MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

THE GAVILAN PROJECT: TESTING RESULTS AND A DATA RECOVERY PLAN FOR ELEVEN PREHISTORIC AND HISTORIC SITES ALONG U.S. 285 NEAR OJO CALIENTE, RIO ARRIBA COUNTY, NEW MEXICO

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ARCHAEOLOGY NOTES 194

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ADMINISTRATIVE SUMMARY

Eleven cultural resource sites were tested and/or evaluated for the New Mexico State Highway and Transportation Department along U.S. 285 near Ojo Caliente, Rio Arriba County, New Mexico. Ten late prehistoric sites, including eight agricultural fields ("grid gardens") and two potential habitations or activity areas (LA 66288, LA 105703–LA 105710 [prehistoric component], and LA 105713) are recommended for data recovery. The morada and store at LA 105710 will be documented in detail through interviews with local people and searches of archival records. The remains of the morada at LA 105710 and the Spanish Colonial site, LA 105712, will be fenced for protection during construction.

Submitted in fulfillment of Joint Powers Agreement J00122 between the Museum of New Mexico and the New Mexico State Highway and Transportation Department.

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NMSHTD Project NH-285-9(7)346, CN 0494
BLM Permit No. 21-2920-95-S (expired June 20, 1996). Testing was conducted in accordance with provisions for auger testing during survey.

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INTRODUCTION

In September 1995 the New Mexico State Highway and Transportation Department (NMSHTD) requested that the Office of Archaeological Studies (OAS), Museum of New Mexico, conduct testing and evaluation of eleven sites along U.S. 285 near Ojo Caliente, Rio Arriba County, New Mexico (Fig. 1 and Appendix 1). The sites, with the exception of LA 66288, were originally recorded for the project by Cibola Research Consultants (Marshall 1995).

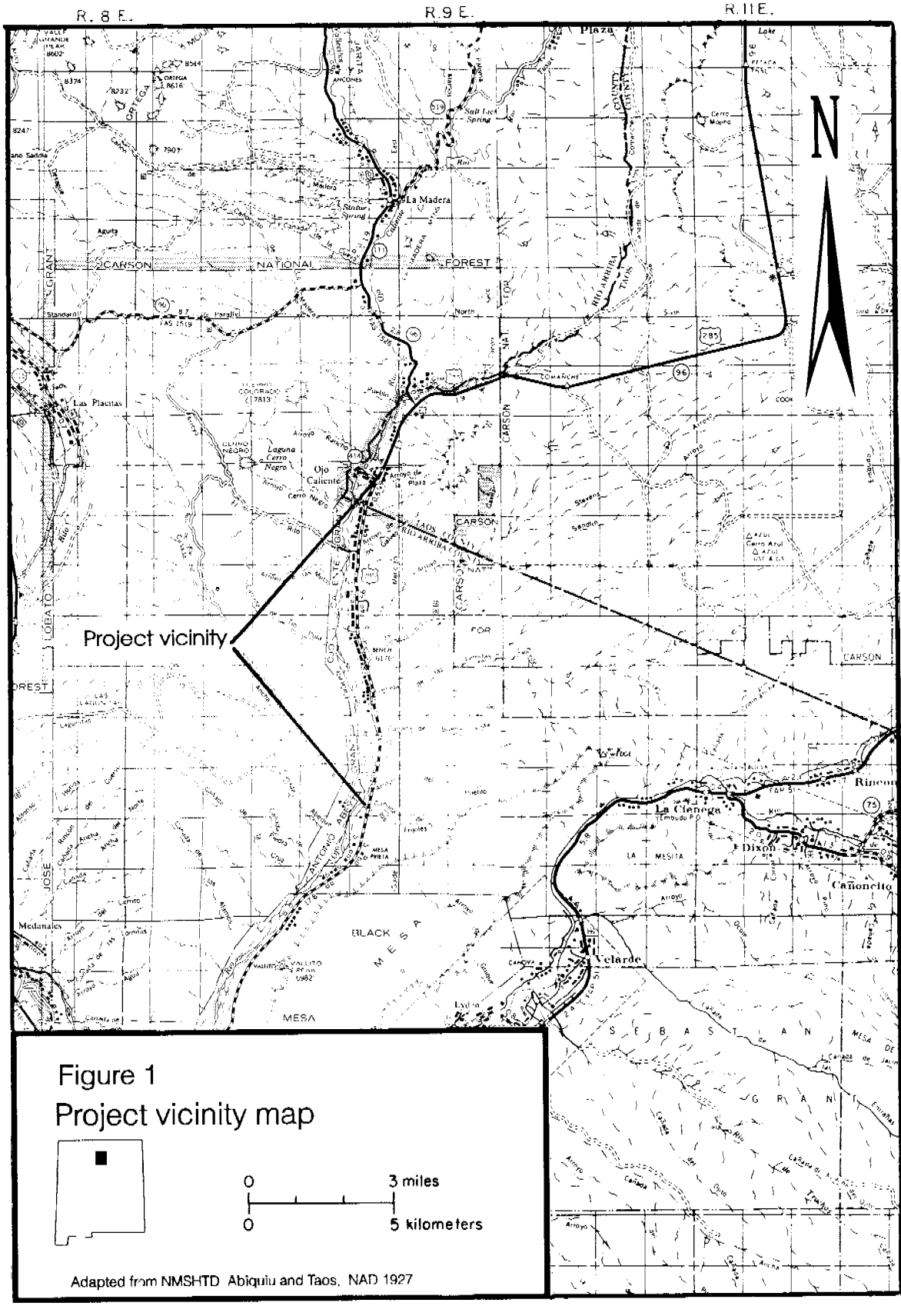
Following a field visit by R. N. Wiseman and J. A. Ware of the OAS staff, it was recommended that the eight agricultural sites (LA 105703–LA 105709 and LA 105713) be considered for data recovery rather than testing. This recommendation, derived from prior experience with similar sites in the lower Ojo Caliente Valley and the Chama River Valley, was based on clear evidence of features recorded by the survey archaeologist, and the sites did not require testing to assess their data potential. Agricultural features such as these evidently belonged mainly, if not solely, to the ancestral northern Tewa villages of the late prehistoric period, especially those dating to the fifteenth century A.D.

Fieldwork at the other three sites (LA 66288, LA 105710, and LA 105712) was conducted between January 16 and 30, 1996. Testing activities were limited to surface artifact inventory and auger testing, both under the Bureau of Land Management Noncollection Survey/Recording permit held by the OAS. Work at LA 66288 involved only the south and the west areas of the first terrace below Hilltop Pueblo (LA 66288). Hilltop Pueblo, on top of the second terrace, lies outside the proposed highway project and was not tested.

The south area of LA 66288 and the north end of LA 105710 are adjacent properties and share the same large dune. Surface artifact inventories and auger testing demonstrated the presence of extensive surface and subsurface prehistoric artifacts belonging to the LA 66288 occupation. That occupation was by ancestors of the northern Tewas and dates primarily to the fifteenth century A.D. These remains clearly have the potential for producing information important to local and regional prehistory, and excavation is recommended.

Historic artifacts belonging to the morada period of LA 105710 are absent, both on the surface and below ground. Since the morada itself will be protected by temporary fencing during highway construction, further excavation is not recommended within the proposed highway construction zone at this site. However, several knowledgeable elderly individuals, including a former member of the morada, are still living in the area. These people should be interviewed about the morada to record and preserve the history of the Ojo Caliente chapter of the Penitente brotherhood.

Interviews with knowledgeable local individuals indicate that the historic building foundation at the south end of LA 105710 belonged to a general store built in 1930, closed in about 1934, and razed in about 1937 for building materials. Intensive examination of the ground surface surrounding the foundation, including the numerous rodent backdirt piles and the nearby highway cut, has disclosed virtually no cultural materials attributable to the store. Detailed


R. 8 E.
R. 9 E.
R. 11 E.
T. 25 N.
T. 24 N.
T. 23 N.
T. 22 N.
N
Project vicinity
La Madera
Las Placitas
Ojo Caliente
Laguna a Cerro Negro
Medanales
La Cienega
La Mesita
Dixon
Canoncito
Velarde
Rinconada
Plaza
CARSON NATIONAL FOREST
BLACK MESA
MESA
SEBASTIAN
GRANT
LOBATO
JOSE
ANTONIO
JUAN
CARSON
Figure 1
Project vicinity map
0 3 miles
0 5 kilometers
Adapted from NMSHTD Abiquiu and Taos, NAD 1927

interviews and archival searches should be conducted to further document this structure, its owners, and its role in the community. Archaeological work at this location is unlikely to provide information beyond that obtainable through interviews and archival searches.

Further visual examination of LA 105712, an eighteenth-century Spanish Colonial habitation and/or stock operation, showed that it lies at the edge of the proposed right-of-way and can be protected with a temporary fence during construction. Consequently, no testing was conducted at this site. The permanent right-of-way fence in the vicinity of the site should be built by hand.

This document presents a plan for data recovery at these ten sites: LA 66288, LA 105703–105710, and LA 105713.

PROJECT ENVIRONMENT

Physiography and Geology

The project study area is in the Rio Ojo Caliente Valley in southeastern Rio Arriba County. The locale, just north and east of the confluence of the Rio Ojo Caliente and the Rio Chama, is part of the USGS Abiquiu quadrangle. Geologically, the valley is a continuation or "re-entrant" of the Española Valley and Rio Grande Depression, which is placed within the Basin and Range province, but its proximity to the Southern Rocky Mountain province leads it to be alternately assigned within the Basin and Range province (Maker et al. 1973:6) and the extreme Southern Rocky Mountain province (Fiero 1978:4). This is because while montane influences are tapering off, the full basin has not yet been realized. The local mesas are not exactly foothills, but the effect is largely the same. Elevations range from 5,500 to 7,000 ft (1,676 to 2,134 m).

