Santiago Escobedo, Tom Ireland and James E. Ivey, *Of Various Magnificence--The Architectural History of the San Antonio Missions in the Colonial Period and the Nineteenth Century.* In Two Volumes, Vol. 1 (Santa Fe, New Mexico: National Park Service, Southwest Regional Office, Southwest Cultural Resources Center, Professional Papers No. 11, 1993), 138.

grown and a mill built to grind it at Mission San José.[5]

For years there has been some confusion as to the dating of the mill. This especially became the case when in 1953 an engineer at the Southwest Research Institute in San Antonio brought a late date traditionally held to be nearer the true one, into question. Dr. Paul L. Czibesz, in a short paper entitled "Unknown Facts About Technical History in San Antonio" twice refers to an inspection report of 1752 mentioning the grist mill.[6] However, research in Spanish documents to date has not found an inventory for 1752. In the inventory of 1753 by Fr. Ildefonso Marmalejo as well as the subsequent report of 1755, only a sugar mill is listed. Once again, in 1758 Governor Jacinto Barrios y Jauregui described the mission and also mentions a sugar mill.[7] It appears that Dr. Czibesz was misinformed for no report from the mission's founding through the 1750s known to date mentions the cultivation of wheat let alone the existence of a mill. Also, the provincial governor would not have issued an order for those living at the missions to cultivate wheat if they were already doing so. As late as 1989 some scholars continued to reference an early date. Dr. James Neely, in his presentation at the symposium, "Cultural Adaptation at the Edge of the Spanish Empire: A Northern View," held in April of 1989, continued along the lines of Czibesz, this time citing correspondence of Fr. Benito Fernandez de Santa Ana to Fr. Pedro del Barco of February, 1740 as mentioning mills on the San Antonio River. The letter in question appears in Volume One of the *San José Papers*. In it Fr. Fernandez speaks of the river being powerful enough to run twelve mills. He is speaking figuratively in relation to the abundance of water in the river, not to an actuality.[8]

Dr. Czibesz visited Mission San José in the summer of 1953, and it was then that he viewed the restored mill. He was quite enthusiastic about his findings, not knowing, however, about the restoration which had been completed about fourteen years earlier (Dr. Czibesz assumed the restored mill was the original--dating to the Spanish colonial period). His paper detailed calculations he performed at the mill, after his visit. Dr. Czibesz's visit was documented in a September 3, 1953 *San Antonio Express Magazine* article "New Facts on Old San Jose" by June Kilstofte (see Figures 2-1 through 2-5).

For many years there has been confusion concerning the existence of two mills at San José. There was speculation as to whether the later grist mill was built close by the site of the sugar mill. The late inventories in which the grist mill does appear also list the sugar mill and its accessories like *piloncillo* (sugar cone) molds and cauldrons for boiling the syrup. However, the two milling processes are not similar and the mechanism and process for pressing the liquid from the sugar cane and cooking it into syrup did not need the close proximity of water to

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[5]*Of Various Magnificence*, Volume One, 138; Fr. Marion A. Habig, O.F.M., *San Antonio's Mission San José--State and National Historic Site 1720-1968* (San Antonio, Texas: The Naylor Company, 1968), 99-102; Habig, *The Alamo Chain of Missions*, 103.

[6]Paul L. Czibesz, "Unknown Facts About Technical History in San Antonio," (Manuscript, *Southwest Research Institute*, June, 1953), 3, 5. For a complete copy of the article, see Appendix C.

[7]*San José Papers*, Vol. 1, 126, 132.

[8]*San José Papers*, Vol. 1, 54, 68, 126.

operate. Animal or human power and a hearth for the cauldrons were all that was necessary.[9]

Of the illustrations which appear with the article, "The Sugar Industry at Mission San José y San Miguel de Aguayo," by John W. Clark, Jr., that in *Figure 3* of a sugar mill near Buda, Texas, most closely resembles the description of the mill given in Fr. Marmolejo's inventory and report of 1753 and 1755 (see Figures 2-6 through 2-10).

> This building is 15 *varas* long and 6 1/2 wide, quite high, and roofed with *tule*. Inside is set up a mill of good wood, well-made and strong, to grind the cane.
>
> There are also 3 small furnaces for the kettles, a large trough, and the necessary moulds for the sugar loaves.[10]

Because of the difference in operation, there is some question as to whether the sugar mill was located inside the mission compound or outside, in proximity to the site later used for the grist mill.[11] Since the mission compound was not enclosed until the 1760s, all manner of work would have been carried out within the community's precincts.[12] This could have continued later after enclosure, or have been moved outside the new walls. In light of this ambiguity in the documents as to its location, a theory developed that possibly the power for operating the sugar cane mill also came from the grist mill (see discussion below, page 2-10). Whatever the case, sugar milling continued beyond secularization into the nineteenth century.[13]

As for the cultivation of wheat and milling of it into flour, no inventories or reports note this until the time of secularization beginning for the missions. Over the years, historians of the missions such as Father Marion Habig placed the construction of the mill in 1789. However, in a report of the state of the missions in that same year, no mention is made of cultivation of wheat, let alone the construction of a mill.[14]

Several documents have recently been discovered which may shed some light on the dating of the original construction of the mill. The first, a report on the state of the missions, records the recent secularization of the mission of San Antonio de Valero. This would date it as being

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[9]Earl Porter, Interview at Rancho de las Golondrinas. Videotape., 22 August, 1996; John W. Clark Jr., "The Sugar Industry at Mission San José y San Miguel de Aguayo," *Bulletin of the Texas Archeological Society* 47 (1976): 246-247.

[10]*San José Papers*, Vol. 1, 126.

[11]John W. Clark, Jr., "The Sugar Industry at Mission San José." 248.

[12]*Of Various Magnificence*, Vol. 1, 14.

[13]Jean Louis Berlandier, *Journey to Mexico During the Years 1826 to 1834*, Sheila M. Ohlendorf, trans., Vol. 2 (Austin: The Texas State Historical Association, 1980), 298-299.

[14]Raphael María Pacheco to the Viceroy, "Estado de las misiones," Archivo del Colegio de Zacatecas, in the Archivo Franciscano de Zapopan, hereinafter referred to as *ACZ*, Roll 1, frames 0999-1003.

written between 1794 and 1796 (see Figure 2-11).[15] After briefly discussing the condition of Texas missions in general, the writer specifically refers to Mission San José and notes:

> In a mission named San Joseph a *labor* [farm plot] for wheat has been recently planted which this year yielded about 120 *cargas*, its minister [missionary] having placed in it a mill, which is the only one in all the province, and that it has cost [involved] immense work to establish it.[16]

In 1794, at the beginning of the process of secularization, Fr. José Manuel Pedrajo compiled an "Inventory of the Material Possessions of Mission San José." All the elements for sugar production including the mill itself were itemized.[17] Several other items were listed which never appeared in previous inventories for the mission: "Ninety *cargas* of unthreshed wheat were stored in the granary and two herds of 45 head of mares with their jackasses. These were given the Indians to be used in common for threshing wheat."[18] As described to us by Earl Porter, a retired engineer and volunteer at Rancho de las Golondrinas near Santa Fe, New Mexico who restored to operation a Spanish colonial mill onsite, a number of livestock (horses, oxen, goats) were herded around a fenced area of packed earth set aside as a threshing floor on which the harvested grain was spread. The movement of the animals threshed the wheat in preparation for winnowing, or removal of the fine chaff, before milling.[19]

Father Pedrajo's report is revealing. By 1794 the native population of the mission had acquired a taste for wheat based products. Wheat was being grown, a threshing floor existed, and a mill had been built.[20] This theory is given further credence by yet another document dated 1794. In that year, further documentation of the mission reveals additional information which will aid in dating of the mill. A document entitled "List of Rations Given to the Indians of the Pueblo of Señor San Josse, October 1, 1794 to December 3 of the same [year]" states it was a "report of the rations that were distributed to the Indians of this Pueblo of Señor San Josse [*sic*] from

[15]Anonymous, "Estado de las misiones," [ca. 1794-1796] ACZ, Roll 1, frames 0846-0849. In frame 0849, the author of the report refers to the secularization of Valero in the past tense. It had already occurred and from the context of the text referring to it, the sense is that it occurred in the recent past.

[16]"Estado de las misiones" [ca. 1794-1796], ACZ, Roll 1, frame 0848. A *carga* as a measure for wheat and flour equaled 329.764 lbs. (Measures and their equivalents are found in Thomas C.Barnes, Thomas H. Naylor, Charles W. Polzer, *Northern New Spain--A Research Guide* (Tucson, Arizona: University of Arizona Press, 1981: 73)). The yield recorded here for San José was 120 *cargas* and therefore considerable. Words appearing in parentheses in the translated excerpt of the document are alternate translations presented here for clarification.

[17]*San José Papers*, Vol. 2, 130-131.

[18]*San José Papers*, Vol. 2, 128-129.

[19]Earl Porter interview, 22 August, 1996.

[20]*San José Papers*, Vol. 2, 129, 131; ACZ, Roll 1, frame 0848.

the wheat harvest of the current year."[21] Approximately 73 *fanegas*, 11 *almudes* of wheat were distributed to forty-five "families" or heads of families. In addition, a quantity of sugar syrup was produced for sale (approximately 7 cauldrons) and 84 *fanegas* of maize were produced as well.

In a comparison between those appearing on the ration list and those termed *Yndios*, or Indians, appearing in the census taken in closest proximity to that date, several things become evident. First, the census of 1792 (see Figure 2-12) was divided on basis of families, with individual listings under each. Of the forty-four "families" (or heads of households, including single men, widowers, widows, and orphans), at least twenty-six of the names of those listed as Indians coincided with those listed two years later as receiving rations of wheat at Mission San José. The ration list of 1794 (see Figure 2-13) listed forty-five "families" or heads of families. Some listed on the census as widowers were now married. On the other hand, some listed as married on the census two years earlier, now appear as widowers. Given that children are listed for each "family" on the census, not on the ration list, there may have been about 100 people termed *Yndios* present at Mission San José between 1792 and 1794, when secularization began. These people, along with missionaries, "*sirvientes*" or salaried employees of the mission, neighbors (residents close by or living on mission lands) were farming and producing sizeable amounts of wheat, maize, and sugar, staple crops which were not only for their own use, but being sold for profit outside the mission community.[22]

It appears from this documentary evidence that on the eve of secularization Mission San José was producing enough staple food items to feed itself as well as a surplus to sell in San Antonio, in the province, and as far east as Louisiana. The population still termed *Yndio* in the census had become sufficiently acculturated by 1794 that wheat could now be successfully cultivated, milled and made into products eaten by residents reflecting the dietary change that was a part of this process.

This late date for wheat cultivation and mill construction reveals a difference between New Mexico and Texas. In New Mexico the same type of horizontal waterwheel mill was in use throughout the province during the Spanish colonial period for grinding both maize and wheat. However, given the lack of mention of any mill but that for sugar cane until about 1794, with the grist mill termed being recent, and its coinciding with the first mention of the cultivation of wheat; it appears for Texas missions maize was ground into meal exclusively with the traditional *metate y mano* [manual corn grinding stone] and that the mill at San José was only employed for grinding wheat into flour, therefore explaining its late arrival.

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[21]"Lista de las Raciones dadas alos Yndios del Pueblo de S.^or S.^n Josse. desde 1.° de Octubre de 1794 hasta 3 de Dre. del mismo," Bexar Archives Microfilm, Roll 25, frames 0053-0068.

[22]"Lista de las Raciones," Bexar Archives Roll 25, frames 0067, 0068. One *fanega* of wheat equaled 82.44 lbs; one *fanega* of maize equaled 101.46 lbs., approximately 12 *almudes* equaled 1 *fanega*, taken from Barnes, Naylor, Polzer, *Northern New Spain*, 69, 73; "Micion de S.^or S.^n Jose Dependiente de la Villa de S.^n Fernando. Padron de las Almas q.^e Existieron En 31 de Diz.^e de 1792," Bexar Archives Microfilm, Roll 22, frames 0984-0986.

Not much is known about the physical appearance of the original mill. Ernst Schuchard, an engineer employed in the restoration of Mission San José, took measurements for any clue as to its original appearance and dimensions when its ruins were unearthed in 1933. He relates:

> In 1933 when the San Antonio Conservation Society started reconstruction work at Mission San José, workmen were cleaning out the irrigation ditch that runs along the north wall of the church and discovered masonry work on the side of this ditch. Following along the masonry work a large conical pit was discovered. After removing dirt it was found that the entire pit, or reservoir, was lined with stone and was well plastered except for one opening in the north side near the bottom. This proved to be a hole leading into an underground vaulted chamber. A great deal of dirt fill had to be removed before the bottom of the vaulted chamber was reached, but when completely excavated it was found to be 13 feet long, 7 1/2 feet wide and 9 feet up to the vaulted ceiling. This room was built of solid tufa stone and the floor was made of large flagstones. At the lower end of it were found four stone steps leading upward and at the side of these stairs a ditch that ran out to the prairie was opened.[23]

Figures 2-14, 2-16 through 2-25, 2-27, and 2-28 illustrate the excavation of the mill site beginning in 1933. An analysis of the birds-eye photo (Figure 2-14) taken presumably in early 1933 shows several curiosities: the top of a ladder appears in the foreground, presumably coming out of the forebay; the lime kilns can be made out as well, however several masonry structures immediately near the kilns are unknown, as these features do not exist today. For the latter structures our guess is that these features belong to the curved retaining wall components seen in Figures 3-122 and 3-124. Figure 2-15 is a copy of a news article "San Jose Mission Excavators Unearth Mysterious Room, Tunnel and Pits, Bearing Evidences Expert Craftsmen [*sic*]" which appeared in the March 19, 1933 edition of the *San Antonio Express*, apparently just after the ruins had been excavated. The purpose of the curious vaulted structure below grade, the conical forebay which connected the vaulted space with a square opening, stone steps, and other interesting questions were posed. Some thought the vaulted wheel room was one of the legendary tunnels to carry Indians away from the missions. As more and more of the site was excavated, Smith and Schuchard began to put the pieces of the mill puzzle together.

One curious question concerned the placement of the mill itself. Historically, "spent" water which had made its way through the mill and mill race was said to have been diverted to fields to the north of the mill. This area was used as the Historic Theater of Texas (also known as the "Huisache Bowl") constructed in the mid-1950s and dedicated in 1958, and later as an outdoor amphitheater (its current use). However, the existing grades would make the function impossible: the elevation between the current amphitheater stage area, surveyed in 1996 is approximately four feet **higher** than the wheel room floor. Both the bottom of the forebay and the amphitheater stage area were surveyed at the same elevation; since the mill race is approximately five feet below the bottom of the forebay, water has nowhere to go. Obviously the grade north of the mill was much different than what exists today. And indeed that was the

[23]Ernst Schuchard, "The Old Mill at San Jose Mission," July, 1936, Typescript, *Schuchard Collection*, San José Mill, Daughters of the Republic of Texas Library, File V.

case. Some early observations indicated that the mill was placed on a ridge of the nearby prairie (see Hoermann's reference below). This certainly would have made sense. The photograph taken ca. 1933 (see Figure 2-14) shows quite a drop off just north of the mill site. Measurements from Smith's detailed field notes of the excavated mill site show a difference of approximately eleven feet from the top of the forebay to the bottom of the wheel room floor. This is the approximate grade differential which may have existed historically. The discrepancy reflects the considerable filling that has taken place since the Spanish colonial period in the area immediately north of the mill.

Ernst Schuchard believed that Father P. Alto S. Hoermann, a German Benedictine prior of the school that order was attempting to establish at Mission San José in the late 1850s and author of the historical novel *The Daughter of Tehuan*, gave an accurate description of the mill.

> It was situated on the opposite of the ditch [the *acequia madre*]. The reservoir [forebay] was built of rough hard rock, plastered with common mortar, and perfectly waterproof. It was supplied with water from the ditch. Next to the reservoir there was a vault built of solid tufa, which opened towards the field. The mill was erected directly over this vault, which contained the turbine. An opening near the bottom of the reservoir allowed the water to fall on the turbine, from a height of about ten feet. After having furnished power for the turbine, the water flowed in a deep ditch to the fields. The mill stood on the ridge of the prairie. . .[24]

Schuchard was convinced that it was not buried under debris when Hoermann was at San José.[25] However, there should be a word of caution. Fr. Hoermann was writing a book of fiction. Historians and archeologists cannot rely heavily on his view of the setting at San José. While his descriptions of structures and landscape may have a basis in fact, a fictional author, no matter how painstaking, will exercise, and rightfully so, a degree of artistic license to evoke a mood or set a tone for his work. After the uncovering of the ruins, Schuchard was able to obtain measurements and ascertain the basic elements that made up the mechanism of the mill. He identified the style of the original construction as that of a Norse Mill.

> After the excavations had been completed the entire plan of the mill was easily discerned. All of the walls of the building have been located. The openings for the flume and the sluice-gates [*sic*] were found, even the foundation for the lower grinding stone; the hole for the shaft and bearings; and groves [*sic*] for the tram-rods in the side wall of the vaulted chamber.
>
> In making calculations and accurately checking all the dimensions of the various parts of the ruins the following data was accumulated. The diameter of the water wheel is 5 feet. It has 12 straight blades 1 foot wide, 2 inches thick and 2 feet

[24]P. Alto Hoermann, O.S.B., *The Daughter of Tehuan or Texas of the Past Century*, Alois Braun trans., San Antonio, Texas: Standard Printing Company, 1932, 95-96.

[25]Schuchard, "The Old Mill at San Jose Mission."

> long, morticed [*sic*] at an angle into the spindle base which is 12 inches in diameter. The number of revolutions of the wheel are between 80 and 90 per minute. The grinding stones were 28 inches in diameter and 7 inches thick, the upper stone turns, the lower being firmly bedded on a square base made of rock. The flume has an opening one foot square, is inclined at an angle of about 45 degrees and has a sluice-gate controlled by levers. The lighter rods (tram-rods) are made of timbers and the tramming of the stones is controlled by double wedges in the top of these rods. The hopper and mill-stone casing are made of wood with all joints morticed [*sic*]. Cedar, live-oak and cypress wood was used . . .[26]

About this same time Schuchard, an avid watercolorist, produced at least one study of his conception of what a finished mill, based on his research and the findings at the newly excavated site, might look like. A photocopy of a watercolor dated Feb. 27, 1933, and signed by Schuchard, was located at the archives of the Texas chapter of the Colonial Dames of America (see Figure 2-26). This early conception of the mill evolved as is evident in his 1934 study (Figure 2-29) of the ruins and a possible configuration of the milling apparatus.

The structure standing today, which was constructed in the 1930s, was based on meticulous research carried out by Schuchard in California, New Mexico, and old Mexico. Careful measurements were made of the foundation and remains. Yet, despite all this, the appearance of the structure has led to some speculation and questioning on the part of archeologists and conservation specialists. It is not known exactly where the details for the milling apparatus (mill wheel, shaft, tram rods, table, hopper, hopper frame, and gates and gate hardware) came from. All of these components had long disappeared when the mill site was located in 1933. However, as many photographs in this report detail, it is easy to discern that information from many similar mills was borrowed for producing the many facets of the milling apparatus. For example, the pyramidal wooden hopper is a common detail in many mills researched for this report. It appears that Schuchard and Smith changed their minds mid-stream, however. As discussed below, the drawings on record do not equal the restoration which was actually accomplished, and the drawings or notes used to accomplish the restoration have not been located to date.

Schuchard did rely on the Hoermann account in *Daughter of Tehuan* for a description of the mill's appearance and final destruction during a siege of the mission by raiding Apache. Also, there is evidence that Schuchard's belief that the mill may still have been sufficiently visible at the time of Hoermann in the 1850s to warrant a degree of reliance on the description in the novel was misplaced. Jean Louis Berlandier, a French traveler, in his visit to San Antonio in 1828, noted that little wheat was grown in the area. He saw one field, but its yield was small. He concluded that was probably so because of the heat and rust. No grist mill at the missions was mentioned, yet the milling of sugar cane merited his attention.[27]

[26]Schuchard, "The Old Mill at San Jose Mission."

[27]Schuchard, "Old Mill at San Jose Mission;" Berlandier, *Journey to Mexico*, Vol. 2, 299.

During a series of inspections made by staff of the National Park Service from Santa Fe, New Mexico after the Mission San José site was declared a National Historic Site in 1941, those observing the reconstruction began having doubts as to the reconstructed mill's authenticity. This was especially true of Senior Archeologist Jesse Neusbaum.[28] Erik K. Reed, in his "Annual Report for 1946-47 on San Jose National Historic Site" referred to the mill as "purely an exhibit." "The mill is about the only nonfunctional structure, in fact, as the gates of the compound are necessary for protection as well as forming part of the restoration."[29]

James Ivey, *et al.*, in the architectural history for San Antonio Missions National Historical Park, *Of Various Magnificence*, states that the reconstruction of the mill incorporates the machine base, "tank" (forebay), and water channel as were found, but that the structure enclosing them has little historical basis.[30] Harvey Smith, the lead architect working on the restoration project for Mission San José in the 1930s, found few wall foundations for the structure which stood around the machinery. This led Ivey to conclude that the original appearance of the building housing the mill is unknown.[31]

A further question may be raised as to whether all of the restoration of the mill mechanism is accurate as well. The forebay south of the wheel chamber may not be exactly as it had been when first constructed. Examination of the one brief description found to date of the grist mill from the Spanish colonial period reinforces this view:

Father Pedrajo, in his inventory of San José in 1794, listed ". . . un molino para moler trigo en corriente con la falta de una cortina."[32] This was originally translated as ". . . a water mill for grinding wheat that is operated by a running stream <u>but no dam</u>." [emphasis ours]. The wording for "*en corriente*" and "*cortina*" in the original translation is questionable. First of all, water flowing into the *acequia* system for Mission San José and therefore for powering the mill, was obtained by means of a dam (on the San Antonio River). The word "*cortina*" could mean a wall or component of a structure controlling the flow of water, in other words, a diverting or retaining wall, or weir. The phrase "*en corriente*" does not necessarily have to refer to water. Idiomatically it might refer to being "up and running," or "operating." This phrase is used once again in the next entry referring to the mill for sugar cane, an operation not needing water to operate. Therefore, the translation of the description of the grist mill could read:

> "a mill for grinding wheat in operation without a diversion wall [presumably for the reservoir]".

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[28]Jesse Neusbaum, Senior Archeologist, "Initial Inspection Report, April 17, 1942," (Annual Reports, National Park Service).

[29]Erik K. Reed, Regional Archeologist, "Annual Report for 1946-47 on San Jose National Historic Site," (Santa Fe, New Mexico: National Park Service), 14.

[30]*Of Various Magnificence*, Vol. 1, 139.

[31]*Of Various Magnificence*, Vol. 1, 139.

[32]*San José Papers*, Vol. 2, 131.

The entry for the sugar mill could read:

> "another [mill] in operation for milling [sugar] cane."

The implication for the original grist mill is that the water probably flowed into the wheel chamber from the forebay, and was controlled from outside the mill confines itself. The water to the forebay may have been controlled by manipulation of the water gate on the *acequia* channel, bringing water to the mill in a similar manner as one of the horizontal mills at Rancho de las Golondrinas in New Mexico.[33] However, the mill at Mission San José appears to be unique with a forebay and a stone lined sluice from the acequia which brings water to the horizontal mill wheel. This mechanism was not employed at the mills in New Mexico.

A second interpretation of the above references to the 1794 inventory is found in an article "The Sugar Industry at Mission San José y San Miguel de Aguayo" by John W. Clark, Jr., an archeologist. According to Clark, there were several references to a sugar mill, including a 1755 description of the sugar refining complex or *ingenio* at San José.[34] The sugar mill was located outside the compound of the mission and was "*en corriente*," as noted above. Using the translation of "water-powered," i.e., by a *corriente*, or current (of water), we have both mills being water-powered. If the reference to "*una cortina*" was translated to mean a wall (or curtain) missing from the mill itself, as is asserted in Clark's analysis, we have a mill with one open side. Records indicate that when Harvey Smith was excavating the mill site in 1934, the east wall foundations were *not* located.[35] However, Schuchard's personal notes indicated that *all* of the walls had been located, and records to corroborate Clark's assertion about the missing east wall foundations remain elusive. Clark proposes a very interesting set up for both the grist mill and *ingenio* (Figure 2-9): The *trapiche*, or mill which pressed sugar cane to extract the cane juice, would have set immediately east of the grist mill, powered by a belt connected to and run from the main shaft from the grist mill through the open or "missing" third (east) wall. The various other components of the *ingenio*, including a caldron for reducing the cane juice to *piloncillo* (brown sugar cones) would be assembled close by.[36] The concern for sanitary conditions with an open-sided milling room was not addressed, but would certainly be a concern today.

A "stone box" structure was located by Harvey Smith during the 1934 excavations at the mill site. Smith identified the structure as a "leather tanning vat."[37] Schuchard, relating his research, also made the same assertion. "Next to the mill at San Antonio de Padua was a tannery. This same plan was also followed at the mission here and a large oblong pit with its

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[33]Earl Porter, interview, 22 August, 1996.

[34]John W. Clark, Jr., "The Sugar Industry at Mission San José y San Miguel de Aguayo," *Bulletin of the Texas Archeological Society*, Volume 47, 1976: 245-248.

[35]Clark, "The Sugar Industry at Mission San José," 255.

[36]Clark, "The Sugar Industry at Mission San José," 255.

[37]Clark, "The Sugar Industry at Mission San José," 249.

water inlet and drain can still be seen just next to the old mill at San Jose."[38] It is this structure which Clark believes was the *payla de cal y canto*, or syrup-reducing caldron. Its configuration certainly resembles other caldrons Clark refers to (see Figures 2-6 through 2-8 and 2-10).

Recent archeology (see Chapter 3) in preparation for the planned ultimate treatment of the mill has raised further questions concerning the source of water and the mechanisms by which it was carried to the millrace. The "tanning vat," excavated in 1974, was re-excavated to determine its depth. Additional archeology and/or studies will be required to shed light on how water was brought in and controlled in the running of the original Spanish colonial mill, and the real purpose of the structure known as the tanning vat. As to the mill itself, at this juncture it is safe to say that the mill mechanism is accurately portrayed, but water control and the structure enclosing the mill above ground are questionable as to historical accuracy. To date, documentary evidence for the location of the sugar mill has not come to light. It is known from historical documents that the sugar mill preceded the grist mill by some thirty-six years. Therefore, Clark's suggested location in proximity to the grist mill and it actually being run by the latter is questionable. Support for the above hypotheses must be left to further study.

However, from research conducted for this report, the following analysis of the operation of the grist mill at Mission San José was able to be developed:

A. With a steady stream of water in the acequia madre, a portion of the flow was directed into the stone-lined sluice immediately south of the forebay;

B. With the sluice gate opened, and the forebay gate closed, water filled the forebay.

C. Once the forebay was filled, the forebay gate was opened moving water onto the wheel.

D. A careful balancing of the two gates (the sluice gate and the forebay gate) was essential at this point to ensure that the source of water to the wheel remained constant, further ensuring that the wheel revolved at a constant rate. It would be necessary to have water from the acequia constantly flowing into the forebay - as it was the forebay which provided a constant head of pressure.

E. We believe the west tram rod was meant to be stationary, operated only to provide maintenance to the bridge tree, wheel, or shaft. The east tram rod provided the actual tramming - or minute adjustment between the two stones depending on the grist type and the preciseness of grinding that was meant to be undertaken. Two wedges in the east tram rod provided this adjustment. A mallet, which appears in historical photographs, was used to drive the wedges in or out (moving the upper stone up or down).

F. With the mill in operation (adjusted for a constant rate of speed), the grain was poured into the hopper and from there was directed by means of a small wooden chute,

[38]Schuchard, "Old Mill at San Jose Mission."

to the center of the upper stone, where through the action of the spinning stone and the cut ("dressing") of the two stones, worked its way between the stones to be ground.

G. The flour was directed out the north side of the stone casing into a second wooden chute, and is collected in a wooden bucket on the floor.

H. The flour was taken to the suspended box for sifting. Bags or other containers were used for the finished product.

B. Phase II - The Chronology of Reconstruction: Making the Mill Run

After years of operation, the grist mill at Mission San José fell into disuse and was possibly destroyed during the long period of unrest in Texas. The mill's very existence appeared forgotten as its remnants filled in and disappeared among rubble and debris. Ernst Schuchard, in his article, "The Old Mill at San Jose Mission" of July, 1936, related its discovery.[39] At first, it was reported that a tunnel connecting San José with the other missions had been found. With continued excavation, and Schuchard's research, it was confirmed to be the remains of the wheel room of the grist mill recorded in late Spanish colonial documents.[40] It was further noted that the original "burrstone," or grindstone, was found as well. It was apparently unearthed in a ditch near the mill site. This stone was not utilized in the restoration, however. In milling two stones are required. The stones in existence are turn-of-the-century stones (see discussion in Chapter 3). It is not known if the stone found by excavators exists or where it could be stored.

The description of the reconstructed mill in a 1938 *San Antonio Light* news article tells of the water to power the mill coming from the river via an *acequia* to a ". . . sluice-pit on the south side of the mill house. Through a sluice-gate at the bottom of the pit the water was allowed to flow through the underground chamber where it turned the wooden water wheel. A shaft connects the water wheel with the mill stone on the floor above." Unfortunately, the author of the article was either misinformed or assumed the mill was used originally for grinding corn. "The mill stone revolves upon the stationary burrstone, grinding the corn between two stones."[41] Although similar mills were used for grinding both maize and wheat during the Spanish colonial period, especially in New Mexico, as was previously noted, in Texas a mill was not constructed until a taste for wheat based products was firmly established.[42]

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[39]Schuchard, "The Old Mill at San Jose Mission;" "Long Forgotten Mill Restored," *San Antonio Light*, Friday, 18 March, 1938.

[40]"Mission San Jose Excavators Unearth Mysterious Room, Tunnel and Pit . . .," *San Antonio Express*, Sunday, 19 March, 1933; "Long Forgotten Mill Restored," *San Antonio Light*, Friday, 18 March, 1938.

[41]"Long Forgotten Mill Restored," *San Antonio Light*, Friday, 18 March, 1938.

[42]See Phase I, for the history and discussion devoted to the document relating the cultivation of wheat and the building of the mill.

This misinformation may have been gotten from an article written by the principal architect involved in the various restoration and reconstruction projects at Mission San José, Harvey P. Smith. He noted in the September, 1935 issue of *Plaza Parade*, a magazine published for the Plaza Hotels, that "Probably the most interesting of all the unusual 'finds' during the research and restoration work of San Jose Mission in San Antonio was the underground portions of the reservoir and old mill in which the padres ground their corn into meal. Since this formed the main portion of their food, this find represents the most important part of the entire mission."[43] After also mentioning that when first discovered, the pit was thought to be the legendary tunnel between missions, Smith goes on to say they had not given up looking for a tunnel. "However, we have followed up many clues which we were told would positively uncover the tunnel, but we have not as yet located it."[44]

Once again, Smith returns to the theme of the mill being used to grind corn. Here, he discusses the evidence for this conclusion coming from Hoermann's book, *Daughter of Tehuan*. "The mill was probably still in operation at that time [1859, when Hoermann was at Mission San José] and his description of it and how it operated gave us proof of the fact that this was the old mill which was used by the early padres to grind their corn."[45] This conclusion on the part of Smith and Schuchard appears to be based on an assumption Hoermann may have gotten from oral tradition grown up after the mill was no longer being used. It is possible that before its destruction the mill was being used for grinding corn. If so, it would have taken place after the colonial period and full secularization in the early nineteenth century. Neither Smith nor Schuchard ever refers to documentary evidence to give credence to this use. Schuchard may have based his conclusion to that effect on what he observed of horizontal mills in New Mexico during his research.

Harvey Smith's measurements (see Figure 2-30) of the wheel chamber are almost identical to those recorded by Schuchard (Figure 2-29).[46] Smith also noted that during the survey of the irrigation ditches for all five missions, ". . . we ran against old mill stones, which while they did not belong to this particular mill [San José], were used in one of the early mills near here and happened to be the exact size (28 inches in diameter) which Mr. Schuhardt [*sic*] said was the size which this mill used."[47]

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[43]Harvey P. Smith, A.I.A., "Old Mill of San Jose Mission," *Plaza Parade*, (September, 1935), 12. For a complete copy of this article (copy furnished courtesy of the Daughters of the Republic of Texas Library, San Antonio, Texas), please see Appendix D.

[44]Smith, "Old Mill of San Jose Mission," 12; "Underground Chamber at Mission San Jose Found," *San Antonio Express*, Sunday, 19 March, 1933.

[45]Smith, "Old Mill of San Jose Mission," 12; Ernst Schuchard, "San Jose Mill", *Bright Scrawl Magazine*, March, 1939, DRT Library, Schuchard Collection, Box 6.

[46]Schuchard, in his 1936 article, spoke of the chamber being 13 feet long, 7 1/2 feet wide and 9 feet up to the vaulted ceiling, while earlier, in 1935, Smith spoke of it being 7' X 13' X 8 1/2' high.

[47]Smith, "The Old Mill of San Jose Mission:" 12-13.

The restoration of the mill did not begin until 1936. The *San Antonio Light* ran an article in its Society Pages documenting the event, "Aid in Restoring Old Mill," see Figure 2-31. Funding was received from various sources. The National Society of Colonial Dames in Texas, as part of the Texas Centennial project effort, donated $900. The total funding needed was estimated to be between $2,000 and $3,000 including labor. WPA funds were sought. State and national chapters of the society would underwrite the balance. The reconstruction of the mill was part of the general work of restoring San Antonio's historic landmarks begun some 25 years before by the San Antonio Conservation Society. Some of the planning, research, and replication, especially of the mill mechanism, was undertaken by Ernst Schuchard, begun on February 21 of that year.[48] From several of the historical photographs taken in 1935 (including Figures 2-27 and 2-28), it appears that the area surrounding the mill ruins was outlined with gravel paths lined with large stones, presumably for interpretation of the area, prior to the onset of the restoration efforts.

Schuchard painstakingly researched the origins of the particular milling mechanism employed in the San José mill. His efforts not only sent him to the library, but to Mexico as part of his overall information gathering for the mission's structures.

> Near Mexico City is an old hacienda called 'Molino de Flores.' It was started in 1700 or earlier and owned by the Cervantes family . . . Among the buildings is an old mill of the same type and construction as the one at Mission San Jose in Texas. A stone lined canal led the water into two large conical pits of stone each about ten feet in diameter at the top and twenty feet deep. These pits or water reservoir[s] are up against a heavy stone wall, of the other side of which is the room for the mill stones and the pits for the turbines. Only one set of mill-stones was now in place, they were about four feet in diameter and a foot thick and were set on heavy wooden timbers five feet above the floor. An iron shaft extended through the floor into the turbine chamber below. In the turbine chamber was a horizontal water wheel about five feet in diameter. . . .[49]

Schuchard apparently located a mill with a forebay similar to that at Mission San José. The construction of the water wheel paddles on the Mexico mill (sketched by Schuchard as thick horizontal boards with carved cups) was very different from other mills, including the wheel which was eventually recreated at San José.

Sometime in 1934, Schuchard built a working model of the mill (see Figure 2-32). Once he had accumulated all the technical information and observations, Schuchard built a second, more detailed working model of the mill in 1936 (see Figure 2-33). This second model was featured

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[48] "Long Forgotten Mill Restored," *San Antonio Light*, Friday, 18 March, 1936; *Of Various Magnificence*, Vol. 2, 110; Felix D. Almaraz, Jr., *History of the San Antonio Missions* Vol. 2, "The San Antonio Missions After Secularization, 1800-1983," (National Park Service: San Antonio Missions National Historical Park, Manuscript, ca. 1994), 303. Notes of Ernst Schuchard dated February 21, 1936, DRT Library, Schuchard Collection, File V, 63.

[49] "Mexico City Trip," notes of Ernst Schuchard dated February 21, 1936, DRT Library, Schuchard Collection, Box 8.

in the March 21, 1936 edition of the *San Antonio Express*, and was to be on display during the Texas Centennial celebration.[50] Figure 2-34 is a copy of a watercolor Schuchard produced and dated in 1937 similar to the model featured in Figure 2-33. The original watercolor is located in the archives of the Texas Society chapter of The Colonial Dames of America in Austin, Texas. Two undated photographs of the second mill model from a collection of several in park archives are included as Figures 2-35 and 2-36. The model was originally located in the restored mill itself in 1959.[51]

Since the production of detailed construction drawings was not common in Spanish colonial times, Harvey Smith had to rely on personal knowledge, research, and first-hand observations of similar colonial structures to come up with the designs for the daunting restoration project at Mission San José. As with many of the buildings at the mission, the mill's designs were based partly on this background information, but mostly on conjecture. Workmen excavated what remained of the mill structure in the early 1930s, but this was limited to the below-ground ruins of the wheel room, remnants of the mill race, several foundation walls (Schuchard, in his notes, mentioned that all the walls were located), and a portion of the floor. The remainder of the construction was left to the creative talents of architect and engineer. New versus old construction is apparent in the lower level near the entrance to the vaulted wheel room. Here one can see (Figures 3-66 and 3-67) where new construction (yellow Lampasas sandstone) begins and the colonial construction (limestone, most of which is parged) ends. Smith had the exterior walls partially built atop the colonial foundations in this area. We assume he did the same for the remainder of the building. However, as has been discovered in the compound of Mission San José, this was not always the case. As to the building height, size, number and placement of openings (i.e., doors and windows); and many other details, it is anybody's guess as to how the architect arrived at his conclusions.

Copies of the only restoration drawings which have been located are included as Figures 2-37 and 2-38, both prepared by Harvey Smith's office. Note that the door into the milling room changed from the west exterior elevation (shown in Figure 2-37) to the east exterior elevation (where it is today), shown in Figure 2-38. The actual construction of the water wheel changed from Schuchard's original concept, drawn in 1934 (see Figure 2-29) and Smith's drawings (Figure 2-37/2-38). In Schuchard's detail, only one band wraps around the wheel blades; in Smith's two bands encircle the blades (as is the case with the restored wheel). Other variations from Smith's drawing and the actual restoration include: notes for a caliche fill roof with cement plaster, a caliche floor (in the ground floor milling room), and lead caulking on the upper stone. The table (with steps leading up to it), and the hopper arrangement were also not followed (Smith's drawings show a hanging hopper much like that viewed at the restored Truchas mill at Rancho de las Golondrinas--while the restored version is a larger wooden hopper

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[50]Research thus far has not revealed where it was first displayed, nor where it is to be found currently. In the late 1950s it was at the opposite end of the granary from where the diorama of the compound is still displayed. By the early 1960s it was to be moved to the mill itself once electricity was made available. NPS Region Three Annual Report, 1958-1959; Annual Report, 1962-63; Annual Report, 1963-64.

[51]Franklin G. Smith, "Visit to San Jose Mission National Historic Site" (Santa Fe: National Park Service), January 12, 1959: 5.

atop a wooden frame). The top of the shaft and bearing were both executed differently, as are the tram rods (only one tram rod was shown to come up from the wheel room into the milling room in Smith's drawing, whereas both tram rods enter the milling room today; the size and shape of the opening through the south wall to control the forebay gate are different as well). It is unknown where the details for the water chute gate and its operating arm, the tram rods and their milling room terminations, and the miscellaneous "furniture" inside the milling room which shows up in Figures 2-40, 2-41, and 2-42 (the meal bucket, tramming wedges, wedge mallet, and suspended sifter) came from.

A note in Schuchard's personal scrapbook dated July 21, 1937, records: "Today I finished the Old Mill at San Jose. All of the machinery is now in and working."[52] Figure 2-43 shows the wheel room just after the restoration was completed. Photographs, which appeared in the July 23, 1937 edition of the *San Antonio Express* (Figures 2-44 through 2-46), and in a March 18, 1938 *San Antonio Light* article (Figures 2-47 through 2-51), give excellent documentary evidence for the milling mechanism from the recently restored mill. The March 24, 1938 issue of the *San Antonio Light* included another photograph (Figure 2-52) looking at the north exterior elevation. The lime kilns and steps leading down to the wheel room are visible. At this point, the development of the flagstone paving and retaining walls which appear in photos dating to the 1950s (Figures 2-55 and 2-56) had not yet happened. Figure 2-54, gives a different viewpoint of the milling table and associated apparatus. This photograph clearly shows a detail as yet unknown: inserted into the bottom of the oblique opening between the two windows in the south wall is a notched block of wood somehow related to the operating mechanism for the forebay gate. The control arm is somewhat shorter than in earlier photographs. Exactly what relation this block of wood had to the operation of the forebay gate is still unknown.

Schuchard published an article entitled "San Jose Mill" for the San Antonio Junior League's *Bright Scrawl Magazine* in March 1939, which details his efforts toward the mill's restoration. Borrowing from various sources he researched leading up to the restoration, he relates his knowledge of history and the workings of horizontal water wheel mills. A sketch he made of the mill, which appears in the Bright Scrawl article, is included as Figure 2-53. The drawing also appears on the cover of this report. A copy of the Bright Scrawl article in its entirety (copy courtesy of the Daughters of the Republic of Texas Library, San Antonio, Texas) is included as Appendix E. Schuchard's drawings and a shorter article appeared in the April, 1940 edition of "Food Facts" published by the Wheat Flour institute (see Appendix F, also courtesy of the Daughters of the Republic of Texas Library). The manuscript of the Bright Scrawl article is at the Daughters of the Republic of Texas Library, in Schuchard's personal collection.

It is not clear if water was ever used to run tests at the newly restored mill. Schuchard's personal notes indicate a "test at San Jose" on September 17, 1939 - years after the restoration was supposedly completed. Schuchard installed a spring balance "at the edge of [the] stone 14 inches from center," and recorded the "pull on spring balance [at] 8 lbs. at [the] edge of [the] paddle wheel 30 inches from center." He notes, "I pulled wheel 10 rev. in 1/2 minutes. Good

[52]"Test at San Jose," notes of Ernst Schuchard dated September 17, 1939, DRT Library, Schuchard Collection, File V. The entire text is included as Appendix G.

speed would be about 40 R.P.M."[53] Schuchard's personal notes also indicate additional tests on September 25, 1939, first at Pioneer Flour Mills, with a small tank and metal piping connected to gauges and a spring balance. He compared his results at Pioneer Mills with the test he performed eight days earlier at San José. From his notes, it appears that Schuchard tested the pressure to turn the water wheel ("8 lbs.") using similar conditions first in a "laboratory" setting (at Pioneer Mills) and finally at the site.[54] Schuchard turned the wheel by hand, but nowhere is there an indication that water was ever run through the forebay onto the wheel. The above newspaper accounts do not relate a similar occurrence either.

It does not appear that the mill was run or tested again. No mention has been found thus far that any plans were carried out to have the mill working as a living history demonstration during the superintendency of Mission San José State Park by Ethel Harris. Her emphasis appeared to be on artisanry and the performing arts, with major programs being the manufacture and sale of tiles and ceramics as well as the development of an open air theater in close proximity to the mill.[55] In 1941, after the mill restoration was completed, Schuchard travelled to New Mexico where many old mills, dating in part or in their entirety from the Spanish colonial period, were still extant. Some were actually in operation at the time of his visit.[56]

C. Phase III--Recent Rehabilitation

In the 1940s and 1950s, rehabilitation projects involving the mill and associated structures (i.e., lime kilns and supposed tanning vat) were relatively minor. The earliest mention of work needing to be done to the reconstructed mill appears in 1941, in the form of site development recommendations by Harry G. Newton, a National Park Service landscape architect who conducted a thorough inspection of San José in June 1941, the only known detailed description of building and site conditions at the time of the mission's designation as a National Historic Site. For the mill he had three recommendations:

> 1. If deep ditches which carried water to the mill area are to be kept open (this seems desirable so that operation of mill may be understood) they should have stone retaining walls, to prevent crumbling and cave-ins.
>
> 2. Dangerous, unsightly steps should be replaced with stone steps, and all walks in area made of cemented flagstone. This stone is available nearby and will cost only for hauling.
>
> 3. Foot-bridges are built of small "cedar" logs. Floors are rough and dangerous. Floors should be leveled and covered with a smooth material. Supt. Hirsch states

[53] Ernst Schuchard, "Test at San Jose."

[54] Ernst Schuchard, "Test at San Jose." p 3.

[55] "Ethel Harris," Special Library, San Antonio Missions National Historical Park, Clippings File.

[56] Earl Porter, interview, 22 August, 1996; Schuchard Collection, DRT Library, including photographs.

> that he has a large quantity of salvaged asphaltum which might be used.[57]

Recommendation 1, which most likely refers to the acequia madre, was not accomplished to our knowledge (the acequia is currently not lined). It is possible that Newton may have been referring to the mill race, however. Figure 2-52 shows that the "back" area of the mill was not "finished" as it exists today, with retaining walls and flagstone surfaces. The mill race is not visible in this early photograph, but the stone materials used for this area and for the mill race retaining walls (see Figures 3-118, 3-124, and 3-135) are identical to each other, and presumably accomplished at the same time, perhaps at Newton's suggestion. Recommendation 2 appears to have been accomplished in part. The steps on the north side of the mill which lead down to the turbine room are stone. Figure 2-52 still shows a couple of wood steps just outside the wheel room. Existing pathways are of unmortared brick pavers. It is not known to what extent Recommendation 3 was executed. The existing bridges have decks of treated planks which are smooth and flush with the adjoining walks. These bridges have obviously been rehabilitated very recently. The bridges to which Newton was referring most likely dated to the designs implemented by Harvey Smith in 1937 (see Figure 3-4).

In his lengthy April 17, 1942 report, "Memorandum to Regional Director, Region Three," National Park Service Region Three Senior Archeologist Jesse Neusbaum reported drainage problems from the mill roof. Neusbaum observed that the roof "was graded to the north, or basement side, where water would discharge through three roof drains. The resultant splash [was] eroding 'the narrow high plinth of gravel formation separating the north mill wall from the mill race ditch.' As the channel fills with sediment, water backs up into the mill basement. [Neusbaum] offered the following solution:"[58]

> To preserve the remaining form and character of the mill race ditch and preclude backflooding [*sic*], the suggestion was made that the roofing paper be removed and replaced after the caliche roof was regraded to drain through *canales* [drains] to be installed in the opposite wall, in such positions as to discharge [water] directly into the surge bowl of the mill [the forebay], thus passing from the surge bowl through the installed conductor to the wheel and basement floor and outward on the floor of the mill race ditch.[59]

It is not known with certainty if this work was accomplished. There is evidence of a change in masonry viewed in Figure 3-36 immediately above the forebay. The color, size, and coursing of stone appear to have been modified; however, a comparison with Figure 2-47 is not conclusive. In any case, if the slope of the roof was changed in the 1940s, it was converted again to drain towards the north via a single concrete drain installed in the late 1960s or early

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[57]Marlys Bush Thurber, and James E. Ivey, *The Missions of San Antonio, A Historic Structure Report and Administrative History*. (Santa Fe, New Mexico: National Park Service, Southwest Regional Office, Southwest Cultural Resources Center, Professional Papers, Review Draft, 11/15/84), Chapter 8, 14-15.

[58]*Of Various Magnificence*, Volume Two, 192.

[59]Jesse Neuabaum, "Memorandum for the Regional Director, Region Three" (Initial Inspection Report), (Santa Fe: National Park Service), 3; *Of Various Magnificence*, Vol. Two, 192.

1970s, when the mill and Indian quarters were re-roofed at San José. Three wooden roof drains were removed and the level of the roof surface was raised. For detailed information on this roofing project, refer to sheets 1 and 2 of the Johnson and Dempsey Architects "Renovations to Buildings, San Jose Mission State Park," Job No. 6724, April 1968 (revised 1/15/69) in the park archives. Refer also to the discussion in Chapter 3 concerning changes to the roof and roof drains.

Neusbaum also stated that "the recent drainage ditch leading from the old canal (here enlarged to partake of the nature of a mill pond) past the entrance of the mill to a connection with the mill race ditch, is eroding the gravel formation badly because of its unchecked fall." [Underlining and parentheses appear in the original report.] He suggests a "subterranean tile conductor from the desired drainage level in the main canal to the floor of the mill race" would be the best solution to the problem. It would allow for the refill of "the scar formed by the present ditch and reestablishment of normal, natural conditions". In making this suggestion he does so assuming the ditch is of recent origin and not part of the original mission *acequia*. He suggests it would be a good WPA project.[60] Again, if this work was accomplished, it was removed at a later date, as no evidence for a "conductor" between the *acequia madre* and the floor of the mill race exists. A drainage tile was installed at the terminus of the mill race (see Figure 3-173) most likely to provide drainage for the race which was blocked off with a masonry wall, presumably in the 1950s. This latter drain has not been tested for integrity or ability to function properly.

It is curious to note that Neusbaum doubted the decision to restore the mill: "I have noted no mention of a flour mill in any document. However, in 1758, Governor Barrios specifically mentions 'the sugar mill.'" [Underlining appears in the original report.] Neusbaum mentions the presence of two "possibly three" masonry "bowls" immediately near the mill, which he mistakenly identified as "the pans, or receptacles for large copper kettles, used in evaporating and reducing sugar cane to syrup consistency, perhaps to the point of crystallization, in which case brown sugar would be the end product."[61] He maintains that the mill would have been a sugar mill instead of a grist mill, considering the proximity of these "evaporating bowls." These "evaporating bowls" are actually the lime kilns.

In his 1946-47 *Annual Report* for the Mission San Jose National Historic Site (NHS), Region Three's regional archeologist Erik K. Reed reported concerning the mill that "Both the structure and its restored furnishings were in good shape." He noted further that "erosion of the outlet ditch caused by runoff from the roof was beginning to undermine the north wall." To rectify this problem, he proposed closing off the center roof drain and enlarging the stone-and-cement catchment apron under the east drain. Agreeing with Neusbaum, Reed recommended, as the "best solution," running the drainage off the opposite side of the roof into the surge bowl, "but

[60]Initial Inspection Report, 1; *Of Various Magnificence*, Vol. 2, 217.

[61]Initial Inspection Report, 10.

this would require complete reworking of the roof."[62]

It appears that Reed's recommendation (to close off the center roof drain and enlarge the "stone-and-cement catchment apron under the east drain") was executed. One can observe subtle changes in the existing stonework at the center of the north elevation which suggests that a drain in this location was removed (refer to Figures 3-29 through 3-35 and discussion in Chapter 3). The "catchment apron" can be viewed in Figure 3-32, directly under the now-closed-off drain at the northeast corner of the building. As noted above, however, this eastern drain was removed during the late 1960s/early 1970s re-roofing project at the mill.

Concerning the mill stones, apparently Neusbaum "had questioned the authenticity of the mill works: 'Mrs. Harris informed me, on inquiry, that the present worn mill stones were obtained elsewhere, as there were none found near the site.' This is an exception, he said, 'to customary conditions where worn out and broken mill stones are usually in evidence about flour mill sites.'"[63] It has been determined that the two stones installed in the 1930s restoration, are indeed, *not* "The burrstone used in the original mill . . ." which ". . . was unearthed in a ditch near the structure."[64] See discussion in Chapter 3.

Excavation of two lime kilns (incorrectly identified as locations for sugar reducing pans by Neusbaum in his 1942 annual report) occurred at the same time as the excavations for the mill (1933-34). These features were stabilized, and apparently also had a wooden shed roof over them. A topographic map produced for the National Park Service's former Region Three Office in Santa Fe (Figure 3-5) indicates this "Shed." In his 1947-48 Annual Report (dated April 29, 1948) for the Mission San Jose National Historic Site (NHS), Region Three's regional archeologist Erik K. Reed described the need to protect the lime kilns:

> Adjacent to and on the north side of the mill are two partly subterranean conical structures approximately four feet in diameter and height. Mrs. Harris requested advice as to ways of protecting these structures. It was suggested that a low shed roof be constructed over them, covered with composition roofing, and the roofing extended into the ground on the back to form a damp-proofing membrane. The structures are apparently of very friable material and would be difficult to restore or stabilize.[65]

In 1950, it was reported that a shelter of palm leaves and logs (instead of composition roofing as suggested by Reed) to protect the lime kilns on the northwest side of the restored mill was

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[62] "Annual Report, San José Mission National Historic Site," 1946-47, NPS; *Of Various Magnificence*, Vol. Two, 217.

[63] *Of Various Magnificence*, Vol. Two, 192.

[64] "Long Forgotten Mill Restored," *The San Antonio Light*, Vol. LVIII, No. 58, Friday March 18, 1938, DRT Library, Schuchard Collection, File V.

[65] *Of Various Magnificence*, 2: 221-222.

built under the direction of Norfleet Bone, Landscape Architect for the Texas State Parks Board.[66] Attached to the "Annual Report for 1949-50" (dated April 7, 1950) is a photograph of the completed shed roof (see Figure 2-55). Figure 2-56, taken shortly thereafter shows the same detailing. Extant evidence disclosed for the purposes of this report (Figures 3-133 through 3-139) detail remnants of this thatched roof and its construction. A portion of the roof is also visible in Figure 2-57.

During further excavations near the mill in 1949, yet another discovery was made. "A small bin-like structure believed to have been a tanning vat has been excavated east of the mill." Restoration of the structure was being considered. However, Harvey H. Cornell, National Park Service Region Three Regional Landscape Architect suggested, upon further consideration, that it should be ". . . sheltered for protection and preserved, modified as an exhibit with an explanatory label and restoration drawing, or else the original backfilled and a replica-plus-restoration built beside it separately."[67] No mention was made of the need for further research to confirm the structure as truly being a tanning vat. To date, documents from the Spanish colonial period do not indicate tanning took place, and no inventory mentions a tanning vat.

In the NPS Region Three *Annual Report* for 1949-1950 a tanning vat is mentioned, this time without qualification.[68] Not only was the structure unqualifiedly referred to as a "tanning vat," but was perceived as being in need of interpretive attention. The "tanning vat" and sheltered nearby pits were in need of interpretation and it was suggested that a full scale restoration be carried out if it could be done with authenticity and accuracy.[69] The references to the structure east of the mill as a "tanning vat" most likely started with Smith's identification in the 1930s. There is no information corroborating this assumption, however. Additional studies or testing of the extant mortar might disclose microscopic remnants of either sugar or tannin, closing the argument on this case. These analyses are beyond the scope of this report.

In their annual report for April 7, 1950, Carl W. Alleman, Landscape Architect, and Erik Reed noted concerning the tanning vat "poor drainage allows water to stand in the tanning vat, causing damage to this recently excavated feature. The installation of a drainage tile was suggested as a solution to the problem of keeping this an exhibit rather than backfilling it."[70] This recommendation was installed presumably at this time, and exists today, with its terminus into the mill race (see Figure 3-143). The drain was located in the archeology performed in 1974 (see Figure 3-162). This requires attention, however, as it constantly fills with silt and debris. It is currently clogged.

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[66]Carl W. Alleman, and Erik K. Reed, "Annual Report for 1949-50 on San Jose Mission National Historic Site," (Santa Fe: National Park Service), 2.

[67]Harvey H. Cornell, and Erik K. Reed, "Annual Report, 1948-49", 2.

[68]Carl W. Alleman, and Erik K. Reed, "Annual Report for 1949-50," 4.

[69]Erik K.Reed, "Annual Report, 1950-51," 6.

[70]Carl W. Alleman, and Erik K. Reed, "Annual Report, 1940-50," 4.

Reed's 1950-1951 annual report stated: "The foot-bridge over the shallow ditch approaching the restored mill is being repaired, with a cement slab being poured. This job was nearing completion on April 26."[71] If this work was accomplished, it has been removed more recently and re-accomplished with wooden planks, that exist as of this writing. Concerning the tanning vat the same year Reed noted, "the tanning vat needs interpretive development of some kind, to have any value and meaning to visitors; a restoration model or drawing, or possibly full-scale restoration in place if that is considered permissible and can be justified for authenticity and accuracy."[72] His 1965 annual report reiterated this, and was supported by Ethel Harris; however, the work was apparently not accomplished, as no evidence to support it exists.

In the mid-1950s focus was on possibly restoring the tanning vat. It was reported that no change in the condition of the mill structure was evident.[73] In his report for 1956, Erik Reed, then Region Three Chief of Interpretation for the National Park Service in Santa Fe, New Mexico, once again referred to the tanning vat. A proposed interpretive project focusing on the tanning vat is discussed. "The only other specific interpretive project [the other being the prefecture where Mrs. Harris had lived until moving into the house built for her on the grounds outside the compound] under discussion at present is the possibility of a full restoration of the tanning vat excavated in 1949 close to the restored mill." Dr. Reed again refers to his 1951 report in which he had suggested interpretive development of some kind. "Mrs. Harris was for full restoration, no objection being made to this, and she planned to study the subject and prepare the necessary materials."[74]

Once completed, the mill appears to have been eclipsed by other projects from those in charge of interpretation. The final mention concerning the mill, other than the movement of the model,[75] was the passing reference in the annual reports to the mill's condition. The assessment of the mill structure remained unchanged according to the "Annual Report for 1965-66." However, the footbridge to it was found to be in bad condition, beyond repair and needing to be replaced.[76] This condition evidently was acute enough to be mentioned in a memorandum dated July 21, 1966 to the Director of the National Park Service from Research Archeologist Erik Reed "Regarding the San Jose Mission Board Meeting." In this memorandum Dr. Reed refers to his "Annual Report" and comments that the footbridge to the mill is "dangerously unstable" and needs to be remedied quickly.[77] It appears Dr. Reed's admonitions were taken

[71]Erik K. Reed, "Annual Report, 1950-51," 4.

[72]Erik K. Reed, "Annual Report, 1965-66," 4.

[73]Erik K. Reed, "Annual Report, 1955-56," 5-6.

[74]Erik K. Reed, "Annual Report for 1955-56," 4-5. Information appearing in the quotation in brackets does not appear in the original report and is added here for clarity; "Annual Report for 1950-51," 6.

[75]Erik K. Reed, "Annual Report, 1962-63," 2.

[76]Erik K. Reed, "Annual Report, 1965-66," 1.

[77]Memorandum, Erik Reed to Director of the National Park Service, 22 July, 1966, with the Annual Reports, Special Library, San Antonio Missions National Historical Park.

seriously, for by the report for 1966-67, Thomas R. Jones refers to Reed's comments concerning the footbridge and reports that it had been repaired.[78]

Several photographs were located at the offices of Texas Parks and Wildlife in Austin and in the park archives, the former dated March 1979, the latter 1981. A few of these (Figures 2-58 through 2-74) are included at the end of this chapter to show comparisons to the existing conditions observed in 1996 (Chapter 3).

In *Of Various Magnificence*, Volume 2, "Recommendation for Management," the Mill and Millrace, Lime Kilns, and Tanning Vat and Acequia Madre were all deemed to be of Level II significance with recommended treatment of preservation through cyclic maintenance.[79]

[78]Thomas R. Jones, "Annual Report, 1966-67," 3.

[79]*Of Various Magnificence*, Vol. 2: 382-383.

Figure 2-1 Summer 1953. Dr. Paul Czibesz and his son looking into the forebay near the sluice gate. *San Antonio Express Magazine*, September 6, 1953. Photo reprinted by permission of the *San Antonio Express-News*. Copy courtesy of the Daughters of the Republic of Texas Library. Note the sluice gate and arm.

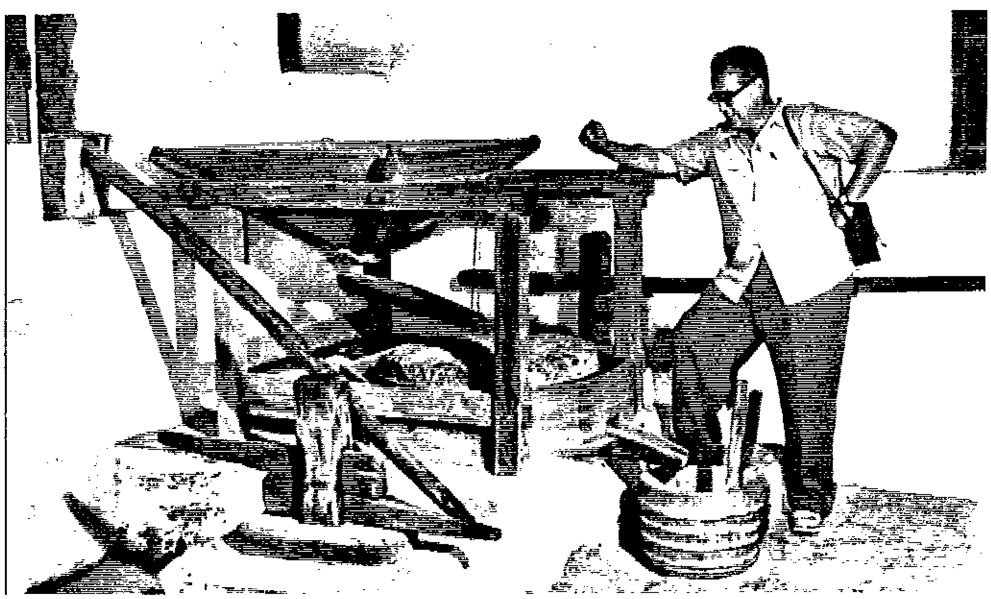


Figure 2-2 Summer 1953. Dr. Czibesz examines the milling apparatus. *San Antonio Express Magazine*, September 6, 1953. Photo reprinted by permission of the *San Antonio Express-News*. Copy courtesy of the Daughters of the Republic of Texas Library. Note the large block of wood (notched) in the oblique opening for the forebay gate control arm.

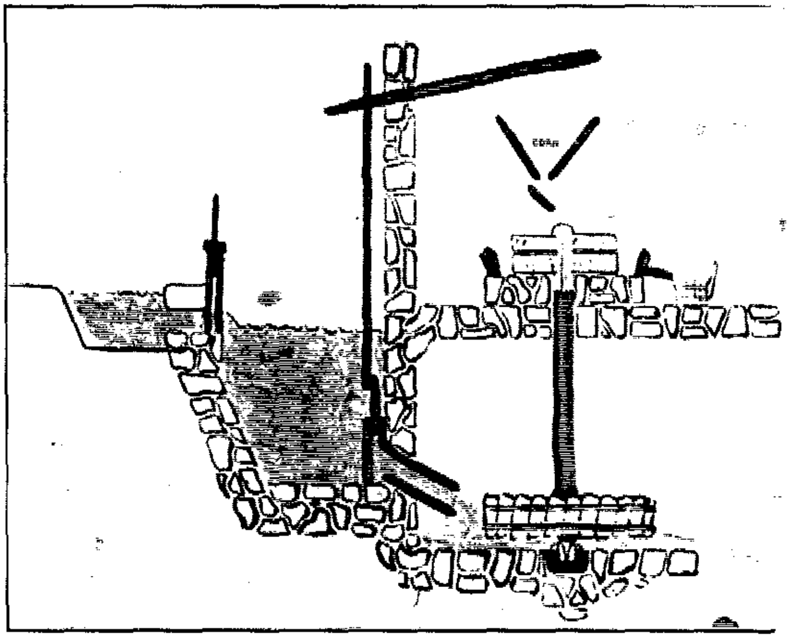


Figure 2-3 Simplified drawing of the mill's operation which appeared in the *San Antonio Express Magazine*, September 6, 1953. Photo reprinted by permission of the *San Antonio Express-News*. Copy courtesy of the Daughters of the Republic of Texas Library. Compare this to a photograph of an old sign located in 1996 (Figure 2-75) which appears to be identical to this drawing.

Figure 2-4 Summer 1953. Dr. Paul Czibesz examines the blades of the water wheel. *San Antonio Express Magazine*, September 6, 1953. Photo reprinted by permission of the *San Antonio Express-News*. Copy courtesy of the Daughters of the Republic of Texas Library.

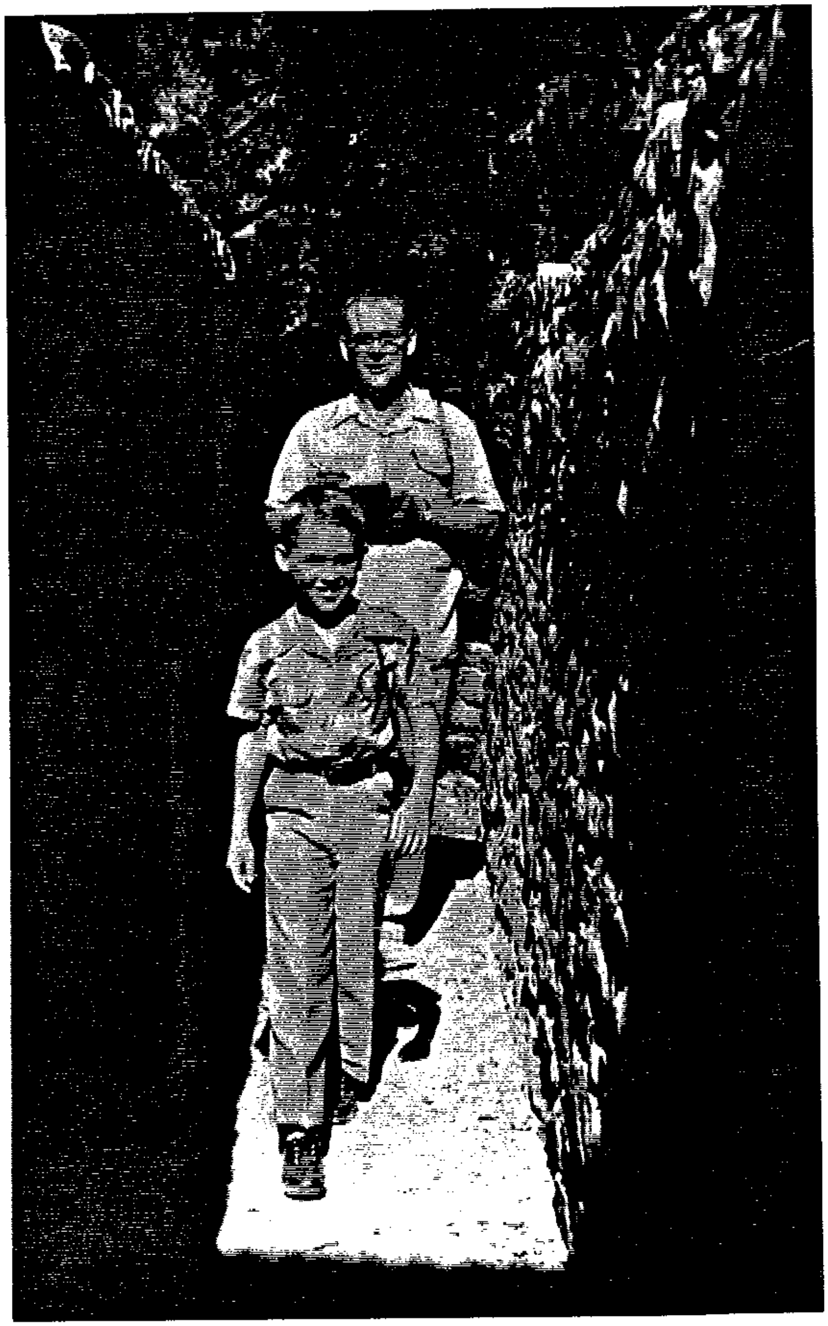


Figure 2-5 Summer 1953. Dr. Czibesz and his son in the restored mill race. *San Antonio Express Magazine*, September 6, 1953. Photo reprinted by permission of the *San Antonio Express-News*. Copy courtesy of the Daughters of the Republic of Texas Library.

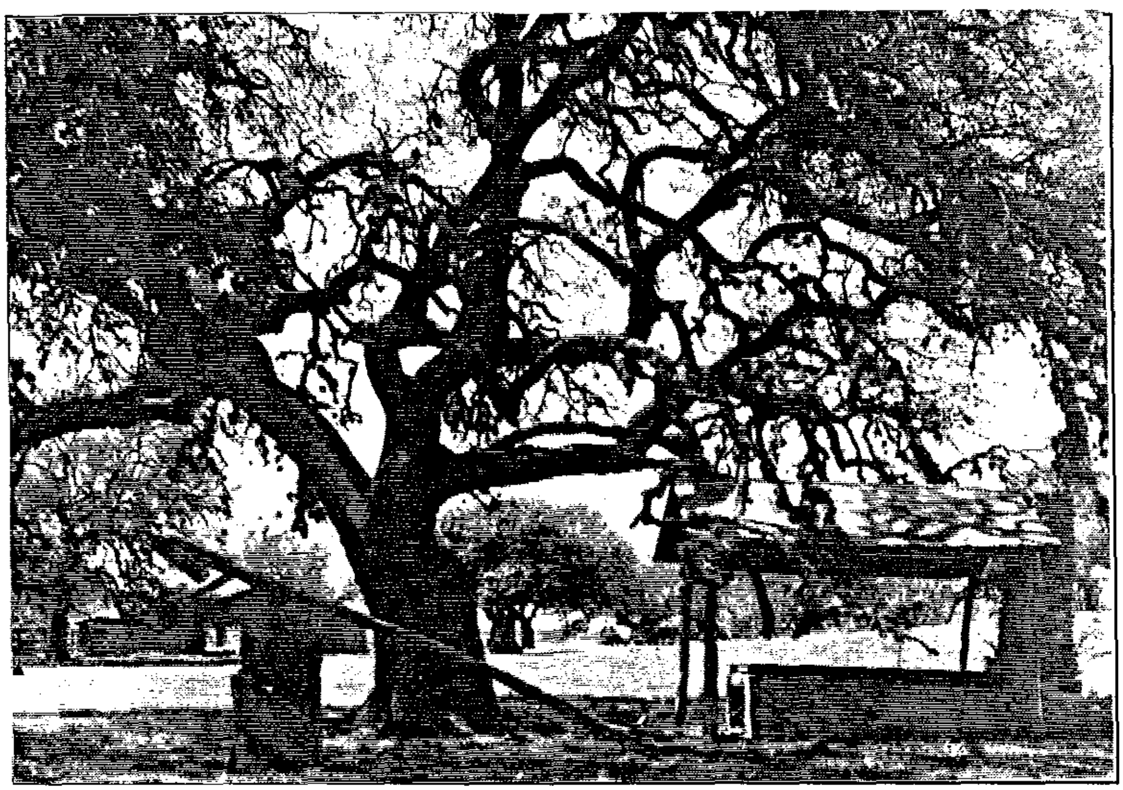


Figure 2-6 Date unknown. "General view of the sugar refinery (*ingenio*) near Buda, Texas, consisting of a metal mill (*trapiche*) [at the left of the photo with the long arm attached] and syrup cooker (*payla de cal y canto*)." (Figure 3 from Clark's "The Sugar Industry at Mission San José . . .," courtesy of the Texas Archeological Society).

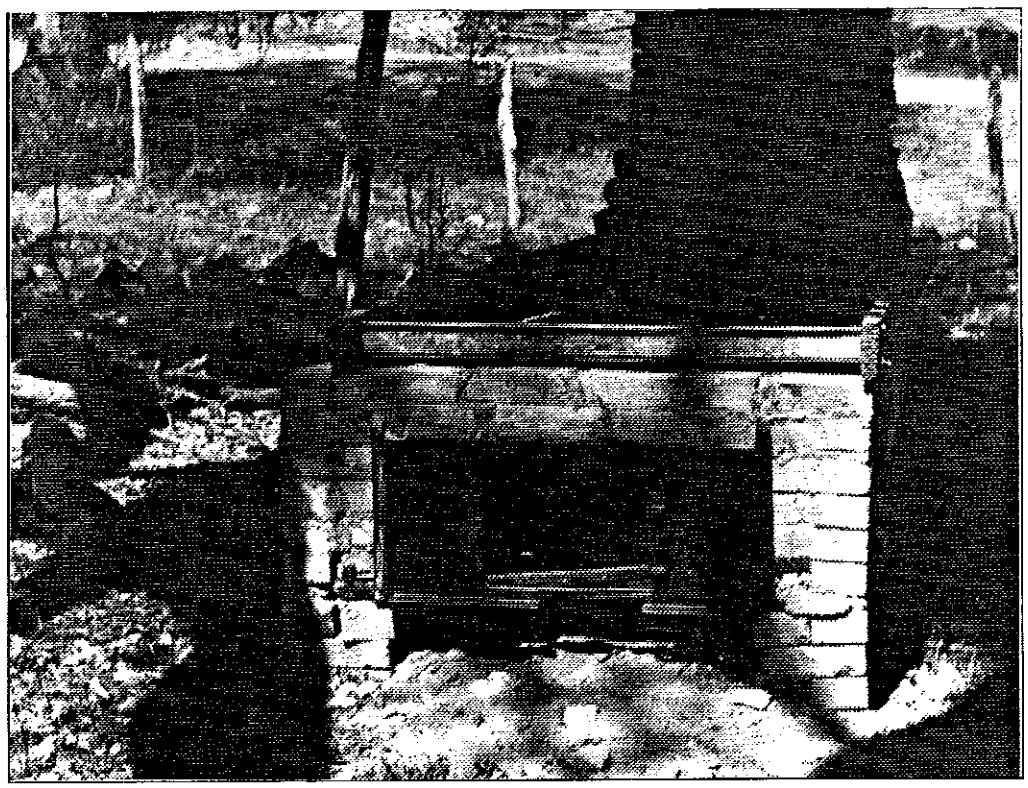


Figure 2-7 Date unknown. "A detail of the Buda refinery showing the iron grate, cast iron door and cooking vat on the top of the *payla de cal y canto.*" (Figure 4 from Clark's "The Sugar Industry at Mission San José . . .," courtesy of the Texas Archeological Society).

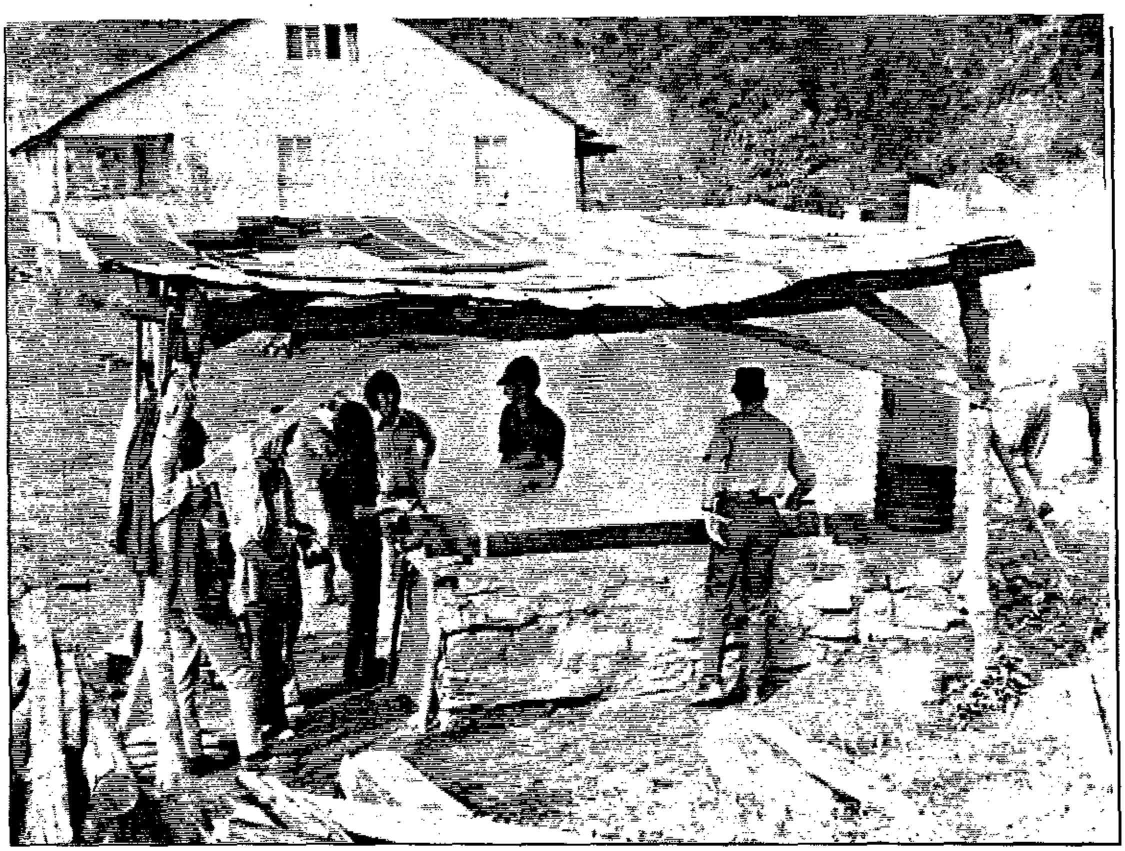


Figure 2-8 Date unknown. "Cooking the juice of the cane and skimming off the foam in a *payla de cal y canto* near Rabun Gap, Georgia." (Figure 7 from Clark's "The Sugar Industry at Mission San José . . .," courtesy of the Texas Archeological Society).

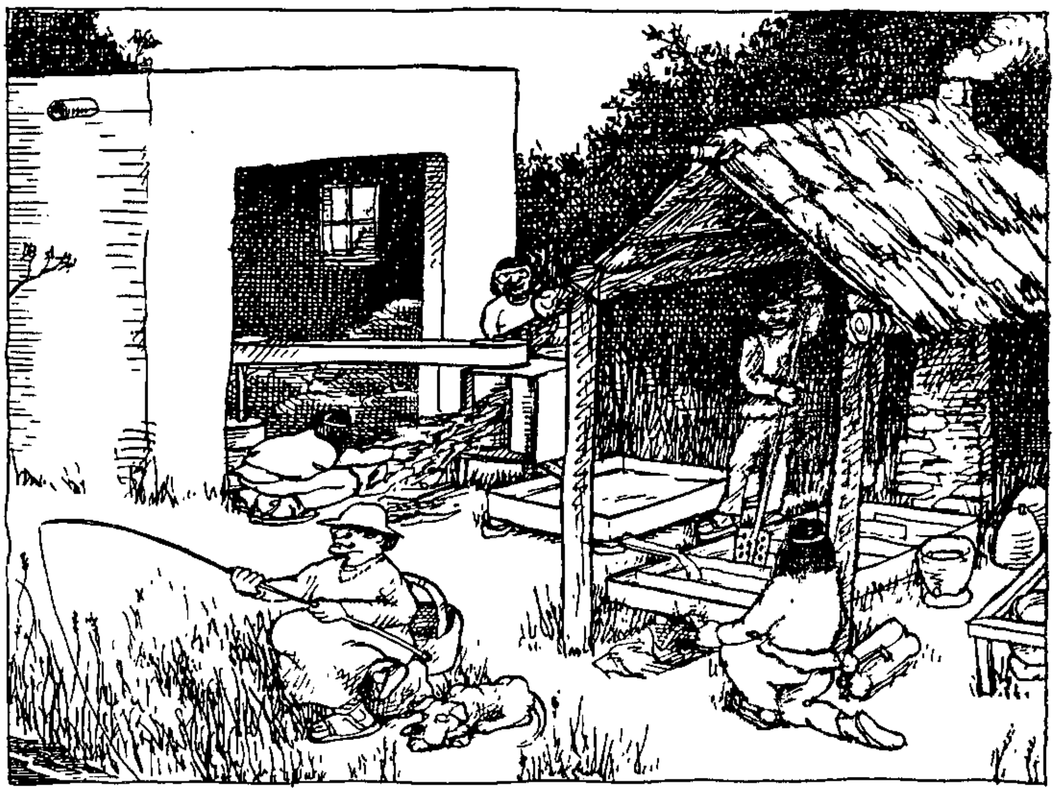


Figure 2-9 1976. "Hypothetical reconstruction of the *ingenio de azucar* at San José Mission as it might have appeared in 1794. Drawing by Jim Bonar." (From Clark's "The Sugar Industry at Mission San José . . .," courtesy of the Texas Archeological Society).

FIGURE 9.

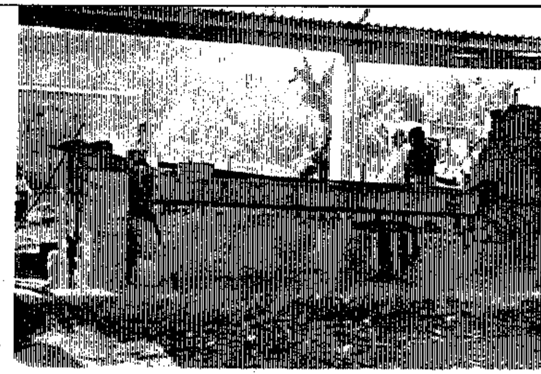


FIGURE 10.

FIGURE 11.

FIGURE 9. *The Ingenio de Azúcar at Bustamante, N.L., Mexico demonstrates the semi-subterranean nature of the structures.*

FIGURE 10. *The refining process begins with the initial cooking of the sugar cane juice cooked in this large rectangular vat.*

FIGURE 11. *After preliminary cooking the syrup is reduced to caramel in this device consisting of a rectangular firebox and circular support for a large copper caldron.*

Figure 2-10 Date unknown. The process of sugar refining in steps. (From Clark's "The Sugar Industry at Mission San José . . .," courtesy of the Texas Archeological Society).

Figure 2-11 (Facing Page) ca. 1794-1796. One page from "Estado de las Misiones" (State of the Missions), from which the reference on page 2-4 was taken (see Appendix H for the entire transcription, and Appendix I for the translation of the underlined phrase)--underline by authors.

endo que hallanme [illegible] ganados [illegible] les quitaban [illegible] asaltan allí los Enemigos, y matan á los Pastores, y Obejas ó desparramarse estas si las dexan vivas. No obstante, de las dos Misiones que tienen esta especie de Ganado, la una mantiene de 300 a 400 Cabezas, y la otra cerca de 50.

En la Taraum.ª tienen muchos Indios su pequeño Chinchorrito que cuidan ellos sin dependencia del Ministro, cuyas Lanas les sirven para hacer sus Mantas de que se cubren.

~~Beneficio de estas consiste en~~ Las siembras de estas se reducen á un poco de mayz que benefician los mismos Yndios en sus respectivas tierras para su manutencion, y una, ó dos fanegas que siembran de Comunidad para los gastos de Yglesia, y sustento del Ministro. Algunas Misiones siembran tamb.ⁿ frixol en poca cantidad y tienen sus Cortijos donde alzan sus Cañaberales para fabricar Piloncillo en las tierras calientes que hay en la Sierra madre. Este se expende en los Reales de Minas de la misma Sierra, ó lo sacan á vender á la Villa de Chiguagua, ó Parral, que es todo el comercio de aquellas tierras, como tamb.ⁿ los Mayzes que suelen sobrar de el del abasto. En la Prov.ª de Texas cada Mision siembra asimismo su Mayz segun las facultades de cada una. En unas se siembran tres, ó quatro, fanegas, y en otras hasta cinco, y todo de Comunidad y á cargo del Ministro porque allí no hay Yndio que tenga tierra por separado, ni que trabaje para mantenerse, á excepcion de uno ú otro que en las mismas labores de la Mision suelen sembrar cada año sus fanegas. En una Mision nombrada S.ⁿ Joseph se há abierto nuevam.ᵗᵉ una labor p.ª Trigo, de que se cosechó este año como 120. cargas, habiendo puesto en ella su Ministro un Molino que es el unico de toda la Prov.ª y q.ᵉ ha costado inmenso trabajo ... establecerla. En dos de ellas hay tambien sus cortos Cañaberales de que fabrican Piloncillo y en una ú otra se siembra tambien frixol para el gasto. Quando las Cosechas son buenas se suele vender el Mayz sobrante á la Habilitacion los años que no dán á basto los que alza el Vecindario de Bexar para suministro de la Tropa: y la Mision del Esp.ᵗᵘ Santo de la Bahia provee á aquel Presidio de Carnes, no teniendo siembra de Mayz por no ser propio el terreno para ello, de cuya semilla se habilita de las otras Misiones. El producto

Figure 2-12 (Facing Page) ca. 1792. Photocopy of the first page of the 1792 census (for a transcription of this page, see Appendix J). The entire transcription (7 pages) is available in the park library archives.

Mición de S. Jos. Jose [illegible] Villa de S. Fernando

[illegible] On 31 de Dic. de 1722.

— 1. José [illegible] Burcillas [illegible] de Edad de 45 a. Casado con [illegible] María, [illegible] de [illegible] 30 años

— 2. Fran.co Ancha, obrajero, de edad de 50 a. Casado con Bernardina Flor. de Edad de 42 a.

— 3. Pablo de Luna, [illegible] de Edad de 55 a. Casado con Teresa de la Garza de Edad de [illegible] [illegible] hijo de Edad de 12 a.

— 4. [illegible] Ramirez, de labrador, de Edad de [illegible] a. Viudo tiene 2 hijos barones el 1. de Edad de 16 a. y el otro de 10 a.

— 5. Juan de Marra, de Edad de 22 a. Casado con María Ramirez de Edad de 22 a.

— 6. Man.l Corrales de Edad de 50 a. Casado con Pasquala [illegible] de edad de 48 a.

— 7. [illegible] Carpintero de edad de 23 a. Casado con [illegible] de Edad de 28 a. [illegible] hijo de Edad de 2 a. y 1 Niña de 10 a.

— 8. [illegible] de Edad de 62 a. Viuda

— 9. [illegible], de Edad de 25 a. Viuda tiene dos hijos 1 de Edad de [illegible] a. y otro de [illegible] y Una Niña de Edad de 7 a.

— 10. [illegible] de Edad de 60 a. Casado con Josefa Villegas, de Edad de 22 a. Tiene [illegible] hijo de Edad de [illegible] y 2 Niñas la 1. de Edad de 14 a. y la otra de 6 a.

— 11. [illegible] Contreras, de edad de 25 a. Casado con María Antonia de la Cruz de edad de 18. tiene 1 niña de Edad de 5 a.

— 12. Jose Nuñez Obrajero de Edad de 22 a. Casado con Felipa Rodales de Edad de 18. Tiene 1 Niña de Edad de [illegible] a. y un niño de 1 año.

— 13. Pedro Salazar, Sastre, de edad de 22 Casado con [illegible] Corrales, de edad de 20 a.

— 14. Juag.n de Vazquez, de edad de 18 a. Casado con [illegible] de Edad de 23 a.

— 15. Roque Salazar de edad de 21 a. con María [illegible] Reside en los Adaes de Edad de 24 a.

— 16. Ygnacio Salas, de Edad de [illegible]

— 17. Vicente de la Cruz, de Edad de [illegible] a. Casado con [illegible] de edad de 17 a. tiene un hijo baron de edad de 10 meses.

— 18. [illegible] de edad de 17 a. tiene un hijo de edad de 11 meses.

— 19. Fulgencio Burcillas de edad de [illegible] [illegible]

— 20. Fran.co de la Garza de Edad de 23 a. Casado con Josefa [illegible]

Figure 2-13 (Facing Page) ca. 1794. Photocopy of the first page of the 1794 ration list for Mission San José (for a translated version of this page from the 1794 ration list see Appendix J).

1

Año de 1794

Noticia de las Raciones que se subministran a los Indios de este Pueblo de Sor S. Jose, de la cosecha de trigo, con seguida en el año corriente

Primera Semana 1a de Obre.

Familias	casad.		Solt.		viudas		Huerf.
Primeramte el Governador deste Pueblo y su esposa dos almudes	A 2	A	0	A	0	A	0 A
Ytt Joachin y su Muger dos almudes	A 2	A	0	A	0	A	0 A
Ytt Jose Gruñez y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Jose Antonio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Calleriano y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Joachin y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Jacobo y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Juan de Rey y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Manuel y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Antonio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Vizente y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Juan Ygnacio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Roque y su Muger dos alm.	A 2	A	0	A	0	A	0 0
Ytt Fulgencio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Pablo y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Juan y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Damacio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Jose Antonio y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Juan Maria y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Raphael y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Franco y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Jacinto y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Ytt Leon y su Muger dos alm.	A 2	A	0	A	0	A	0 A
Solteros							
Prim. Buenaventura un almud.	A 0	A	1	A	0	A	0 A
Ytt Gaspar un almud.	A 0	A	1	A	0	A	0 A
Ytt Enrrique un almud.	A 0	A	1	A	0	A	0 A
Va a la Buelta	A 4	A	7	A	0	A	0 A

Figure 2-14 (Facing Page) ca. 1934. Shot looking north from a high point (possibly the church) at Mission San José towards the north at the excavations taking place at the mill site. Note: 1) The large pile of rubble stone in the foreground ("A")--presumably stones brought in to accomplish the restoration of the mission; 2) The stairways at the center left of the photo ("B"), remnants of which were excavated in 1996 (see Chapter 3); 3) The apparent sharp drop-off toward the north ("C") indicating the conditions which existed earlier, making the location of the mill and its relation to historic farmlands north more plausible elevation-wise (to drain water from the mill, the fields would have to have been approximately 12 to 15 feet lower than the milling room; and 4) A ladder which most likely exist the forebay ("D").


C
D
A
B

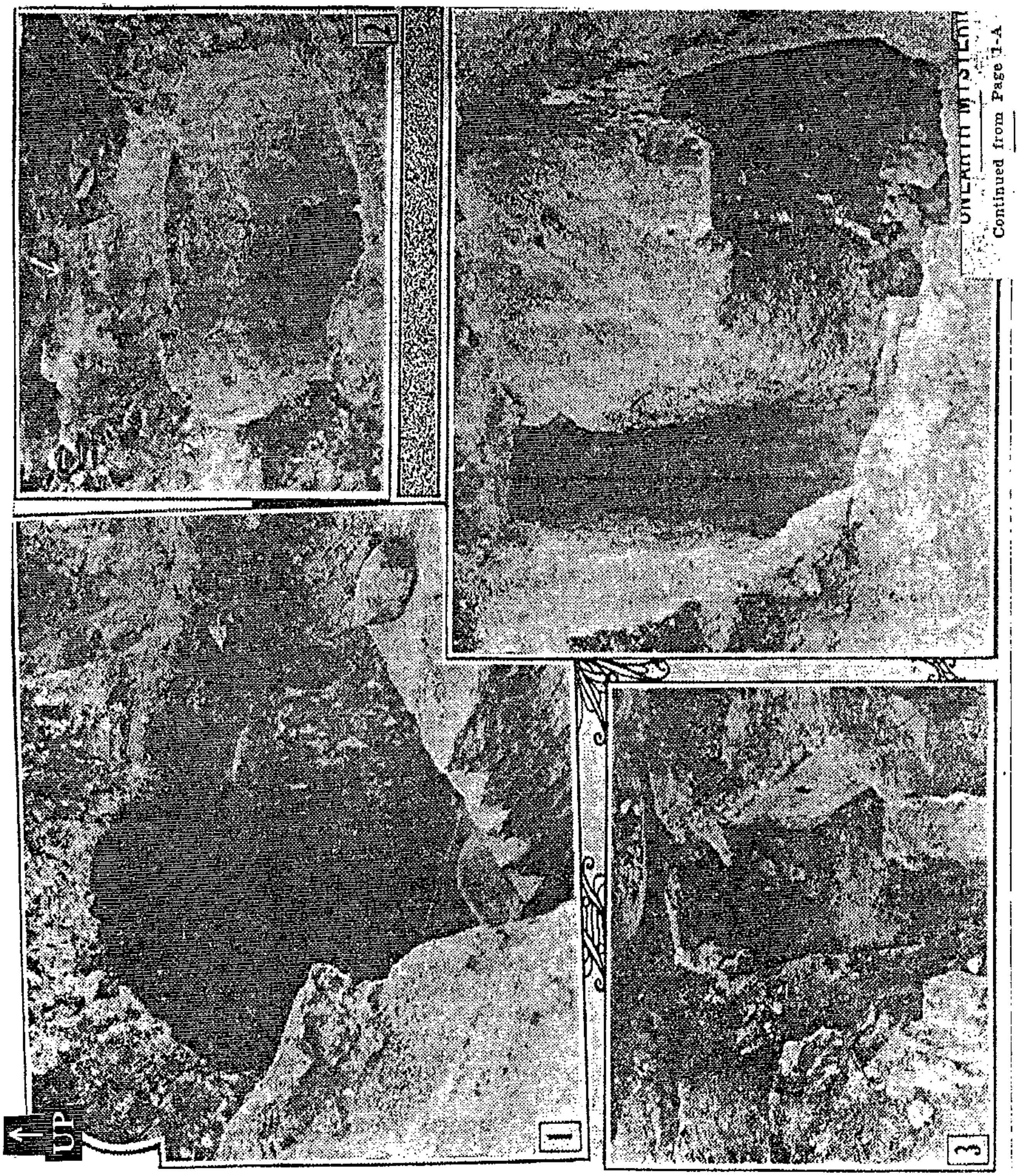


Figure 2-15 March 19, 1933. Photos which appeared in the *San Antonio Express* news article, "San Jose Mission Excavators Unearth Mysterious Room, Tunnel and Pits Bearing Evidences Expert Craftsmen." The reporter's description of these findings is amusing to read, since apparently at the time the story was written, its disclosure as the foundation for the Spanish colonial mill were unknown. Courtesy of the Daughters of the Republic of Texas Library.