Española Valley, to the south, is a basin created by late Tertiary extension, subsequently filled by alluvial sediments from the surrounding highlands. These sediments are primarily a mixture of Miocene sedimentary and Pliocene to Holocene volcanic rock and sediments (Drake 1991:4). Black Mesa shadows the area--literally in the most easterly project sites--sustaining frozen ground conditions there, while the Cerrito de la Baca ridge is the most prominent geologic feature west of the study area.

The Abiquiu quadrangle consists of Tertiary volcanic and sedimentary rocks overlying older rock with angular unconformity. Of the three formations that make up the quadrangle (El Rito, Abiquiu, and Santa Fe), the study area is identified as including the thickest part of the Santa Fe formation, which extends parallel and next to the western slopes of Black Mesa (Drake 1991:4). The Santa Fe deposit is the lower end of a piedmont alluvial fan deposit extending west by southwest from the Sangre de Cristo range. It is distinguished from the similarly appearing Abiquiu formation by the absence of fossils in the latter. The formation is composed of both consolidated and unconsolidated deposits of sand, silt, clay, and pebbly beds with small amounts of calcareous and tuffaceous material locally interbedded with subsequent basalt flows. In dunes, fluvial and eolian cross-bedding and concretionary structures are many.

Irregularly placed, large, brecciated uplifts such as Cerrito de la Baca indicate the location of both pre- and post-Tertiary faulting. Intrusive sills and dikes, some displaced by faulting, are also present. Within the sand dunes, faults are indicated by irregularly occurring cemented zones.

Soils

The valley bottom soils of the Rio Ojo Caliente Valley belong to the Green River-El Rancho-Werlow association (Maker et al. 1973). This alluvial association occurs as a long, narrow linear tract running from the canyon narrows 5 km north of the village of Ojo Caliente to where the Cañada de Buena Vista joins the Rio Ojo Caliente, about 10 km south of the village.

In spite of its 15 km length, the narrowness of the valley limits the area of this tract to about one-tenth of the total of this association within the county, or about 1,416 ha (3,500 acres). The three primary soils of this association are similar in that they are composed mainly of calcareous reddish brown to light brown fine sandy loams, sandy clay loams, clay loams, and loams as surface layers and substrates to depths of five feet or more. Drainage characteristics are variable. The water table ranges from two to seven feet from the surface. Suitability for farming, especially nonmechanized farming, is excellent. Susceptibility to flooding is moderate to great depending upon distance from the Ojo Caliente channel.

The dominant area soil group of bordering the Rio Ojo Caliente bottoms is classified as Pojoaque-Rough Land Association (Maker et al. 1973:33). This association consists of rolling hills criss-crossed by arroyos and washes. The Pojoaque soils have a thin surface of light reddish brown sandy clay loam containing occasional rounded igneous rock. Underlying this is 5 or more feet of sand loam. Small gravels comprise from 15 to 35 percent of the soil matrix. Blowouts are very common. Rough Broken Land consists of unconsolidated, shallow alluvial deposits of varying depth (Maker et al. 1973:33). A thin layer of soils is found on the tops of the intermittent ridges that occur throughout this association and between the outcrops of the sedimentary materials of the Santa Fe formation (Maker et al. 1973:33). The uppermost ridge tops are typically capped with a surface layer of gravel, and areas fitting this description are steep and widely dispersed.

Climate

The climate is semiarid, sometimes identified with the northernmost extreme of the Sonoran life zone. Though temperatures can be extreme, there is a growing season of 140-160 days a year (Tuan et al. 1973). The last killing frosts occur between mid to late April, beginning again in mid to late September. A record high temperature of 106 degrees F was recorded in nearby Española in 1925, where winter temperatures frequently reach the low 20s (Wendorf 1953; Maker et al. 1973). During the summer months, temperatures are more moderate. The July daily average is 72.3 degrees F. Summer temperatures are lower in wetter years than in dry years.

An important factor in sustaining agriculture is the fluctuating level of rainfall throughout the valley. While average annual precipitation is 9-10 inches (229-254 mm), the amount can vary significantly from year to year. For example, Española received 15.38 inches (391 mm) of total precipitation in 1911 but only 3.76 inches (96 mm) in 1956 (Maker et al. 1973).

Another factor to be considered in local farming practices is the problem of cold-air drainage. Cold, heavy air drains off peripheral mountain and mesa tops and courses through the lower valleys on still nights, causing valley temperatures to plummet (Tuan et al. 1973). Farmers in the valley consistently lose one in three late-maturing crops a year to low temperatures caused by cold-air drainage (Bugé 1984). Flooding from the Rio Ojo Caliente also causes occasional crop loss in the area (Wendorf 1953).

Flora and Fauna

The contemporary floral environment is similar to conditions that have existed since the prehistoric period (Wendorf 1953). The highly erodible sandy soils and high elevations (5,500-7,000 ft; 1,676 to 2,134 m) in the area support the Upper Sonoran life zone subtype "juniper-piñon woodland." Considered similar to a savannah and with fewer species than other life zones, this community includes an open overstory of mixed juniper and piñon stands with pure stands of juniper occurring at the lower elevation and pure stands of piñon occurring toward the higher. The understory typically includes several species of grama grass, Indian ricegrass, ring muhly, sand dropseed, three-awn, rabbitbrush, chamisa, and yucca, several of which are edible species. Numerous blowouts in the area are attributed to overgrazing of cattle and sheep. Cholla and snakeweed, which are indicative of overgrazing, are plentiful (Ford 1978:56).

The life zone along the river banks is riparian woodland, following the typical pattern throughout the Southwest (Lowe 1964:60). This type of woodland consists of stands of intermingling willow and cottonwood.

Comparisons between animal communities in the juniper-piñon woodland and the riparian woodland zones are hampered by the heavy incidence of contemporary farming and grazing of domesticated stocks that alters the riparian zones. It is probable that game animals were never plentiful in the area, but two important species that existed previously, elk and bighorn, have since disappeared (Wendorf 1953). Smaller animals of food value in the area include lizards, snakes (western hognose, prairie bull, brown garter, and prairie rattler), and leopard frogs, in addition to suckers, minnows, dace, and fresh-water eels in local streams (Wendorf 1953). Mammals living in the area include ground squirrels, jackrabbits, cottontails, coyotes, and mule deer (Findley et al. 1975). Seasonally, migratory sandhill cranes are abundant, along with ravens, jays, various raptors, larks, and other small birds.

ARCHAEOLOGICAL OVERVIEW

Recent comprehensive summaries of archaeological research in the lower Chama Valley have presented the details of nearly 100 years of archaeological investigations in the region (for example, Beal 1987; Anschuetz et al. 1985). The following overview will present only the highlights of that history as an introduction to discussions of regional cultural history and important research questions that follow. The present overview focuses on the lower or southern portion of the Chama District as defined by Cordell (1979). The district extends from the Piedra Lumbre Valley in the north to the confluence of the Rio Chama and Rio Grande in the south, and from the foot of the Jemez Mountains in the southwest to the confluence of the Rio Ojo Caliente and Vallecitos Creek in the northeast.

The earliest recorded archaeological investigations in the lower Chama Valley date to the late nineteenth century. In 1874, Dr. H. C. Yarrow, a member of the Wheeler 40th Parallel Survey, visited and described the fifteenth-century pueblo of Poshuouinge (Beal 1987). Eleven years after Yarrow's visit, Adolf Bandelier surveyed the lower Chama Valley and described several large Classic pueblo ruins (Bandelier 1892; Beal 1987:11). Bandelier was probably the first to describe the extensive prehistoric agricultural systems in the lower Chama district (Maxwell and Anschuetz 1987:26), and it was largely due to Bandelier's explorations that early twentieth-century archaeologists began focusing their attention on the region.

Surveys were conducted in the lower Chama in the early years of the twentieth century by Hewett and Harrington, and in the 1930s by H. P. Mera and Frank Hibben. Early excavations in the valley were carried out by Jeançon, Greenlee, and Hibben. These early studies focused on the large, Classic pueblos of the region. Surveys by Hewett in 1906 (Hewett 1906) and Harrington in 1910 (Harrington 1916) added the sites of Ku, Te'ewi, Tsiping, Yunque, Mariana, Tsama, Leafwater (Kap), Peseduingue, Nute, and Ponsipa-akeri to the inventory of ruins described by Bandelier. Harrington collected Tewa oral traditions regarding the origins of these communities and the constituency and historic disposition of their populations.

The first intensive reconnaissance of the Chama Valley was conducted in the mid-1930s by Frank Hibben of the University of New Mexico, who surveyed from the mouth of Gallina Creek on the north to the confluence of the Rio Chama and Rio Grande on the south. Hibben's survey defined eight general categories of archaeological sites: (1) large Biscuit Ware ruins; (2) Tewa Polychrome and historic ruins; (3) Wiyo Black-on-white or "Biscuitoid" ruins; (4) single house ruins and lodge sites; (5) tipi rings and rockshelters; (6) chipping areas and quarries; (7) garden areas and shrines; and (8) torreones and ledge houses.

H. P. Mera's surveys of biscuit ware sites in the lower Chama established a ceramic seriation for the period from ca. A.D. 1200 to 1600. With his improved chronology of the region, Mera was perhaps the first to note the large-scale depopulation of the lower Chama 1400 and 1600 (Beal 1987:12).