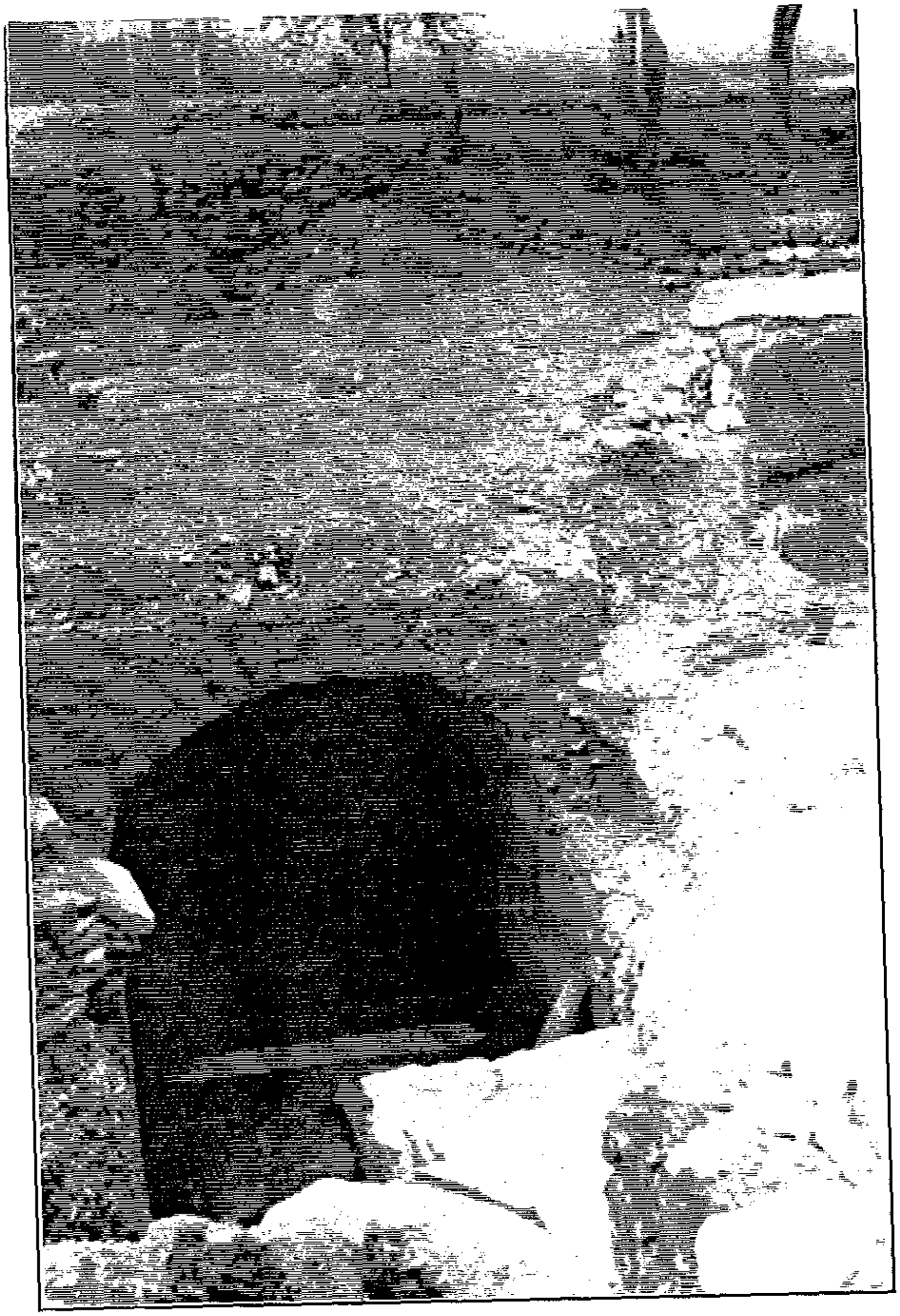


Figure 2-16 1934. Excavations at the mill site, looking south towards the wheel room. Courtesy of the Daughters of the Republic of Texas Library.

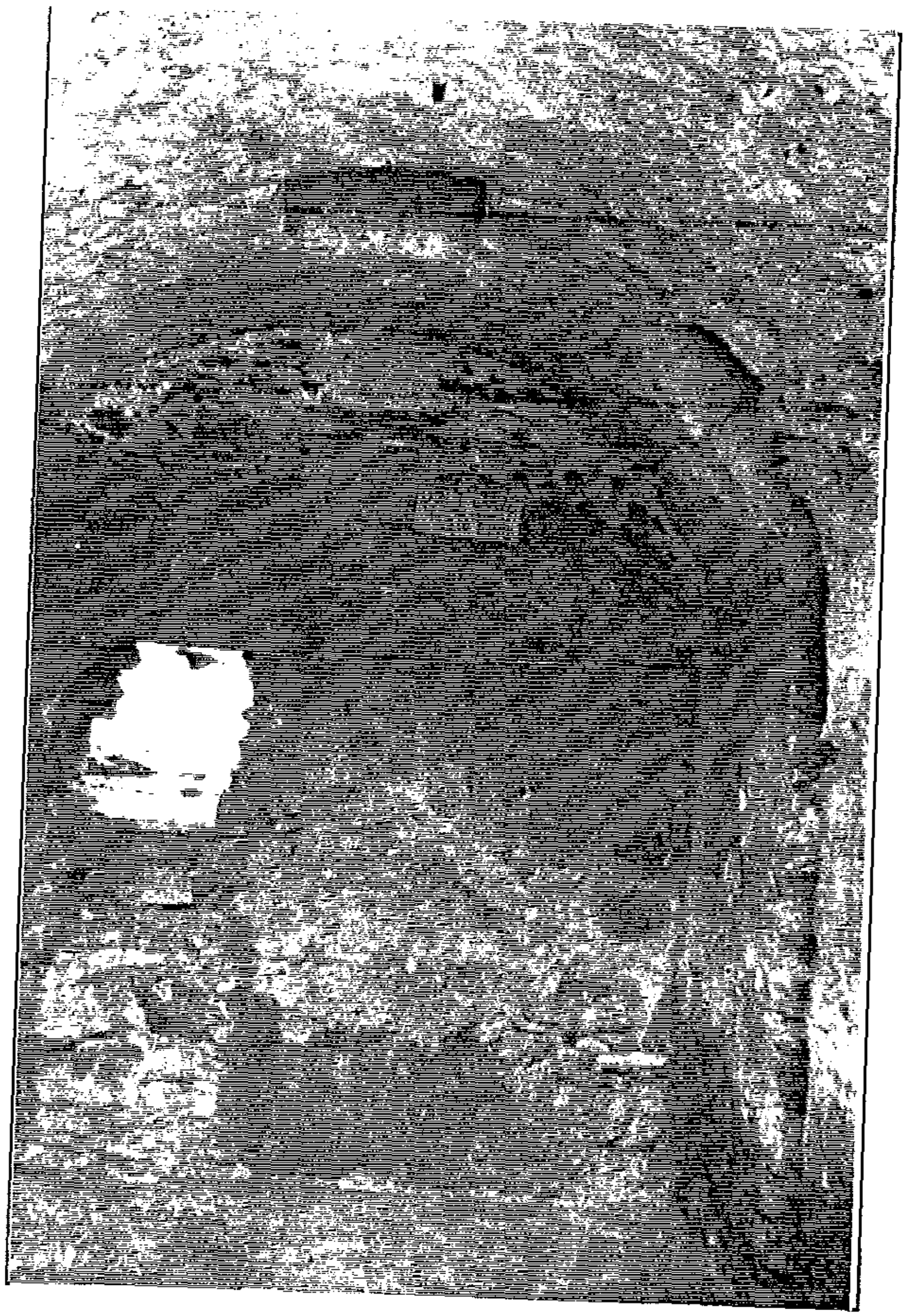


Figure 2-17 1934. (Looking south): The wheel room has been totally excavated revealing various holes and notches in the walls. The hole at the center left enters into the bottom of the forebay. A small sign at the center reads: "Don't carve on these walls, $25.00 fine." Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-18 ca. 1934. Excavations revealed the forebay and several walls, one of which is curved, immediately south of the forebay.

Figure 2-19 ca. 1934. The curved wall south of the forebay and a bank just beyond the striped pole are also visible.

Figure 2-20 ca. 1934. Standing at the approximate floor level of the milling room looking south. The forebay is at the upper center and the hole for the wheel shaft can be seen in the lower center.

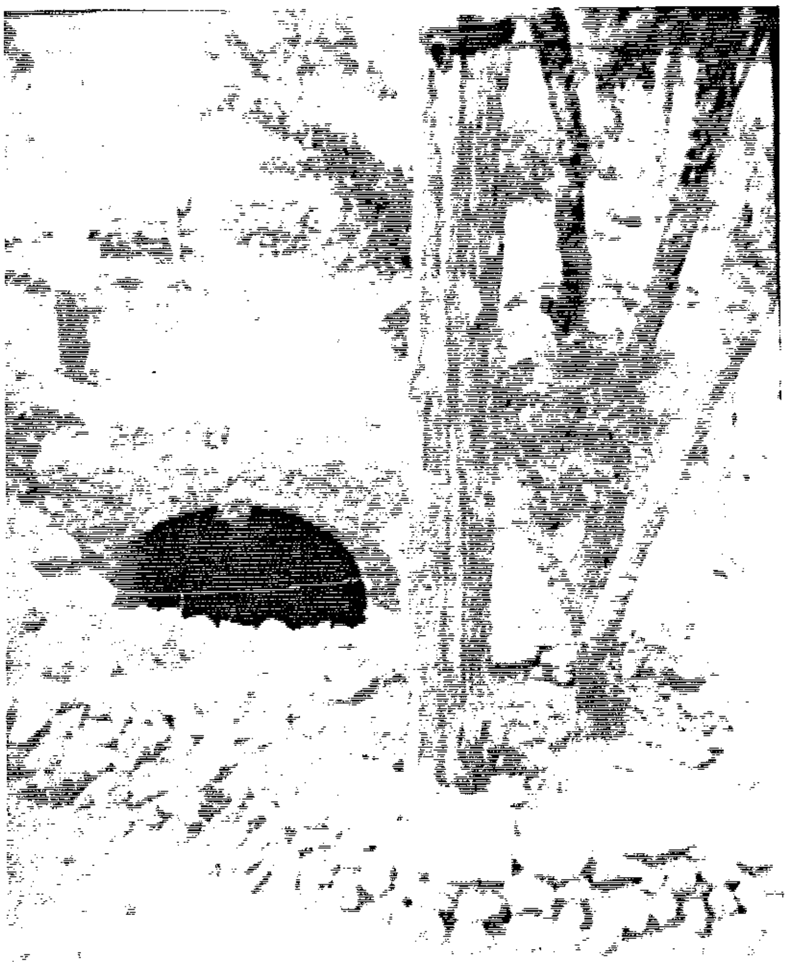


Figure 2-21 ca. 1934. Looking south towards the wheel room vault. Stacked stones line a walkway in the foreground.

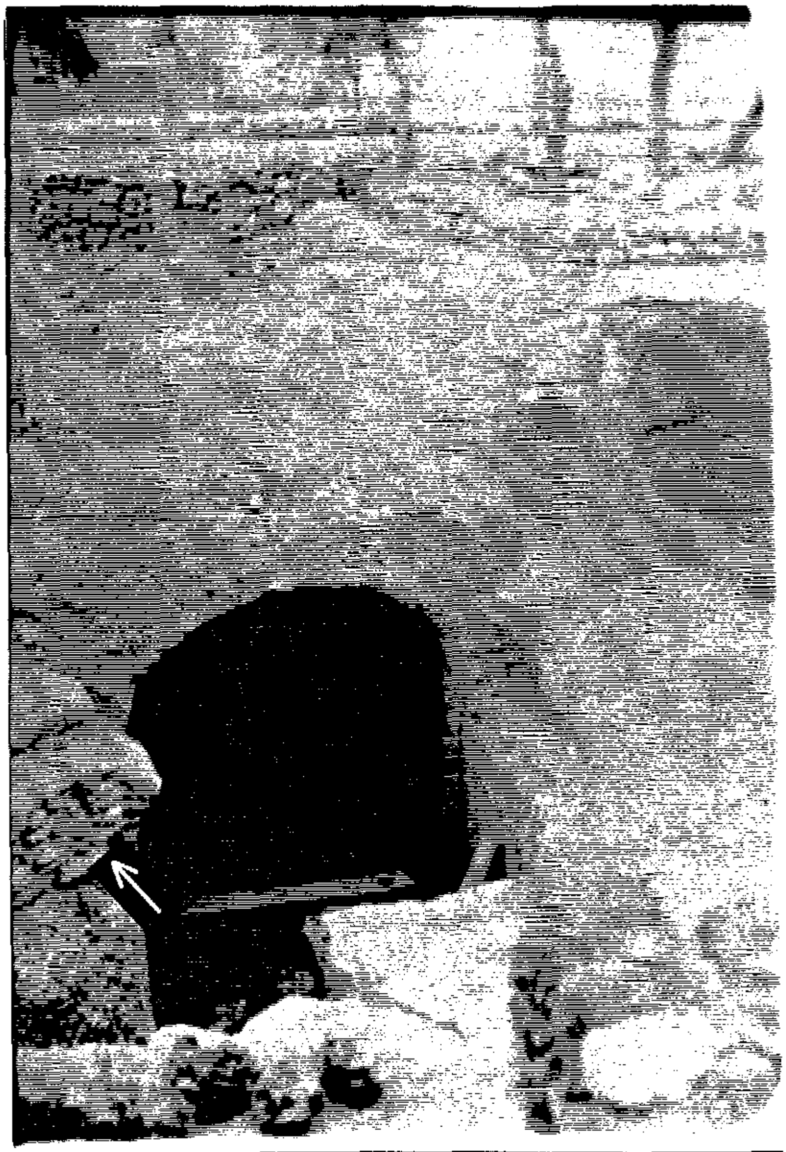


Figure 2-22 ca. 1934. Looking south toward the turbine room opening. A few stones from the mill race (presumably historic) can be seen at the lower left (arrow). The "tail" of the arrow appears to point to a wooden element approximately the shape of a bridge tree, however, this has not been documented.

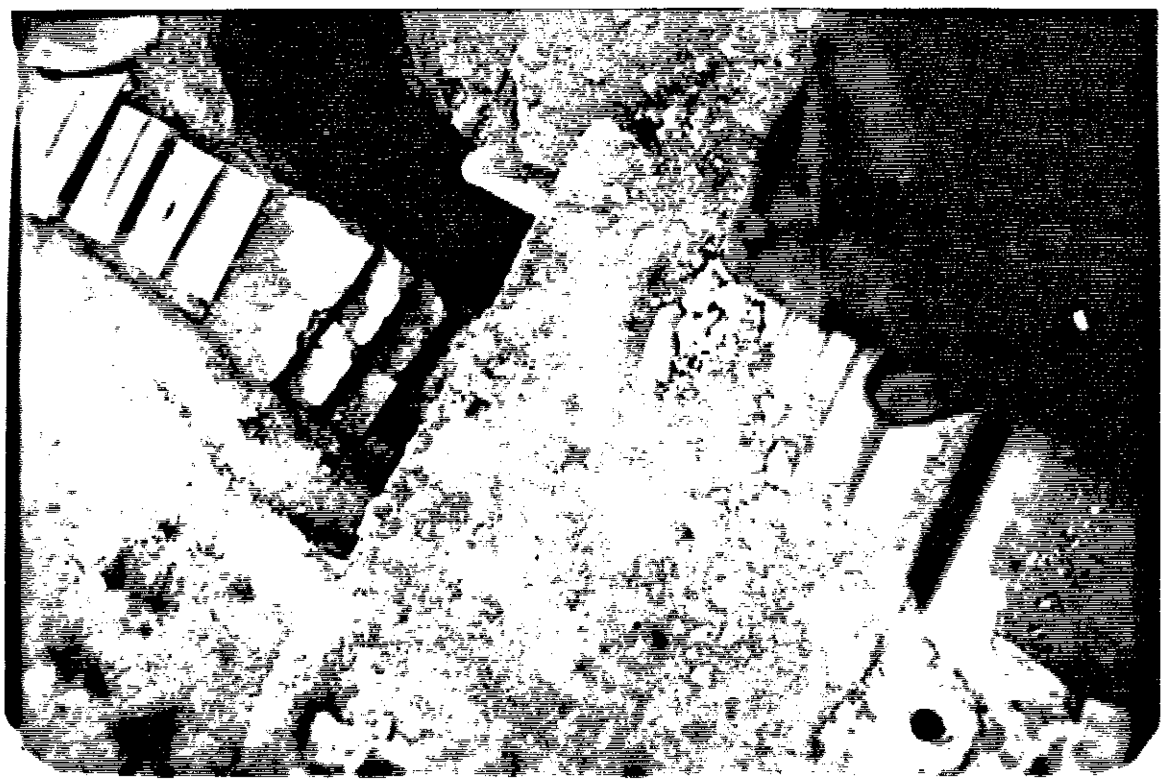


Figure 2-23 ca. 1934. Standing in the milling room looking roughly northeast. The hole for the shaft can be seen at the lower right, steps (both wooden and stone) are visible at the upper left.

Figure 2-24 ca. 1934. Looking down into the mill race, which has been totally excavated. The stone steps out of this lower area can be seen at the upper right, and the steps down into the wheel room at the lower left. Temporary wooden steps have been installed immediately above the stone steps.

Figure 2-25 ca. 1934. Another shot looking down toward the mill race. One of the lime kilns can be seen at the lower left.

Figure 2-26 (Facing page) February 27, 1933. Watercolor study of possible configuration of the San José mill produced by Ernst Schuchard. Note the flat blades of the mill wheel, flume for "spent" water, wooden mill stones table, and wooden platform atop which stands a man pouring grist into a suspended hopper. Courtesy of the Texas Chapter of the Colonial Dames of America.

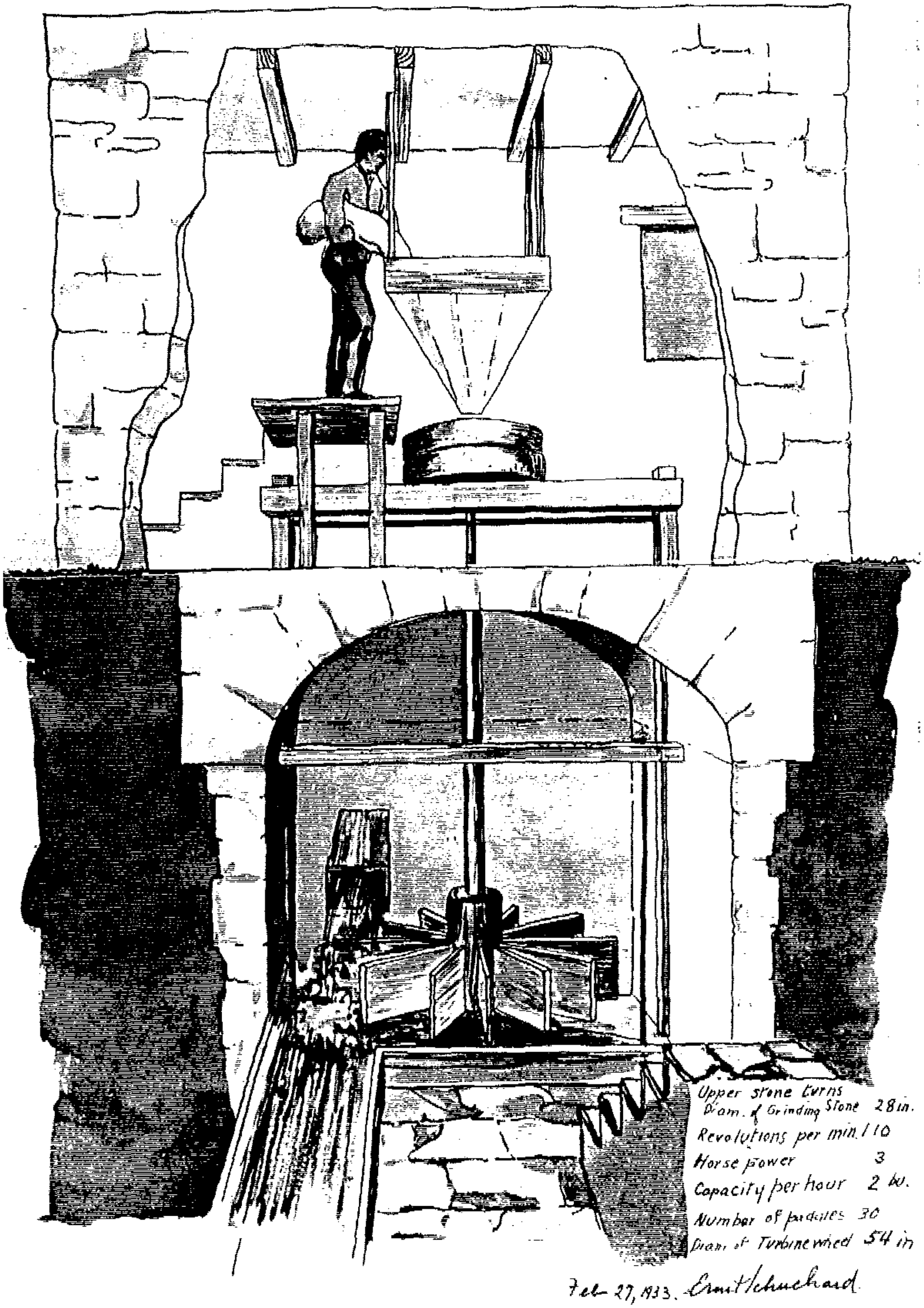

Upper stone turns
Diam. of Grinding Stone 28 in.
Revolutions per min. 110
Horse power 3
Capacity per hour 2 bu.
Number of paddles 30
Diam. of Turbine wheel 54 in
Feb 27, 1933.

Figure 2-27 (Facing Page) July 1935. Overall view of the completed excavations. Courtesy of the Daughters of the Republic of Texas Library.

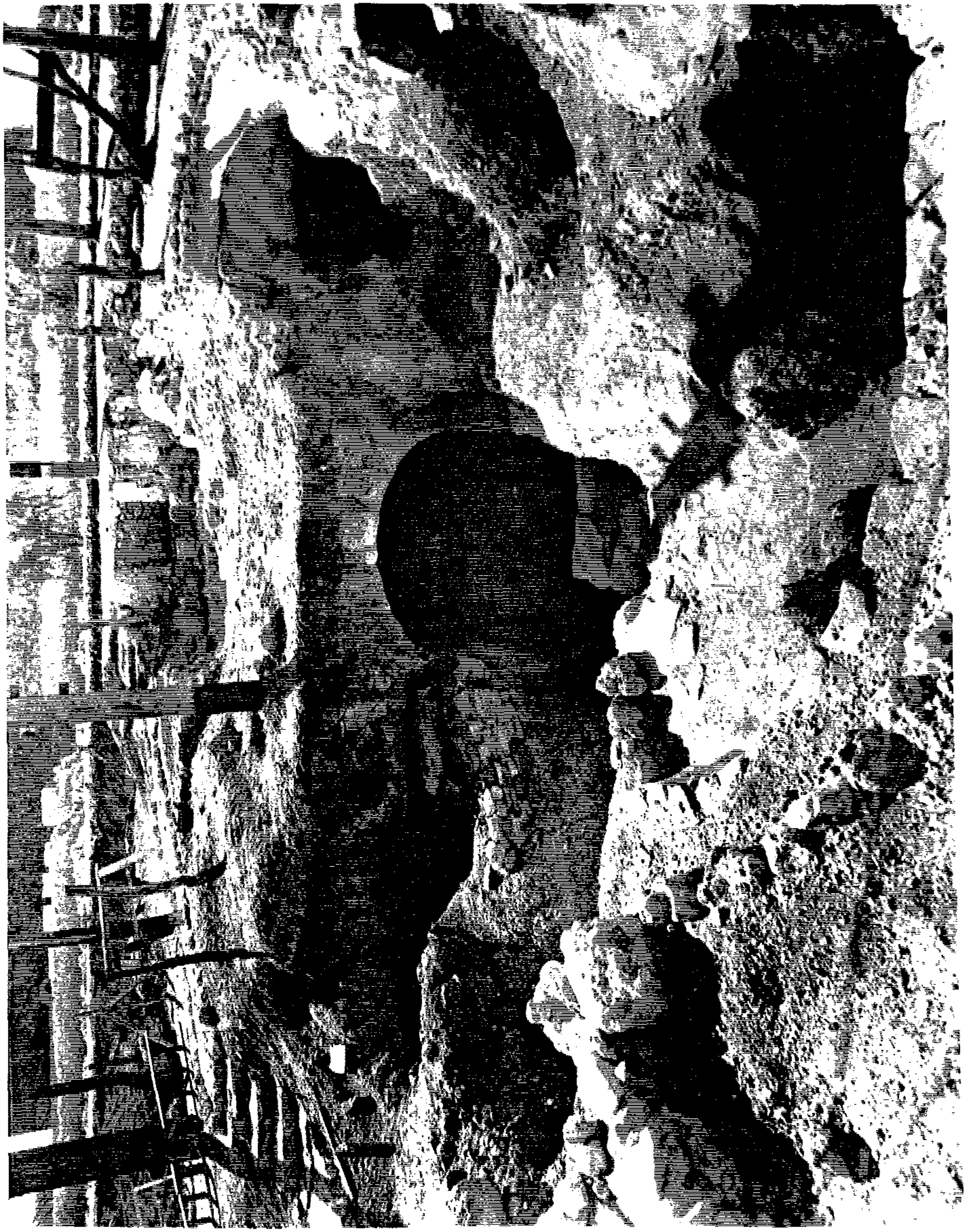


Figure 2-28 (Facing Page) July 1935. Overall view of the completed excavations. Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-29 (Fold-out, following) 1934. Watercolor produced by Ernst Schuchard showing measured dimensions of the mill excavations, calculations, and designs for an apparent restoration. Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-30 (Fold-out, following) Not dated. "Measured Drawings of Mill, Mission San Jose de Aguayo, San Antonio, Texas." Office of Harvey P. Smith, AIA, Architect. This drawing shows measurements taken at the site of the newly discovered mill in the mid-1930s.

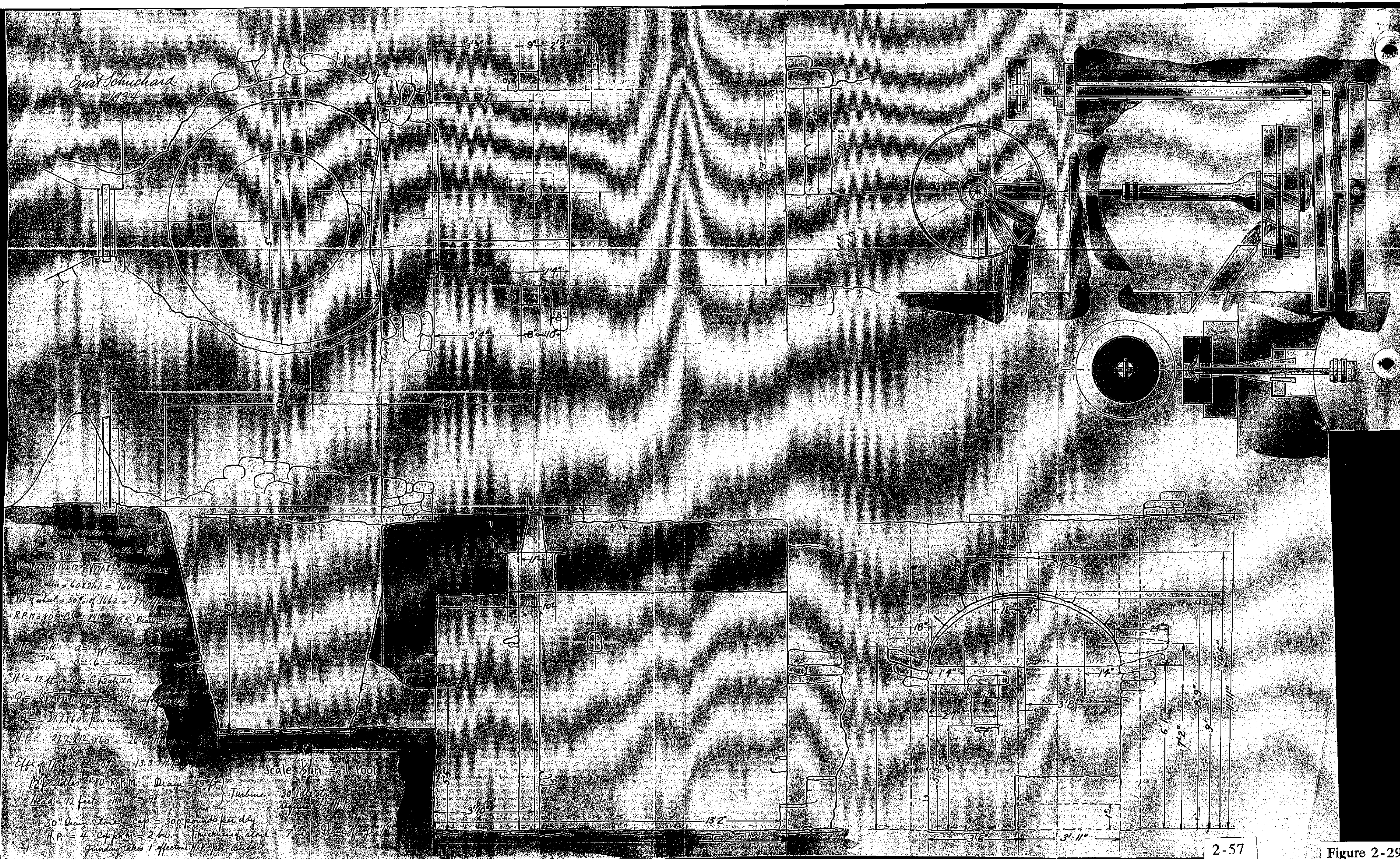

Ernst Schuchard
1934
Scale 1/2 in = 1 foot
Eff of Turbine = 50% = 13.3 H.P.
12 paddles 80 R.P.M. Diam = 5 ft
Head = 12 feet H.P. = 9
Turbine
30" Diam Stone cap. = 300 pounds per day
H.P. = 4 Cap per hr = 2 bu. Thickness of stone = 7 in
Grinding takes 1 effective H.P. per Bushel.

Figure 2-29

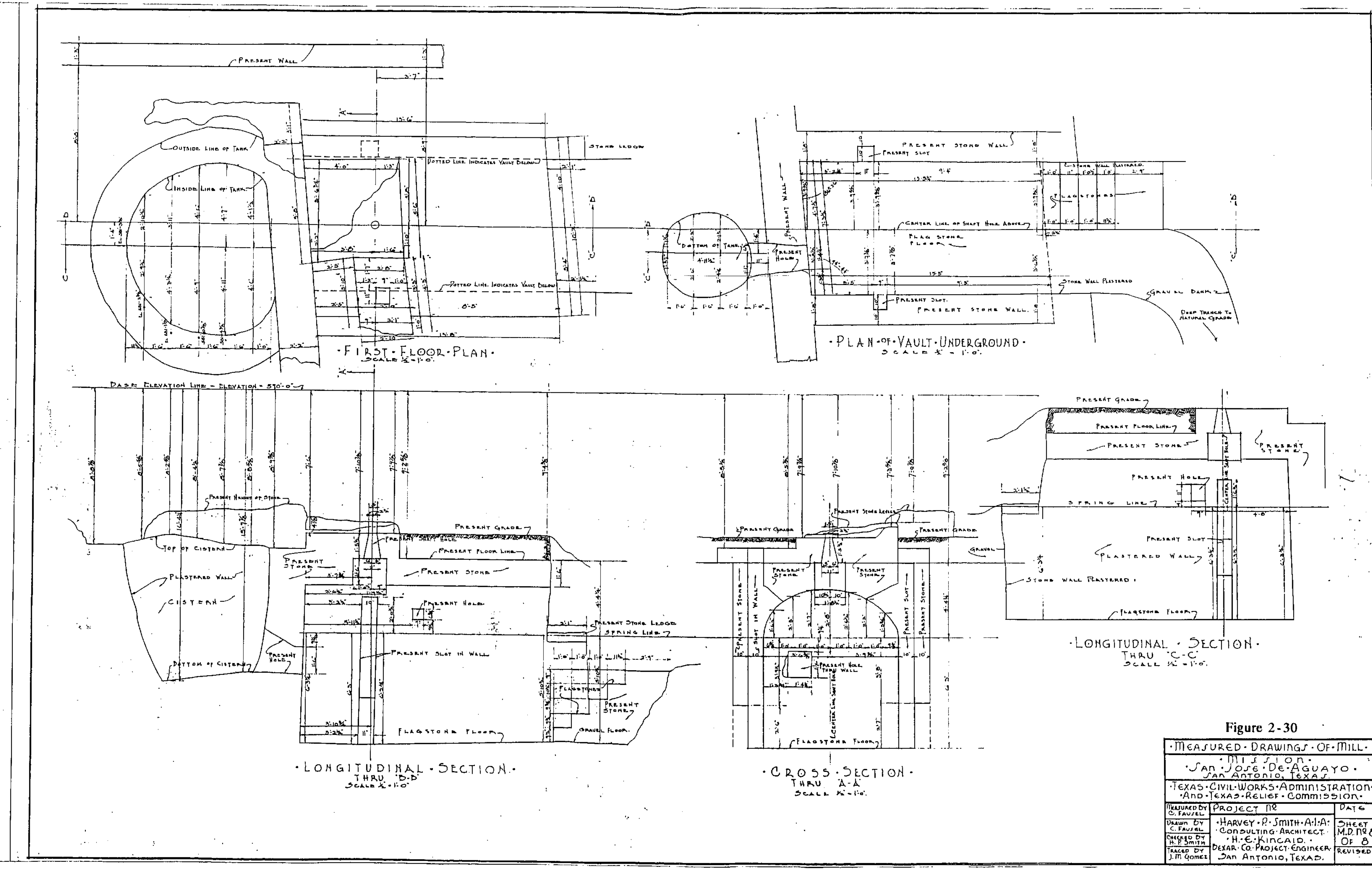

·FIRST·FLOOR·PLAN·
SCALE ¼"=1'-0"
·PLAN·OF·VAULT·UNDERGROUND·
SCALE ¼"=1'-0"
·LONGITUDINAL·SECTION·
THRU "D-D"
SCALE ¼"=1'-0"
·CROSS·SECTION·
THRU "A-A"
SCALE ¼"=1'-0"
·LONGITUDINAL·SECTION·
THRU "C-C"
SCALE ¼"=1'-0"
PRESENT WALL
OUTSIDE LINE OF TANK
INSIDE LINE OF TANK
DOTTED LINE INDICATES VAULT BELOW
STONE LEDGE
PRESENT STONE WALL
PRESENT SLOT
CENTER LINE OF SHAFT HOLE ABOVE
FLAG STONE FLOOR
BOTTOM OF TANK
PRESENT HOLE
STONE WALL PLASTERED
GRAVEL BANK
DEEP TRENCH TO NATURAL GRADE
DASH ELEVATION LINE - ELEVATION - 570'-0"
PRESENT HEIGHT OF STONE
TOP OF CISTERN
PLASTERED WALL
CISTERN
BOTTOM OF CISTERN
PRESENT GRADE
PRESENT SHAFT HOLE
PRESENT FLOOR LINE
PRESENT STONE
PRESENT HOLE
PRESENT STONE LEDGE
SPRING LINE
PRESENT SLOT IN WALL
FLAGSTONE FLOOR
GRAVEL FLOOR
SPRING LINE
·MEASURED·DRAWINGS·OF·MILL·
·MISSION·
·SAN·JOSE·DE·AGUAYO·
SAN ANTONIO, TEXAS.
·TEXAS·CIVIL·WORKS·ADMINISTRATION·
·AND·TEXAS·RELIEF·COMMISSION·
MEASURED BY C. FAUSEL
DRAWN BY C. FAUSEL
CHECKED BY H. P. SMITH
TRACED BY J. M. GOMEZ
PROJECT Nº
DATE
·HARVEY·P·SMITH·A·I·A·
·CONSULTING·ARCHITECT·
·H·E·KINCAID·
BEXAR·CO·PROJECT·ENGINEER·
SAN ANTONIO, TEXAS.
SHEET M.D. Nº 8 OF 8
REVISED.

Figure 2-30

Figure 2-31 March 22, 1936. *San Antonio Light* photo which accompanied the article, "Aid in Restoring Old Mill." The caption read: "Mrs. Conn L. Milburn, left, Erhard Guenther and Mrs. J.K. Beretta taken at the San Jose Mission where work was inaugurated on the restoration of the old mill by the Conservation society. Mrs. Beretta, in Centennial costume, presented the society with a check from the Colonial Dames for the rock work and Mr. Guenther promised to restore the machinery. Mrs Milburn is chairman of the Mission committee. It is hoped to have the mill in operation soon." Courtesy of the Daughters of the Republic of Texas Library.

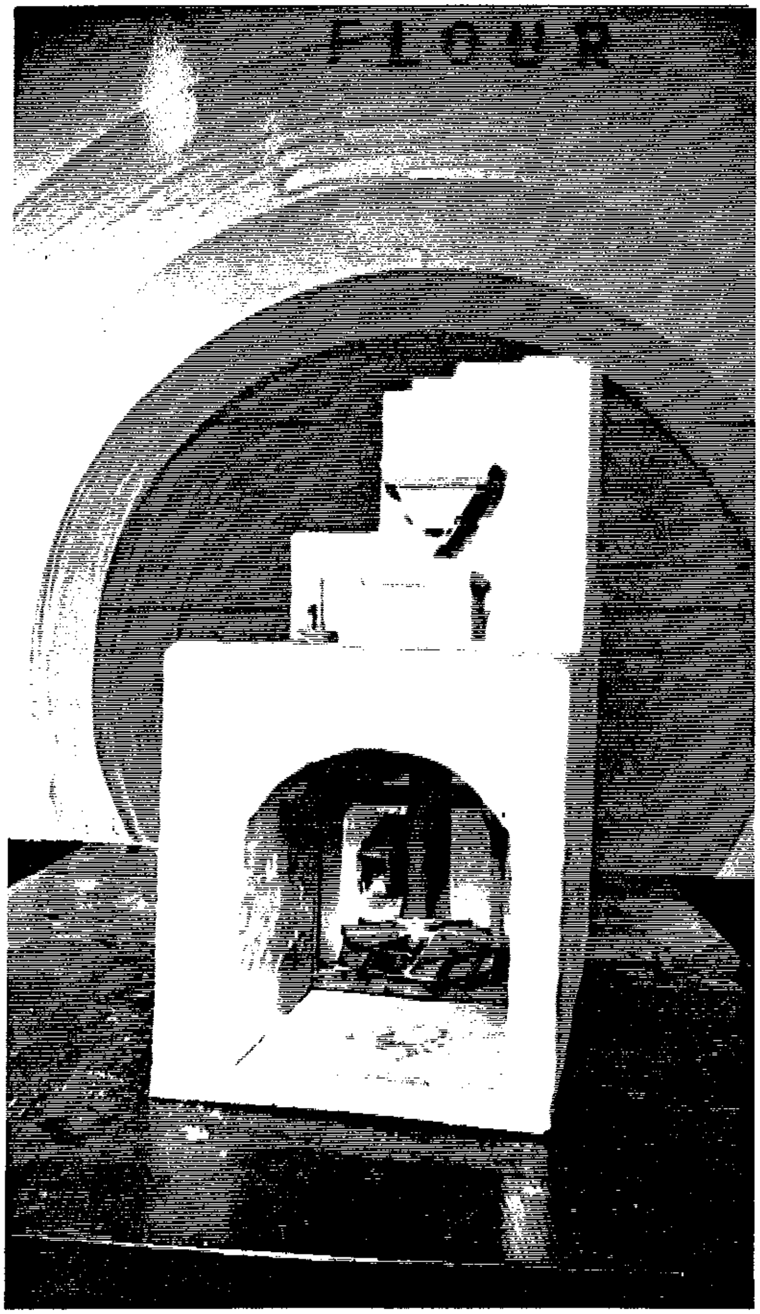
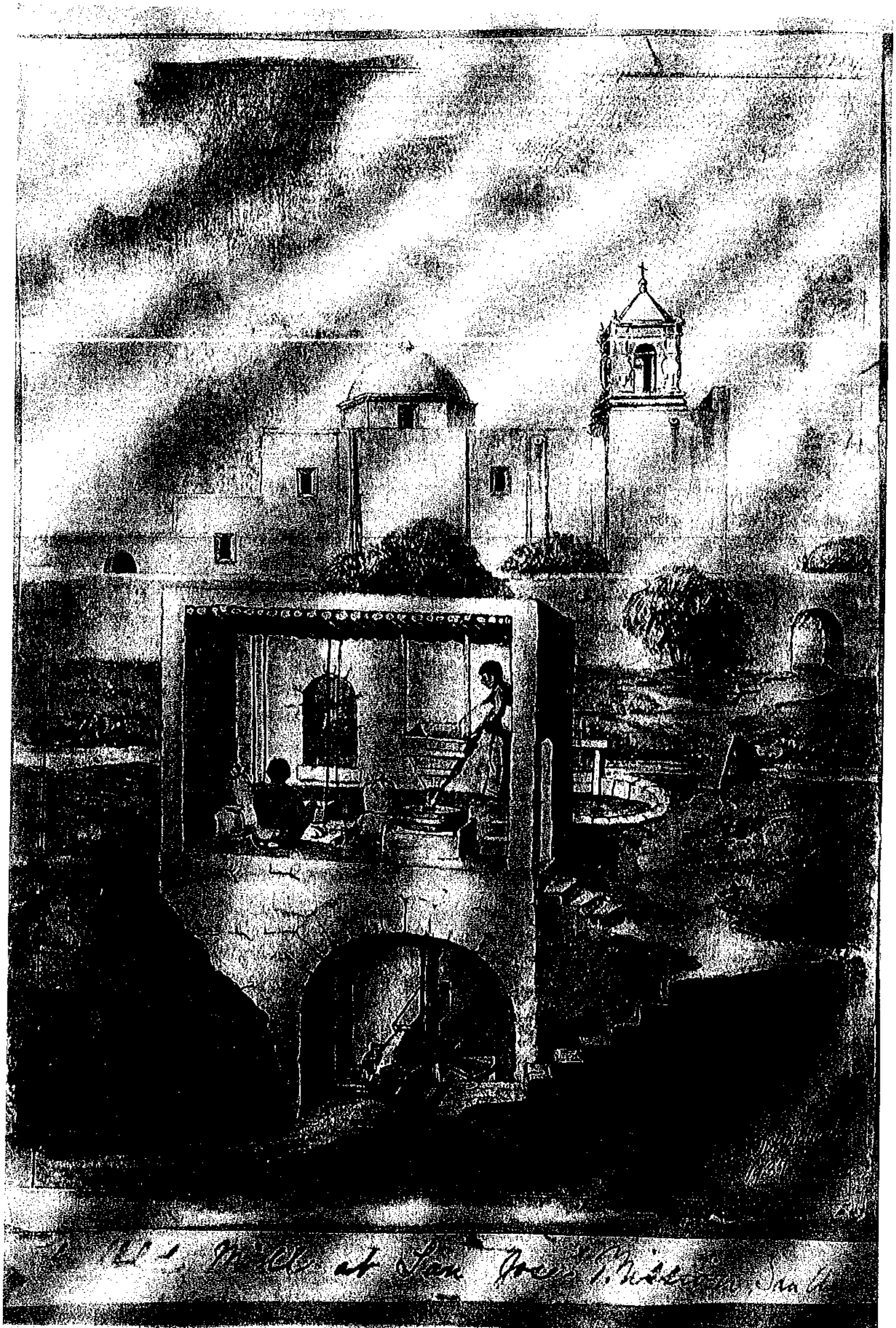


Figure 2-32 1934. Early model of the mill built by Ernst Schuchard. Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-33 (Facing Page) July 1936. Photo of a second model (set into a diorama) built by Ernst Schuchard which appeared in the *San Antonio Express* newspaper, March 21, 1936. Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-34 (Facing Page) 1937. Color laser copy of an original watercolor by Ernst Schuchard of the mill model he built shown in Figure 2-33. Courtesy of the Texas Chapter of the Colonial Dames of America archives.


Mill at San José Mission

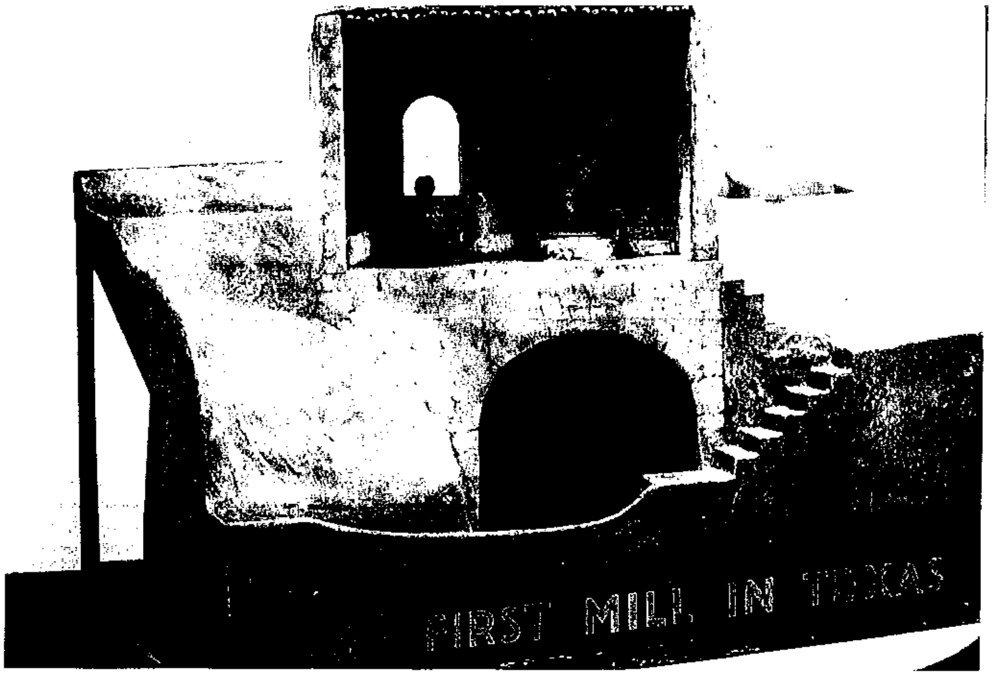


Figure 2-35 (Date unknown). Photograph of working mill model built by Ernst Schuchard in the late 1930s. See Figure 2-33 for a photo of a completed diorama including this model.

Figure 2-36 (Date unknown). Detail of the milling room on the above model built by Schuchard in the late 1930s.

Figure 2-37 (Fold-out, following) Not dated. "Reconstruction Plan of Mill, Mission San Jose de Aguayo, San Antonio, Texas." Office of Harvey P. Smith, AIA, Architect. This drawing (ink on vellum -- from which a blueprint exists in the park archives), and the one which follows it, details Smith's designs for the "reconstruction" of the mill. This drawing is almost identical to the following drawing, but shows the door and window in the west and east elevations, respectively, reversed.

Figure 2-38 (Fold-out, following) December 5, 1934. "Alterations & Additions to the Mission San Jose de Aguayo, San Antonio, Texas." Office of Harvey P. Smith, AIA, Architect. This drawing (pencil on vellum) accurately reflects the current position of the door in the east elevation and window in the west elevation. A slight change was also made to the roofing design.

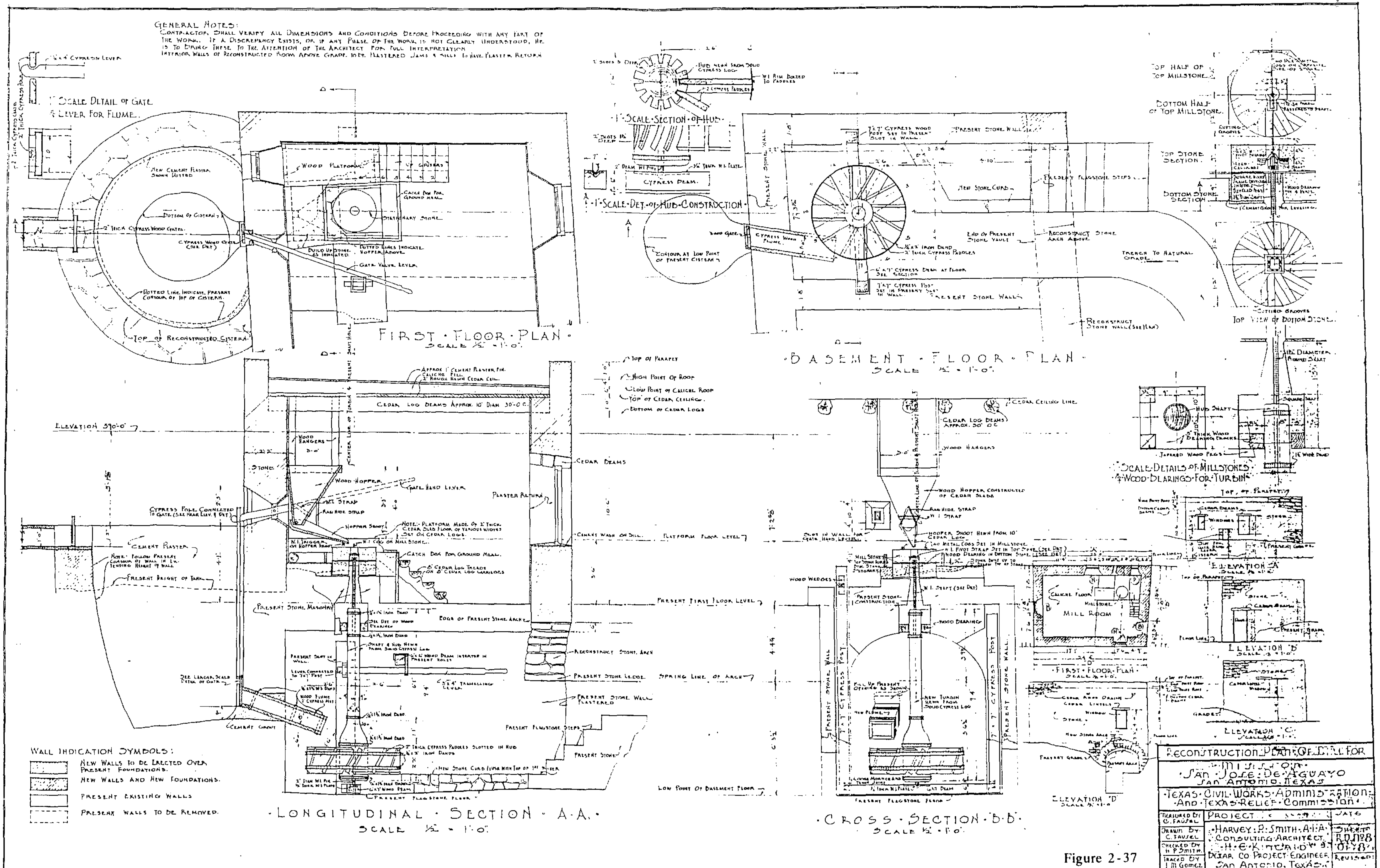
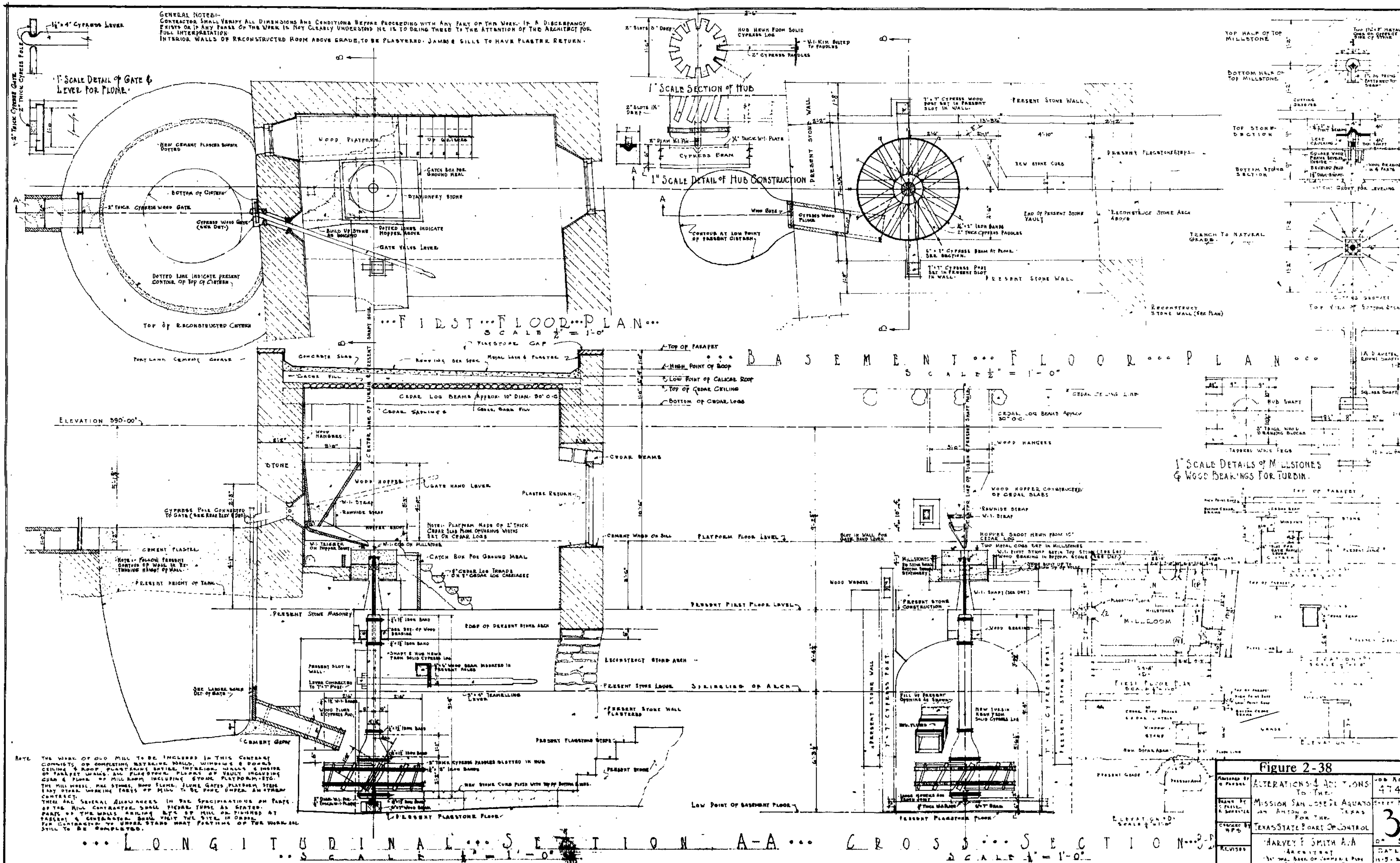

GENERAL NOTES:
CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS BEFORE PROCEEDING WITH ANY PART OF THE WORK. IF A DISCREPANCY EXISTS, OR IF ANY PHASE OF THE WORK IS NOT CLEARLY UNDERSTOOD, HE IS TO BRING THESE TO THE ATTENTION OF THE ARCHITECT FOR FULL INTERPRETATION
1" SCALE DETAIL OF GATE & LEVER FOR FLUME.
1" SCALE SECTION OF HUB
1" SCALE DET. OF HUB CONSTRUCTION
FIRST FLOOR PLAN
SCALE ½" = 1'-0"
BASEMENT FLOOR PLAN
SCALE ½" = 1'-0"
TOP HALF OF TOP MILLSTONE
BOTTOM HALF OF TOP MILLSTONE
TOP STONE SECTION
BOTTOM STONE SECTION
TOP VIEW OF BOTTOM STONE
1" SCALE DETAILS OF MILLSTONES & WOOD BEARINGS FOR TURBIN
ELEVATION "A"
ELEVATION "B"
ELEVATION "C"
ELEVATION "D"
FIRST FLOOR PLAN
MILL ROOM
LONGITUDINAL SECTION A-A.
SCALE ½" = 1'-0"
CROSS SECTION B-B
SCALE ½" = 1'-0"
WALL INDICATION SYMBOLS:
NEW WALLS TO BE ERECTED OVER PRESENT FOUNDATIONS.
NEW WALLS AND NEW FOUNDATIONS.
PRESENT EXISTING WALLS
PRESENT WALLS TO BE REMOVED.
RECONSTRUCTION PLAN OF MILL FOR
MISSION
SAN JOSE DE AGUAYO
SAN ANTONIO, TEXAS
TEXAS CIVIL WORKS ADMINISTRATION
AND TEXAS RELIEF COMMISSION
PROJECT
HARVEY P. SMITH A.I.A. CONSULTING ARCHITECT
H. E. KINCAID
BEXAR CO PROJECT ENGINEER
SAN ANTONIO, TEXAS
MEASURED BY C. FAUSEL
DRAWN BY C. FAUSEL
CHECKED BY H. P. SMITH
TRACED BY J. M. GOMEZ
SHEET
OF 8

Figure 2-37


GENERAL NOTES:-
CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS BEFORE PROCEEDING WITH ANY PART OF THE WORK. IF A DISCREPANCY EXISTS OR IF ANY PHASE OF THE WORK IS NOT CLEARLY UNDERSTOOD HE IS TO BRING THESE TO THE ATTENTION OF THE ARCHITECT FOR FULL INTERPRETATION.
INTERIOR WALLS OF RECONSTRUCTED ROOM ABOVE GRADE, TO BE PLASTERED. JAMBS & SILLS TO HAVE PLASTER RETURN.
1" SCALE DETAIL OF GATE & LEVER FOR FLUME.
1" SCALE SECTION OF HUB
1" SCALE DETAIL OF HUB CONSTRUCTION
FIRST FLOOR PLAN SCALE 1/2" = 1'-0"
BASEMENT FLOOR PLAN SCALE 1/2" = 1'-0"
1" SCALE DETAILS OF MILLSTONES & WOOD BEARINGS FOR TURBIN.
LONGITUDINAL SECTION A-A SCALE 1/2" = 1'-0"
CROSS SECTION B-B SCALE 1/2" = 1'-0"
ELEVATION 590'-00"
ALTERATIONS & ADDITIONS TO THE MISSION SAN JOSE DE AGUAYO SAN ANTONIO TEXAS FOR THE TEXAS STATE BOARD OF CONTROL
HARVEY P. SMITH A.A. ARCHITECT
JOB NO 474
SHEET NO 3
Figure 2-38

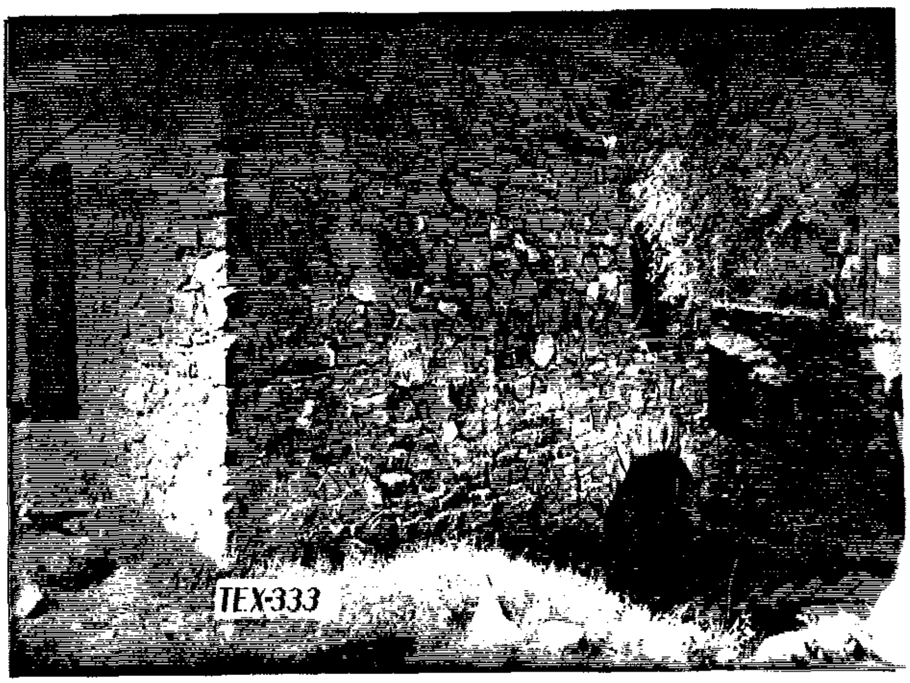


Figure 2-39 ca. 1937. One of the earliest photographs of the recently restored mill taken as part of the Historic American Buildings Survey (HABS) recordation project undertaken in the late 1930s. It is apparent from this photograph that the restoration of the mill race and other associated retaining walls which appear in photographs dating to the 1950s (see Figures 2-55 and 2-56) was most likely not undertaken until the 1940s when another major restoration effort was occurring at Mission San José. There are wooden steps down into the wheel room, and two of the original three wooden canales can be seen.

Figure 2-40 (Facing Page) ca. 1937. Looking west into the newly restored milling room. Of special note: "Furnishings:" hanging flour sifter, tramming mallet, wooden hopper and frame, wooden bucket for collecting flour, wooden ladle or spoon in bucket. Note also the arm for the west tram rod and the arm for the forebay gate. This photograph appeared in the January 11, 1938 edition of the *San Antonio Express*. Courtesy of the Daughters of the Republic of Texas Library.

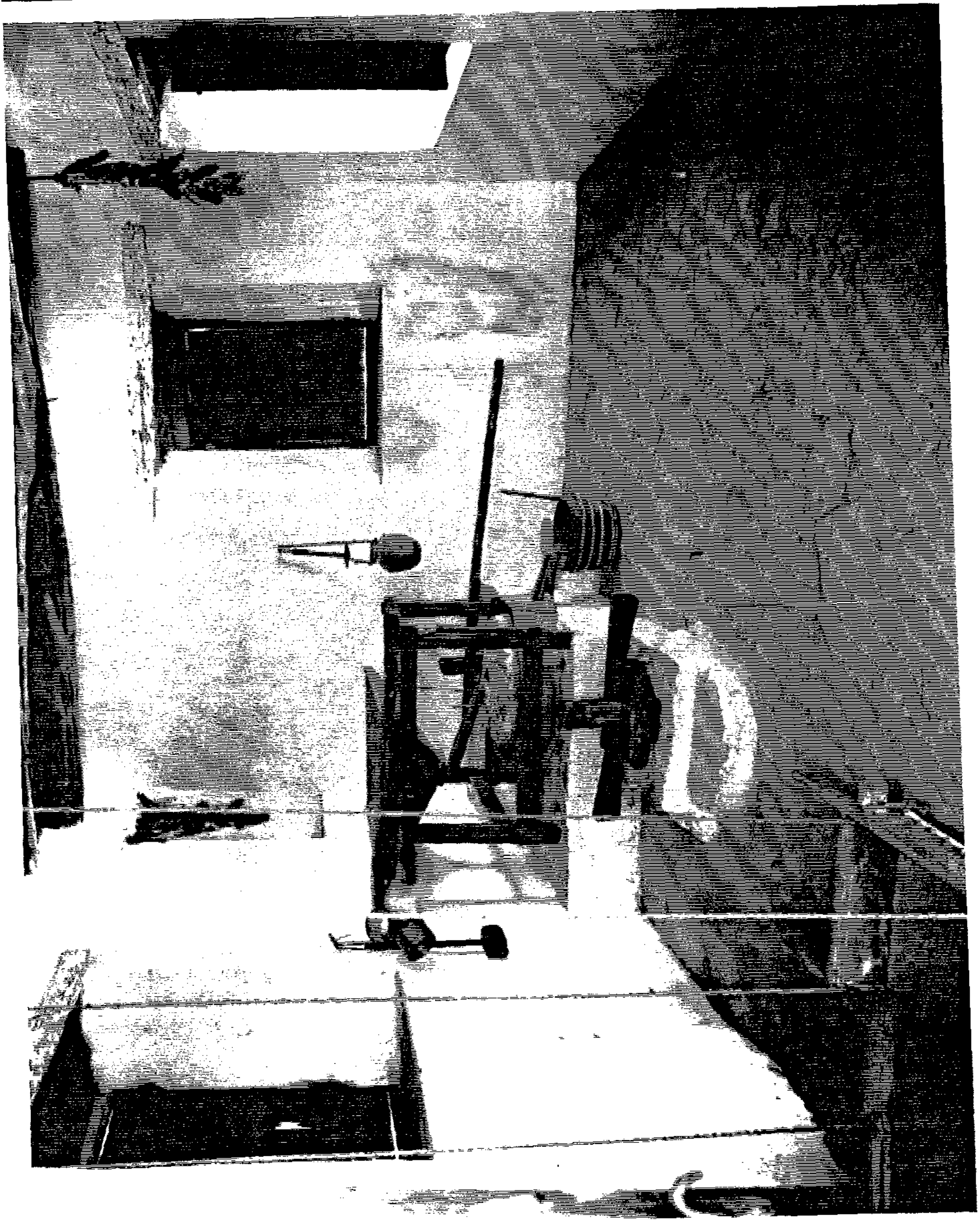


Figure 2-41 (Facing Page) ca. 1937. Looking south inside the milling room. This photo gives perhaps the best documentary evidence for replication of the various missing milling apparatus. One detail which has changed is the absence of a masonry block immediately north of the hole for the west tram rod (see Figure 3-95). Courtesy of the Daughters of the Republic of Texas Library.

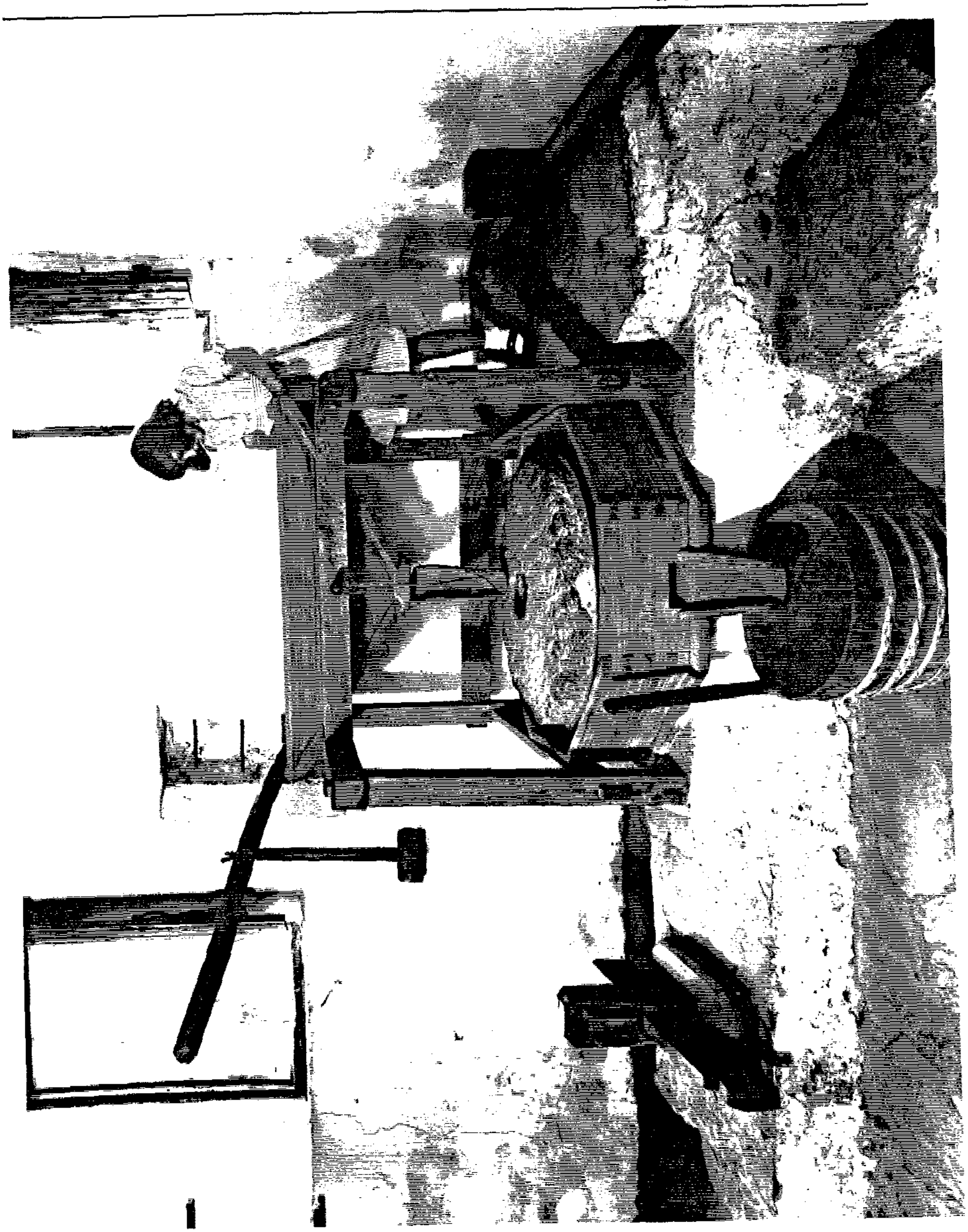


Figure 2-42 (Facing Page) ca. 1937-38. Looking southwest into the newly restored milling room.

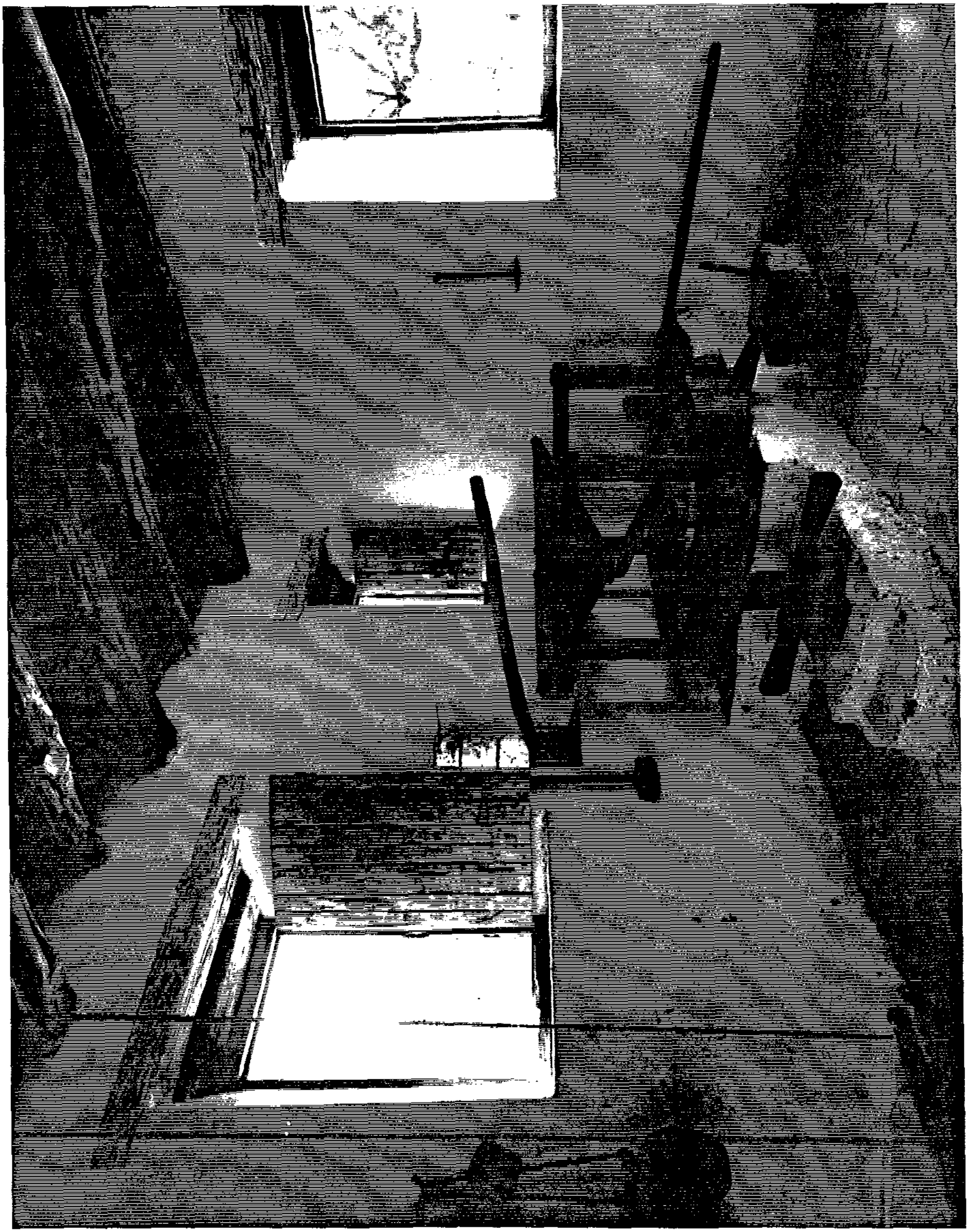
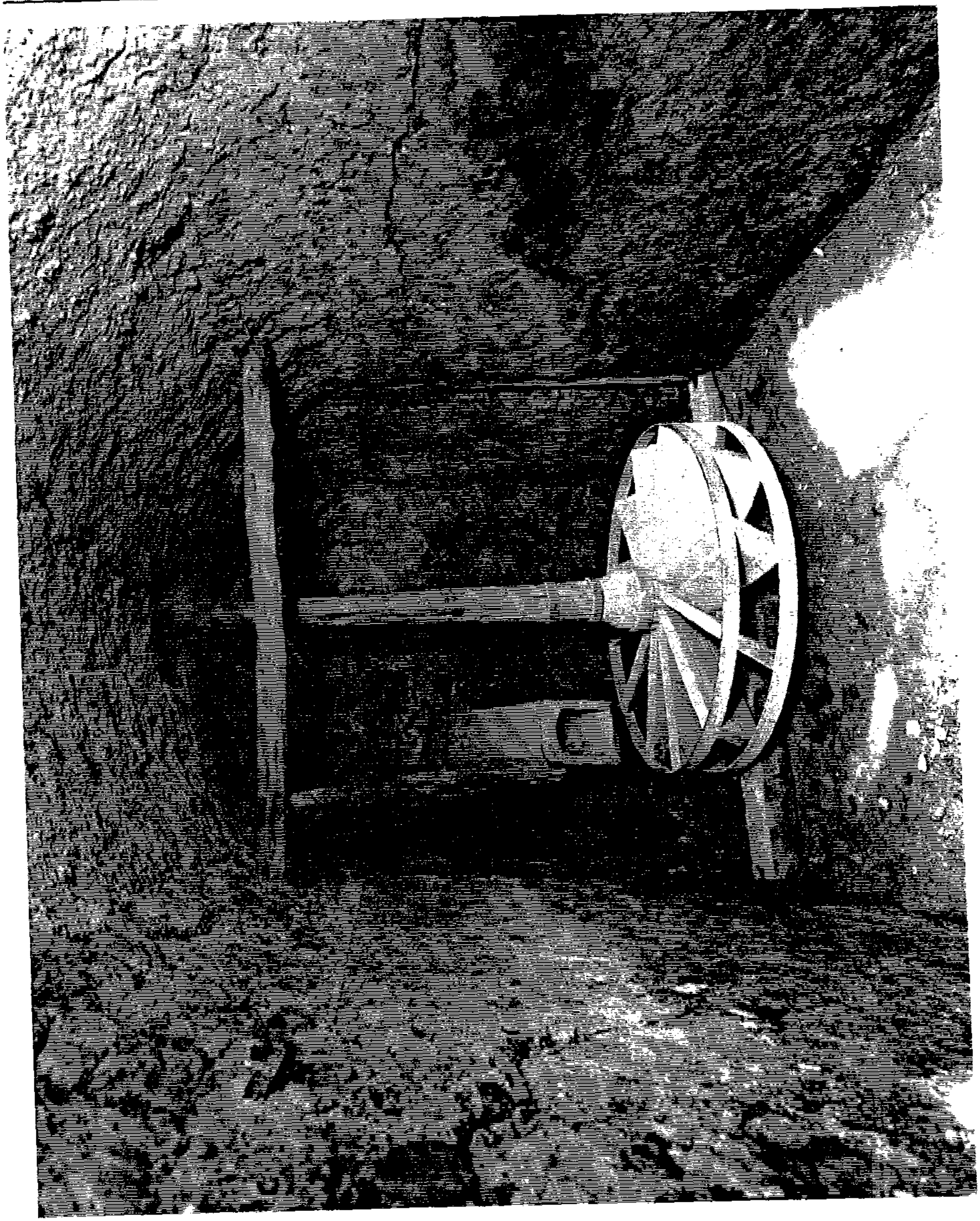


Figure 2-43 (Facing Page) ca. 1937. Looking south into the newly restored wheel room. All of the components of the milling mechanism: The restored wheel and main shaft, the two tram rods, the supported wooden water chute, and the bridge tree are all clearly visible. It is interesting and curious to note that the bridge tree looks as if it is resting on soil, not suspended from the tram rods as one would suspect. Courtesy of the Daughters of the Republic of Texas Library.



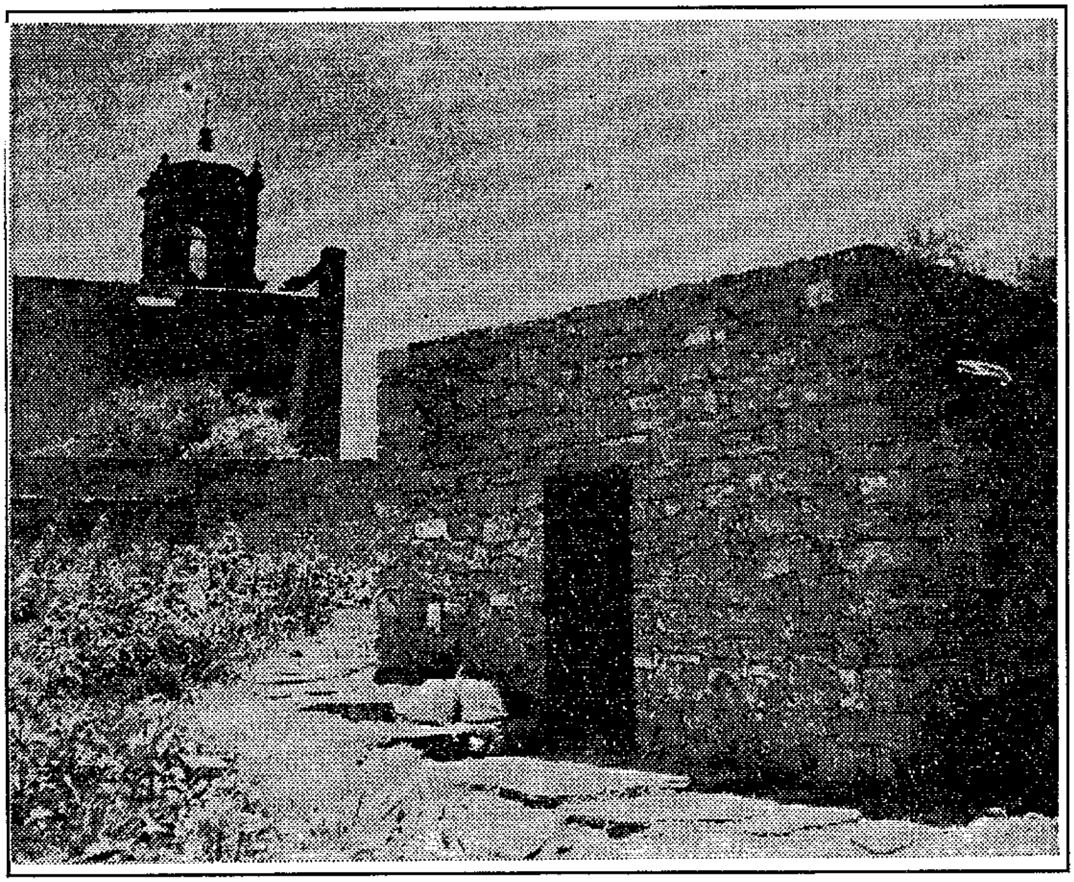


Figure 2-44 July 23, 1937. Photo from the *San Antonio Express* of the newly restored mill, looking southwest toward Mission San José. Note the flagstone path which appears to step down to the east entrance; note also the wooden canal at the north east corner of the building. Courtesy of the Daughters of the Republic of Texas Library.

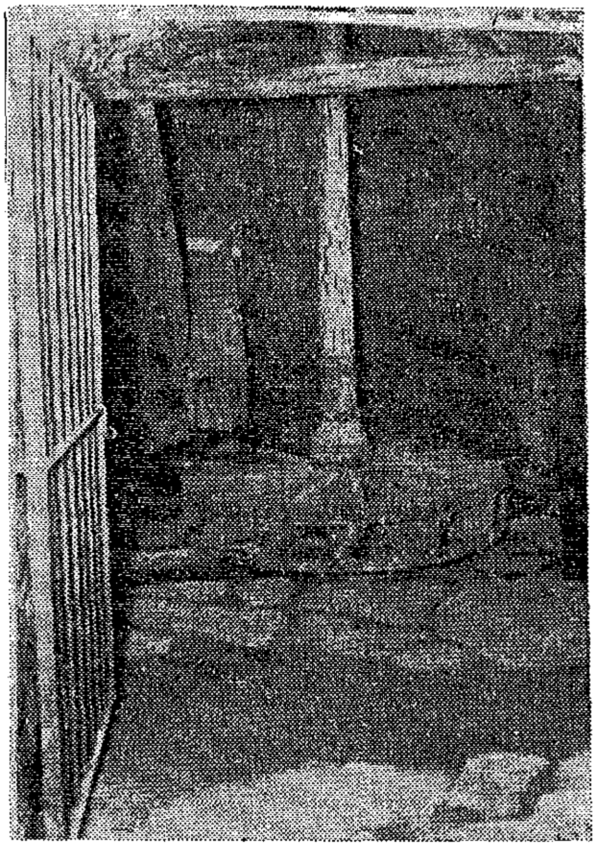


Figure 2-45 July 23, 1937. Photo from the *San Antonio Express* of the newly restored mill, looking south into the wheel room. Note the metal gate which has been installed, most likely for safety and security. If we assume a 4-inch spacing of the vertical bars, the gate would have been about 30 inches wide. A second section appears at the extreme top of the photo indicating that the upper section of the vault was closed in above the gate (presumably enclosing the semicircular section of the vault above the gate). Hardware for this gate was located during existing conditions investigations in 1996 (see Figures 3-66 and 3-67). Courtesy of the Daughters of the Republic of Texas Library.

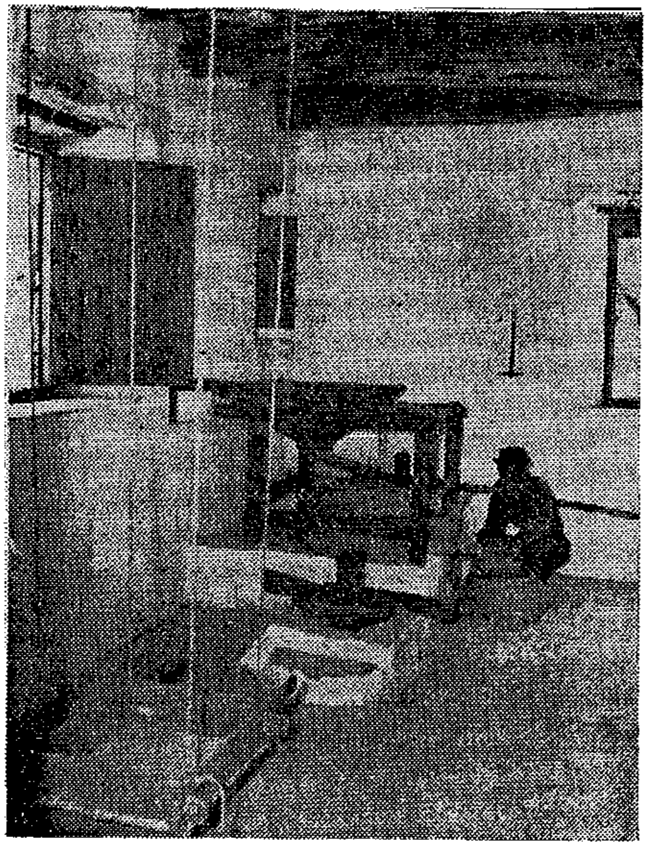


Figure 2-46 July 23, 1937. Photo from the *San Antonio Express* of the newly restored mill, looking west into the milling room. Courtesy of the Daughters of the Republic of Texas Library.

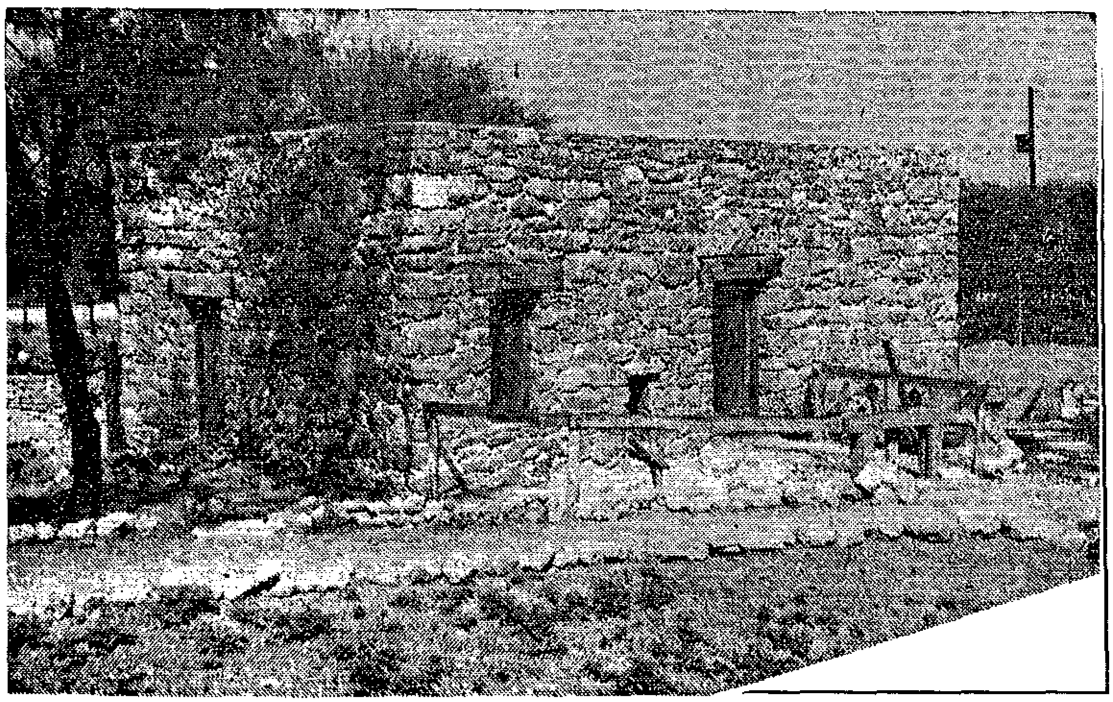


Figure 2-47 March 18, 1938. Photo from the *San Antonio Light* of the newly restored mill, looking northeast. A board fence has been erected around the forebay for safety. Courtesy of the Daughters of the Republic of Texas Library. (The photo was cropped in the newspaper article).

Figure 2-48 March 18, 1938. Photo from the *San Antonio Light* of the newly restored mill, looking into the forebay. The caption read, "B. Vallejo in sluice pit raises sluice gate letting water into bottom of mill through wooden pipe." (If this was true, Mr. Vallejo would be standing in water). This photo does give a good view of some of the operating mechanism particularly the forebay gate and attached control arm. Courtesy of the Daughters of the Republic of Texas Library. (The photo was cropped in the newspaper article).

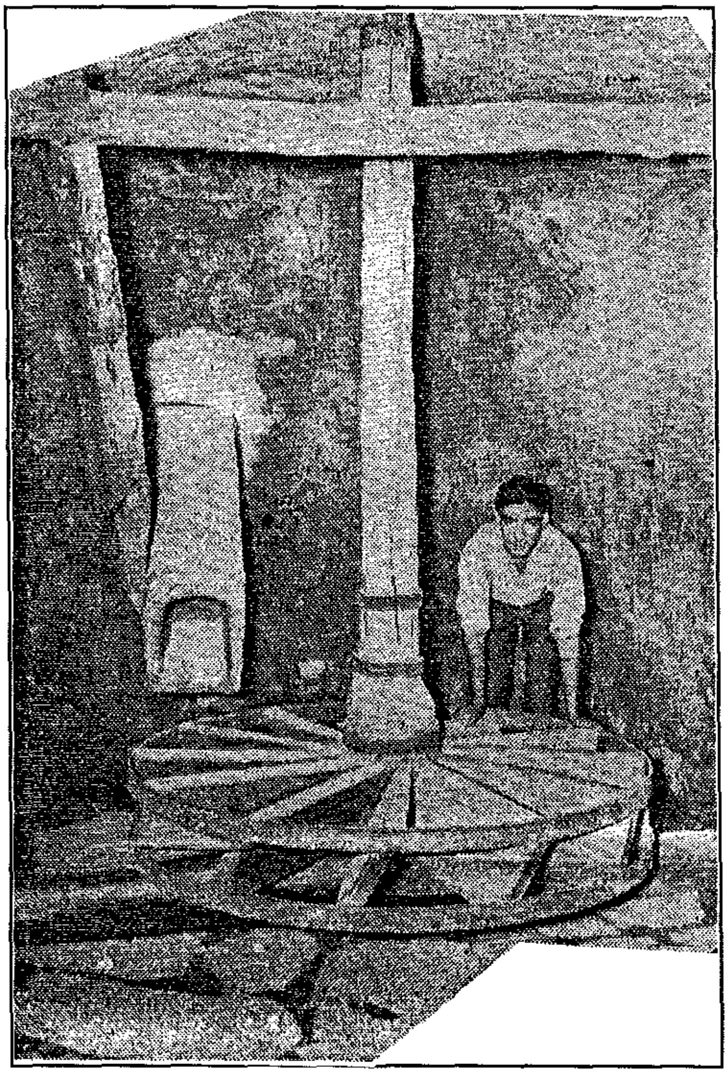


Figure 2-49 March 18, 1938. Photo from the *San Antonio Light* of the newly restored mill, looking into the wheel room. The caption read, "Vallejo at water wheel in mill interior showing wooden pipe through which water enters from sluice pit [forebay]. Wheel shaft is attached to mill stones." Courtesy of the Daughters of the Republic of Texas Library. (The photo was cropped in the newspaper article).

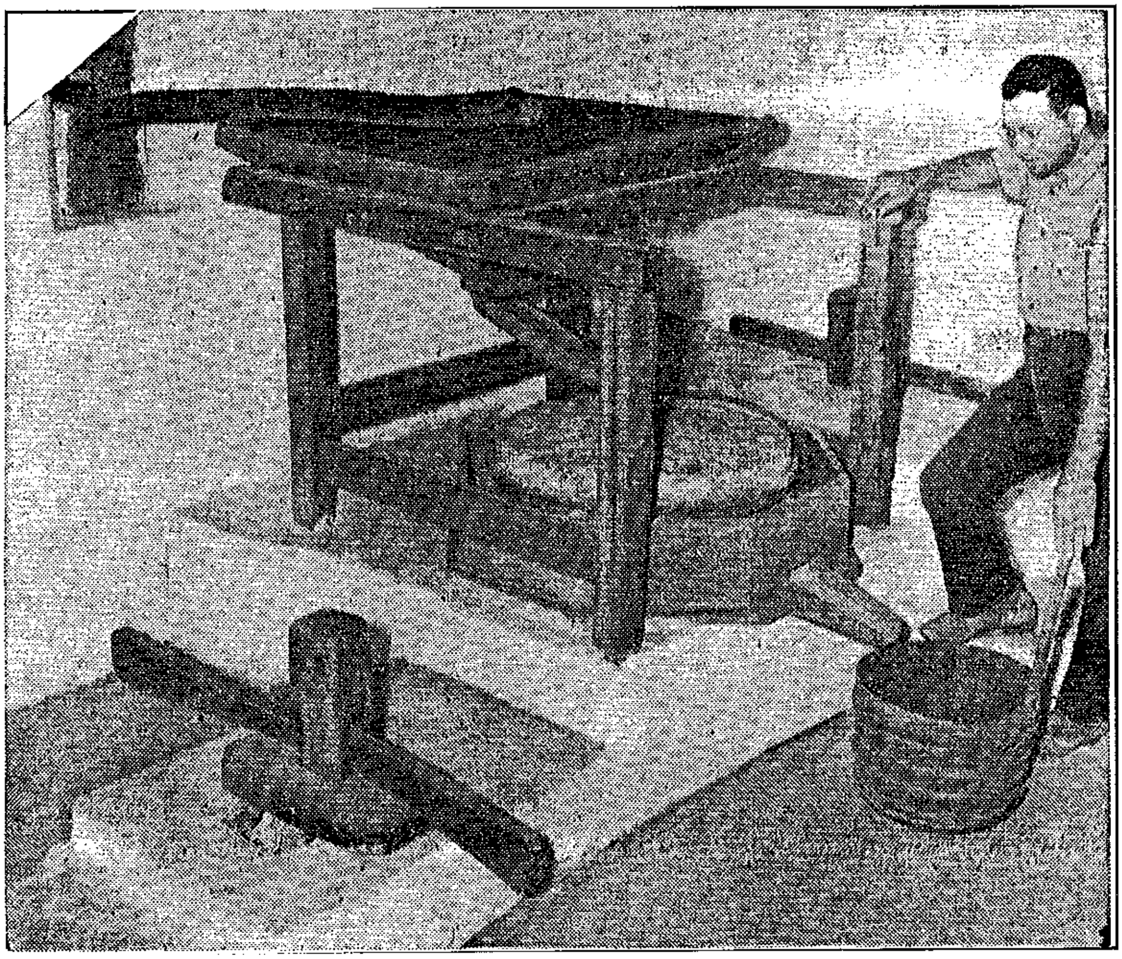
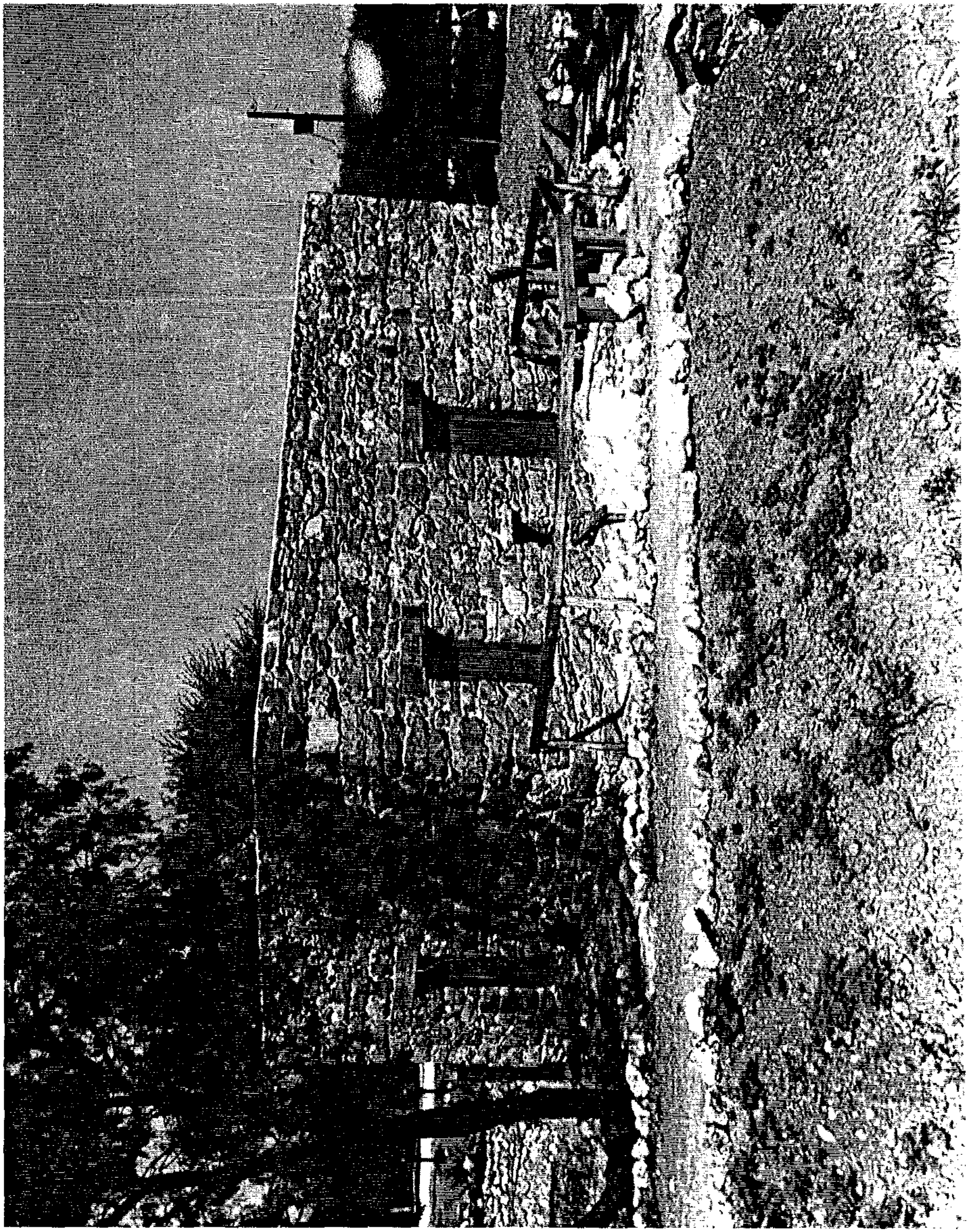


Figure 2-50 March 18, 1938. Photo from the *San Antonio Light* of the newly restored mill, looking at the milling apparatus in the milling room. The caption reads, "Frank Guido shows mill stones on ground floor of corn mill. Hopper into which corn is poured is above millstones, water powered." Courtesy of the Daughters of the Republic of Texas Library. (The photo was cropped in the newspaper article).