Although limited test excavations were apparently carried out by Yarrow and Bandelier

in the late nineteenth century, the first large-scale excavations in the lower Chama were carried out by Jeançon in 1911. Jeançon excavated 60 rooms at the site of Peseduingue on the Rio del Oso (Jeançon 1912), and eight years later he cleared 130 rooms at Poshuouinge, near the confluence of the Rio Chama and El Rito Creek (Jeançon 1923). During his field work at Poshuouinge, Jeançon described complex linear and curvilinear stone alignments near the pueblo that he interpreted as house foundations, shrines, and symbolic figures. In retrospect, many, if not most of these features, were probably agricultural grids and garden plots.

The next excavation in the lower Chama was conducted in the early 1930s by R. Greenlee of the Museum of New Mexico, who excavated 12 rooms at the fifteenth-century pueblo of Tsama, near the confluence of El Rito Creek and the Rio Chama. This work, which remains unpublished, was followed by Hibben's excavations at the Riana Ruin, a late Coalition period (ca. A.D. 1200-1325) village above the junction of Cañones Creek and the Rio Chama (Hibben 1937).

The 1950s saw several major excavation projects associated with proposed changes in the stream flow of the Rio Chama. In the summers of 1950 and 1951, Fred Wendorf of the Museum of New Mexico excavated 27 rooms and four kivas at the ruin of Te'ewi in the lower Chama Valley, the site of a proposed dam across the Rio Chama. At the same time, and under the field supervision of Ralph Luebben, Wendorf opened up 18 rooms and four pit structures at the Leafwater Ruin (Kap), across the valley and several kilometers northeast of Te'ewi. Based on these and other excavations in the Northern Rio Grande, Wendorf and Erik Reed (1955) collaborated on a synthesis of Rio Grande prehistory that remains one of the most influential interpretations of prehistoric change in the eastern Anasazi region.

Later in the 1950s, Stewart Peckham of the Museum of New Mexico excavated 27 rooms and a single kiva at the Palisades Ruin in advance of construction of Abiquiu Dam. The Museum of New Mexico's highway salvage program also began in the 1950s, when a New Mexico Highway Department construction project crossed part of the fifteenth-century ruin of Howiri in the upper Ojo Caliente Valley.

Contract archaeological projects continued to explore the prehistoric resources of the lower Chama in the 1960s and 1970s with a major survey and excavation project in the Abiquiu Reservoir maximum pool zone (Schaafsma 1976, 1978, 1979) and an assortment of highway and powerline construction projects. The survey of Abiquiu Reservoir was especially important because it was the first systematic intensive areal survey within the region. As such, it contributed significantly to our understanding of archaeological variability in the lower Chama, evaluating and expanding on the categories of archaeological remains identified during Hibben's less intensive surveys of 1937.

By documenting nearly 200 sites, from Middle Archaic encampments through nineteenth-century historic farmsteads, the Abiquiu surveys expanded the range of known occupation of the lower Chama by several thousand years. The surveys also showed what had only been assumed up to that time: there is little or no evidence of Basketmaker III through the early Coalition period occupation of the lower Chama.

In the 1960s, 1970s, and 1980s, several highway, powerline, and university field school projects were undertaken in the lower Chama Valley. Highway surveys in the 1960s (Ingram 1962) documented a variety of lithic and lithic and ceramic scatters, small pueblo sites, and historic farming and herding sites. In the following decade, surveys of powerline corridors (Enloe et al. 1974; Lang 1979, 1980) recorded a variety of archaeological site and settlement types. Most of the occupations dated from the mid to late Archaic (ca. 3200 B.C.-A.D. 400) and the Classic Pueblo period (A.D. 1325-1540). The University of New Mexico field school, directed by Florence Hawley Ellis, excavated at a number of protohistoric and historic Tewa villages, including San Gabriel del Yunge Oweenge (Ellis 1970, 1987, 1989; Skinner 1965), Sapawe, Tsama, and Abiquiu. The Occidental College field school at Ponsipa-akeri in the late 1970s, directed by David Bugé, is not yet published.

Highway surveys and excavations in the 1970s and 1980s documented important aspects of regional archaeological variability, especially late prehistoric agricultural systems that are concentrated along the terraced margins of the Chama and its tributaries. Excavations by Fiero (1978), Anschuetz and Maxwell (Anschuetz et al. 1985), and Moore et al. (in prep.) have documented extensive agricultural facilities and features associated with the Classic period occupation of the region. The extent of these features suggests that they played an important role in the economic adaptation of Pueblo farmers in the lower Chama. An understanding of how and when they were constructed may help to explain why the systems were constructed and why they ultimately failed.

In summation, during the early years of the twentieth century and the later years of the twentieth, archaeologists were concerned primarily with documenting the archaeological variability contained within the large Classic Pueblo ruins that dominate the archaeological landscape of the lower Chama Valley. Most of the problems that were addressed related to the apparently sudden appearance of these large communities and to their rapid decline and abandonment about the time of the Spanish entrada of 1540. As a result, the long history of interest in the Chama region has focused on such questions as Tewa origins, population immigration and emigration, and abandonment processes. Unfortunately, these questions have been pursued in a region where the status of chronometrics is so poor that we know with certainty very little more today than Mera and his contemporaries knew in the 1930s. There are no good published stratigraphic excavations in the region encompassing the time periods of primary interest. Therefore, we are limited in the questions we can realistically address until the development of more than just a skeletal chronology of the region. These issues will be addressed in more detail in the data recovery plan, which is presented after the testing report.

OVERVIEW OF CULTURE HISTORY

Early Hunters and Gatherers (10,000 B.C. to 600 A.D.)

Chert quarries on the slopes of Cerro Pedernal, south of the Piedra Lumbre Valley above a tributary of the Rio Chama called Cañones Creek, may have been in use as early as the Clovis period (Warren 1974; Cordell 1979). Although no substantiated Paleoindian sites have been documented in the lower Chama District to date, scattered surface finds of Paleoindian projectile points--some manufactured from Pedernal chert--suggest that the area was at least visited by Paleoindian and early Archaic hunters and gatherers.

The best candidate for a Paleoindian site in the lower Chama is probably AR-413, recorded within the maximum pool zone of Abiquiu Reservoir (Schaafsma 1976). The site has a cultural layer approximately 2.5 m below an Archaic horizon. No temporally diagnostic artifacts were noted within the buried component, the layer was not excavated, and no datable materials were recovered. However, the relative stratigraphic position of the component in relation to an established Archaic horizon suggests considerable antiquity (Schaafsma, pers. comm., 1992).

Very little evidence of Early Archaic occupation or use of the lower Chama Valley has been reported. No Jay phase (5500-4800 B. C.) material has been reported from the region, and only a few Bajada points and one apparent Bajada phase site were recorded during the Abiquiu Reservoir survey. In contrast, Middle and Late Archaic (ca. 3200 B.C.-A.D. 600) materials appear to be comparatively abundant in the Chama Valley. It would be reasonable to conclude that the frequency and/or intensity of use of the region increased sometime during the San Jose phase (ca. 3500 B.C.) and continued through the Late Archaic En Medio phase (Basketmaker II-A.D. 100).

Despite the early recognition of preceramic archaeological components in the lower Chama (Hibben 1937), no systematic research was conducted on early hunter-gatherer sites until the 1970s and 1980s. Surveys of the Abiquiu Reservoir showed some 56 probable Archaic sites and components (Schaafsma 1978:48), most dating to the Late Archaic En Medio phase, and the majority on terrace settings above the Rio Chama floodplain. The School of American Research excavated 13 of these sites. Common features included shallow charcoal and ash-filled basins (both with and without heat-fractured rock), large cobble piles, and isolated clusters of fire-cracked rock (Schaafsma 1978:48). Schaafsma (1979:20) postulated that at least five Late Archaic sites in Abiquiu Reservoir were warm-season base camps focusing on the exploitation of riverine resources. From his review of Schaafsma's Abiquiu evidence and his excavation of a Late Archaic multiactivity site in the Piedra Lumbre Valley (LA 11836), Snow (1983) argues that Schaafsma's base camps may have been temporary special-use locales with multiple superimposed occupations.

Additional Archaic sites have been recorded and excavated along the Rio Chama between the Abiquiu Reservoir and the confluence of the Chama and Rio Ojo Caliente. A survey of a 345 KV transmission line between Fruitland and Chili, New Mexico, recorded seven

probable Archaic components. Most are on ridges, mesa tops, and benches flanking the Chama Valley (Enloe et al. 1974:7). The sites were described as small quarry and work areas associated with concentrations of fire-cracked rock and hearths. Typical artifacts included lithic debitage, small cores, low frequencies of retouched flakes, and an occasional projectile point. No grinding implements or pottery were noted on the sites.

During another transmission line survey near the confluence of the Rio Ojo Caliente and the Rio Chama, Lang (1979) reported six Archaic-Basketmaker II lithic artifact scatters and several additional sites with fire-cracked rock that may date to the Late Archaic. Most of the sites were chipped and ground stone artifact scatters associated with heat-fractured rock and surface charcoal stains.

Data recovered from three Archaic sites excavated by Lang (1980) are especially relevant to the current project because the sites are clustered on the western terrace of the Rio Ojo Caliente less than a mile northwest of the current project area. All three sites have multiple temporal components, and at two sites, OC-8 and OC-9, Middle to Late Archaic components comprise most of the visible cultural assemblage. The third site, OC-7, is a large complex of Classic period agricultural fields and features that overlie a small Late Archaic encampment.

The largest of the three sites, OC-8, is particularly noteworthy. It contained 20 to 21 basin-shaped hearths associated with quantities of heat-altered rock and a feature that Lang describes as a shallow pit structure dating to the Bajada-San Jose boundary (ca. 5,200 B.P.). The feature was a shallow, oval pit measuring just over 2 m in diameter and from 10 to 20 cm deep. The floor was charcoal-stained, compacted sand. No floor features were noted, although there were several charcoal stains on or immediately above the occupation surface, and there was no evidence of a superstructure (i.e., postholes, burned roof beams, wall footings, etc.). Lang bases his age estimate of the feature on a single radiocarbon date of 5,240 ± 130 B.P., derived, not from the structure itself, but from a charcoal-filled depression about a meter southeast of the feature. Considering the absence of a prepared floor, floor features, and tangible remains of a superstructure, Lang's interpretation of a domestic structure at OC-8 must be considered questionable. However, a site the size and complexity of OC-8 suggests a substantial Middle to Late Archaic occupation and use of the lower Ojo Caliente Valley.

To summarize, there are abundant remains of early hunters and gatherers in the lower Chama region. In fact, Middle and Late Archaic sites (ca. 3,200-1,500 B.P.), may be common archaeological manifestations in the region. Yet, we can say little with certainty about Archaic adaptations in the lower Chama because there has been very little systematic research on the period. A review of the literature suggests interesting regional variation among Archaic sites in the lower Chama. Schaafsma has argued for seasonal base camps in the Piedra Lumbre Valley, and Lang believes that he has identified an Early to Middle Archaic structure in the Ojo Caliente Valley. Archaic assemblages throughout the region suggest complex subsistence, settlement, and ethnic affiliation patterns in the region that persisted for at least several thousand years. Obviously, the region contains an Archaic data base that is rich in research potential, but very little research has been proposed or done, perhaps because of the historic emphasis on the spectacular Classic Pueblo remains in the region.

Early Farmers (A.D. 600 to 1300)

There is a general absence of early prehistoric farming sites in the lower Chama region. This pattern is repeated in other areas of the northern Rio Grande, including the Galisteo Basin, the Santa Fe River Valley, and the Pajarito Plateau. Maxwell and Anschuetz (1987:25) conducted a search of the Archaeological Records Management System at the Laboratory of Anthropology in 1987 and found 110 Coalition-Classic period sites and components but only nine Basketmaker III-Pueblo II components (A.D. 600-1200). The later were isolated occurrences of early Pueblo-style projectile points. No Taos Black-on-white (ca. A.D. 1150-1250) and only a single sherd of Kwahe'e Black-on-white (ca. 1125-1200) have been discovered in the lower Chama Valley (Schaafsma 1979; Moore et al. in prep.). The implication is that while the lower Chama was not a residential locus during the Developmental period, the area may have supported mobile bands of hunters and gatherers during the first millennium A.D. According to Beal (1987:17): "Except for transitory Basketmaker III–Pueblo I visits, the Chama region seems to have been unoccupied by humans for nearly 900 years. . . . For all intents, the lower Chama River supported little or no appreciable population between A.D. 400 and 1250." In other words, there may have been very little change in regional settlement and resource use strategies from the Late Archaic into the early thirteenth century A.D., long after adjacent populations on the Colorado Plateaus to the west had made substantial commitments to residential farming.

Classic Period Farmers (A.D. 1300-1600)

The first sedentary farming villages to appear in the lower Chama District were founded in the late A.D. 1200s or early 1300s, near the end of the Rio Grande Coalition period (Wendorf and Reed 1955). The Coalition period (A.D. 1200-1325) witnessed important changes throughout most of the northern Rio Grande. There was significant population growth throughout the region, even in areas that had little evidence of pre-Coalition population, such as the Galisteo Basin, the Pajarito Plateau, the Santa Fe, Taos, and Gallina areas, and of course, the lower Chama Valley. There appeared in these areas, without developmental antecedents, large aggregated communities. In the Chama Valley, the Palisade and Riana ruins and Leafwater Pueblo were established between A.D. 1200 and 1300, and at least five Classic period communities, including Tsiping, Te'ewi, Hupobi, Sapawe, and Ponsipa-akeri were founded about the same time. Important changes in material culture coincided with the establishment of these large population centers. Changes included the appearance of organic-painted pottery and a variety of other material culture traits that suggest important influences from the Colorado Plateau to the west.

There has been considerable debate among scholars over the causes of these processes. Some (for example, Wendorf 1953) have argued that the Rio Grande Coalition was the result of growth, expansion, and diversification of a local population responding to extensive and influential contacts with Anasazi populations to the west. Other scholars attribute change during the Coalition to large-scale immigration into the Rio Grande Valley from the west. Much research and debate have been directed toward identifying the cultural affiliation of these supposed migrants. Some scholars argue for an influx of people from Mesa Verde, Chaco, and

west-central New Mexico (Stuart and Gauthier 1981:51). There is general agreement that migrations of people into the northern Rio Grande province played an important role in the cultural dynamics of the region, especially at the end of the Coalition period, during the first half of the fourteenth century A.D.

Literature reviews by Maxwell and Anschuetz (1987:25) documented 15 Coalition components in the lower Chama Valley. Three of these have been excavated and published: Riana Ruin (Hibben 1937), the Palisades Ruin (Peckham 1981), and the lowest levels of Leafwater Pueblo (Luebben 1953). Regionally, Coalition period sites range from one or two rooms to over 200 rooms, and most sites falling within the 15-30 range (Stuart and Gauthier 1981:51). The Riana and Palisade ruins fall close to this average, with 26 and 50 rooms, respectively. The size of the Coalition component at Leafwater Pueblo and other Classic period sites in the region is unknown due to subsequent construction and remodelings during the Classic period. Luebben (1953) excavated three pit structures at Leafwater that probably date to the late Coalition period, as suggested by the associated ceramics.

Based on this small and potentially unrepresentative sample of excavated sites, the "typical" Coalition site appears to consist of a rectangular block of surface rooms enclosing a plaza on three sides with a masonry or cobble palisade on the fourth side (Peckham 1981; Maxwell and Anschuetz 1987:23). Some investigators have argued that this "enclosed" community plan may have been a response to increased population density resulting in conflict over diminishing land and other resources. As Peckham (1984:279) points out, there was tremendous population mobility during the Rio Grande Coalition. One dominant pattern of the late thirteenth and early fourteenth centuries was settlement abandonment, relocation, and expansion of groups into previously unpopulated areas.

The small Coalition population of the lower Chama presumably provided the seed for the dramatic growth and expansion of population during the latter half of the 1300s and early 1400s. During this period, at least 15 large pueblos with 100 or more rooms were established on the lower Chama and its tributaries, including El Rito Creek, the Rio Ojo Caliente, and the Rio del Oso (Beal 1987:19). Maxwell (1991:2) has estimated that as many as 14,700 rooms may have been constructed during the fourteenth and fifteenth centuries in the lower Chama District.

Other areas of the northern Rio Grande saw a similar peak in population growth during the late prehistoric or Rio Grande Classic period (Wendorf and Reed 1955). Traditionally, the Rio Grande Classic begins around A.D. 1325 with the appearance of a distinctive red-slipped glaze-painted pottery and ends at the close of the sixteenth century with the arrival of European colonists. The period was one of cultural expansion and florescence, noted primarily for its large aggregated communities and a variety of highly distinctive cultural materials. These materials included a range of new vessel forms, carved bone tools, elaborately decorated pipes, carved stone axes and effigy forms, mural paintings, and a distinctive Rio Grande art style featuring masked figures (Wendorf and Reed 1955:153; Cordell 1979:58).

The hallmark of the Rio Grande Classic was population growth and aggregation, typically accompanied by the construction and maintenance of large-scale agricultural and water

control features, including dams, reservoirs, terrace grid gardens, and clusters of dispersed fieldhouses. Sites of the period show a distinctive bimodal distribution. The most common sites range from one to four rooms or more than 50 rooms (Stuart and Gauthier 1981:53). Significantly, the average Coalition period site of 15 to 30 rooms is nearly absent in the Rio Grande Classic. Masonry architecture, established as the principal construction medium at the end of the Pueblo Coalition, continued as the dominant form throughout the Classic period. Above-ground kivas eventually gave way to subterranean kivas in plazas, and great kivas appeared at many Classic sites in the Northern Rio Grande (Wendorf and Reed 1955:151).

At least 15 large Classic period pueblos were occupied in the lower Chama Valley, and excavations have been conducted at eight of these: Peseduingue (Jeançon 1912), Poshuouinge (Jeançon 1923), Tsama (Beal 1987:12), Te'ewi (Wendorf 1953), Leafwater (Luebben 1953), Sapawe (Skinner 1965; Ellis 1970, 1975), Ponsipa-akeri (Bugé 1984), and Howiri (Fallon and Wening 1987). The sites range from just over one hundred to several thousand rooms and are architecturally complex, with rectangular roomblocks of coursed adobe masonry enclosing multiple plazas. The site of Sapawe on El Rito Creek has been described as the largest adobe ruin in New Mexico, with an estimated 2,000 ground-floor rooms enclosing seven plazas covering an area of more than 25 acres (Ellis 1975).