Figure 2-51 (Facing Page) March 18, 1938. Enlarged detail of photo (Figure 2-47) from the *San Antonio Light* of the newly restored mill. From this photograph details concerning the sluice gate and frame were obtained for the purposes of this report. One elusive detail concerns the large wedge-shaped board which appears to exit the oblique opening in the center of the south elevation. This board had something to do with the mechanism for raising and lowering the wooden gate at the bottom of the forebay, but was never located. It's details are very difficult to discern too, making the rehabilitation difficult.



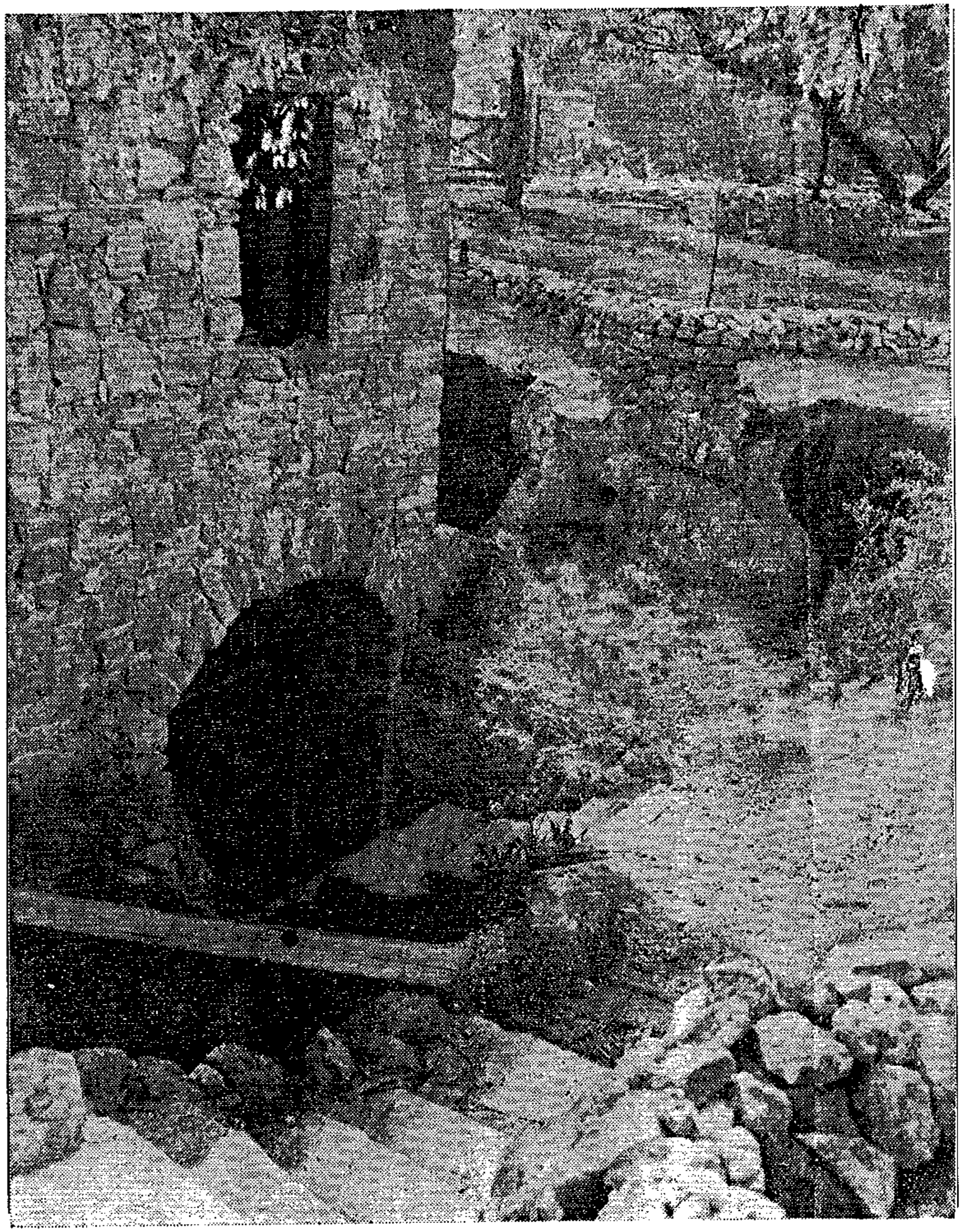


Figure 2-52 March 24, 1938. "Steps at Old Mill Restored," (from the *San Antonio Light*). This photograph shows an undeveloped north side of the mill (prior to the flagstone surfacing of this entire area). Courtesy of the Daughters of the Republic of Texas Library.

Figure 2-53 (Facing Page) ca. 1939. Drawing by Ernst Schuchard which appeared in the article "The Mill at San Jose Mission" by Schuchard in the April 1940 issue of "Food Facts." Courtesy of the Daughters of the Republic of Texas Library.

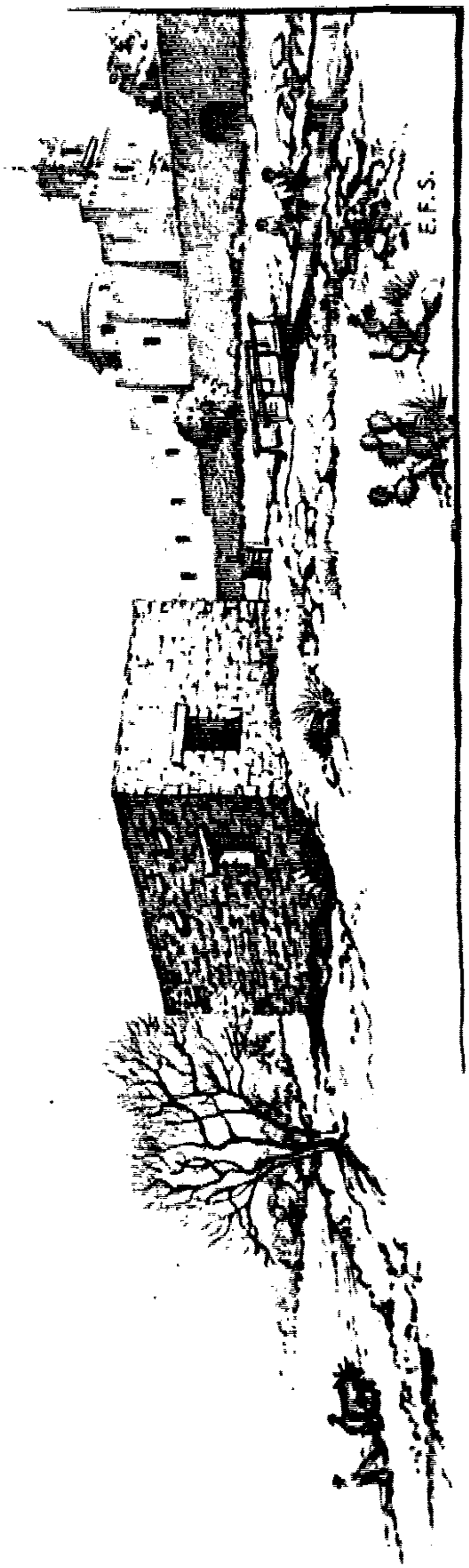
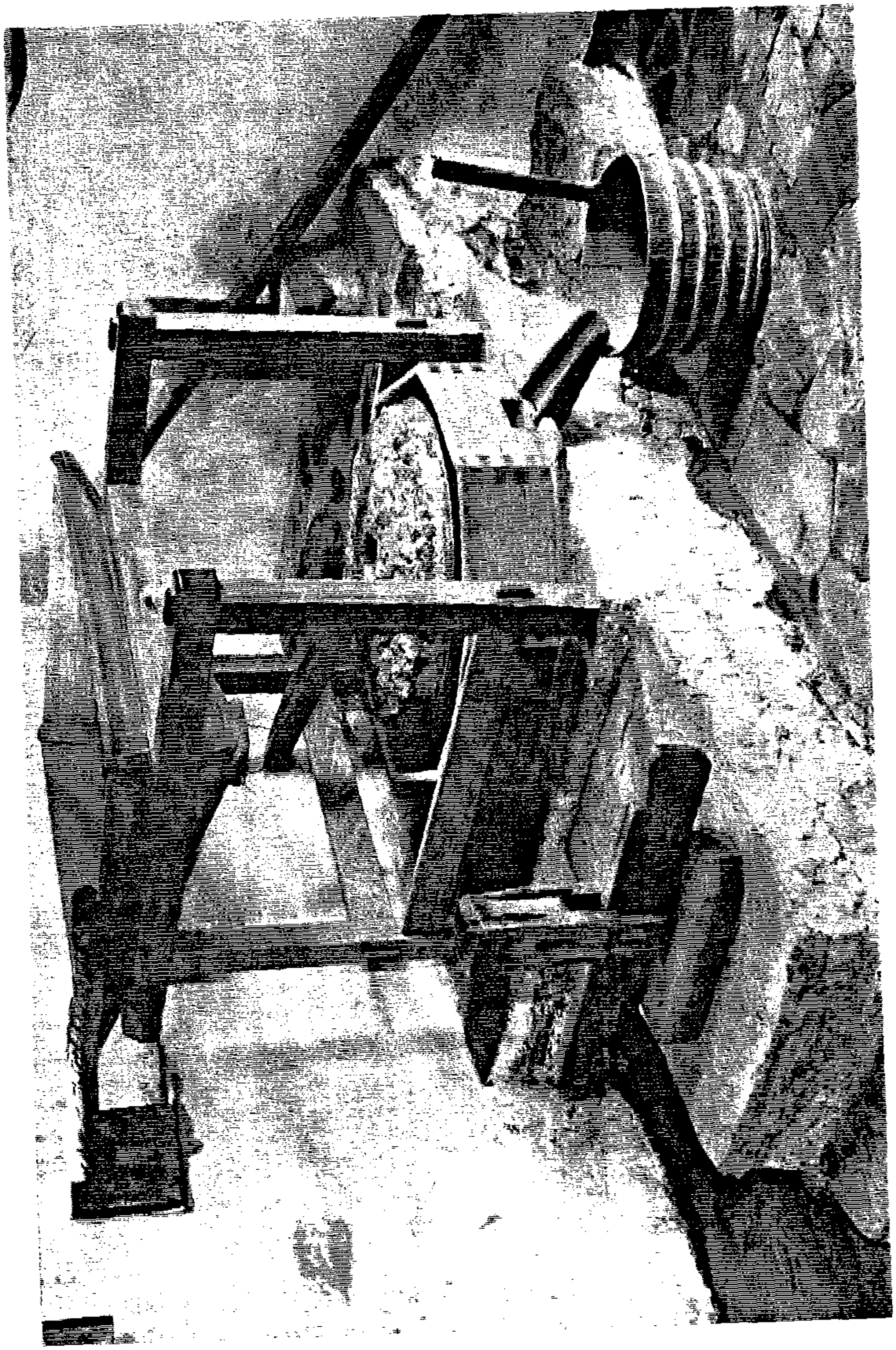

E.F.S.

Figure 2-54 (Facing Page) ca. 1942. Photograph which appeared in a reprint of "San Jose: Queen of the Missions" (17th Ed.) by Ethel Wilson Harris, a pamphlet circulated at Mission San José when it was operated by the State of Texas. Courtesy of the Catholic Archives of Texas. Note the notched block of wood in the small opening at the upper left side of the photograph and the length of the control arm for the forebay gate immediately above this block of wood. The function of the wood block has not been discerned.



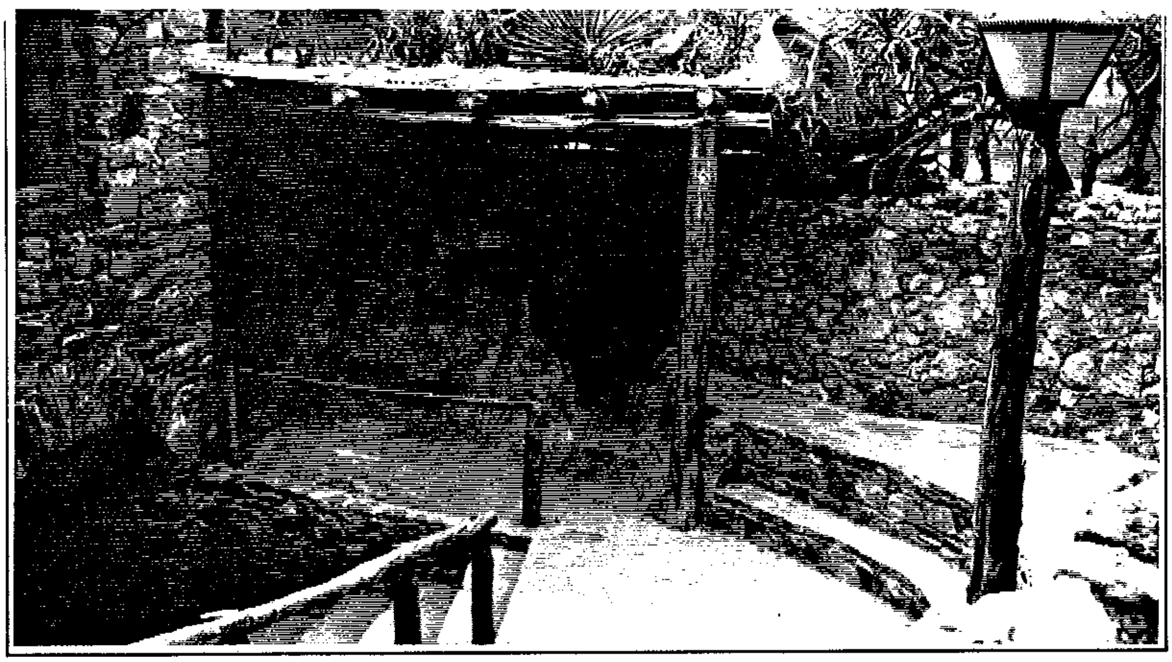


Figure 2-55 April 7, 1950. "Shelter constructed of cedar logs and palm leaves over features [lime kilns] at northwest of restored mill." This photo was included with the NPS Region Three Annual Report for 1949-1950, for the San José Mission National Historic Site.

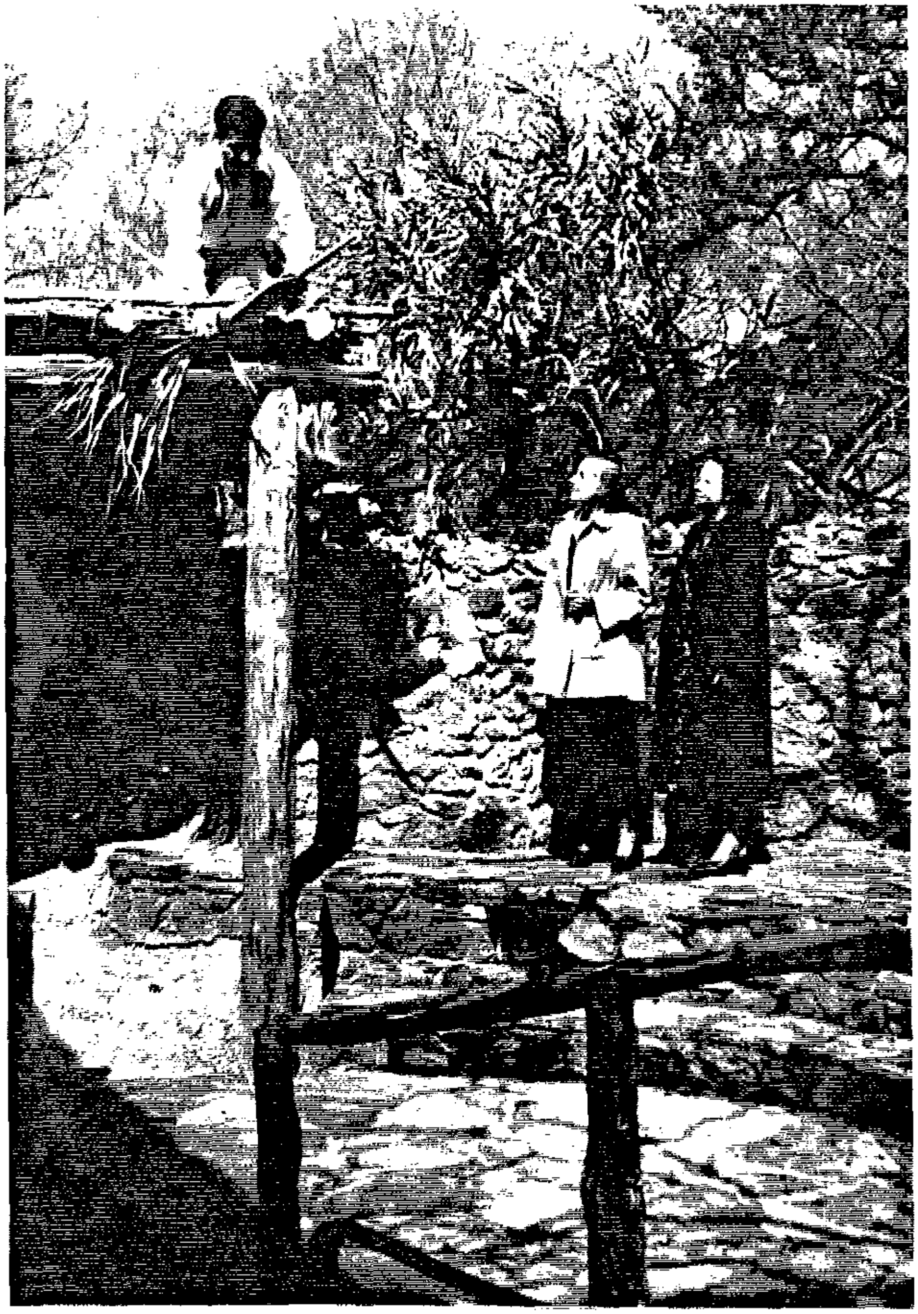


Figure 2-56 April 16, 1950. "Angel Rendon shows Mrs. Hubert Pouquet, Mrs. E.C. Wood how to thatch." (From the *San Antonio Express Magazine*). This is a second photograph located which helps provide details for the missing shed roof over the lime kilns. Courtesy of the Daughters of the Republic of Texas Library.

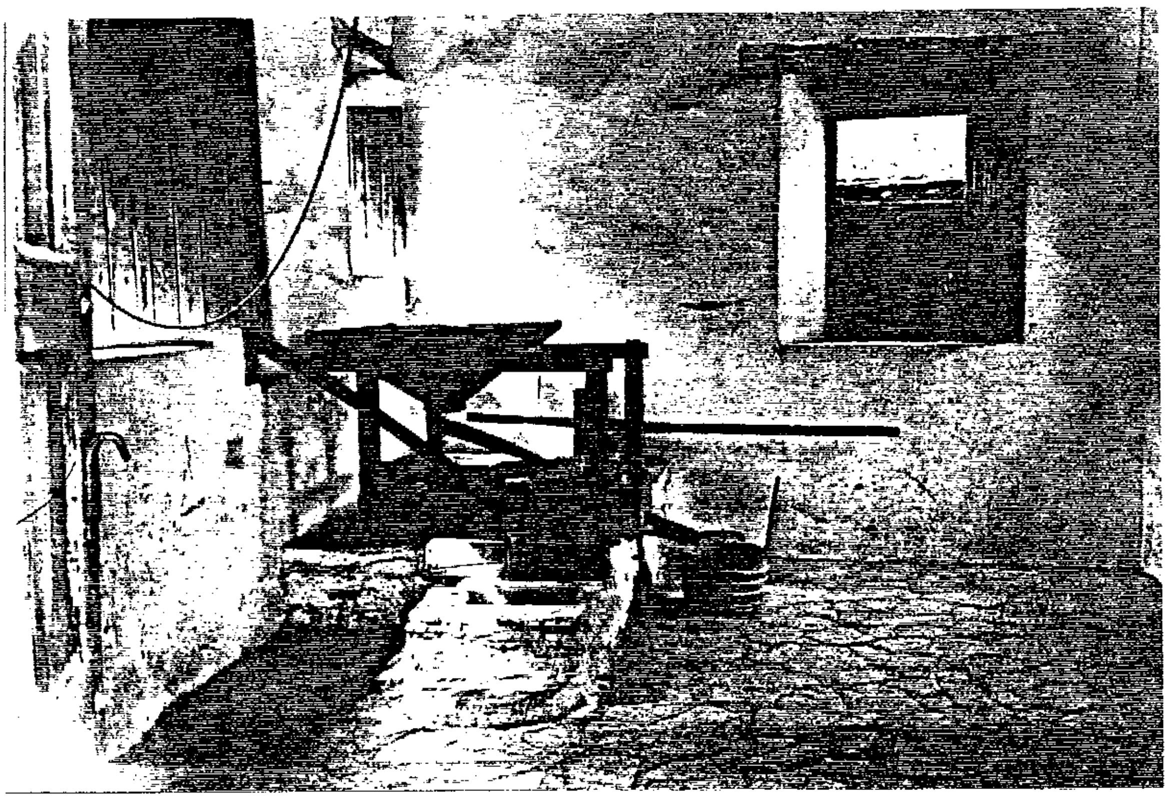


Figure 2-57 ca. 1950. Photocopy of a photograph showing the interior of the restored mill and, through the open window in the west elevation, a view of the thatched shed roof over the lime kilns.

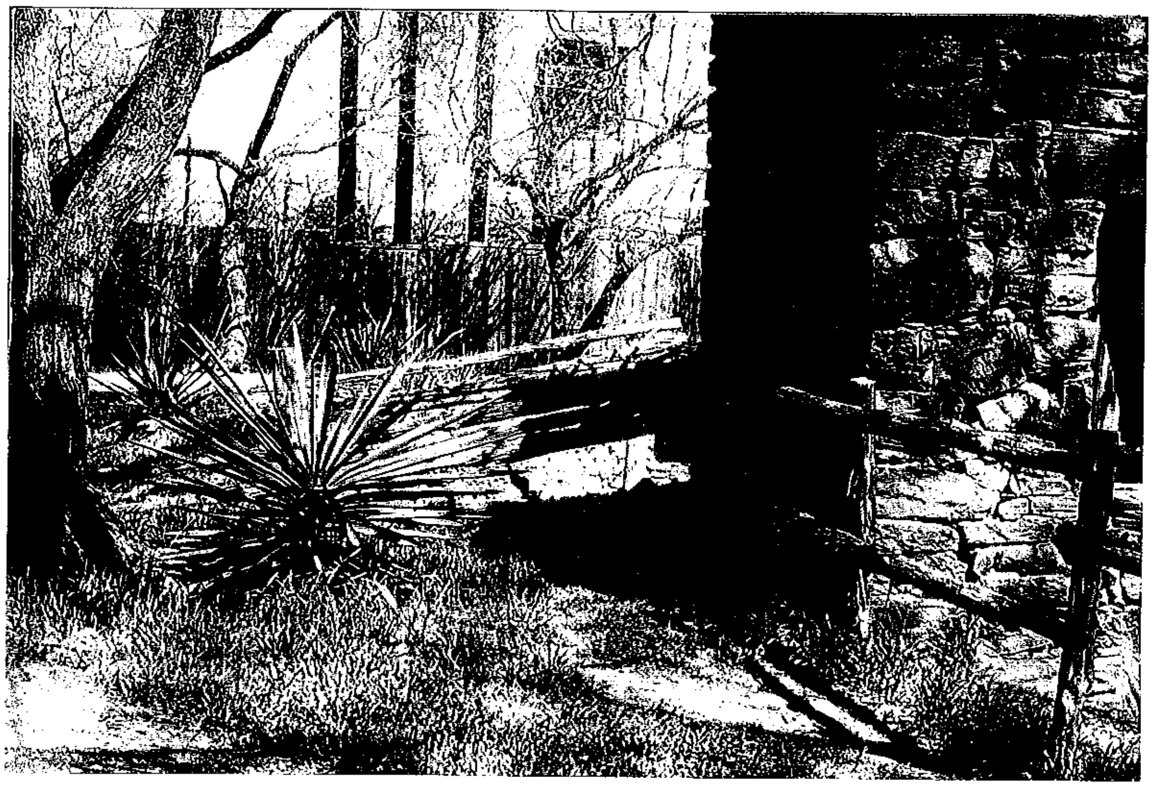


Figure 2-58 March 1979. View of the mill with some members of the shed roof still intact. Courtesy of the Texas Parks and Wildlife Department.

Figure 2-59 March 1979. View of the mill with some members of the shed roof still intact. Cedar posts for a new fence (presumably to protect visitors from falling into the lime kilns) are in the process of being installed. Courtesy of the Texas Parks and Wildlife Department.

Figure 2-60 March 1979. View of the mill with some members of the shed roof still intact. Courtesy of the Texas Parks and Wildlife Department.

Figure 2-61 March 1979. View of the mill with some members of the shed roof still intact. Courtesy of Texas Parks and Wildlife Department.

Figure 2-62 March 1979. View of the mill with some members of the shed roof still intact. Note additional short vertical log between the *viga* end log and horizontal ridge log which no longer exists. Courtesy of the Texas Parks and Wildlife Department.

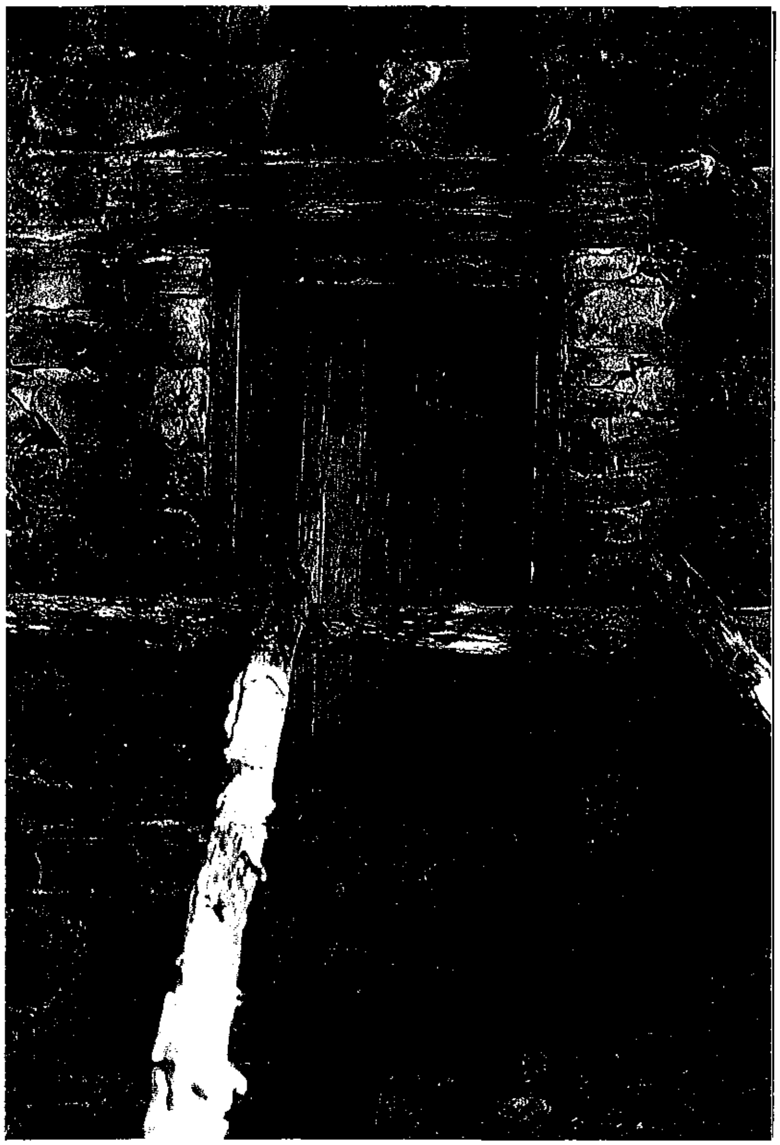


Figure 2-63 March 1979. Enlarged detail of the window in the west elevation of the mill with some members of the shed roof still intact. Courtesy of the Texas Parks and Wildlife Department.

Figure 2-64 March 1979. View of the south elevation of the mill. Note the upper portion of the sluice gate frame still intact. Courtesy of the Texas Parks and Wildlife Department.

Figure 2-65 1981. Looking northeast. The mill looks almost as it did in 1996 with the exception that the sluice gate frame is still in place.

Figure 2-66 1981. South elevation - much as it looked in 1996. Note the (tilted) sluice gate frame.

Figure 2-67 1981. Close-up view of the south elevation. Note the flagstone crossing and sluice gate frame. Compare this photograph to Figure 3-36.

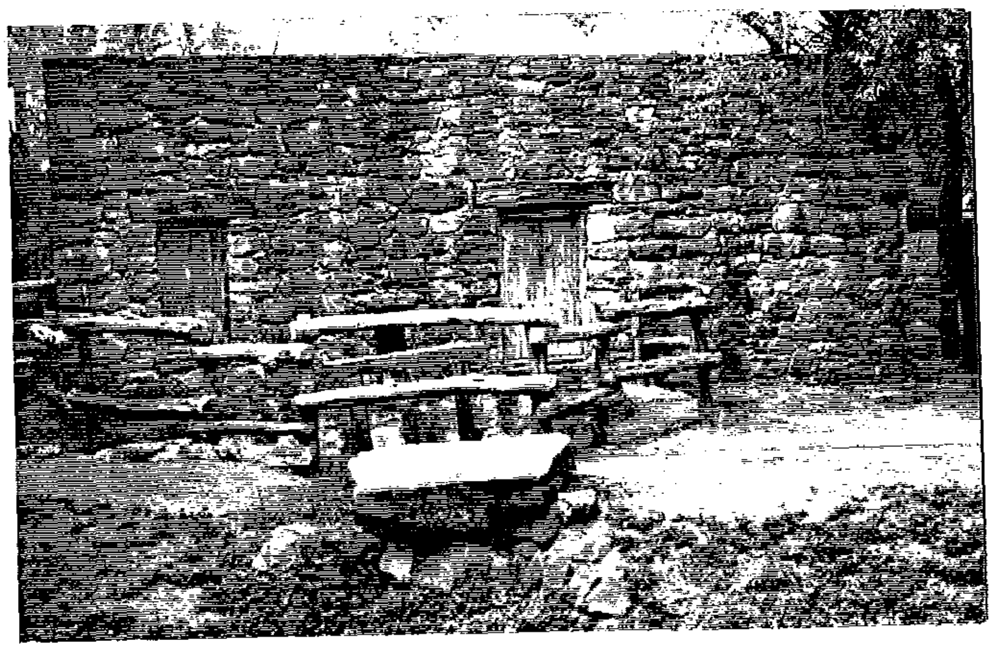


Figure 2-68 1981. South elevation. Note that the lower copper plaque described in Chapter 3 (Figure 3-41) is missing.

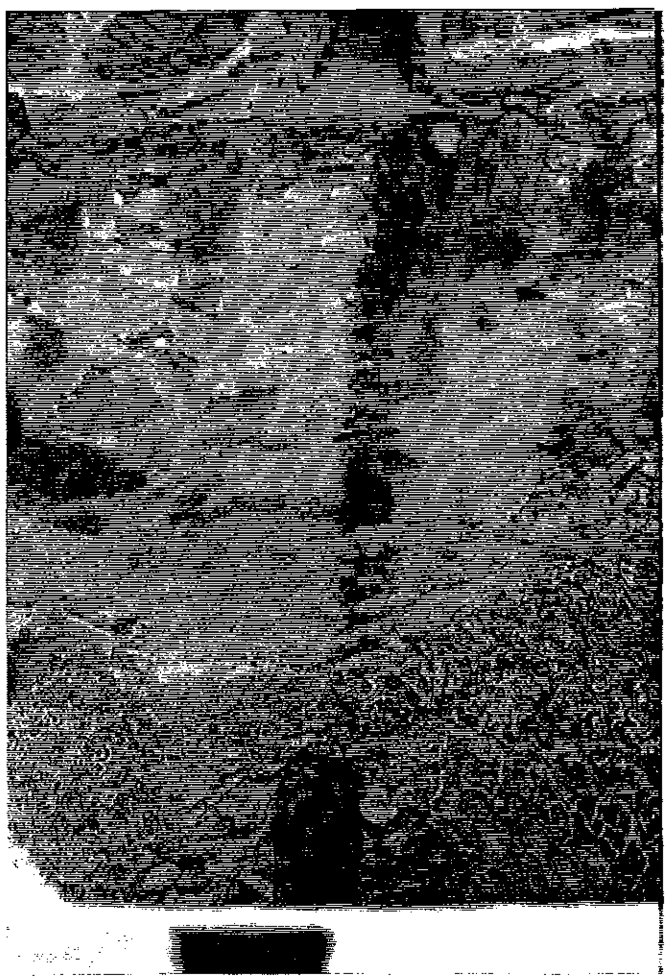


Figure 2-69 1981. Looking into the forebay. Note the presence of the forebay gate still in place.

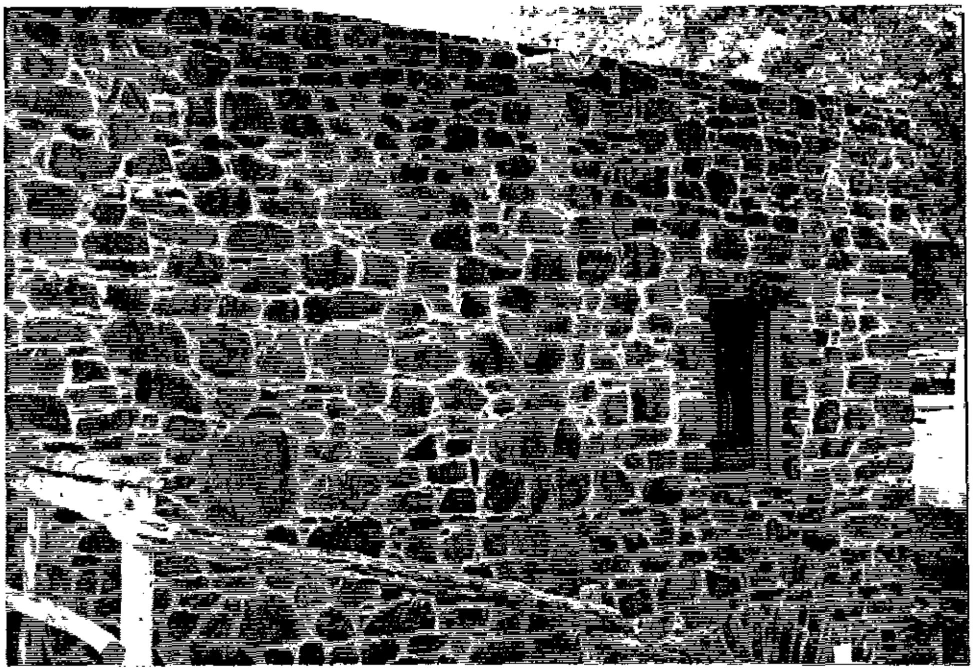


Figure 2-70 ca. 1982. View of the north exterior elevation. The change in masonry immediately below the concrete canal in the upper center of the photograph is very obvious in this photograph supporting the change from three drains to a single one in the 1950s (refer to Figure 3-35).

Figure 2-71 ca. 1982. Photograph taken for the List of Classified Structures (LCS) inventory. The tops of the lime kilns have crumbled.

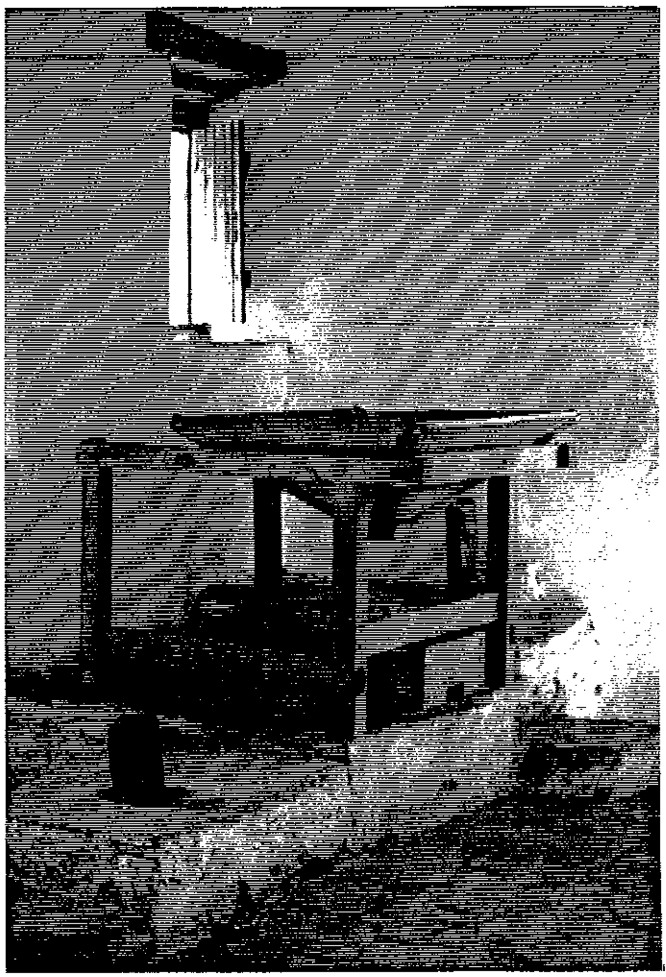


Figure 2-72 ca. 1981. A detail of the milling equipment. Both tram rods are in place, however, many other parts of the milling apparatus are missing (tramming wedges, wedge bushing, wood chutes, operating arms for both tram rods).

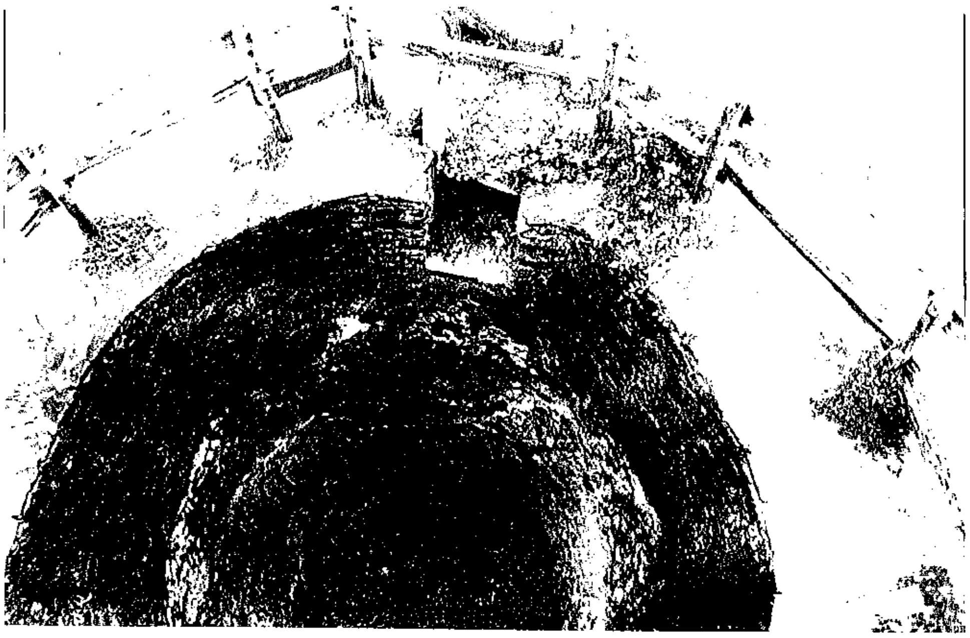


Figure 2-73 ca. 1988. View of the forebay. One side member of the sluice gate frame and a couple sections of the gate itself are all that remain of this feature.

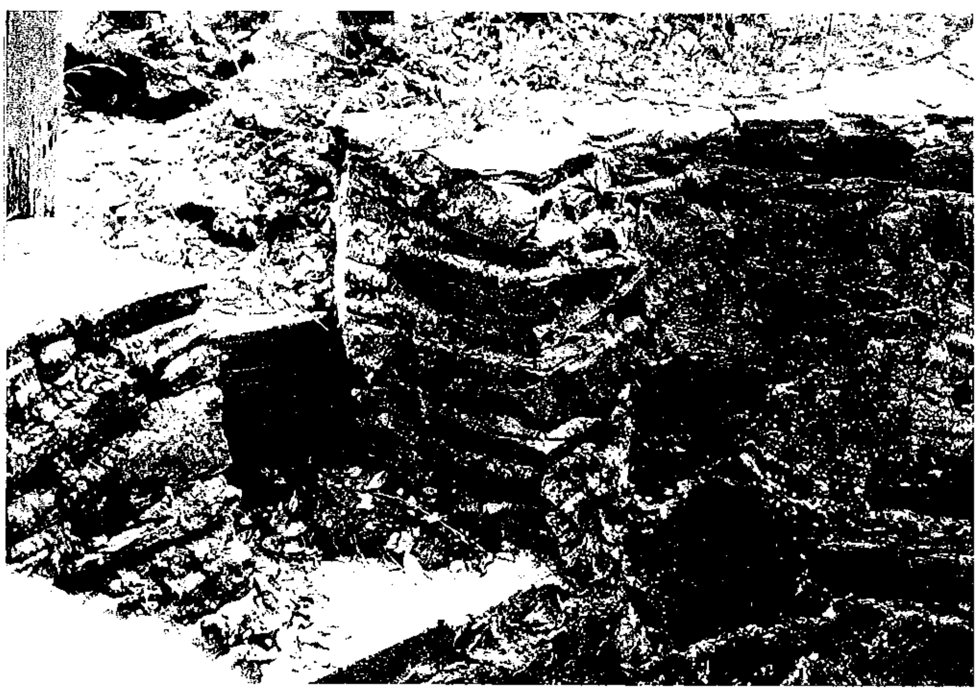


Figure 2-74 ca. 1988. Enlarged detail of the end of the sluice just before the forebay. The remnants described above are visible at the extreme left of the photograph.

Figure 2-75 February 11, 1997. Hanging painted illustration of the grist mill operation which was located in storage at Mission San José. The information reads: "--The oldest mill in Texas. --Run by water brought from the San Antonio River by means of acequias, or ditches. The lower part of the mill is original. --The upper room is restored. --After powering the mill, the water was conducted through the lower ditch to the fields for irrigation. The diagram below shows how the mill operated." The diagram, which has deteriorated considerably, resembles the illustration which appeared in the *San Antonio Express Magazine*, September 6, 1953 (see Figure 2-3).

3 PHYSICAL DESCRIPTION

Physical Description

The grist mill at Mission San José consists of three main components: the surrounding landscape and associated structures surrounding the mill; the mill (structure) itself; and the site-related elements (including structures) directly associated with the mill, but not a part of the building proper. Figure 3-1 is an overall site plan produced in the fall of 1996 in preparation for this report.

A. The Surrounding Landscape:

1. The *acequia madre* (main or "mother" irrigation ditch) runs immediately in front (south of) the mill, and would have provided water directly for Mission San José, and indirectly for the mill. The *acequia madre* shows up in a 1930 plot plan (Figure 3-2) and in a plan of the San José *acequias* produced in 1995 for the San José Cultural Landscape Report (Figure 3-3). It is also illustrated in Harvey Smith's plan of the mill area in 1937 (Figure 3-4). From our research we have been able to discern that as reconstructed in the 1930s, it was intended that water from the *acequia madre* would enter the mill's forebay via a smaller sluice which most likely had a small wooden gate of some type which diverted water to the mill. The remnants of what was assumed to be the wooden gate were located during the December 1996 archeological work (see Figure 3-157). The current run of the *acequia madre* begins west of the mill just beyond a modern wood privacy fence seen in Figures 3-6, 3-7 and 3-8. The San José *acequia madre* has been severed from its source, the San Antonio River, and all but this small section of it (which passes in front of the mill) is left intact from the Spanish colonial period. The present southern terminus of the *acequia madre* can be seen in Figure 3-22, passing south and west of the modern dressing room described below. The existing portion of the *acequia madre* is assumed to date to the ca. 1722 to ca. 1870 time period.[1] Archeology performed in December 1996 in the vicinity of stone steps discussed below disclosed the historic profile of the *acequia madre* (see Figures 3-147 through 3-150). The *acequia madre* was said to have been ". . . 15 feet wide and about four feet deep . . . 'like a river.'. . .. From the Mission [San José] the ditch which ran only six feet outside of the easternmost wall it circled around the Mission to the south and can be easily followed by the trees along the ditch after cutting across the west corner of the city gravel pit [which eventually became, in part, the Historic Theater of Texas and still later the amphitheater at San José]. But here it takes off at almost right angles to the southeast through a large field . . . which it irrigated 150 years ago . . . back into the [San Antonio] river at San Jose Burial Park . . ."[2]

Currently the *acequia madre* is dry, and has been---most likely since modern development for south San Antonio started encroaching on the historic mission. To date, historic records have not disclosed exactly if Mr. Schuchard provided water to the mill for the tests he performed in 1939, with the exception of reference to the use of "centrifugal pumps" (refer to discussion in

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[1] James and Juarez Architects, Land and Community Associates, *Mission San José Cultural Landscape Report*, National Park Service Southwest Region, November 1995, *Exhibit H*, 2-10.

[2] "Almost Forgotten Mission Waterways which Determined San Jose Location Bared by Geologist During Surveys," *San Antonio Express*, Sunday, 16 May, 1936

Chapter 2). The *acequia madre* continues south past the board fence (Figures 3-9 and 3-10), under a wooden bridge (Figure 3-9), in front of the mill (Figure 3-12), and south past the modern dressing room building (Figure 3-22). Present condition is good.

A stone-lined sluice constructed as part of the 1930s reconstruction (Figure 3-13) fed water from the *acequia madre* to the forebay of the mill. This sluice has a large slab of sandstone spanning it just south of the forebay. A similar arrangement is detailed on Harvey Smith's site plan of the amphitheater/mill complex (Figure 3-4). Archeology performed in December 1996 disclosed the full extent of the sluice (Figures 3-156 through 3-159). From historical photograph 2-47, the frame and lifting arm for the gate, which terminated the sluice immediately before the forebay, were identified. Three of the wooden pieces recovered from the turbine room and forebay in September 1996 matched the two grooved side channels and the top member (Figures 3-68 and drawings Figures 3-76 and 3-77). Mortise and tenon joints, and their respective peg holes matched exactly. Missing is an assumed bottom member, which would also have been grooved to accept the gate, would have been mortised to the two side rails, and set into a notch (see Figure 3-159) in the bottom of the masonry and cement sluice. Condition of the sluice is good, however, the stone at the inlet from the *acequia madre* and lining the bottom should be repaired. Several stones have come loose and the entire structure requires pointing.

2. The stone-faced concrete wall below the board fence seen in Figures 3-6 through 3-8 was apparently constructed after 1951, as it does not show up on the "Topographic Map" prepared by the NPS in May 1951 (see Figure 3-5). A six-inch pipe goes through the wall connecting both sides of the *acequia madre*. Condition is very good.

3. A real curiosity is the stone and concrete "conversation pit" (Figures 3-6, 3-14, and 3-15) which sits outside the board fence west of the mill. This structure forms the beginning of the extant portion of the *acequia madre* since it appears to sit right in the *acequia's* profile, but its exact use is thus far unknown. It, too, appears to have been constructed during the WPA period (see detail of flagstones in Figure 3-15). Condition is fair---portions of the "pit" have settled, and cracking is very obvious. There are no plans to restore this feature as an adjunct to the mill.

4. Two sets of stone steps (see Figures 3-16 and 3-17) appear to lead down into the *acequia madre* just west of the bridge shown in Figures 3-18 and 3-19. This set of steps appears to show up in the historical bird's eye photograph of the site (Figure 2-14). Additional archeology performed in December 1996 (see Figures 3-151 through 3-155) disclosed additional steps which appears to match Figure 2-14. Condition is fair. There are no plans to restore these features.

5. A wooden footbridge (Figures 3-18 and 3-19) crosses the *acequia madre* northwest of the mill. This footbridge apparently did not exist prior to the excavations and eventual reconstruction of the mill in 1937. The historical bird's-eye view (Figure 2-14) of the excavations indicate the stone steps mentioned above, but no bridge. Harvey Smith's designs for a bridge very similar to the existing bridge can be seen in his 1937 drawing, Figure 3-4. Two wooden footbridges were designed by Smith: One crossing the *acequia madre*, the second crossing the newly (in 1937) constructed mill race. Although existing construction is similar,

both bridges have been rebuilt over the years, and in the process, Smith's original detailing has changed (compare Smith's details in Figure 3-4, and Figures 3-18 and 3-140). Existing construction is 2x12 treated joists supported on masonry abutments with 2x10 treated decking. Rails are of cedar. Condition is good.

6. Another curiosity is the stone-lined pit southeast of the mill (see Figures 3-20 and 3-21). According to research prepared for this report (see Chapter 2), the erroneous assumption was made that this feature was used as a tanning vat. There is also discussion about it being the foundation for a sugar-reducing caldron related to a sugar cane mill. However, to date its exact use has not been determined. We suggest an analysis of mortar to determine possible presence of any residues (either tannin or sugar) which might point the use in one direction or another. There appears to have been a clay pipe run between this sunken feature and the mill race installed in the early 1950s (see discussion in Chapter 2). The terminus of this pipe is seen in Figure 3-143. This sunken feature is in good condition. It is unknown to what period it dates.

7. Modern structures not associated with the mill, but in the vicinity, include a concrete block dressing room (sheathed in halved cedar logs) built in the late 1960s or early 1970s (Figure 3-22) and the amphitheater (Figure 3-23), the latter built as the Historic Theater of Texas, dedicated in 1958. The dressing rooms, which support the amphitheater, are located directly west of the mill and are partially hidden by existing vegetation. There are no plans to address this structure in conjunction with the ultimate treatment of the mill.

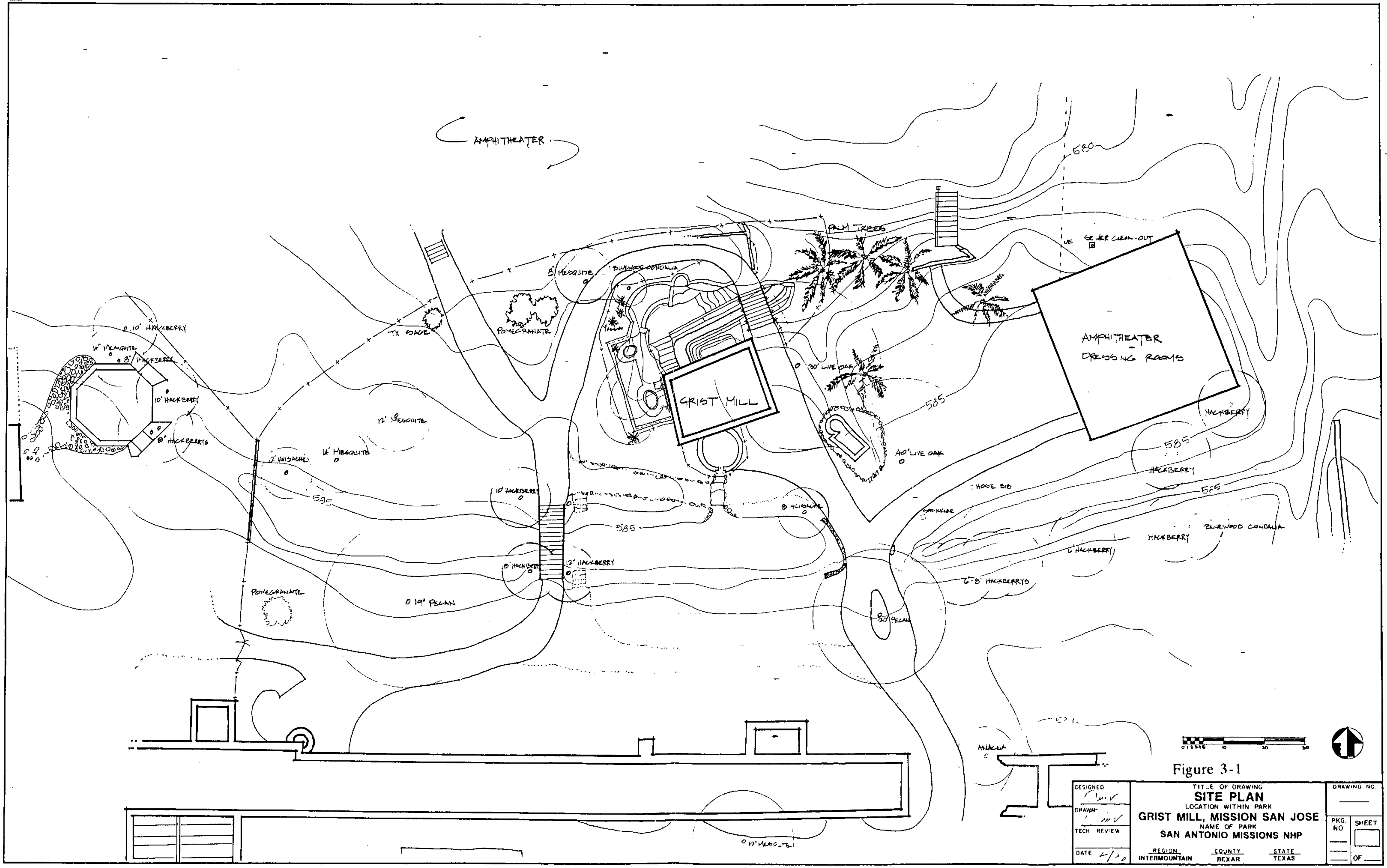

AMPHITHEATER
PALM TREES
SEWER CLEAN-OUT
8' MESQUITE
BLUEWOOD CONDALIA
POMEGRANATE
TX SAGE
10' HACKBERRY
4" MESQUITE
8' HACKBERRY
10' HACKBERRY
8" HACKBERRYS
12' MESQUITE
12' HUISACHE
14' MESQUITE
GRIST MILL
30' LIVE OAK
40' LIVE OAK
AMPHITHEATER
DRESSING ROOMS
HACKBERRY
585
HACKBERRY
585
HOSE BIB
SPRINKLER
BLUEWOOD CONDALIA
HACKBERRY
6' HACKBERRY
6-8' HACKBERRYS
10' HACKBERRY
585
585
8 HUISACHE
8' HACKBERRY
12' HACKBERRY
POMEGRANATE
19' PECAN
28' PECAN
ANACUA
12' MESQUITE
580
DESIGNED
DRAWN
TECH REVIEW
DATE
TITLE OF DRAWING
SITE PLAN
LOCATION WITHIN PARK
GRIST MILL, MISSION SAN JOSE
NAME OF PARK
SAN ANTONIO MISSIONS NHP
REGION
INTERMOUNTAIN
COUNTY
BEXAR
STATE
TEXAS
DRAWING NO.
PKG. NO
SHEET
OF

Figure 3-1

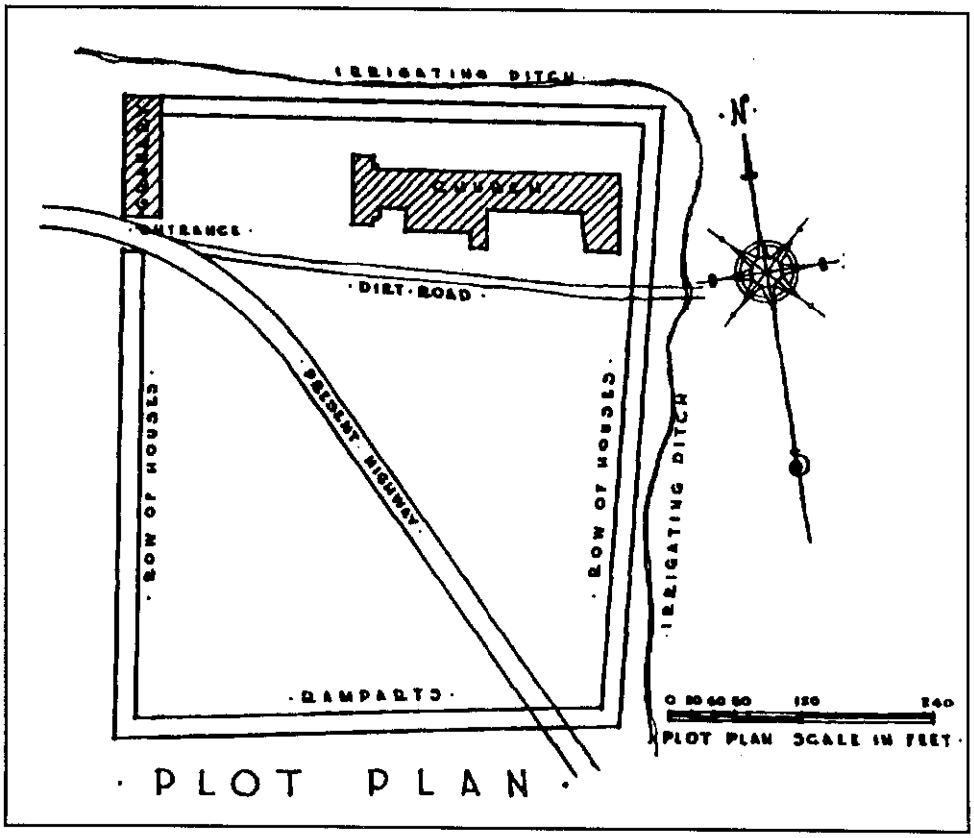
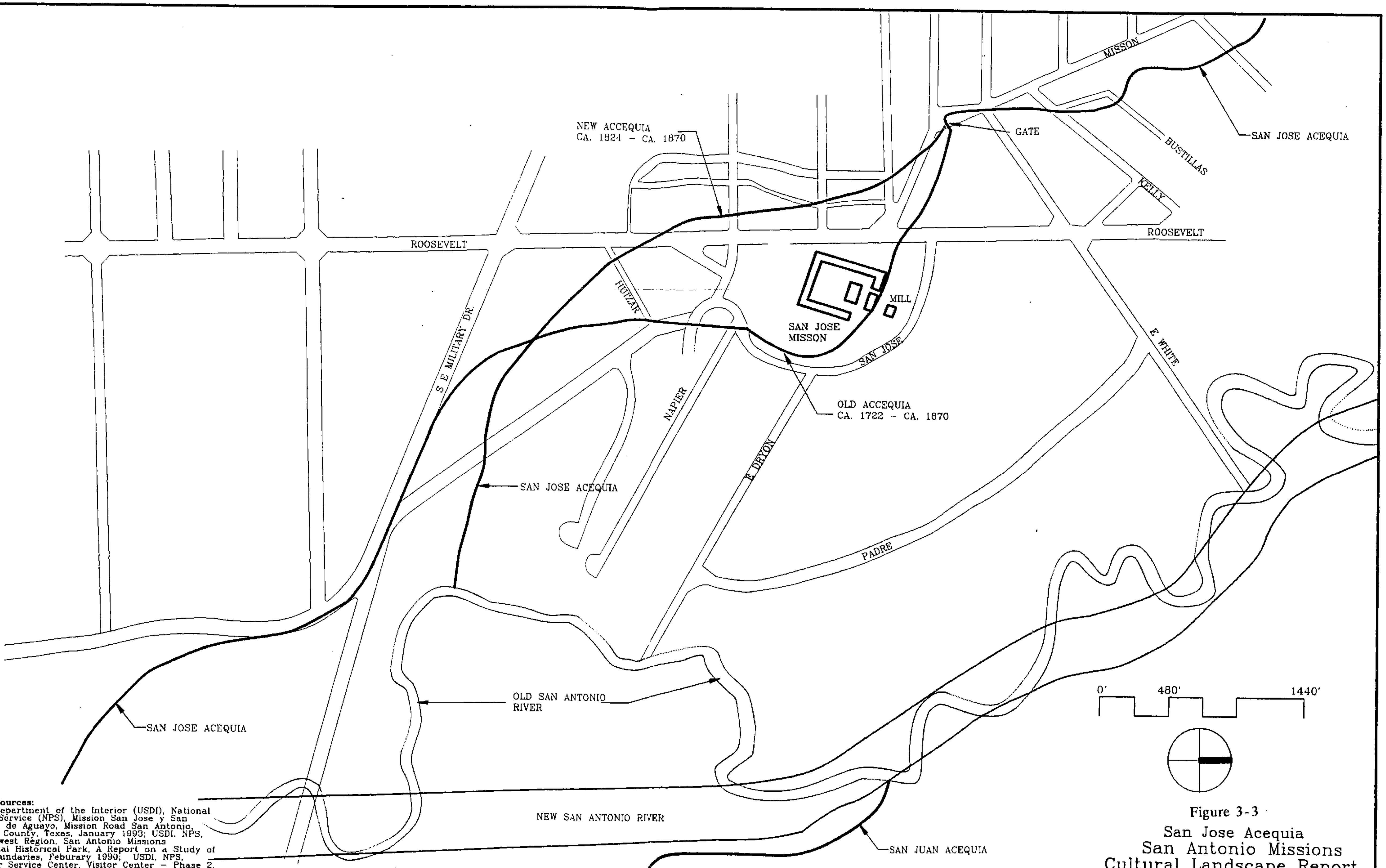


Figure 3-2 ca. 1930. "Plot Plan" detail from Robert Leon White's drawing of the San José compound. Note the location of the *acequia* ("irrigation ditches").

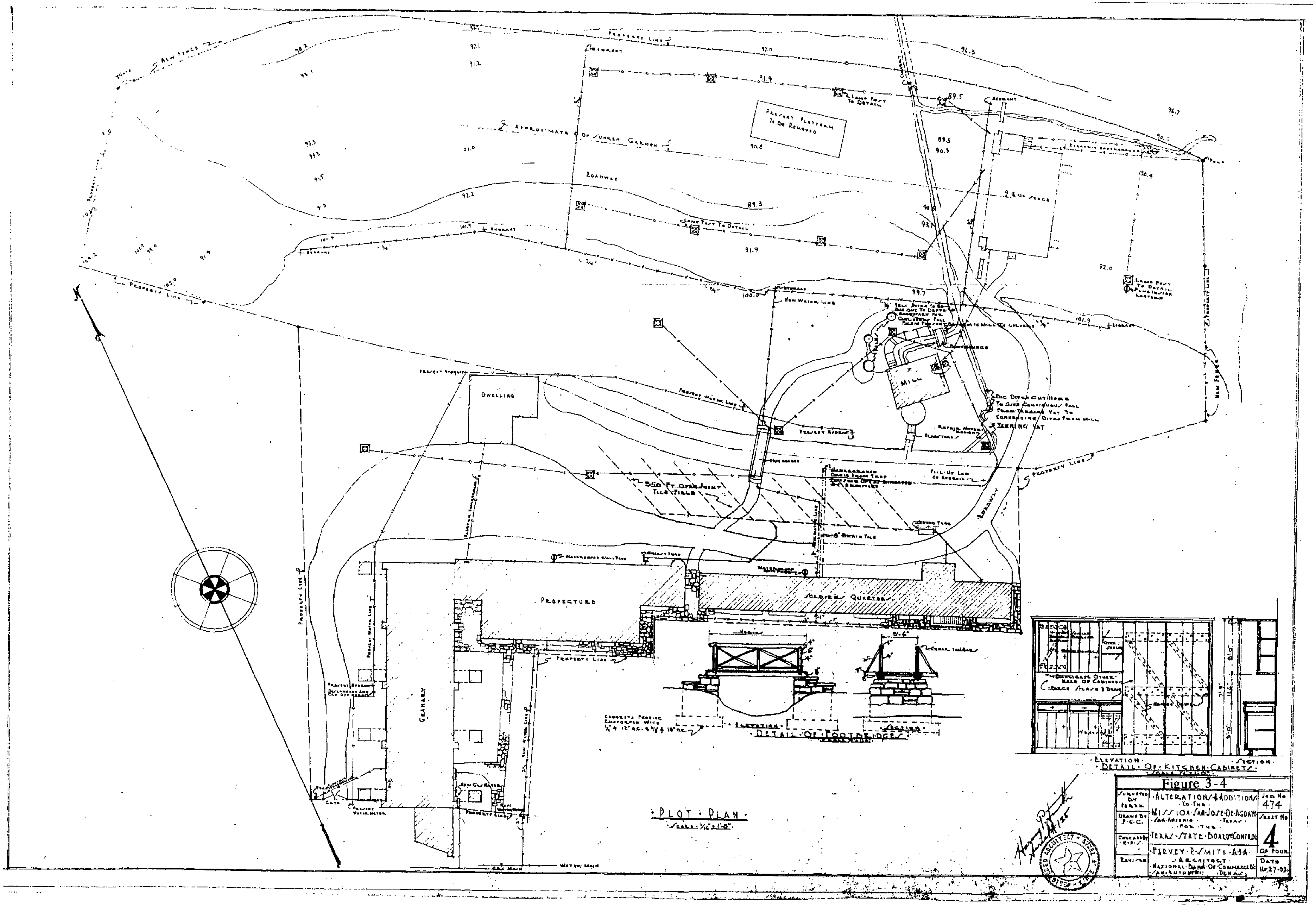
Figure 3-3 (Fold-out, following) 1992. "San Jose Acequia, San Antonio Missions Cultural Landscape Report, Mission San Jose."

Figure 3-4 (Fold-out, following) November 27, 1937. "Alterations & Additions to the Mission San Jose de Aguayo, San Antonio, Texas." Sheet 4 of 4. Office of Harvey P. Smith, AIA, Architect. This drawing shows an interesting layout of the mill and amphitheater, as well as Smith's designs for two wooden bridges to cross the *acequia*.



Map Sources:
U.S. Department of the Interior (USDI), National Park Service (NPS), Mission San Jose y San Miguel de Aguayo, Mission Road San Antonio, Bexar County, Texas, January 1993; USDI, NPS, Southwest Region, San Antonio Missions National Historical Park, A Report on a Study of its Boundaries, Feburary 1990; USDI, NPS, Denver Service Center, Visitor Center – Phase 2, Mission San Jose, Sheets 1-27, September, 1992; LCA fieldwork.

Figure 3-3
San Jose Acequia
San Antonio Missions
Cultural Landscape Report
Mission San Jose



PROPERTY LINE
NEW FENCE
PRESENT PLATFORM TO BE REMOVED
ROADWAY
DWELLING
MILL
TANNING VAT
350 FT. OPEN JOINT TILE FIELD
PREFECTURE
SOLDIERS' QUARTERS
GRANARY
WATER MAIN
GAS MAIN
ELEVATION
SECTION
DETAIL OF FOOTBRIDGES
ELEVATION
SECTION
DETAIL OF KITCHEN CABINETS
PLOT PLAN
SCALE 1/16" = 1'-0"
ALTERATIONS & ADDITIONS TO THE MISSION SAN JOSE DE AGUAYO SAN ANTONIO TEXAS FOR THE TEXAS STATE BOARD OF CONTROL
HARVEY P. SMITH A.I.A. ARCHITECT
NATIONAL BANK OF COMMERCE BLDG. SAN ANTONIO TEXAS
JOB NO 474
SHEET NO 4 OF FOUR

Figure 3-4

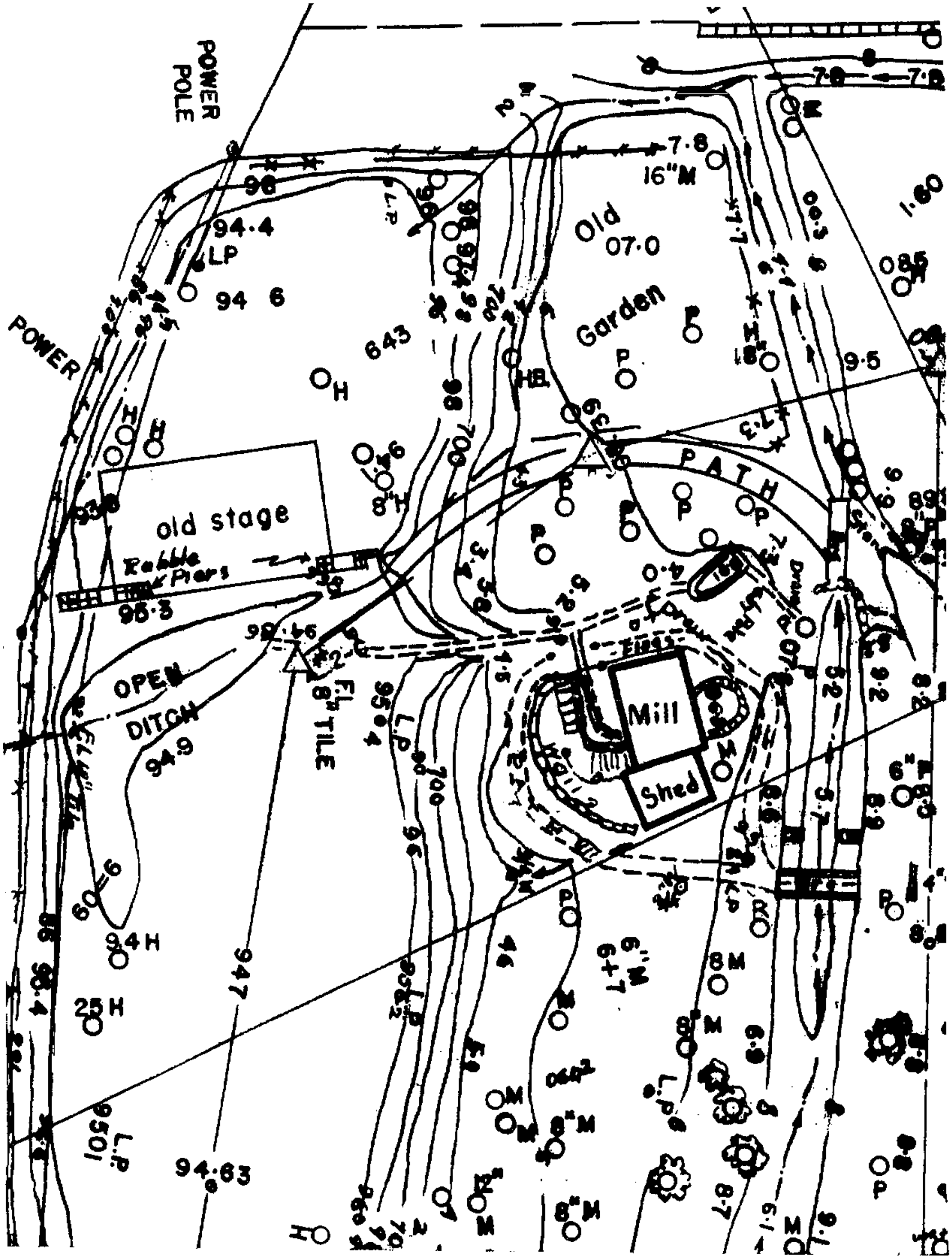


Figure 3-5 May 1951. Detail from "Topographic Map, Entire Area, San Jose Mission National Historic Site." National Park Service, Region Three.

Figure 3-6 December 2, 1996. View looking east toward the "conversation pit." The *acequia madre* which fed the mill is located at the center of the photograph, just beyond the pit. The *acequia madre* continues into the mill area beyond the board fence through a six-inch diameter pipe embedded in a concrete wall under the fence.

Figure 3-7 December 2, 1996. Detail of the *acequia madre* near the conversation pit, the board fence, and the stone-faced concrete wall (the opposite side is stone-faced) beneath with embedded pipe.

Figure 3-8 December 2, 1996. "Front" or east elevation of the stone-faced concrete wall. The photographs is taken standing in the *acequia madre* looking west.

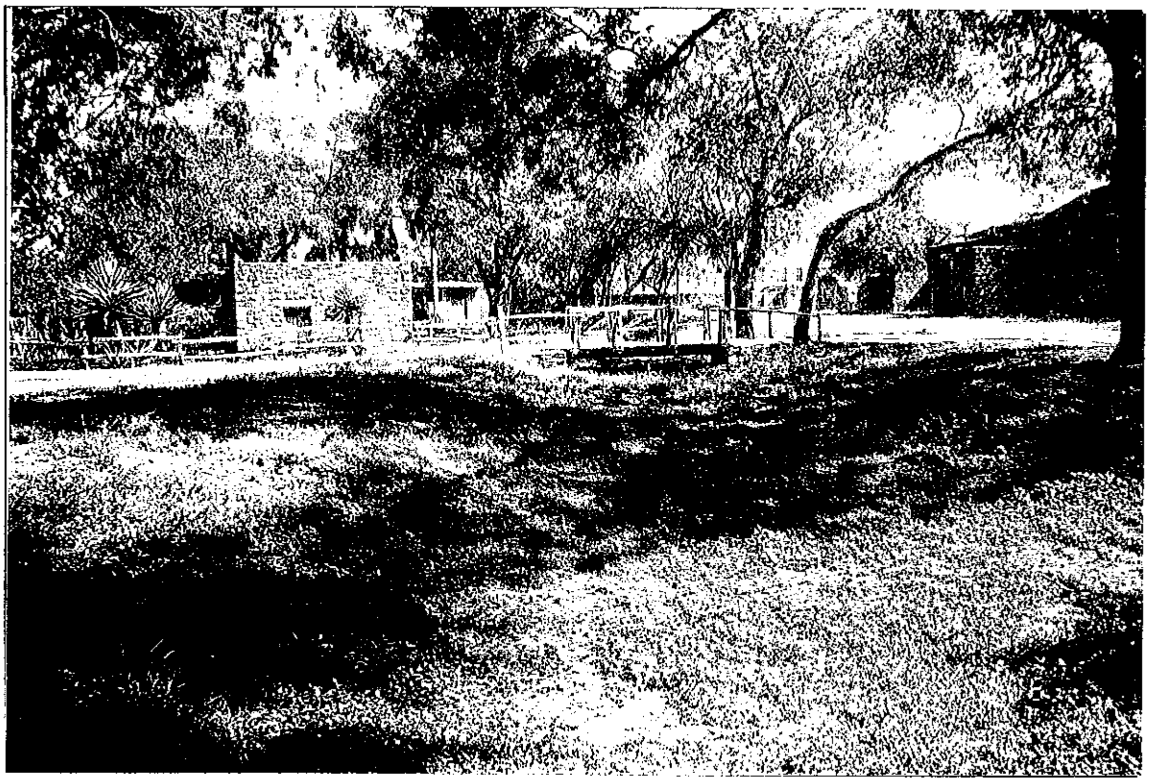


Figure 3-9 September 30, 1996. View looking east along *acequia madre* standing in front of the fence/wall pictured in Figure 3-8. The mill is at the left of the photo. A small wooden bridge which replicates those which appears in Harvey Smith's 1937 "Plot Plan" (Figure 3-4) can be seen at the middle of the photograph.

Figure 3-10 January 17, 1997. View of the *acequia madre* and south exterior elevation of the mill, looking northeast.

Figure 3-11 September 30, 1996. View of masonry retaining wall (non historic) which acts like a weir directing *acequia madre* water through a culvert under a modern brick walk south of the mill. The modern dressing room pictured in Figure 3-22 can be seen at the upper left of the photograph.

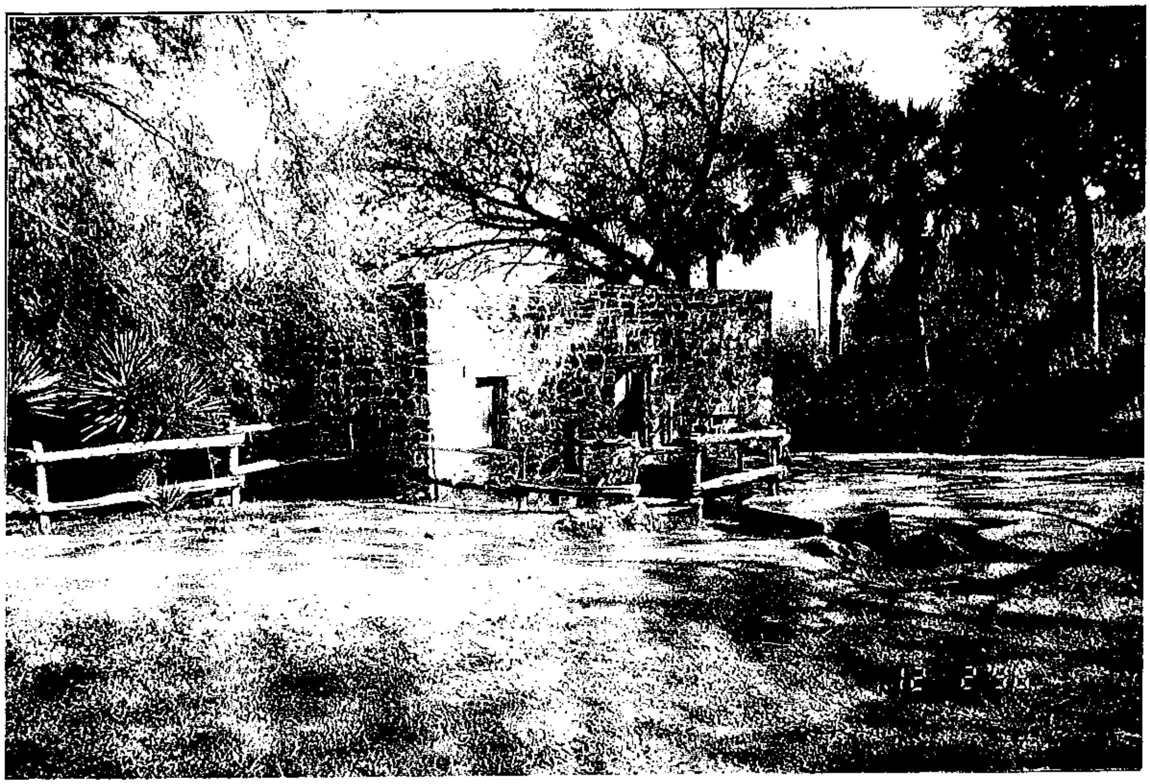


Figure 3-12 September 30, 1996. South exterior elevation of the mill, and a detail of the stone lined and stone covered inlet from the acequia to the forebay in front of the mill. The cedar fence was installed in the 1960s as protection (the forebay is about eleven feet deep).

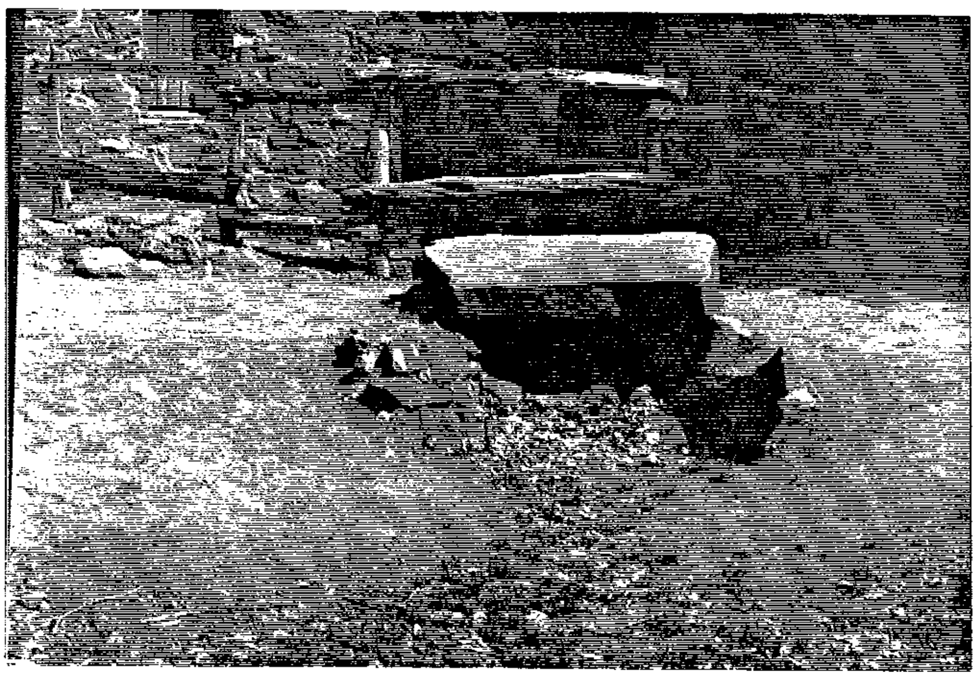


Figure 3-13 June 1996. Detail of the stone lined and stone covered sluice from the acequia to the forebay in front of the mill (prior to excavation).

Figure 3-14 June 1996. View looking northwest toward the stone and concrete "conversation pit," which is situated just outside the board fence on the alignment of the acequia which fed the grist mill.

Figure 3-15 June 1996. Detail of the stone steps in the "conversation pit." The flagstones and masonry techniques used are very similar to other work near the mill and at San Jose attributed to the Civil Works Administration (CWA) and the Works Progress Administration (WPA), both agencies which contributed to the restoration of Mission San José.

Figure 3-16 June 1996. Detail of remnants of stone steps viewed on the south bank of the acequia near the wooden bridge (see the stone steps at the left of the historical photograph, Figure 2-14).

Figure 3-17 June 1996. Detail of remnants of stone steps viewed on the north bank of the acequia near the wooden bridge (see the stone steps at the left of the historical photograph, Figure 2-14).

Figure 3-18 September 30, 1996. Detail of the wooden bridge which crosses the acequia just southwest of the mill (looking east).

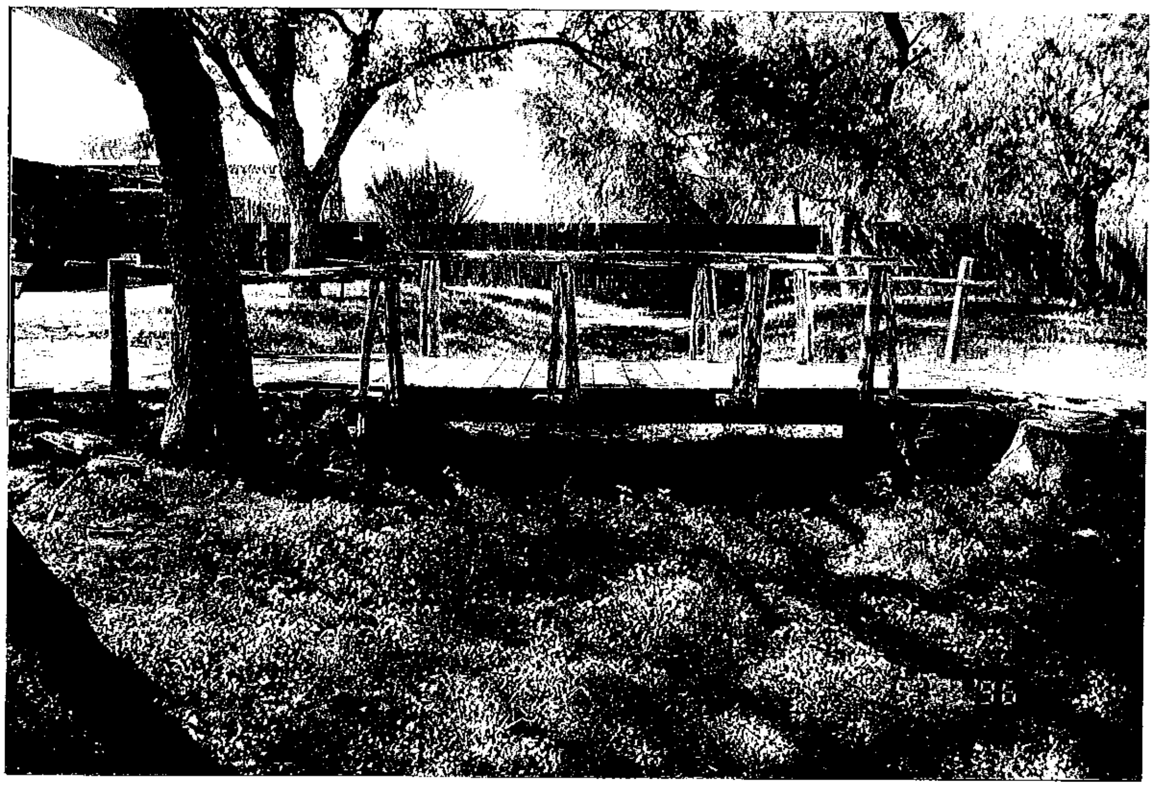


Figure 3-19 September 30, 1996. Detail of the wooden bridge which crosses the acequia just southwest of the mill (looking west).

Figure 3-20 June 1996. Southeast of the mill, looking north into what historical documents call the "tanning vat" other references mention a sugar vat (the caldron which was used to boil down cane juice to make the *piloncillo* cones).

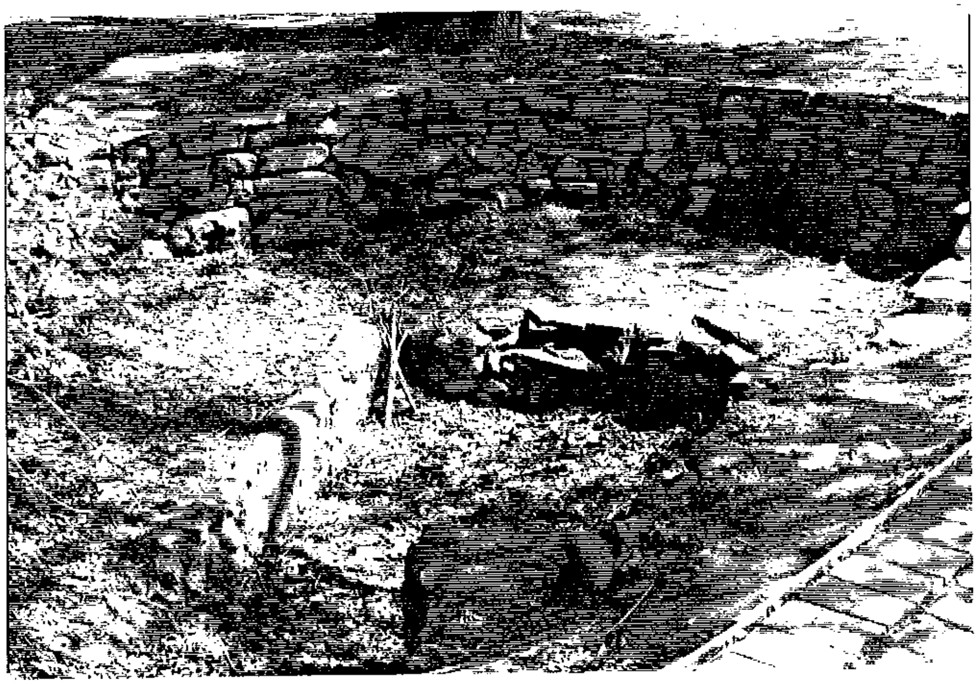


Figure 3-21 June 1996. The "tanning vat" / sugar vat, looking south.

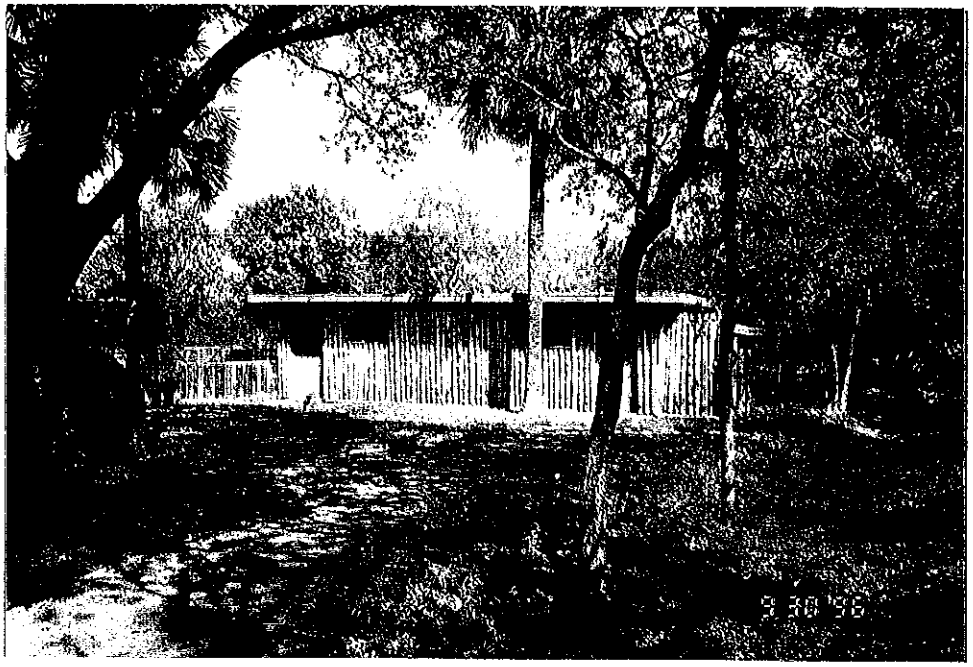


Figure 3-22 September 1996. Modern (ca. 1970) concrete block dressing room which has been sheathed in halved cedar logs in an attempt to help blend the structure with its surroundings. This structure sits almost due east of the mill and is a modern intrusion into the historic scene. The acequia, which terminates just south of the building, can be seen in the lower right corner of the photograph.

Figure 3-23 September 1996. View of the modern amphitheater, looking east toward the stage.

B. The Mill Proper (Figures 3-24 through 3-111): Restored in the mid- to late-1930s through the efforts of the Works Progress Administration (WPA), this Lampassas yellow sandstone structure consists of a one-story milling room (3-26) with cedar shuttered windows and a cedar door in the east elevation. Below the milling room, in a vaulted tufaceous limestone room, were found remnants of the restored turbine wheel and other wooden members related to the milling mechanism (3-52 through 3-77). The condition of the above ground structure is very good with minor pointing required around doors, windows, and walls. The below-grade vault requires more intensive preservation. Archeology performed in December 1996 exposed the flagstone floor of the turbine room and mill race which were described and photographed in the late 1930s. Scaled drawings of the mill (Figures 3-24 and 3-25; see also Appendix Q for the 1973 Historic American Engineering Record [HAER] drawing) were produced in 1993 for the park-produced report entitled "San José Grist Mill," which is referenced in Chapter 2.

1. Roof (Figures 3-27 through 3-35): The roof is a modern built-up system with a very shallow parapet and asbestos-laden, asphalt impregnated flashings. The roof slopes gently north to a single *canal* (drain), Figure 3-35. Looking at three historical illustrations: the ca. 1937 Historic American Buildings Survey (HABS) photo (Figure 2-39); the *San Antonio Express* July 23, 1937 newspaper article (Figure 2-44); and the 1937 sketch of the mill by "E.F.S." (Ernst F. Schuchard)--see Figure 2-53, it appears that the roof system installed during the 1936-1937 restoration may have been lower, given the placement of the drains in these historical illustrations. In the case of Figure 2-39, the <u>wooden</u> drains (the existing <u>single</u> drain is concrete formed to resemble a hollowed log) is shown approximately 24 inches down from the edge of the parapet. Contemporary evidence (Figures 3-29 through 3-35, and 2-70) has disclosed location of all three wooden drains installed in the 1930s. Condition of the roof is very good; removal and proper disposal of asbestos-laden flashings will need to be considered in the future (they are not currently in a friable condition).

2. Exterior (Figures 3-36 through 3-51): Rubble-laid Lampassas yellow sandstone in very good condition. Wall thickness averages 27 inches.

a. The south elevation (Figure 3-36) includes two shuttered windows (Figures 3-37, 3-39, and 3-40) with squared cedar lintels; and one smaller oblique masonry opening (Figure 3-38) between the two windows which held the wooden lifting arm for the wooden gate in the bottom of the forebay. There is a small painted copper-over-wood plaque (one of two originally) on the southeast corner of the building (Figures 3-41 and 3-42).

b. The east elevation (Figure 3-43) includes a single cedar door (Figure 3-44). There is evidence of metal hardware (Figure 3-45) on both jambs of the doorway, most likely for a metal gate which would have allowed visual access into the milling room, but still allow for security. Evidence for a similar gate to the turbine room (Figures 3-66 and 3-67) and historical precedent (Figure 2-45) exist. There is also evidence of an electrical box (Figure 3-46), perhaps for a lamp which was removed or never installed.

c. The north elevation (Figures 3-31 and 3-47) includes one shuttered window (Figure 3-48) and the opening to the vaulted turbine room in the lower level. The one concrete drain described above can be seen in Figure 3-49.

d. The west elevation (Figure 3-50) includes a single shuttered window (Figure 3-51) similar in construction and detailing to other openings.