Besides residential sites, many special-activity sites dating to the Classic period have been recorded in the lower Chama. Perhaps the most ubiquitous of these sites are agricultural features and facilities. Bandelier (1890, 1892) was the first to identify extensive agricultural features in the lower Chama, but no systematic work was done on these sites until the last few decades. The most extensive survey of agricultural features conducted to date was near Ponsipa-akeri in the lower Ojo Caliente Valley by Occidental College in the late 1970s (Bugé 1981, 1984). Bugé and his students conducted extensive surveys of the Rio Ojo floodplain, terrace, and terrace slopes, and recorded a variety of agricultural facilities and field types, including cobble-bordered grid fields, gravel-mulched fields, floodwater fields, small terrace fields, checkdams, and waffle gardens (Bugé 1984:29-31). Other extensive farming and field systems have been documented on the El Rito (Skinner 1965; Ellis 1970), on the lower Ojo Caliente (Lang 1979, 1980), and on the Chama (Fiero 1978; Anschuetz et al. 1985; Moore et al. in prep.). Excavations have been conducted at several field locations. Most of the research on agricultural systems has focused on the age of the systems, the kinds of crops grown, and the nature and extent of field variability.

The Classic period occupation of the lower Chama probably ended around the turn of the sixteenth century. There is very little evidence of new construction in the Chama after A.D. 1440 (Beal 1987:19), and although there is some evidence of ephemeral Tewa use of the Chama during the A.D. 1500s and 1600s, the area was probably abandoned as a residential focus during the early decades of the sixteenth century.

Wendorf (1953:94) believed that most of the Classic pueblos of the lower Chama were abandoned precipitously around A.D. 1500. He suggests that nomadic raiders or internecine warfare played a role in the withdrawal of population from the valley. Others (for example, Fallon and Wening 1987:48; Anschuetz and Maxwell 1987) have argued that the Chama and its

tributaries were abandoned because of failure of the food production system due to population-resource imbalances.

Historic Period

The historic period on the lower Chama was the stage for interactions among several different cultures and ethnic groups. The first Spanish contact with the native populations of the region occurred in the summer of 1541, when a party from the Coronado expedition encountered the Tewa village of Yunque-Yunque, near the confluence of the Chama and Rio Grande. Sustained contact did not occur until 1598, when Oñate established the community of San Gabriel near the same river confluence. The few surviving documents from this early contact period do not mention permanent Tewa residences upstream on the lower Chama and Ojo Caliente rivers, but some scholars have insisted that a sizable Tewa population held out in the valley well into the historic period.

Hibben (1937) noted at least three historic Tewa Polychrome components on his reconnaissance of the lower Chama in the 1930s. Schroeder and Matson (1965) have suggested that Te'ewi, located near the confluence of the Rio Chama and the Rio del Oso, may have been occupied until just before the establishment of San Gabriel. Ellis (1975) has argued for a continuing Tewa occupation of the lower Chama based on her recovery of sheep and cattle bones from a trash midden at Sapawe and historic metal artifacts from the nearby ruin of Tsama. Finally, Jeançon (1923:3) mentions that the Cordova family, owners of Poshuouinge before the land was transferred to the U.S. Forest Service, claim to have found silver beads and articles of Spanish manufacture in the ruins. However, Jeançon notes that in his excavations at Poshuouinge in 1919, no metal artifacts of any kind were found, and nothing suggesting Spanish contact was recovered.

Ethnohistoric records (Wozniak n.d.; Kemrer n.d.) show that Tewa Indians were herding sheep and goats in the lower Chama as far north as the Piedra Lumbre Valley between 1630 and 1740, but the same records do not mention permanent Tewa residences in the valley north of San Juan.

Besides Tewa herdsmen, several other Native American groups frequented the lower Chama Valley during the early historic period, including Navajos, Utes, Comanches, and considerably later, Jicarilla Apaches. The archaeological remains of these groups are problematic and have been the subject of considerable controversy. Schaafsma (1979) identified 33 sites in the Abiquiu Reservoir as seventeenth- and eighteenth-century Navajo occupations, and he recognized 17 other sites as nonhistoric Navajo Indian occupation. Recently, Kemrer (n.d.) has questioned Schaafsma's ethnic assignments, especially his Piedra Lumbre phase material. The continuing debate over ethnic affiliation of historic sites in the area underscores fundamental methodological problems associated with correlating archaeological remains with specific cultural groups. As Kemrer points out, cultural affiliation is based on linguistic criteria and shared value and belief systems. These dimensions are normally beyond the grasp of archaeology.

We know from historical documents that expansion of Spanish settlement into the lower Chama did not occur until after the Pueblo Reconquest of 1692 and that throughout most of the eighteenth century, Spanish homesteading of the Chama Valley was severely curtailed by conflict with local Indian groups--notably Comanche and Ute. The *genízaro* settlement at Abiquiu was the northernmost European settlement throughout the Spanish period (Schroeder 1953:7). Further penetration was prevented largely because Ute and Comanche predations intensified throughout the first half of the eighteenth century following an alliance between the two tribes.

Events in the Ojo Caliente Valley paralleled those in the Chama Valley to the west. The earliest Spanish settlement on the Rio Ojo Caliente was a small grant to Antonio de Abeyta on the west side of the river, established in 1736 (Jenkins 1991). The grant was abandoned in 1780 due to Comanche harassment and was reestablished by Abeyta's grandchildren and others in 1805. The Black Mesa Grant of Diego de Madera and Juan García de la Mora originated seven years after the Abeyta grant and included land on both sides of the river and most of Black Mesa, all the way to the Rio Grande on the east (Jenkins 1991:2). The Ojo Caliente Grant, encompassing the site of the Ojo Caliente Mineral Springs, was probably established sometime in the early 1730s, although an actual accession is not on record. These northernmost settlements on the Rio Ojo Caliente were abandoned around 1748 because of Indian hostilities, and the area was not resettled by Europeans in large numbers until the early 1790s (Jenkins 1991:9). Spanish and Mexican settlement continued north, up the river valley, in the early decades of the nineteenth century, but hostilities and resultant settlement instability persisted until the beginning of the American period in A.D. 1846.

Life in northern New Mexico's villages changed little during the first century of the American period. Although the railroad came into the territory in the 1880s and statehood was conferred in 1912, life in small, out-of-the-way villages continued to focus on farming and herding as the primary economic activities (Kutsche and Van Ness 1988). Although railroads brought tons of manufactured goods into Santa Fe and other towns of New Mexico, rural New Mexicans were generally too poor to afford many luxuries.

Following World War II, paving of highways permitted some families in the Abiquiu-Ojo Caliente region to purchase cars and improve access to Santa Fe and elsewhere. Since that time, wage labor outside the villages, money received from relatives living in distant towns and cities, and federal subsidy programs have improved the general economic situation in northern New Mexico villages. However, the price in terms of dispersal of families, loss of economic autonomy through loss of farming and herding, and general dissolution of the social fabric of the villages has been great and continues to this day. Knowledge of the old ways is rapidly disappearing because most of those who experienced them first-hand have passed on.

TESTING OBJECTIVES, METHODS, AND RESULTS

The eleven prehistoric and historic sites comprise two basic site types: habitations and agricultural gardens/fields. Three (LA 66288, LA 105710, and LA 105712 are habitation sites representing the prehistoric Native American, Mexican-American, and Spanish Colonial periods, respectively. Eight (LA 105703–LA 105709 and LA 105713) are prehistoric agricultural sites. The testing and evaluation procedures varied by site type, as described below. Site locations and ownership/jurisdiction data are in Appendix 1.

LA 66288 (Hilltop Pueblo)

Hilltop Pueblo is a single-plaza Biscuit Ware village believed to be ancestral to one or more of the modern Tewa Pueblos along the Rio Grande north of Santa Fe. Culturally, it belongs to the Rio Grande Classic period and dates approximately A.D. 1325 or 1350 to 1540 or 1600. The central part of the site, the plaza pueblo on top of the high terrace east of U.S. 285, lies outside the proposed highway project area. However, peripheral manifestations, generally denoted by a surface scatter of pottery and lithic artifacts, are strewn at the base of the terrace, inside the project area. The remains east of U.S. 285 are south of the pueblo, while those west of U.S. 285 are west of the pueblo. Because the conditions and results differed for each area, testing activities and results are described separately below.

South Area (East of U.S. 285)

Two aspects of the south area are important to our understanding of the results. First, local topographic conditions, wind patterns, and land use problems (overgrazing/farming) have resulted in the accumulation of a major eolian sand deposit (i.e., a single large dune) piled at the base of the high terrace east of U.S. 285. It centers on the south area of LA 66288, with which we are concerned, as well as around the morada at LA 105710 (Fig. 2). Second, three abandoned roads that provided access between the highway and the top of the high terrace transect the area to be tested. These broad, shallow troughs vary from 25 to 75 cm deep. The central road is deepest, in part because it has been "dredged" of accumulated sand to permit use. The sand removed during the dredging was thrown to either side of the road, creating linear sand mounds that look suspiciously like house mounds.

Our testing shows that LA 66288 continues south from the limits originally described by survey archaeologists. Surface and subsurface pottery and lithic artifacts were documented to and beyond the morada of the adjacent site, LA 105710.

Methods. One grid served both the west and south areas of LA 66288. Because of the proximity of LA 66288 and LA 105710, the same main datum was also used for both. The grid north squares comprise LA 66288, and the grid south squares comprise LA 105710. A drainage emanating from the high terrace to the east provides a convenient demarcation between the two sites. The main datum is 30 cm west of a vertical station marker (yellow railroad rail) placed 5

m north of the northwest corner of the LA 105710 morada by NMSHTD. Our datum is a piece of two-feet-long rebar driven into the ground, leaving only a few centimeters protruding above the surface. The designation of each square is determined by the distance and direction of the northeast corner of each square from main datum.