3. Turbine (waterwheel) Room Interior (Figures 3-52 through 3-67): As found in the 1990s, the turbine room contained the following elements from the 1936-37 reconstruction: waterwheel, wooden shaft, horizontal cedar beam which supports the wooden water chute with an additional cedar arm; cedar water chute; and two sets of "tram rods" at either side of the vaulted chamber. The "bridge tree" which supported the entire wheel assembly was buried with modern fill from the 1940s to the time the entire wheel room was excavated (December 1996). Only remnants of the bridge tree were located (Figures 3-165 through 3-167). Condition of the masonry structure (one of only two areas to which Spanish colonial fabric may be viewed first-hand---the second is the forebay) is fair. The vaulted room has sustained considerable damage to the wall surfaces most likely due to the high degree of moisture which is retained in the walls. The wall surfaces appear to have been parged, but this coating is in very poor condition. Several cracks are apparent as well.

a. The waterwheel (Figure 3-53 through 3-55) is constructed of twelve solid cedar blades each 2" by 12" by 24" mortised into a 12" diameter cedar spindle, held together by two iron bands. Reconstructed according to Schuchard's research, these wheel paddles are set at 45 degrees.

b. The shaft (Figures 3-53 through 3-55 and 3-57) is constructed of two solid cedar log sections spliced just above the waterwheel. A solid 2" steel rod is inserted into the top of the shaft, held into the shaft by two more iron bands. This rod goes up through a cedar cross beam, or bearing (Figure 3-57), into the milling room, through the bottom mill stone and terminates inside the upper stone (see Figure 3-105).

c. Tram rods (Figures 3-58 through 3-60, and 3-68 through 3-70): as discussed earlier in this report, the purpose of the tram rod was to adjust the distance between the two milling stones, depending on what was being ground, and how fine the raw grain was to be ground. The mill at San José contained two sets of tram rods, versus the single rod viewed at the restored Truchas mill at Rancho de Las Golondrinas (and other mills at the Rancho). From historical evidence (i.e., photographs and other illustrations) we have been able to determine that the western-most tram rod was stationary while the second rod provided the adjustment (given the presence of wedges viewed in Figures 2-40 through 2-42).

d. Bridge tree: Attempts were made in December of 1996 to locate the 1937 restored bridge tree (seen in Figure 2-43). Remnants were located and photographed (see Figures 3-165 through 3-167 and 3-175). Since the bridge tree had been buried in moist soil for approximately forty years, it had almost totally deteriorated.

4. Milling Room Interior (Figures 3-78 through 3-111). The interior of the milling room is plastered and whitewashed. There is an outer layer of whitewash on top of an earlier layer. Walls are splayed inward at the window and door openings. Overall condition is very good. Door and window lintels consist of squared cedar beams, the outermost flush with the plaster surfaces and visible.

a. The east elevation (Figure 3-78) includes the cedar door (Figures 3-79 through 3-81). There is one electrical outlet and an electrical box to the left of the doorway.

b. The north elevation (Figure 3-82) includes one shuttered window (Figure 3-84) and two brass plaques (Figure 3-83): the upper commemorating The National Society of the Colonial Dames of America - which furnished funds in 1936 for the restoration of the mill; the lower honoring Pioneer Flour Mills for furnishing the milling hardware.

c. The west elevation (Figure 3-85) includes one shuttered window (Figure 3-86).

d. The south elevation (Figures 3-87 and 3-92) includes two shuttered windows (Figures 3-87 and 3-88) and the oblique opening (Figure 3-89) which held the wooden lifting arm for the sluice gate. A horizontal metal bar spans the upper part of this latter opening. There is a vertical crack under the left window (Figure 3-91) indicating movement of some type, but this is not serious, as the exterior masonry does not contain a respective crack. This interior cracking is most likely the result of a temperature shift in the plaster. Interestingly, a crack with a very similar configuration appears in Figure 2-41. Therefore the crack has never been repaired, or it has reappeared in exactly the same location. In this elevation closest to the door is an electrical panel (Figure 3-93), which is still active.

e. Milling Apparatus (Figures 3-26, and 3-94 through 3-106):

1) Most of the extant apparatus sits on a masonry "table" (Figures 3-26, 3-94, 3-108, and 3-109). The table holds the lower milling stone in place and contains two sets of approximately 9-inch square holes from which the two tram rods enter the milling room from the lower level turbine room. Historical photograph 2-41 shows the two tram rods in place: the east rod was the adjustment rod, the west basically held the bridge tree in place. Figure 3-96 show details of the west opening; Figures 3-26, 3-94, 3-108, and 3-109 show details of the east opening. A masonry block which does not show up in Figure 2-41, but was in place as early as 1942 (see Figure

2-54) can be seen in Figures 3-95 and 3-96. This block was a later addition to the 1937 restoration; however, its exact function is not yet known. The tram rods were removed from the turbine room in September 1996 for safe-keeping, measured recording, and as patterns for re-fabrication.

2) Immediately atop the masonry table is an oak casing for the mill stones seen in Figures 3-26, 3-94, and 3-97. This casing kept grain from flying loose around the milling room and also directed ground flour through a wooden chute (see Figures 2-40 and 2-41) to be collected. The chute, plus the wooden dowel and wire or cord holding it in place, are missing and must be re-created.

3) Above the mill stones is an oak frame holding an oak hopper (Figures 3-26, 3-94, and 3-108). Missing is a second wooden chute which was attached to the bottom of the hopper (see Figures 2-40, 2-41, and 2-54) which directed the grain to the middle of the upper stone to be ground.

4) The mill stones (Figures 3-97 through 3-106) were originally believed to have been those "unearthed in a ditch near the mill site" during the archeological investigations in 1933. However, close visual inspection undertaken for this report revealed a number of curiosities not seen to date with our mill research:

a) The stones looked at first like either concrete or limestone (both which would never have functioned properly). To determine exactly what type of stones were in place, Geologist David Hartsfield of the San Antonio firm AGRA Earth and Environmental, Inc. did a visual inspection, and tests. The upper stone was subjected to a hydrochloric acid test (to determine reactivity with cement). Once thoroughly cleaned, it became apparent that the stones were formed by a composite made of quartzite bonded in a cement (hypothesized to be silica-based due to its hardness and non-reactivity with the hydrochloric acid).[2] This composition matched the following description found in our research: "The most popular millstones in early America were French burr-stones, composed of 'burrs,' or small pieces of quartz from the Marne Valley of northern France. These small burrs were pieced together, joined with cement, and then bound with round iron hoops."[3] See Figures 3-101 and 3-102. Most of the mill stones observed in our research were dense, porous stones

[2]For the detailed analysis, see Appendix P.

[3]Dave Gilbert, *Where Industry Failed; Water-Powered Mills at Harpers Ferry, West Virginia*, Charleston, West Virginia: Pictorial Histories, Publishing Co., 1984, Ch. 3, "Early Industry Around Harpers Ferry," 13.

found in the New Mexico mills.

b) Both stones had ferrous metal bands wrapped around them (Figures 3-101 and 3-102). None of the milling stones observed during our research were similarly fashioned. The above explanation offers a clue, however. Figure 3-107, taken in August 1996 at the restored El Molino Grande de Sapello at Las Golondrinas, shows a mill stone with very similar characteristics to the upper stone at San José, particularly the color, and presence of a metal band and curved metal "rynd."

c) Imbedded into the top of the lower stone and on the underside of the upper stone are two ferrous bearing plates secured with molten lead (Figures 3-103 through 3-106). The plate set into the lower stone is grooved perhaps to accept ball bearings (a supposition by the authors). Again, none of the milling stones observed during our research had this feature. The problem with this assembly is that the two metal plates prevent the two stones from touching, thus preventing any grinding action.

Our theory is that the original milling stones were either not found, or were damaged beyond repair and reuse. Recycled mill stones (most likely from a local turn-of-the-20th century mill) were obtained and fitted to the new milling mechanism. Why the two stones were raised off of each other with the metal rings (new friction/bearing pads essentially) is still a mystery. It is the author's supposition that the arrangement was intended to provide freely rotating stones but without the capacity for grinding grist.

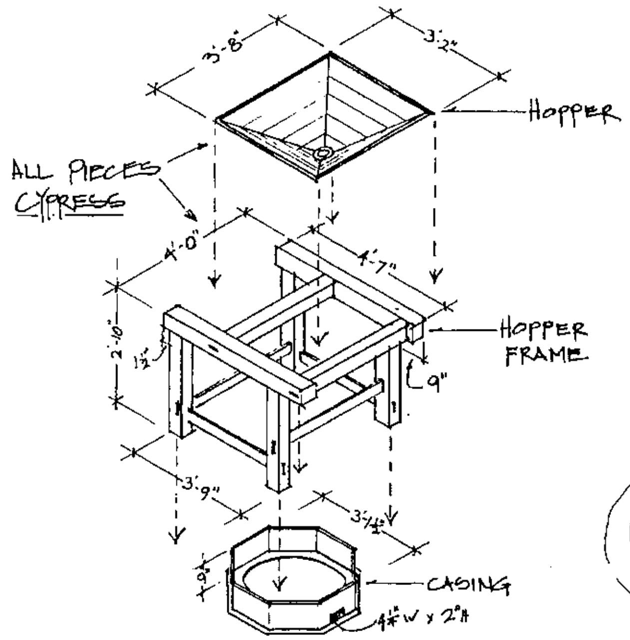
f. Ceiling (Figures 3-110 and 3-111): The ceiling inside the milling room consists of cedar *vigas* (beams) and *latillas* (smaller cross beams)---a construction typical of that found in the Indian quarters at San José. Above the wooden ceiling is a modern metal purlin and metal pan system supporting the modern built-up-roof. This construction (as with that of the Indian quarters) took place in the late 1960s or early 1970s. Condition is very good. Some of the *latillas* will need to be re-installed.

g. Utilities: Currently only electricity is provided to the mill (installed in the late 1960s, and therefore not a part of the 1930s restoration). The main breaker is located inside the San José compound near the Los Compadres gift shop. The outlets noted above inside the milling room are "live." Given the location of covered flush boxes, there may have been anticipated provisions for electrical lights of some type (such as wall sconces), but none were found or have shown up on historical photographs. An electrical panel inside the mill is noted on an April 1968 drawing produced by Johnson and Dempsey Architects, San Antonio, (Job No. 6724, sheet E-1). This drawing (located in park archives) indicates that the panel was to serve the mill and path lights. These "path" lights are non-existent today. It is not known if the underground conduits installed for them exist.

h. Structural: Mr. Michael Zezula, P.E. of the San Antonio firm of Beicker Engineering, Inc. was retained in November 1996 to determine if the mill structure would be affected if water were returned to the structure and the milling apparatus rehabilitated to full operation. Mr. Zezula responded in January 1997 (see Appendix L) with a preliminary report stating that no structural damage would occur if the mill was put into operation again.

Figure 3-24 (Fold-out, following) February 1997. "Plans, San Jose Grist Mill, San Antonio Missions NHP." Plans and details of the existing conditions of the mill recorded originally in January of 1992.

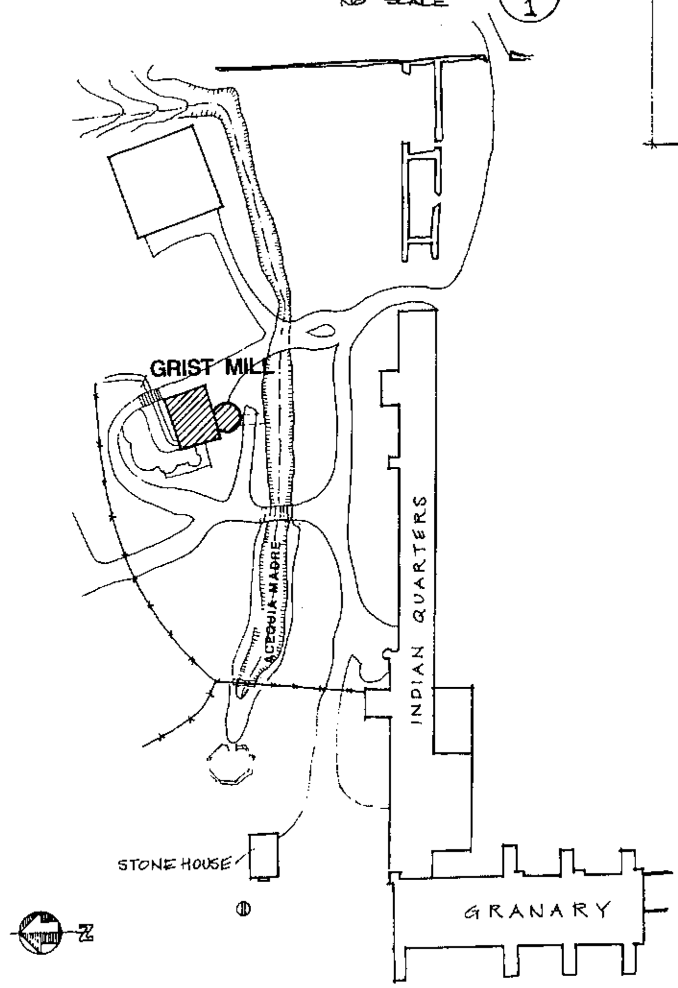
Figure 3-25 (Fold-out, following) February 1997. "Elevations and Section, San Jose Grist Mill, San Antonio Missions NHP." Drawings of the existing conditions of the mill recorded originally in January of 1992.



HOPPER ASSEMBLY

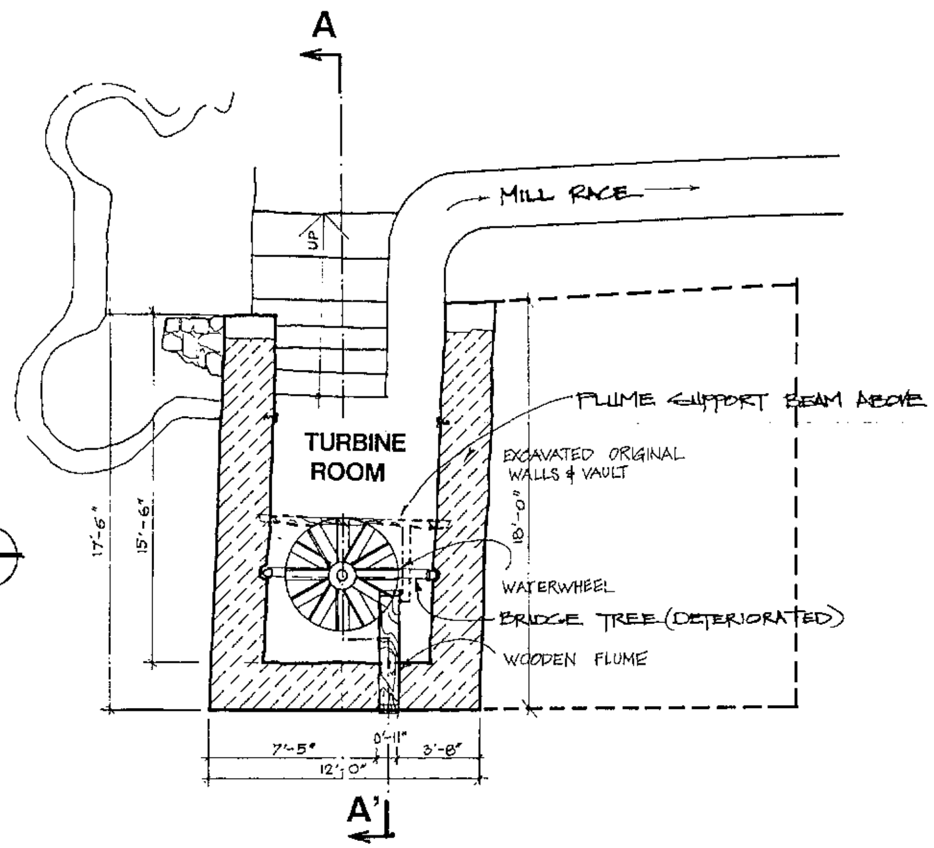
NO SCALE

1/1



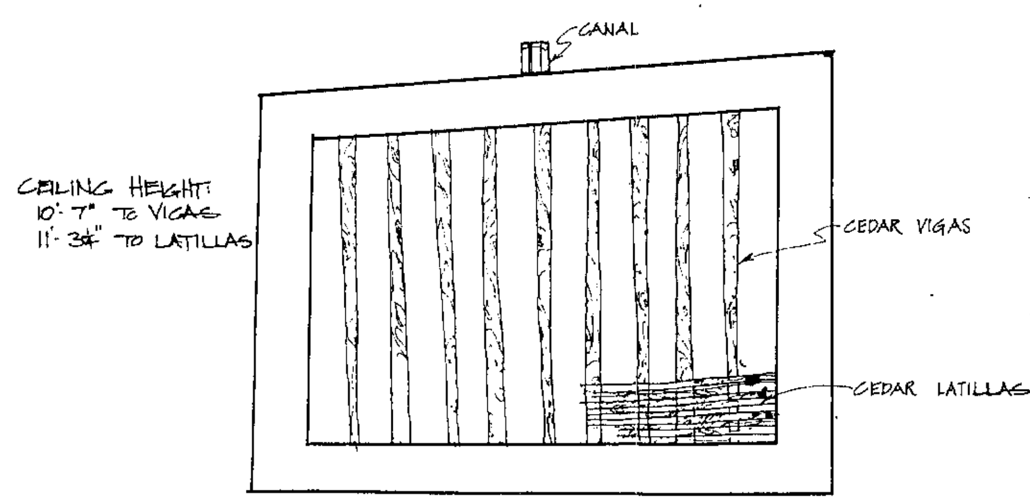
SITE PLAN

SCALE 1"=40'-0"



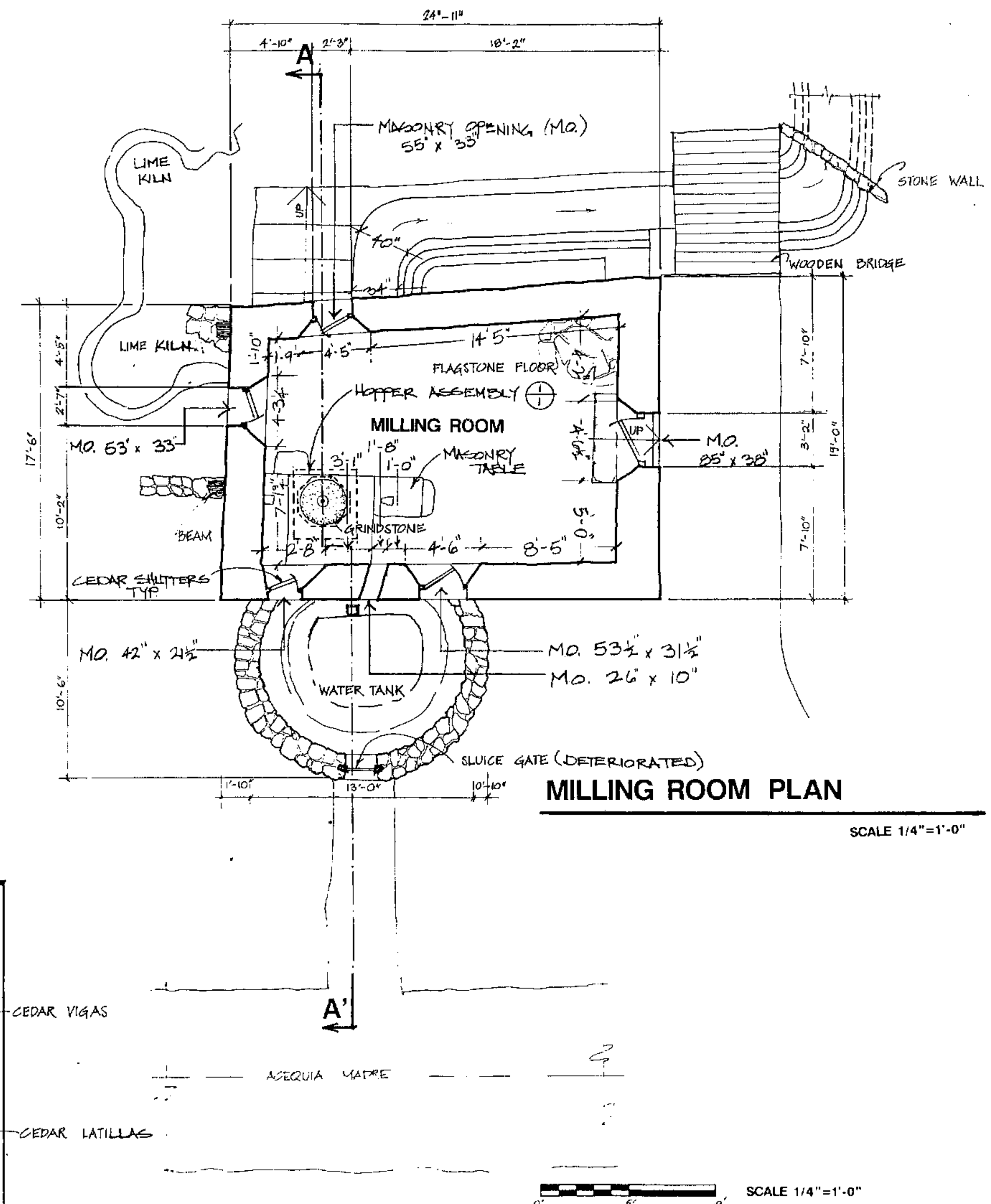
TURBINE ROOM PLAN

SCALE 1/4"=1'-0"



CEILING PLAN

SCALE 1/4"=1'-0"

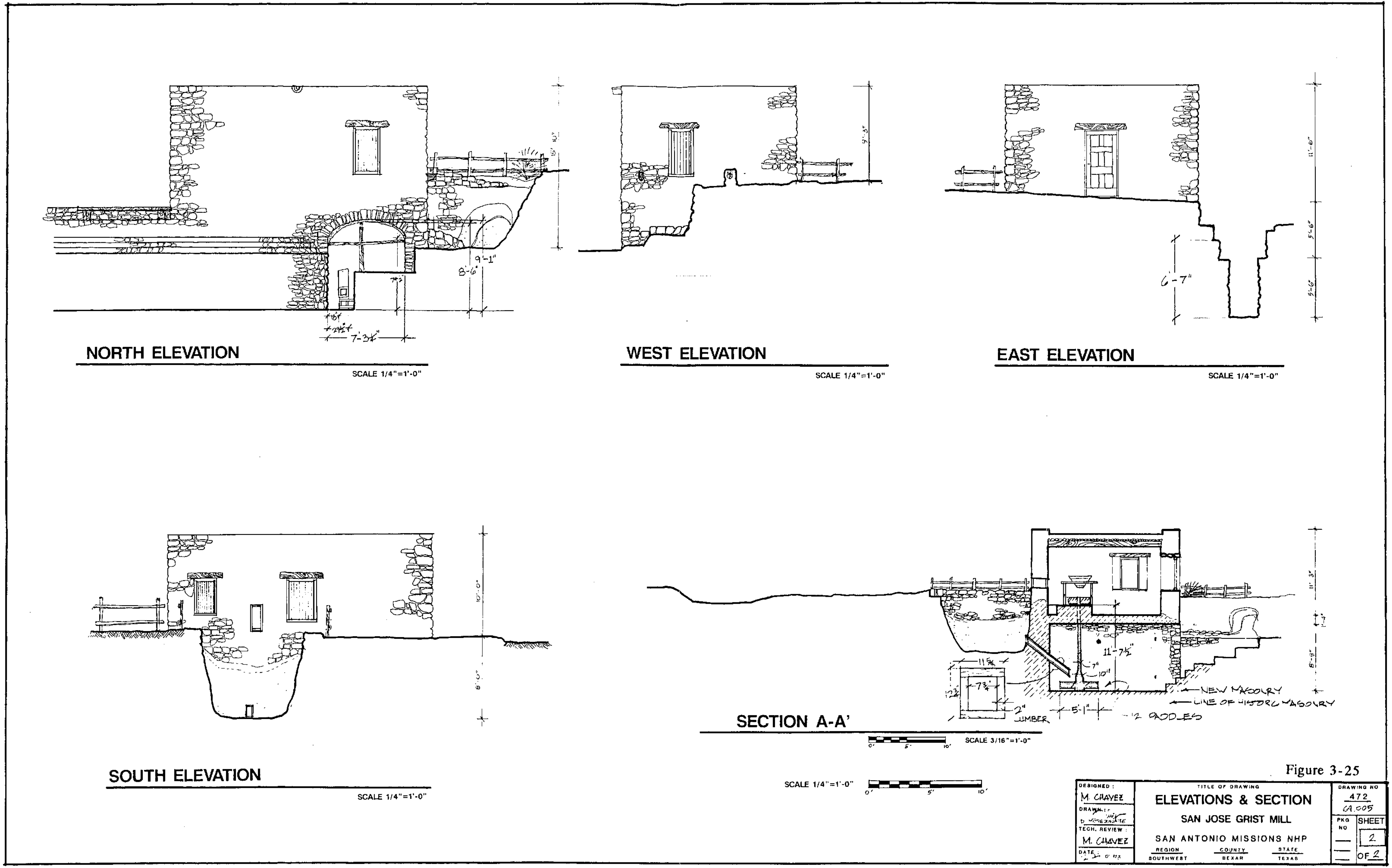


MILLING ROOM PLAN

SCALE 1/4"=1'-0"

Figure 3-24

DESIGNED M. CHAVEZ DRAWN [illegible] TECH REVIEW M. CHAVEZ DATE [illegible] '93	TITLE OF DRAWING PLANS SAN JOSE GRIST MILL SAN ANTONIO MISSIONS NHP REGION SOUTHWEST · COUNTY BEXAR · STATE TEXAS	DRAWING NO 472 64 005 PKG NO SHEET 1 OF 2


NORTH ELEVATION
SCALE 1/4"=1'-0"
WEST ELEVATION
SCALE 1/4"=1'-0"
EAST ELEVATION
SCALE 1/4"=1'-0"
SOUTH ELEVATION
SCALE 1/4"=1'-0"
SECTION A-A'
SCALE 3/16"=1'-0"
SCALE 1/4"=1'-0"
9'-1"
8'-6"
7'-3½"
6'-7"
11'-7½"
5'-1"
NEW MASONRY
LINE OF HISTORIC MASONRY
12 PADDLES
LUMBER
DESIGNED:
M. CHAVEZ
DRAWN:
TECH. REVIEW:
M. CHAVEZ
DATE:
TITLE OF DRAWING
ELEVATIONS & SECTION
SAN JOSE GRIST MILL
SAN ANTONIO MISSIONS NHP
REGION
SOUTHWEST
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TEXAS
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472
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2
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Figure 3-25

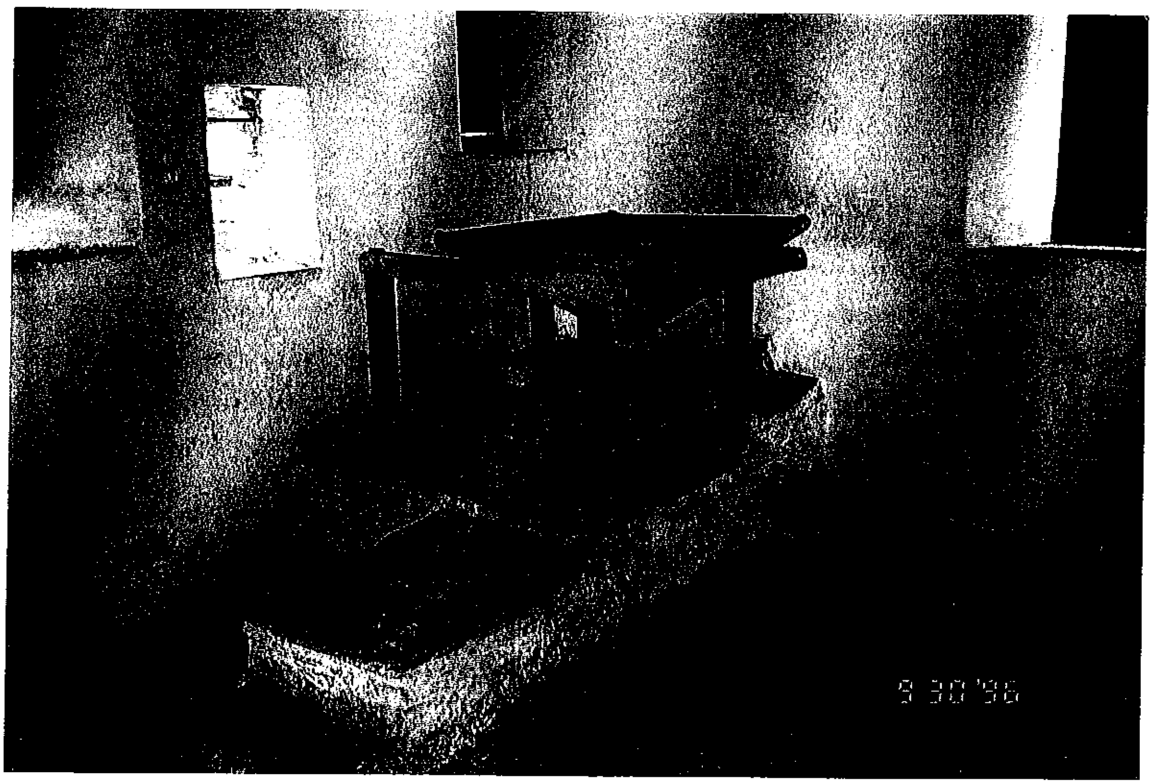


Figure 3-26 September 30, 1996. View into the milling room looking southwest.

Figure 3-27 January 17, 1997. Roof of mill looking northwest. The surface is built up with gravel ballast and one drain formed of concrete to resemble a hollowed out log. The parapet is only two to three inches high, and is composed of asphalt impregnated asbestos fabric flashing.

Figure 3-28 January 17, 1997. Detail of roof drain and flashing.

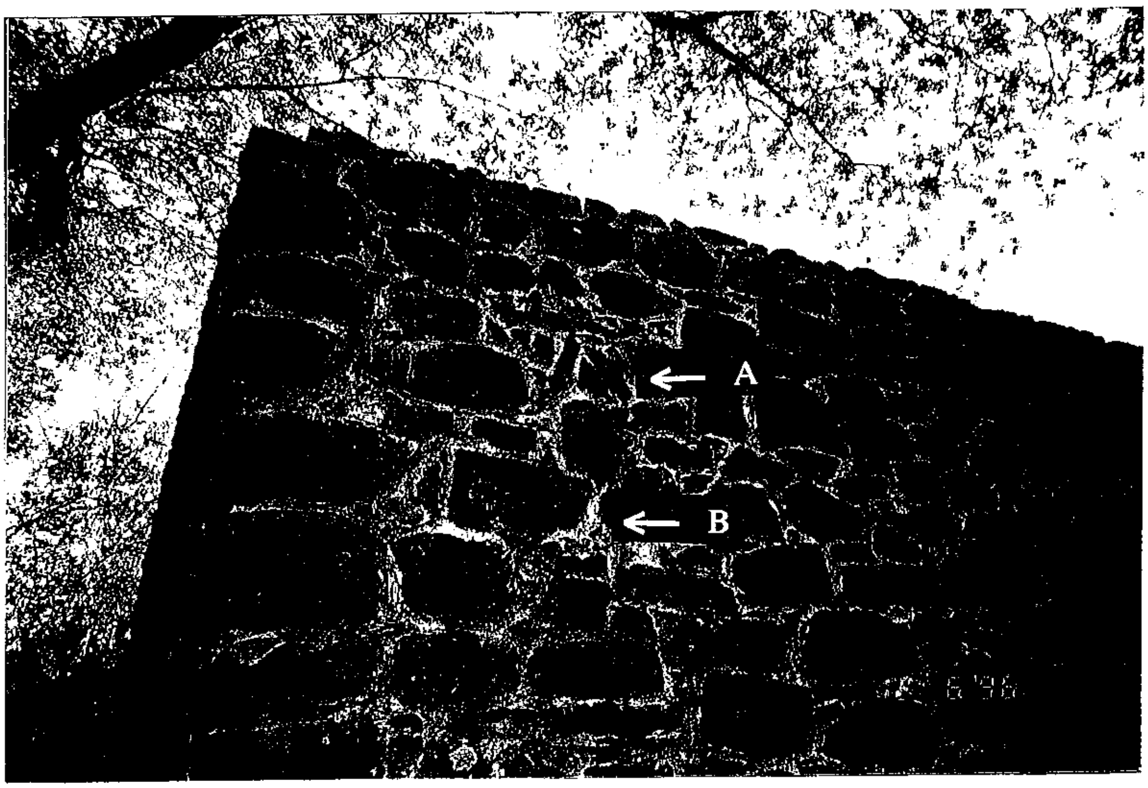


Figure 3-29 December 6, 1996. Detail of upper northeast elevation indicating possible presence of removed wooden drain in this location. Arrow "A" points to inverted "V" arrangement of flagstones used in the 1930s to form a lintel-arrangement above all wooden drains installed at that time (see Figure 3-34). In the 1960s, during the re-roofing of the mill and Indian quarters at Mission San José, all wooden drains were closed off (the mill's were also removed) and concrete drains formed to resemble wood, were installed. Arrow "B" points to tar drips immediately below this inverted "V" indicating that a drain did indeed exist at this location.

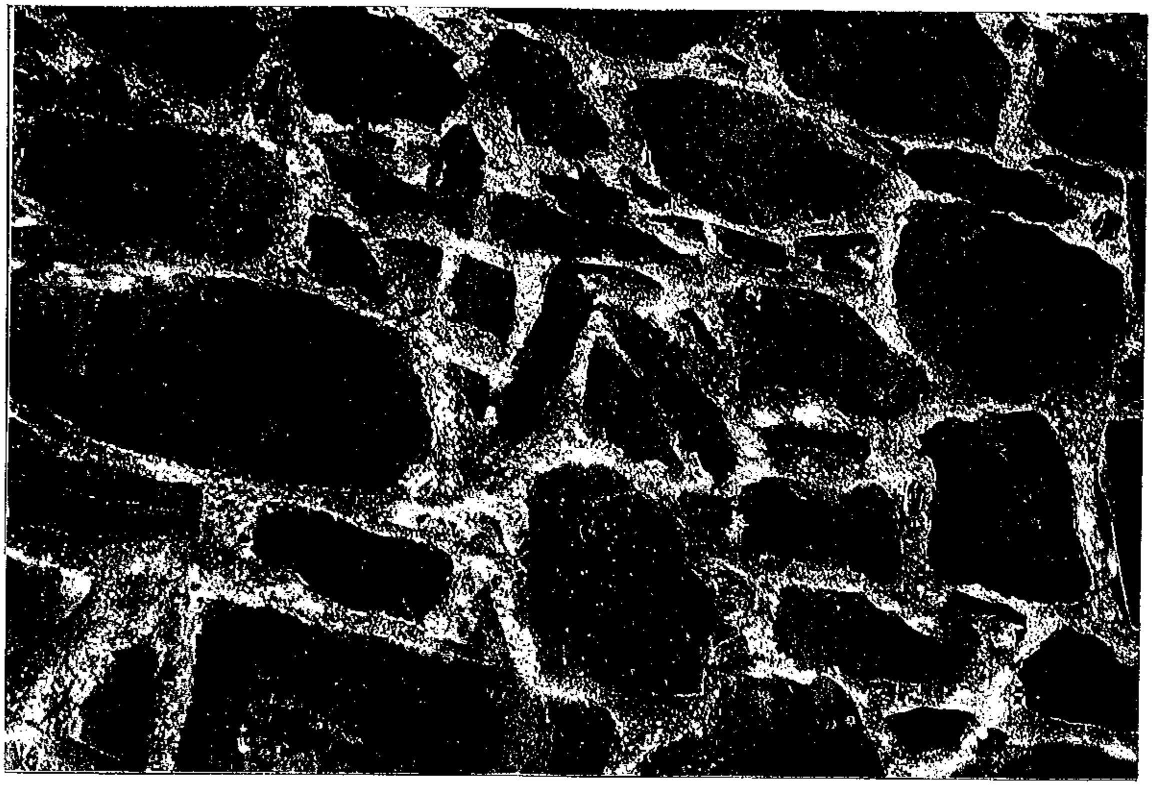


Figure 3-30 December 6, 1996. Enlarged view of inverted "V" arrangement of flagstones described in Figure 3-29.

Figure 3-31 December 6, 1996. Detail of eastern end of north elevation. Arrow points to the "stone-and-cement catchment apron" described in Chapter 2 (page 2-19), which was apparently enlarged per Erik Reed's 1946-47 Annual Report for the Mission San Jose National Historic Site (NHS).

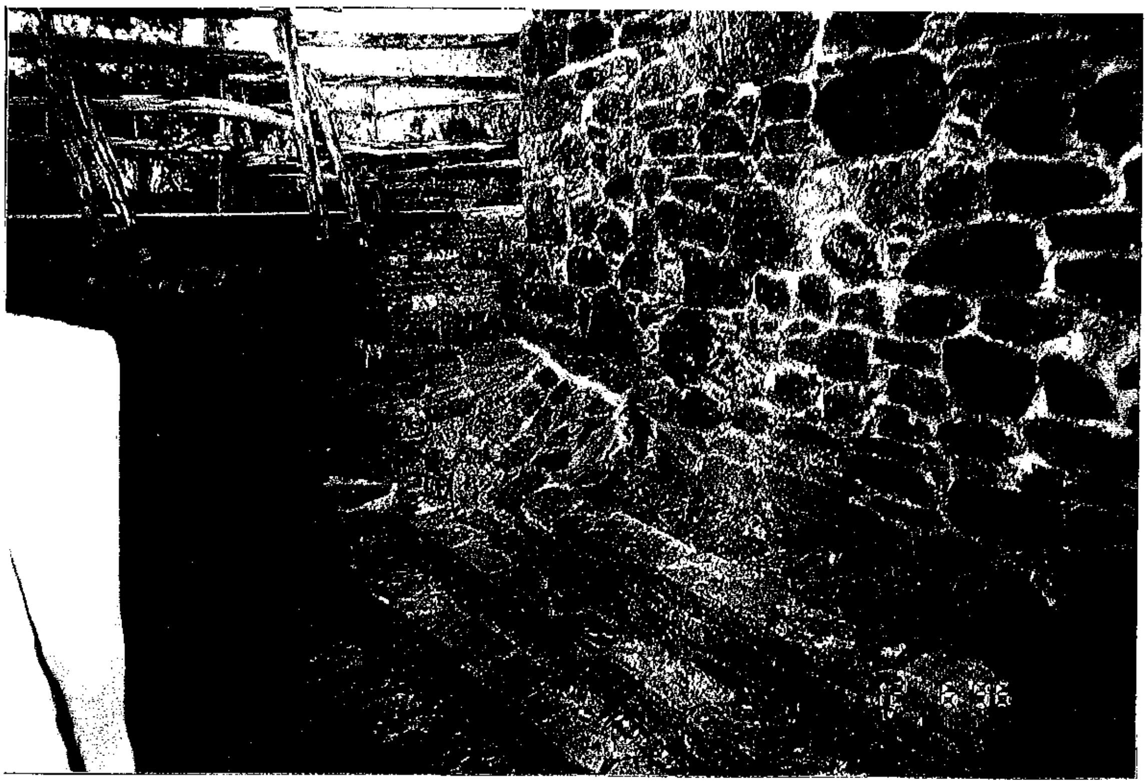


Figure 3-32 December 6, 1996. Enlarged view of "catchment apron" described in Figure 3-31.

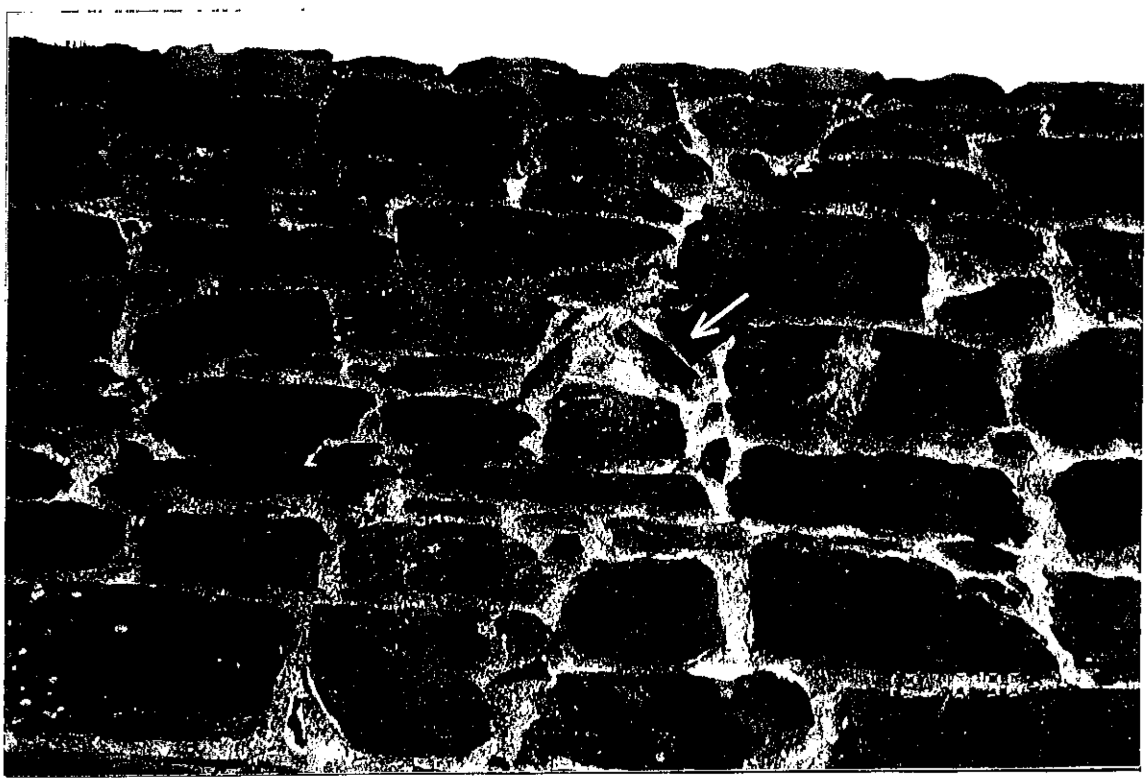


Figure 3-33 December 6, 1996. Detail of upper northwest elevation indicating possible presence of removed wooden drain in this location. Arrow points to inverted "V" arrangement of flagstones used in the 1930s to form a lintel-arrangement above all wooden drains installed at that time (see Figure 3-34).

Figure 3-34 December 6, 1996. One of the existing wooden drains on the inside of the compound at Mission San José, used originally during the 1930s restoration to drain the Indian quarters roof to the inside of the compound. In the 1950s re-roofing project, all these drains were closed off, and the roof were re-configured to drain to the outsides of the compound via concrete drains formed to resemble wood (Figure 3-35).

Figure 3-35 December 6, 1996. Detail of single existing concrete drain in the north elevation. The stonework appears to have been changed immediately below this drain (the lighter stone and absence of lichens is most likely due to the drain acting like a small roof over these stones). Note the variation in stone <u>size</u> however: The coursing appears to change radically in this 12-inch by 32-inch section of the wall below the drain. This seems to support the late-1940s rehabilitation discussed in Chapter 2 (pages 2-18 to 19) which stated that, due to deterioration by this center roof drain of masonry walls below, this drain was removed and the drain at the northeast corner of the building enlarged. See also Figure 2-70.

Figure 3-36 September 30, 1996. Overall south elevation. Note the huge slab of sandstone spanning the sluice. This stone (or one similar) is indicated in Smith's 1937 site plan of the mill area (Figure 3-4).

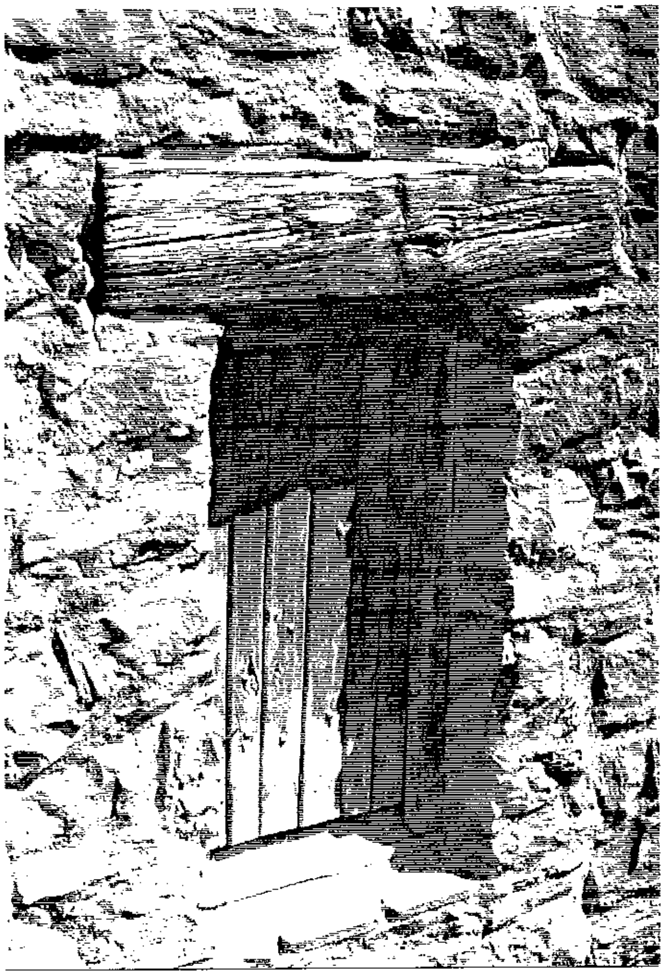


Figure 3-37 June 1996. Detail of the southwest window in the south elevation. The condition of the lintel is fair to good.

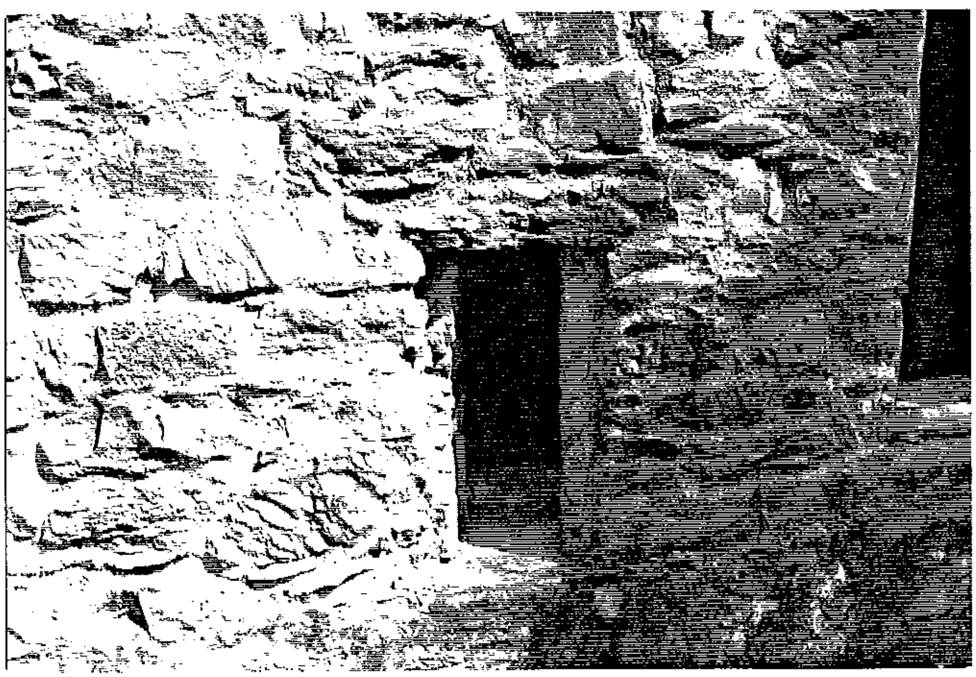


Figure 3-38 June 1996. Angled Window immediately above the forebay, which held the lifting arm for the gate chute inside the forebay. The angle is toward the west.

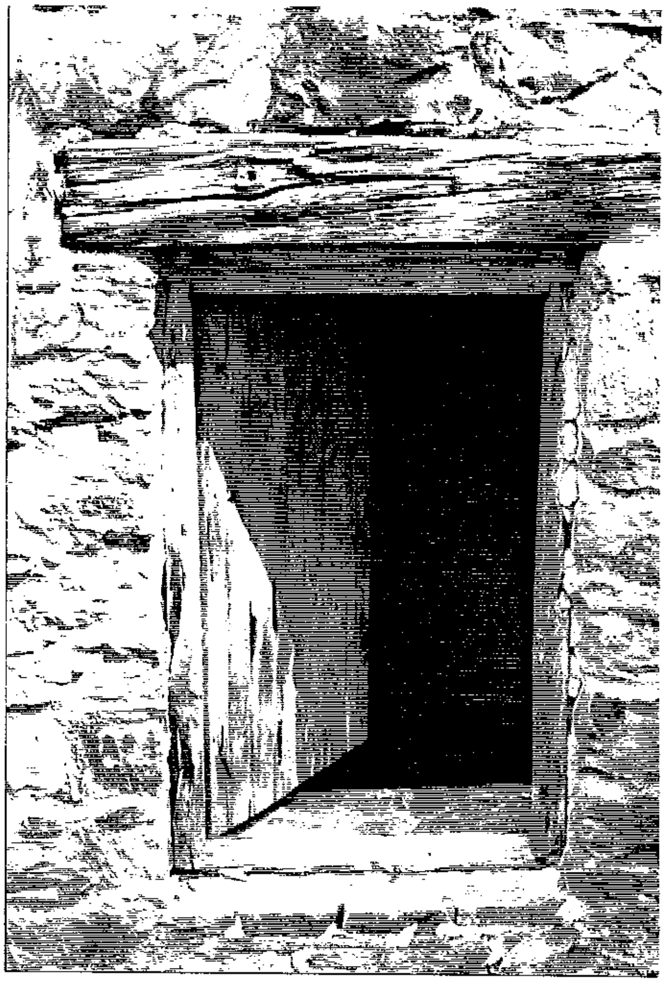


Figure 3-39 June 1996. Detail of the middle window in the south elevation. The condition of the lintel is fair to good, minor pointing is required, primarily above the window lintel.

Figure 3-40
June 1996
Detail of the sill of the middle window in the south elevation (typical for all window sills).
The condition of the sill is good, minor pointing is required.

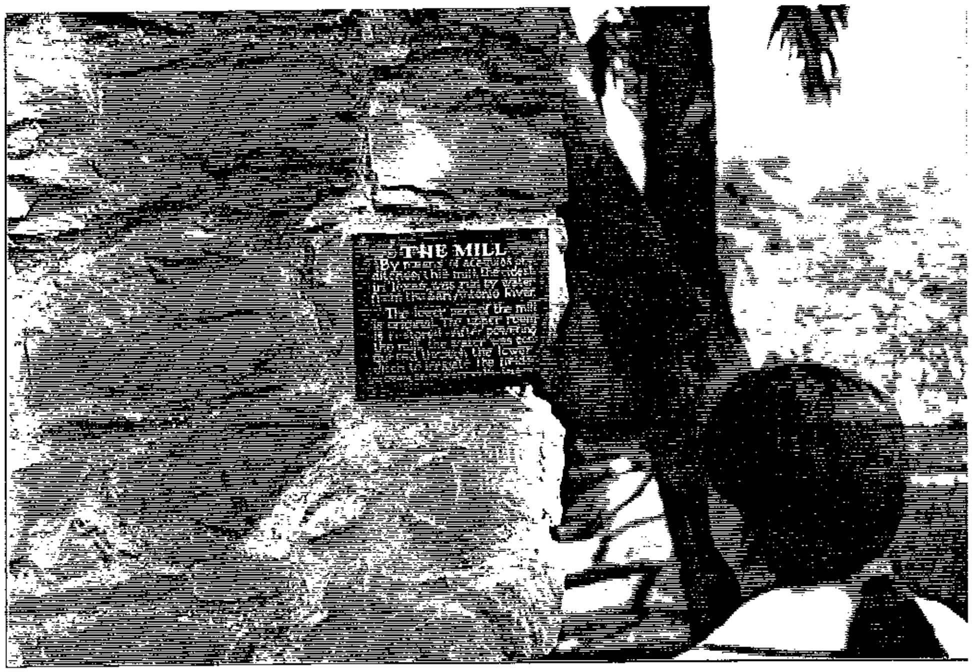


Figure 3-41 June 1996. Detail of the mill plaque, south exterior elevation.

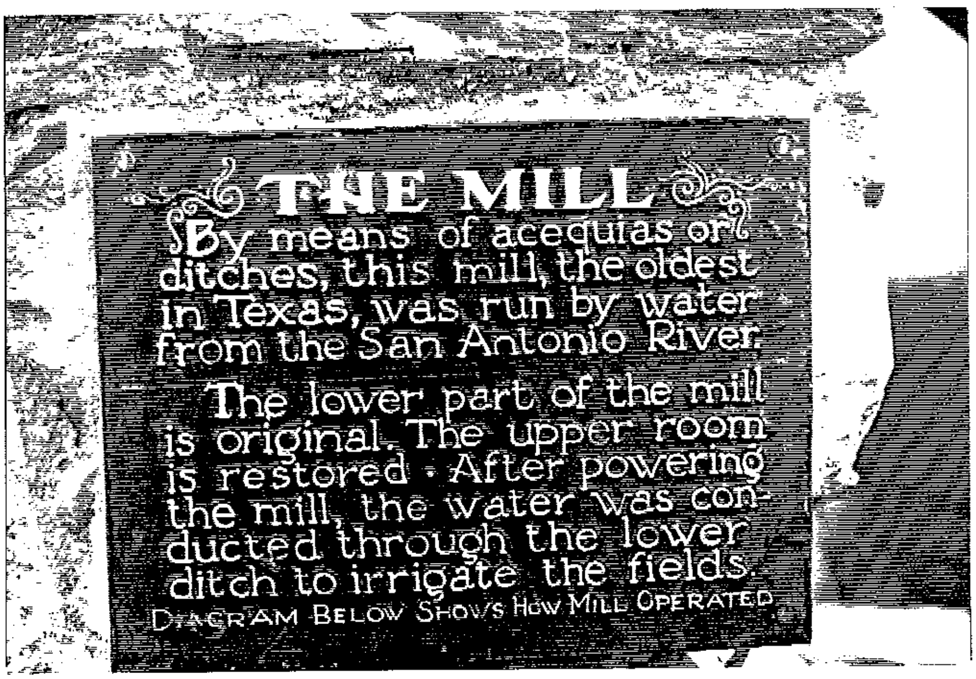


Figure 3-42 June 1996. Enlarged detail of the plaque on the southwest corner of the building (a second plaque which had the "diagram" is missing).

Figure 3-43
June 1996
East exterior elevation. The arrow points to the covered junction box seen in Figure 3-46.

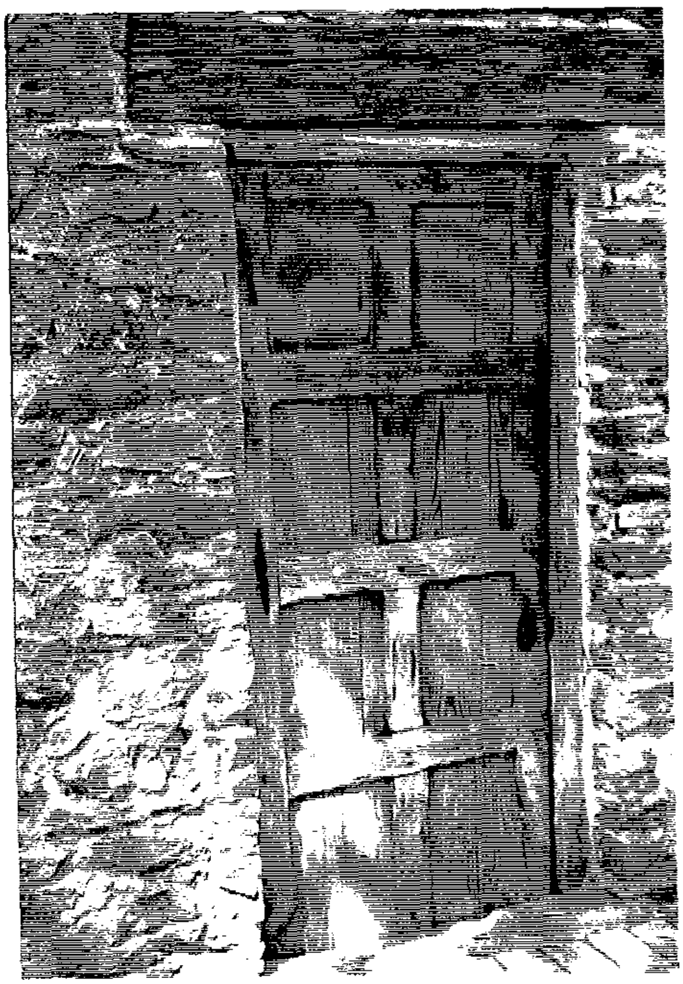


Figure 3-44
June 1996
Detail of the door in the east elevation. The door is pretty difficult to open and close. The jamb is loose and the lintel is in good to fair condition.

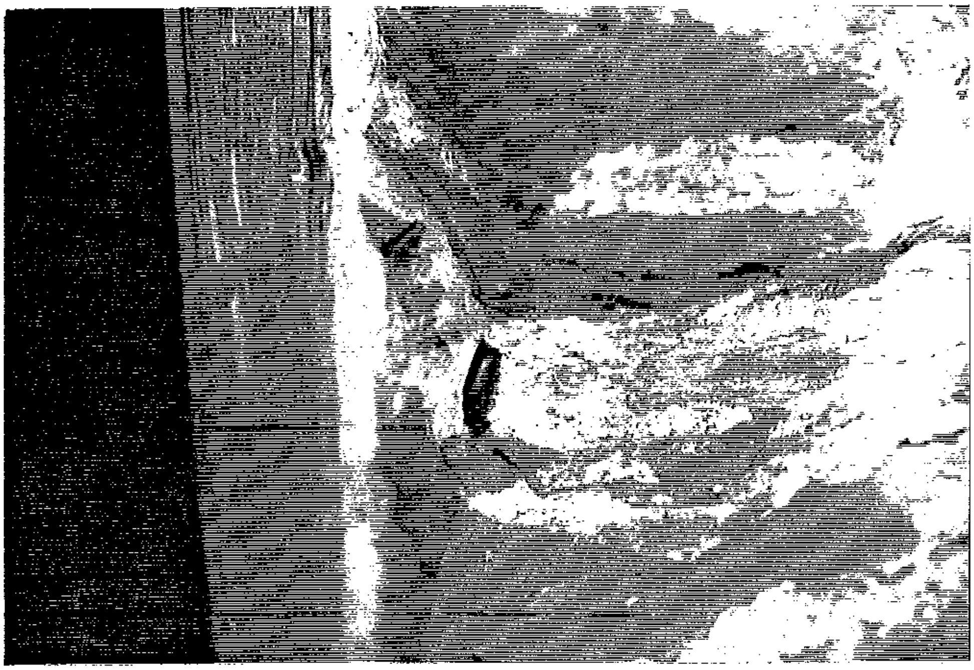


Figure 3-45 June 1996. Detail of the small ferrous metal embedded item on the right side of the doorway as you face it. There are two of these metal pieces embedded in the diagonal side of the entrance stonework, most likely for a gate.

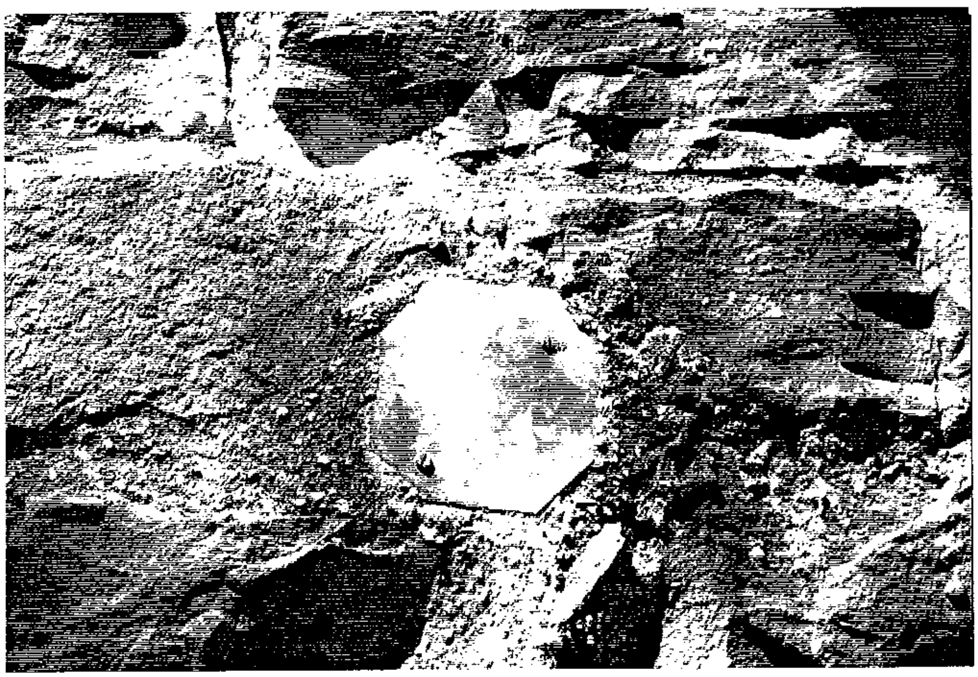


Figure 3-46 June 1996. Detail of an embedded electrical box with a cover on it on the east exterior elevation.

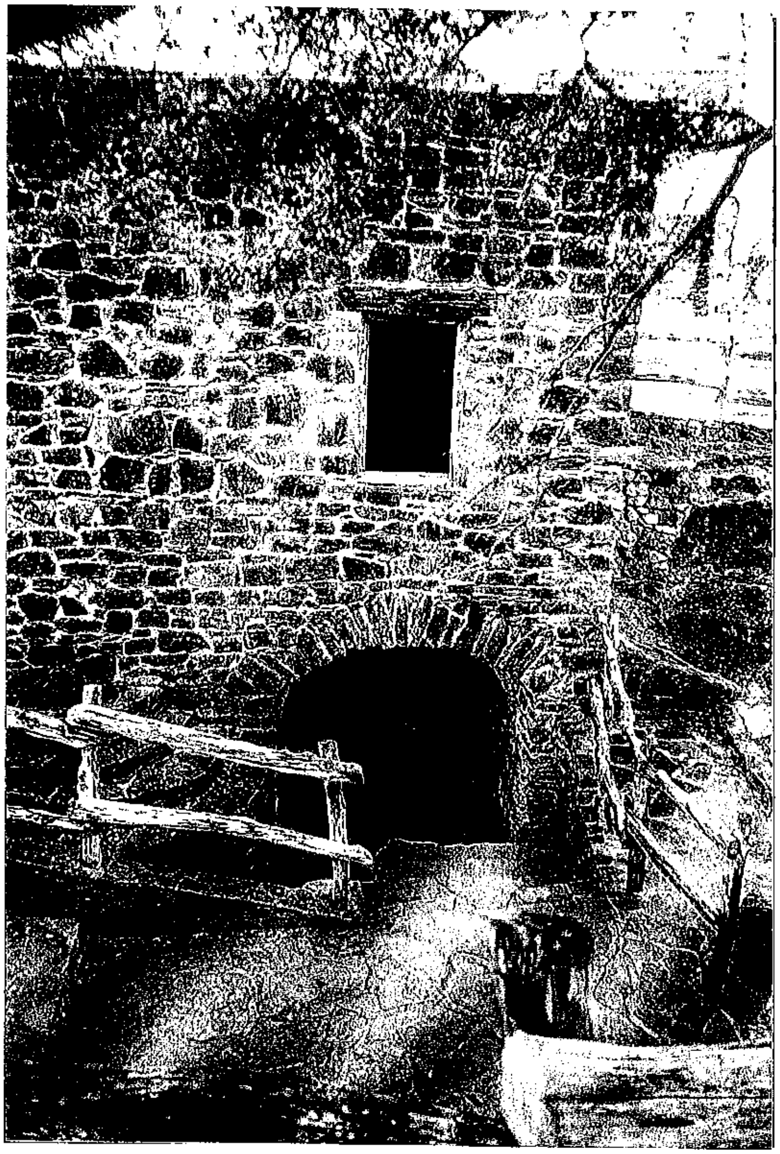


Figure 3-47 June 1996. Overall north elevation of the mill. There is one shuttered window at the northwest corner. The arched stonework above the wheel room vault can be seen at the lower right of the photograph.

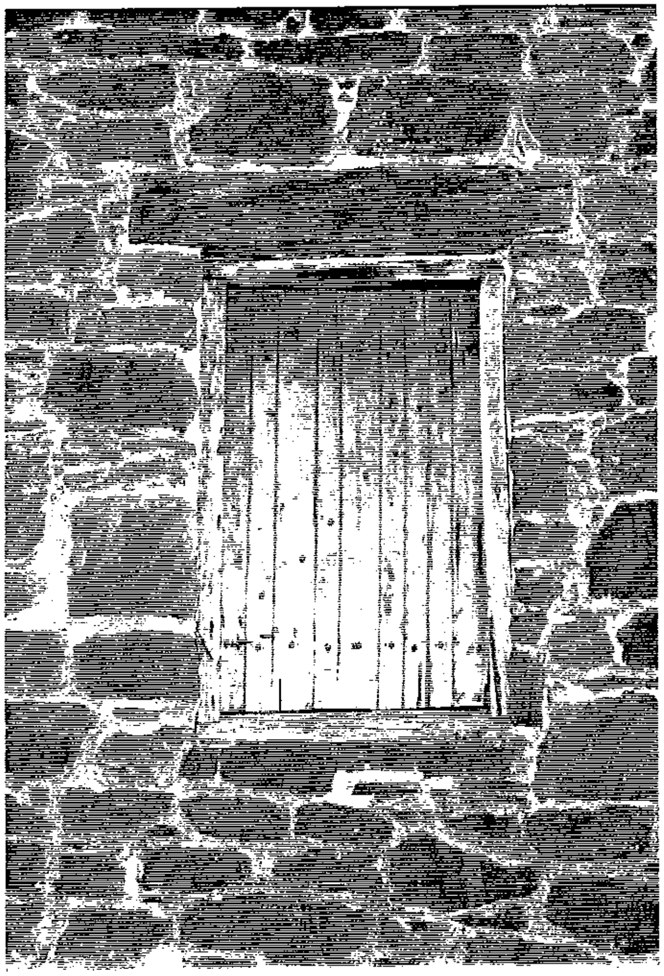


Figure 3-48 June 1996. Detail of the window/shutter in the north elevation.

Figure 3-49 June 1996. Detail on the north elevation of the simulated wood drain, fashioned out of concrete. Many of these drains were installed by the State on the Indian quarters of the San Jose compound in the 1960s.

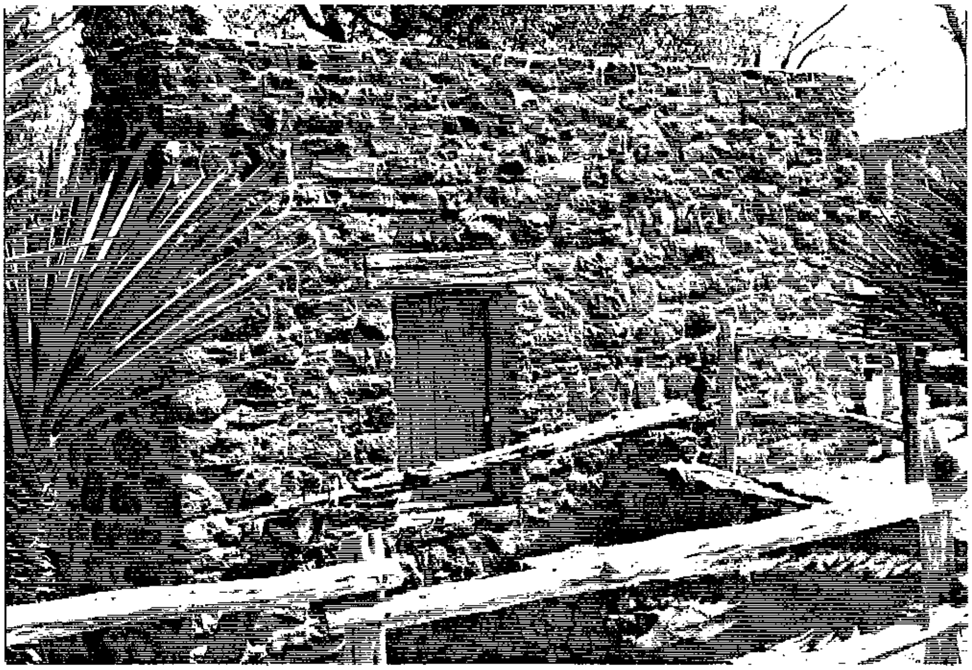


Figure 3-50 June 1996. Overall west elevation. Timber at base of window is a remnant of the "shed" roof which was installed in the late 1940s or early 1950s.

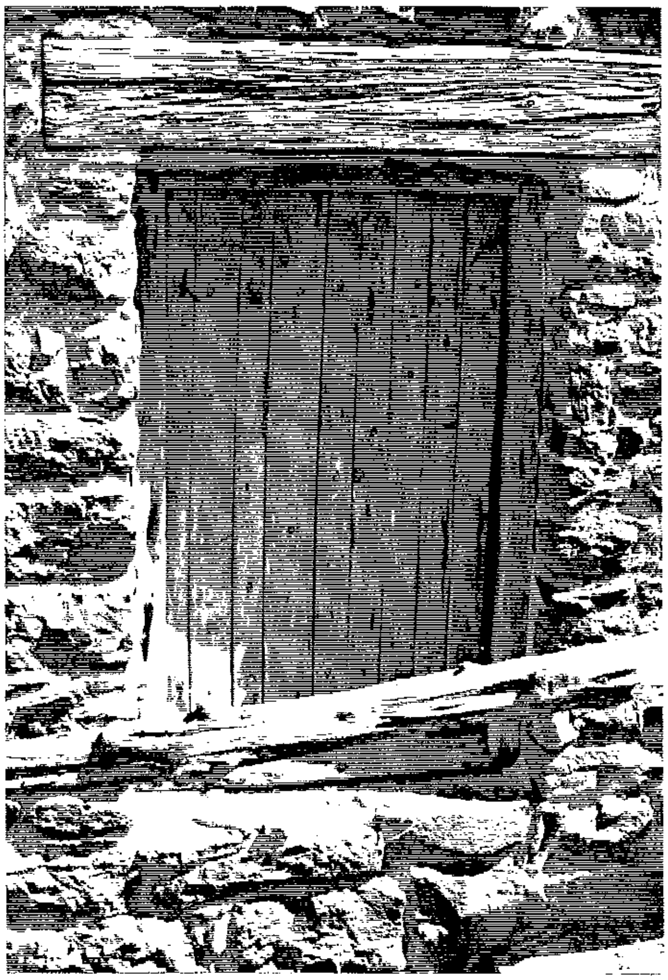


Figure 3-51 June 1996. Detail of the window in the west elevation. Condition of the masonry on the west elevation is excellent again with the exception of some pointing that needs to be done around the window.

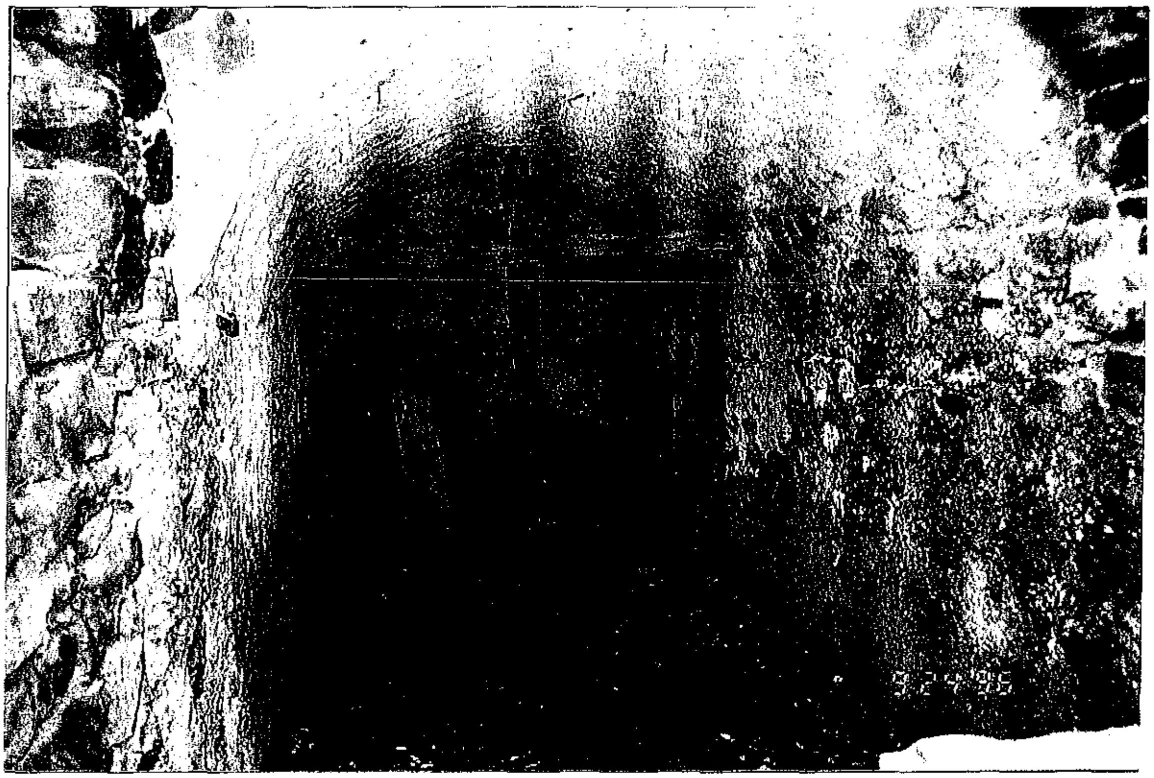


Figure 3-52 September 24, 1996. Looking down into the turbine room in the north elevation, under the milling room. The wooden shaft, wheel, and water chute as remained from the 1930s are visible. Also visible is a cross beam and supporting arm which support the chute (at the left of the vaulted area). The vault at the time of the photography was covered by a layer of soil and debris - which was excavated in December 1996 (see text and archeological report).

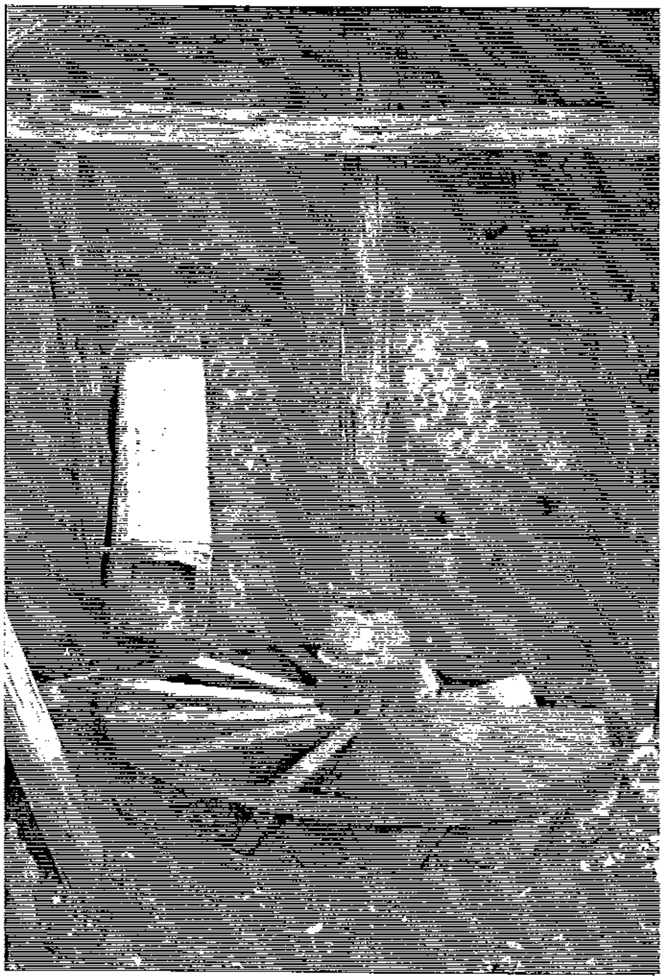


Figure 3-53 June 1996. Detail of the waterwheel, main shaft, and wooden water chute (at the left of the photograph. Remnant wooden pieces discovered at the beginning of the research for this report can also be seen. These wooden members were recorded in their found locations and were removed for safe-keeping and detailed measurements.

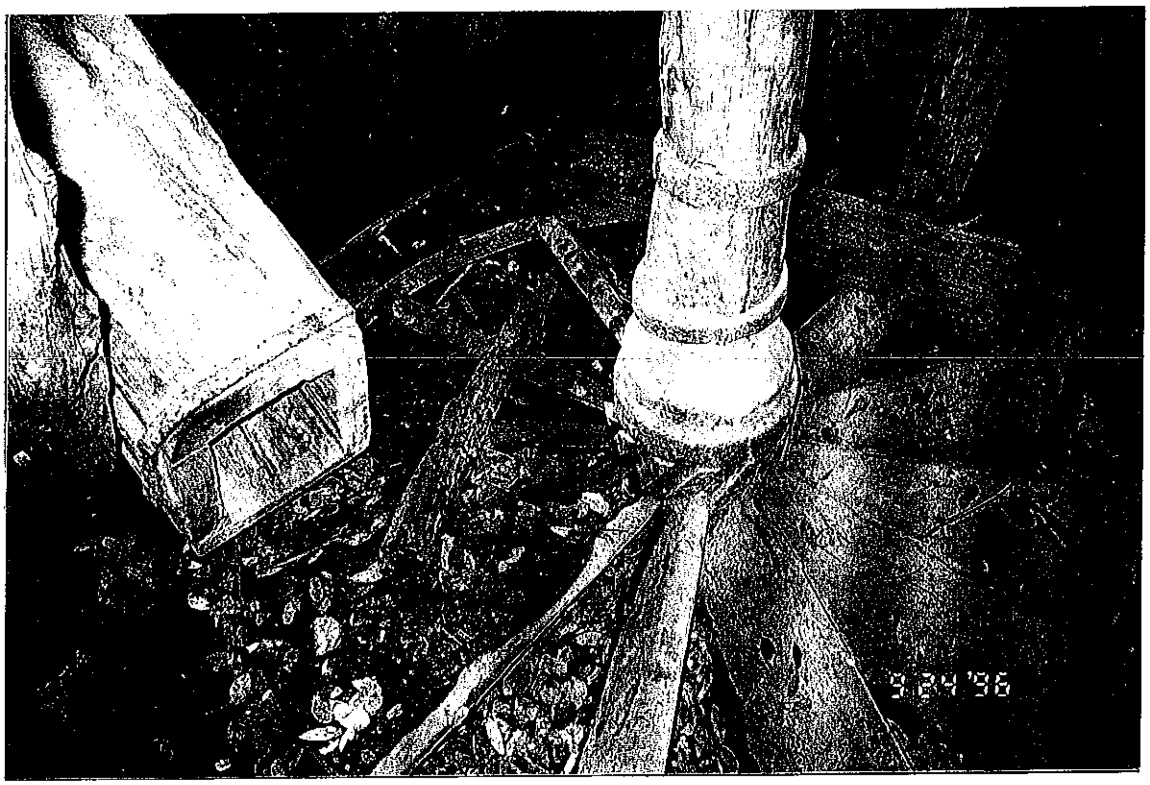


Figure 3-54 November 4, 1996. Detail of the deteriorated water wheel and wooden chute. The support post for the chute is visible at the extreme left of the photograph.

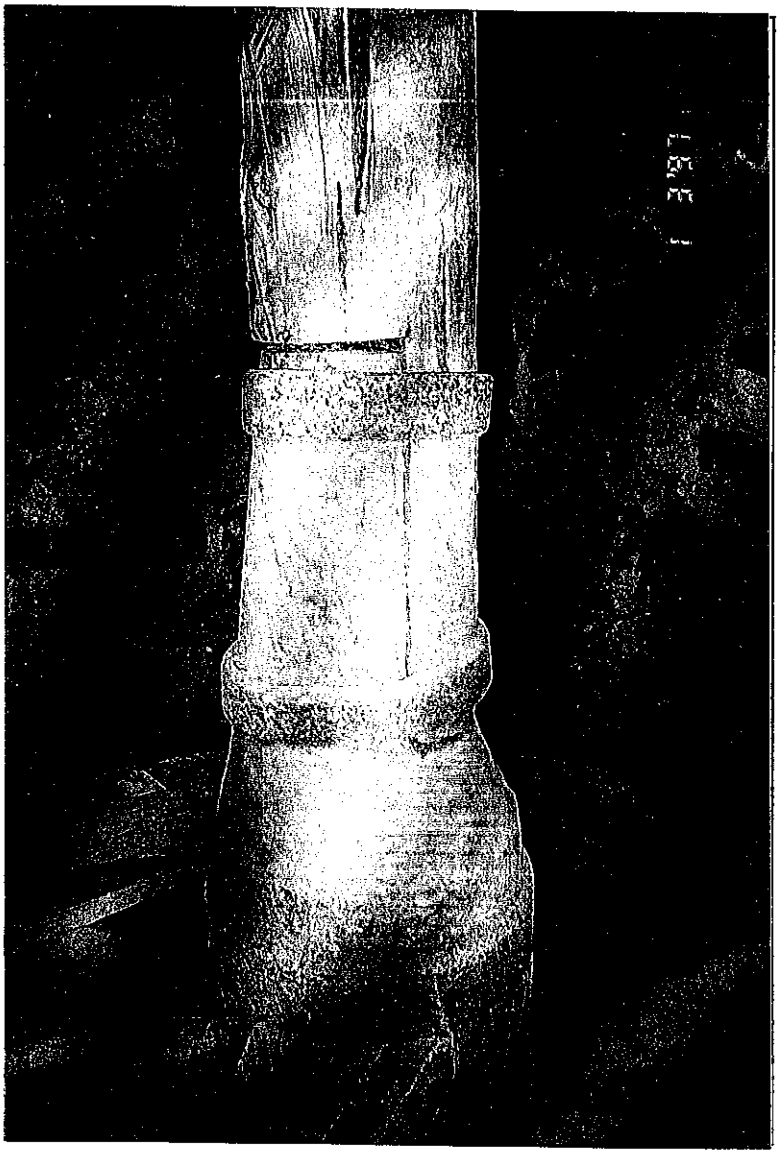


Figure 3-55 January 3, 1997. Detail of the main shaft - splice just above the water wheel held together by two metal bands would have allowed for ease of removing and maintaining either the wheel or shaft.

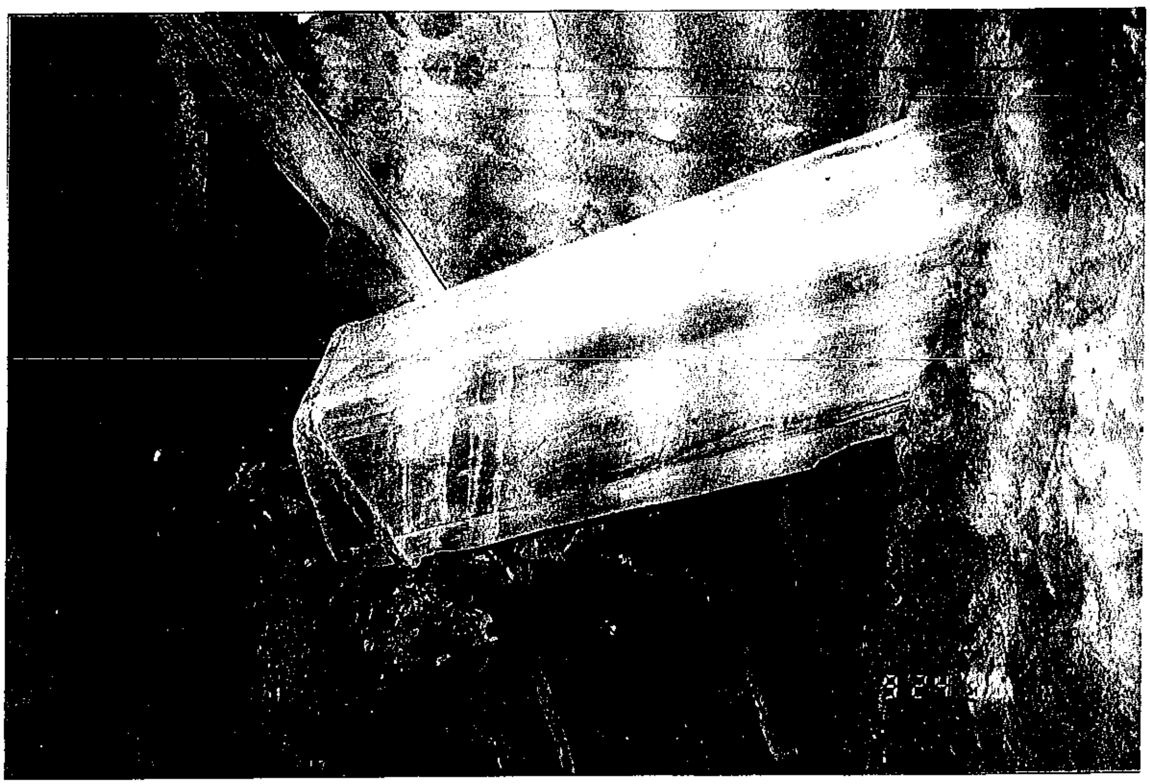


Figure 3-56 September 24, 1996. Detail of the wooden water chute (looking east).

Figure 3-57 January 3, 1997. Looking up the central wooden shaft toward two cross beams embedded in the masonry floor of the milling room. These cross beams held the metal shaft (which protrudes from the top of the wooden shaft) in place. The metal shaft then goes through the floor, into the masonry "table" holding the lower stone, and finally through the top stone (which it turns). See Figure 3-90.

Figure 3-58 September 24, 1996. Detail of the east tram rod and wall notch. The tram rod would have been connected to the bridge tree and extended up through the floor into the milling room above. The supporting pole for the wooden chute is also visible crossing diagonally at the right of the photograph.

Figure 3-59 September 24, 1996. Detail of the east tram rod and wall notch. The cross beam and supporting pole for the wooden chute is also visible crossing diagonally across the photograph.

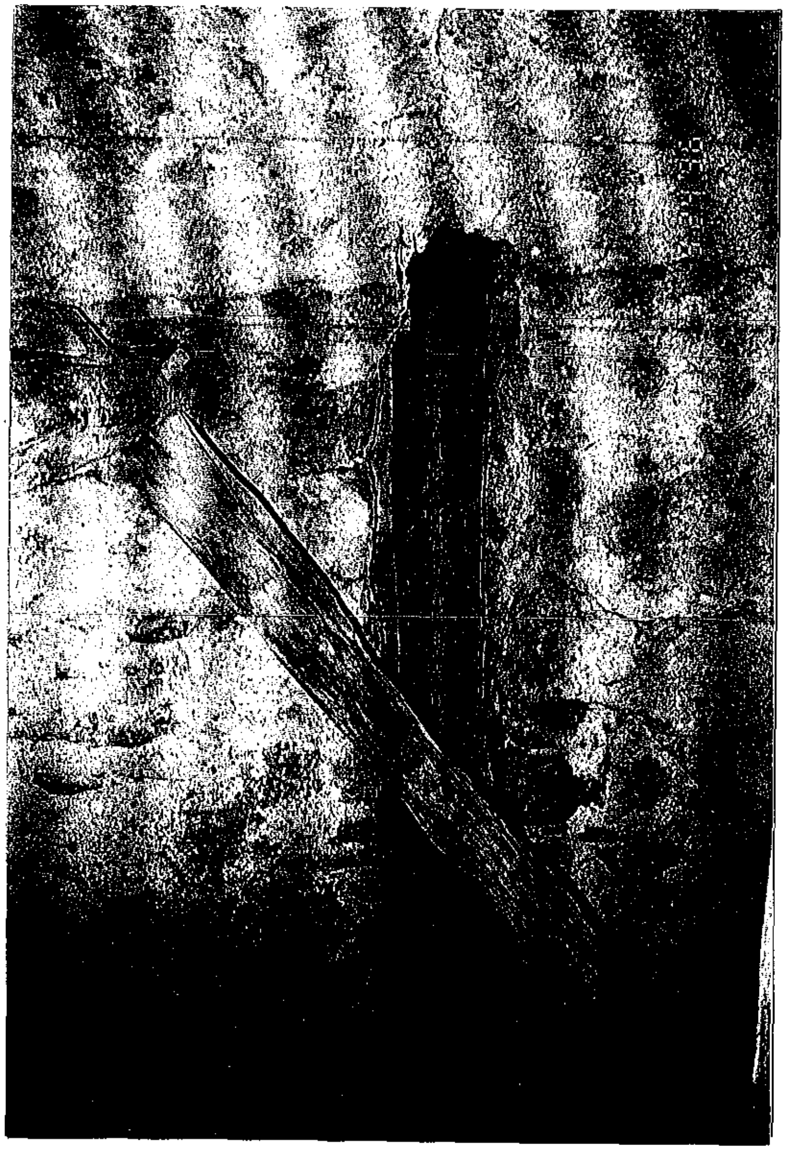


Figure 3-60 September 24, 1996. Close-up view of the top of the east tram rod and wall notch.

Figure 3-61 September 25, 1996. Detail of the east wall notch with the tram rod removed (all wooden members were removed for storage in September 1996 for safe-keeping, and detailed measuring and analysis), see Figures 3-68 through 73.

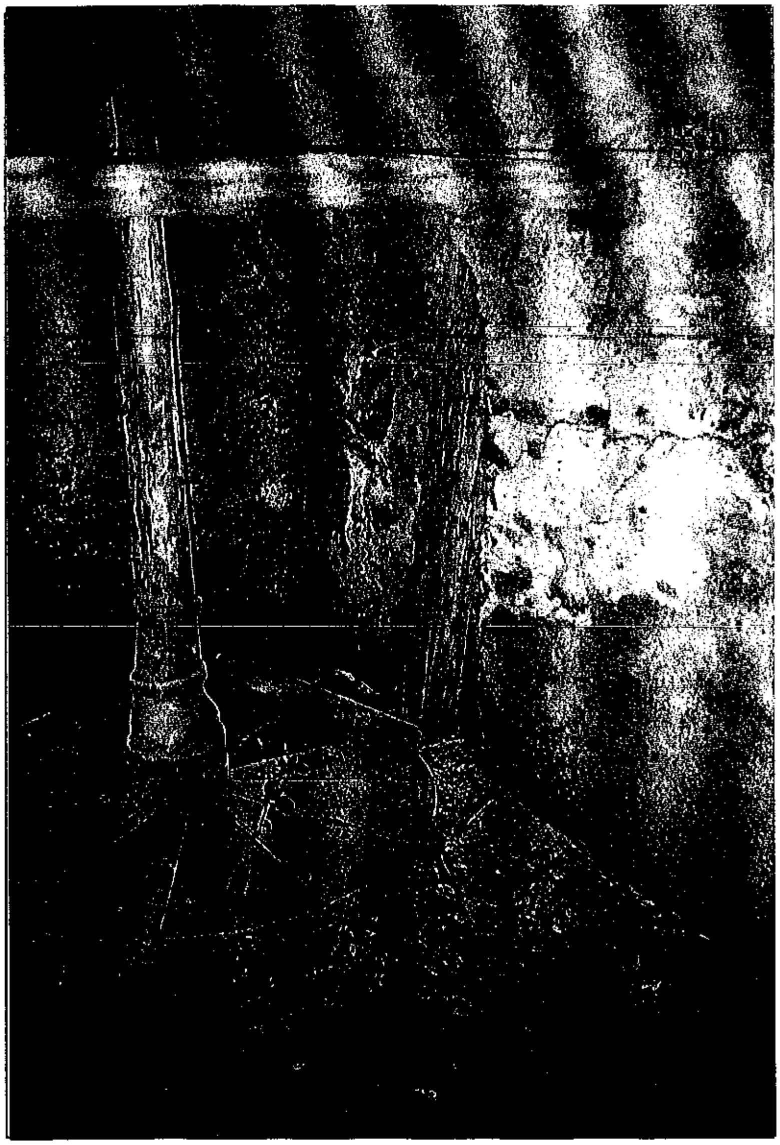


Figure 3-62 September 24, 1996. Looking southwest into the vaulted turbine room. The west tram rod can be seen entering a similar wall notch which leads up through the floor into the milling room. Note the horizontal crack in the masonry (non-structural) at the right of the photograph. Remnants of historic parging can be seen.

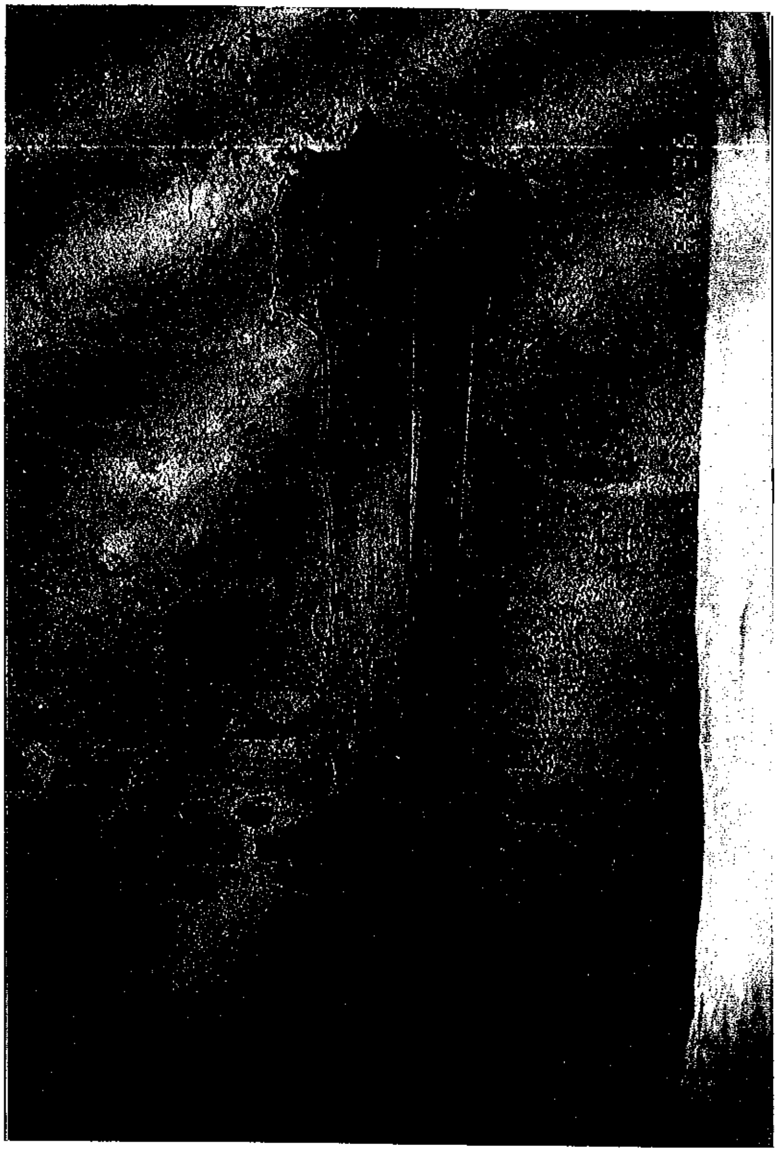


Figure 3-63 September 24, 1996. Detail of the upper section of the west tram rod and wall notch. The tram rod is composed of two members roughly rectangular, which would have been spliced and pegged together for ease of removal and repair.

Figure 3-64 September 25, 1996. Detail of the right wall notch with the tram rod removed (all wooden members were removed for storage in September 1996 for safe-keeping, and detailed measuring and analysis), see Figures 3-68 through 3-73.

Figure 3-65 September 30, 1996. Looking into the turbine room with the wooden members removed for safe-keeping and analysis.

Figure 3-66 September 30, 1996. Looking southeast along the junction of the historic wall/parging (at the right of the photograph) and the 1930s restoration masonry. The joint between old and new is obvious. The arrow points to what looks to have been a hinge pin for a metal gate which shows up in one of the historical photographs associated with the San Antonio Express newspaper article, July 23, 1937 (Figure 2-45). There are four pieces of metal sticking out of the wall, two on either side that would have held the gate.

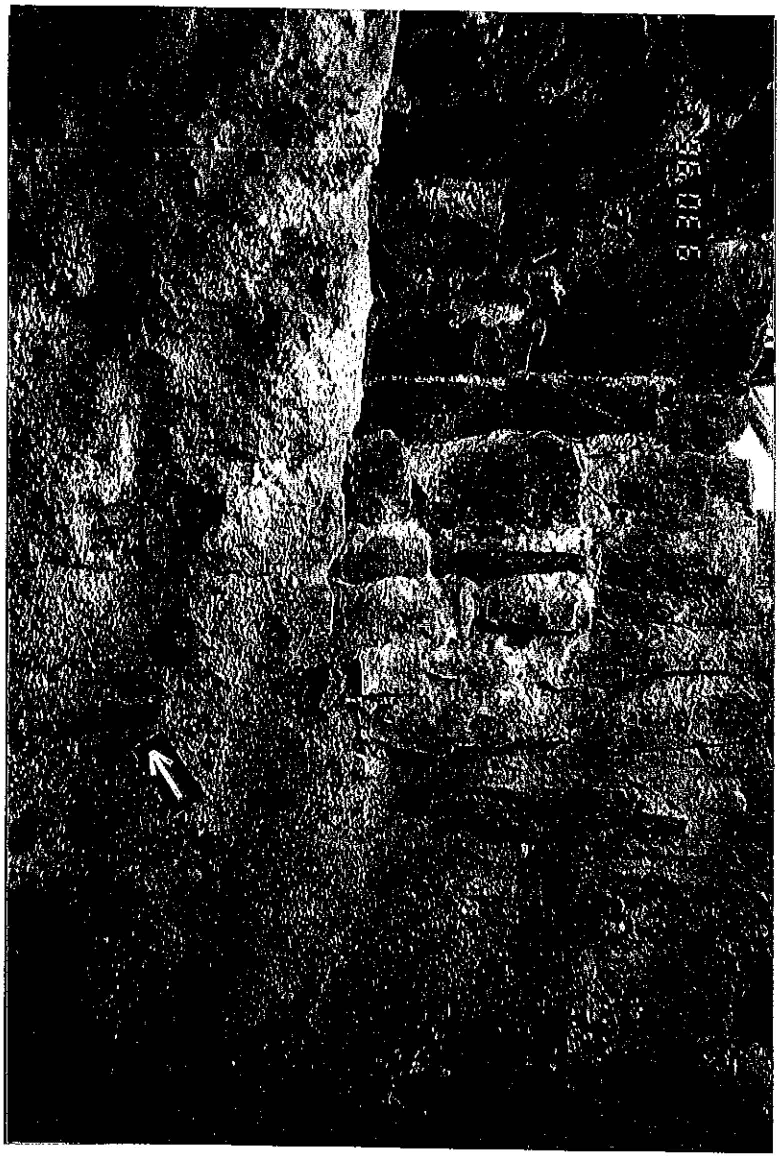


Figure 3-67 September 25, 1996. Looking northwest along the junction of the historic wall/parging (at the left of the photograph) and the 1930s restoration masonry. The arrow points to another gate hinge pin.

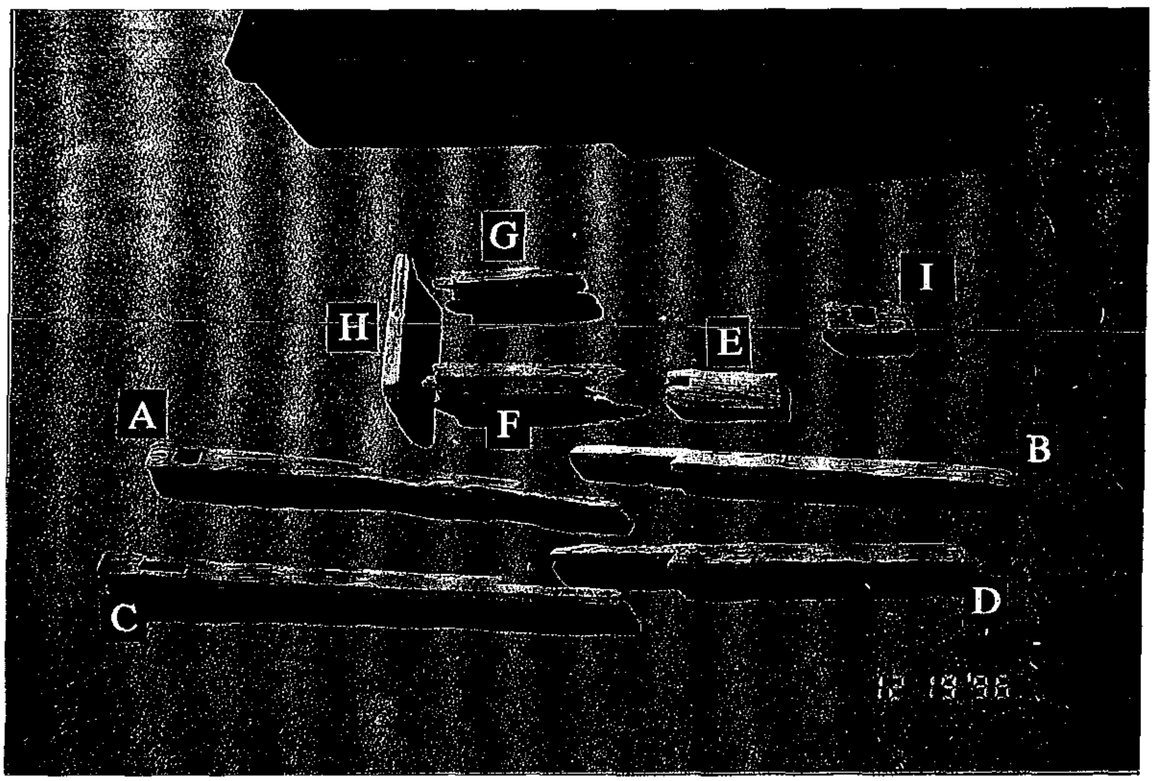


Figure 3-68 December 19, 1996. Loose wooden elements which were found at the beginning of the research for this report were photographed in place, carefully removed, and placed in storage in the park maintenance shop for safe-keeping and detailed analysis and measuring. Figures 3-76 and 3-77 are scaled drawings of these elements. The west tram rod is represented by "A" and "B," the east tram rod by "C" and "D," the remnants of the sluice gate frame by "F," "G," and "H," the forebay gate by "E" and the tram wedge bushing by "I."

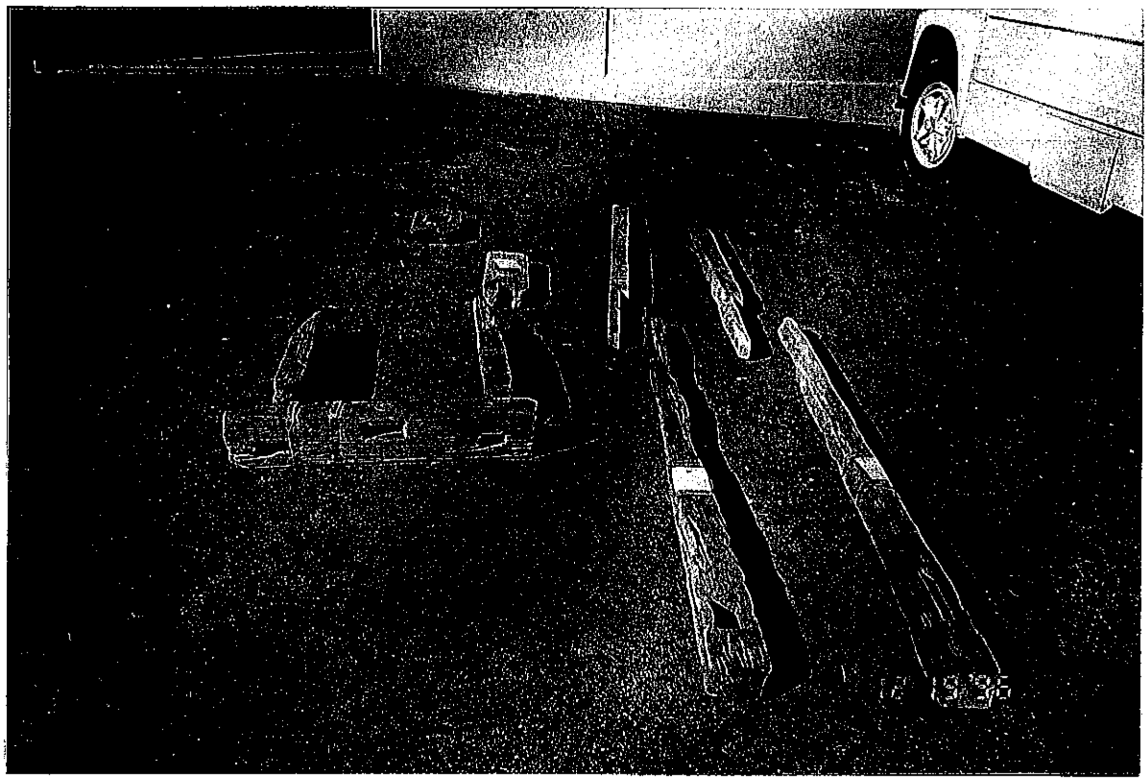


Figure 3-69 December 19, 1996. Wooden elements: The sluice gate frame is at the left, with the wedge bushing and forebay gate just above it, and the two tram rods are at the right.

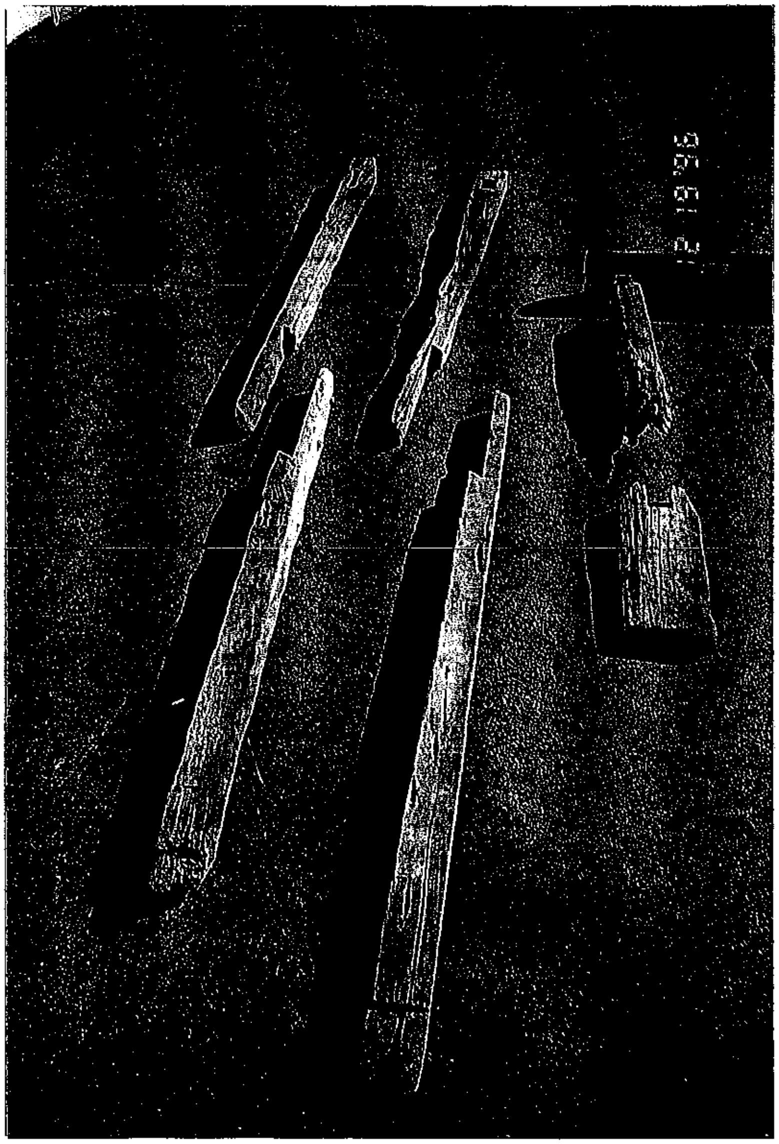


Figure 3-70 December 19, 1996. Wooden elements: The angled splices in the two tram rods (which were then pegged together) can be seen, as well as the forebay gate and two sections of the sluice gate frame (the latter at the far right).

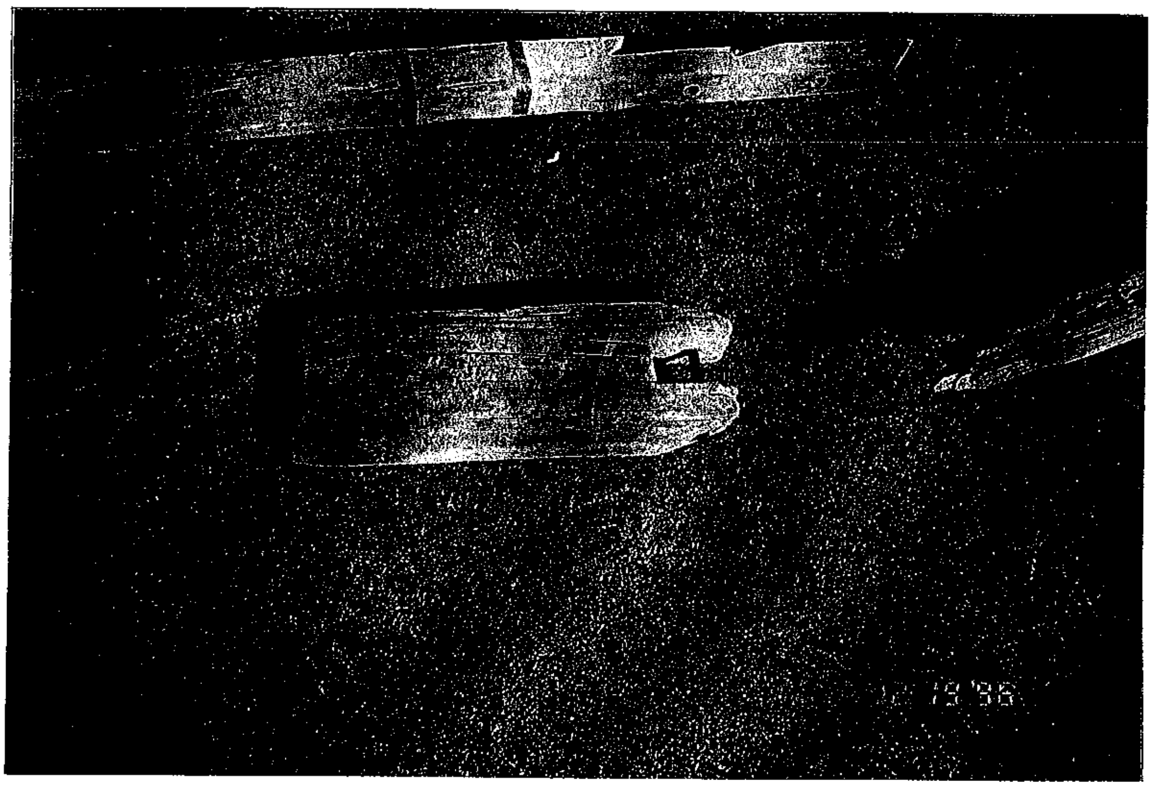


Figure 3-71 December 19, 1996. Wooden elements: Close-up view of forebay gate. One of the tram rods is at the top of this photo. The bolt is actually the top of the gate and was the hinge pin for the lifting mechanism.

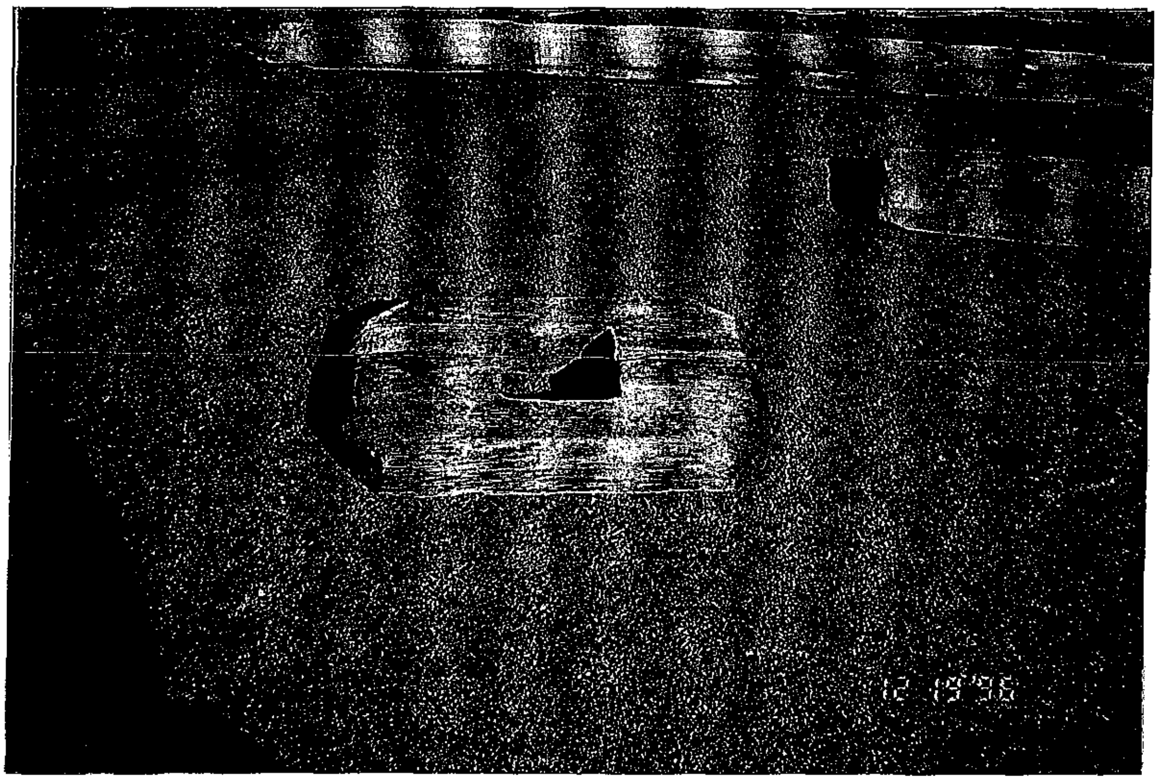


Figure 3-72 December 19, 1996. Wooden elements: Close-up view of wood wedge bushing.

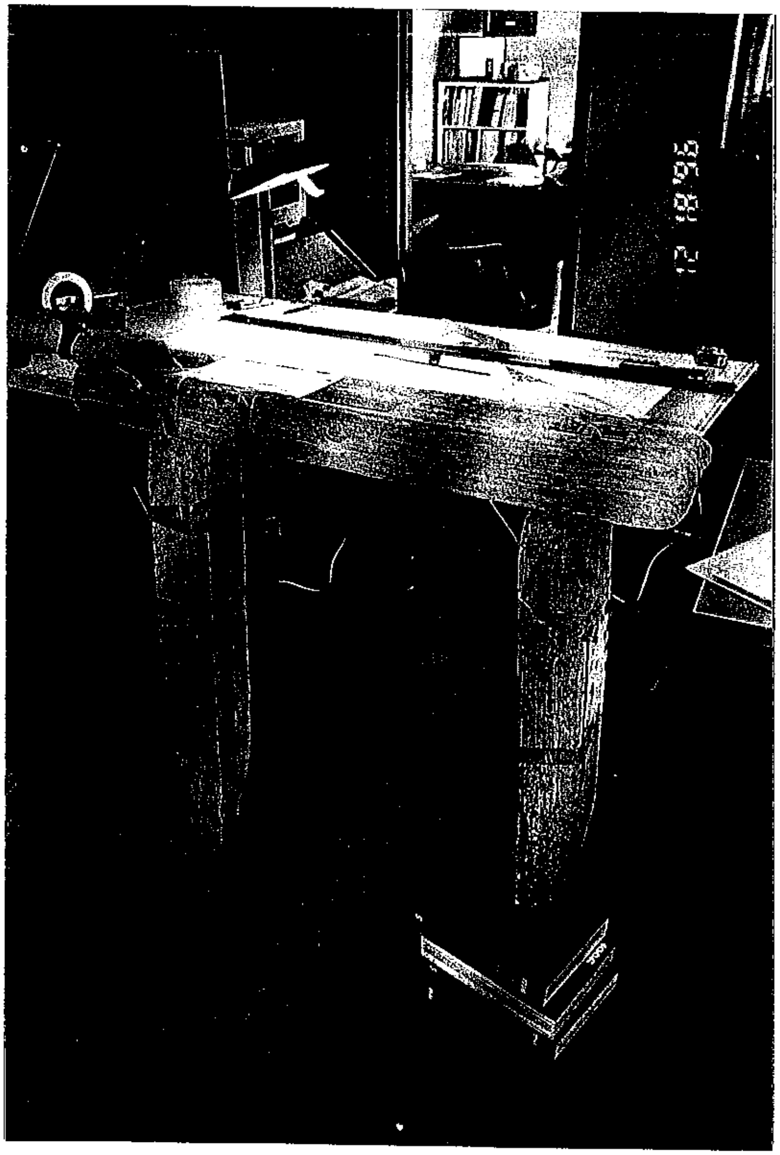


Figure 3-73 December 1996. Three of the extant members from what was assumed to be the sluice gate frame have been assembled approximating its historic configuration.

Figure 3-74 January 15, 1997. Wooden elements: Remnants of what were believed to be the sluice gate located during archeological investigations in December 1996.

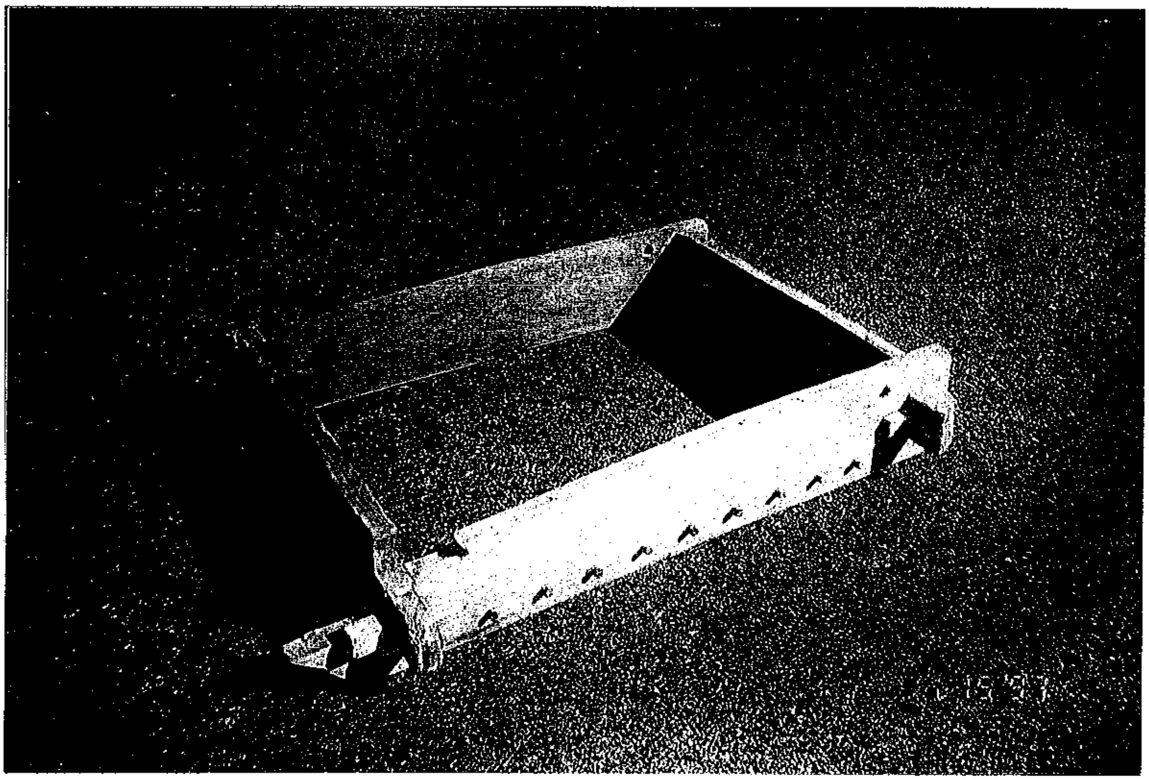


Figure 3-75 January 15, 1997. Wooden sifting box which was located at Mission San José.

Figure 3-76 (Fold-out, following) December 1996. "Details: Wooden Pieces, San Jose Grist Mill, San Antonio Missions NHP." Details of existing wooden elements and scaled drawings. Sheet 1 of 2.

Figure 3-77 (Fold-out, following) December 1996. "Details: Wooden Pieces, San Jose Grist Mill, San Antonio Missions NHP." Details of existing wooden elements and scaled drawings. Sheet 2 of 2.

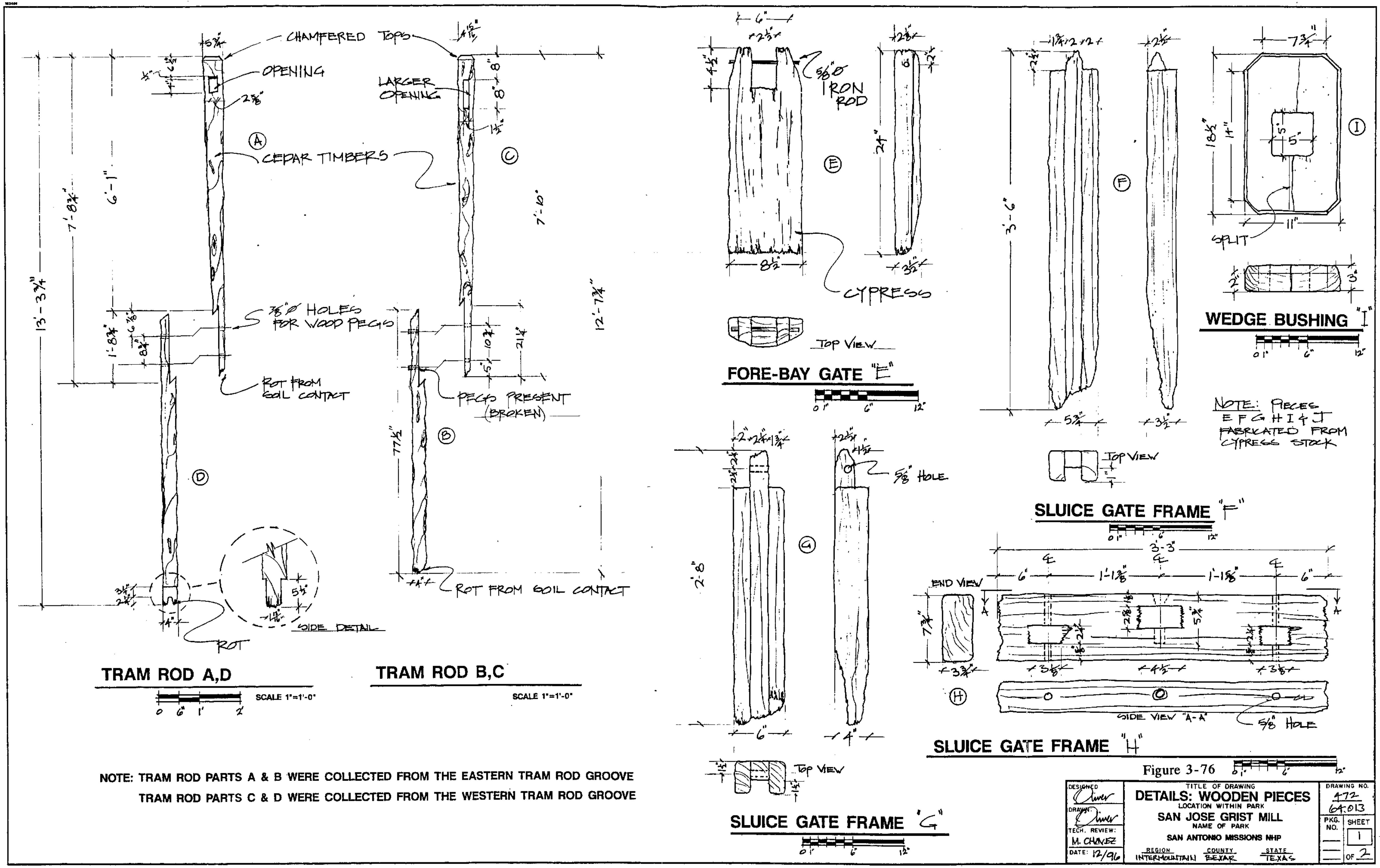
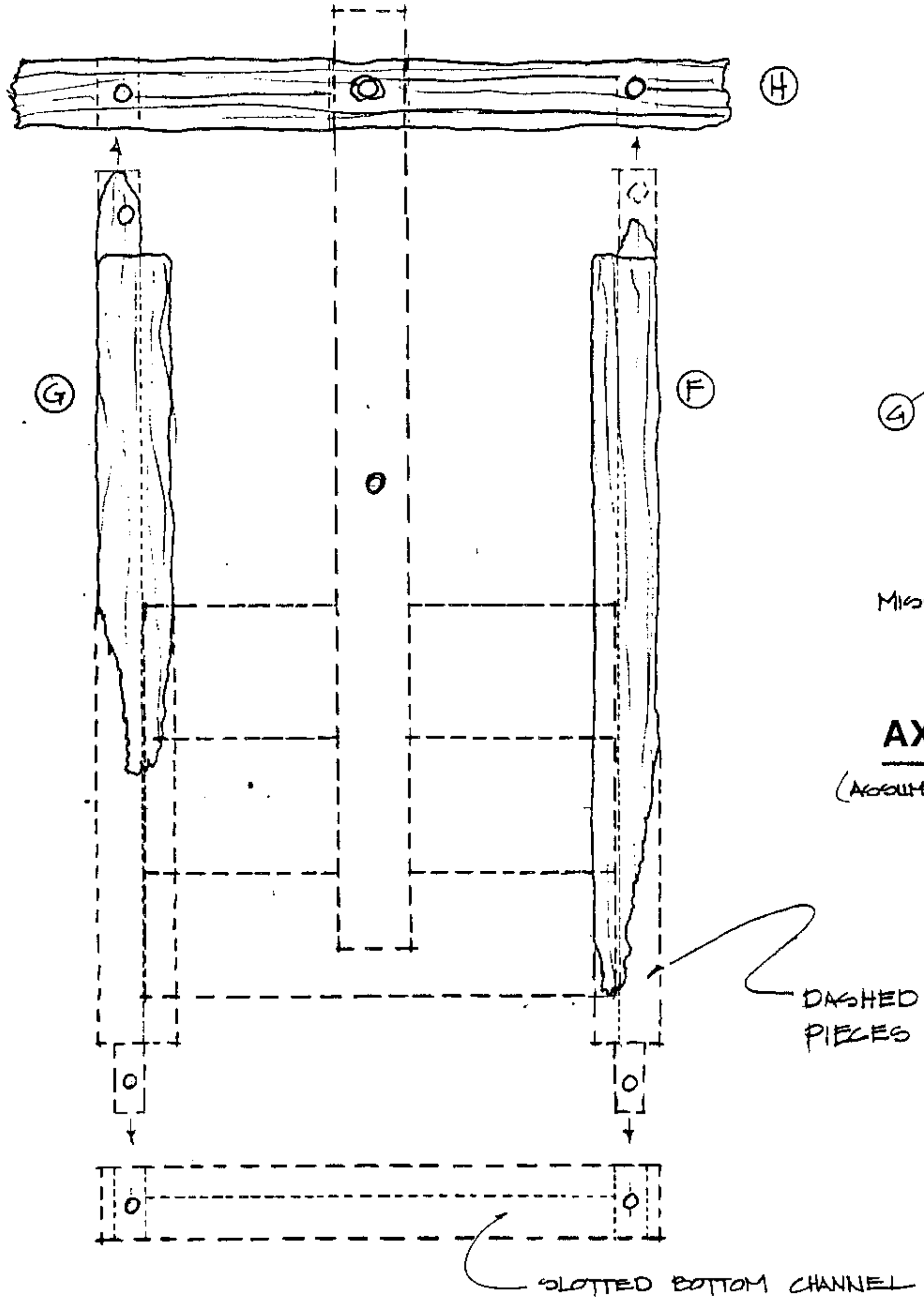
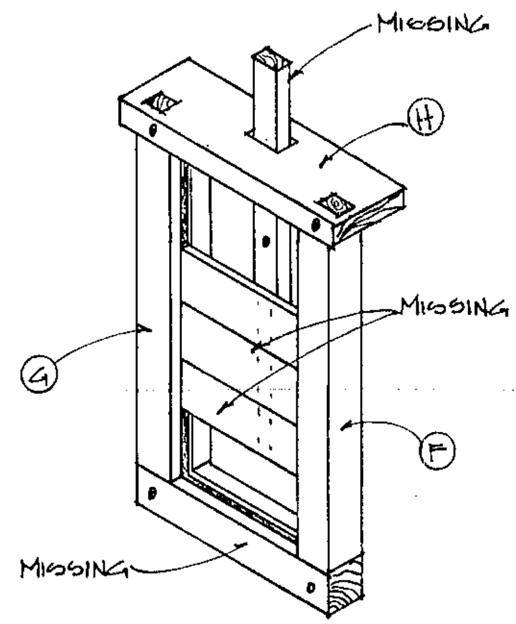

CHAMFERED TOPS
OPENING
LARGER OPENING
CEDAR TIMBERS
3/8" Ø HOLES FOR WOOD PEGS
ROT FROM SOIL CONTACT
PEGS PRESENT (BROKEN)
ROT FROM SOIL CONTACT
SIDE DETAIL
ROT
13'-3¾"
7'-8¾"
6'-1"
1'-8¾"
7'-10"
12'-7¼"
77½"
21¼"
10¼"
TRAM ROD A,D
SCALE 1"=1'-0"
TRAM ROD B,C
SCALE 1"=1'-0"
NOTE: TRAM ROD PARTS A & B WERE COLLECTED FROM THE EASTERN TRAM ROD GROOVE
TRAM ROD PARTS C & D WERE COLLECTED FROM THE WESTERN TRAM ROD GROOVE
5/8" Ø IRON ROD
CYPRESS
TOP VIEW
FORE-BAY GATE "E"
8½"
3½"
24"
3'-6"
5¾"
3½"
TOP VIEW
SLUICE GATE FRAME "F"
7¾"
18½"
14"
5"
11"
SPLIT
WEDGE BUSHING "I"
NOTE: PIECES E F G H I & J FABRICATED FROM CYPRESS STOCK
5/8" HOLE
2'-8"
6"
4"
TOP VIEW
SLUICE GATE FRAME "G"
3'-3"
6"
1'-1⅝"
1'-1⅝"
6"
END VIEW
7¾"
3¾"
SIDE VIEW "A-A"
5/8" HOLE
SLUICE GATE FRAME "H"
DESIGNED Oliver
DRAWN Oliver
TECH. REVIEW: M. CHAVEZ
DATE: 12/96
TITLE OF DRAWING
DETAILS: WOODEN PIECES
LOCATION WITHIN PARK
SAN JOSE GRIST MILL
NAME OF PARK
SAN ANTONIO MISSIONS NHP
REGION INTERMOUNTAIN
COUNTY BEXAR
STATE TEXAS
DRAWING NO. 472 64013
PKG. NO.
SHEET 1 OF 2

Figure 3-76



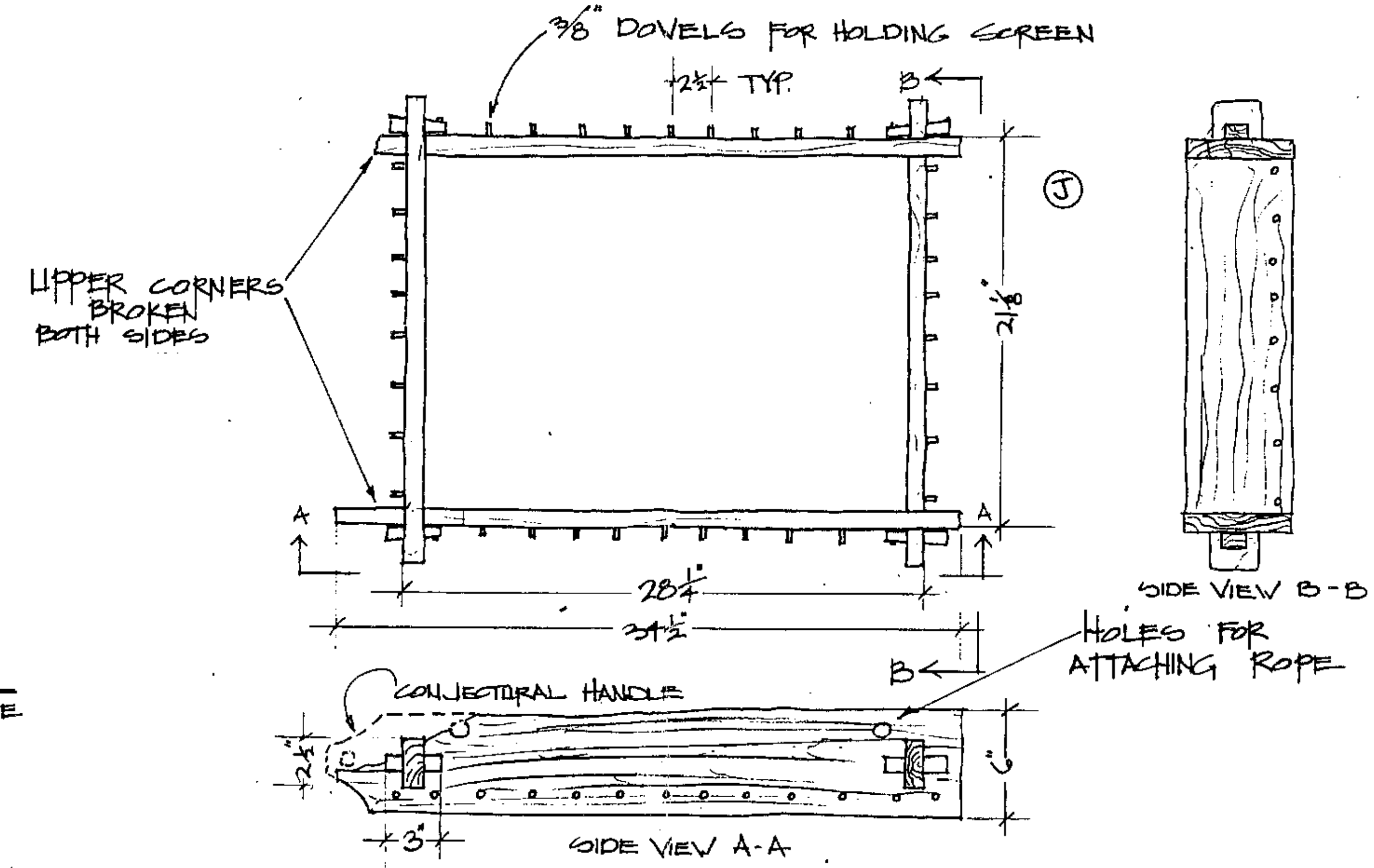
SLUICE GATE ASSEMBLY

NO SCALE



AXONOMETRIC VIEW

(ASSUMED HISTORIC CONFIGURATION) NO SCALE



SIFTER "J"

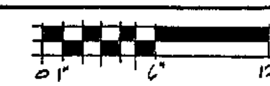


Figure 3-77

DESIGNED: Oliver	TITLE OF DRAWING: **DETAILS: WOODEN PIECES**	DRAWING NO. 472 / 64, 613
DRAWN: Oliver	LOCATION WITHIN PARK: **SAN JOSE GRIST MILL**	PKG. NO.
TECH. REVIEW: M. CHAVEZ	NAME OF PARK: **SAN ANTONIO MISSIONS NHP**	SHEET 2
DATE: 1/97	REGION: INTERMOUNTAIN · COUNTY: BEXAR · STATE: TEXAS	OF 2

Figure 3-78
November 1996
The interior east elevation. Note the electrical outlet and junction box (covered) to the left of the door way opening.

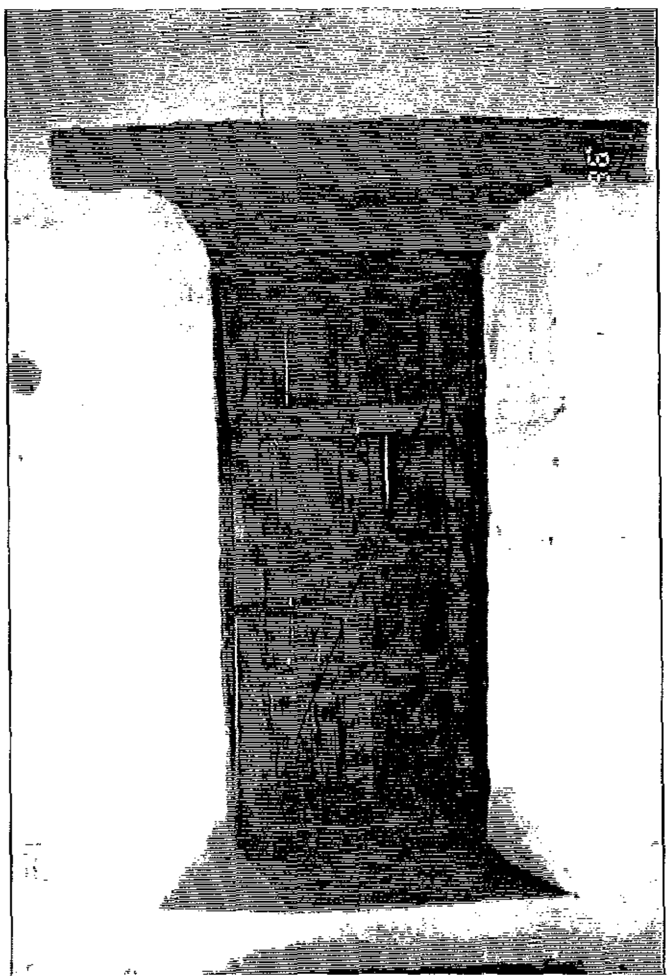


Figure 3-79
November 1996
Detail of the door in the east elevation.

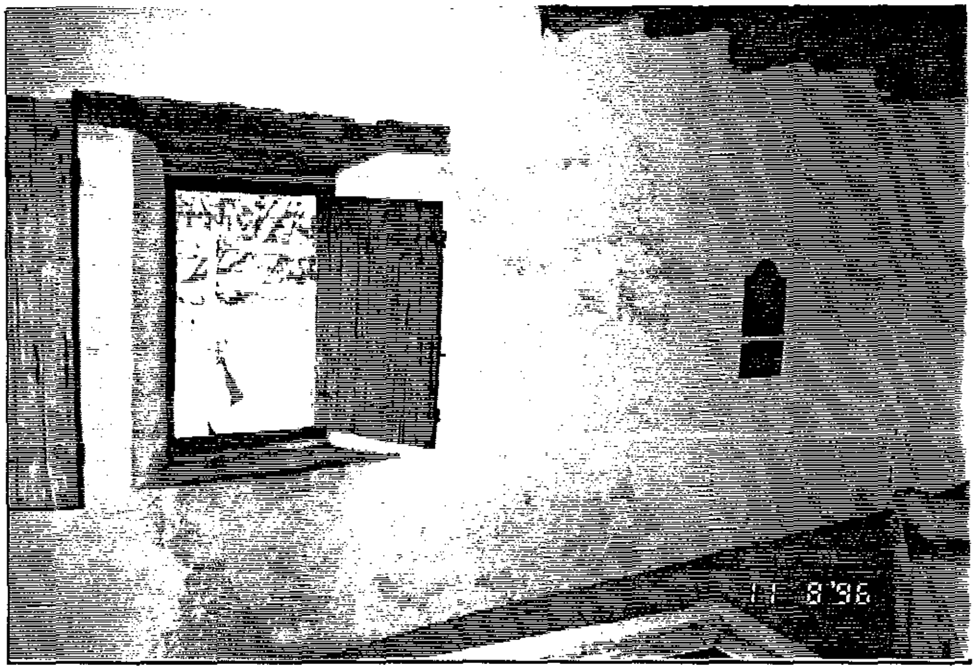


Figure 3-82
November 8, 1996
North interior elevation.

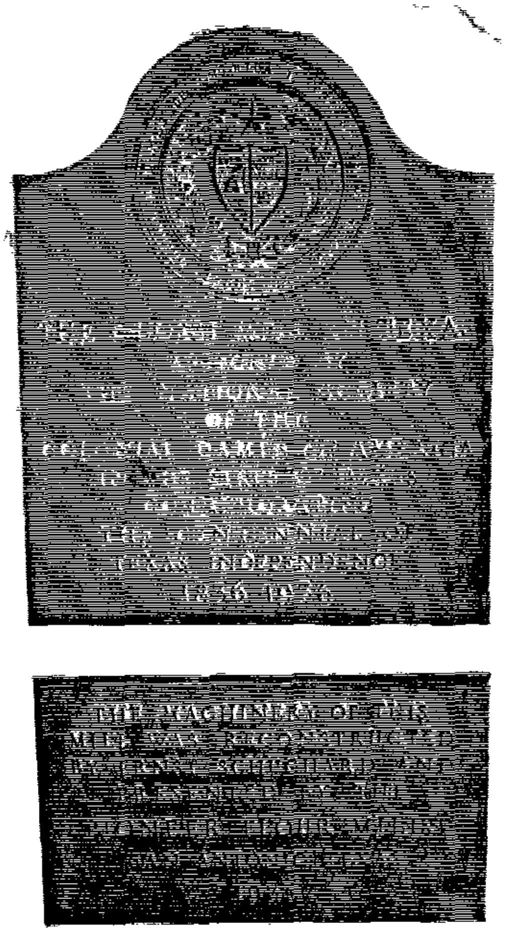


Figure 3-83
November 8, 1996.
Detail of bronze plaques on the north interior elevation near the door. The upper plaque reads: "The Oldest Mill in Texas, Restored by the National Society of the Colonial Dames of America, in the State of Texas Commemorating the Centennial of Texas Independence, 1836-1936." The lower plaque reads: "The Machinery of this Mill was Reconstructed by Ernst Schuchard and Presented by the Pioneer Flour Mills, San Antonio, Texas, 1936."

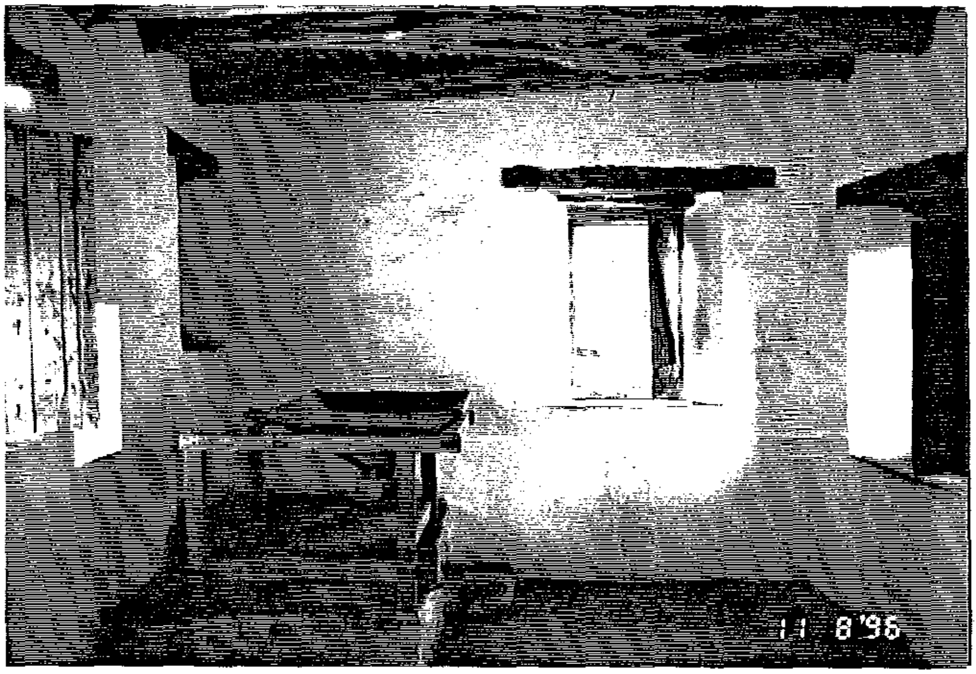


Figure 3-85
November 8, 1996
West interior
elevation.

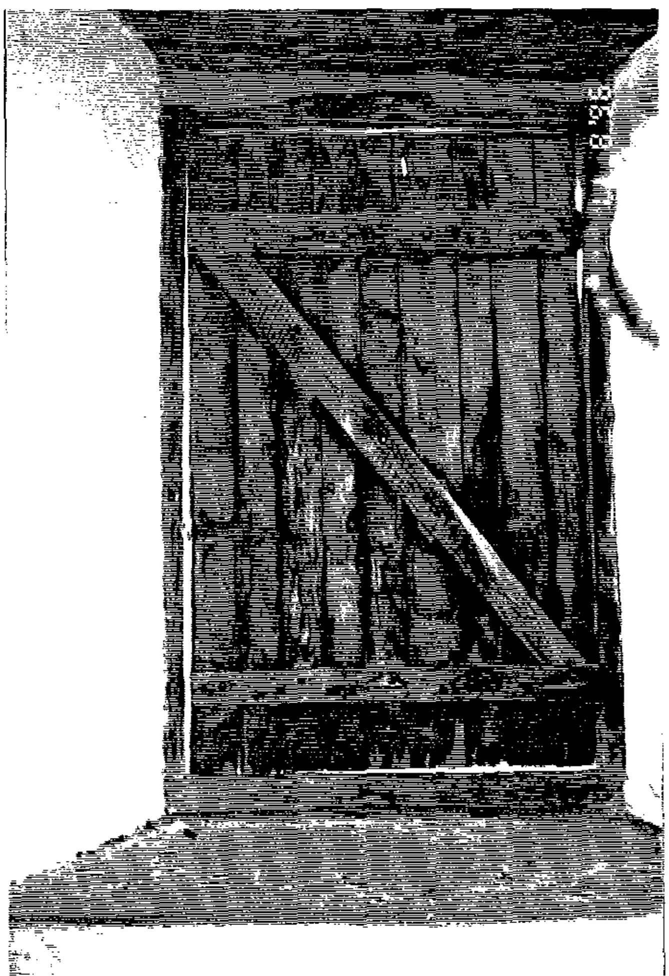


Figure 3-86 November 1996. Detail of the shuttered opening in the west elevation.

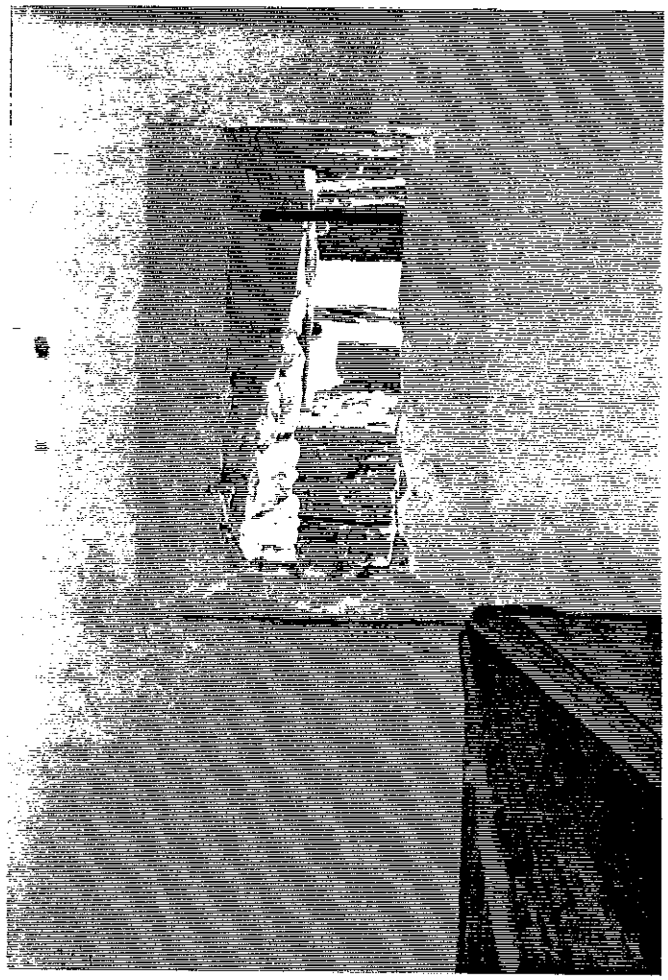


Figure 3-89 June 1996. Detail of the oblique opening in the center of the south elevation which held the lifting arm for the forebay sluice gate (see Figure 2-36). Note the horizontal metal rod spanning the opening at the top -- Figure 2-36 shows two metal rods. Figure 3-90 shows evidence of the second rod which was missing in 1996.

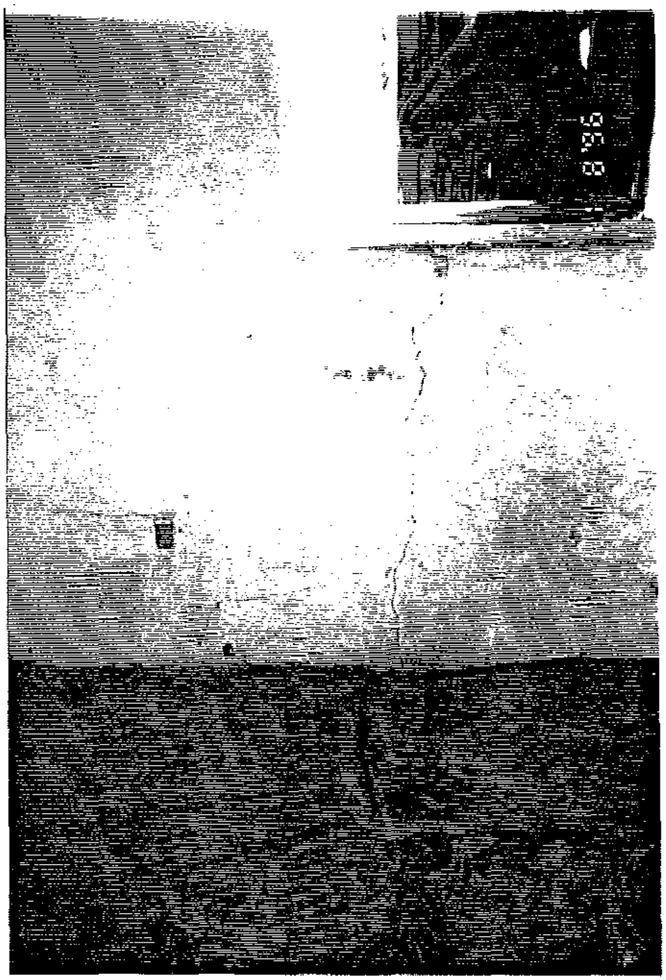


Figure 3-91 November 8, 1996. Detail of wall below center window in south elevation. Note crack which runs vertically from the window sill to the floor. This same crack (identical configuration) appears in Figure 2-41, and therefore has never been repaired, or has reappeared in exactly the same location. Note also the electrical outlet at the left center of the photograph.

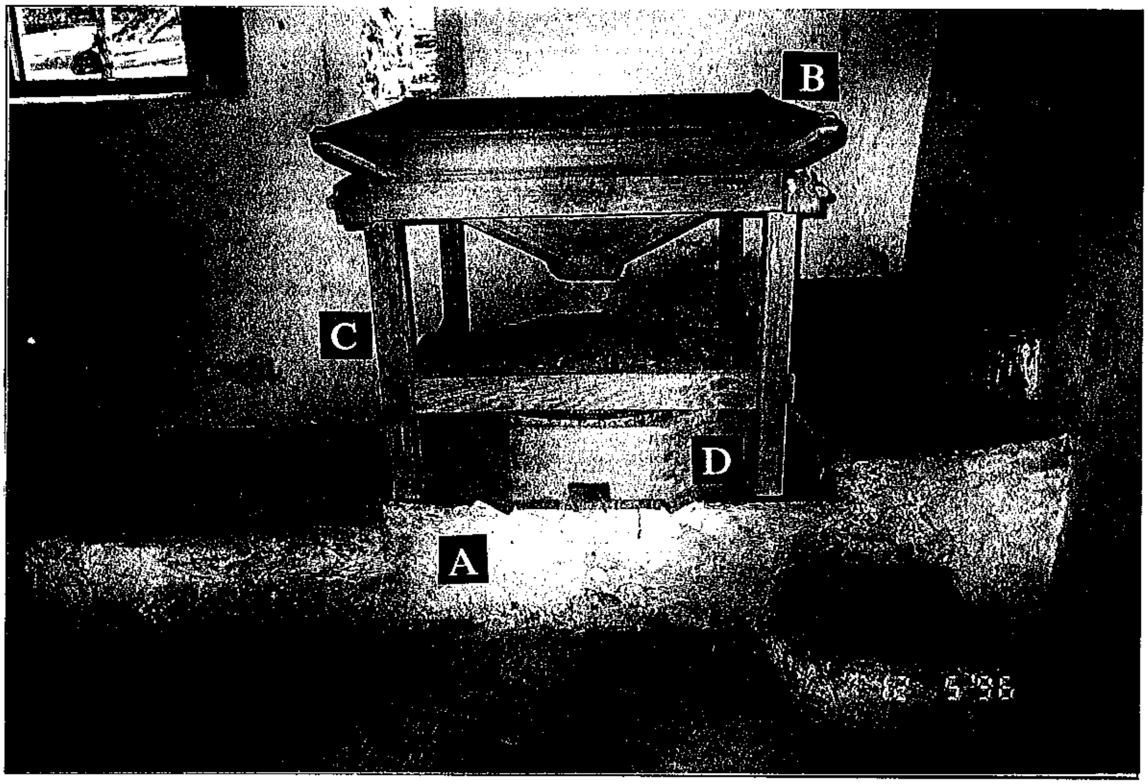


Figure 3-94 December 5, 1996. Detail of masonry "table" and oak hopper, hopper frame, and mill stone casing.

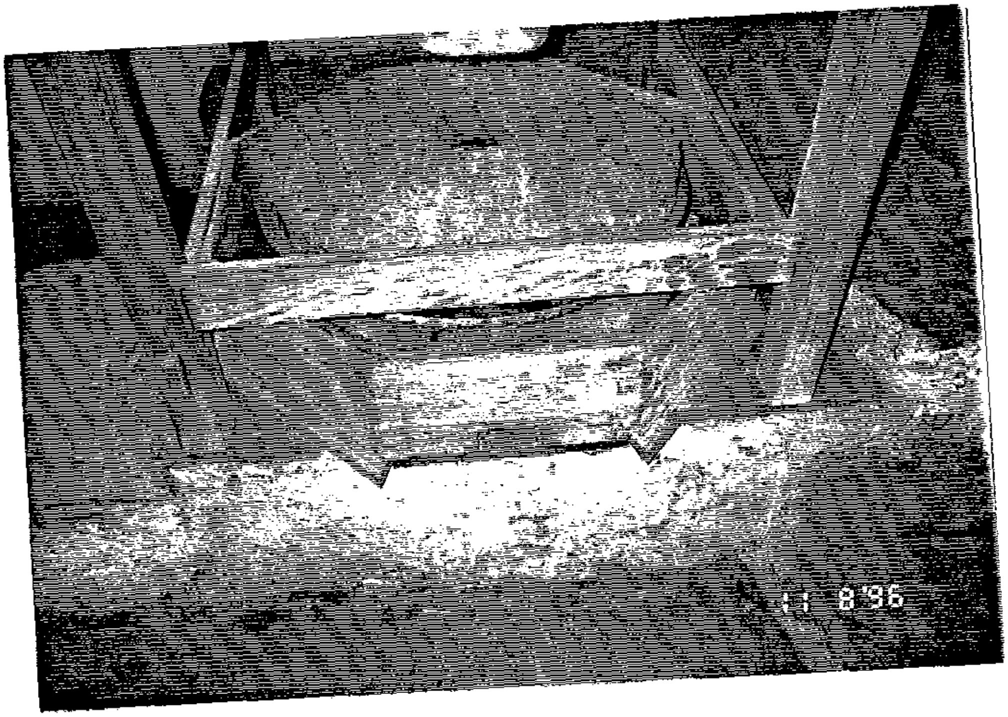


Figure 3-97 November 8, 1996. Detail of oak casing and top mill stone. Note the opening at the bottom of the casing which would have directed ground meal to a receiving apparatus.

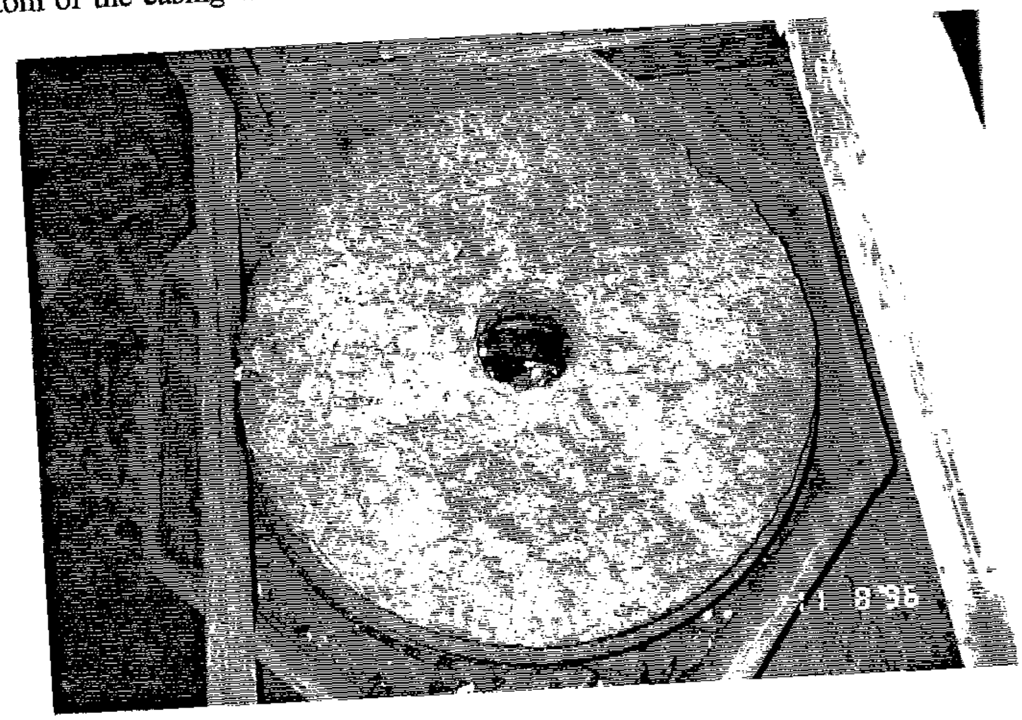


Figure 3-98 November 8, 1996. Detail of top mill stone. The stones are not basalt as those viewed during research for this report, but instead a composite of quartzite and silica cement.

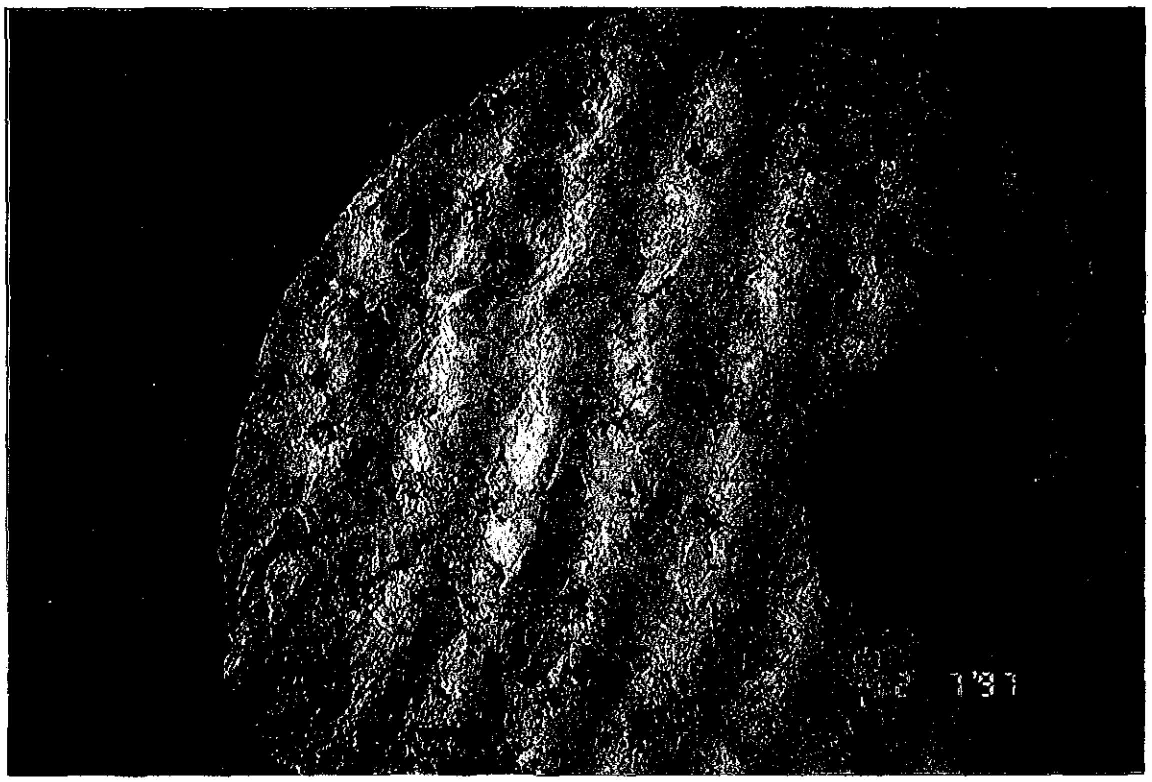


Figure 3-100 February 7, 1997. Detail of top mill stone. The stone has been cleaned revealing quartz "burrs" embedded in a very hard (most likely silica) cement. From our research this type of stone was manufactured in France and dates to the turn of the century versus being contemporary to the mill's original construction.

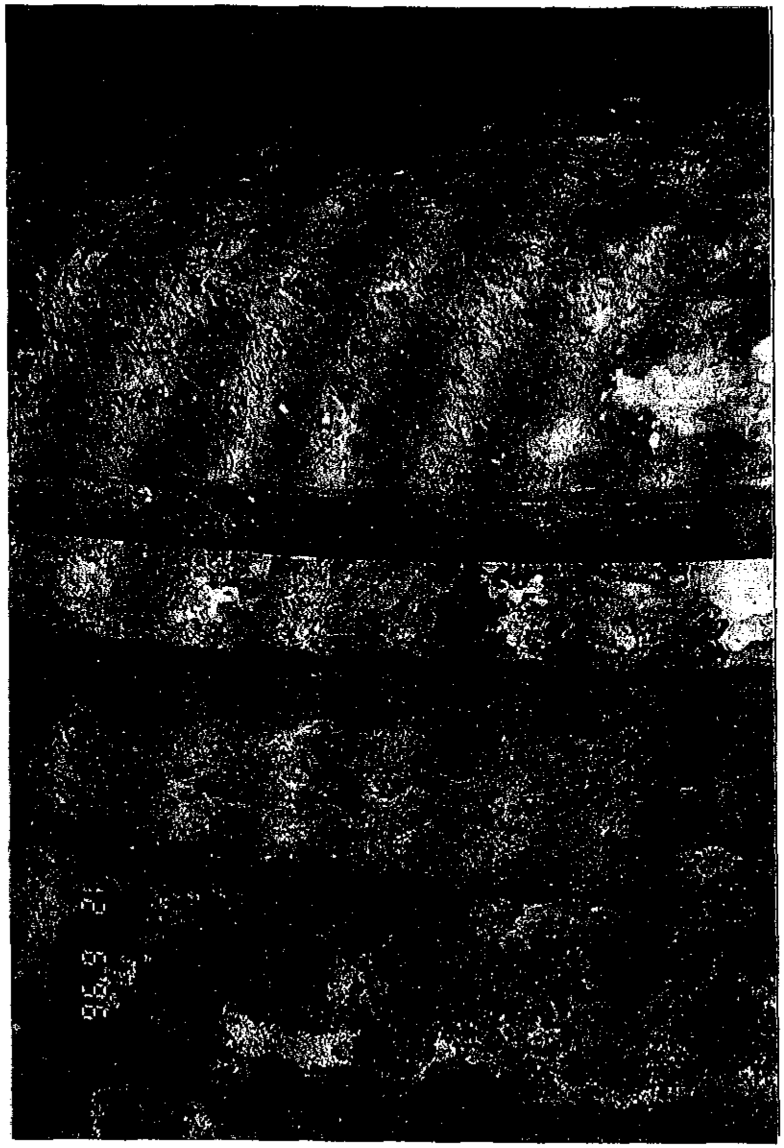


Figure 3-102 December 6, 1996. Close-up view of edges of two mill stones. Note iron bands.

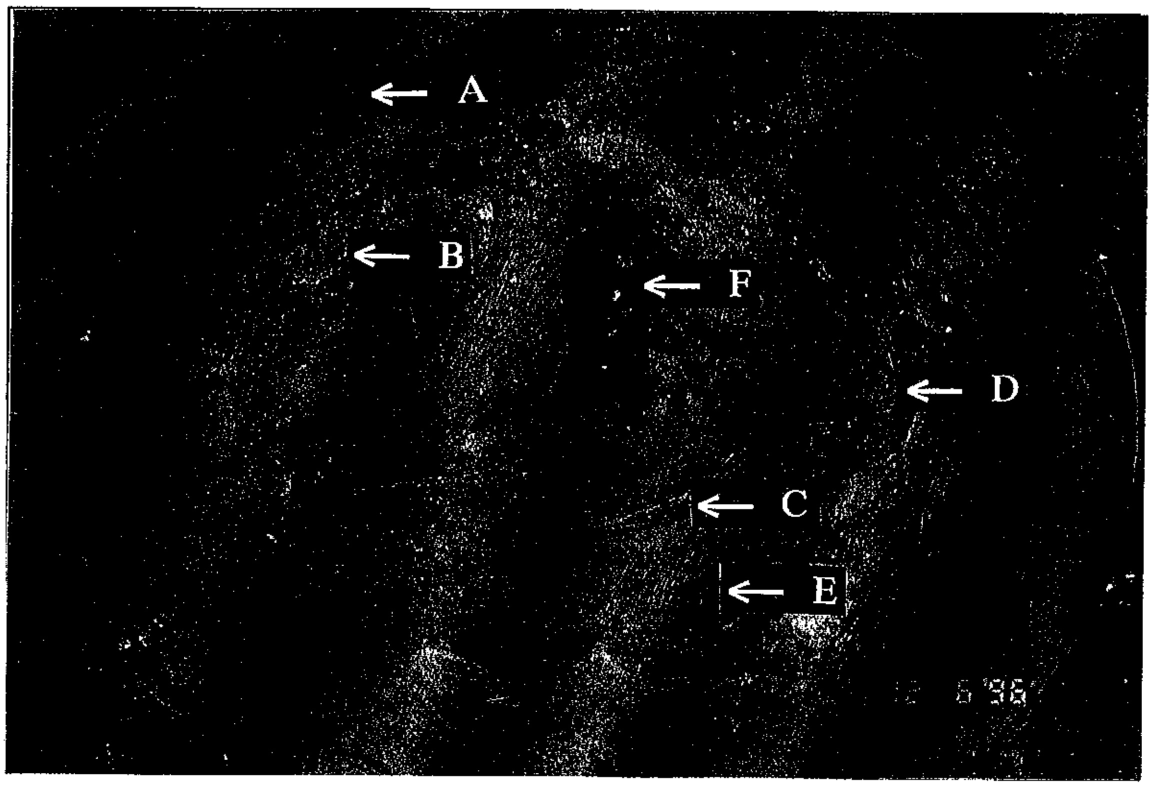


Figure 3-104 December 6, 1996. Detail of lower mill stone. Once minimal cleaning was accomplished with a metal brush, additional details were revealed: The metal ring embedded into this stone included a groove ("A"), purpose thus far unknown (possibly for either grease or ball bearings); this metal ring was embedded using with molten lead ("B"); a galvanized washer ("C") has been placed between the "rynd" ("D") and another block of wood ("E") which was wedged into the lower stone and most likely functioned as the bearing point for the spindle ("F").

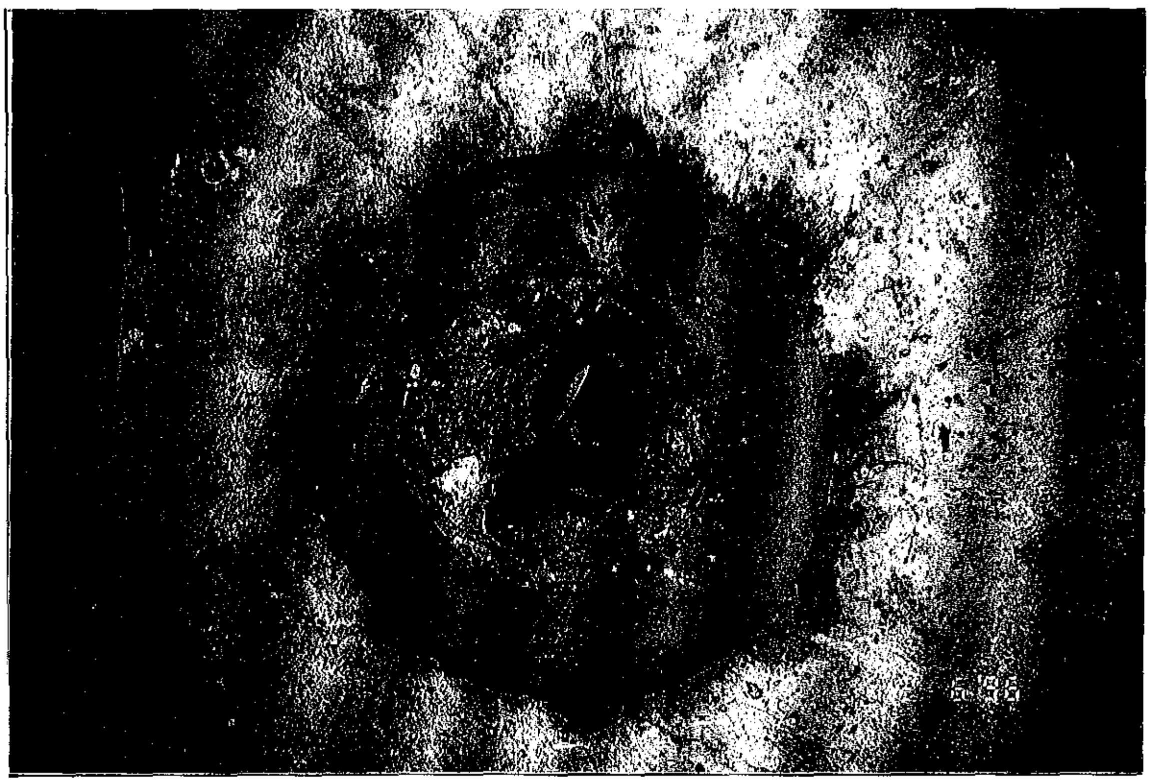


Figure 3-106 December 6, 1996. Detail of bottom face of upper mill stone. Note embedded ferrous metal ring, similarly embedded with molten lead. Note also the embedded "balance rynd" set into the same notches the driver would have been set into.

Figure 3-108
November 8, 1996
Overall shot of milling apparatus, looking due west. The east tram rod opening can be seen in detail at the bottom center of the photograph.

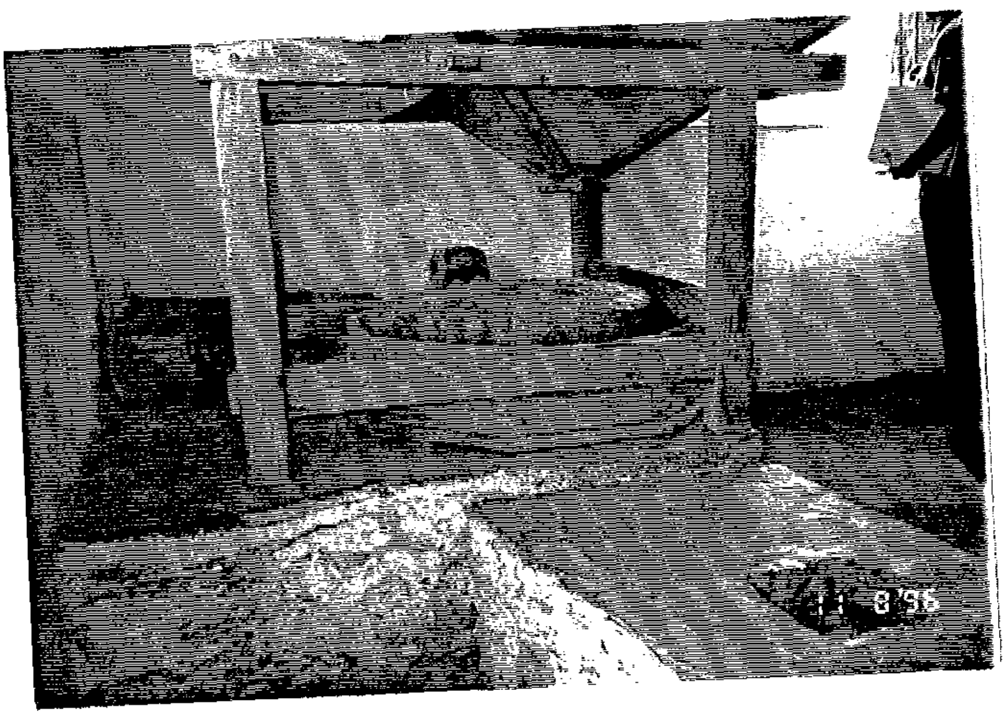


Figure 3-109
November 8, 1996
Detail of oak hopper, hopper frame and casing, looking due west. The east tram rod opening can be seen in detail at the extreme lower right of the photograph.

C. Site-related Elements Directly Associated with the Mill:

1. Forebay (Figures 3-112 through 3-115): Additional photographs were taken of the forebay after archeological investigations were completed in December 1996 (Figures 3-174 through 3-176). The forebay is a stone conical shaped well with historic parging in place in the lower portion. Figure 3-115 shows the junction between historic masonry/parging and restored masonry from the 1936-37 restoration. There was approximately 18 inches of modern fill and debris removed from the bottom of the forebay for purposes of this report. Three wooden members: the forebay gate and two side rails for the sluice gate frame, were also retrieved from the bottom of the feature. Condition of the forebay is good, however, a determination will need to be made regarding re-parging the interior surface prior to the reintroduction of water.

2. Mill race (Figures 3-116 through 3-121): From our research it appears that the lining of the entire mill race (stone retaining wall) was undertaken sometime after the initial restoration in the late 1930s. The type of stone used to pave the north side of the mill landing just outside the turbine room matches that used for the race retaining wall. Photographs dating to this period (i.e., Figure 2-39) do not show flagstone paving in this area installed in the late 1940s or early 1950s (see Figure 2-55). It is our assumption that all of this work was accomplished at the same time. (Please refer to discussion in Chapter 2). The reconstructed mill race consists of a stepped masonry lined channel. Historically "spent" water from the turbine room would have been directed via some sort of a channel, such as the extant race, to fields north of the mill. (The 1937 Harvey Smith drawing, Figure 3-4, shows what appears to be an *acequia* running across what is now the approximate stage area of the amphitheater). Archeology performed in December 1996 determined that the masonry race did not extend past its existing configuration. The race varies in width from 34 inches at the origin to an average of 25 inches along its length. It has a dirt floor (Figure 3-172) and is in need of pointing. A later edition wall (Figures 3-119 through 3-121) was built just past the wooden bridge to block off the race from extending northward toward the amphitheater. It is unknown when this wall was installed. Condition of the mill race is good, however the entire length will require repointing. A determination will need to be made whether or not to line the bottom of the race once water is reintroduced.

3. Stepped masonry retaining wall and flagstone-paved landing (Figures 3-122 through 3-129): Sometime in the late 1940s (see discussion in Chapter 2), the area around the mill race, immediately north of the mill, was constructed using a series of bench-like structures, all forming an elaborate masonry retaining wall system. Sandstone pavers were also installed providing a completely hard-surfaced lower landing as one descends to the turbine room. The stone used for the mill race retaining wall and this area match--indicating that all of this work was accomplished at approximately the same time. A set of masonry steps is a part of this construction, and can be seen in Figures 3-124 and 3-129. Cedar handrails complete the installation. Condition is very good with minor pointing required.

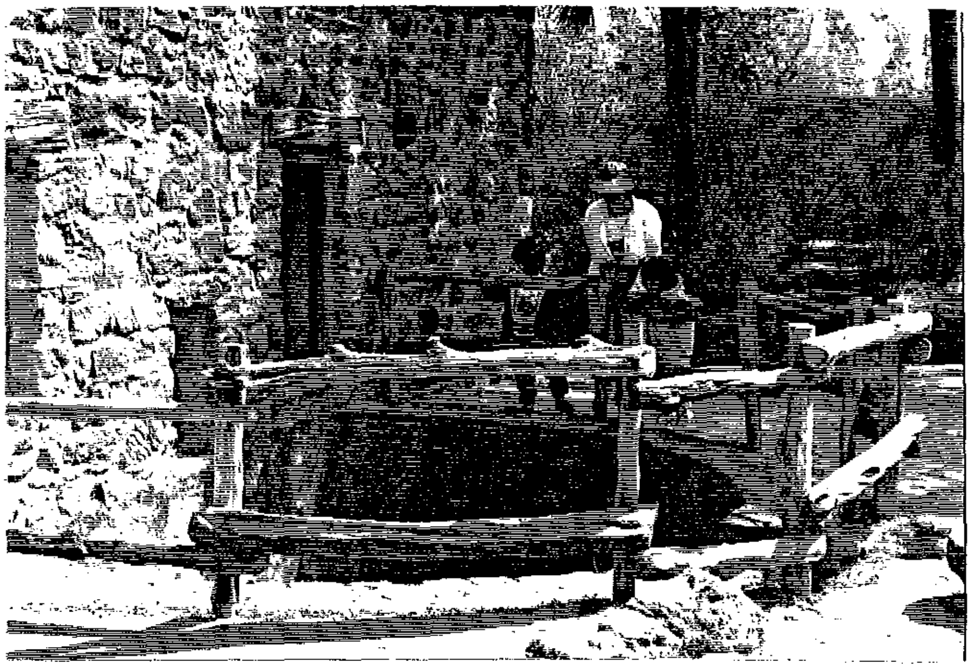


Figure 3-112 June 1996. Looking east toward the forebay. The stone-lined sluice from the *acequia madre* can be seen at the extreme lower right side of the photograph.

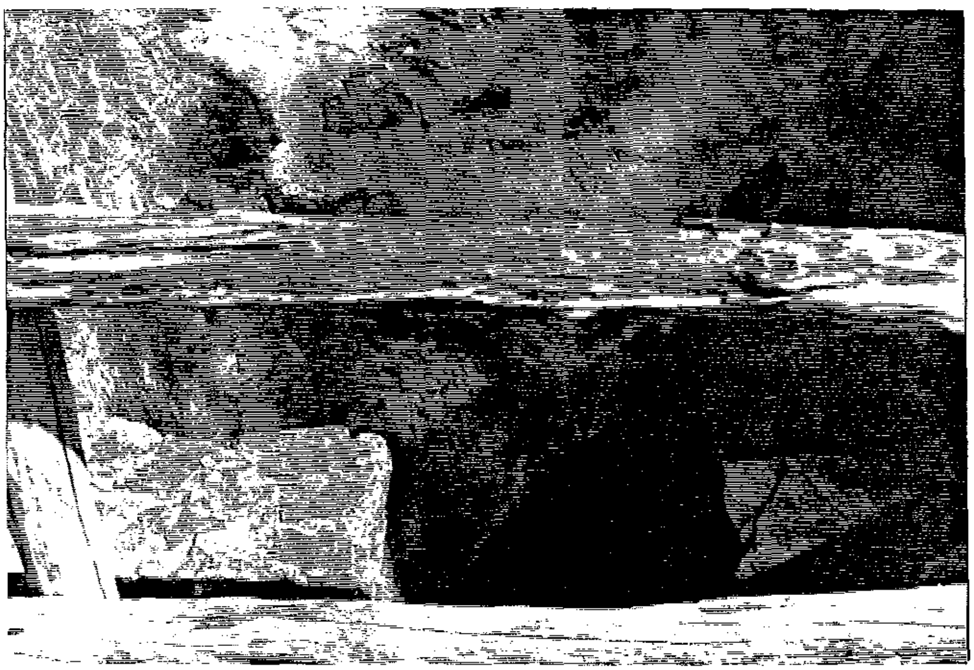


Figure 3-113 June 1996. Looking toward the forebay long the inlet from the *acequia madre*.

Figure 3-115 December 5, 1996. Looking down into the forebay at the junction between the 1930s restored masonry (yellow sandstone) and historic (colonial) surface (whitish parged surface) with smaller limestone masonry.

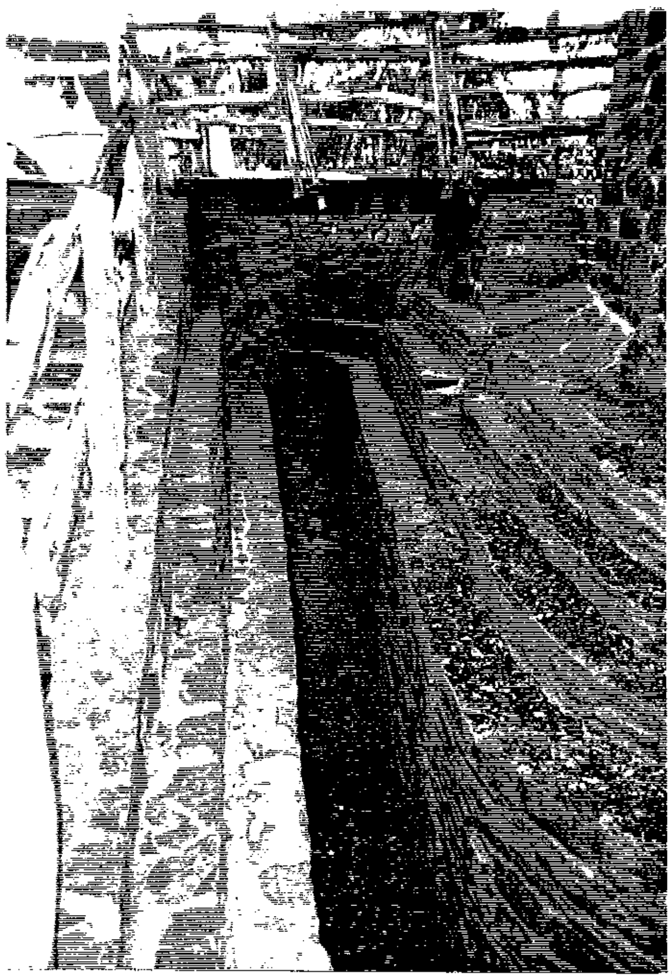


Figure 3-118 November 8, 1996. Looking due east down the millrace, where at the bottom level of the millrace the quality of the masonry in this area is quite spectacular. At the very eastern end of the millrace there is a more contemporary wall (Figure 3-120) which was put in, not historic, to basically block off the millrace from going future towards the northeast and north toward the amphitheater.

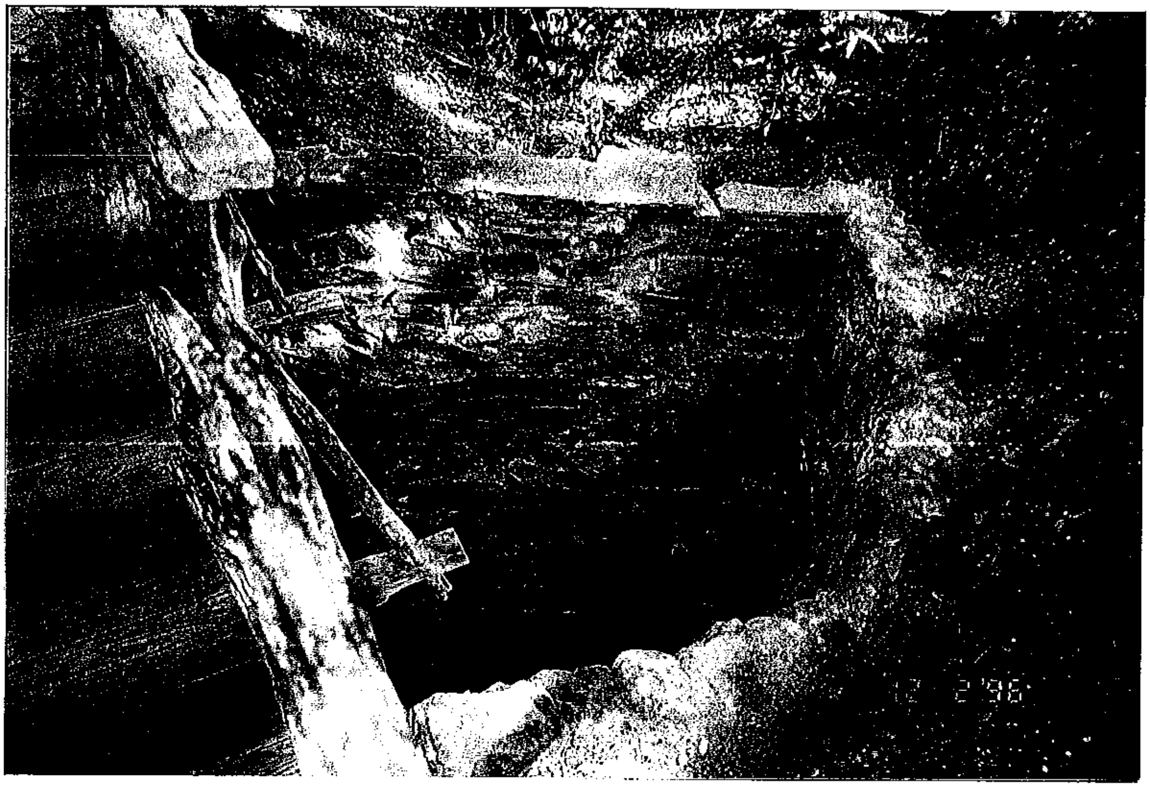


Figure 3-120 December 2, 1996. Detail of the modern masonry wall which terminates the race.

Figure 3-121
June 1996
Looking west toward the mill at the back (east) side of an obviously later wall that was installed in the mill race, cutting it off immediately south of the amphitheater.

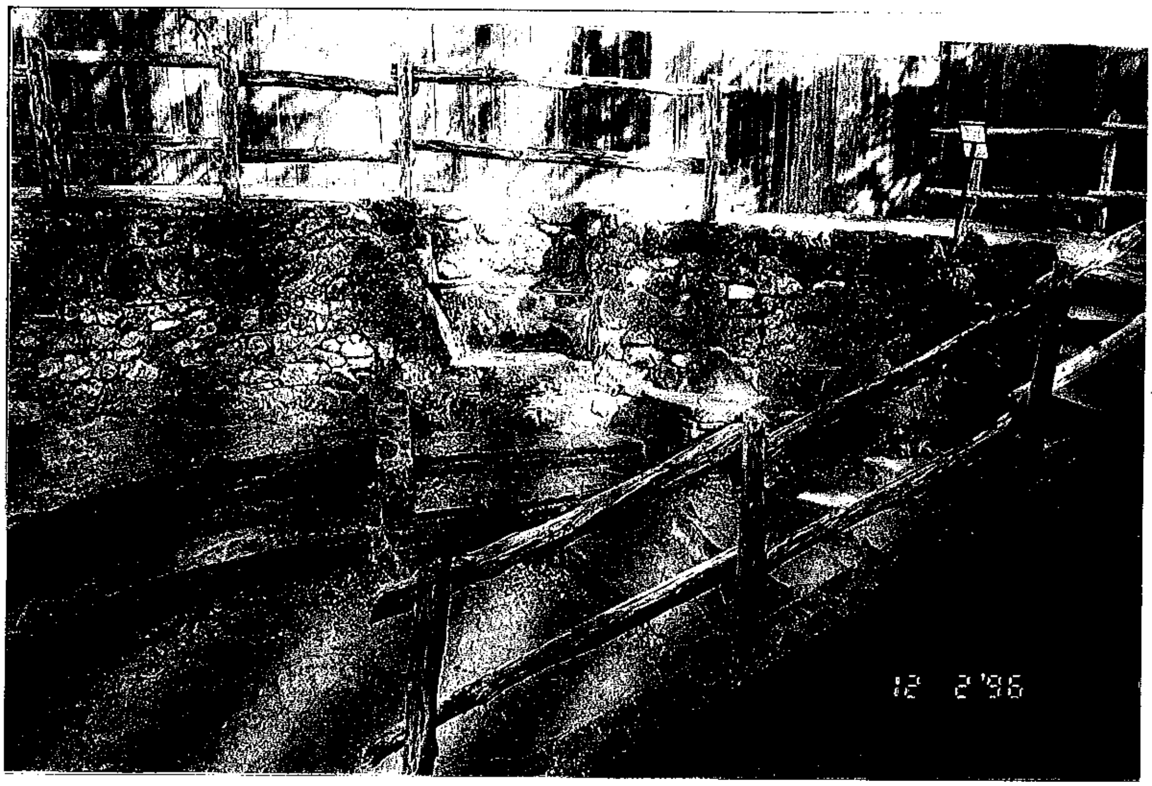


Figure 3-124 December 2, 1996. Looking north towards the amphitheater at the same retaining wall, stepped arrangement, and stone steps up from the turbine room.