All surface artifacts were pinflagged. Next, a basic grid form was established using rebars at critical junctures, all measured from the main datum using a lensatic compass and 50 m tape. All cultural items dating to before 1950 were recorded in 2 by 2 m squares established by 50 m stretched between the base lines of the grid and using 3 m tapes to delineate individual squares. Most artifacts were left where found, though unusual items requiring further identification were brought back to the laboratory for analysis.

East of U.S. 285, three parallel lines of auger holes were dug by hand. The 52 tests were spaced at 3 m intervals along lines spaced 4 m apart (Figs. 3 and 4). Final depths varied from 15 to 165 cm, with an average of 140.1 cm (SD = 45.71). The shallower tests were curtailed by rocks or other materials that could not be penetrated by the auger. In some cases, second and even third attempts were made by shifting 30 to 50 cm to one side.

Each bucket of fill pulled up by the auger was screened through 1/8 inch wire mesh into a plastic pail. Records were made of all artifacts recovered in each bucketful. Approximate depths, fill composition, texture, color, and the presence of known or suspected cultural materials (especially charcoal stain, flecks, and pieces) were recorded. At the completion of each test, the hole was backfilled with the screened fill, and the artifacts were placed on the fill pile. Only those artifacts requiring further analysis for identification were collected for study in the laboratory.

Results. In spite of the dunal nature of the south area, 363 prehistoric and historic surface artifacts were inventoried. The occurrence and distribution of surficial artifacts is clearly related to rodent activity. Of the total, 97 percent are late prehistoric pottery sherds and pieces of lithic debitage. Historic artifacts include rusted lap-seam cans (motor oil), milk cans, purple glass fragments, and a four-hole shell button. The highest surface artifact densities east of the highway occur on the sand piles along the margins of three old road scars (Fig. 3). Judging by the auger results, we believe that the high-density areas derive from the twin factors of periodic road dredging and increased rodent burrowing on the south-facing slopes associated with the roads. Thus, the areas of high artifact density are probably the result of these dirt-turning activities, not of aboriginal occupation preferences.

Auger tests indicate the subsurface deposits are relatively uniform and predictable in terms of soil composition, texture, color, and cultural content. The basic matrix is fine sandy silty loam that often contains charcoal flecks and bits. The charcoal appears to derive mainly from natural fires or wind-deposited cultural charcoal blown from upwind sites. The usual natural zone of slightly to moderately compacted fill (the fine sandy silty loam of the site) was encountered in every test, usually starting at a depth of 20 to 30 cm; its thickness varied from 30 to 60 cm. Occasional lenses of sand and fine gravel were encountered in some tests, but these tests were usually near small water channels emanating from the terrace slopes.

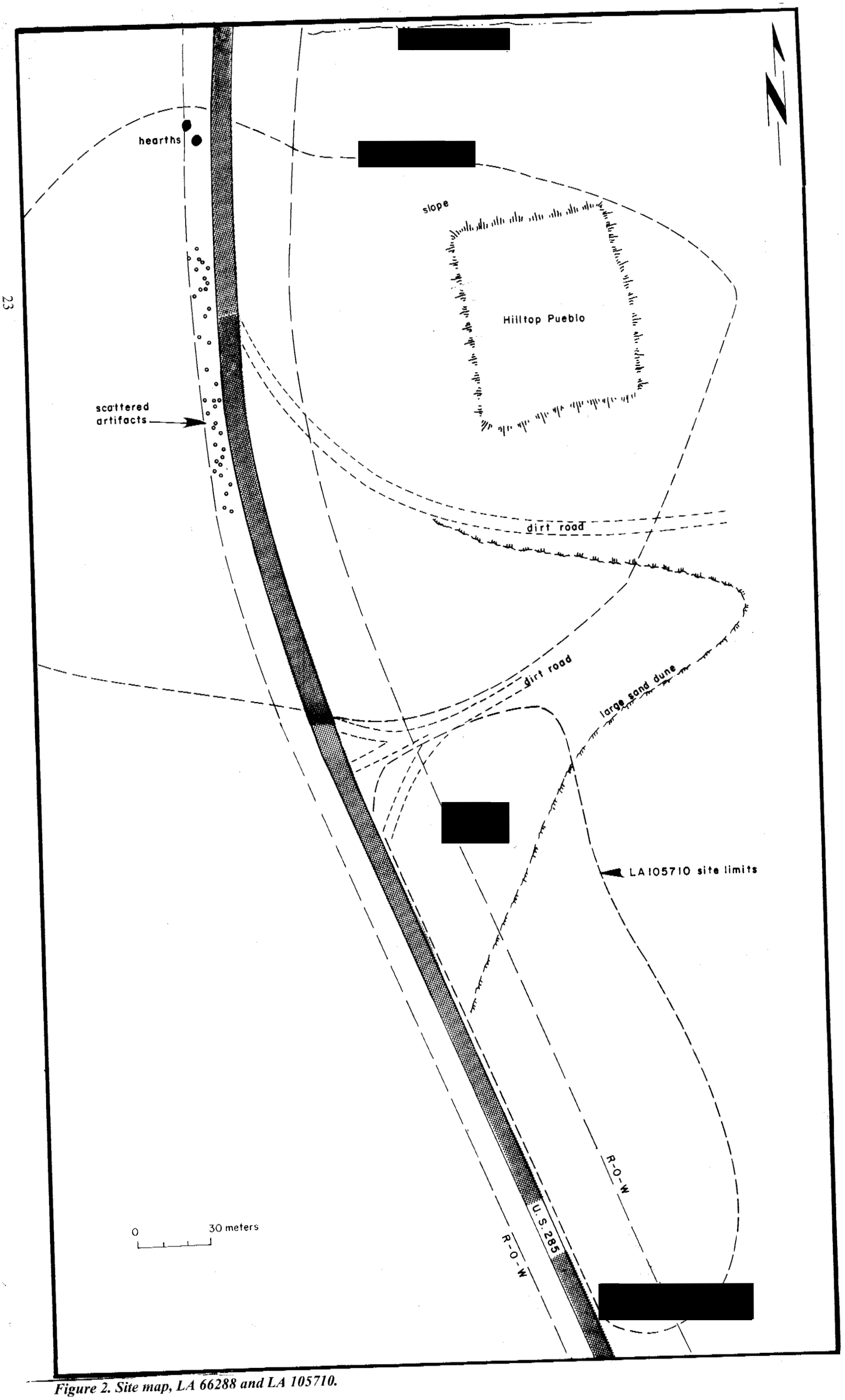
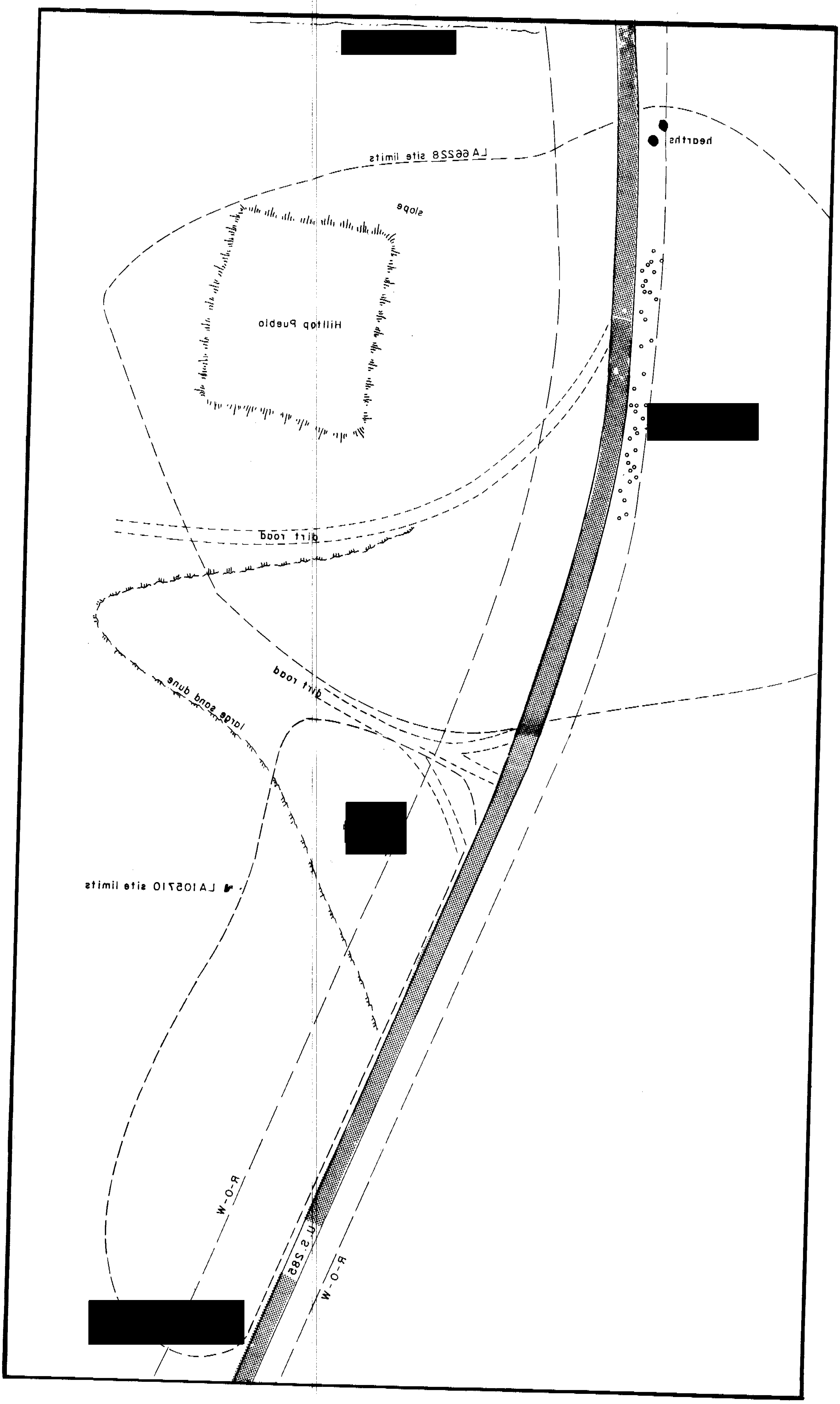


Figure 2. Site map, LA 66288 and LA 105710.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LA 66228 site limits
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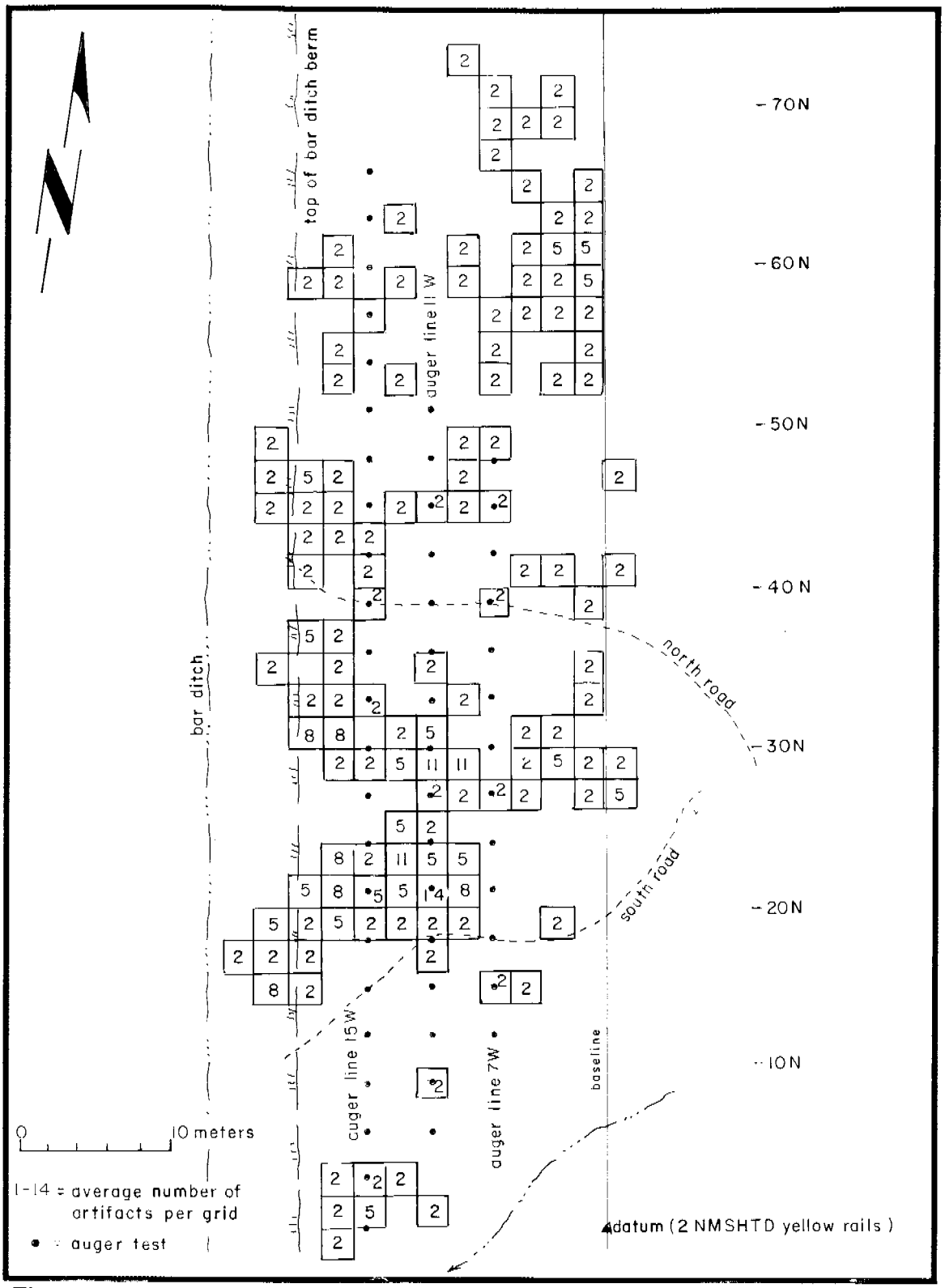

Figure 3. Surface artifact density plot and auger pattern, south area, LA 66288.

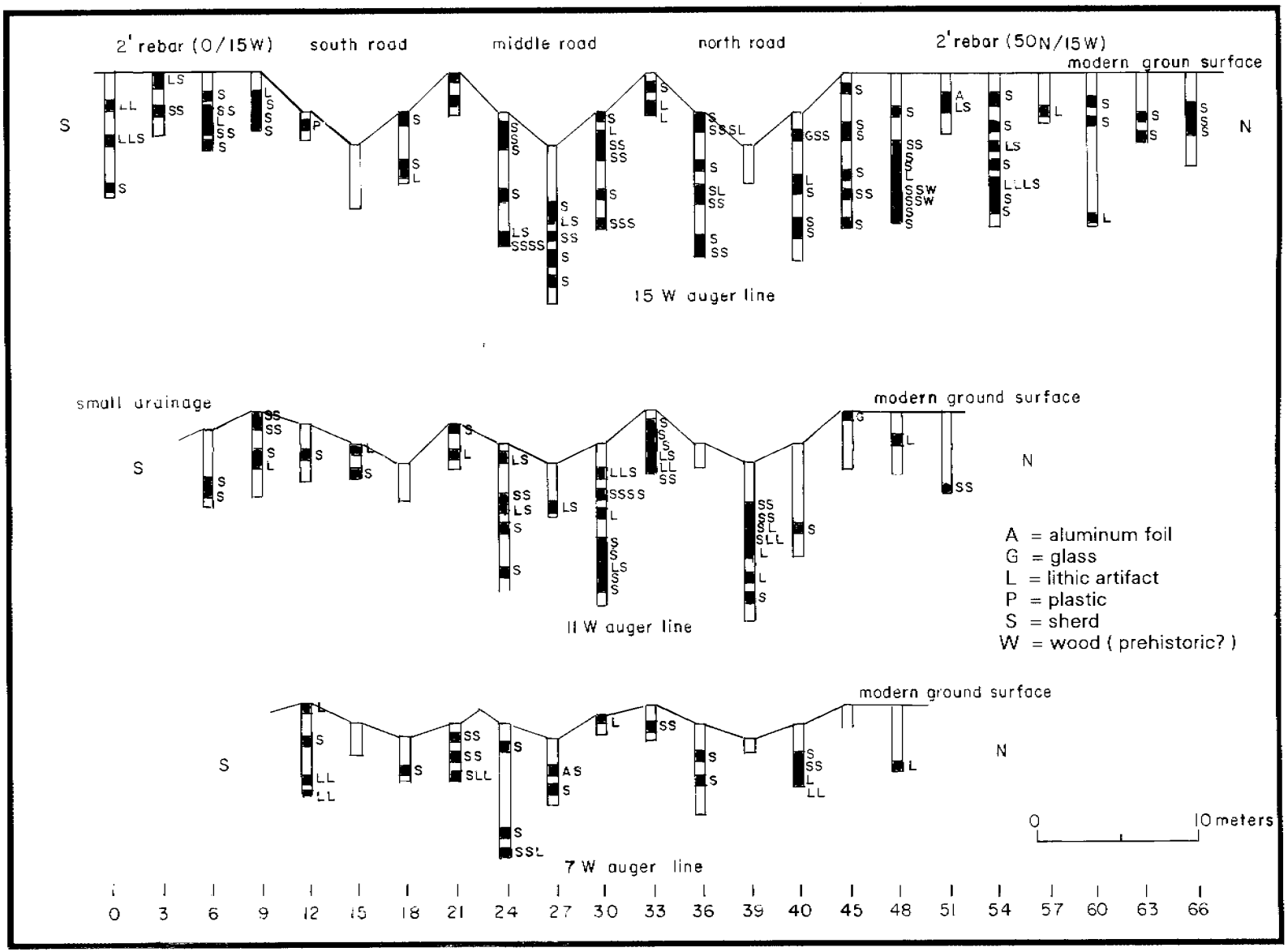

Figure 4. Auger profiles, south area, LA 66288.

The only test to produce a variance in the nature of the fill was 24N/7W, situated on the south slope (north-facing) of the middle road. There, a very hard, adobe-like material was encountered within 5 cm of the surface. However, with effort, the auger penetrated the material after a couple of centimeters and continued to a depth of 140 cm. No other hard fill was encountered. Since the rest of the fill in the test was typical of that encountered throughout the site, including a number of prehistoric artifacts, it seems likely that the initial hardness was the result of night-time freezing, not cultural activity.

Artifacts, mainly pottery sherds and lithic artifacts numbering 219 items, came from all depths (average items per test = 4.2; range = 0-14; SD= 3.93) (Fig. 4). Forty-five (86 percent) of the 52 tests recovered artifacts. In terms of auger buckets excavated (about 435 buckets), there was about one artifact recovered for every two buckets, a very high recovery rate for augering. Five pieces of glass, plastic, and aluminum foil were also recovered, but all came from within 30 cm of the surface.