Figure 3-127 November 8, 1996. Blown-up detail of an end wall showing a round impression for a second post--most likely for the lamp which shows up in Figure 3-140.

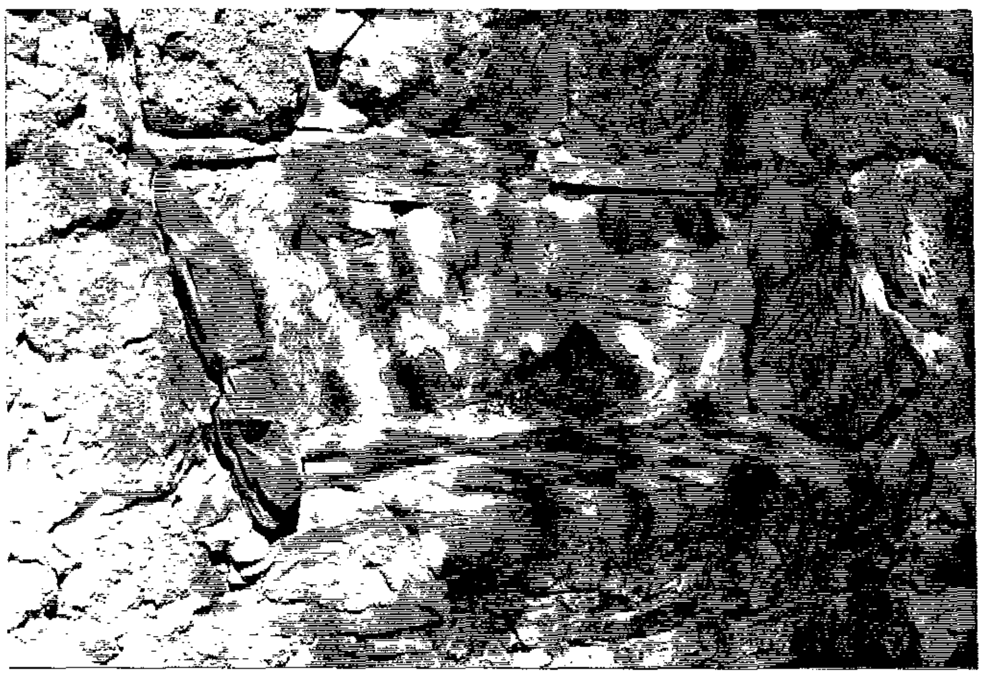


Figure 3-128 June 1996. Looking northeast towards the last of these stepped masonry arrangements before the steps. This is one of the more curious features and appears to be a "seat" formed out of masonry.

Figure 3-130 September 24, 1996. View along the northwest corner of the mill toward the northwest lime kiln.

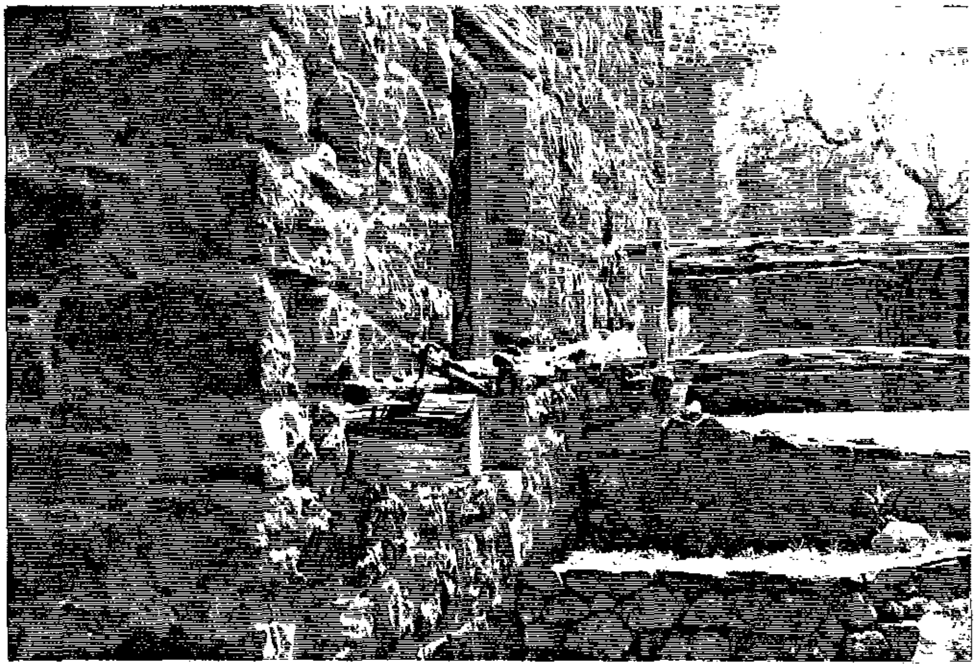


Figure 3-133 June 1996. Looking south along the west elevation. Remnants of the shed roof which was installed over the lime kilns in the 1950s (for protection). A wooden beam with ferrous bolts attached to it rests across viga-like wooden posts coming out of the west elevation of the building. At the back of the photo, just below the rails of the cedar fence, is a short masonry wall which slopes to the west and comes to rest at another very short masonry wall with another wooden beam still embedded in it (see Figures 3-137 and 3-138).

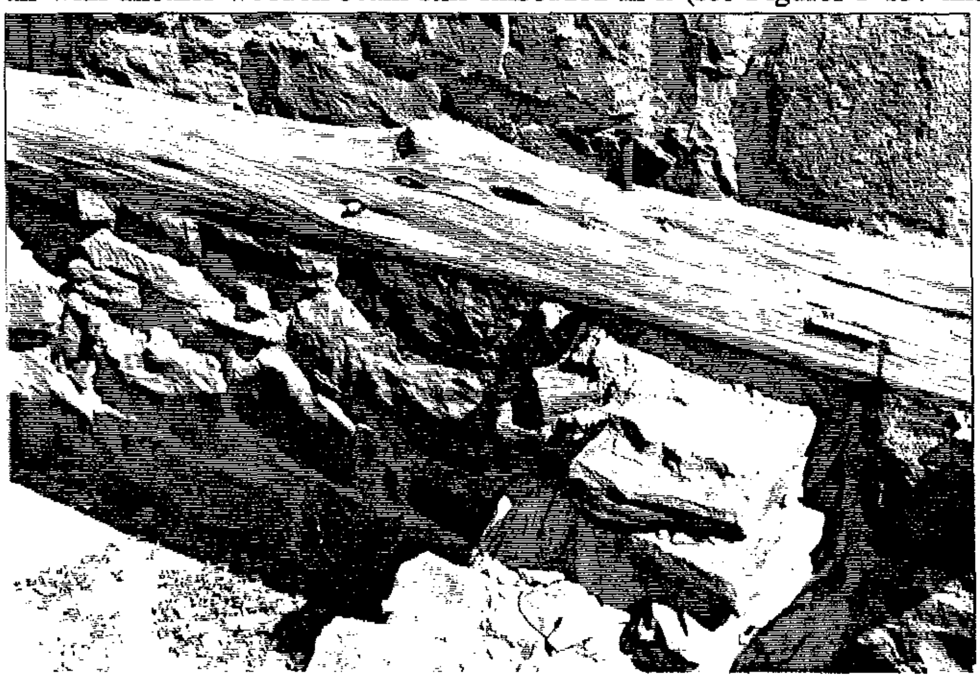


Figure 3-134 June 1996. Detail of the long wooden beam with ferrous bolts attached to it, which rests on the vigas and atop the short masonry wall viewed in this photograph.

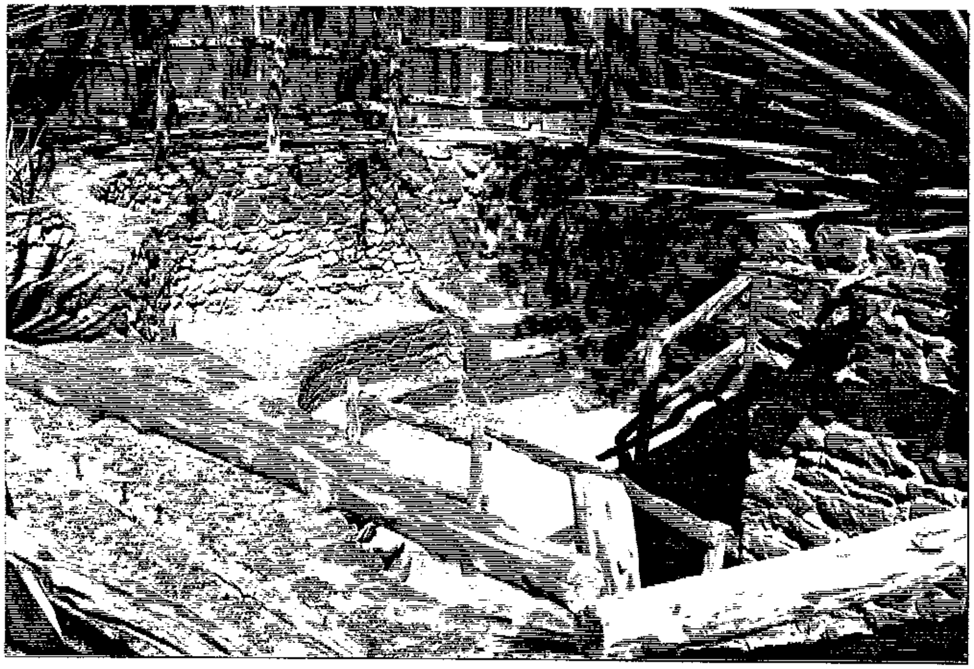


Figure 3-136
June 1996
Looking northeast down toward the stepped masonry elements at the west and north elevations of the structure. The terminus of the lime kiln shed roof can be seen at the lower left of the photograph. (See Figures 3-137 and 3-138).

Figure 3-137
June 1996
Looking south across the tops of the lime kilns at the alleged lime kiln roof arrangement. Two short sloped masonry walls can be seen (one at the top of the photograph, the second at the bottom of the photograph). These walls contain the impression of a wooden beam which would have been embedded in the mortar at the top of the walls. These beams, together with the two additional beams, one viewed in Figure 3-134, the second in this figure along the right side of the photograph, are assumed to have carried the shed roof seen in Figures 2-55 and 2-56.

Figure 3-139 June 1996. Detail of the northernmost sloped wall described in Figure 3-137. Note the curved impression which it is assumed belonged to a wooden beam which formed part of the conjectural roof structure. The beam which would have rested on this wall would (it is assumed) have been supported from a post which is located in Figure 3-123.

Figure 3-142 June 1996. Detail of a section of the wall which goes under the board fence into the amphitheater. This area needs backfilling and possibly some stabilization for the walkway.

Figure 3-143 June 1996. Detail of a clay drainage tile, which comes from "tanning" vat to the south. Note: It looks like a section of the masonry millrace was taken out to put in the terra cotta drainage pipe.

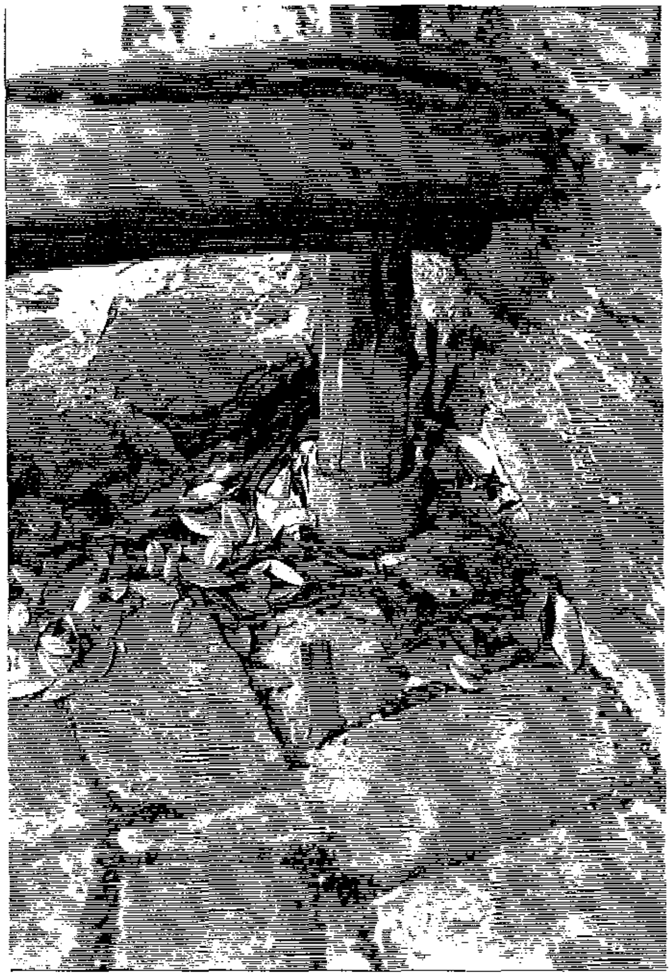


Figure 3-145 June 1996. Pipe embedded in pavement to support the cedar fence post for easy removal. This detail occurs at all posts surrounding the forebay.

D. Archeological Investigations, December 1996:

Under contract with San Antonio Missions National Historical Park, the University of Texas at San Antonio's Center for Archaeological Research (UTSA/CAR) conducted investigations in and around the grist mill the weeks of December 2 and 9, 1996 for the purposes of gaining additional information for this report. Under the guidance of Research Associates Ann A. Fox and Cynthia Tennis, Co-Field Directors Kevin Gross, and Andrew Scease led student archeologists Maureen Brown, Owen Ford, Donna Edmundsen, Ed Johnson, Bruce Moses, and Bobby Rector through the two week field investigations. The project entailed examination of the following seven areas (see Appendix M for complete scope of work, and Appendix N for the UTSA/CAR report). All features (except the sluice, forebay, mill race, and turbine room) were backfilled once the investigations were completed. General findings are noted below:

1. *Acequia* profile: Determine, to the greatest extent possible, the historic profile of the *acequia madre* which runs south of the mill.

Findings (Figures 3-147 through 3-150): The profile of the Spanish colonial *acequia madre* was located approximately 24-inches below the 1996 grade near the stone steps.

2. Stone steps west of the bridge over the *acequia madre* (south side): Determine the extent and design of the steps and their possible relationship to another walkway (possibly stone-lined) in the area.

Findings (Figures 3-151 through 3-155): Remnants of the stone steps which show up in historical photograph Figure 2-14 were disclosed. In addition, a "stepping" stone (Figure 3-154), one of three which also shows up in Figure 2-14 can be seen.

3. Sluice from *acequia madre* to the forebay of the mill: Determine possible existence of a slide gate from the *acequia madre*, and any other features related to the mill proper.

Findings: Three wood remnants were located, excavated, and removed (see Figures 3-157 and 3-74). It was assumed these three members belonged to a wooden gate dating to the 1930s restoration, but they could also have just been placed in the sluice to prevent soil and debris from falling into the forebay. The entire sluice was excavated (Figures 3-156 through 3-160). A notch formed into the sides and bottom of the sluice (Figure 3-159) was uncovered. This notch held the wooden sluice gate frame (Figure 3-73). While excavating this feature, archeologists located remnants of a low masonry wall (see #8 below).

4. "Tanning vat" - or "sugar mill" site (west of the mill): Examine this area for depth and evidence of additional structures.

Findings (Figure 3-163): The depth of one of the masonry walls was located approximately three feet from the top of the wall. This feature was also excavated in 1974 (see Figures 3-161 and 3-162).

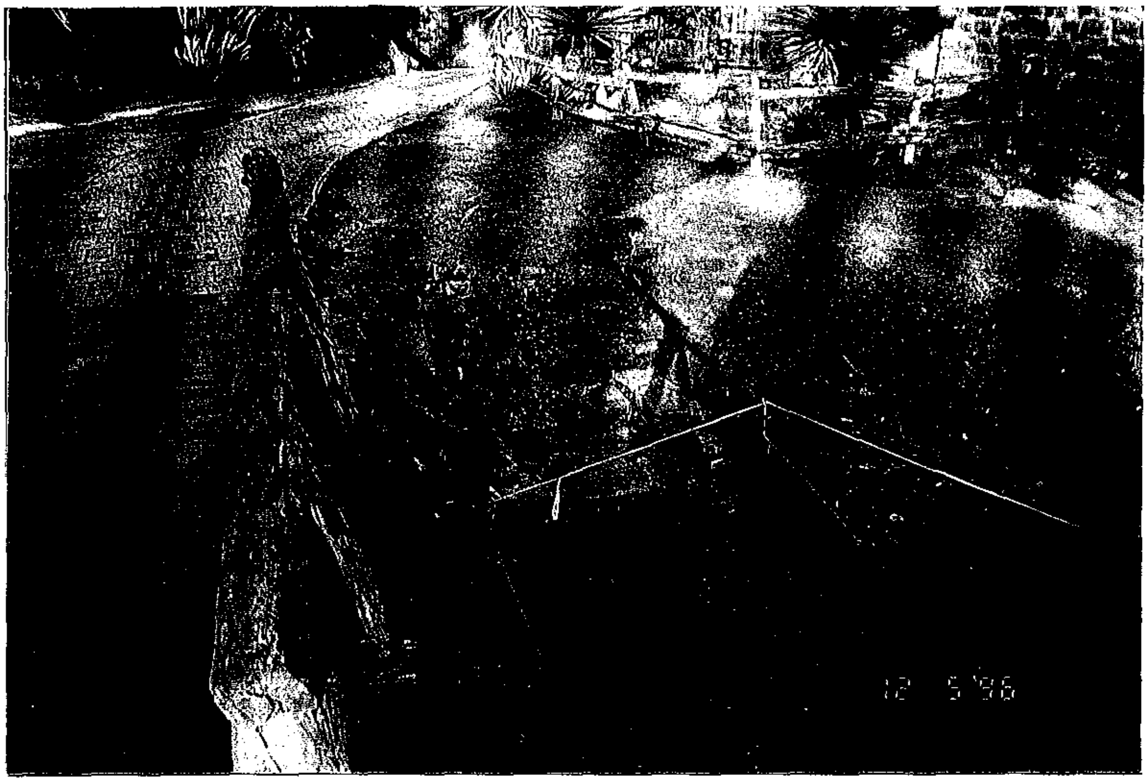


Figure 3-147 December 5, 1996. Detail of archeological investigations: Firstly, to examine additional existence of stone steps which show up in Figure 2-14; Secondly, to determine historic *acequia madre* profile.

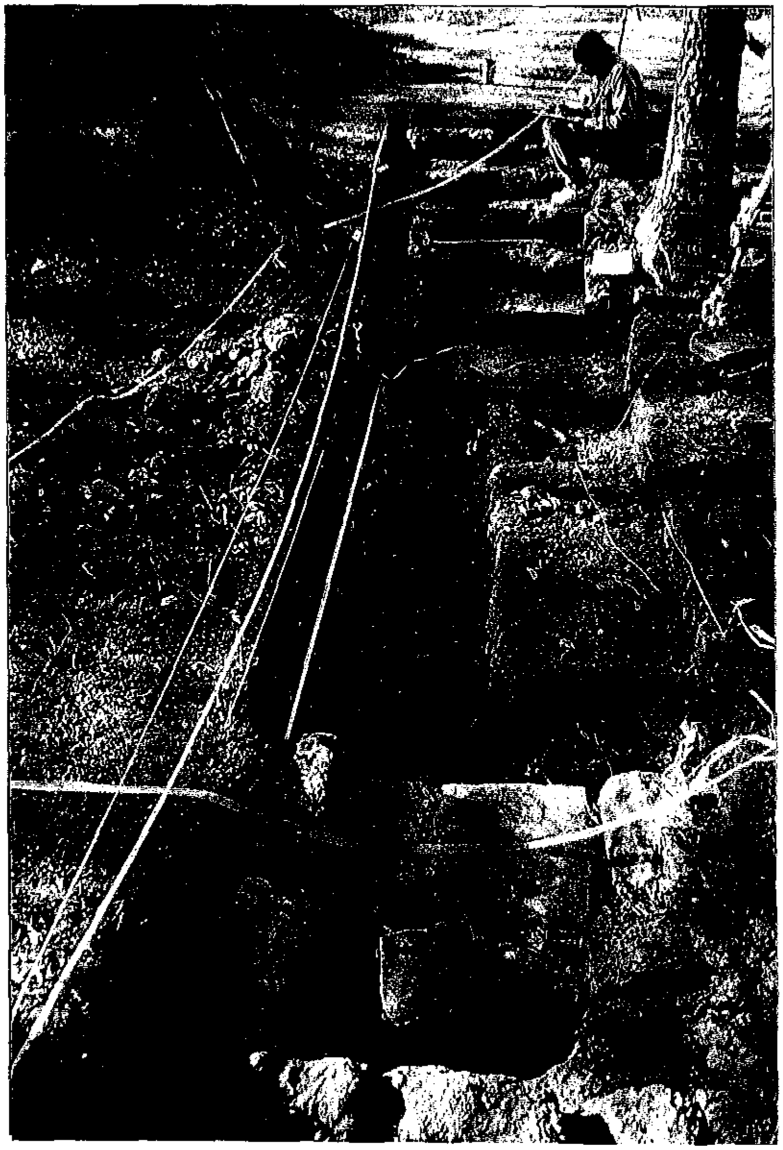


Figure 3-149 December 12, 1996. Detail of archeological investigations to determine historic *acequia madre* profile.

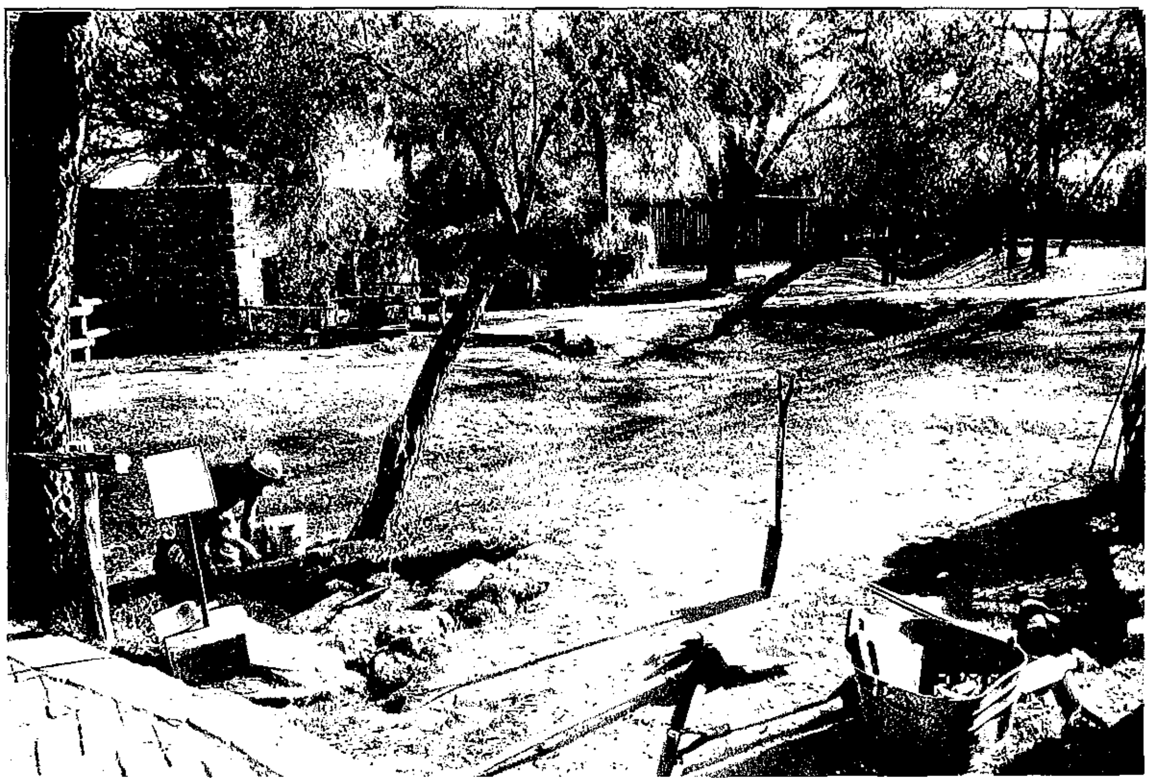


Figure 3-151 December 2, 1996. Archeologists are beginning to explore the west bank of the *acequia madre* near the exposed masonry steps to determine their extent.

Figure 3-153 December 3, 1996. Archeology continues on the east bank of the *acequia madre*. Four steps and one stepping stone have been located on the west bank. In addition, side walls are barely visible.

Figure 3-155 December 3, 1996. Findings on the east bank of the *acequia madre*: Two stone steps have been located.

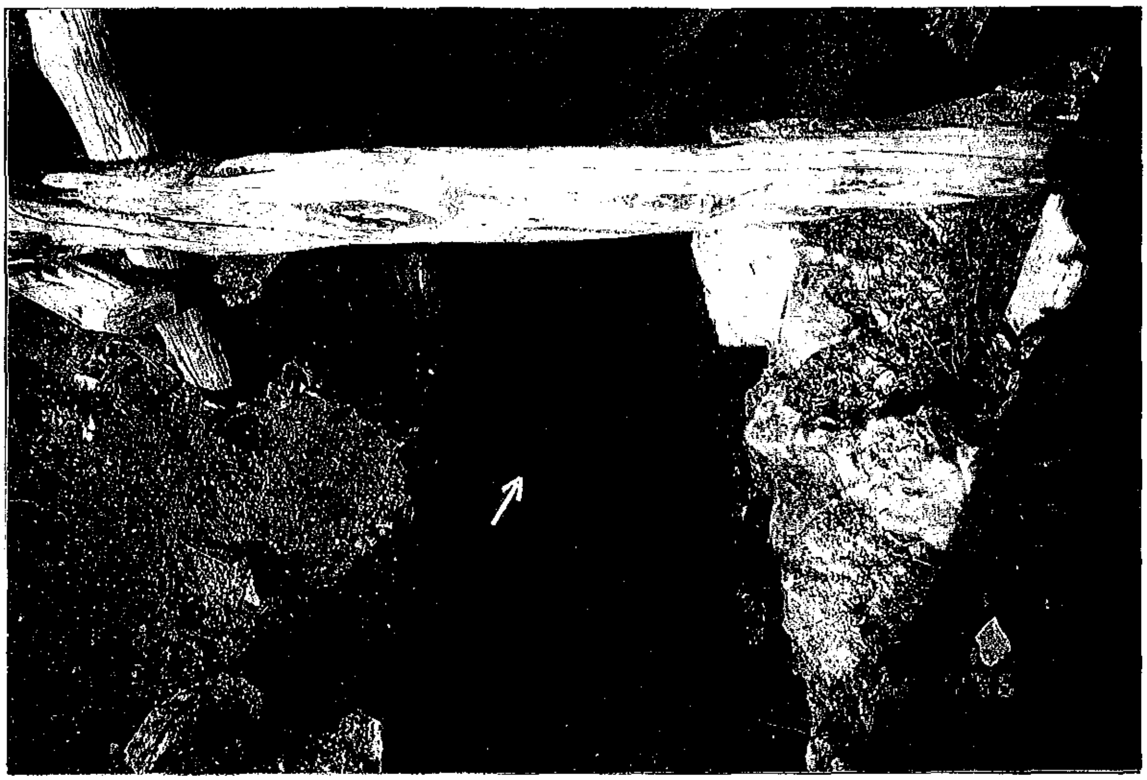


Figure 3-157 December 1996. Detail of remnants of what was assumed to be a wooden gate which date to the 1936 restoration.

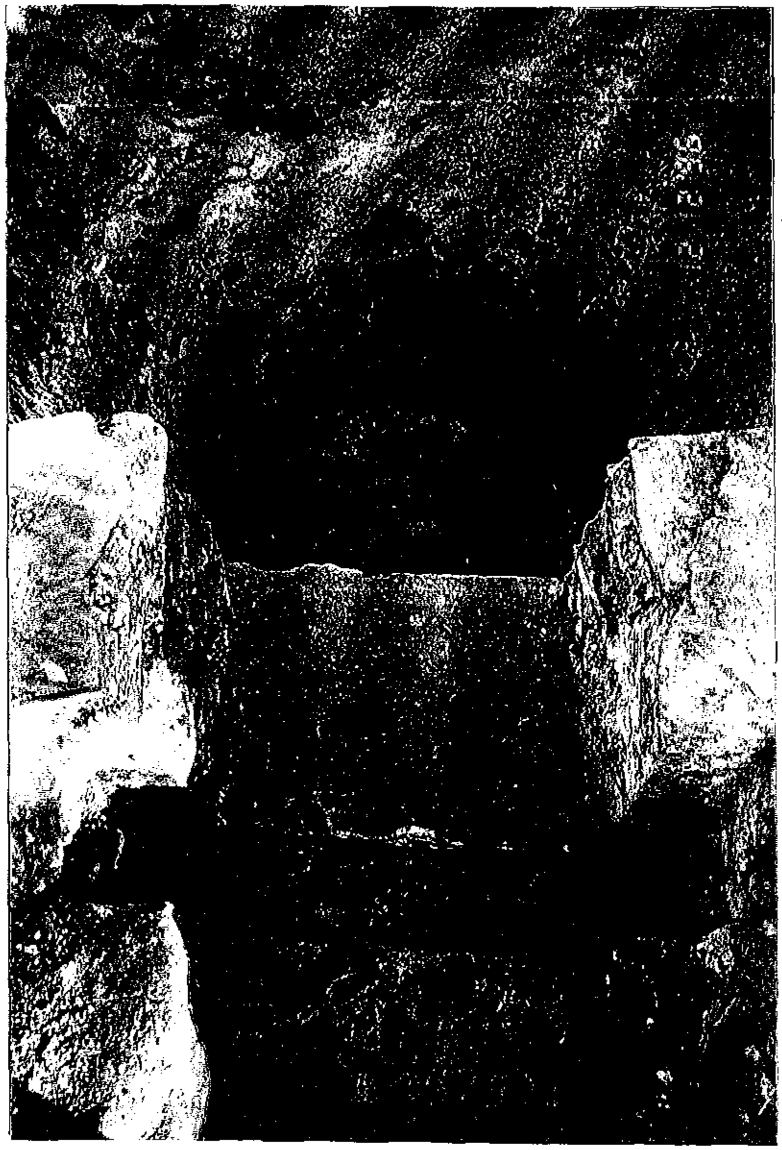


Figure 3-159 Detail of cleaned-out sluice immediately before the forebay. The arrow points to a channel, formed in modern (1930s) masonry and cement, which makes up the enclosure for a wooden gate frame, pieces of which were located in the bottom of the forebay at the start of this project in the fall of 1996 (see Figure 3-54), and on top of the wheel (see Figure 3-114).

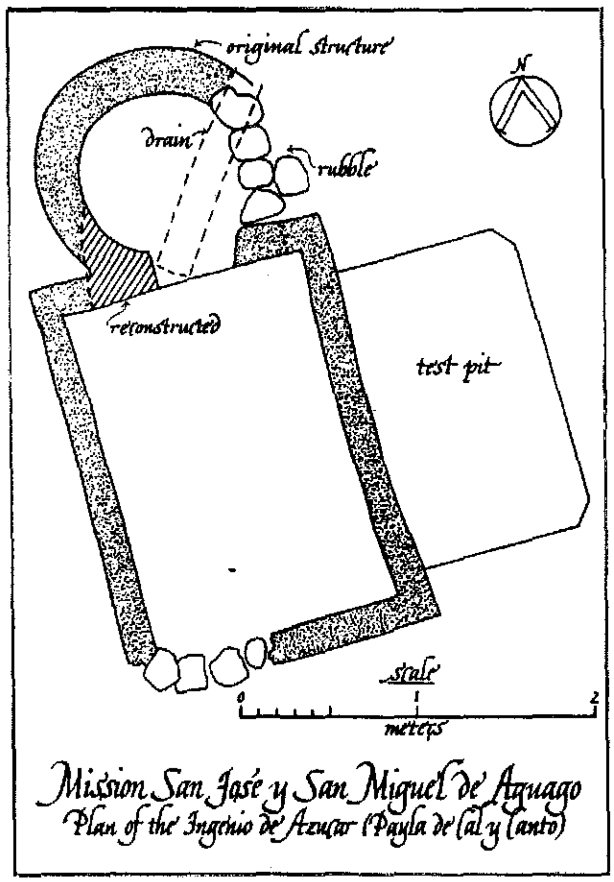


Figure 3-161 December 1974. Drawing of archeological test pit installed east of the "tanning vat" during archeological investigations at Mission San José. The "drain" is a tile conductor installed in the early 1950s to drain this feature into the mill race.

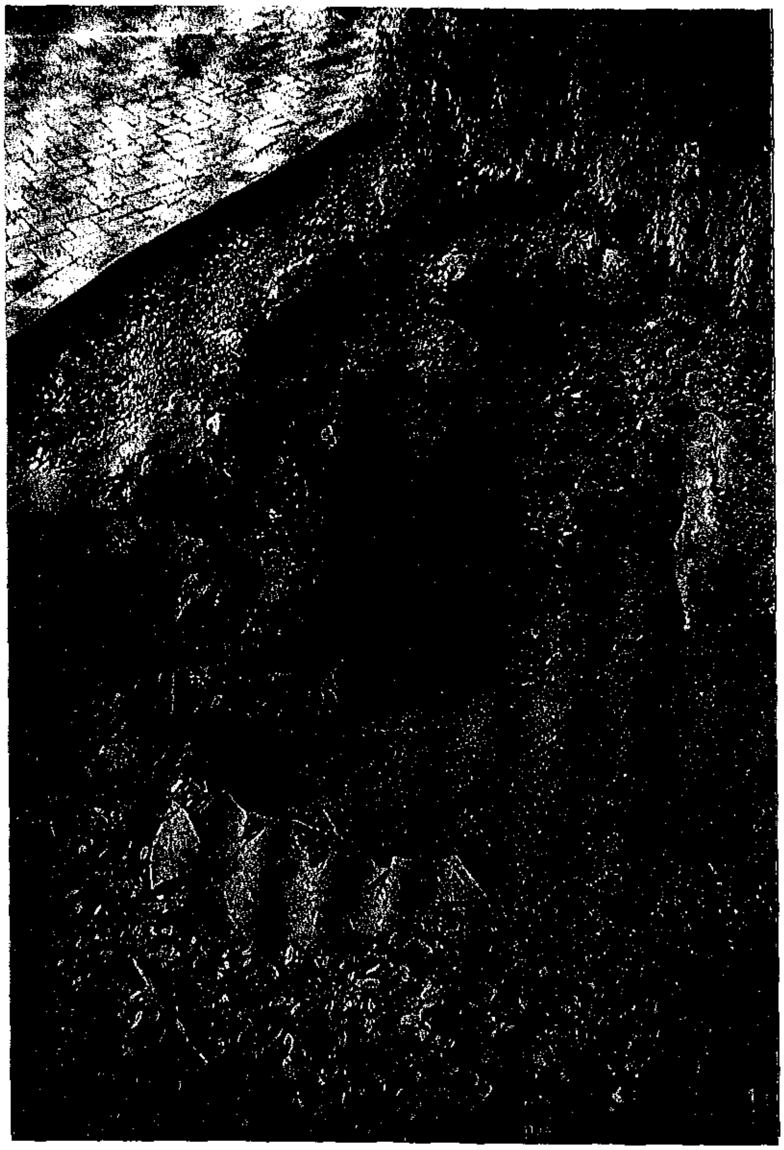


Figure 3-163 December 5, 1996. The bottom of one of the walls of the "vat" structure has been excavated, approximately 18 inches below existing grade.

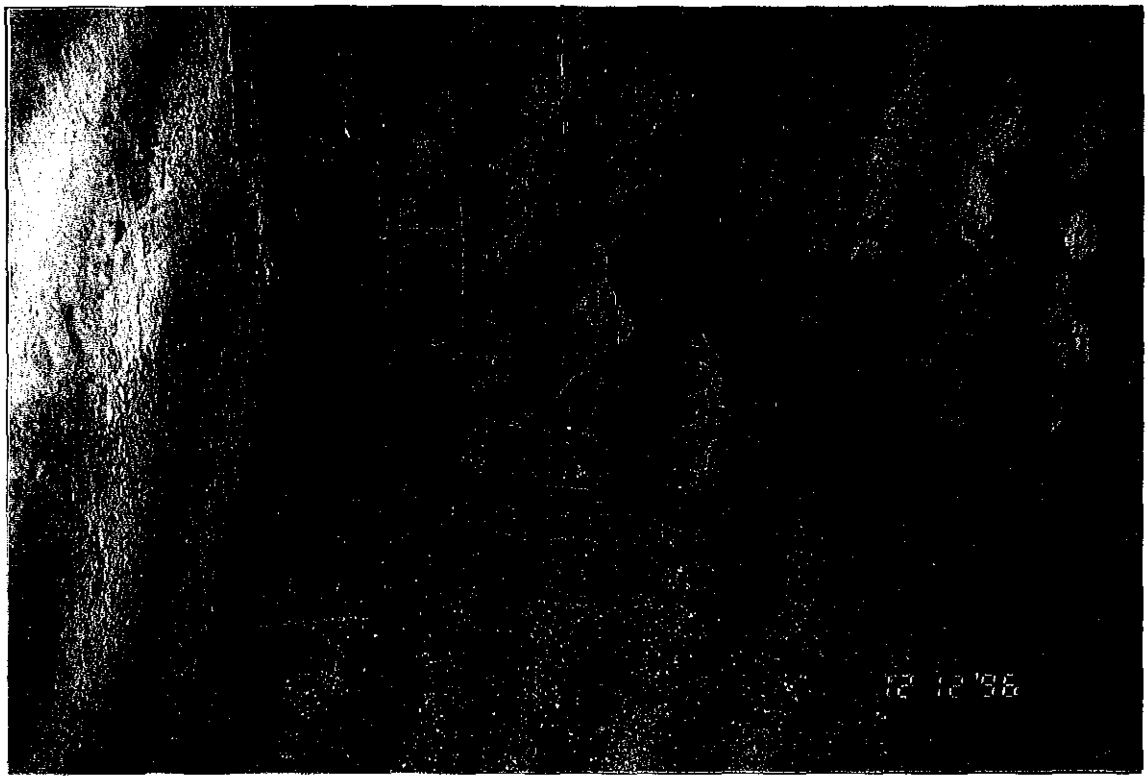


Figure 3-165 December 12, 1996. Detail of turbine room after the floor was excavated.

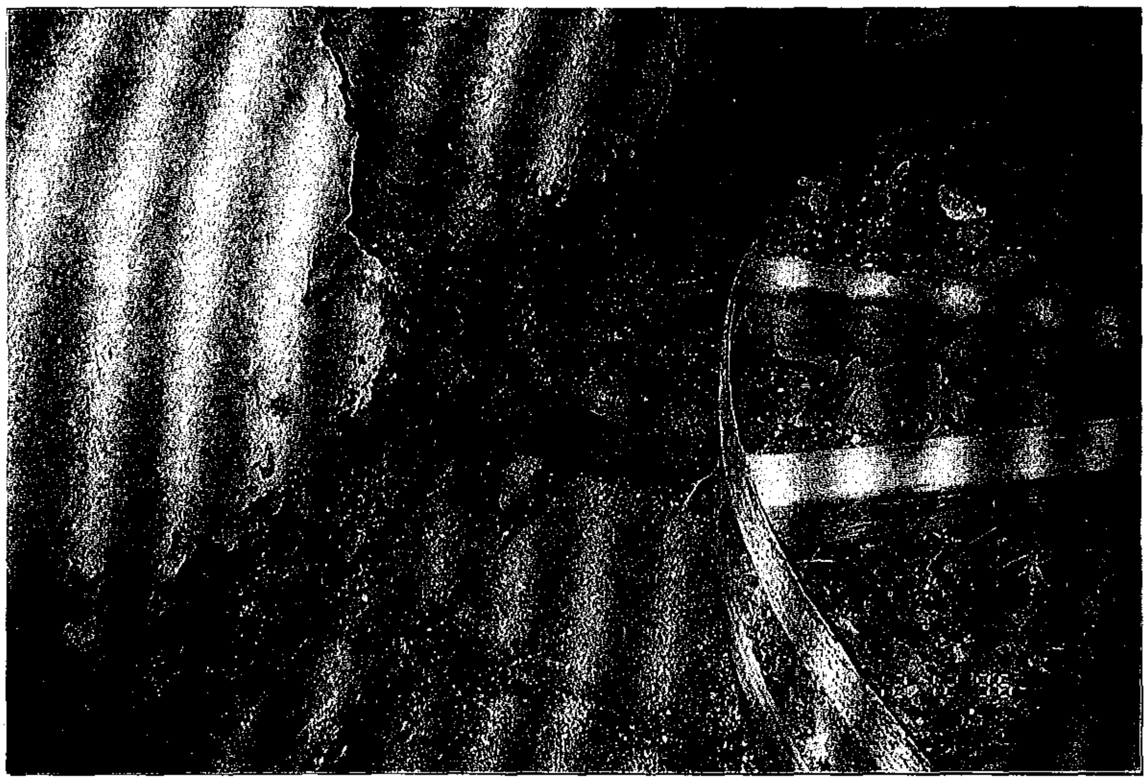


Figure 3-167 December 12, 1996. Detail of bridge tree remnant located during excavations for the turbine room floor. The tree was considerably deteriorated, being in moist soil for approximately 40 years. The water wheel has yet to be excavated.

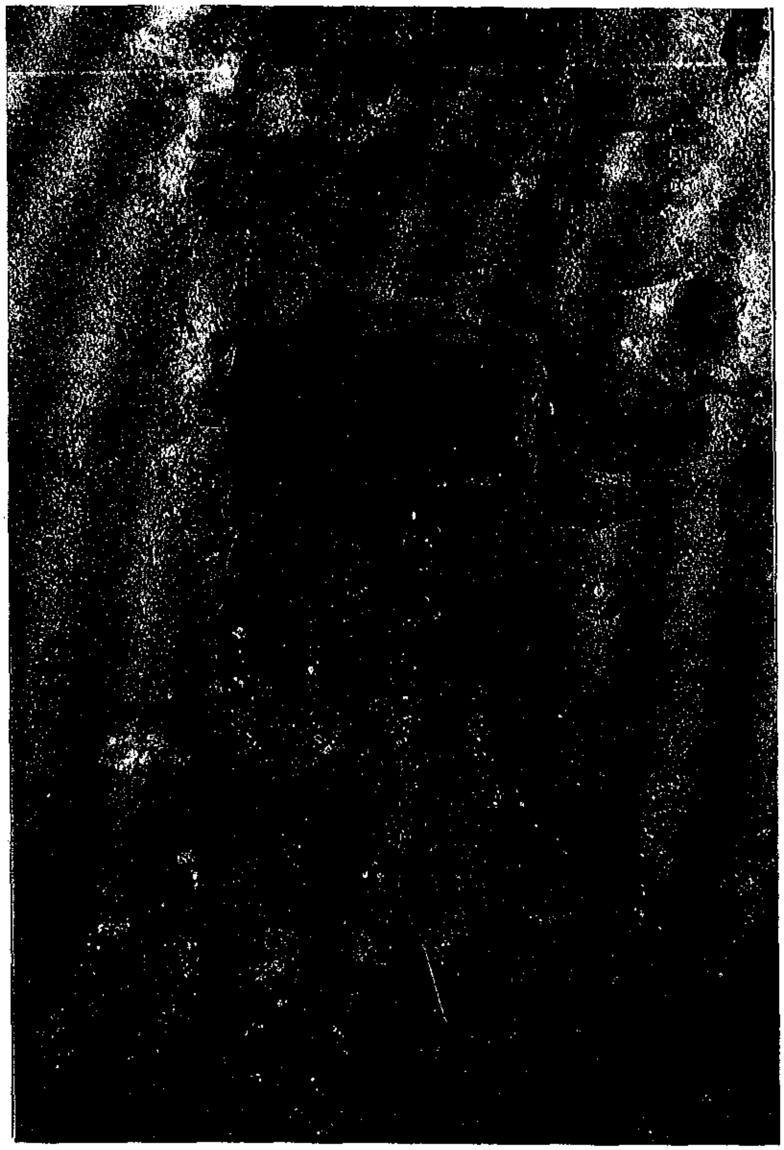


Figure 3-169 January 3, 1997. Detail of wall notch in eastern wall of turbine room for bridge tree.

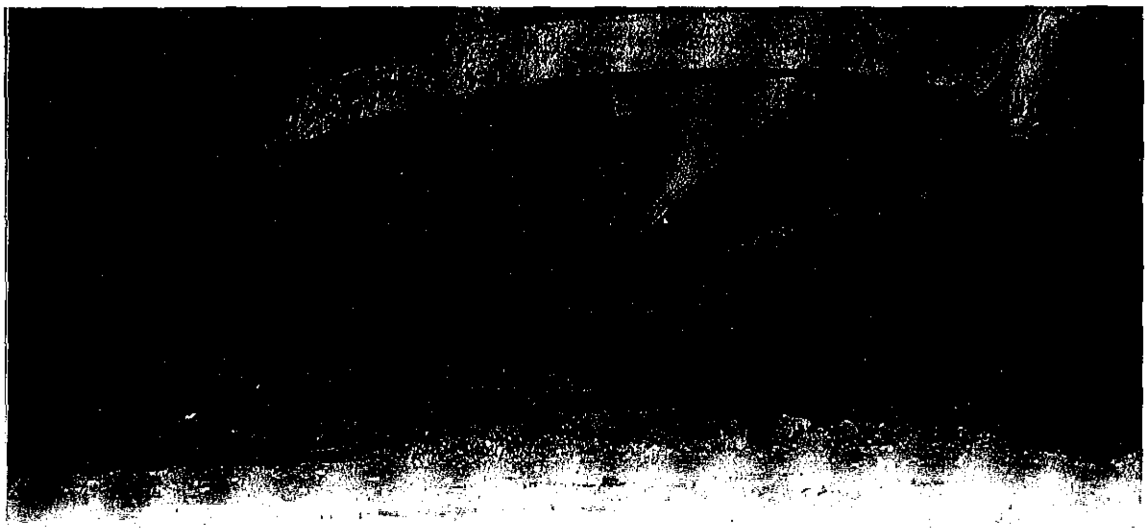


Figure 3-171 January 7, 1997. Detail of mill race post-cleaning. Approximately 8 inches of modern fill was removed.

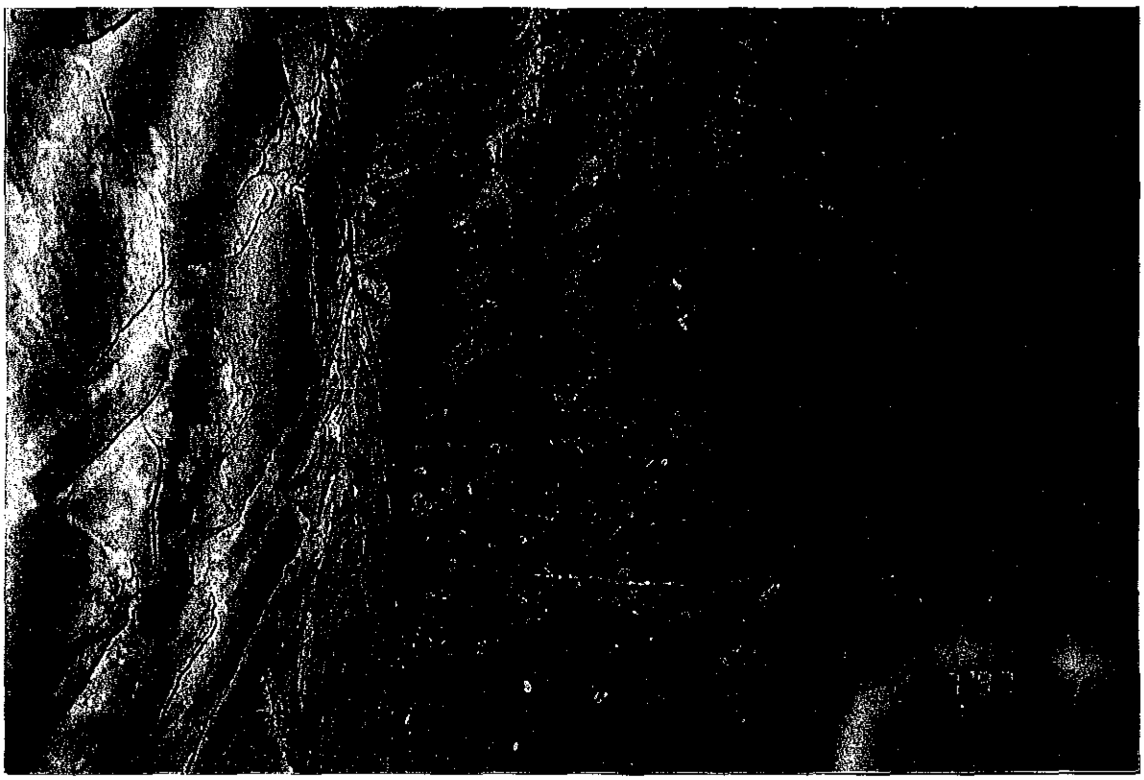


Figure 3-173 February 7, 1997. At the terminus of the mill race, a masonry wall was installed (presumably in the 1950s), as well as a drainage tile--the latter exposed during the December 1996 excavations. This drainage tile's terminus, integrity and ability to function properly will need to be tested.

Figure 3-175 December 5, 1996. Looking down into the forebay from the west side. The arrow points to a stone splash block at the bottom directly under the sluice.

Figure 3-177 December 6, 1996. Looking west from the sluice just prior to archeological investigations to determine the extent of the mortared stone wall indicated by the arrow, and to trace the extension of the alleged colonial wall which shows up in Figure 2-46.

Figure 3-179 December 12, 1996. Archeological testing just south of the forebay. A curved wall, possible the same one which shows up in Figure 2-18 (purpose unknown) has been located.

Figure 3-181 December 12, 1996. Archeological testing just south of the forebay. Detail of testing described in Figure 3-180.

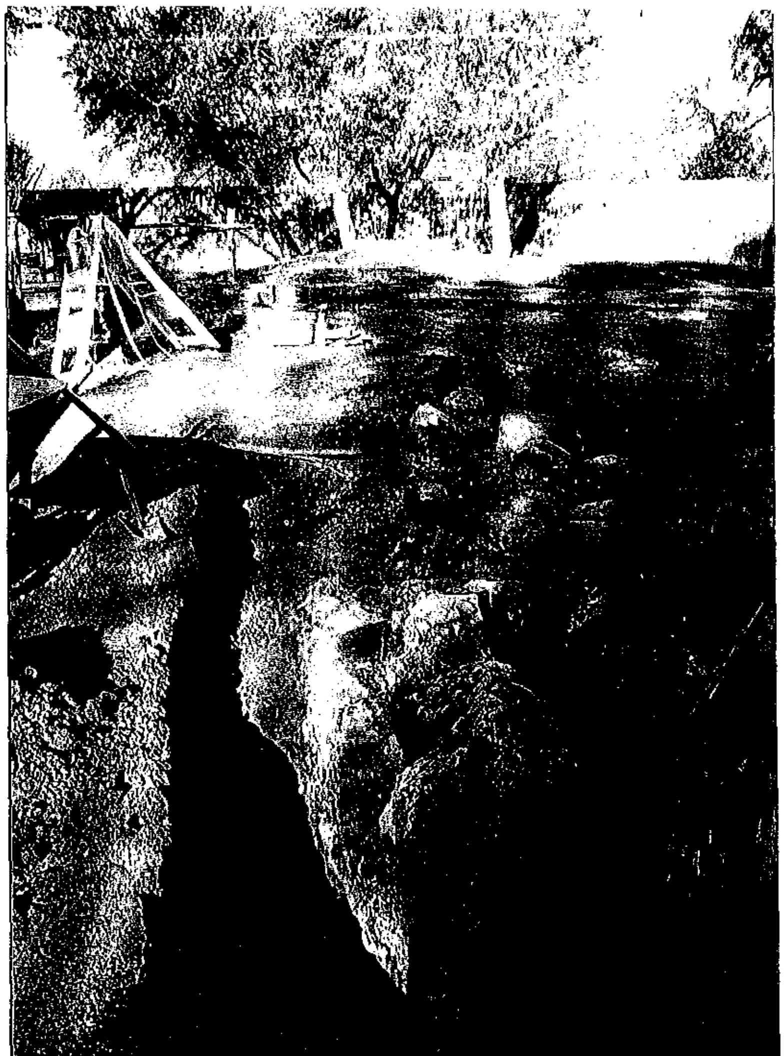


Figure 3-183 December 12, 1996. Details of excavations to determine wall extensions.

E. Topographical and Hydrological Engineering Studies, November - December 1996:

The firm of Overby Descamps Engineers, Inc. of San Antonio was retained to produce a detailed topographical map of the mill area and propose preliminary alternatives for reintroducing water to the *acequia madre* for the purposes of bringing the mill into full operation. The entire Overby Descamps report is included as Appendix O. Under the general supervision of Vice President Gerald James ("Jim") Overby, P.E.; Associate Engineer Frank Masch, Ph.D., P.E.; and designer Dan Ritsema, E.I.T., the firm provided the following general alternatives. *Exhibit A* in Appendix O is the final topographical map, followed by drawings of the three options (*Exhibits C, D,* and *E* in Appendix O, respectively).

A. Range of alternatives: Three options were explored: all three introduce water into the only remaining section of the historic *acequia madre* from the fenced area west of the mill. Option 1 fills the entire visible section of the *acequia madre* to the east, just beyond visual range of the *acequia madre* as it passes the dressing room building. Option 2 fills the *acequia madre* from the wood bridge to the culvert passing under the existing brick walkway. Options 1 and 2 propose a recirculation system, with Option 2 downscaled from Option 1. Option 3 does not propose a recirculation system.

> Option 1: This option presents the desired visual appearance intended for full interpretation of the mill and the *acequia madre* which fed it. It consists of two collection points for "spent" water which works its way through the mill: one at the end of the mill race, the second behind the dressing room building. The system proposes a recirculating pump system which would return filtered and treated water back to the starting point (near the "conversation pit" west of the mill). This system would be designed and sized to function whether the mill was running or not (in the latter case, the *acequia madre* would continue to "flow," but water would be gated from entering the forebay of the mill).

> Option 2: This option accomplishes most of Option 1, but cuts off the flow of water at the above culvert, thereby eliminating the need for a second collection point at the dressing rooms. A simpler return system would send water to the starting point.

> Option 3: This option does not include a recirculating system. Water is introduced as with the other options, but at the mill race terminus, the spent water is turned into the City's sanitary sewer system. As with Option 2, the culvert under the brick walkway is closed off. Since there would be a huge amount of water used any time the mill was to be run, this is not an economically feasible solution.

B. Recommendation: **Option 1.** Before a permanent solution is designed, park management will need to address all of the engineer's concerns.

4 REQUIREMENTS FOR TREATMENT

Requirements for Treatment

The requirements which follow enumerate the various authorities governing the treatment and use of the grist mill:

♦ Applicable Laws[1]

1. **Antiquities Act of 1906** (P.L. 59-209, 34 Stat. 335): provided for protection of historic, prehistoric, and scientific features on federal lands, with penalties for unauthorized destruction or appropriation of antiquities; authorized the President to proclaim national monuments; authorized scientific investigation of antiquities on federal lands subject to permit and regulations.

2. **National Park Service Act of August 25, 1916** (P.L. 64-235, 39 Stat. 535): established the National Park Service; directed it to manage the parks "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of further generations."

3. **Historic Sites Act of 1935** (P.L. 74-292, 49 Stat. 666): declared "a national policy to preserve for public use historic sites, buildings, and objects. . ."; authorized the programs known as the Historic American Buildings Survey, the Historic American Engineering Record, and the National Historic Landmarks Survey; authorized the NPS to "restore, reconstruct, rehabilitate, preserve, and maintain historic or prehistoric sites, buildings, objects, and properties of national historical or archaeological significance and . . . establish and maintain museums in connection therewith"; authorized cooperative agreements with other parties to preserve and manage historic properties.

4. **National Historic Preservation Act of 1966 (NHPA)** (P.L. 89-665, 80 Stat. 915; as amended by P.L. 91-243, 84 Stat. 204; P.L. 93-54; P.L. 94-422, 90 Stat 1313; P.L. 94-458; P.L. 96-199; P.L. 96-244; P.L. 96-515, 94 Stat. 2987; P.L. 98-483; P.L. 99-514; P.L. 100-127; and P.L. 102-575, 106 Stat. 4753): declared a national policy of historic preservation, including the encouragement of preservation on the state and private levels; authorized the secretary of the interior to expand and maintain a National Register of Historic Places including properties of state and local as well as national significance; authorized matching federal grants to the states and the National Trust for Historic Preservation for surveys and planning and for acquiring and developing National Register properties; established the Advisory Council on Historic Preservation; required federal agencies to consider the effects of their undertakings on National Register properties and provide the Advisory Council opportunities to comment (Section 106). Amended in 1976 (P.L. 94-422) to expand Section 106 to properties eligible for as well as listed in the National Register. Amended in 1980 (P.L. 96-515) to incorporate E.O.

[1]United States Department of the Interior, National Park Service (US-DOI, NPS), *Cultural Resources Management Guideline* (NPS-28), Release No. 4, July 1994, Appendix B, pp. 201-205.

♦ Applicable Regulations[2]

The following CFR citations are most pertinent to cultural resource management.

1. **Occupational Safety and Health Administration Act (OSHA)** (29 CFR 1910): In 1970, Congress passed OSHA. This landmark legislation established the requirement that a safe and healthful workplace be provided to all Americans engaged in lawful commerce. Section 19 of the Act, entitled "Federal Agency Safety Programs and Responsibilities," dictated that the same safety standards which applied to industry were to be applied with equal vigor to the Federal Government. The OSHA Act serves as the keystone for developing protective measures for NPS employees.[3]

2. **Uniform Federal Accessibility Standard (UFAS)** (42 U.S.C. 4151-4157, 1968): Presents uniform standards for the design, construction, and alteration of buildings so that physically handicapped persons will have ready access to and use of them in accordance with the Architectural Barriers Act of 1968, as amended (P.L. 90-480). It sets standards for facility accessibility by physically handicapped persons for Federal and federally-funded facilities.

3. **Americans with Disabilities Act (ADA)** (42 U.S.C. 12101, 1990): Title III of the ADA prohibits discriminination on the basis of disability by private entities in places of public accommodation, and requires that all new places of public accommodation and commercial facilities be designed and constructed as to be readily accessible to and usable by persons with disabilities.

4. **Antiquities Act** (43 CFR 3) establishes procedures to be followed for permitting the excavation or collection of prehistoric and historic objects on federal lands.

5. **Archaeological Resources Protection Act** (43 CFR 7, Subparts A and B), as amended), "Protection of Archeological Resources, Uniform Regulations: and "Department of the Interior Supplemental Regulations," provides definitions, standards, and procedures for federal land managers to protect archeological resources and provides further guidance for Interior bureaus on definitions permitting procedures, and civil penalty hearings.

6. **"National Register of Historic Places," 36 CFR 60** (NHPA and EO 11593), addresses concurrent state and federal nominations, nominations by federal agencies, revision of nominations, and removal of properties from the National Register.

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[2]Regulations are promulgated and published in the *Code of Federal Regulations* (CFR) to direct the implementation of laws.

[3]US-DOI, NPS, *Loss Control Management Guideline* (NPS-50), Release No. 2, January 1991, Introduction p. ii.

establish, maintain, and refine park cultural resource programs. The guideline is intended to aid managers, planners, staff, and cultural resource specialists. It outlines the basic principles and ingredients of a good park preservation program.[5]

3. **Loss Control Management Guideline** (NPS-50): Based on Public Law, Executive Order, and the Code of Federal Regulations, the objectives of the National Park Service's Safety and Occupational Health Program are to improve the management and cost-effectiveness of operations by:

a. Reducing the frequency and severity of accidents and losses for employees and visitors,

b. Providing a safe and healthful work environment for employees,

c. Providing for the safety and health of the public (visitors) from recognized hazards in NPS operations, on NPS lands, and in NPS facilities,

d. Protecting NPS and private property from accidental damage or loss associated with NPS activities; and

e. Including safety and health as an integral part of every operation.[6]

♦ Applicable Texas Regulation:

The Antiquities Code of Texas (established by Senate Bill No. 58, Chapter 442, Government Code of Texas, redefined as the Texas Natural Resource Code of 1977, Title 9, Chapter 191. Revisions reflected in Senate Bill 231, 1983, House Bill 2056, 1987 and Senate Bill 365, 1995): A designated State Archeological Landmark 1) is placed on a statewide inventory of significant sites, 2) cannot be removed, altered, damaged, salvaged or excavated without a permit from the Texas Historical Commission and 3) allow the owner of a property another avenue to seek prosecution if unauthorized persons vandalize the site.

♦ Functional Requirements:

The grist mill at San José will require very little to make it operational once more (see Chapter 5). Preservation of the building, rehabilitation of the milling apparatus, and a system for re-introducing water to the acequia madre comprise the basic needs of this project.

[5]NPS-28, Introduction, pp. 1, 3.

[6]NPS-50, Chapter 1, *Authority, Policy and Responsibility*, p. 1.

system with pull box, smoke and/or fire detectors, and audible and visual alarms should be installed. Park staff will also be required to be trained as above.

♦ Energy Conservation:

The existing structure is neither heated or cooled, and there are no plans to do so. Minimal electrical power is provided to the building for lighting.

♦ Abatement of Hazardous Materials:

Presently only one hazard exists at the mill, the asbestos-laden roof flashings. Since the existing roof is in good condition (including the flashings), we recommend that until friability of the flashings or deterioration of the roofing becomes a concern, that the present roof be maintained. If the flashings or existing roofing deteriorate, we recommend re-roofing the structure with a modern roofing system essentially invisible from the ground.

♦ Handicapped Accessibility:

1. NPS *Management Policies* states:

> "The National Park Service will provide the highest feasible level of physical access for disabled persons to historic properties, consistent with the preservation of the properties' significant historical attributes. Access modifications for disabled persons will be designed and installed to least affect the features of a property that contribute to its significance. Some impairment of some features will be accepted in providing access. If it is determined that modification of particular features would destroy a property's significance, however, such modifications will not be made."[8]

2. The Americans with Disabilities Act (ADA) states:

> "Alterations to buildings or facilities that are eligible for listing in the National Register of Historic Places under the National Historic Preservation Act, or are designated as historic under State or local law, shall comply to the maximum extent feasible with section 4.1.7 of the ADA Accessibility Guideline (ADAAG).
>
> "If it is determined under the procedures set out in section 4.1.7 of the ADAAG that it is not feasible to provide physical access to an historic property that is a place of public accommodation in a manner that will not threaten or destroy the historic significance of the building or facility, alternative methods of access shall be provided pursuant to the

[8]NPS Management Policies, Chapter 5, *Cultural Resources Management*, p. 14.

Figure 4-1 September 30, 1996. South elevation of the mill showing the modern brick walk which approaches the mill from the south part of the Mission San José complex.

5 ULTIMATE TREATMENT AND USE

Ultimate Treatment and Use

The park's source documents referring to the ultimate treatment (preservation / rehabilitation / restoration) and use of the San José mill as identified in the Executive Summary are:

a) The GMP (1983): In the Visitor Use / Interpretation chapter, subheading Mission San Jose, Supportive Resources for Interpretation: The mill is listed under the heading "The following site resources will support the interpretive program: . . . ."[1]

b) The draft parkwide Historic Structures Report (HSR) states: "Mill and millrace - Significance Level II ("High Significance, allowing only minimal alteration"), with the treatment listed as "Preservation through cyclic maintenance."[2]

The "Introduction" beginning on page ix above, discusses the basic elements of the General Management Plan (GMP), the park's interpretive theme, Mission San José's site themes and the mill's place in them, its significant role in the development of sites depicting mission life, outlined elements of a historic structure report, as well as the recommendation made at the time for cyclic maintenance in the draft parkwide HSR. As a result of the research carried out for this historic structure report it was discovered that with the employment of a mill engineer, Ernst Schuchard, his subsequent extensive research and observation of horizontal mills especially in old and New Mexico, the resultant mill reconstruction of the 1930s produced a structure intended for use as a educative interpretive tool. This is substantiated by the trial runs carried out which are discussed in "Chronology and Development and Use--Making the Mill Run," page 2-16. Therefore, the park's proposed ultimate treatment of the structure may be justified as the fulfilling of the intent of the work carried out in the 1930s.

Rehabilitation is consistent with NPS Cultural Resources Management Guideline (NPS-28): "Rehabilitation improves the utility or function of a historic structure, through repair or alteration, to make possible a compatible contemporary use while preserving those portions or features that are important in defining its significance. . . ."[3] Restoration is consistent with NPS-28, "Restoration accurately presents the form, features, and character of a historic structure as it appeared at a specific period. It may involve the replication of missing historic features and removal of later features, some having cultural value in themselves.

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[1]U.S. Department of the Interior, National Park Service (NPS), Southwest Regional Office, *General Management Plan/Development Concept Plan for San Antonio Missions National Historical Park* (July 1982), 44.

[2]Marlys Bush Thurber, Santiago Escobedo, Tom Ireland and James E. Ivey, *Of Various Magnificence--The Architectural History of the San Antonio Missions in the Colonial Period and the Nineteenth Century*. In Two Volumes, Vol. 1 (Santa Fe, New Mexico: National Park Service, Southwest Regional Office, Southwest Cultural Resources Center, Professional Papers No. 11, 1993), Chapter 8 - Recommendations for Management, 383.

[3]United States Department of the Interior, National Park Service, Cultural Resources Management Guideline (NPS-28), Release No. 4, Chapter 8, *Management of Historic and Prehistoric Structures*, 136.

Standards for Preservation[5]:

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

Analysis/Compliance: The mill will be used as it was intended in the 1930s reconstruction: a functioning mill.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationship that characterize a property will be avoided.

Analysis/Compliance: The historic character of the mill will be retained and preserved. Intact and/or repairable building fabric will be preserved or repaired. Existing features, spaces and spatial relationships will be maintained.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

Analysis/Compliance: Through interpretative means, the mill will be recognized as a physical record of its time, place, and use. Newly replicated wooden elements will be date stamped with the month and year of fabrication. All of the existing historic masonry will be retained and preserved. Pointing mortars will be matched to existing as to hardness, color, consistency and workmanship. Existing finish surfaces such as parging and whitewashes will be retained as much as possible, and new surfaces carefully blended to match. A detailed photo documentation of this latter work will be implemented.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

Analysis/Compliance: No significant changes have been made to the mill since the 1930s reconstruction.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

Analysis/Compliance: Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the mill will be preserved.

[5]*Secretary of the Interior's Standards for the Treatment of Historic Properties*, 1995. p. 18.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

Analysis/Compliance: Through interpretative means, the mill will be recognized as a physical record of its time, place, and use. All replicated wooden elements will be based on historical documentation researched for this report. Since the mill is meant to function, replacement mill stones of the appropriate era will be sought to replace the existing non-functioning mill stones. The existing stones will be curated.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

Analysis/Compliance: No significant changes have been made to the mill since the 1930s reconstruction.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

Analysis/Compliance: Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the mill will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new material will match the old in composition, design, color, texture, and where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

Analysis/Compliance: The existing condition of the mill is documented in Chapter 3. Repair and limited replacement of various items will be required and is detailed in this chapter. Each existing element (i.e., the wood sifting box) will be carefully examined by a trained craftsperson to determine the suitability and feasibility of repairing and re-utilizing it rather than fabricating a matching element. New materials used for replicated items will match the old in composition, design, color, texture, and wood species.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

Analysis/Compliance: Chemical treatment of exposed wood elements is proposed utilizing proven NPS materials and treatments. Physical treatments are proposed for pointing, parging and whitewashing. These will be undertaken with the gentlest means possible. Treatments that cause damage to historic materials or the existing mill structure will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate and conserve materials and features from the reconstruction period will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

Analysis/Compliance: Through interpretative means, the mill will be recognized as a physical record of its time, place, and use. All replicated wooden elements will be based on historical documentation researched for this report.

4. Materials, features, spaces, and finishes that characterize other historical periods will be documented prior to their alteration or removal.

Analysis/Compliance: No significant changes have been made to the mill since the 1930s reconstruction. All restorative and rehabilitative work will be thoroughly documented prior to and during construction.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

Analysis/Compliance: Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the mill will be preserved.

6. Deteriorated features from the reconstruction period will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new material will match the old in composition, design, color, texture, and where possible, materials.

Analysis/Compliance: The existing condition of the mill is documented in Chapter 3. Repair and limited replacement of various items will be required and is detailed in this chapter. Each existing element (i.e., the wood sifting box) will be carefully examined by a trained craftsperson to determine the suitability and feasibility of repairing and re-utilizing it rather than fabricating a matching element. New materials used for replicated items will match the old in composition, design, color, texture, and wood species.

7. Replacement of missing features will be substantiated by documentary and physical evidence. A false sense of history will not be created by adding conjectural features, features from other properties, of by combining features that never existed together historically.

Analysis/Compliance: Replication of missing features will be based on documentary evidence gathered and presented in chapters 2 and 3 of this report; and by detailed designs based on these findings. Since the mill is meant to function, replacement mill stones of the appropriate era will be sought to replace the existing non-functioning mill stones. The existing stones will be curated.

2. Reconstruction of a landscape, building, structure, or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.

Analysis/Compliance: As noted above, only reconstruction of missing wooden elements will be undertaken. No subsurface archeological resources will be disturbed.

3. Reconstruction will include measures to preserve any remaining materials, features, and spatial relationships.

Analysis/Compliance: All remaining materials, features, and spatial relationships will be preserved.

4. Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance the appearance of the non-surviving historic property in materials, design, color, and texture.

Analysis/Compliance: The reconstructions of various missing objects noted above will be based on documentary evidence (historical photographs) located during research for this project.

5. A reconstruction will be clearly identified as a contemporary re-creation.

Analysis/Compliance: Through interpretive means, the modern recreated elements will be identified. All new replacement wooden members will be date stamped with the month and year of fabrication.

6. Designs that were never executed historically will not be constructed.

Analysis/Compliance: Only those elements identified as missing from historical photograph will be recreated.

Interpretation:

The park Interpretive Prospectus calls for the development of particular topics at each of the four missions. They are:

-Concepción: the mission as a spiritual center
-San José: the mission as a social center and as a protective site
-San Juan: the mission as an economic (agricultural) center
-Espada: the mission as a vocational center

Analysis of Mill Operation:

From our research, the following is an analysis of the operation of the grist mill at Mission San José:

A. With a steady stream of water in the *acequia madre*, a portion of the flow would be directed into the stone-lined sluice immediately south of the forebay;

B. With the sluice gate opened, and the forebay gate closed, water filled the forebay.

C. Once the forebay was filled, the forebay gate was opened moving water onto the wheel.

D. A careful balancing of the two gates (the sluice gate and the forebay gate) was essential at this point to ensure that the source of water to the wheel remained constant, further ensuring that the wheel revolved at a constant rate. It would be necessary to have water from the *acequia* constantly flowing into the forebay - as it is the forebay which provides a constant head of pressure.

E. The west tram rod we believe was meant to be stationary, operated only to provide maintenance to the bridge tree, wheel, or shaft. The east tram rod provided the actual tramming - or minute adjustment between the two stones depending on the grist type and the preciseness of grinding that was meant to be undertaken. Two wedges in the east tram rod provided this adjustment. A mallet, which appears in historical photographs, would be used to drive the wedges in or out (moving the upper stone up or down).

F. With the mill in operation (adjusted for a constant rate of speed), grist is poured into the hopper and from there it is directed by means of a small wooden chute, to the center of the upper stone, where, through the action of the spinning stone and the cut ("dressing") of the two stones, works its way between the stones to be ground.

G. Flour is directed out the north side of the stone casing into a second wooden chute, and is collected in a wooden bucket on the floor. (To ensure a continuous operation, two buckets should really be employed - one to collect the flour while the second is taken over to the sifter).

H. The flour is taken to the suspended sifting box for sifting. Bags or other containers, appropriate to the historical period, should be provided for the finished product.

structural integrity (re-fabricate if necessary using cedar or cypress heart wood). Thoroughly document the interior to HABS standards. Remove samples of existing parging and mortars to have tested. Remove existing parging and completely repoint all parged masonry surfaces with mortar matching historic mortar in hardness and composition. Re-parge entire interior vaulted room with new plaster matching historic plaster in hardness and composition. Re-fabricate bridge tree based on documentary and physical evidence using cedar or cypress heart wood. If existing are structural unsound, re-fabricate two tram rods based on documentary and physical evidence using cedar or cypress heart wood. Reassemble bridge tree, tram rods, waterwheel, and main shaft. Reattach wood water chute to support arm. Design a compatible fire extinguisher enclosure either in the vault or immediately in the proximity of the vault. Design gated enclosure for main entrance for security and safety purposes based on historical photograph (see Figure 2-45).

• Mill Race: Completely repoint all masonry surfaces with mortar matching historic mortar in hardness, color, mix, and workmanship. Build extension of race to amphitheater fence line, using design based on structural engineer's recommendations. Face mill race extension with stone to match existing. Remove modern end wall and patch masonry surfaces. The floor of the race was not finished (i.e., with flagstone as is the turbine room). A decision will need to be made to incorporate a liner of some type if that is necessary. Incorporate water collection system at this point based on hydrological engineer's recommendations (see Appendix O). The stone steps leading down from the bridge level to the flagstone landing north of the building are very uneven, and during wet events, are a slipping hazard. The turning mill wheel would afford an excellent interpretive experience, but will need to be viewed from the walkway above. Access to this lower level should be limited to park staff.

• Lime Kilns: As described in Chapter 3, the lime kilns are in very good condition. There is no evidence of deterioration or loss of fabric (the kilns were carved out of bedrock limestone). We are, therefore recommending that the shed roof which was installed in the late 1940s or early 1950s to protect the kilns not be restored. Drawings for this roof have not surfaced to-date, accordingly an exact duplication cannot be made. The remaining elements (wood and masonry features) should be retained and preserved in-place, treated with preservatives to improve longevity, but not be replaced.

• Sitework: Restore the path which ran in front (south of) the mill as shown in Figure 2-47. This path should be constructed with a hard-surfaced material which meets the requirements of the ADA and is compatible with other approved modern surface pathways in the park. The pathway should match the level of the large flagstone which spans the top of the stone-lined sluice from the acequia to the fore-bay, and existing brick walkways.

• Cedar Fencing: Check all posts and rails for structural adequacy and replace those which are damaged or deteriorated. It may be necessary to redesign the protective cedar fencing to follow applicable laws and standards, such as the Occupational Safety and Health Administration (OSHA) as to height, construction, etc.

the 1930s be re-fabricated. This will provide safety while the mill is running, plus afford security for the delicate milling apparatus when the site is closed. For the protection of visitors from the turning mill stone, an interpretive ranger, volunteer, or docent will be present at all times. At those times that the mill is not in operation, we recommend that a second gate be installed in the main entrance to the milling room as we presume one was historically (from physical evidence near the main entrance--see Chapter 3). There would be visual access into the milling room, but no physical access. Protection of visitors from the water-filled acequia and forebay will also be important. The latter is more critical, and retention of fencing around the forebay is essential. Fencing off the acequia is not recommended, as it would seriously detract from the historic scene. A physical presence by a uniformed staff member is advised.

- Maintenance of the rehabilitated/restored milling apparatus will be essential:

    1. The stones will need to be redressed periodically, as the process of milling wears the grooves decreasing the effectiveness of the milling operation. There are several books on the subject which should be studied and followed. Ideally, a millwright or craftsperson familiar with proper dressing techniques should be invited to dress the replacement stones while being videotaped.

    2. The stones will also need to be cleaned periodically. This is accomplished by lifting the two stones apart. The upper stone is quite heavy, so this operation will require assistance.

    3. The design and installation of the two water gates (sluice and forebay) is important to ensure longevity, ease of operation, and ease of maintenance. In particular, since there is so much force operating on the forebay gate, its design will require careful consideration, with designed elements which are capable of withstanding tremendous forces. Periodic maintenance of both gates will be necessary to endure smooth operation.

    4. After months or years of operation, it may be necessary to re-fabricate several wooden elements, namely the forebay gate lifting arm, the tram rods, and the main wheel shaft--the milling apparatus under the greatest stress. The design of the latter two elements in the 1930s took this into consideration: splices in the main wooden members will enable easy removal and replacement of damaged parts.

DESCRIPTION	QTY	UNIT	COST	
			RATE	TOTAL
Metal gate for entrance.	25	S.F.	20.00	500
Fabricate: Hopper chute, casing chute, stationary tram rod arm (cypress or oak), moveable tram rod wedges (oak), moveable tram rod wedge support (cedar or oak), and fore-bay gate control arm (cypress or oak).	5	Ea.	150.00	750
Purchase compatible mill stones and install per historical evidence.	2	Ea.	500.00	1,000
Fabricate: Sifting box (suspended from vigas), wood collection bucket, and wood mallet.	3	Ea.	400.00	1,200
New track lighting.	400	S.F.	8.00	3,200
Video production (for ADA compliance).	1	LS	20,000.00	20,000
Cast working model (for ADA compliance).	1	LS	10,000.00	10,000
Travel, salary, per diem for mill specialist (1 month initial project coordination).	1	LS	8,200.00	8,200
Travel, salary, per diem for mill specialist (2 months construction supervision).	1	LS	16,000.00	16,000
Archeology.	1	LS	50,000.00	50,000
Subtotal, this page				110,850
Subtotal, page 1				153,440
SUBTOTAL				$264,290
General Conditions (10%)				26,429
PROJECT TOTAL (Class "C")				$290,719

6 GLOSSARY

GLOSSARY OF TERMS

Milling Terms

Bedstone. Fixed bottom millstone.

Bridge tree. Horizontal support, usually made from a single log, positioned under the wheel mechanism and used to raise and adjust the millstones by means of a connecting vertical **tram rod**.

Damsel. A small wooden frame connected to the hopper chute which "dances" along the top of a running mill stone. The vibration caused by the turning stone shakes the chute allowing for a continuous flow of grist from the hopper to the stones.

Dressing. Maintenance of **furrows** or grooves in millstones.

Forebay. (Or tank). Receptacle for water from the *acequia*, or irrigation ditch, channeled to the mill wheel. When released by means of a regulating gate, water flows rapidly down into the wheelroom at a velocity enabling the wheel to turn grinding the grain.

Furrows. Grooves etched into the millstones to aid in grinding grain.

Hopper. Funnel-shaped wooden, leather, or cloth container, open at the bottom, into which grain is placed to be shaken by means of the damsel down a chute onto the stone for grinding.

Horizontal Mill. Water powered mill of ancient origin, variously known as a "Greek" or "Norse" mill. Notable for its horizontally positioned wheel placed in a subterranean wheel room and powered by water whose velocity comes from gravity of falling from the height of a trough or from a gate controlled forebay where water from the irrigation ditch is allowed to collect.

Lands. Spaces between grooves, or **furrows** in the millstones.

Millrace. Stone lined trough through which water runs from the wheelroom back to the irrigation ditch or elsewhere away from the mill.

Natural speed. Unique to each mill's particular configuration. A relatively constant speed resulting from the diameter of the wheel and the velocity of the water striking it.

Pivot point. (Or thrust bearing). Metal plate, pointed on the outer end, attached to the bottom of the main shaft which holds the wheel. The point rests in a groove in the bridge tree.

Running stone. The moveable and adjustable top millstone.

Rynd. A metal element, sometimes loose and moveable, at other times fixed on the main shaft which runs through the center of the millstones aiding in their fine adjustment.

Sluice. A narrow trough through which water is channeled to the mill and controlled by means of a gate. When the gate is opened water pours down into the forebay, also gate controlled, entering the wheel room to turn the wheel mechanism.

Thrust bearing. See pivot point.

Tram rod. Vertical wooden rod extending from the milling room and secured to the bridge tree running under the wheel mechanism in the wheel room below. Used to adjust the space between the stones and thus the fineness of the milled grain.

Vat. (Or hoop). A wooden casing for the millstones.

Wedges. Wooden, used to lift the entire wheel/shaft/upper stone/bridge tree assembly to adjust for grinding grain.

Spanish Terms

Acequia Irrigation ditch. Along with a dam and, when necessary, an aqueduct, diverts and carries water to farm fields.

Acequia madre Main (or "mother") irrigation ditch. Carries water diverted from the river by a dam to farm fields where lateral ditches supply water to areas to be irrigated.

Canal Roof drain.

Cortina Literally, a curtain. A retention wall or partition element of a water storage receptacle.

Ingenio Sugar milling mechanism.

Labores	Farm fields designated under the Spanish colonial system for each community, mission or civil.
Latillas	Slender branches, trimmed and peeled, laid tightly across *vigas*, or roof beams, to create a base for a flat roof.
Metate and mano	*Metate*: usually a slab of porous volcanic stone slightly raised on one end, used for the grinding of maize by native groups, especially those in Spanish-speaking America. *Mano*: oblong stone of the same material as the *metate* and used for hand grinding maize.
Molino	Flour mill.
Payla de cal y canto	Cauldron used for cooking cane syrup.
Piloncillo	Cone-shaped sugar loaves. The traditional shape of processed sugar in Spanish-speaking areas.
Trapiche	Press type mill for crushing sugar cane to produce syrup.
Vigas	Roof beams, usually of logs, sometimes peeled and left round, sometimes dressed and squared.

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8 FIGURE CREDITS

Figure Credits

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CHAPTER 3:

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Figure 3-3	(Illustration): James and Juarez Architects, et al, CLR: Exhibit H, p. 2-17.

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9 APPENDICES

APPENDIX A

APPENDIX A

Form No. 10-306 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR FEDERAL PROPERTIES

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TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC
Mission Nuestra Señora de la Purísima Concepción de Acuña; Mission San José y San Miguel de Aguayo; Mission San Juan Capistrano; Mission San Francisco de la Espada; Espada Dam; Espada Acequia; Espada Aqueduct; San Juan Dam; and San Juan Acequia.

AND/OR COMMON
San Antonio Missions National Historical Park

2 LOCATION

STREET & NUMBER
727 E. Durango, Room A612
__NOT FOR PUBLICATION

CITY, TOWN
San Antonio
__ VICINITY OF

CONGRESSIONAL DISTRICT
22, 23

STATE
Texas 78206

CODE
41

COUNTY
Bexar

CODE
029

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
X DISTRICT	__PUBLIC	X OCCUPIED	X AGRICULTURE	X MUSEUM
__BUILDING(S)	__PRIVATE	X UNOCCUPIED	__COMMERCIAL	X PARK
__STRUCTURE	X BOTH	__WORK IN PROGRESS	X EDUCATIONAL	X PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	X RELIGIOUS
__OBJECT	X IN PROCESS	X YES: RESTRICTED	X GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	X YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER:

4 AGENCY

Note: Private owners listed on continuation sheet.

REGIONAL HEADQUARTERS: *(If applicable)*
Southwest Region Office, National Park Service

STREET & NUMBER
P. O. Box 728

CITY, TOWN
Santa Fe
__ VICINITY OF

STATE
New Mexico 87501

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.
Bexar County Courthouse

STREET & NUMBER
Main Plaza

CITY, TOWN
San Antonio

STATE
Texas 78285

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
See continuation sheet.

DATE
__FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS

CITY, TOWN

STATE

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	X DETERIORATED	__UNALTERED	X ORIGINAL SITE
X GOOD	X RUINS	X ALTERED	__MOVED DATE______
X FAIR	X UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The San Antonio Missions National Historical Park contains a total of 86 structures directly associated with the four missions and an additional 21 archeological and historical sites which record more than 260 years of history. The following discussion of the resource is in three parts. Part I is an overview of the present day character of the district. Part II describes the missions and their environs at three points in time: 1780, 1824, and 1890. Part III is a detailed description of each standing structure at the missions today and a listing of the archeological and historical sites within the district.

Part I OVERVIEW OF THE MISSIONS: PRESENT-DAY CONTEXT

San Antonio Missions National Historical Park, which comprises the National Historical District with its four Spanish colonial missions and associated resources, is a 475-acre area located in south central San Antonio. The missions are situated at intervals along the San Antonio River over a distance of about 8 miles. They are, from north to south, Mission Nuestra Señora de la Purísima Concepción de Acuña, on the east side of the river; Mission San José y San Miguel de Aguayo, on the west; Mission San Juan Capistrano, again on the east; and Mission San Francisco de la Espada, on the west. Not included in this district is Mission San Antonio de Valero, popularly known as the Alamo, located just east of San Antonio's Riverwalk and central plazas.

In the district are included the dams of missions Espada and San Juan with their associated acequias, or irrigation ditches; the aqueduct which carries the Espada acequia over Piedras Creek; the labores, or fields, of Espada and San Juan; and other cultural resources consisting of prehistoric sites, colonial sites outside the missions proper, and Mexican and Anglo-American sites associated with the missions or with the development of the mission lands.

The missions were originally established in the eighteenth century as self-sufficient enterprises distant from urban San Antonio. In the southern part of the district, around missions San Juan and Espada, this rural character still remains, although urbanization and industry present a growing threat to the tranquil setting. The San Antonio River, which used to meander between the missions, has been confined to a man-made channel. Of the four acequia systems, today only Espada's still functions, but there are plans to restore the San Juan acequia flow by pumping water from the channelized river. The northernmost missions, Concepción and San José, are now so encompassed by residential and commercial development that they have become anomalies in their own setting.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
X PREHISTORIC	X ARCHEOLOGY-PREHISTORIC	X COMMUNITY PLANNING	_ LANDSCAPE ARCHITECTURE	X RELIGION
_ 1400-1499	X ARCHEOLOGY-HISTORIC	X CONSERVATION	_ LAW	_ SCIENCE
_ 1500-1599	X AGRICULTURE	X ECONOMICS	_ LITERATURE	X SCULPTURE
_ 1600-1699	X ARCHITECTURE	X EDUCATION	X MILITARY	X SOCIAL/HUMANITARIAN
X 1700-1799	X ART	X ENGINEERING	_ MUSIC	_ THEATER
X 1800-1899	X COMMERCE	X EXPLORATION/SETTLEMENT	X PHILOSOPHY	_ TRANSPORTATION
X 1900-	_ COMMUNICATIONS	X INDUSTRY	X POLITICS/GOVERNMENT	_ OTHER (SPECIFY)
		_ INVENTION		

SPECIFIC DATES 1720-80; 1830's; 1860's; 1880-1920; 1930's; 1950-70. BUILDER/ARCHITECT Several; see text.

STATEMENT OF SIGNIFICANCE

INTRODUCTION

The San Antonio missions were a major part of the Spanish colonial system for the establishment and management of its defensive and settlement frontier in the American Southwest. This frontier had significant and far-reaching effects on the development of the United States both politically and culturally, effects which are continuing today. The missions were directly involved in the military, religious, and cultural development of the Texas frontier, and they influenced policy-making in these areas across the entire Southwest. Their impact upon the development of the American cattle industry was pronounced. Their contribution to agriculture and commerce was of critical importance to the development of the state of Texas and to the San Antonio region. The structures themselves constitute a unique record of the architecture, art, and sculpture of the Spanish colonial period in Texas. This record has had a substantive influence on the study of the history of architecture and decorative arts in the American Southwest. Archival collections of the Mission documents offer unlimited opportunities for historical studies on the topics of acculturation, culture change, comparative frontier studies, and the mechanics and implementation of the Mission system. The unparalleled archeological record of each Mission offers a unique resource for study of the progressive changes in material culture which occurred at each of the missions, changes which may well be representative of culture change throughout the Southwest.

The San Antonio Mission and the Spanish Frontier

SPANISH COLONIAL MISSIONARY SYSTEM

The process of exploring and settling a frontier during the Spanish colonial period usually involved three elements: the presidio, or fort; the colonial town; and the Mission. The San Antonio missions were a critical part of the extension of the Spanish frontier into Texas. Their purpose as part of the colonial effort was to:

--Spread Christianity and European culture on the Texas frontier;

--Serve as an essential element of frontier policy, in conjunction with the presidio and the colonial town of San Antonio.

They served to control the Indian population, to lighten the burden of defense imposed on the military, and to lessen the threat of raid and theft to the colonial town. The San Antonio complex formed the base from which Spanish military and missionary operations and activities in Texas were carried out. It supported the frontline, short-lived presidios and missions to the north and east. A principal component of these operations was the observation, control and opposition of the French colonies of the Mississippi valley and the central Gulf coast in the period from 1720 to 1763, the English colonies and the Indians to the north from 1763 to 1776, and the United States and the Comanches after 1776.

Two missions and a presidio were established in the San Antonio area in 1718-1720, and political, military and religious considerations moved three new missions into the same small valley in 1731. As a result, five missions were located in the San Antonio River valley under the protection of a single presidio. They were grouped closely, for two principal reasons. First, the fields required irrigation, and this could be accomplished only in a narrow area along the upper ten miles or so of the valley. Second, the threat of attack from hostile northern Indian tribes was ever present, and the missions needed to be near the presidio and each other for mutual protection. The San Antonio missions form a viable example of what has been described as "missions of occupation." These were groups of missions which aided in the pacification of the frontier during Spain's northern expansion.

This religious and military complex formed a principal logistical center for the northern Spanish frontier and was a key element in political decisions concerning that frontier. In addition to their more political purposes, the missions served to educate the Indian in the Catholic religion and the Hispanic culture, producing useful citizens in an area where the manpower shortage was a major difficulty; moreover, they supplied the military with food and supplies that otherwise might not be available.

THE MISSIONS AND THE AMERICAN CATTLE INDUSTRY

Each mission had a ranch on which were raised the sheep, goats, and cattle that supplied the necessary animal products, such as meat, wool, milk, cheese, and leather. The entire cattle industry, from ranching to the driving of cattle across great distances to principal markets, was developed in Mexico during the two centuries prior to the establishment of San Antonio.. Spanish ranching as it was practiced in Texas formed the basis for the American cattle industry, and the mission herds were the source of the wild cattle which formed the basis for that industry.

AGRICULTURE AND COMMERCE

The missions brought a specialized method of agriculture using irrigated farmland to the San Antonio river valley. This system, extended by later settlers, formed the subsistence basis for the San Antonio economy for over a century. Portions of mission-built irrigation systems continue in use in San Antonio and other areas of Texas today. Necessary industries such as weaving, iron working, and carpentry established by the missions were of great importance to the maintenance of the entire military and political structure of the eastern portion of the frontier. Mission-trained artisans and workers were a principal source of labor and finished goods on the labor-hungry frontier, and the surplus produced by mission shops helped fill the need for goods in an area at the far end of a long and expensive supply line. The supply line itself was operated to a large extent by the missions and formed the basis for the development of similar supply systems by merchants.

CULTURE AND SOCIETY

The four missions as a group form a clearly defined region within which their influence has been dominant. The missions were dynamic societies which, once established, began a process of cultural change affecting not only the Indians placed in their charge, but also the fathers who administered the missions, the military establishment which protected them, and the Spanish colonists who competed with them for land and water and for the labor of the mission Indians. As this process of interaction continued, the physical structures of the missions were altered in response to the changing priorities of the mission community. As the Indians became Hispanicized and as Hispanics settled in the vicinity, the missions dominated the cultural development of their local area. Eventually the missions became, to one extent or another, centers of a distinctive culture blending Indian and Hispanic elements. Today each mission continues to be a center of this pastoral Hispanicized culture, the church in each instance serving as the local parish church.

The surviving structures and structural remains contain examples of architectural change from every period of the history of the missions. A wide range of sculptural and painted decoration is still extant, illustrating the development of these arts on the frontier. The San Antonio missions are among only a very few relatively intact examples of the colonial mission in the American Southwest and have been of great importance to general architectural studies of this period. Most of this record has yet to be studied in any detail.

HISTORICAL AND CULTURAL STUDIES POTENTIAL

The records of the mission period form a large reservoir of primary information about mission life, growth, and influence over the military and political currents of the Spanish frontier and of San Antonio and Texas in later years. Much of this material is virtually untouched and will be of great importance to future historical studies concerning the establishment of the San Antonio missions, their operation and management, their influence over the frontier, and their decline.

ARCHEOLOGICAL STUDIES POTENTIAL

Archeological resources within and around each mission are extensive and unique. The very limited archeological work carried out at the missions has already begun to cast new light on the historical record, resulting in the reinterpretation of earlier conclusions about the missions and their influence, change, and conversion to secular villages. The implications of this work in archeology and history are only just beginning to be recognized and will have a great impact on future historical and cultural studies of Texas and the Spanish frontier.

INTEGRITY

The district as a whole reflects a very high level of integrity. The missions stand today on their eighteenth century sites. Some retain elements of the colonial mission complex virtually unchanged within their surviving structures, while others have kept the details of their plan and siting intact. The community of each still survives, although in a greatly modified form. This community still looks to the mission church as a vital element in its social and religious life. All the missions echo their own version of the most significant factor associated with the district: the continuity of the life and spirit of the community from the eighteenth century to the present.

FEELING

The missions evoke distinctive feelings for visitor and local resident alike. For the parishioner, the mission complexes are as much a part of their daily lives as their homes, their families or their jobs; they are a part of the tradition and continuity of their lives. For the visitor from nearby places, the structures are surviving reminders of that mysterious and romantic part of their Texas past, the days of the Spanish Empire. For all who travel to them, the sense of age, of mass, of substance and permanence, of the presence of the past unchanged, is profoundly felt.

The archeological record at Concepción has been damaged by later construction and road work but a significant proportion of the remains of earlier mission construction survives. The first convento, the adobe church standing in 1745, the granary and associated workrooms, and the eastern, northern and western rows of Indian Quarters were found in recent excavations. In addition, archeology indicates that evidence of an earlier mission occupation of the area has been found just south of the walls of the square of Mission Concepción. This occupation could have been either the first site of Mission San José or the site of the short-lived mission San Xavier de Nájera. The record of the various early forms of Concepción is an invaluable archeological resource because much remains to be learned about the process of structural change undertaken by the missionaries. Such information would aid not only the study of missions within Texas but also across the entire American Southwest.

MISSION SAN JOSE

The most dominant characteristic of Mission San José is the sense of the space and containment within a mission complex. This is the result of the extensive restoration and reconstruction work carried out in the 1930's when the mission structures were rebuilt by the federal government. This reconstruction in itself constitutes a significant aspect of the district, being the outstanding example of conservation efforts carried out at the missions in that decade. It is also a notable example of the results of the social and economic programs developed to counter the effects of the Great Depression.

The surviving original portions of the church, convento, granary and mill preserve a great deal of architectural and technical information about the construction and use of these structures. The original parts of the church and sacristy preserve a rich selection of examples of the decorative arts, both of surface treatment and sculpture. The ornate facade of San José is one of the finest examples of carved mission stonework in the American Southwest.

Recent studies have shown that San José is an extraordinary example of the baroque style of architecture and decorative arts fashionable in Mexico in the second half of the eighteenth century. In fact, the quality of design and stone carving shows no provincialism in the use and execution of the style. The time of construction of Mission San José, 1768-1782, is contemporaneous with the height of the baroque in Mexico. According to some experts, no finer example of this decorative style is to be found outside the larger cities of Mexico.

Mission San José served as the headquarters of the Father President of the Zacatecan missions of Texas; and as such shares a number of similarities with Mission Concepción. The comparison of these similarities between the two missions reveals much about the relationship between structure and use as seen by the missionaries. Such insights are of critical importance to the understanding of the history and architecture of the colonial mission system.

Archeology at Mission San José has been rather limited, but what has been undertaken indicates that a large percentage of the archeological record is intact in the ground. San José's development is proving to be distinctly different from that of the Querétaran missions. This record constitutes a very important example for comparison and contrast with the structural and cultural histories of the other three missions within the district.

MISSION SAN JUAN

Perhaps the most significant contribution by San Juan to the district has been in the form of information arising out of the extensive archeological investigations. These field data, in conjunction with detailed historical records (such as the Inventory of 1772 with its many references to construction at the mission), have revealed far more about the process of development at San Juan than any other mission in Texas, if not on the entire colonial frontier.

In terms of architectural significance, the relieving arches visible on the east side of the church of San Juan are of great interest to architects and historians. When constructed sometime after 1772, the arches were open, but they were later filled in. It has been argued by some architects that these arches indicate that the present church of San Juan was originally built as an open chapel. This was a structural form used in Mexico in the 1500's and is distinct from a closed chapel in that only the area of the altar is enclosed and roofed. However, most historians and architects discount this possibility. The location of the main entrance on the side of the church rather than at one end is an arrangement differing from the other San Antonio mission churches and one somewhat rare among mission churches in general.

CONCLUSION The significance of the missions of San Antonio as discussed above is based on present knowledge. Several of the areas of significance are derived from very recent research. As intensive studies continue, further contributions and qualities of the missions not presently recognized will undoubtedly become apparent. The missions were not and are not simple institutions with limited influence, but a major force in the history of the American Southwest. This growing understanding of their importance in our national heritage is the principal reason for this nomination.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

See continuation sheet.

10 GEOGRAPHICAL DATA

See continuation sheet.

ACREAGE OF NOMINATED PROPERTY 475 acres

UTM REFERENCES

	ZONE	EASTING	NORTHING		ZONE	EASTING	NORTHING
A				B			
C				D			

VERBAL BOUNDARY DESCRIPTION

The boundaries for the National Register District are those shown on the Boundary Map, attached. These boundaries are identical to those for San Antonio Missions National Historical Park.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
Not applicable.			
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

See continuation sheet for names of other contributors.

NAME / TITLE
James E. Ivey and Marlys Bush Thurber, Principal Writers

DATE
February 20, 1983

ORGANIZATION
National Park Service, San Antonio Missions National Historical Park

STREET & NUMBER
727 E. Durango, Room A612

TELEPHONE
512/229-6000

CITY OR TOWN
San Antonio

STATE
Texas 78206

12 CERTIFICATION OF NOMINATION

STATE HISTORIC PRESERVATION OFFICER RECOMMENDATION

YES____ NO____ NONE____

STATE HISTORIC PRESERVATION OFFICER SIGNATURE

In compliance with Executive Order 11593, I hereby nominate this property to the National Register, certifying that the State Historic Preservation Officer has been allowed 90 days in which to present the nomination to the State Review Board and to evaluate its significance. The evaluated level of significance is ____National ____State ____Local.

FEDERAL REPRESENTATIVE SIGNATURE

TITLE DATE

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

DATE

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST: DATE

KEEPER OF THE NATIONAL REGISTER

GPO 899-214

APPENDIX B

APPENDIX B

Charles F. Gritzner provides an excellent synopsis of New Mexico mills construction and operation:

> Mills were built astride a small ditch (*acequia*) or trough into which water could be diverted from a nearby stream. No elaborate dam, millpond, or extensive system of canals was needed to provide adequate power. . . . The gradient of the ditch was of little significance. A sufficient velocity to power a mill was achieved by water rushing down a millrace directed beneath the structure at a sharp angle and descent . . . Water which had passed beneath the mill was diverted for irrigation, or channeled back into the stream. . . .
>
> The flow of water to the mill wheel was always controlled. Waterwheel, axle, and runner (upper millstone) were a fused unit. The millstone could not remain stationary while the waterwheel continued to rotate, as in mills with gear mechanisms and a clutch. Continued rotation when not in use would have caused the rapid deterioration of both stones. The flow was controlled by diversion at the ditch head or at some point along its course above the mill or, if the mill were on a ditch which was also used for irrigation, the water was diverted from the waterwheel itself. This diversion was accomplished by using a moveable sluice, or by securing a horizontal diversion board atop the mill wheel if the sluice itself was stationary [see Figures 1-41 and 1-42, page 1-40].
>
> Grain was fed from a suspended hopper into the "eye" of the upper stone, or "runner," which rotated upon a stationary lower stone, or "bed stone." The runner was fixed to a straight spindle or shaft whose lower extremity was connected to the waterwheel. There was no intermediate gear mechanism; the runner and waterwheel rotated at the same speed, which was determined by the volume and velocity of water permitted to play upon the stones' interface. The weight of the entire shaft was supported by a single-point bearing at its base.
>
> Waterwheels varied in dimension, although they were remarkably similar in design. The nine wheels found intact ranged in diameter from thirty-two to forty inches and in width from five to eight inches. Hubs were made from modified wagon wheels, with wooden paddles, or flat flanges, placed at a slight angle in order to present a nearly perpendicular face to the flow of water from the sluice. a outer rim of wood secured the extreme end of the paddles. In all instances the sluice was directed to rotate the waterwheel and millstone in a counterclockwise direction.
>
> Millstones were hewn from abrasive rocks of volcanic origin which were available in most communities. They were cut by individual mill owners; their cutting ["dressing"] appears to be a lost skill. . . . The average diameter of millstones was approximately thirty inches, with extremes of twenty-three and forth inches. Top stones, or runners, varied from three to five inches at the

center and tapered to a thickness of two to three inches at the rim. Bedstones were of the same diameter, flat in cross-section, and considerably thicker than runners, with extremes of six and twelve inches. The life of a millstone varied from "several years" under heavy use and "unskilled operation," to "a lifetime." Runners wore out faster than bedstones. Their useful life was determined by the quality of the rock, the amount of use, and the skill of the miller. All stones required frequent "sharpening," or regrooving because abrasion "burned" or shallowed the vital grooves. These grooves permitted the free flow of meal across the bottom stone to its periphery, where it fell into a collecting bin."[1]

Other early descriptions of New Mexican gristmills include: the 1847 report of J. W. Abert in Manzano (Torrance County). This particular mill was a horizontal water wheel mill, two mill-stones without an enclosing "vat" or case, with overhanging ox-hide hopper, and wooden "damsel" which rested on the upper stone and was connected to the hopper. Secondly, horizontal water wheel mills were observed and described in 1855 near Peña Blanca, Sandoval County, and in 1881 near Santa Cruz, Santa Fe County.

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[1]Charles F. Gritzner, *Hispano Gristmills in New Mexico*, Annals of the Association of American Geographers, Vol. 64, No. 4, December 1974, 517-18.

APPENDIX C

APPENDIX C

UNKNOWN FACTS

ABOUT TECHNICAL HISTORY

IN SAN ANTONIO

by

Paul L. Czibesz, Dr.

SOUTHWEST RESEARCH INSTITUTE

MANUSCRIPT

San Antonio June 1955

UNKNOWN FACTS ABOUT TECHNICAL HISTORY IN SAN ANTONIO

In the ancient culture center of San Antonio it is well known that the earliest traces of organized cultural life are the remains of the Catholic Missions. Especially, the San José Mission is pointed out as the most remarkable; and truly, it is remarkable. One would be amazed if he could see what had been done in order to raise the native Indians from their primitive pagan life to the level of cultured, prosperous, well- organized community life.

No one has observed the most amazing fact: the unique document of technical history buried within the stone walls of San José. People walk around the grounds, giving just a cursory glance at the mill. They might wonder while reading the records shown on a plaque on the inside wall of the mill, but that is all. Even technically educated people - engineers - when questioned about the mill answer shortly, "What's so interesting about it? It's just an old water-driven stone mill, nothing more." They have looked but have not seen. Nobody before recognized the spark of technical genius incorporated in the humble, wooden waterwheel of the mill. The Lord gave me the gift, opening my eyes on a Sunday afternoon, when I visited the Mission. The hydraulic machinery of the San José Mission mill is living proof that the impulse-turbine was invented a long time before Pelton had published his invention.

The waterwheel of this ancient mill is not an ordinary waterwheel. It is really a turbine runner. Waterwheels work on gravity force or they use the velocity head of the water flow. The turbine wheel of the San José mill utilizes, obviously, the impulse energy. We know that if a fluid jet is deflected from its axis, a force is brought about. (Figure 1)

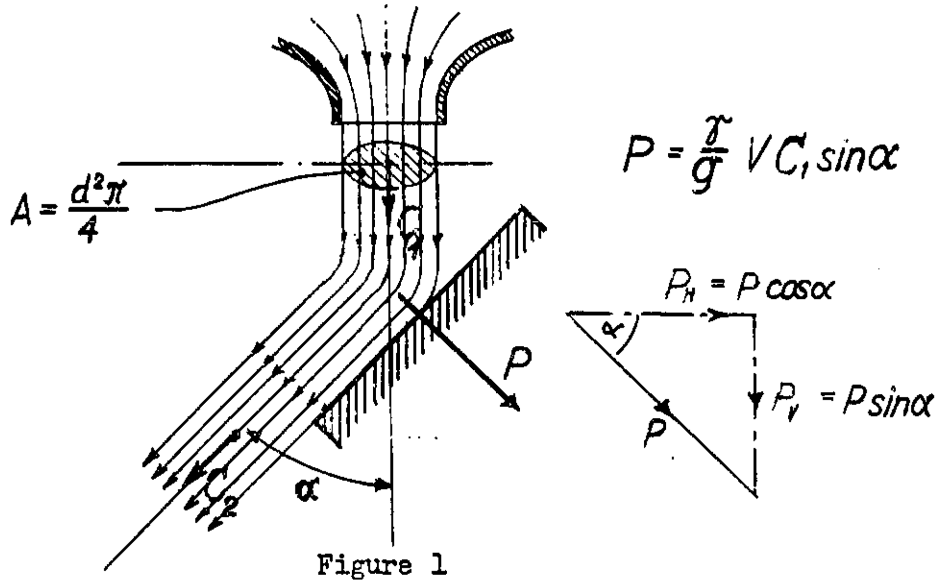


Figure 1

The velocity, C_1, is not very different from C_2. C_2, the outlet velocity, is only less than C_1 by a considerably small part, due to different losses (impact, friction, etc.). The flow rate of the jet, $V = C_1 \times A$, where A is the cross section of the jet. The runner of the Mission mill has the blades, unconventionally, in radial assembly and these blades have an angle of 45° in respect to the wheel axis. (Figure 2)

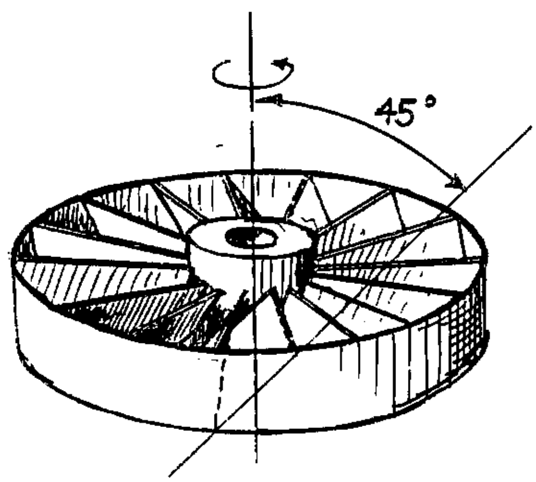


Figure 2

The water jet is led through a square-section wooden nozzle at an angle of approximately 60° in reference to the perpendicular. Therefore, the impact angle of blade and jet is (Figure 3)

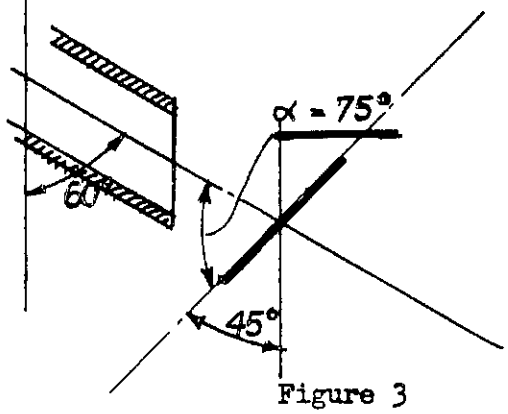
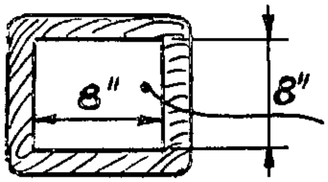


Figure 3

The cross-sectional area of the jet nozzle is:



$$A = 8 \times 8 = 64 \text{ sqin} = \frac{64}{144} = .45 \text{ sqft.}$$

The static head of the system can be set by fair estimates at a maximum of 10 feet and, assuming first the theoretical formula of Toricelli, the jet nozzle velocity can be set for:

$$C_1 = \sqrt{2gH} = \sqrt{2 \times 32.2 \times 10} =$$
$$= \sqrt{644} = 25.5 \text{ ft/sec}$$

Considering the losses due to the primitive structure, including the contraction, the true nozzle velocity can be set at:

$$C_{1_{eff}} = \zeta \times C_1 = .78 \times 25.5 \cong 20 \text{ ft/sec} \quad *$$

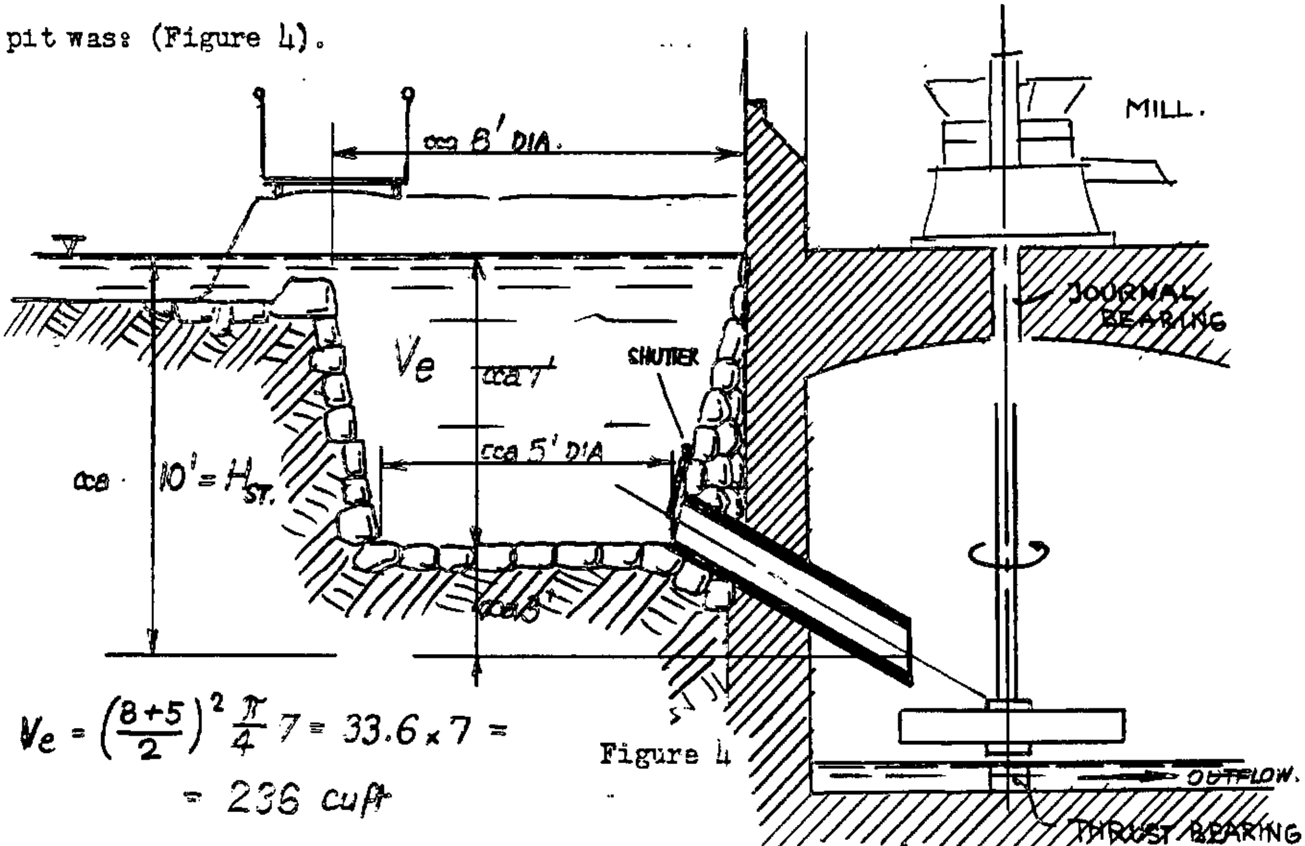
With these data, the volume rate can be determined.

$$V = C_{1_{eff}} \times A = 20 \times .45 = \underline{9 \text{ cuft/sec}}$$

---

* Estimated value for $\zeta = .78$

This amount was, probably, the inflow from the gravitational aqueduct. This is substantiated by the layout of the water supply system. And, here again, we can see the originality of the designer who planned the whole outfit. The water supply, in the ditch, is not directly connected to the penstock, but there is an equalizer vat, in order to stabilize the static head. From the dimensions of this equalizer vat, we can estimate that the volume in the pit was: (Figure 4).



$$V_e = \left(\frac{8+5}{2}\right)^2 \frac{\pi}{4} 7 = 33.6 \times 7 =$$
$$= 236 \text{ cuft}$$

Figure 4

In reference to the rate of flow $\vartheta = \frac{9}{236} = .04 = \frac{1}{25}$ the ripple coefficient.

The uniformity of the static head was assured within the tolerance of $\pm$ 4%: This would insure an amazingly uniform revolution speed of the machinery. It is emphasized in ancient records that the quality of the flour produced by this mill was excellent. Here is the answer: Despite the raw structure of the millstones, the constant RPM brought about a homogeneous product. The more we analyze this ancient design, the better we can recognize the originality of the unfortunately unknown Franciscan monk who made it. The absolute coordination of every detail shows that the design was not a matter of gambling or unconscious play. It was a perfect development.

Texas, at the time of the Padres, could not have been richer in waters than it is now. This has been proved by geology. The waters which were available to drive the mill were scarce; also, the geographical pattern of the site had not allowed such a static head which would give, despite the small rate of flow, considerable power with an overshot wheel. The remains of similar waterwheels in Catalonia, Spain, show, usually, diameters of 40 to 60 feet. Because of the small rate of flow, an undershot wheel would also be omitted. And, last but not least, the simplicity of a direct shaft drive would give the direction to the wheel-mill layout, as it is. The design shows a definite tendency to assure the uppermost mechanical efficiency with the given conditions. The fluid mechanics of the system are also amazingly perfect. We have no record of the year of construction, but from the inspection records of the Mission in 1752 it is obvious that the mill was already in operation. The coincidence of the following chronological dates is interesting. The mill was built somewhere between 1736 and 1752. Bernoulli published his epochal "Hydrodynamica" in Strassburg in 1738. It is not impossible that a young Franciscan friar studied this book before he sailed from Spain as a missioner to Texas. And it is almost impossible to believe that the hydraulics of this mill could have been the result of a series of luckily accidental thoughts. It is easier to believe that the designer, the Franciscan monk, had used the classic Bernoulli formula

$$Z + \frac{p}{\gamma} + \frac{C^2}{2g} = CONST.$$

It might have been that this ancient engineering genius developed, by himself, the train of ideas which led him to the formulas of impulse turbine.

The small rate of flow forcibly involved the use of partial action. The RPM was possibly 40 to 60, due to the characteristics of the directly driven millstones. Roughly calculating, the available total hydraulic horsepower could be

$$N_{MAX} = \frac{V.\gamma.H}{550} = \frac{9 \times 62.4 \times 10}{550} = 10.25 \text{ HP.}$$

The hydraulic efficiency of the runner can be fairly estimated as

$$\eta_h = .40\% = .4$$

Then the horsepower available on the wheel shaft could be

$$N_1 = \eta_h \times N_{MAX} = .4 \times 10.25 = 4.1 \text{ HP}$$

and also estimating the mechanical efficiency of the thrust bearing and journal bearing of the machinery (Figure 4), which because the allowable wooden structure and water lubrication was as low as

$$\eta_m = 35 \sim 45\%$$

the mill was supplied with the net energy of

$$N_{eff} = .35 \times 4.1 \sim .45 \times 4.1 = 1.4 \sim 1.6 \text{ HP}$$

This energy amount sounds reasonable, considering the dimensions of the millstones, (2-1/2 ft. diameter), and the low RPM. With a conventional waterwheel, where we should consider a maximum hydraulic efficiency of 20% and a gear transmission (with wooden notches, of course) having a mechanical efficiency of 25% maximum, the useful HP would be only

$$N'_{eff} = .25 \times .2 \times 10.25 = .51 \ HP$$

which would not be enough to drive the mill. The originality of the late designer made it possible to exploit the natural energy source of hydraulic power to the top of the possibility of that time.

The old mill remains there and even if no more water flows through her channels and the stones ~~lay~~ lie dead instead of grinding the seeds of corn or whear, - the blessings of the Lord - she speaks. The old mill tells a story of lonely hours of thinking; a story of careful planning, of hard and long-lasting work. She is the call of human invention spirit; the witness of a true inventor's mind, which always seeks to build and to produce. The weapons which destroyed this ancient technical monument have vanished. The mill was demolished; however, even under a heap of ruins she had remained to show us the pioneer spirit of her designer and builder.

Paul L. Czibere

This previous report was set up based on data taken roughly by inadequate or estimated measurements and the most primitive of instruments. It is intended by the author to carry on an exact survey and full analysis at a 'ater date.

APPENDIX D

Old Mill of San Jose Mission

By HARVEY P. SMITH, A. I. A.

PROBABLY the most interesting of all the unusual "finds" during the research and restoration work of San Jose Mission in San Antonio was the underground portions of the reservoir and old mill in which the padres ground their corn into meal. Since this formed the main portion of their food, this find represents the most important part of the entire mission.

When the work was begun on the mission restoration, no one of us had any knowledge that the old mill ever existed. We were having workmen clean out the old irrigation ditch that runs along the north wall of the mission, known as Acequia Madre, when we ran into some masonry work which led off on the north side of the ditch. Following along the sides of the masonry wall, we discovered a circular reservoir and excavating the dirt from within the circular wall, we disclosed the lower three-quarters of an egg-shaped basin entirely plastered. Down in the bottom, we tapped on some loose stones, which were removed, thus disclosing to view a recess through the wall into an underground chamber. At first we thought this was the legendary tunnel so often mentioned as having led from the mission to a secluded spot somewhere outside the mission walls so that the padres could escape in the event of an attack by hostile Indians. However, we have followed up many clues which we were told would positively uncover the tunnel, but we have not as yet located it.

This underground chamber proved to be merely the room in which the turbine or paddle wheel of the mill was located, the center of the turbine being a shaft straight up through an opening in a stone (which still exists) to the grinding stones above. The water was let in from the irrigation ditch until the reservoir was filled. A small flue directed the water from the bottom of the reservoir through the wall of the underground chamber directly against the paddle wheel. The force of about a ten or twelve foot head of water was sufficient to turn the turbine, which, in turn, rotated the mill stones above. After excavating the lower chamber, which was approximately 7 ft. x 13 ft. x 8 ft. 6 in.. high with a vaulted stone ceiling, we disclosed a set of flagstone steps leading down to this chamber from the opposite end. We then followed the foundation walls around the mill room above until we knew the exact size of it, so we were able to reconstruct on paper almost exactly how the old mill must have looked when it was in operation.

We were able to gain a good deal of information for these reconstruction drawings from Mr. Ernst Schuhardt of the Pioneer Flour Mills here, who found for us in an old mill book a replica of a very similar mill of about this same period. This showed the operation of the mill completely, and, with Mr. Schuhardt's knowledge of mill operations, we were able to make the restoration drawings, which we now have on file ready for the restoration work. Mr. Schuhardt has also made a little working model of this old mill with its reservoir which he actually operates by running water. One of the best pieces of information about the mill we were able to obtain in our research work was that written on page 95 of "The Daughter of Tehuan," written by one of the old padres (of the Benedictine order) who lived at the mission in 1859 when the Benedictines came down here just prior to the Civil War in order to rehabilitate and operate the old mission. The mill was probably still in operation at that time, and his description of it and how it operated gave us proof of the fact that this was the old mill which was used by the early padres to grind their corn. When we were surveying all of the irrigation ditches connected with the five missions around San Antonio, we ran against old mill stones, which while they did not belong to this particular mill, were used in one of the early mills near here and happened to be the exact size (28 inches in diameter) which Mr.

(*Continued on page 13*)

OLD MILL

(*Continued from page 12*)

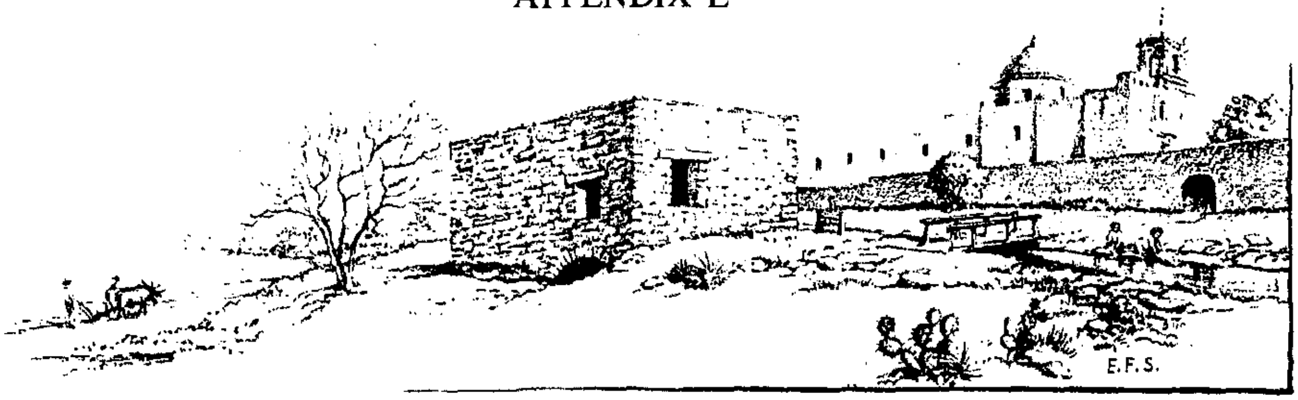
Schuhardt said was the size which this mill used. We have those mill stones now at the mission ready to place when we start the restoration work.

It is my fondest hope and desire that we will be able to reconstruct this mill exactly as it was originally, even to the operation of the turbine, shaft, millstones, hopper, water gate, etc. Then, if we are able, to reconstruct the old wing dam on the river, which diverted the water from the river to the irrigation ditch which leads down to this mill. It would be a very interesting and fascinating sight to watch the water from the Acequia Madre actually operate this old mill just as it was operated by the padres and the peaceful mission Indians two hundred years ago.

PLAZA HOTELS
ETTA MARTIN, *Editor and Publisher*
JACK WHITE, Operator
"PLAZA PARADE"
Sep. 1935

APPENDIX E

APPENDIX E



SAN JOSE MILL

by ERNST SCHUCHARD

ILLUSTRATED BY THE AUTHOR

WHEN Mission San Jose was in its prime the place was like a village. It had its church and monastery, its houses for the Indians and soldiers' barracks. There were irrigated fields and orchards, large herds of cattle and everything that was needed to make it self-supporting. Mission San Jose had its own mill for grinding corn and this was the first mill built in Texas. The mill may seem small and very crude compared to our present standards, but the output was more than enough for all the needs of this active community.

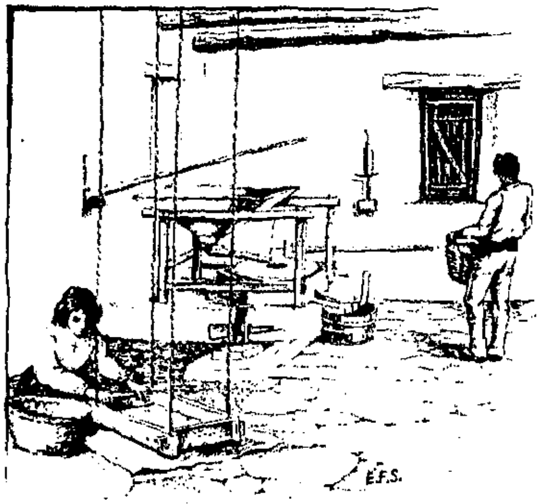
San Jose Mission stands on a ridge above a big prairie that stretches north and east from there to the San Antonio river. On the edge of this ridge next to the main irrigation canal, which was called Acequia Madre, is the old mill. It was so placed that the water from the canal could be used for power to drive the mill before allowing it to flow on to the fields and orchards for irrigating.

Two centuries ago the mill functioned daily under the guidance of the Franciscan Fathers. One day, however, the water ceased to flow in the ditches and the Franciscans suspected that the Indians had again damaged the canal and cut off the water supply. There was still some water in the reservoir of the mill, but this would not last long and the Padres knew that they must soon go out and repair the damages. A group of workers was organized, but as they started out of the mission enclosure, arrows came whizzing among them; they knew it was the Indians. The arrows came from the windows of the mill, an excellent place for the attackers. Before the Padres could do anything the Indians had opened the reservoir and let out all of the water, the deep ditch which had carried the water off to the fields was being used as an entrenchment. The Indians firmly held their position in the mill and were within a few paces of the church wall. Heavy fighting ensued, finally the Padres and their soldiers had to resort to a cannon in order to rout out the enemy. They bombarded the mill, destroying the upper part of the building.

This incident is found in an old novel "The Daughter of Tehuan." The book also contains some interesting descriptions of the mill. It was written by Father Alto Hoermann, a Benedictine Monk, who come to Texas just prior to the Civil War, to restore Mission San Jose and rehabilitate it. At that time the old mill must have still been uncovered, for his descriptions and measurements of it were very accurate, in fact were a great help in restoring the mill later.

One of the main things causing the final abandonment of the mill was the fact that the missions of Texas were secularized by the Mexican Government in 1792 and the lands around the missions were divided among the converts and dependents living there. With no strong organization to attend to the necessary repairs on the canal, the dam and the ditches, the great irrigation system went to pieces. After years of neglect the canal and ditches were hardly to be recognized, the mill was covered with earth and rubbish and all was forgotten.

It was not until 1933 when the San Antonio Conservation Society started reconstruction work at Mission San Jose that this interesting structure came to light again. In order to restore part of the old irrigation system, that they knew was there, workmen were cleaning out the main canal, which ran along the north side just outside of the quadrangle wall. Masonry work was discovered on the side of this canal. By digging further along the edge of this masonry work a large conical pit was uncovered. After removing the dirt it was found that the entire pit or reservoir was lined with stone and was well plastered except for a hole in one side. This proved to be an opening leading into an underground vaulted tunnel and everyone thought that at last one of the legendary tunnels, so often mentioned as having led from one mission to another, had been discovered. But after a little more excavating the vaulted ceiling of this cellar ended and the idea of the lost tunnel had to be given up. The underground construction was a small chamber very solidly built of tufa



stone, the same kind of stone the mission church is built of, and had a floor made of well-laid flagstones. Just outside of this vaulted chamber a deep ditch was uncovered leading out into the prairie where the fields had been. Above the vault were found low walls and foundations indicating that a large room had been there. These findings remained a mystery for quite a while until the descriptions and measurements in the Benedictine Father's story and pictures in milling histories were studied more closely in respect to this old construction.

The underground chamber proved to be a room in which a turbine or paddle wheel had been. A hole in the ceiling showed exactly where the shaft of this turbine passed through to the grinding stones above. Grooves in the side walls showed where the tram rods had been and in the back wall was an opening for the flume, which directed the water from the conical pit onto the turbine blades.

This type of mill is known as a "Roulet Volant" or "Norse Mill," the distinguishing feature is a horizontally revolving water wheel with a vertical shaft on which a grinding stone is mounted directly, thus doing away with any gear or intermediate mechanism. It is one of the simplest types of mills known. The name "Norse Mill" is really a misnomer, for these mills are not confined to that country alone, they were used in many countries and are still found in places where the population is slightly touched by civilization. This type of mill was used in Rome in the days of Pliny. It was seen in the Holy Land in 1668. It was used in Arabia, Wales, Ireland, France, Norway, Spain and America. The construction varies somewhat in different countries depending upon the materials at hand and conditions of the land, naturally. The design of the mill at San Jose comes from Spain and was brought into Texas through Mexico.

Near the City of Mexico on an old hacienda called "Molino de Flores" there is a mill identical to ours except that it is a tandem having two pits and two turbine chambers. One or two of the missions of California had similar mills. Helen Hunt Jackson in "Glimpses of California" describes a mill that she had seen at Mission San Antonio de Padua California previous to 1883.

The mill at San Jose is of interest not only as an ancient mill but it gives a clearer picture of the varied activities and life at the mission. It also shows the extensive building and careful planning of the whole establishment by the Franciscan Fathers who directed this work.

The water for driving the turbine of the mill was taken into the main canal from the San Antonio river at a dam located two miles above the mission just a little above where now the Riverside Golf Course is. According to ancient records it supplied water for 1500 irrigated acres and had a flow of water almost like a river. Water for the mill was taken from the canal through a sluice gate into the big conical pit. From the bottom of this pit a flume directed the water on to the turbine blades. The water struck the blades with a force of about a 12 foot fall, giving ample power.

For grinding, the corn was put into a hopper above the stones and was automatically fed through the center of the stone to the grinding surface. The adjustment for grinding or tramming as it is called, was done by wedges on a tram rod which raised or lowered the upper revolving stone. The lower stone never turned, it being permanently fixed on a foundation. The ground meal was discharged at the outer edge of the stones and was collected in a wooden casing that surrounded the stones. Hand operated sieves were all that was used to sift the meal and take out some of the very coarse particles.

The reconstructed mill as you see it today is the result of four years of research and effort of the San Antonio Conservation Society with the help of the Pioneer Flour Mills and the Society of the Colonial Dames of America and should be of interest to every Texan.

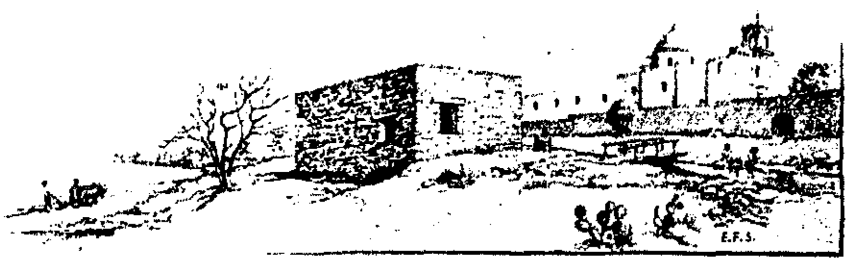
Tourists in San Antonio, to whom the missions are of great interest, now have the opportunity of seeing the old mill at San Jose. Not only the mill, but the whole mission has been restored to such an extent that the visitors can better appreciate the purpose, the plans and activities there, in the days of the Padres and the Indians.

APPENDIX F

PUBLISHED BY THE WHEAT FLOUR INSTITUTE • 309 WEST JACKSON BLVD., CHICAGO

FOOD FACTS

APRIL • 1940

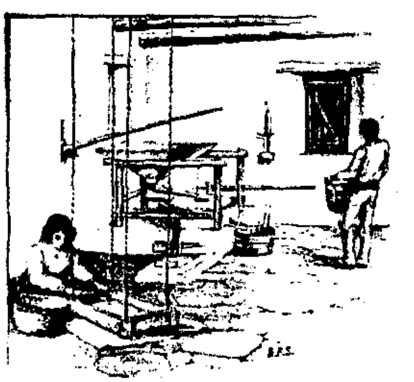


THE MILL AT SAN JOSE MISSION

First Texas Mill Illustrates Mission Life

By ERNST SCHUCHARD*

LIFE in the early Spanish missions is illustrated in the reconstructed San Jose Mission mill near San Antonio. This reconstruction program was started in



1933. As excavation work proceeded, masonry of the reservoir and mill were discovered, and after consulting old records it was possible to restore them.

The mission proper stands on a ridge above a prairie. On the edge of this ridge is the old mill, next to the main irrigation canal called "Acequia Madre" ("Mother Canal"). It was so placed that water from the canal could be used for power before flowing on to fields and orchards through an irrigating system.

The reservoir is a conical pit, lined with stone and plastered. A flume in one side leads to an underground vaulted room of tufa stone, with flagstone floor. Here a horizontal water wheel has a shaft fastened to the grinding stone in a room above. Outside the lower chamber a ditch leads out into the prairie.

Water was taken into the main canal from the San Antonio River at a dam two miles above the mission. The canal supplied water for 1,500 irrigated acres. Water for the mill was taken from the canal through a sluice gate into the reservoir, and from the pit bottom the flume directed water onto the wheel, striking the blades with a force of about a 12-foot fall, and giving ample power.

Corn was put into a hopper above the stones and fed automatically through the center of the stone to the grinding surface. Adjustment for grinding was made by wedges on a tram rod which raised or lowered the upper revolving stone. The lower stone never turned, it being fixed on a foundation. Ground meal was discharged at the outer edge of the stones, where it was collected in a wooden casing. A hand-operated sieve was used to sift the meal.

Two centuries ago this mill functioned daily under the guidance of Franciscan fathers. When the mission was in its prime, the place was like a village, a self-supporting community. It had its church, monastery, houses for Indians, soldiers' barracks. In addition to irrigated fields and orchards, large herds of cattle were kept. Although today the mill may seem crude and small, its output was ample for all the inhabitants.

This type of mill is known as a "Roulet Voland" or "Norse Mill." Its distinguishing feature is the horizontally revolving water wheel with vertical shaft on which the grinding stone is mounted directly, thus doing away with any gear or intermediate mechanism. It is one of the simplest types of mills.

**Pioneer Flour Mills, San Antonio, of which Mr. Erhard R. Guenther is president and Mr. Schuchard secretary, sponsored reconstruction of this old mill, in cooperation with San Antonio's Conservation Society and Colonial Dames of America. Sketches are by Mr. Schuchard.*

"A LOAF OF BREAD . . ."

(Continued from page 1)

Paklava, made of layer upon layer of pastry, each layer so thin that it seems thinner than thinnest tissue, put together with layers of cracked walnuts, is served with honey sirup. This dessert, rich and delicate and quite ambrosial, is a favorite with Rudy Vallee, according to Mr. Mardikian.

There seems no end to the tempting, unusual dishes that are to be had at Omar Khayyam's. Here one makes an evening of dining and being welcome guest.

"Wheat in all its forms, from cracked grain to fine white flour, has always been an important part of the Armenian dietary," says Mr. Mardikian. "As for Lavash, Peda and Bertouj, three fundamental and important items in an Armenian's life, Armenians eat more bread than any other people I know of. Their meals call for bread." And, we add, Mr. Mardikian is keeping alive the tradition of good Armenian breads and Armenian cookery, for a meal at Omar Khayyam's is an Experience.

APPENDIX G

Test at San Jose Sep 17 1939

Pull on spring balance is 16 lbs at edge of stone 14 inches from Center.

Pull on spring balance is 8 lbs at edge of paddle wheel 30 inches from center.

I pulled wheel 10 rev in $\frac{1}{2}$ minutes. Good speed would be about 40 R.P.M.

$$H.P. = 16 \times \frac{28}{12} \frac{\times \pi \times 40}{33000} = \frac{4480}{33000} = .13 \ H.P.$$

$$H.P. = \frac{8 \times 5 \times \pi \times 40}{33000} = \frac{4068}{33000} = .12 \ H.P.$$

---

9 ft effective head = 24 ft per per sec and 73.5 cubic feet of water per min to develope 1 h.P. 80% eff.

$$R.P.M. \text{ of } 5 \text{ ft wheel} = \frac{24 \times 60}{5 \times \pi} = 91$$

$$H.P = \frac{Q \times 62 \times H}{33000 \times eff} \qquad Q = \frac{H.P. \times 33000 \times eff}{62 \times H} = \frac{.2 \times 33000 \times .6}{62 \times 9}$$

$$Q = \text{number of cubic feet per min} = \frac{3960}{558} = 7 \text{ cu ft per min}$$

$$1 \text{ h.P.} = 73.5 \text{ cu ft per per min} \quad .2 = .2 \times 73.5 = 14.70 \text{ cu ft per min}$$

H = head of water = 12 ft

V = Vel of water ft per sec = $\sqrt{2g} = \sqrt{2 \times 32.1 \times 9}$ = 24 ft per sec

Feet per min = 60 X 24 = 1440 ft per min.

Circ of 5 ft wheel = 3.14 X 5 = 15.70 ft

Rev per min = $\frac{1440}{15.7}$ = 90 R.P.M. 50% eff = 45 R.P.M.

$H.P = \frac{Q'H'}{706}$ $Q' = C\sqrt{2gh} \times a = .6\sqrt{2 \times 32 \times 9}\,a = .6\sqrt{577} \times a$

$.2 = \frac{9Q \times 60}{706}$ $Q = \frac{.2 \times 706}{9}$ 15.7 cu ft water per min 73.5 X .2 = 15.7 cu ft per min

15.7 ÷ 60 = .26 cu ft per sec

$.26 = .6\sqrt{577}\,a = \frac{.26}{.6} = \sqrt{577}\,a = .43 = 24\,a = a = \frac{.43}{24}$

a = area sq feet = $\frac{.43}{24}$ = .02 sq ft = 2.8 sq in

Q = cubic feet of water per sec C = coeff = .6

$2g$ = 2 X 32.1 H = head in feet center of hole to level of water = 9 ft

a = area in square feet.

Pressure = 10 lbs Wt of water = 62 lbs per cu ft

Column 1 sq in x 1 ft high = $\frac{62}{144}$ lbs. 9 ft high column = $\frac{9 \times 62}{144}$ = 3.8 lbs.

8 lbs requires $\frac{8}{3.8}$ = 2.2 sq in.

area of 2 inch pipe = 3.14 sq ins / $2\frac{1}{2}$" pipe = 4.9 / 3" pipe = 7.0

Clark says average net work for 8 hrs = 1/10 H.P. for a man.

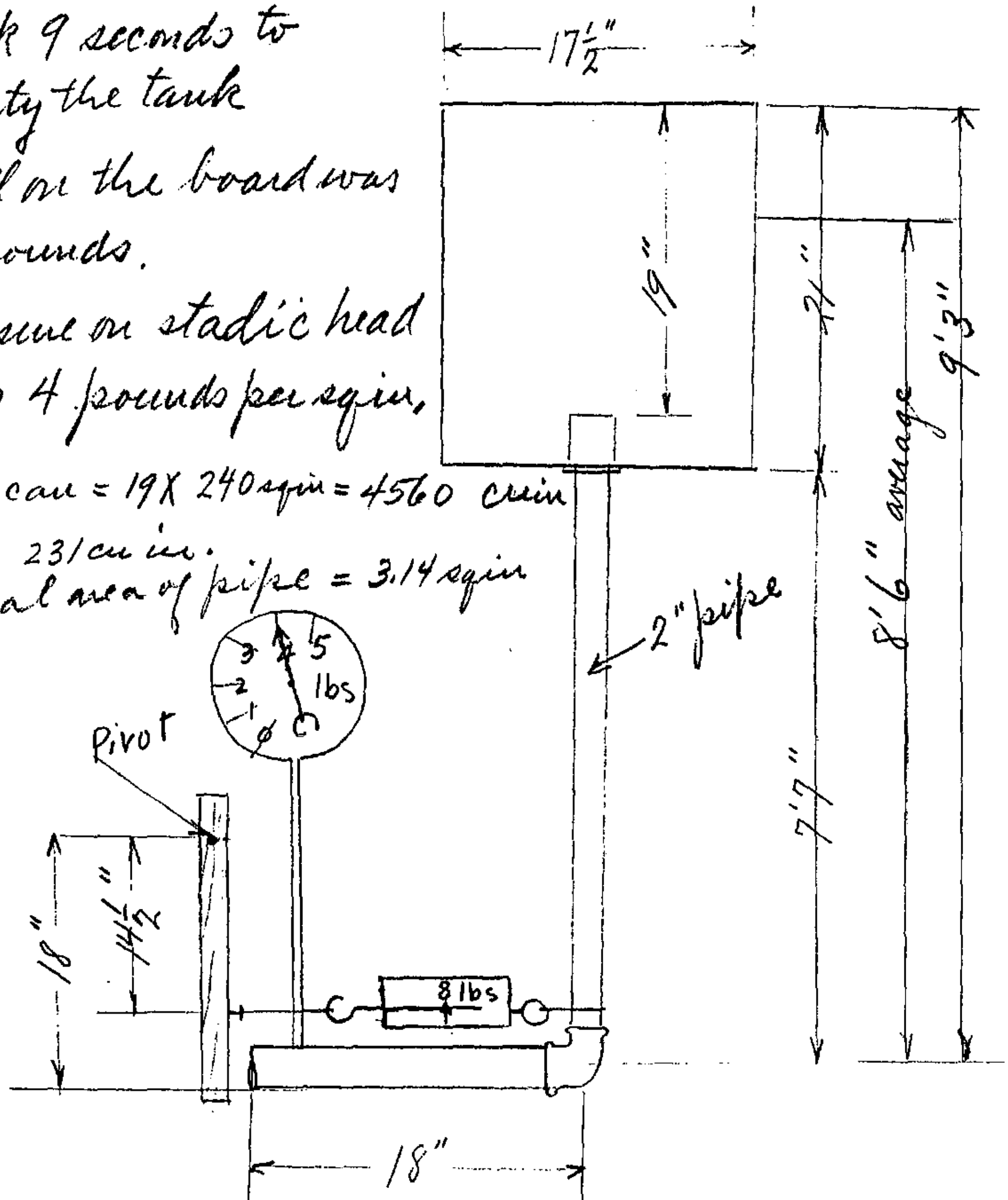
Pioneer Flour Mills

Tests made Sep 25 1939 by E.F.S.

Took 9 seconds to empty the tank

Pull on the board was 8 pounds.

Pressure on stadic head was 4 pounds per sq in.



Vol of can = 19 X 240 sq in = 4560 cu in

1 gal = 231 cu in.

actual area of pipe = 3.14 sq in

$\frac{4560}{231}$ = 19.7 gal per 9 sec = $\frac{19.7}{9}$ = 2.2 gal per sec.

Cu ft per min = $\frac{4560 \times 60}{1728 \times 9}$ = 17.6 cu ft per min

The same spring balance pulled the water wheel at 8 lbs when attached to the rim of the 5 foot wheel.

Velocity of water in ft per sec and the Cubic feet of water per min. to develop 1 one horsepower at 80 % efficient.

Head = 10 ft Velocity = 25.36 Cuft = 66.17

Head	Vel.	Cuft.	
8	22.6	82.7	
9	24.0	73.5	
10	25.3	66.1	
11	26.6	60.1	
12	27.7	55.1	

Cubic feet water discharged per min by an orifice 1 sq in under Head

Head	Cubic Feet
8	1.75
9	1.85
10	1.94
11	2.03
12	2.12

3.14 sq in
1.8
2512
314
5.652

H.P. = number cu. ft. of water per min multiplied by 62 1/8 multiplied by head in feet and divided by 33.000 x efficiency.

Loss of head in 100 ft of pipe = $\left(\frac{1}{2}\text{ Vel}\right)^2$ divided by diam of pipe in inches

Weight of water = $62\frac{1}{8}$ lbs per cuft. = 1728 in or $7\frac{1}{2}$ gal.

pressure in lbs per squ, multiply the head by .434.

Yield = 80 - 100 bu per day
Horse power = 6-8 low grinding
Rev per minute to give periphery 26 to 30 ft per sec.

4' diameter at 100 R.P.M. stone speed

$17\frac{1}{2}$ in diameter X 20 inches high can took 9 seconds to empty through a 2 inch pipe at a head of $8\frac{1}{2}$ feet.

240 sq in X 20 in = 4800 cu in. 1 gal = 231 cu in

gallons per minute = $\frac{4800}{231} \times \frac{1}{9} \times 60 = 139$

Gal. per hr = 139 x 60 = 8140

Goulds Centrifugal pumps 2" opening

R.P.M = 1750 H.P. = 1 15 ft head = 100 Gal per min

Alamo centrifugal pumps.

Discharge	Gal per Min	H.P. at 15 ft		
2"	75	15 X .038 = .57 H.P		
$2\frac{1}{2}$	125	15 X .064 = .96 H.P.		
3"	185	15 X .094 = 1.4 H.P.		
$2\frac{1}{2} \times 2\frac{1}{2}$	150	2 H.P.	20 ft.	1750 R.P.M.
3 X 3	200	$1\frac{1}{2}$ H.P	15 ft	860 R.P.M.

APPENDIX H

APPENDIX H

COLEGIO DE ZACATECAS MICROFILM, ROLL I
(Transcription)

N.D. State of the Missions. Frame 0846-0849

Exmo. Sor.

El adjunto Plan instruirá á V.E. [crossed out] de las misiones que estan a cargo de este Colegio, Provincias de su situacion nombres de los Religiosos q.[e] las ocupan, Sinodos, que gozan que todos son de Real Hacienda, y numero de Almas que las reintegran de que como me pensiera [?] V.E. le informe en oficio de 23 de Sept.[e] en este hare presente á V.E. el estado en que se hallan en lo espiritual y temporal, el comercio, siembras, é industria de que viven los yndios de ellas y las que se trata de secularizar que todo los havia es á la forma siguiente.

Es constante el afan, y fatigas de los Misioneros de su principal ministerio para con los Yndios que por lo tocante á lo Espiritual cada dia se ven lograda los frutos de su trabajo a las Misiones de ambas Provincias donde se hallan los yndios tan instruidos en los Misterios de Religion, que hacen ventaja respectivam.[te] á muchos Christianos viejos de estos Reynos, sabiendo, y entendiendo mejor la Doctrina xtiana, que muchos de estos. Asisten diariam.[te] al rezo de las oraciones la Doctrina Xtiana que se les enseña en las yglesias, y quando por la distancia de sus pueblos, como sucede en la Taraumara, no puede estar presente el Ministro á dho. Reso, y Explicacion, vienen dado corte para que no falte este socorro, visitando continuam.[te] sus Pueblos quanto lo permite la fragosirad[?] de la tierra, y copiosos Rios de que abunda. En las misiones de Texas, y aun algunas de Taraum.[a] no faltan Yndios devotos que como los mejores Catolicos, asisten diariam.[te] á la Misa, rezan el Rosario, y Frecuentan Sacramentos. Bien que esto no es tan general que no haya como en todas partes, Yndios duros ignorantes, y mal aficionados á cosas de la Religion. Los hay efectivamente en las Misiones de ambas Provincias con quienes es doble el trabajo del Ministro, y mas necesario su rezon. Muchas veces es menester valerse de los Justicias de los Pueblos para obligar á los tales á que asistan á la Doctrina, y vayan á la Yglesia á oir Misa cuyo defecto es mas frecuente desde que los Ministros estan sin autoridad para castigar á los rebeldes, y la tienen solos los Gobernadores, y Alcaldes de los Pueblos, que por lo comun son lo mismo que ellos.

Por lo que toca á lo temporal de las Misiones debe hacerse diferencia entre las de Taraumara que estan en la Prov.[a] de la N. Vizcaya, y las de Texas que estan en la Prov.[a] de este nombre es el obispado de N. Reyno de Leon, porque en ambas hay distinto manejo desde sus fundaciones. En la Taraum.[a] no hay duda que desde que la recibio este Colegio q.[e] fue el año de 67 hasta el presente han tenido [crossed out] notable asimento, habiendose reparado por los Ministros muchas Yglesias, construidora otras adornadora la mas, y surtidora de [fr. 0847] Vasos Sagrados, y ornamentos por la industria del Misionero, aplicando de su Sinodo, y de lo que busca con sus Misas, y Sermones quando le sobra de su preciso sustento y mantencion. En los bienes que llaman de Comunidad que se reducen á un corto numero de Rezes ha sido tambien notable el aumento respecto de como las recibieron.

Las de Texas por el contrario, pues se hallan en la actualidad en suma decadencia en orden á sus bienes. Estos se reducan á Ganados mayor y menor, y caballadas para el servicio. Estos bienes son adquiridos por la mayor parte por la industria de los Ministros, á cuyo cargo esta el manejo de las temporalidades de las Misiones desde su fundacion, pero son del dominio de los yndios, en cuyo nombre las administran los Misioneros. El motivo de la decadencia en este genero de bienes consiste principalm.[te] en la hostilidad de los enemigos, que continuam.[te] hacen guerra no solo á las Personas sino tambien á los Ganados, y caballadas. Antiguam.[te] quando estaba aquella Prov.[a] en paz tenian las Misiones tanto numero de caberas de Ganado mayor ó bacuno, que habia Mision que contaba 40d Reses: y en el dia apenas cuenta 2 ó 3d á pura industria, y afan del Ministro: y asi respectivam.[te] de las otras Misiones, que unas tienen como 10 Reses, y otras 200 ó 300 de manera que solam.[te] las conservan para el susteno de los yndios, á quienes se manasiam.[te] se les mata, una, ó mas Reses, segun al num.[o] de los habitantes [crossed out] sin que haya quadado [sic] el arbitrio que antes tenian de vender en la Prov.[a] de Coahuila partidas de Reses para fomento de la misma Mision. El destroro de esta especie de Ganado consiste no solam.[te] en el frecuente latrocinio de los Yndios Apaches, y de muchos malos vecinos de los Presidios de Bexar y Bahia, que no tienen otro modo de mantenerse sino es del robo, y latrocinio, sino tambien en el salvo conducto que se dió en los años pasados por la comand.[e] Gral. a qualq.[r] vecino para hacer partidas de Ganado [crossed out] y sacarlas á vender á otras Provincias [crossed out] con solo el la pension de pagas al Rey cierta cantidad, con cuya libertad ha sido tan crecido el num.[o] de cabezas q.[e] se han sacados de la Prov.[a] de Texas (la mayor parte pertenect.[e] á las Misiones á pasar de la declaracion del Vecindario de que son Realengas ú orejanas) que en solos 7 años se hizo cuenta se habian sacado mas de 30d Reses

En las que tienen de Ganado menor de pelo y lana tambien hay su meno cabo por la misma razon de la hostilidad de los Yndios, sucediendo [fr. 0848] que hallandose los Ganados en sus Agostaderos, suelen asaltar alli los Enemigos, y matar á los Pastores, y obejas, ó descarriarse estas, si las dexan vivas. No obstante, de las dos Misiones que tienen esta especie de Ganado, la una mantiene de 300 á 400 cabezas, y la otra cerca de 5d.

En la Taraum.[a] tienen muchos yndios sus pequeños Chincorritos que cuidan ellos sin dependencia del Ministro, cuyas Lanas les sirven para hacer sus Mantas de que se cubren.

[crossed out] Las siembras de estas se reducen á un poco de mayz que benefican los mismos Yndios en sus respectivas tierras para su mantencion, y una, ó dos fanegas que siembran de comunidad para los gastos de Yglesia, y sustento del Ministro. Algunas Misiones siembran tamb.[n] frisol en poca cantidad, y tienen sus cortijos donde alzan sus cañaberales para fabricar Pilonsillo en las tierras calientes que hay en la Sierra Madre. Este se expende en los Realitos de Minas de la misma sierra, ó lo sacan á vender á la Villa de Chiguagua, ó Parral, que es todo el comercio de aquellas tierras, como tamb.[n] los Mayzes que suelen sobrar de el del abasto.

En la Prov.[a] de Texas cada Mision siembra asimismo su Mayz, segun las facultada de cada una. En unas se siembran tres ó quatro fanegas, y en otras hasta cinco, y todo de Comunidad y á cargo del Ministro, porque alli no hay Yndio que tenga tierra por separado, ni que trabaja para mantenerse, á excepcion de uno u otro, que en las mismas Labores de la Mision suelan sembrar cada año sus frutas. **En una Mision nombrada S. Joseph se ha abierto nuevam.[te] una Labor p.[r] Trigo, de que se cosecho este año como 120 cargas, habiendo puesto en ella su Ministro un Molino, que es el unico de toda la Prov.[a] y q.[e] ha costado inmenso trabajo al establecerlo.**[2] En dos de ellas hay tambien sus cortos Cañaberales, de que fabrican Pilonsillo y en una ú otra se siembra tambien frisol para el gasto.

Quando las Cosechas son buenas se suele vender el Mayz sobrante ó la Abilitacion los años que no dan á basto los que alza al Vecindario de Bexar para surtimiento de la Tropa: y la Mision del Esptu. Santo de la Bahia provar á aquel Presidio de Carnes, no teniendo siembra de Mayz por no ser propia el terreno para ello, de cuya semilla se habilita de las otras Misiones. El producto [fr. 0849] que saca esta Mision de sus Rezes, y las otras de sus Mayses, de los pocos carneros q.[e] exponden, de la Lana, y algun algodon q.[e] suele sobrar del que se alza para texer Mantas para los yndios, se le entrega al Procurador de las Misiones, para q.[e] con este auxilio, y el de los Sinodos que paga el Rey, las introdusca anualm.[te] los Avios para la mantencion de los Ministros é Yglesias, y vestuario de los Yndios. Dhos. Avios se reducen á ornamentos, Vasos sagrados, Vino, y Cara para las Yglesias. Vestuarios, Arina, Tabaco en polvo, Arroz, Garbanzo, y demas necesarios p.[a] el Ministro. Mantas, Bayetas, Paños, Sombreros, Frasadas, Tabaco en rama, Xicaras, Belduques, ó Cuchillos, Pita, Hilo ET.[a] para los yndios, y herramientas de labor para las Misiones: y una corta cantidad de generos nobles como bretañas, Yndianillos ET.[a] para los Sirvientes españoles, que se ocupan en los oficios de Mayordomos, Bacieros, y Caballerangos, que sirven por Salario, cuyos individuos son indispansables en aquellas Misiones, por no son capaces los Yndios de emplearse en estos ministerios, siendo naturalm.[te] propensos á destruir, mas que á conservar y cuidar.

Dos son las Misones ó Pueblos que se trata de secularizar, y entregar al orden.[o] La Mision del S. Antonio Valero [crossed out, three lines, half of sentence in parentheses] que en le dia esta ya secularizada en virtud de Sup.[or] orden de V.E. y entregados sus bienes á los Yndios,con sus correspond.[tes] tierras, aparos, yantas de Bueyes ET.[a]) y el Pueblo de Nacogdoches. Este, Sor. Ex.mo., no es propiam.[te] Mision, ni tiene las calidades, que demanda nro. Instituto para ser administrado por Misioneros Apcos. El se compone de Vecinos Españoles, Franceses, y Castas. No hay en el Yndios Neofitos ni Gentiles con quienes exeraro[?] el Ministerio. Se mantienen dos Religiosos con Sinodo de 450 p.[s] cada uno, que paga al Rey, pudiendo emplearse en vivas conversiones: y aunque por parte de este Colegio se promovió ante V.E. la renuncia de dho. Pueblo, no ha tenido efecto con motivo de la separacion a el Vir.[y] de la Comand.[a] Gral. del Virreynato á donde dirigió V.E. el expres.[do] q.[e] trata de la materia como V.E. se sirvió prevenirlo a nro Apoderado el P.P. Manuel de Silva en oficio de [incomplete sentence]

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[2]Portion appearing in **bold** is the key to the dating of the mill at Mission San José, and the first recorded planting of wheat there. This key phrase follows in translation with explanatory footnotes.

Esto es todo lo que puedo informar á V.E. por lo pertenec.[te] á las Misiones de mi cargo, y con lo que contemplo haber satisfecho su Sup.[or] orden, que quedo siempre pronto á obedecer.

Colegio Apco. de N.S.[a] de Guad.[e] de Zacat.[s] Oct.[e]

Nota: aunque no fue el Ynfre. como esta aqui, en la subst.[a] fue lo mismo

[END DOCUMENT]

APPENDIX I

APPENDIX I

TRANSLATION FROM ZACATECAS MICROFILM DOCUMENT CONCERNING THE MILL AT MISSION SAN JOSE

In an anonymous report to the Colegio de Zacatecas of the state of the missions in the Tarahumara and in Texas made between 1794 and 1796, the writer, when referring to Texas, notes:

"In a mission named San Joseph a *labor* for wheat has been recently planted which this year yielded about 120 *cargas*.[3] Its minister (missionary) having placed in it a mill, which is the only one in all the province, and that it has cost (involved) immense work to establish it (set it up)."[4]

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[3]Thomas C. Barnes, Thomas H. Naylor, Charles W. Polzer, *Northern New Spain--A Research Guide* (Tucson, Arizona: University of Arizona Press, 1981: 73).

[4]Report. N.D. *State of the Missions*. Archivo del Colegio de Zacatecas in the Archivo Franciscano de Zapopan. Microfilm, Roll I, Frame 0848.

APPENDIX J

APPENDIX J

BEXAR ARCHIVES MICROFILM, ROLL 22
1792 CENSUS (Partial)
MISSION SAN JOSE
(Transcription)

Frames 984-986

Frame 984

Micion de S.^{or} S.^{n} José Dependiente de la Villa de S.^{n} Fernando.
Padron de las Almas q.^{e} Existieron En 31 de Diz.^{e} de 1792.

Familias de Yndios

1 Jose Antonio Bustillos, Alvañil de Edad de 45 a.^{s} Cassado con Jusepa [sic] Maria de Edad de 30 a.^{s}

2 Fran.^{co} Arocha, obraxero, de edad de 50 a.^{s} Cassado con Bernardina Flor.^{s} de Edad de 42 a.^{s}

3 Pablo de Luna, de labrador, de Edad de 55 a.^{s} Cassado con Teressa de la Garza de Edad de 40 a.^{s} tiene 1 hijo de Edad de 12 a.^{s}

4 Enrriq.^{e} Ramires, de labrador, de Edad de 30 a.^{s} Viudo, tiene 2 hijos barones el 1 de Edad de 16 a.^{s} y el otro de 10 a.^{s}

5 Juan de Matta, de Edad de 27 a.^{s} Cassado con Maria Ramon de Edad de 22 a.^{s} 6 Man.^{l} Costales, de Edad de 50 a.^{s} Cassado conPasquala de edad de 48 a.^{s}

7 Fermin Arguayo, Carpintero de edad de 43 a.^{s} Cassado con Paula S.^{ta} de Edad de 28 a.^{s} Tiene 1 hijo de Edad de 2 a.^{s} y 1 Niña de 10 a.^{s}

8 Bentura Marg.^{l} de Edad de 62 a.^{s} Viudo

9 Gaspar Romero, de Edad de 25 a.^{s} Viudo. Tiene dos hijos 1 de Edad de 11 a.^{s} y otro de 9 y Una Niña de Edad de 7 a.^{s}

10 Fermin Toro, de Edad de 60 a.^{s} Cassado con Josefa Billegas de Edad de 27 a.^{s} Tiene 1 hijo de Edad de 4 [a.^{s}] y 2 Niñas la 1 de Edad de 14 a.^{s} y la otra de 6 a.^{s}

11 Antonio Marg.^{l} Contreras, de edad de 25 a.^{s} Cassado con Maria Antonia de la Cruz de edad de 18 tiene 1 niño de Edad de 5 a.^{s}

12 Jose Nuñez Obrajero de Edad de 22 a.^{s} Cassado con Felipa Rodela de Edad de 18 Tiene 1 Niña de Edad de 2 a.^{s} y un niño de 1 año 13 Pedro Selestino, Sastre, de edad de 27 Cassado con Rosalia Costales, de edad de 20 a.^{s}

14 Juaq.^{n} de Varutia, de edad de 18 a.^{s} Cassado con Maria Asuncion de edad de 23 a.^{s}

15 Roque Salasar de edad de 21 a.^{s} con Maria Camacho, Mulata N[atural] del Extinguido Precidio de los Adaes, de Edad de 24 a.^{s}

16 Ygnacio Salas, de Edad de 16 a.^{s} Soltero

17 Bicente de la Cruz, de Edad de 16 a.^{s} Cassado con Refugia Casorla de Edad de 17 a.^{s} tiene un hijo baron de edad de 13 meses

18 Xacobo del Rio, de Edad de 19 a.^{s} Cassado con Mariana de los S.^{tos} Velles de edad de 15 a.^{s} tiene un hijo de edad 11 meses

19 Fulgencio Bustillos de edad de 19 a.^{s} Cassado con Barvara Camacho Mulata N[atural] del Extinguido Precidio de los Adaes de Edad de 22 a.^{s}

20 Fran.^{co} de la Garza, de Edad de 23 a.^{s} Cassado con Josefa Camacho Mulata
Frame 985 N[atural] del Precidio de Bexar de Edad de 16 a.^{s} tiene una hija de dos años de edad

[End of first page]

APPENDIX K

APPENDIX K

BEXAR COUNTY ARCHIVES MICROFILM, ROLL 25
1794 RATION LIST (Partial)
(Transcription)

Frames 0053-0068

Frame # 0053

Lista de las Raciones dadas alos Yndios del Pueblo de S.^{or} S.^{n} Josse. desde 1.^{o} de Octubre de 1794 hasta 3 de Dre. del mismo

Frame 0054

<u>Año de 1794</u>

Noticia de las raciones que se subministr.^{an} a los Yndios de este Pueblo de Sor. S.^{n} Josse de la cosecha de trigo, conseguida en el año corriente.

<u>Primera semana 7 de obre.</u>

Familias	cassad.^{s}	Sole.^{s}	Viudas	Guerf.^{s}
Primeram.^{e} el Governador deste Pueblo y su esposa dos almudes	2	#	#	#
Ytt.^{e} Joachim y su mujer dos almudes	2	#	#	#
Ytt.^{e} Josse Nuñez y su Mujer dos alm.^{z}	2	#	#	#
Ytt.^{e} Josse Antonio y su Mujer dos alm.^{z} . . .	2	#	#	#
Ytt.^{e} Calletano y su Mujer dos alm.^{z}. . . .	2	#	#	#
Ytt.^{e} Joachin y su Mujer dos alm.^{z}	2	#	#	#
Ytt.^{e} Jacobo y su Mujer dos alm.^{z}.	2	#	#	#
Ytt.^{e} Juan de Rey y su Mujer dos alm.^{z}. . .	2	#	#	#

[Familias	cassad.[s]	Sole.[s]	Viudas	Guerf.[s]][5]
Ytt.[e] Manuel y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Antonio y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Vizente y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Juan Ygnacio y su Mujer dos alm.[z] ...	2	#	#	#
Ytt.[e] Roque y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Fuljensio y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Pablo y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Juan y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Damacio y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Jose Antonio y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Juan Maria y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Raphael y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Fran.[co] y su Mujer dos alm.[z]	2	#	#	#
Ytt.[e] Jacinto y su Mujer dos alm.[z]	2	#	#	#

[5]Everything appearing in brackets ([]) has been added for clarity by the author and does not appear in the original document.

[Familias	cassad.[s]	Sole.[s]	Viudas	Guerf.[s]]
Ytt.[e] Leon y su Mujer dos alm.[z]	2	#	#	#
Solteros				
Prim.[e] Buenaventura un almud.	#	1	#	#
Ytt.[e] Gaspar un almud. . .	#	1	#	#
Ytt.[e] Enrrique un almud.	#	1	#	#
Passa la Buelta . .	4	1	#	#

[End of first page]

APPENDIX L

BEICKER ENGINEERING, INC.
9901 Broadway, Suite 113 • San Antonio, Texas, 78217 • Phone (210) 824-2908 • Fax (210) 824-0746

January 10, 1997

Mr. Lloyd Walker Jary, Architect
Lloyd Walker Jary and Associates
12915 Jones Maltsberger, Suite 604
San Antonio, Texas 78247

Re: Grist Mill at San Jose Mission #96161-0
San Antonio, Texas

Dear Mr. Mr. Jary:

As you requested, Beicker Engineering, Inc. has performed an investigation of the Grist Mill at the above referenced project. The purpose of this investigation was to observe the existing condition of the structure and determine if the mill could be put back in services without any damage to the building.

At the time of our visit the archaeological study of the lower portion of the building where the paddle wheel is located was completed. An observation of this area found the canal bottom to be a hard surface similar to concrete.

Based on our observation we feel that no structural damage to the building will occur when the mill is put back into operation.

Comments and recommendations made were based on the condition of the structures at the time of the investigation and includes only what is reported herein. This report does not treat, nor is this firm responsible for defects which were latent or not apparent or visible at the date of the investigation. No design or testing was done nor was any examination made to determine compliance with any governmental code or regulation. This report is not to be considered a warranty of this structure concerning future use, operability or suitability.

If you have any questions, please call.

Respectfully,

BEICKER ENGINEERING, INC.

Michael J. Zezula, P.E.

Michael J. Zezula, P.E.
Texas Registration Number 66581

STATE OF TEXAS
MICHAEL J. ZEZULA
66581
REGISTERED PROFESSIONAL ENGINEER

MJZ/di

APPENDIX M

APPENDIX M

SCOPE OF WORK
Archeological Testing and Report Preparation
MISSION SAN JOSE - GRIST MILL
San Antonio Missions National Historical Park

October 29, 1996

I. General: Archeological testing and report preparation per NPS guidelines related to the production of a Historic Structure Report (HSR) for the historic grist mill including the areas described herein.

II. These services include:

A. Provide on-site archeological testing of specific areas related to the grist mill for the purposes of determining architectural and site-related details:

B. Provide information (both historic and current) to Supervisory Landscape Architect James Oliver in conformance with the attached "Guidelines for Clearance Reports Produced in the Division of Anthropology." The National Park Service will assume responsibility for final preparation of the report (typing and reproduction, etc.).

III. Specific Areas (letters refer to site map):

A. Acequia profile: Determine, to the greatest extent possible, the historic profile of the *acequia madre* which runs south of the mill.

B. Stone steps west of the bridge over the acequia madre (south side): Determine the extent and design of the steps and their possible relationship to another walkway (possibly stone-lined) in the area.

C. Side ditch from acequia madre to the "fore-bay" of the mill: Determine possible existence of a slide gate from the acequia madre, and any other features related to the mill proper.

D. "Tanning vat" - or "sugar mill" site (west of the mill): Examine this area for depth and evidence of additional structures.

E. Vaulted wheel room: Excavate to determine if a flagstone floor exists below the wheel. Examine the floor for evidence of additional wooden members related to the operation of the mill wheel.

F. Mill race: Excavate area at the north end of the mill race to determine the extent of the race (whether or not it extends further toward the amphitheater).

G. Fore-bay: Excavate modern fill to bottom of fore bay to determine actual depth and structural characteristics.

IV. Cultural Resources Management:

A. The mill and immediate surrounding areas are listed on the National Register of Historic Places. All work shall be directed towards the preservation and protection of those qualities which make the buildings eligible for inclusion on the National Register of Historic Places. All work requires extreme care in order to preserve original materials, and workmanship.

IV. Contacts:

A. Chief, Division of Professional Services Mark Chavez, 534-8833.

B. Landscape Architect James Oliver, 534-8833.

sows\archeo.mil

APPENDIX N

APPENDIX N

Archaeological Investigation of the Gristmill at Mission San José y San Miguel de Aguayo, San Antonio, Texas

Andrew J. Scease and Kevin J. Gross

March 1997

Acknowledgments

Thanks are extended to the Center for Archaeological Research (CAR) field crew: Maureen J. Brown, Donna Edmondson, Owen A. Ford, Ed Johnson, Bruce K. Moses, and Robert R. Rector. Anne A. Fox's assistance in the field and laboratory is greatly appreciated. Johanna Hunziker is also thanked for her time in analyzing the faunal remains. Thanks also to Cynthia L. Tennis, the small projects coordinator at CAR, for completing the pre-fieldwork and for reviewing preliminary drafts of this report. We are grateful to Mark Chavez and James Oliver, both from the National Park Service (San Antonio Missions National Historical Park), for sharing their observations and knowledge. Thanks also go to Bruce Moses and Fernando Valenzuela for drafting the figures and to Marcie Renner for her editing skills. Robert J. Hard, director of CAR and principal investigator for the project, is thanked for his assistance and guidance throughout the project.

Introduction

The Center for Archaeological Research of The University of Texas at San Antonio undertook archaeological investigations of the gristmill and adjacent areas at Mission San José y San Miguel de Aguayo in San Antonio, Texas, in mid-December 1996. The work was completed in advance of work proposed for making the mill operational. The partial restoration—only a small segment of the acequia will be used with constantly recycled water—is being conducted by Los Compadres de San Antonio Missions National Historical Park and the National Park Service (NPS), with technical assistance from Overby Descamps Engineers. The restoration required that the following six areas be examined (Figure 1): a set of limestone staircases crossing the acequia near the mill (Area A), the interior of the mill's sluice (Area B), the forebay (north of Area B), the floor of the mill vault (Area D), a small portion of the mill race (Area F), and a stone-lined pit that is presumed to be either a tanning or sugar processing vat east of the mill (Area E). The original (i.e., Spanish colonial) acequia channel was identified in units excavated in association with the staircases (excavation units A-C).

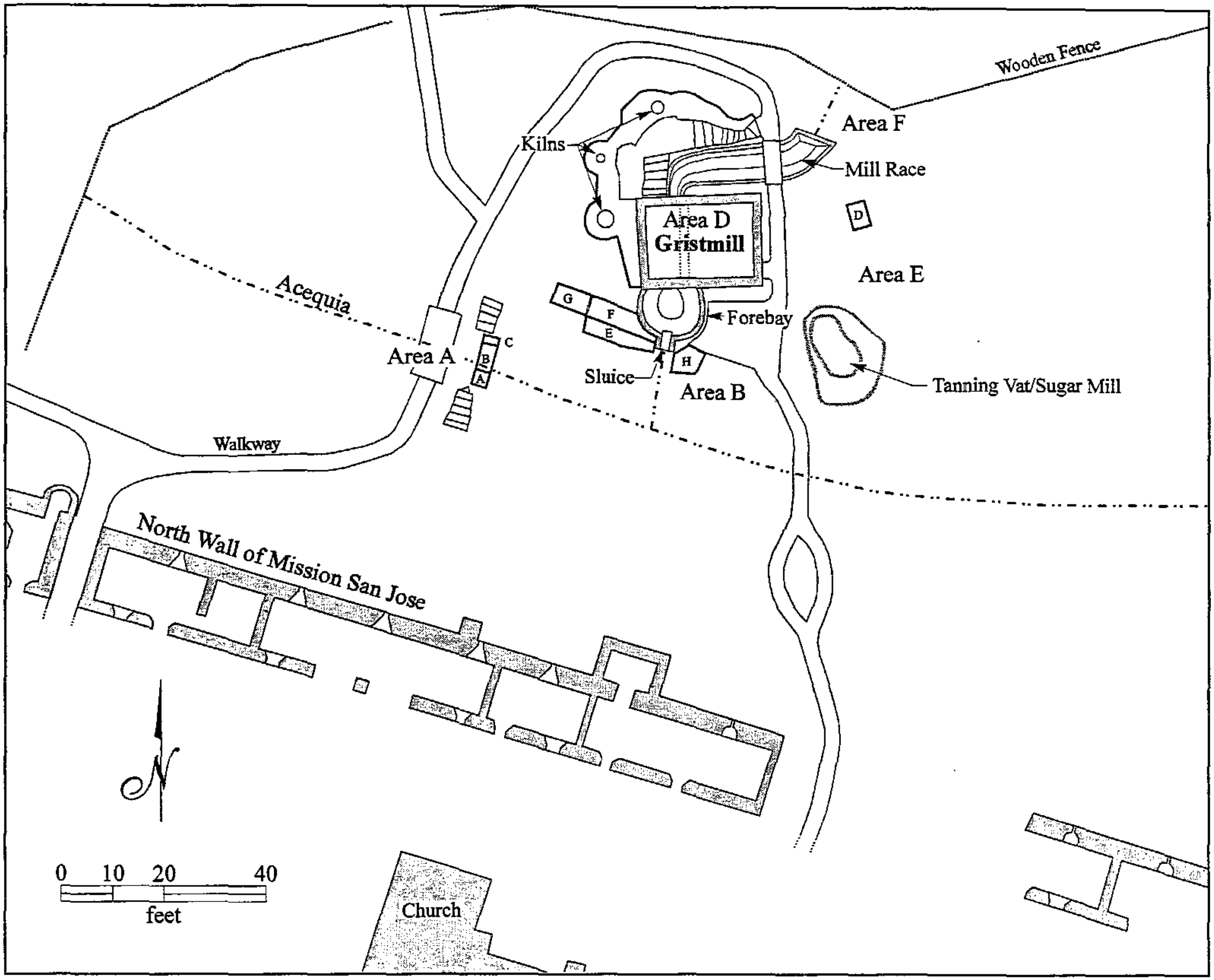

Figure 1. Plan view of grist mill area.

Excavation of the sluice was expanded to include areas around the channel (excavation units E-H); wall remnants were encountered in these units. No intact Colonial or post-Colonial deposits were identified in the units associated with the sluice.

Project Area Background

History

Only a brief overview of Mission San José's general historical development is presented here. Habig (1968a, 1968b) and Day (1965:129–164) should be consulted for more complete histories of the mission. Similarly, Ivey et al. (1990a, 1990b) have described the architectural history of the mission. Habig (1978), Habig et al. (1983), and Leutenegger and Casso (1990) provide rich descriptions of San José and its inhabitants. Bolton (1915), Chipman (1992), Jones (1979), and Schuetz (1980) also provide useful descriptions of the Spanish colonial period in San Antonio and Texas.

Mission San José was originally established in 1720 on the east bank of the San Antonio River about 3.5 miles south of Mission San Antonio de Valero (the Alamo). The mission was moved to its present location on the west side of the river between 1724 and 1727. Campbell and Campbell (1985:46–59) believe that members from at least 21 Native American groups lived at San José at various times during the Colonial period. However, since many of the early records from San José have been lost, the actual number of groups that lived at the mission was probably much greater. The Native American population at San José fluctuated radically throughout the Colonial period. In the late 1730s, as many as 300 Indians lived at the mission. Epidemics in 1739 and 1740 killed many Indians and caused others to flee the mission. The population quickly increased, however, and by 1768 the number of Indian neophytes probably climaxed at about 350 persons. Thereafter, the Indian population began a gradual, but continuous decline until secularization. The last census of San José in 1815 recorded only 49 Indians (Habig 1968b:270).

In 1749 a visitor to the mission reported that the granary, friary, stone houses for the Indians, and a large church constructed of adobe had been completed (Habig 1968b:116). This first church was destroyed in 1768 and foundations for a new stone church were laid in the same location. The second church, which still stands —albeit partially reconstructed in the nineteenth and twentieth centuries—was completed in 1782. Ivey et al. (1990a) believe that Mission San José was an unwalled pueblo until about 1758–1768. Increasing attacks by hostile Indian tribes, most notably the Apache and Comanche, forced the construction of the defensive walls.

Habig (1968a:100) believes that the mill was constructed between 1789 and 1794. Indeed, the first mention of a mill at San José was included in a comprehensive inventory of the mission completed in 1794, "a water mill for grinding wheat that is operated by a running stream but no dam" (Habig et al.1983:131). It is believed that Fr. Pedrajo, the missionary in charge of San José at the time, directed the construction of the flour mill as had been instructed by Governor Domingo Caballo in 1778. Caballo wanted wheat, barley, and beans planted in the mission fields in addition to corn (Habig 1968a:100; Ivey et al. 1990:138). Habig (1968a:100) suggests that wheat had not been raised in previous years because "the Indians did not care for it."

A few references suggest that the mill was operational until at least the middle nineteenth century. Two inventories of the mission completed in 1809 mention that the mill was still grinding wheat (Habig et al. 1983:264, 274). A novel, *Daughter of Tehuan*, published in 1866, provides a detailed description of the mill (Hoermann 1932:29, 95). The book's author, The Reverend P. Alto S. Hoermann, was a Benedictine father who resided at Mission San José from ca. 1859–1864 (Hoermann 1932:4). Although a work of fiction, Hoermann's descriptions of features and events seem generally correct. Therefore, it is assumed that, at very least, enough of the mill's superstructure was still standing for Hoermann to make his observations. References to the mill from the late-nineteenth century have not been located.

Figure 2. Vaulted turbine housing, facing south. *Courtesy Daughters of the Republic of Texas Library.*

Clark (1978:41) reports that the mill was encountered in 1934 by workmen cleaning the acequia. The mill complex was excavated and reconstructed by the Works Progress Administration (WPA), under the general direction of Harvey P. Smith, Sr. (Smith 1935:12–13), as a part of the larger reconstruction of the mission. Photographs (Figures 2, 3, and 4) taken during excavations associated with the reconstruction suggest that the entire area had been severely disturbed before and during reconstruction.

Figure 3 reveals that a large portion of the acequia's north bank immediately south of the mill was removed during restoration. Figures 2 and 4 show that the forebay and vaulted turbine room were intact under the surface.

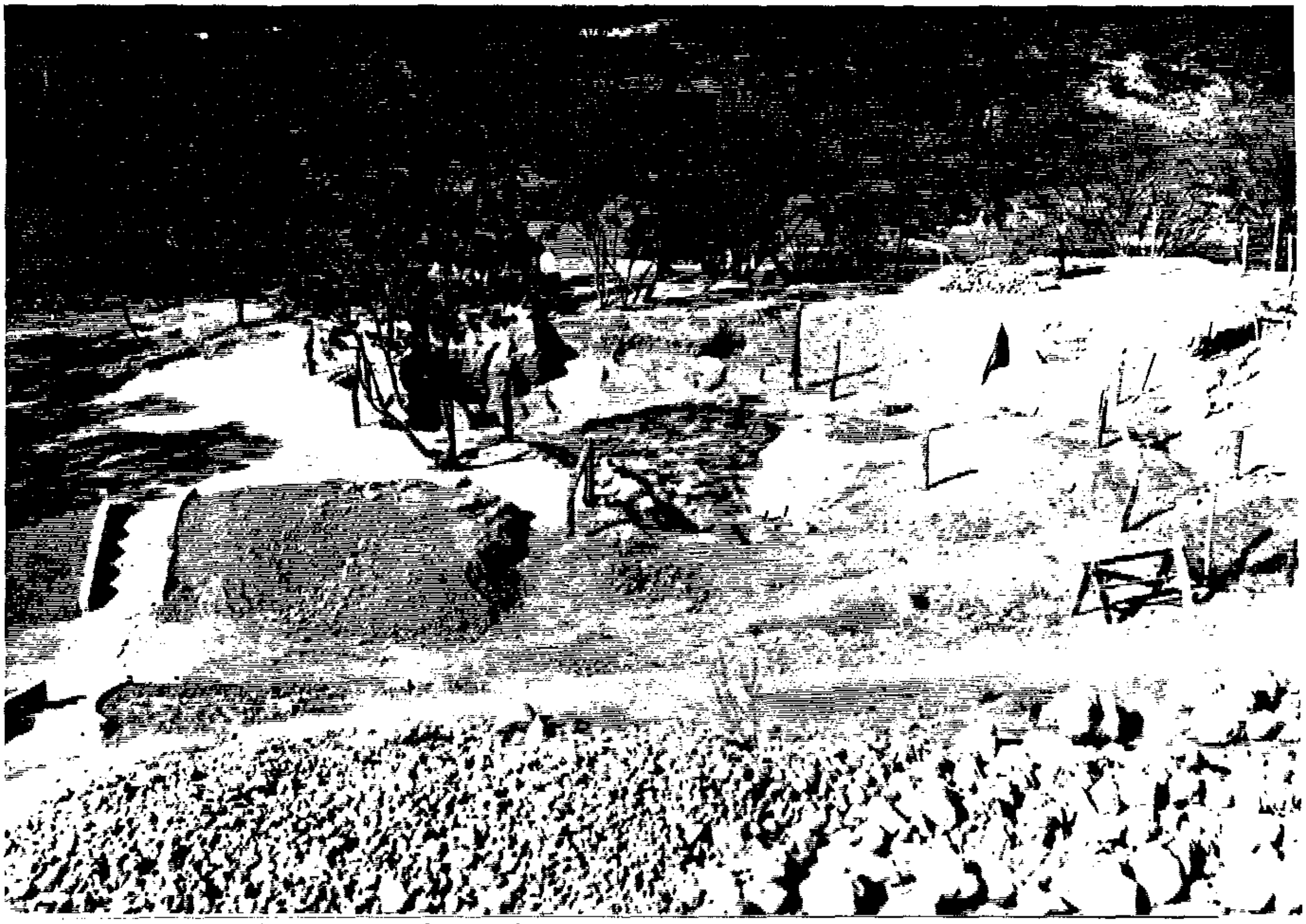

Figure 3. Gristmill reconstruction, facing north. *Courtesy San Antonio Missions NHP.*

The WPA reconstruction followed plans designed by Smith and Ernst Schuchard (then an employee of Pioneer Flour Mills in San Antonio). In short, Schuchard's research culminated in the mill that exists today: water from the acequia would have been directed into the forebay through a sluice. The sluice apparently would have had a mechanism (most probably a wooden gate) to control the flow of water into the forebay. An aperture near the bottom of the forebay would have discharged water into the vault directly onto the mill turbine. The mill wheel itself was horizontal with a series of angled paddles radiating from the shaft. Water entering the vault would have struck the paddles with enough force to turn the grindstones (Schuchard 1934:9). An engineer who studied the mill at San José concluded that the forebay's design ensured that water entered the vault and struck the turbine at a constant rate. The overall quality of the flour is improved when the number of revolutions per minute of the millstones can be kept at a uniform rate (Czibesz 1955:4).

Figure 4. Forebay and acequia, facing south from above. *Courtesy San Antonio Missions NHP.*

The actual milling would have occurred in the structure above the vault. The shaft would have entered the mill room through a hole in the floor (which Smith located) and connected to two stones: the top stone was rotated by the movement of the turbine below, while the bottom stone remained stationary. The height of the top stone could be adjusted by a series of connected levers extending down into the vault. Grains were placed into a hopper and fed through the center of the stone to the grinding surface. The ground meal was discharged at the outer edge of the stones and was collected in a wooden casing surrounding the stones (Schuchard 1934:9). While Smith intended for the final reconstruction of the mill to be functional, it is unclear if it ever was (Smith 1935:13); a report from 1955 says that the mill was not operational at that time (Czibesz 1955:7).

Previous Archaeological Investigations

A number of archaeological investigations have been completed at Mission San José since the early 1970s, as summarized by Hard et al. (1995). Only Clark (1978) investigated areas near the mill. Clark excavated eight test pits in the northern portion of the compound, both inside and outside, and two of these units, Test Pits 4 and 8, were within the boundaries of the current project area. All the archaeological work performed at San José, including Clark's excavations, has been limited in area and scope to testing projects completed in advance of construction activities.

Schuetz (1970) excavated several shallow trenches throughout the park in preparation for the construction of a sprinkler system. In 1969 and 1970, Daniel Fox excavated units near the north wall of the church and convento and along the north wall of the compound in advance of sewer and electrical trenches (Fox et al. 1970). The southwest and southeast corners of the compound were tested by Roberson and Medlin (1976) in 1974 and 1976 prior to the construction of a new office and sanitary facilities and in preparation for the construction of a visitors' center, respectively. Clark and Prewitt (1979) excavated five test pits along the outside of the granary's western wall prior to the installation of a drainage system. In 1984, Henderson and Clark (1984) recorded a possible corral, a previously disturbed human burial, and a portion of a Colonial acequia south of the mission beneath Napier Avenue (Park Road 39). A proposed sewer line outside of the mission's west wall necessitated investigations by Hafernik and Fox (1984). They located a post-Colonial well in their test trench. In 1991 Fox and Cox (1991) located the Acequia Madre and a related lateral ditch with 11 backhoe trenches on the east side of the mission.

In 1993 CAR archaeologists undertook archaeological investigations at Mission San José to assess the impact of a proposed visitors' center (Hard et al. 1995). The entire interior compound of the mission was tested to identify Spanish colonial deposits. Additional units were excavated in the southeast gate and south of the mission wall. In 1996 Tennis (1997) reinvestigated the southeast gate area with a hand-excavated trench.

Field Methodology

Excavations for this project were limited to the removal of predominantly post-1934 fill from the mill and associated features, including the interiors of the sluice and the forebay, the mill vault floor, and the north mill race (Figure 1). A set of stairs east of the mill, on the north and south banks of the acequia, were also exposed. A 2-x-3-ft unit was hand excavated in the circular pit referred to as the "tanning vat/sugar processing area" so that researchers from the NPS could collect residue samples to determine the feature's function. Only the matrix from the stairs and a unit excavated east of the sluice (Unit H) was screened. Elevations for the entire area were recorded with an electronic distance measuring instrument. Brief descriptions of the excavation units and soils are provided below.

Area A (Features 1 and 2)

An arbitrary datum for Area A (586.53 ft amsl) was placed on the southwest corner of the uppermost stair on the south side of the acequia. Artifacts from the limestone stairs on the south (Feature 1) and north sides (Feature 2) of the acequia were collected separately. Along both outside edges of the stairs a course of stone was placed and cemented with a loose sandy mortar. Both sets of stairs were fairly uniform in size. Each step was approximately 40 inches wide (excluding the single course of stone on each side), six to seven inches thick, and between 14 and 20 inches deep.

The first two steps on the south side were fragmented; the first step apparently as the result of grounds-keeping activities and erosion, and the second from erosion only (Figure 5). The next three steps were better preserved, showing only slight damage from erosion. A triangular flagstone, with a maximum width of 27 inches and a maximum length of 24 inches, was identified after the last step at the bottom of the south stairs.

The stairs on the north side of the acequia were also cleared of overburden. Only four steps were identified on this side (Figure 6). A photograph taken during the WPA reconstruction (Figure 3) suggests that in ca. 1934 there were five steps, so it appears the topmost step is missing. The northern staircase was relatively less intact and less uniform than the southern staircase. The intrusion of large roots from a nearby hackberry tree are probably responsible for the fragmentation of the north stairs. The topmost remaining step had been repaired at an unknown time with portland cement. The other steps were in pieces, with 50 percent of the third step missing. Except for the topmost step, all the steps on the north side of the acequia were constructed with the same loose, sandy mortar found in the south stairs.

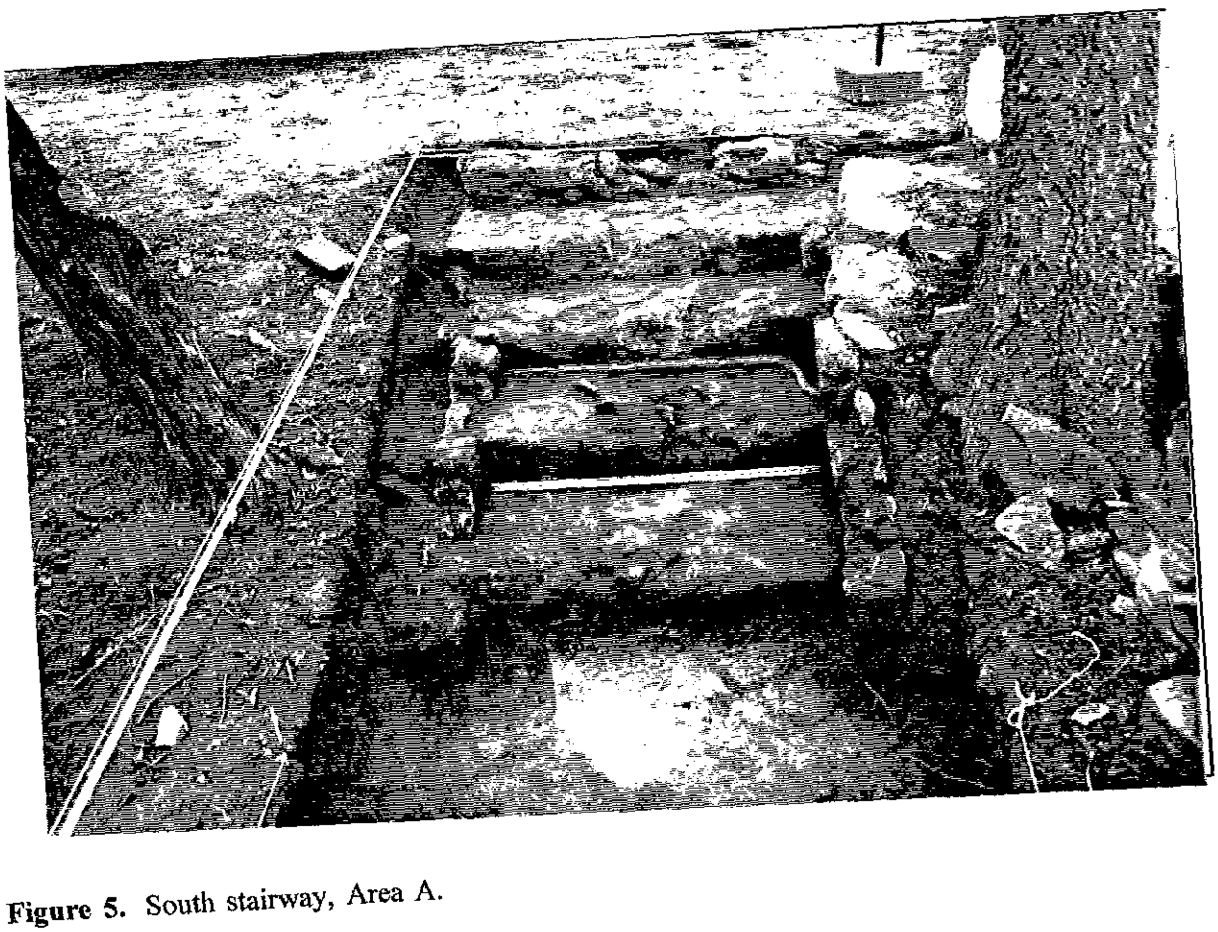

Figure 5. South stairway, Area A.

Figure 6. North stairway, Area A.

Three test units—Units A, B, and C—were excavated in Area A between the two sets of stairs in the acequia's existing bed (Figure 1). These units were excavated in six-inch levels and the material screened through ¼-inch screen. A local datum for all three units was established in the southwest corner of Unit A at 584.63 ft amsl (25 inches below the Area Datum and two-inches above the existing ground surface).

Unit A

Unit A, measuring 3.5 x 5 ft, was opened to the north of the south stairs, immediately adjacent to the triangular flagstone mentioned above. Only the eastern half of Unit A was excavated below the first six-inch level.

The soils in Unit A can be divided into four distinct zones based on observed differences in soil color and texture (Figure 7). Zone 1 is a grayish-brown, loose sandy clay with small gravel (with maximum diameters of half an inch). Within Zone 1 was a sand lens (Zone 1a) approximately three inches thick extending into Unit B. Zone 2 consisted of a four inch-thick layer of silty clay similar in color to Zone 1. Zone 3 is a 20- to 30-inch-thick layer of very dark brown, blocky clay loam containing gravel up to four inches in diameter. Zone 3 also contained several pieces of shaped sandstone, presumably associated with the ca. 1930s reconstruction. Zone 4 consisted of a very light brown, firm clay loam matrix with grey, ashy mottling. Zone 4 was confined to the south half of Unit A at 36 inches below datum and is approximately six inches thick, sloping down towards the middle of the acequia. Unit A was excavated to a depth of 42 inches below datum.

Unit B

Unit B was 5.5 x 5 ft. As with Unit A, excavation of Unit B was limited to the east half of the unit after the first six-inch level. The soil zones in Unit B generally correspond to those mentioned above for Unit A. Zone 1a extended into Unit B about 12 inches. The Zone 2 identified in Unit A tapered off approximately 12 inches into Unit B as well. In the northern half of Unit B, 15 inches below datum, was a lens of sandy clay with a high gravel content approximately 18–20 inches across (Zone 3a). Zone 4 was about 18 inches higher in Unit B than in Unit A, about 18 inches below datum. Zone 4 dips sharply towards the center of the acequia to the south. Overlying Zone 4, where it ends in the unexcavated portion of Unit B, is a light grey, firm clay loam containing small limestone gravel (Zone 4a). This level was differentiated from Zone 4 by its slightly darker color and the absence of the grey, ashy mottling present in Zone 4. At the northern margin of Unit B, Zone 4 was approximately 14 inches thick. Unit B was excavated to a depth of 42 inches below datum.

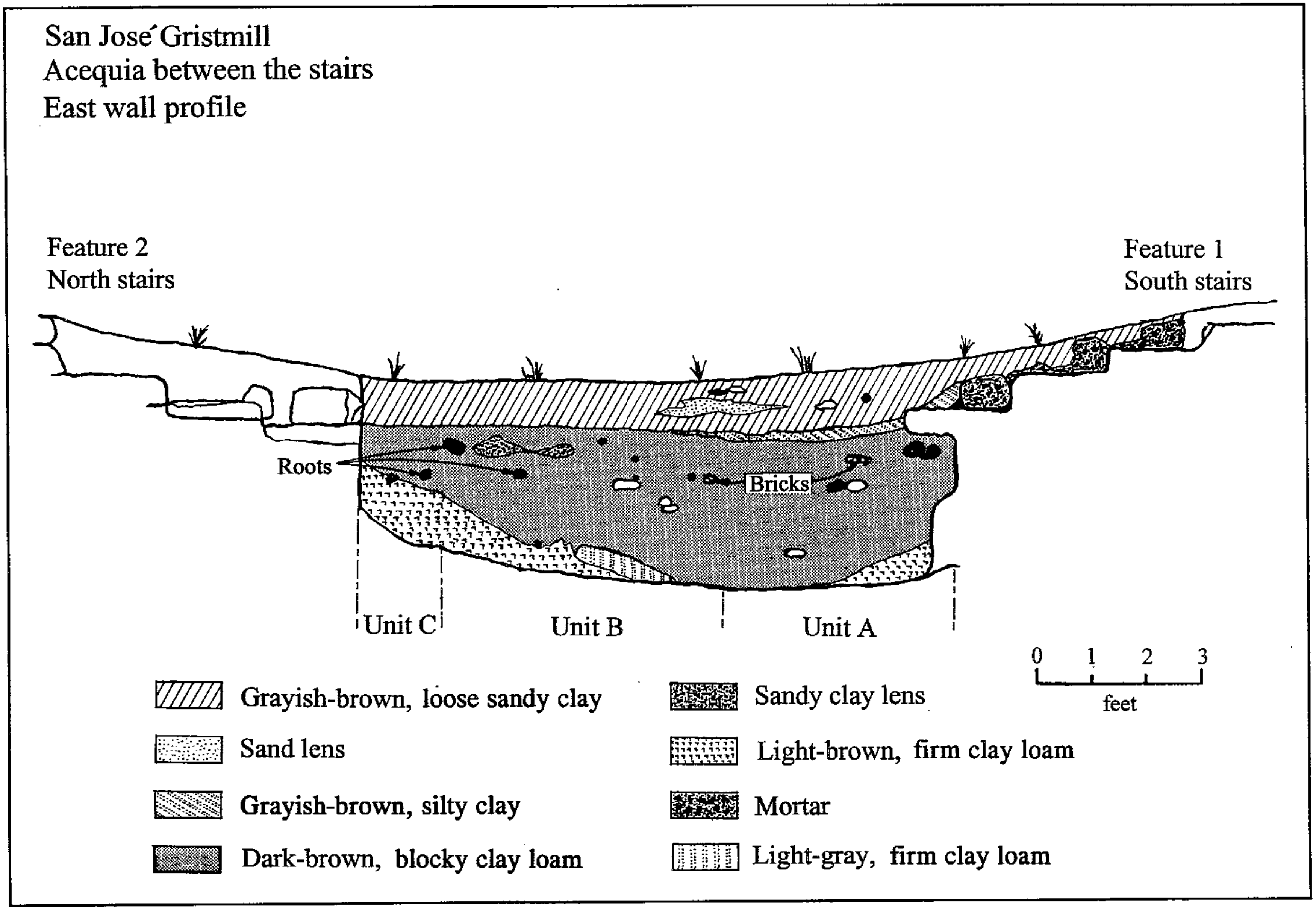

Figure 7. Area A, Units A, B, and C, east wall profile.

Unit C

Unit C originally extended the width of the bottom stair of the north stairs, between Unit B and the stairs, making it 18 inches wide and 48 inches long.

Only soil Zones 1, 3, and 4, are present in the profile of Unit C. Zone 1 was about 12 inches thick in Unit C, as it was in Units A and B. Zone 3 was only about 8–12 inches thick in Unit C. The top of Zone 4 was identified at 18 inches below datum and was about 12 inches thick. The top of the underlying caliche bedrock dipped to the south and was identified at 27 inches below datum in the northern profile of Unit C, and at 36 inches beneath datum in the southern profile. The southern portion of Unit C was excavated to a final depth of 36 inches below datum.

Area B (Features 3, 4, and 5)

Area B was centered around the stone-lined sluice leading from the acequia to the forebay (Figure 8). Excavation of the sluice was undertaken to determine its association with the acequia and existence of any unknown structures related to the operation of the mill itself. An arbitrary datum was established along the west wall of the sluice (584.15 ft amsl).

Figure 8. Excavated sluice, looking north toward the mill.

Two soil zones were identified in the sluice. Zone 1 consisted of approximately four inches of fill deposited since the WPA restoration. Zone 2 (16 inches below datum) was a hard-packed, light tan clay, mottled with slightly darker granular, sandy clay. Zone 2 was excavated to a depth of 36 inches below datum. There was no evidence of any Colonial-era structures in this underlying level.

Remnants of a wall, Feature 3 (see Figure 10), were observed running perpendicular to the west wall of the sluice. The top of this wall was cleaned, and excavation on both the north and south sides (Units E and F, respectively) was undertaken to determine how much, if any, of the structure remained in situ. An alignment of limestone cobbles adjacent to Units E and F was designated Feature 4. The datum established for the sluice was used for both Units E, F, and H. Feature 5 consisted of a low, semi-circular wall abutting the eastern wall of the sluice (see Figures 11 and 12).

Unit E

Unit E was 1 x 8 ft, exposing the south side of Feature 3. The first soil zone was hard-packed, pea-size gravel approximately 3–5 inches in depth. Zone 2 is a gray to light brown sandy loam containing a large amount of stream-rolled limestone and quartzite gravel less than two inches in diameter. This zone continues to about 20 inches below datum. Zone 3 is similar to Zone 2, except for the absence of the rounded gravel. Zone 3 continues to a depth of 42 inches below datum. Where the wall in Unit E abuts the west wall of the sluice, its base was 36 inches below datum. The wall becomes shallower to the west. At its westernmost point, the base of the wall is only 2–4 inches below the surface. Unit E was excavated to a depth of 42 inches.

The wall itself was constructed of limestone cobbles held in place with a loose, sandy mortar. There appeared to be no formal coursing of the mortared cobbles.

Unit F

Unit F exposed the north side of Feature 3 and the area between the wall and the reconstructed forebay. Zone 1 of this unit corresponds to Unit E, Zone 1. Zone 2 was a dark gray sandy loam without the gravel present in Unit E, Zone 2. In the eastern portion of this unit was a large limestone rock (24 x 18 inches) immediately adjacent to the wall, 6–8 inches below datum. To the west of the large rock, Zone 2 continues to a depth of 8–12 inches below datum. Zone 3 begins at 12 inches below datum. The soil matrix in Zone 3 is basically the same as the previous level, but the soil is mottled with a large amount of a chalky substance and limestone cobbles from 3–6 inches in diameter. Unit F was excavated to a depth of 24 inches below datum.

Unit G

The alignment of limestone cobbles to the west of Units E and F was uncovered to a depth of 12 inches to determine if there was any association with the wall described above. The alignment was limited to the surface and the stones are most likely remnants of the lining of a walkway constructed by Smith in the 1930s (Figure 2).

Unit H

Unit H, measuring 2.5 x 3 ft, was adjacent to the east wall of the sluice. The northern edge of the unit is delineated by the south wall of Feature 5. Zone 1 is similar to Zone 1 in Unit E, with pea-sized gravel to a depth of 3–5 inches below the surface. Directly under this zone was a layer of sandy clay mixed with limestone cobbles up to six inches in diameter. This second zone continued to the bottom of the wall, 20–23 inches below the top of the wall. As with Feature 3, the limestone cobbles were mortared with a loose, sandy mortar and showed no formal coursing (Figure 9).

Area D

Area D consists of the vaulted turbine room below the millroom. No artifacts were collected from the area. Excavations in Area D were limited to exposing the flagstone floor. Schuchard (1934:9) noted the presence of the floor during the reconstruction excavations, but it is unclear if it was constructed in the Colonial or post-Colonial period. Limited areas around the mill wheel were also cleaned to identify intact portions of the reconstruction-era wooden bridge tree.

Area E

A 2-x-3-ft area within the structure referred to as the tanning vat/sugar processing area was cleared of material deposited since the ca. 1930s reconstruction.

Unit D

Unit D is a 5-x-5-ft unit which includes both sides of an north-south alignment of sandstone blocks mortared with portland cement. Excavation of this unit was undertaken to determine if this alignment is Colonial in origin. Unit D was excavated in six-inch levels to a depth of 12 inches before we determined that the alignment was limited to the surface.

Area F

Area F included the area to the north of the sandstone wall at the north end of the mill race. This area was not screened and no artifacts were collected. This area was excavated to determine if the sandstone lining of the mill race continued past the wall. Excavation showed that the sandstone lining terminated three feet from the north side of the wall.

Area G

Area G included the area to the north of the sandstone wall at the north end of the mill race. This area was not screened and no artifacts were collected. This area was excavated to determine if the sandstone lining of the mill race continued past the wall. Excavation showed that the sandstone lining terminated 3 feet from the north side of the wall.

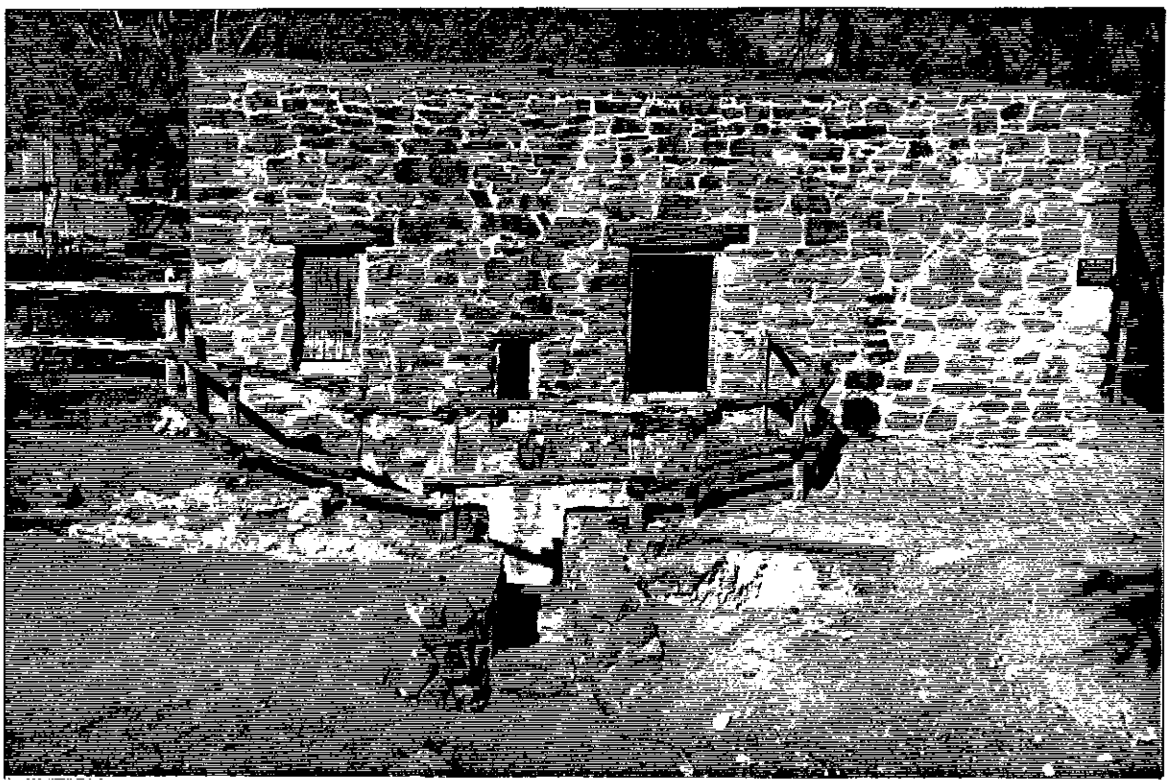

Figure 9. Area B, after excavation, looking north from the mission wall.

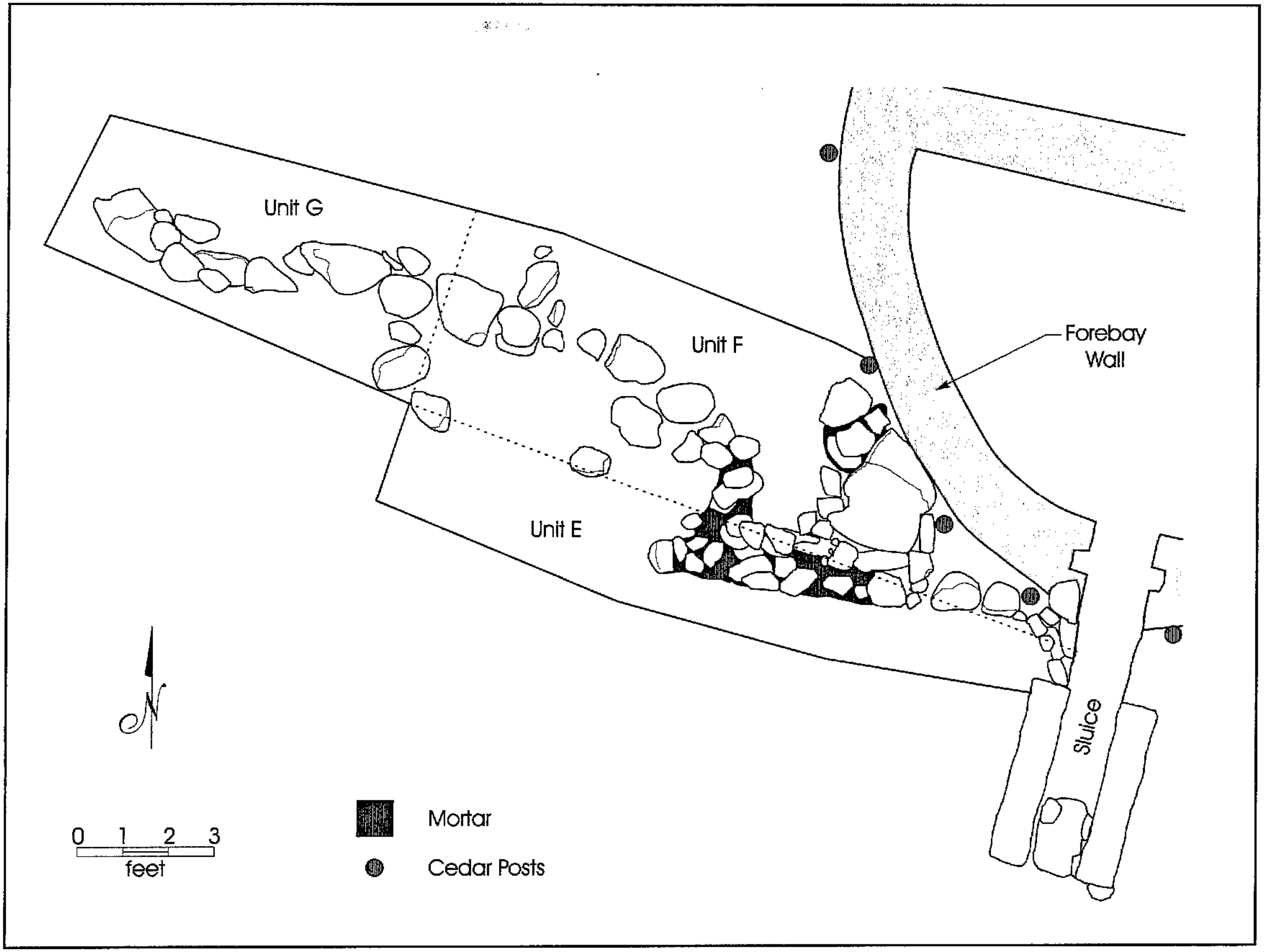

Figure 10. Units E, F, and G, Feature 3, plan view.

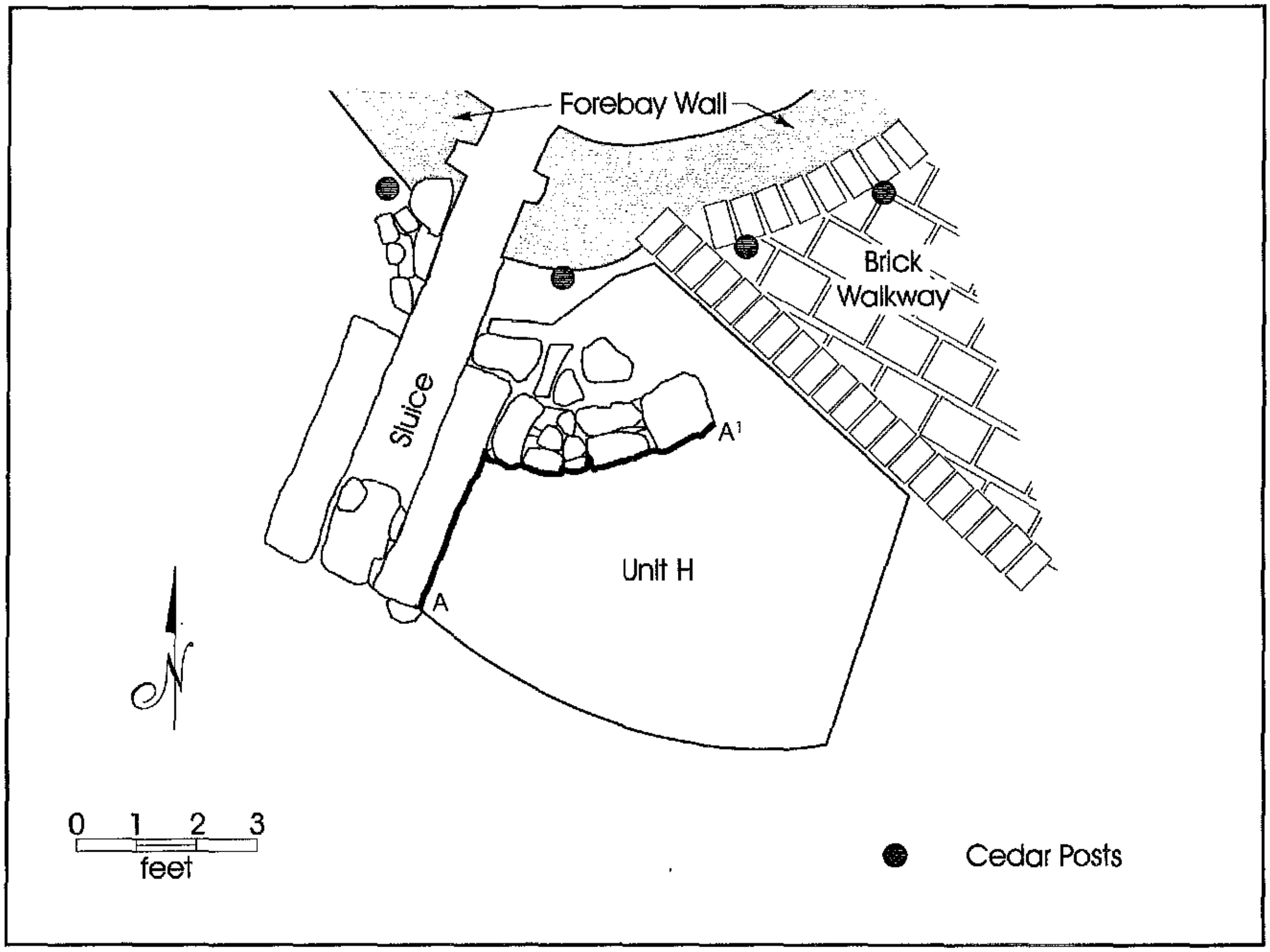

Figure 11. Unit H, Feature 5, plan view.

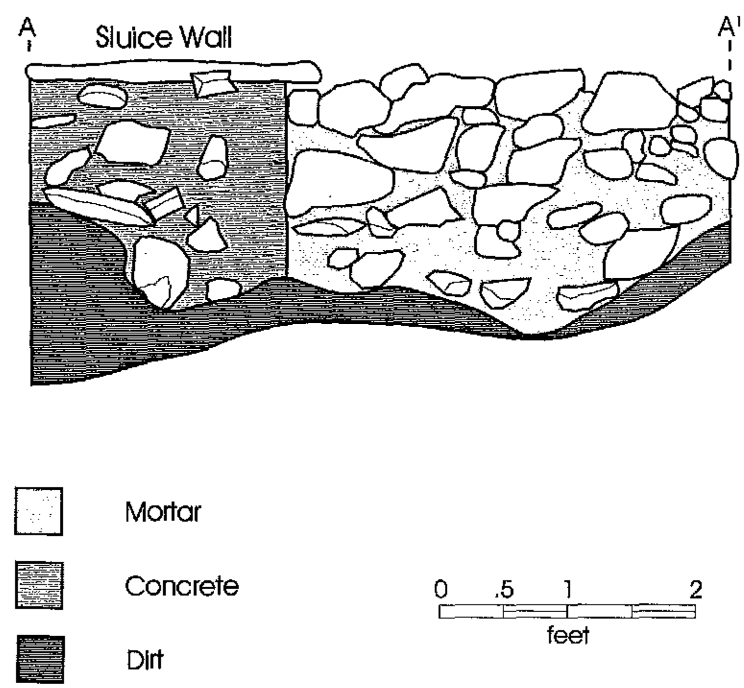

Figure 12. Unit H, Feature 5, profile.

Artifacts

Because of the level of disturbance and amount of fill removed from the area in the reconstruction of the gristmill in the 1930s, little can be learned from the artifacts recovered in our excavations. Most deposits are a mix of Colonial, post-Colonial, and modern items. Very little material was recovered in unmixed contexts from any of the areas. Only in the lower levels of Area A (Units A, B, and C) were discreet components observed.

In the upper levels of Area A artifact deposits were quite mixed. Spanish colonial Goliad and majolica sherds were found in direct association with post-Colonial decorated and undecorated whitewares, as well as with many items of modern origin. The modern items included personal items such as coins and fragments of plastic barrettes, a small plastic dove, and pieces of star-shaped colored foil. Other modern items included wire nails; screws; fence staples; small fragments of sewer pipe; a small fragment of ceramic tile; bottle caps; aluminum can pull tabs; plastic coated wire; metal wire; brown, green, and white bottle glass; and the base of a Christmas tree light bulb.

Only in the levels below the bottommost step of each stairway (18–42 inches below datum) do artifacts from before the twentieth century occur in an unmixed context (Tables 1 and 2). In addition to the ceramic artifacts recovered from Levels 4, 5, and 6 in Unit A and Levels 3 and 4 in Unit B (all within soil Zone 3), there were small quantities of hand-blown glass fragments, heavily weathered animal bone, and small unidentifiable fragments of metal. Unit A, Level 4 contained the base of a green hand-blown glass bottle, two thinner glass fragments of the same color and one fragment of bleached, hand-blown glass. The right carpal of a cow (*Bos taurus*) and four fragments of bone (29.76 g) from another, unidentified, large mammal were also recovered. The ceramics included one sherd of blue on white majolica, one sherd of lusterware, and seven sherds of undecorated whiteware.

Unit A, level 5 contained one cut nail and one fragment of bleached, hand-blown glass. Excavation also recovered the lower left molar of a cow (*Bos taurus*) and five small fragments of bone (8.7 g) from an unidentified large mammal. The phalanx of a horse or donkey (*Equus* sp.) was also recovered. Recovered ceramics included one sherd of blue on white majolica, one sherd of handpainted whiteware, and five sherds of undecorated whiteware.

Table 1. Ceramic Artifacts from Units A and B (all levels)

Category	Subcategory	Type	Count	% of Total
Unrefined				
	Unglazed	Goliad	9	18
	Lead-glaze		3	6
	Tin-glaze	Majolica	3	6
	Total		**15**	**31**
Refined				
	Whiteware			
		Undecorated	22	45
		Handpainted	3	6
		Sponge	1	2
		Transfer	1	2
		Edgeware	2	4
		Spatter	2	4
		Banded slip	2	4
		Luster	1	2
	Total		**34**	**69**
	Grand Total		**49**	**100**

Table 2. Ceramic Artifacts from Unmixed Contexts
(Unit A, levels 4, 5, and 6 and Unit B levels 3, 4, and, 5)

Category	Subcategory	Type	Count	% of Total
Unrefined				
	Lead-glaze		1	4.3
	Tin-glaze	Majolica	2	8.7
	Total		**3**	**13.0**
Refined				
	Whiteware			
		Undecorated	15	65.4
		Handpainted	2	8.7
		Sponge	1	4.3
		Transfer	1	4.3
		Luster	1	4.3
	Total		**20**	**86.6**
	Grand Total		**23**	**100**

Unit A, level 6 contained 28 fragments (90.14 g) of unidentified large mammal bone. No glass was recovered from this level. One sherd of sponge-decorated whiteware and one sherd of undecorated whiteware were excavated from this level.

Unit B, Level 3 contained one fragment of bleached, hand-blown glass and one fragment of green bottle glass similar to that recovered in Unit A, level 4. Two fragments of unidentifiable bone were also recovered from this level. This level contained one sherd of transfer-decorated whiteware and one sherd of undecorated whiteware.

Unit B, level 4 contained two fragments of hand-blown green bottle glass similar to those found in the previous level and five fragments of bleached, hand-blown glass. There was also a fragment of Spanish Colonial brick recovered. Faunal remains consisted of the left carpal and two lower molars of a cow and nine fragments (18.80 g) of unidentified large mammal bone (two of which were burned). Ceramics from this level included one sherd of lead-glazed earthenware, one sherd of handpainted whiteware, and one sherd of undecorated whiteware.

The only other areas with significant artifact recovery were Units E and H in Area B. However, as with the upper levels of Area A, artifacts from divergent time periods were found in close association. A one-quart paint can was excavated from 18 inches below datum in Unit E and one piece of undecorated whiteware was recovered at the same level. In Unit H an eight-inch piece of barbed wire, machine-made bottle glass, and a thin sandstone block covered in asphalt were found in close association with the medial fragment of a chert biface and the scapula of a large mammal.

Discussion

Much of the excavation in and around the gristmill involved the removal of the modern detritus deposited during the last 60 years. The cleaning of Areas D and E was a straightforward exercise and does not require more comment than has been presented above. The features excavated in Areas A and B present us with issues which are not so easily defined. We can present a number of hypotheses regarding the origin and function of these features; however, a conclusive explanation is not available given both the lack of archival data and the degree of disturbance associated with the excavation and reconstruction of the mill by Smith and Schuchard in the 1930s. While these problematic areas do not affect the proposed refurbishing of the mill, they do raise some interesting questions which should be addressed.

It was thought that the stairs identified in Area A were Colonial in origin; however, excavation and archival research strongly support a modern origin. Clark states as much, and also shows the stairs on a site map with the date "1933" in parentheses (1978:54, Figure 3). While it might be assumed that Clark found evidence for the origin of the stairs in Smith's field notes, this is never explicitly stated in Clark's report. Figure 3 shows the stairs as they looked during the 1930s reconstruction. It is not clear in the photo if the stairs are a reconstruction of a preexisting Colonial feature, or an entirely new construction built by Smith. The associations of the soils in the east wall of Area A (Units A, B, and C) with the stairs and the artifact content of these soils support the latter.

The profile of contiguous Units A, B, and C (Figure 5) shows the original position of the acequia. Zone 4 in the profile represents the surface of the acequia. This designation is supported by the artifact content of Units A, B, and C. Zone 1, immediately overlying the stairs, contained artifacts from both modern and post-Colonial eras. Below Zone 1, no modern artifacts were recovered in association with post-Colonial or Colonial ceramics. The soil in Zone 3 apparently represents fill accumulated in the acequia between the early nineteenth century and the 1930s. The absence of artifact mixing in Zone 3 leads us to believe that the cleaning of the acequia in the 1930s did not extend deep enough to expose the original limits of the ditch. Zones 3 and 4 also extend well underneath the south stairs, leading us to conclude that the stairs are not contemporaneous with the original acequia. Based on the artifactual and stratigraphic evidence then, the stairs were apparently constructed on what the WPA assumed was the edge of the acequia, when in reality the acequia was significantly deeper and somewhat to the south.

Features 3 and 5 are the most puzzling of the structures excavated at the gristmill. Several photographs give an excellent idea of the original physical relationship of these features. In Figure 4, Feature 5 (see also Figures 11 and 12) is the remaining portion of the east side of the semi-circular wall in the center of the photo. The concave side faces the forebay. Feature 3 can be seen running perpendicular to the west side of the semi-circular wall. There appears to be a matching wall opposite Feature 3. Comparing our excavation results with Figure 3, the amount of disturbance to this structure is readily apparent. Unfortunately, while showing the original relationship of the features, these photos give no clues to the construction date or function of the features, although the mortar was a soft lime usually associated with the eighteenth or first half of the nineteenth century. In the absence of any definitive answers, we offer several alternative hypotheses on the origin and function of the features.

The acequia may have been dammed below the mill, allowing the water to pool in the area directly in front of the forebay. In this scenario the wall would have served to stabilize the bank on the mill side of the pool. Support for this hypothesis comes from the elevations taken during our excavations.

Recorded elevations show that the sluice, as reconstructed in the 1930s, is 2.22 ft higher than the bottom of the acequia during the Spanish colonial era. If the present-day elevation of the sluice is the same as it was in the 1790s, it may indicate that dammed water was indeed pooled in front of the forebay. As the level of the pool rose, it would have reached a level high enough to flow into the forebay. This arrangement would have been an effective means of keeping water out of the mill when it was not in use (without having to use both a dam and a gate for the sluice), as well as keeping out sediment.

If the above assumptions about the elevation of the sluice are changed, then we are presented with a different set of hypotheses. Clark (1978:41) states that Smith added 3.5 ft to the forebay walls in his reconstruction. If this is the case, then the top of the forebay was considerably lower than the present elevation. In this case the wall may have served as a means to control the force of water as it entered the sluice and forebay. However, Figures 3 and 4 show no means for water to enter the forebay through the wall, and the relevant portion of the wall was destroyed in the reconstruction.

James Ivey (personal communication 1997) believes the wall may represent the remnants of a lime kiln originally built in the 1740s. Construction and subsequent use of the lime kilns created a large gully which was then incorporated into the mill, built in the 1780s. However, evidence from previous excavations (Fox et al. 1970:Figure 3) suggests the lime kilns were built into a preexisting gully and the construction and utilization of the lime kilns did not in itself create the gully. In addition, the identification of this wall as the remnant of the upper portion of a lime kiln still leaves no way for water to enter the forebay through the wall. As above, with the relevant portion of the wall removed in the reconstruction of the mill, we are left with little evidence to prove or disprove either hypothesis.

Water may have entered the forebay from a sluice coming in from more of an oblique angle to the acequia, rather than the perpendicular direction in the 1930s reconstruction. The wall may be the remnant of an east-to-west-oriented sluice. If the water did enter from a more westerly direction then a Colonial origin for Features 3 and 5 is better supported, but the function of the semi-circular wall is still unclear.

There is some disagreement as to the possibility of a dam in the vicinity of the gristmill. The 1794 inventory of the mission states "*ytem un molino para moler trigo en corriente con la falta de una cortina,*" which translates to "a watermill for grinding wheat that is operated by a running stream but no dam" (Habig et al. 1983:131). Clark (1978:40–41), however translates the same passage as "a water-powered mill to grind wheat, lacking a curtain." Clark believes that the "curtain" is a reference to the open north side of the vaulted turbine housing. *Cortina* can refer to a curtain, shade, or screen, but also may refer to "part of a wall or rampart which lies between two bastions" (Velazquez et al. 1943:182). Which interpretation is correct is still open to debate.

There are several possible functions for Features 3 and 5 that point to a post-Colonial origin. The first of these may involve post-Colonial water rights. The wall may have served to prevent water from flowing through the unused mill and out the mill race into the fields between the mission and the San Antonio River. However, we have found no support for this hypothesis in the post-Colonial archives.

The wall also may have been erected to keep livestock from falling into the deep forebay or the lower parts of the mill. As it is likely that parts of the mill were still visible in the mid-nineteenth century (see the above discussion of Father Hoermann), it is possible that injury to livestock may have been a concern of nineteenth-century farmers and ranchers.

Finally, there is the possibility that the wall was built by WPA work crews during the reconstruction as a means of keeping debris out of the forebay and mill while excavations were taking place. Without access to Smith's field notes this hypothesis cannot be supported.

Presented with so many hypotheses, all lacking supporting archival or archaeological evidence, it is inadvisable to make any definitive statements about the origin or function of Features 3 and 5. Further excavation is unlikely to answer all but one of the alternative hypotheses: close monitoring of construction during the proposed refurbishment of the gristmill may reveal information on the location of the original sluice.

Conclusions and Recommendations

The profile of Area A shows the limits of the original acequia to be deeper than was assumed by the WPA restoration crew. Because no significant archaeological deposits were found in Area A, continued archaeological work, other than monitoring of future construction, is not recommended.

Based on the results of our excavation, the stone stairways on the north and south banks of the ditch are thought not to be Colonial in origin. All evidence points to the construction of the steps taking place during the reconstruction of the mill in the 1930s.

Cleaning and excavation of the sluice leading from the acequia into the forebay in Area B found no significant archaeological features within the limits of the sluice itself. The remnants of the slide gate constructed at the juncture of the sluice and the forebay in the 1930s was noted during our investigations. The function or origin of the walls adjacent to the east and west sides of the sluice (Features 3 and 5) could not be determined based on the available information. While, as noted above, these features may have had some function in the operation of the mill during the Spanish colonial occupation, it is unlikely that the proposed construction will have any affect on the remaining structures. However, because of the lack of clarity surrounding the origin of these features and their relationship to the acequia and the gristmill, monitoring of future construction in this area is recommended.

Investigations around the tanning vat/sugar mill (Area E) did not uncover evidence of additional structures associated with this feature. The area was heavily disturbed during the WPA excavations, so it is unlikely that intact deposits are still extant.

Cleaning of the vaulted turbine housing (Area D) did reveal that the original flagstone floor and a badly rotted bridge tree underneath the mill turbine were still in situ. Monitoring of any construction involving disturbance of the flagstone floor is recommended. Intact deposits associated with the operation of the lime kilns that pre-date the gristmill may underlie the flagstone floor.

Excavation of Area F at the north end of the mill race showed that the sandstone lining did end just north of the sandstone wall which blocks the north end of the mill race. In addition, based on comparisons of photographs from ca. 1930 with the modern landscape, the soils in this area consist entirely of fill deposited since the 1930s. This area does not merit further investigation.

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List of Figures and Tables

Figures

Tables

APPENDIX O

GRIST MILL-MISSION SAN JOSE

Prepared for

Los Compadres De San Antonio Missions National Historical Park

for use by the National Park Service

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

Overby Descamps Engineers, Inc.

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

TABLE OF CONTENTS

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

I. INTRODUCTION

The National Park Service, supported by Los Compadres, is preparing to return the Grist Mill at Mission San Jose to operation. Overby Descamps Engineers, Inc. completed this preliminary hydraulic and hydrologic report for the purpose of determining the feasibility of circulating water to the Grist Mill. This report is intended to serve as the basis for the engineering plans and subsequent construction.

Mission San Jose is located near the intersection of Roosevelt Ave. and Mission Road. The mill is located on the north side of the mission, outside of the mission walls (Figure 1). Figure 2 is a photograph of the mill as it exists today.

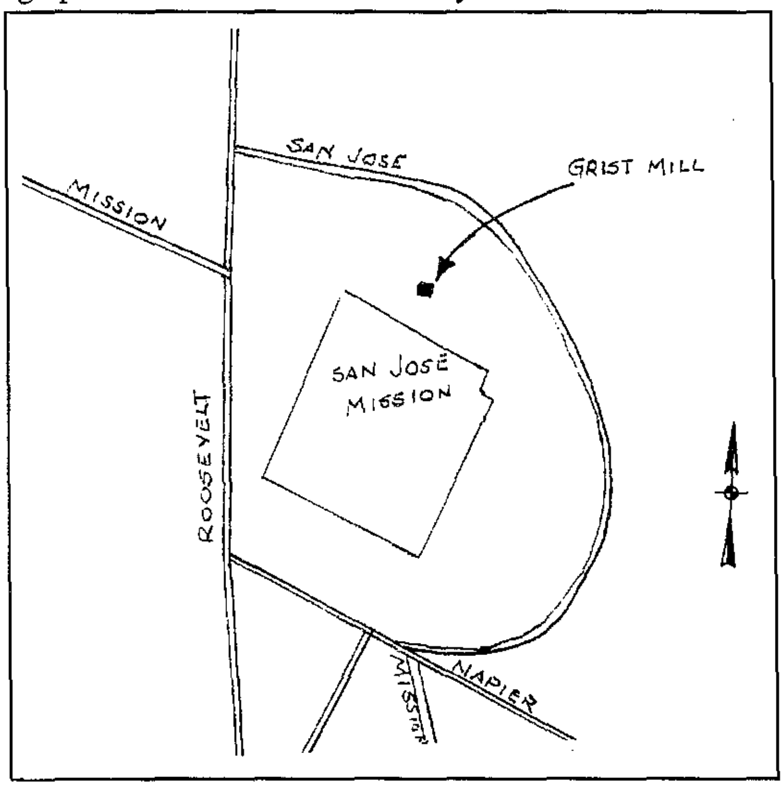

Figure 1. Location Map.

The date of construction of the Grist Mill is unknown but falls somewhere between the construction of the mission, begun on 19 March 1768[1] and the recording of a mill at Mission San Jose in the inventories of 23 July 1794.[2] According to the Historic Structures Report "The mill disappeared from view and from records after about 1825".[3] The mill was uncovered by a Works Project Administration (WPA) excavation in 1933. All that remained of the original mill was the turbine room and reservoir.

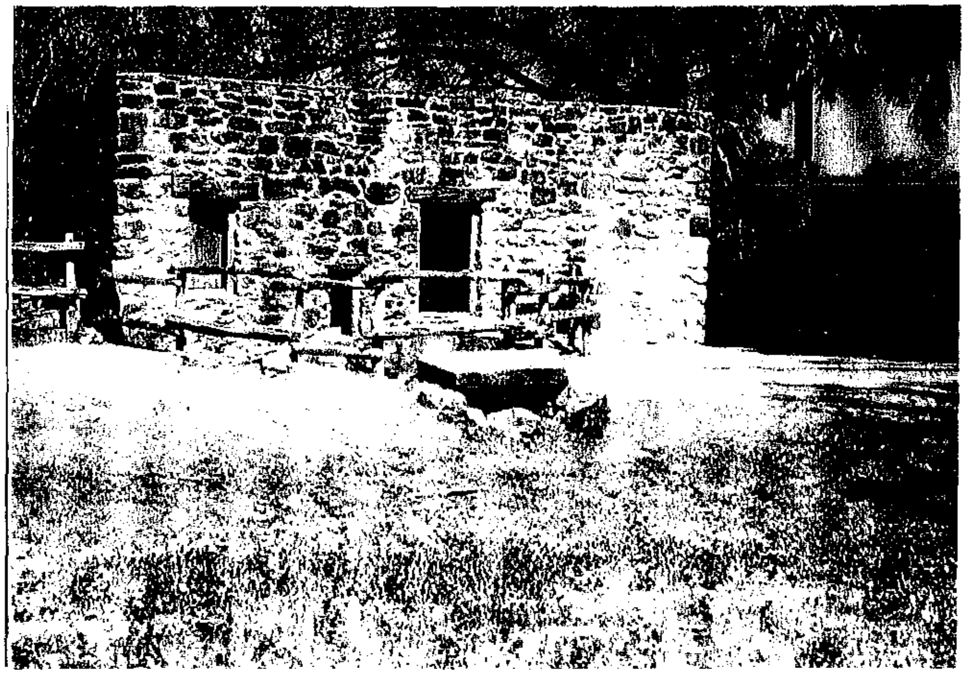

Figure 2. Mission San Jose Grist Mill.

The upper portion of the mill was reconstructed in 1936-37.[4] Ernst Schuchard, an engineer with Pioneer Flour Mills was deeply involved in the restoration. Schuchard conducted extensive research into mills[5] including visiting a site outside of Mexico City and consulting the Museum of Science and Industry in Jackson Park, Chicago. At the same time the upper portion of the mill was reconstructed, the turbine, shaft, and sluice gates were also returned to an

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[1] San Jose Grist Mill, Park Staff-San Antonio Missions National Historical Park, January 1993, page 8.

[2] Ibid, page 7.

[3] Ivey and Thurber, Historic Structures Report, Part II, 6:336 from San Jose Grist Mill, Park Staff-San Antonio Missions National Historical Park, January 1993, page 8.

[4] San Jose Grist Mill, Park Staff-San Antonio Missions National Historical Park, January 1993, page 6.

[5] Ibid, page 10.

operating condition.

The information gathered by the National Park Service includes not only this hydraulic and hydrologic analysis, but also an archaeological excavation of significant areas around the mill. A detailed archaeological investigation was completed to determine the extent of the historic structure. According to the archaeological report, few structural remains date to the colonial period in the vicinity of the mill. The arched turbine room and reservoir are the primary structures. The mill room and mill race are of WPA construction. The brick walks around the Grist Mill were added within the last 30 years.

II. SCOPE OF WORK

The scope of this project includes investigation of the following areas:

Hydraulic and Hydrologic Elements
Mill Operation
Drainage and Maintenance
Water Quality protection
Visitor Protection Requirements

Specific parameters regarding the operation and appearance of the system defined in cooperation with the National Park Service include:

Continuously running Acequia except when shut down for maintenance.
Supply enough water to the mill so there is sufficient power to grind wheat.
Remain historically true to the WPA reconstruction.
Design a system that is low maintenance.
Make provisions for storm water inflows.
Avoid conflicts with known historic features.

In the initial stage of this investigation, a topographic survey is to be completed. This topographic survey will form the basis of the engineering design.

III. SUMMARY OF FINDINGS

Hydraulic and Hydrologic Elements

Overview

The completed topographic survey of the mill and surroundings is shown in Exhibit A. What remains of the Acequia Madre begins at the parking lot of the service drive. It is currently grass lined and has a slope of 0.48% up to a small stone drain (Figure 3). Beyond the stone drain approximately 95 feet, the channel makes a 90 degree turn and runs north. After 120 feet the channel comes to a fence for a storage yard. At this point the channel ceases to exist.

Figure 3. Acequia Madre from Fence at Parking Lot to Grist Mill.

Immediately before the small stone drain is a rock lined channel, 2 feet wide and perpendicular to the Acequia Madre, that connects the Acequia Madre with a reservoir (forebay) adjoining the mill (Figure 4). At the base of this reservoir is a flume that discharges water from the reservoir onto the turbine (Figure 5). Water flows from the turbine room into the mill race. The mill race is rock lined and has a rock wall at the end with an 8" clay pipe at the bottom.

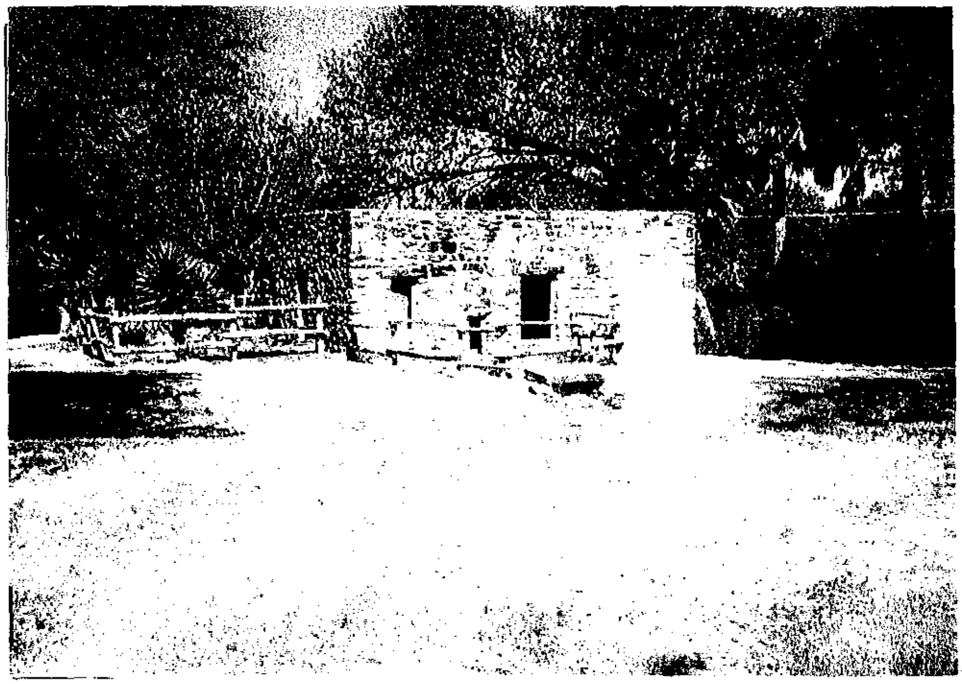

Figure 4. Channel from Acequia Madre to Reservoir.

Figure 5. Turbine Room.

SYSTEM REQUIREMENTS

Overby Descamps Engineers recommends extending the mill race from the existing termination point to beyond the wood fence that separates the mill area from the amphitheater (See Exhibit A, Topographic Survey). This will give the visual image of water running from the mill off to the fields. Water for the mill will be introduced upstream of the mill and collected or disposed of at the end of the mill race.

Water to fill the Acequia Madre and replace losses from evaporation and infiltration will come from the San Antonio Water System. The San Antonio Water System pumps water for distribution from the Edwards Aquifer. The Edwards Aquifer is the sole source of water for the San Antonio Region. While colonial water use techniques likely did not focus on conservation, present day circumstances emphasize limited use. Conservation of this resource is essential. This includes reducing the water loss through infiltration.

According to the Soil Survey of Bexar County Texas published by the United States Department of Agriculture, the soil in the area of the Grist Mill are of the Patrick Series. This series has a "granular structure" with "medium internal drainage" and moderate permeability. Because of the granular structure (also observed during the archaeological excavations), even when saturated the soil will not "hold" water. Therefore, the granular structure should be "bound" together by means of cement stabilization.

Cement stabilization will reduce water loss by decreasing permeability. The top 6" of soil will be removed and the next 6" to 8" will be cement stabilized. After stabilization, the top 6" will be replaced and seeded. As it is possible for the top soil to wash off, it should be observed that the appearance of the cement stabilized soil likely will not be objectionable. In order to determine the percent cement needed, a soil-cement curve should be created during design.

Mill Operation

In order for the mill to operate, the turbine, shaft, and sluice gates will need to be replaced. A controlled flow to the turbine will be necessary along with a steady flow of water to the reservoir. Allowing the water to pool in the Acequia Madre will be the best method for maintaining a constant surface level in the reservoir.

After the reconstruction of the mill in 1937 several promotional photographs were taken of the mill. Although these photographs give the impression of a mill in operation, most likely the mill was not operated or used to grind wheat or corn into flour. The grinding stones themselves had a metal band and facing with a track most likely for a bearing. Although the stones appear hard enough to be used for grinding[6], the face of each stone would need to be dressed for use.

The Park Service has decided to operate the mill based on the configuration that existed after the WPA reconstruction with the ability to grind wheat. The power necessary to grind wheat determines the flows in the Acequia Madre and outflow lines. Various approaches can be used to determine the flow requirements. All of these methods involve some type of assumption. While these assumptions may lead to a reasonable flow that "feels" correct, the best method for determining the flow required is to do a controlled test of the turbine after the rehabilitation of the turbine, turbine shaft, sluice gates, and mill stones.

Drainage and Maintenance

While there is no water currently flowing in the Acequia Madre, it serves to remove storm water runoff from part of the mission. Some storm water runoff can be used to replace losses from evaporation and infiltration. The remaining stormwater runoff will follow the original flow pattern away from the mission. The return pump used to bring water back to the start of the Acequia Madre will also need to be connected to either the sanitary sewer system or storm water runoff system so the Acequia Madre can be drained for repairs.

Water Quality Protection

Because the Acequia Madre doubles as a storm water runoff channel grates and filters for trash and sediment removal will be necessary. Also, undesirable plants and excessive growth along the Acequia Madre will need to be monitored. Decaying plant matter will need to be removed to avoid the Acequia from becoming a fetid pool.

Visitor Protection Requirements

The general public must be protected from certain elements of the system. Protection and barriers, however, are not always attractive or historically accurate. The reservoir because of the depth and natural attraction should have some type of barrier to keep people from falling in. Currently a cedar post fence surround the reservoir. The spacing of the rails is now too wide to prevent children from gaining access.

The pumps and return points will be away from the public eye and will therefore be easier to protect because the fencing will not need to be aesthetically pleasing. Protection of the Acequia itself will be particularly difficult, especially on a hot day. A low wall or unique plantings between the walk and the Acequia Madre may be sufficient to prompt people to keep

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[6] According to David Hartsfield of AGRA Earth and Environmental, Inc.

their distance.

Photographs of the Grist Mill after the reconstruction in the 1930's show two metal gates that close to prevent access to the turbine room while allowing the turbine to be viewed. The posts that served as the hinges for the doors are still present in the wall of the Grist Mill. Overby Descamps Engineers recommends that these gates be restored in order to prevent injury to a curious spectator by the moving turbine and to protect the turbine from vandalism. In addition to the turbine, spectator restraints will be needed in the area of the mill stone operation.

Utilities

Three utilities are needed for the design of a recirculating water system: water, wastewater, and electricity. Along the west side of Roosevelt Avenue is a 12-inch water main from the south side of Mission Road to the south. A four-inch water line runs from the 12-inch main at Mission Road to the mission grounds. Along the south side of the street named San Jose Drive to the north of Mission San Jose is three phase electrical power. Also at the center line of this street is a sanitary sewer line.

Options

Three options were investigated for the circulation of water to the mill and are summarized on the following pages. The cost estimate provided with each is intended only to be a relative comparison of the options and not a construction cost estimate. Several items of identical cost to each are not included. Also not included in the cost estimate are operation and maintenance expenses. These options were presented to the National Park Service for discussion and direction.

Each option was initially presented as systems that would be operated intermittently with storage of the water in the system. A continuously circulating system was subsequently directed.

Option 1 is a complete system option. Water flows from the fence at the service drive to the dressing room for the amphitheater. This option is shown in Exhibit C. Option 2 maintains the Acequia Madre only as a pool before the reservoir. Water is recirculated from the end of the mill race to the Acequia Madre. This option is shown in Exhibit D. Option 3 introduces water from a San Antonio Water System main at the fence by the service drive and disposes of water at the end from the mill race to the sanitary sewer system. This option is shown in Exhibit E.

OPTION 1: FILL ACEQUIA MADRE FROM SERVICE DRIVE TO DRESSING ROOM

SUMMARY

Water from a storage tank located in the amphitheater area is introduced to the Acequia Madre at the wooden fence separating the mill area from the service drive. The Acequia Madre flows from the service drive to behind the dressing room. Water to power the mill is diverted from the water flowing past in the Acequia Madre. Water in the mill race flows into the storage tank and is recirculated from there. Water flowing behind the changing room is returned by gravity flow to the storage tank.

ADVANTAGES

1. Appearance of whole system in operation
2. Can regulate flows to mill

DISADVANTAGES

1. Large system components
2. Increased maintenance costs
3. Fencing and protection necessary
4. Must provide storm water release
5. Large water use and storage requirements

APPROXIMATE CONSTRUCTION COST:

ITEM	APPROXIMATE COST
1. Pipe from Roosevelt Ave. water line to Acequia Madre	$ 3,700
2. Headwater structure at start of Acequia Madre	5,000
3. Grading of Acequia Madre	400
4. Cement Stabilization for Acequia Madre	16,900
5. Pipe from end of mill race to behind dressing room	7,500
6. Stilling basin	2,800
7. Storage tank	11,000
8. Pump - 1530 GPM	10,700
9. Pipe from mill race to service drive	6,800
TOTAL	$64,800

OPTION 2 FILL ACEQUIA MADRE FROM WOOD BRIDGE TO STONE DRAIN

The Acequia Madre is filled with water from the wood bridge to the stone drain. Water is circulated to power the mill only. A storage tank is placed near the end of the mill race.

ADVANTAGES

1. Significant portion of Acequia Madre in operation.
2. Smaller storage tank and stilling basin.
3. Shorter pipe lengths.
4. Smaller pump sizes.
5. Reduced water and electric requirements

DISADVANTAGES

1. Entire Acequia Madre not in operation

APPROXIMATE CONSTRUCTION COST:

ITEM	APPROXIMATE COST
1. Pipe from Roosevelt Ave water line to Acequia Madre	$ 4,600
2. Headwater structure at start of Acequia Madre	2,000
3. Grading of Acequia Madre	100
4. Cement Stabilization of Acequia Madre	4,900
5. Wood dam	600
6. Pipe from end of mill race to storage tank	800
7. Stilling basin at outlet	1,500
8. Storage tank	6,000
9. Pump - 765 GPM	6,200
10. Pipe from storage tank to headwater structure	2,900
TOTAL	$29,600

OPTION 3: NON-RECIRCULATING SYSTEM

SUMMARY

The non-recirculating system introduces water to the Acequia Madre at the wooden fence separating the mill area from the service drive. The water comes directly from the SAWS water line on Roosevelt Ave. Water flows through the Acequia Madre to the reservoir, through the mill, and out the mill race. At the end of the mill race is a drain that discharges water to the sanitary sewer system.

ADVANTAGES

1. No storage.
2. Reduced maintenance costs.

DISADVANTAGES

1. Large amount of water purchased each time the mill is operated.
2. Sewer impact fees will be necessary.
3. Appearance of insensitivity in a water scarce area to waste any volume of water that could be recirculated or reused.
4. Lift pump needed at end of mill race.

APPROXIMATE CONSTRUCTION COST:

ITEM	APPROXIMATE COST
1. Pipe from Roosevelt Ave water line to Acequia Madre	$ 5,300
2. Headwater structure at start of Acequia Madre	2,000
3. Grading of Acequia Madre	200
4. Cement Stabilization for Acequia Madre	9,000
5. Wood Dam	300
6. Outlet structure at end of mill race	2,500
7. Pump	6,200
8. Pipe from end of mill race to sanitary sewer line	4,200
TOTAL	$29,700

IV. RECOMMENDATIONS

Option Recommended

After discussion with and within the National Park Service, Option 1 is recommended. A schematic of this option is shown in Exhibit C. This option was selected for implementation because it gives the appearance of the entire Acequia Madre in operation. In addition, the water level in the reservoir can be regulated. The return pipe passes by the amphitheater dressing room, which according to the archaeological studies, is not an archaeologically sensitive area.

Operational Considerations

Water will be pumped to a headwater structure and introduced to the system north of the board fence that separates the Grist Mill area from the service drive area. Water will be most turbulent within the headwater structure. Once in the Acequia Madre, the water should not cause erosion. Although the Acequia Madre currently flows to the south, some grading will be required to establish appropriate elevations.

The initial hydraulic requirements were estimated using the work of Ernst Schuchard. Exhibit F shows the hydraulic calculations used to estimate the pipe and pump sizes and the flows needed in the Acequia Madre. For this system a 1530 gallon per minute pump with a four-inch return line will be needed. The flow in the Acequia Madre will be 3.5 cubic feet per second prior to the channel for the reservoir. After the reservoir, the flow in the Acequia will drop to 1.7 cubic feet per second when the mill is in operation. This assumes that the flow into the flume can be regulated by a sluice gate. These are preliminary calculations that must be refined following a controlled test of the power requirements for the restored turbine.

The flow needed is determined by the revolutions of the millstone. The number of revolutions per minute determine how much wheat can be milled. Since the grinding will be done for demonstration, the number of revolutions per minute will be lower than that needed for production. A lower operating speed will also reduce the long term maintenance requirements. The ideal speed of the grinding wheel and turbine, will be determined during the controlled test.

Storm water runoff, beyond what is needed to replace losses, will follow the original path. Losses from evaporation and infiltration during dry periods will be replaced by the water line from the San Antonio Water System water main. The pump will be connected to either the sanitary sewer system or the storm sewer system to allow draining of the Acequia Madre for maintenance.

The amount of water in the system is approximately 50,000 gallons. This water will need to be filtered and possibly even treated with chlorination to prevent unwanted bacterial growth in the water. Further, storm water run off tends to collect trash which will need to be screened from the system.

Cost Items

The Approximate Construction Cost given with the three options were prepared to give on equal comparison. The Approximate Construction Cost given below includes more detail on the items and cost.

APPROXIMATE CONSTRUCTION COST:

ITEM	APPROXIMATE COST
1. 1" pipe from Roosevelt Ave. water line to Acequia Madre	$ 3,700
2. Headwater structure at start of Acequia Madre	5,000
3. Grading of Acequia Madre	400
4. Cement Stabilization for Acequia Madre	16,900
5. 15" pipe from behind dressing room to end of mill race	7,500
6. Stilling basin	2,800
7. 10'x15'x10' Storage tank	11,000
8. Pump - 1530 GPM	10,700
9. 4" pipe from mill race to service drive	6,800
10. Electrical service to pumps	30,000
11. Water Treatment	1,000
SUBTOTAL	$95,800
Contingency 25%	23,950
TOTAL	$119,750

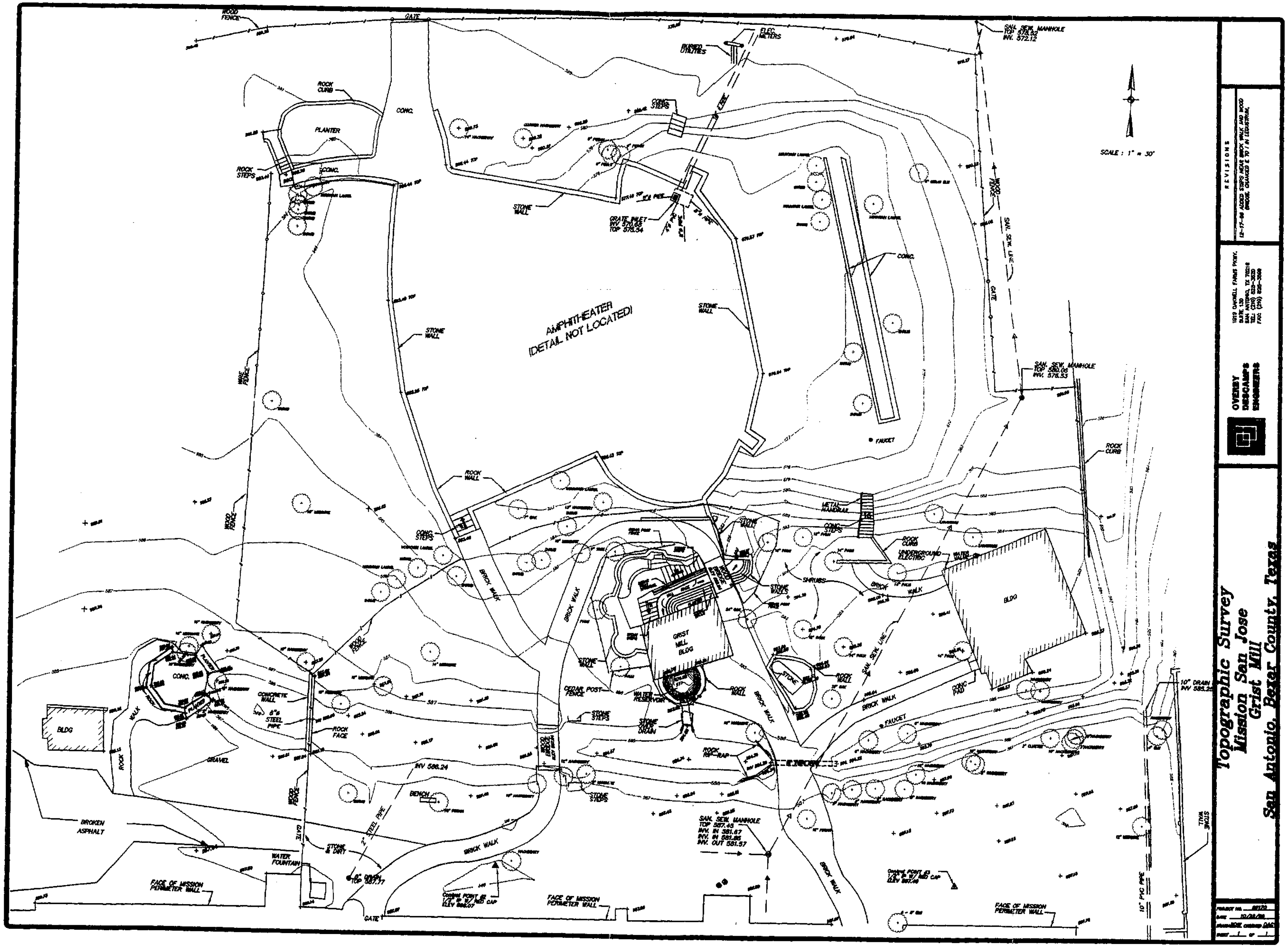
In addition to the approximate construction cost estimate provided above other general costs will be incurred. The final design of the hydraulic system will minimize, within the constraints of the system, the long term operating and maintenance expenses. Preservation of the water cleanliness and integrity of the Acequia Madre bottom will need consistant attention. The pumps will need to be serviced periodically. Operating costs will include water and electricity.

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT A

TOPOGRAPHIC SURVEY

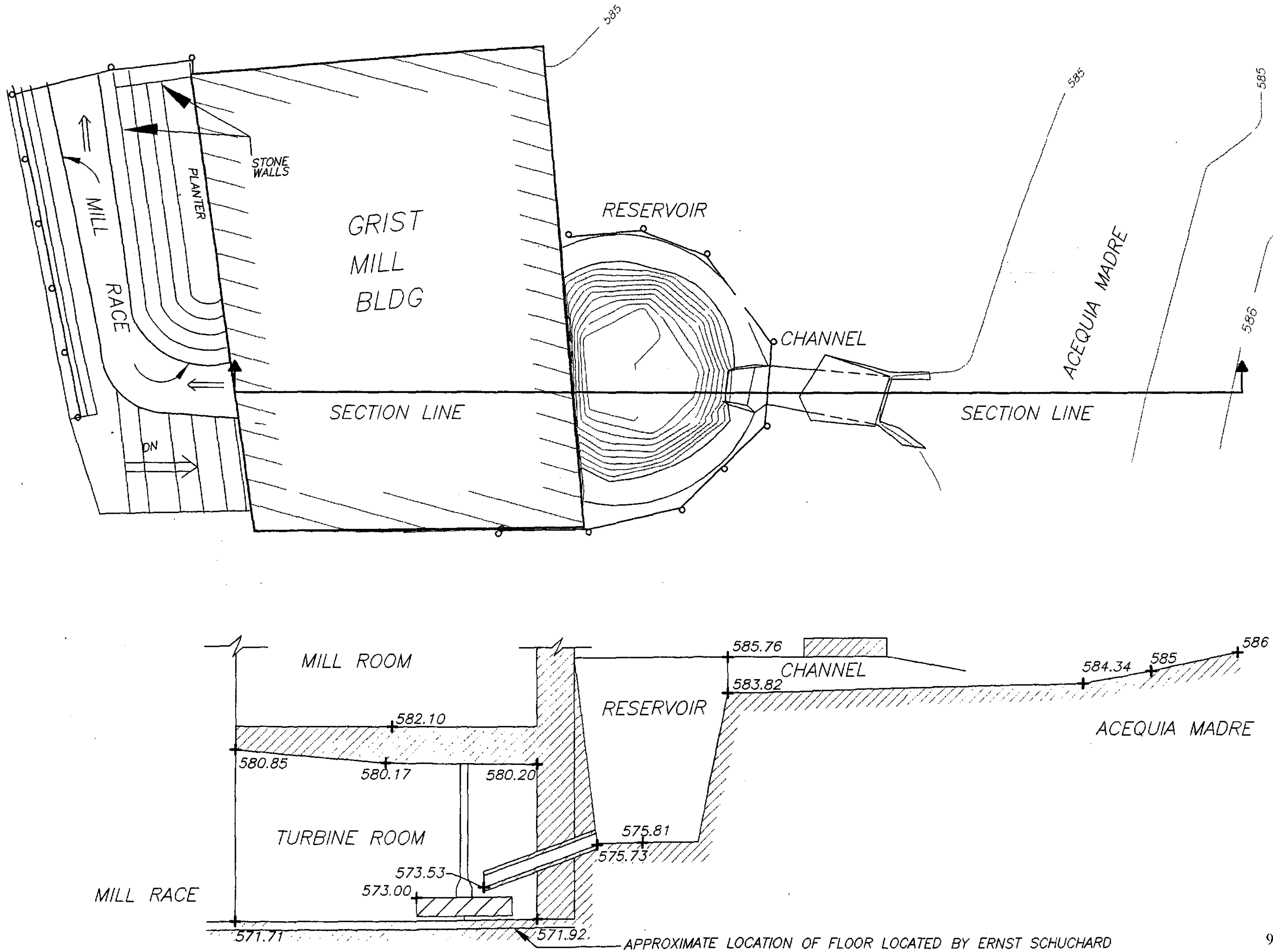

Topographic Survey
Mission San Jose
Grist Mill
San Antonio, Bexar County, Texas
OVERBY DESCAMPS ENGINEERS
REVISIONS
SCALE : 1" = 30'
AMPHITHEATER
(DETAIL NOT LOCATED)
GRIST MILL BLDG
BLDG
PLANTER
ROCK CURB
ROCK STEPS
CONC.
STONE WALL
ROCK WALL
CONC. STEPS
METAL HANDRAIL
BRICK WALK
WOOD FENCE
GATE
ELEC. METERS
BURIED UTILITIES
GRATE INLET
SAN. SEW. MANHOLE
TOP 578.92
INV. 572.12
SAN. SEW. MANHOLE
TOP 580.06
INV. 575.53
SAN. SEW. LINE
FAUCET
UNDERGROUND ELECTRIC
SHRUBS
STONE STEPS
STONE DRAIN
WATER RESERVOIR
CEDAR POST FENCE
CONCRETE WALL
ROCK FACE
GRAVEL
BROKEN ASPHALT
INV 586.24
BENCH
STONE & DIRT
WATER FOUNTAIN
ROCK RIP-RAP
CONC PAD
FACE OF MISSION PERIMETER WALL
SAN. SEW. MANHOLE
TOP 587.45
INV. IN 581.67
INV. IN 581.86
INV. OUT 581.57
10" DRAIN
10" PVC PIPE
2" STEEL PIPE
6" STEEL PIPE

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT B

SECTION FROM ACEQUIA MADRE TO MILL RACE



REVISIONS

OVERBY DESCAMPS ENGINEERS

1919 OAKWELL FARMS PKWY.
SUITE 130
SAN ANTONIO, TX 78218
TEL: (210) 828-3520
FAX: (210) 828-3599

SAN JOSE MISSION GRIST MILL

ELEVATIONS FROM ACEQUIA MADRE TO MILL RACE

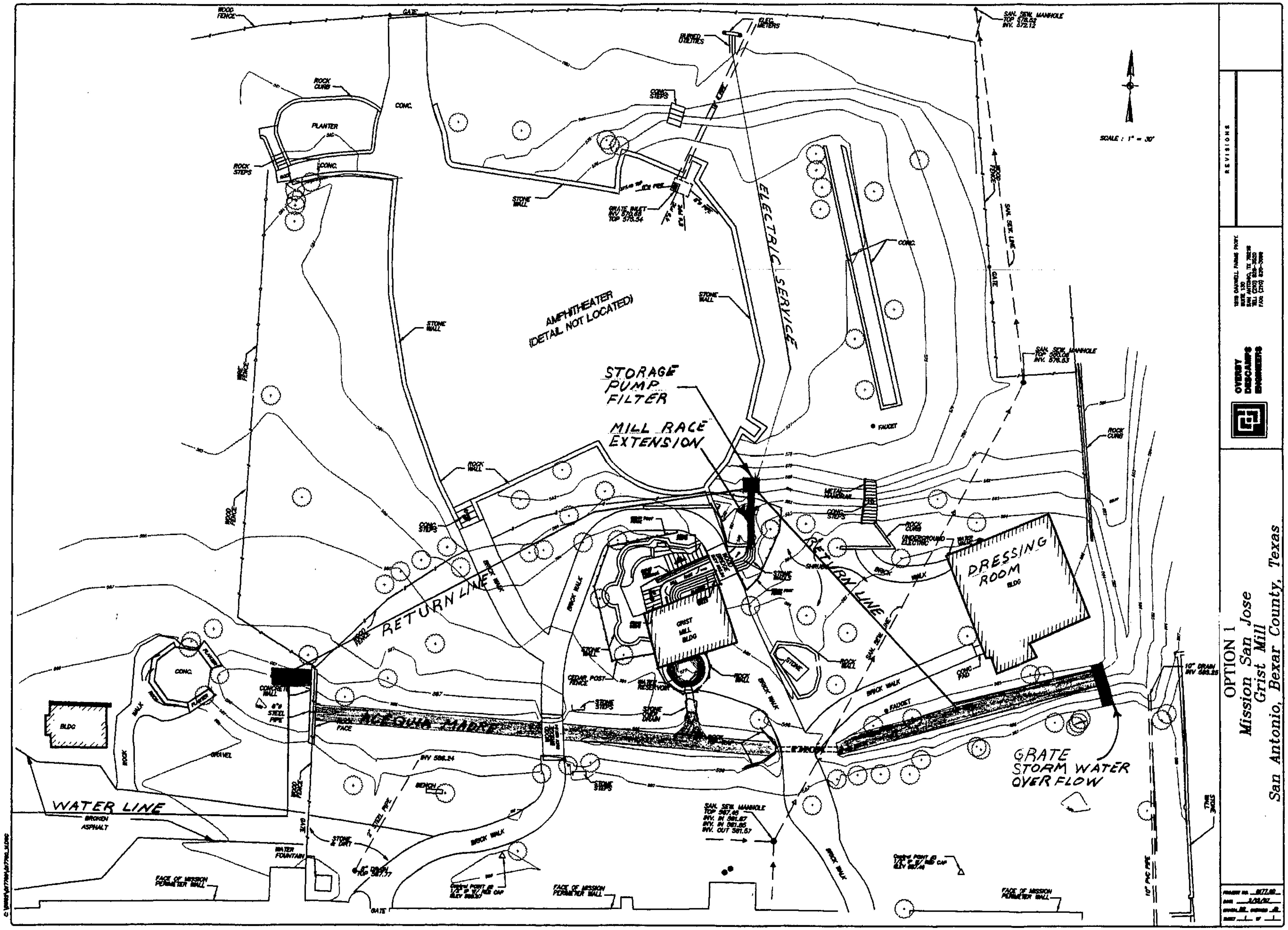
PROJECT NO. 0177.00
DATE 1/8/97
DRAWN DR CHECKED ____
SHEET ____ OF ____

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT C

OPTION 1

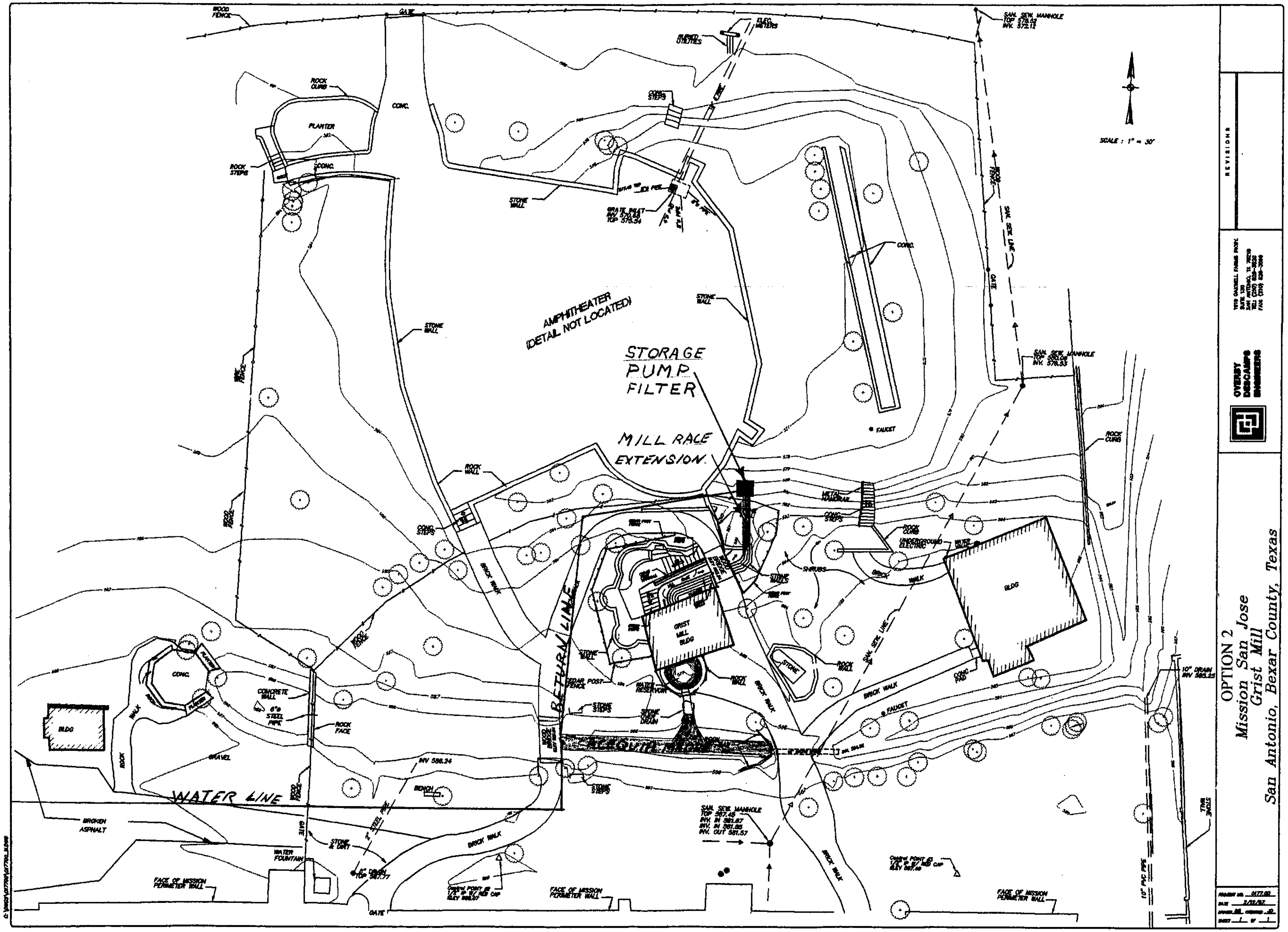

AMPHITHEATER
(DETAIL NOT LOCATED)
ELECTRIC SERVICE
STORAGE
PUMP
FILTER
MILL RACE
EXTENSION
RETURN LINE
DRESSING
ROOM
GRIST
MILL
BLDG
ACEQUIA MADRE
GRATE
STORM WATER
OVERFLOW
WATER LINE
PLANTER
STONE WALL
BRICK WALK
SCALE : 1" = 30'
OPTION 1
Mission San Jose
Grist Mill
San Antonio, Bexar County, Texas
OVERBY DESCAMPS ENGINEERS
REVISIONS

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT D

OPTION 2

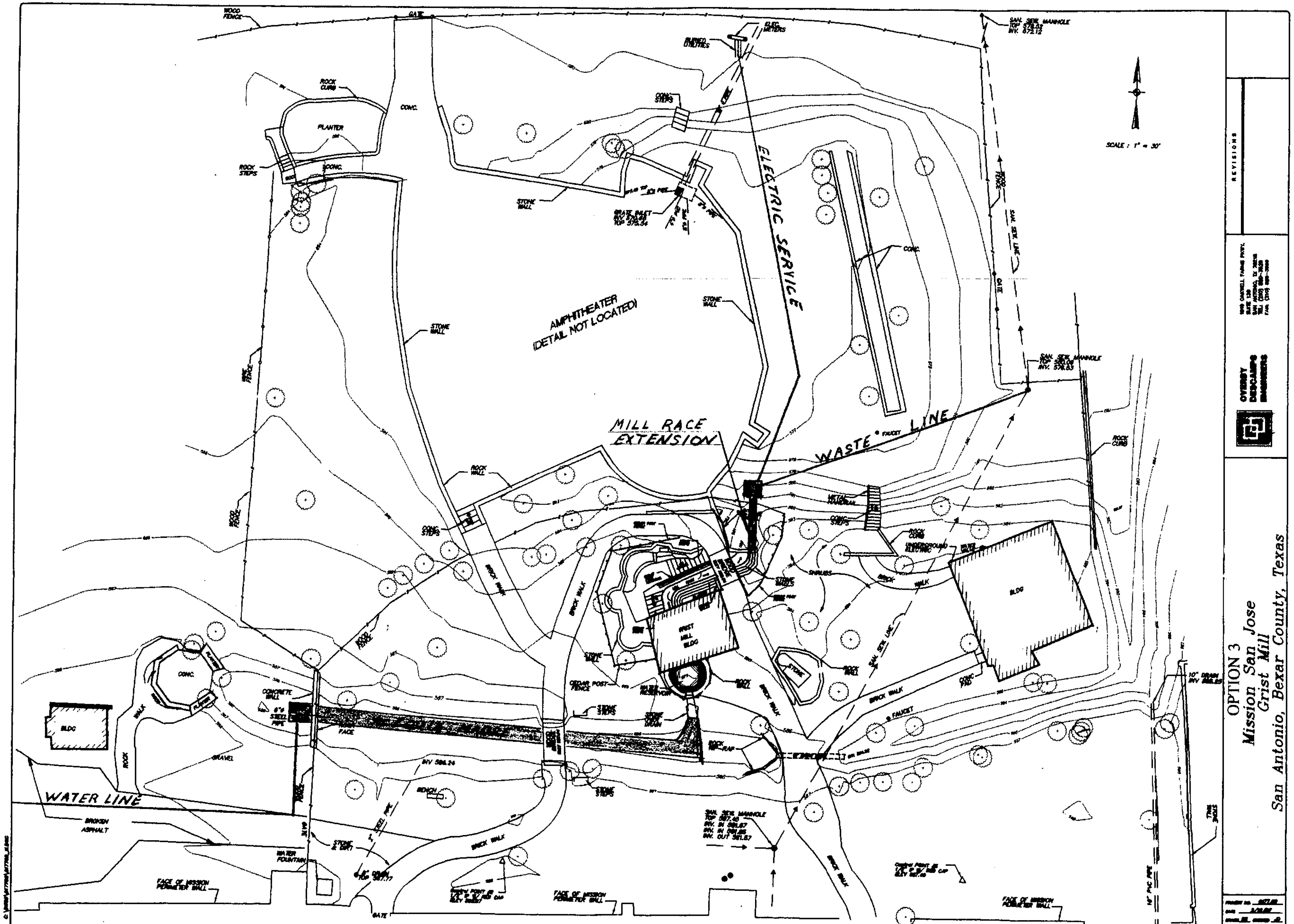

AMPHITHEATER
(DETAIL NOT LOCATED)
STORAGE
PUMP
FILTER
MILL RACE
EXTENSION
RETURN LINE
WATER LINE
GRIST
MILL
BLDG
BLDG
SCALE : 1" = 30'
OPTION 2
Mission San Jose
Grist Mill
San Antonio, Bexar County, Texas

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT E

OPTION 3



WOOD FENCE
GATE
SAN. SEW. MANHOLE
ROCK CURB
PLANTER
CONC.
ROCK STEPS
BURIED UTILITIES
ELEC. METERS
CONC. STEPS
STONE WALL
GRATE INLET
ELECTRIC SERVICE
AMPHITHEATER
(DETAIL NOT LOCATED)
SCALE : 1" = 30'
SAN. SEW. LINE
MILL RACE
EXTENSION
WASTE LINE
ROCK WALL
BRICK WALK
GRIST MILL BLDG
BLDG
CONC.
WATER LINE
BROKEN ASPHALT
WATER FOUNTAIN
FACE OF MISSION PERIMETER WALL
STONE STEPS
BENCH
ROCK RIP-RAP
REVISIONS
OVERBY DESCAMPS ENGINEERS
OPTION 3
Mission San Jose
Grist Mill
San Antonio, Bexar County, Texas

GRIST MILL-MISSION SAN JOSE

PRELIMINARY HYDRAULIC AND HYDROLOGIC REPORT

EXHIBIT F

Calculations

Putting the mill into operation requires a flow of water capable of turning the grinding wheel at a speed suitable to grinding wheat. Because of his extensive research, the calculations for the flow of water needed are predicated on Ernst Schuchard's work.

Schuchard calculated that the horsepower needed to turn the grinding wheel 40 revolutions per minute is 0.15 HP.[7] Schuchard also states 1 effective HP is needed to grind wheat.[8] Based on these two pieces of information, the power assumed necessary for the grinding wheel is taken to be 1.15 HP.

The power derived from the water discharging onto the turbine is calculated from the flow of the water, the height of the fall, and the specific weight of water. Because not all of the power in the water is transferred to the shaft of the turbine, an efficiency is given to the turbine. The efficiency is the ratio of the output power to the input power. The efficiency used is 50%. This would adjust higher or lower depending on the actual configuration of the turbine and bearings. This efficiency is consistent with Schuchard who states that the efficiency of the turbine is 50%.[9]

The height of the water or"head" is the distance between the water surface in the reservoir and the top of the water wheel. The elevation of the top of the water wheel from Exhibit B is 573.00. The elevation of the water surface is, at most, 585.76. The difference between these two numbers is 12.76 feet. A head level of 12 feet is assumed.

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[7] Test at San Jose, Ernst Schuchard, September 17, 1939.

[8] From plan sheet dated 1934.

[9] Ernst Schuchard from plan sheet 1934.

A preliminary flow (Q), in cubic feet per second, for the mill was determined from the following equation:

$$HP = \left[\frac{Q \gamma H}{550}\right](eff.)$$

Where:

HP = *Horse Power*
Q = *Flow* (ft^3/sec)
γ = 62.4 lb/ft^3
H = *Head Level* (ft)

Rearranging for Q:

$$Q = \left[\frac{(HP)(550)}{(\gamma)(H)(eff.)}\right]$$

Using the following values:

HP = 1.15
H = 12
γ = 62.4
eff. = 0.5

and solving for Q

Q = 1.7 cfs

This is the flow needed into the reservoir to keep the grinding wheel turning during milling operations. The flow in cubic feet per second is equivalent to 765 gallons per minute (gpm). A 765 gpm pump is used in Option 2 and a 1530 gpm pump is used in Option 1.

Exhibit F. Calculations.

APPENDIX P

AGRA
Earth & Environmental

AGRA Earth &
Environmental, Inc.
12758 Cimarron Path, Suite 128
San Antonio, TX 78249
Tel (210) 699-6595
FAX (210) 699-6597

February 14, 1997

Mr. Mark Chavez
San Antonio Missions National Historic Park
2202 Roosevelt Avenue
San Antonio, Texas 78210

Millstone Classification
Mission San Jose
6701 San Jose Drive
San Antonio, Texas
AEE Project No. 7-714-000005

Dear Mr. Chavez:

In accordance with your request and instructions, David L. Hartsfield of AGRA Earth & Environmental, Inc. (AEE), visited the Mission San Jose Mill on December 30, 1996, in order to perform a megascopic classification of an on-site millstone. Based on our observations, the millstone was circular, tan in color, and appeared to be comprised of quartz. Application of cold hydrochloric acid (HCL) on the millstone yielded no visible effervescence characteristic of a calcium carbonate composition (limestone). The millstone exhibited conchoidal fractures and a hardness on the Mohs' scale of hardness (ranging from 1 to 10) of approximately 7, both of which are consistent with a quartz composition.

The millstone was bound with an iron hoop. Much of the millstone was covered by a dusty residue. Based on our findings and the presence of the dusty residue, it was decided to scrub and rinse the millstone with distilled water in an effort to confirm our initial findings. After scrubbing and rinsing of the millstone by park personnel, AEE again visited the site on January 10, 1997. Our second visit revealed that the millstone was actually comprised of quartz fragments cemented by a yellow groundmass. Neither the cleaned quartz fragments nor the groundmass effervesced with application of cold HCL. Based on our observations, the yellow groundmass may also be comprised of quartz.

An excerpt from a document written by Dave Gilbert in 1984 entitled "Where Industry Failed; Water-Powered Mills at Harpers Ferry, West Virginia", provided to AEE by the client, indicates that the most popular millstones in early America were composed of "burrs" or small fragments of quartz from the Marne Valley of northern France. Reportedly, the quartz pieces were pieced together, joined with cement, and subsequently bound with round iron hoops. Based on our observations, it is our opinion that the millstone at Mission San Jose may have a similar origin.

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If you have any questions, or require additional information, please contact us at (210) 699-6595. We appreciate the opportunity to work with you on this project.

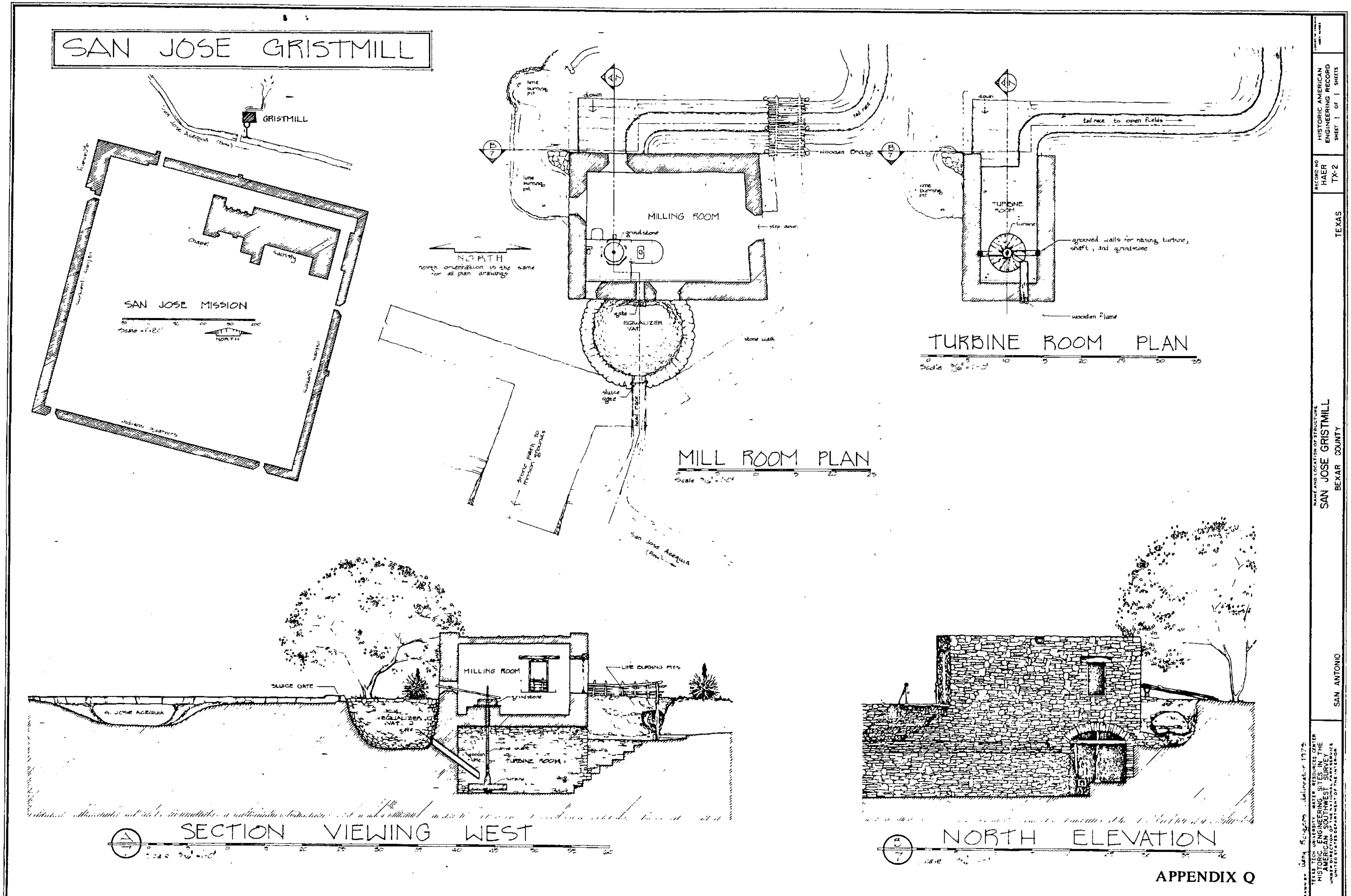
Sincerely,
AGRA Earth & Environmental, Inc.

David L. Hartsfield, Geologist
Environmental Program Manager

Copies: Above (2)

C:\WPDOCS\ELPASO\77140005.R

APPENDIX Q



SAN JOSE GRISTMILL
GRISTMILL
San Jose Acequia
SAN JOSE MISSION
Chapel
Sacristy
Indians Quarters
NORTH
north orientation is the same for all plan drawings
lime burning pit
down
MILLING ROOM
grindstone
step down
EQUALIZER VAT
gate
sluice gate
stone walk
head race
tail race
wooden bridge
stone path to mission grounds
San Jose Acequia
MILL ROOM PLAN
TURBINE ROOM
turbine
grooved walls for raising turbine, shaft, and grindstone
wooden flume
tail race to open fields
TURBINE ROOM PLAN
SLUICE GATE
S. JOSE ACEQUIA
EQUALIZER VAT
MILLING ROOM
grindstone
TURBINE ROOM
LIME BURNING PITS
SECTION VIEWING WEST
NORTH ELEVATION
HISTORIC AMERICAN ENGINEERING RECORD
SHEET 1 OF 1 SHEETS
HAER TX-2
SAN JOSE GRISTMILL
BEXAR COUNTY
SAN ANTONIO
TEXAS
TEXAS TECH UNIVERSITY WATER RESOURCES CENTER
HISTORIC ENGINEERING SITES IN THE AMERICAN SOUTHWEST SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR

APPENDIX Q