Two general periods of occupation are represented in the south area artifacts: late prehistoric Native American and Mexican-American (Table 1). The Native American period, represented by the ancestral Tewa pottery series of Wiyo Black-on-white, Biscuit A (Abiquiu Black-on-gray), Biscuit B (Bandelier Black-on-gray), Sankawi Black-on-cream, and Potsuwii Incised, indicates one or more occupations related to Hilltop Pueblo and the Classic period (ca. A.D. 1300 to 1600).

The earliest and the latest pottery types in the south area are generally concentrated in different places. All but one of the Wiyo and Wiyo-Biscuit sherds were noted in auger tests north of the road scars (Fig. 2). Sankawi Black-on-cream, the latest pottery type, is surface material. All but three sherds were found in the south end of the site.

The earliest evidence for Mexican-American use of the site--purple glass, transfer-print "china," and patinated glass fragments--dates to the turn of the century (ca. A.D. 1900). All six of these items were found on the surface or in the auger tests north of the middle road scar. All items recovered in auger tests were within 30 cm of the surface.

Table 1. Diagnostic artifacts from all proveniences within the project area, LA 66288 (frequency)

Artifact Type	South Area		West Area	
	Surface	Auger	Surface	Auger
Prehistoric				
Wiyo Black-on-white	-	5	-	-
Wiyo-Biscuit	-	3	1	-
Biscuit A	25	12	6	-
Biscuit B	32	14	10	-

Artifact Type	South Area		West Area	
	Surface	Auger	Surface	Auger
Biscuit "C"	1	-	-	-
Biscuit-Sankawi	1	1	1	-
Sankawi Black-on-cream	7	-	-	-
Potsuwii Incised	-	1	-	-
Galisteo (?) Black-on-white	1	-	-	-
Rio Grande Glaze	-	1	-	-
Tesuque Smeared Indented	3	-	-	-
Sapawe Micaceous Washboard	35	11	-	-
Historic				
Transfer-print china	1	-	1	-
Purple glass	2	-	-	-
Patinated brown glass	-	1	-	1
Patinated clear glass	-	1	-	-
Clear glass	*	-	*	1
Brown glass	*	-	*	5
Fluted green glass	*	-	*	1
Sanitary can	1	-	*	-
Meat can	1	-	*	-
Milk can	1	-	*	-
Motor oil can	3	-	*	-
Paint can lid	1	-	*	-
Plastic	*	1	*	4
Electrical tape	*	-	*	1
Aluminum foil	*	2	*	-
Leather	*	-	*	1
Wire nail	*	-	*	1
Tar	*	-	*	1
Asphalt	*	-	*	1
Concrete				

* Surface finds of historic items other than obviously old pieces (purple and/or patinated glass, etc.) were not inventoried.

Interpretation. Three aspects of the south area are notable: the numerous artifacts on and below the surface; the absence of clear-cut stained cultural deposits and stratigraphy; and the fact that although the primary components of the pottery assemblage are Biscuits A and B, the earlier sherds (Wiyo) and the later sherds (Sankawi) found during the testing are discretely distributed both vertically and horizontally. The pottery assemblage as a whole is the same as that of Hilltop Pueblo, indicating that the south area was an outlier of the pueblo and part of it.

Many of the artifacts were recovered from as deep as 1.5 m. Even considering the potential for artifact breakage during augering (especially sherds) and the probability that some items from higher in the fill would occasionally dislodge and fall to lower depths prior to recovery in the auger, it is clear that substantial archaeological remains (artifacts) occur from the surface downward to depths of at least 1.5 m and possibly deeper.

More intensive work, including the opening of large, vertical exposures, will be necessary to determine the origin and nature of the cultural materials and their associations.

West Area (West of U.S. 285)

One aspect of the west area is important to our understanding of the results. Previous alignments of what we now call U.S. 285 cover the entire area within the proposed highway project. The remnants of these roads, plus turnouts to the houses to the west, have seriously mixed archaeological deposits in the project zone, as will become evident in the descriptions to follow.

Methods. The main datum and grid established for the south area of LA 66288 also served the west area (Fig. 2). The activities and procedures used in the south area were used here as well.

One line of 18 auger holes spaced at 5 m intervals was dug along the 35/40 west line. A jog from one alignment to the other at 100N was necessitated by the proximity of a property wall to the west (Fig. 5). Final depths varied from 5 to 165 cm, with an average of 71.9 cm (S.D.= 58.67). The shallower tests were curtailed by old pavement or compacted roadbed that could not be penetrated by the auger. In some cases, second and even third attempts were made by moving 30 to 50 cm to the side.

Results. Few surface artifacts, consisting mostly of pottery sherds and lithic debitage, were inventoried in the west area. Twenty-two of the 29 total artifacts inventoried were in the south half of the west area, between 85N and 120N (Fig. 5). Only one historic item (transfer-print china) dating to before 1950 was noted.

The 18 auger tests made in the west area indicate that the subsurface deposits are relatively uniform and predictable in terms of soil composition, texture, color, and cultural content. The basic matrix is the same fine sandy silty loam noted in the south area. Here, too, charcoal flecks and bits, which are relatively common throughout the fill, appear to derive mainly from natural fires or were wind-deposited from upwind cultural sites. The usual natural

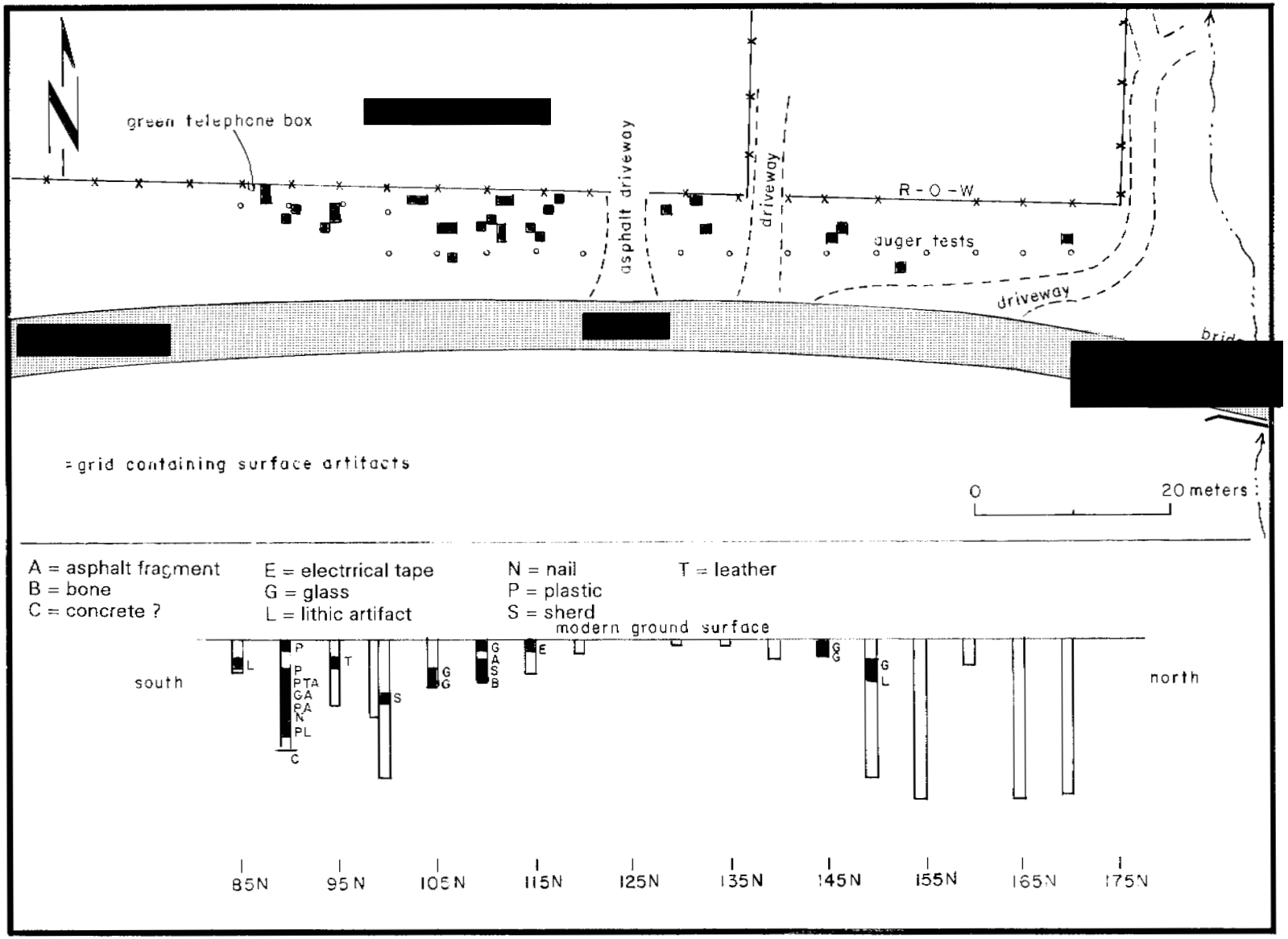

Figure 5. Surface artifact density plot and auger profiles, west area, LA 66288.

zone of slightly to moderately compacted fill (the fine sandy silty loam of the site) was encountered in every test not terminated by old highway pavement or compacted road fill. Final test depths are considerably shallower than in the south area. They ranged 5 to 165 cm deep and average 52.5 cm (SD = 58.67).

The 27 artifacts recovered by augering are mainly historic in origin. They came from all depths and averaged 0.7 items per test (range = 0-14) (Fig. 5). In terms of auger buckets excavated (about 131 buckets), about one artifact was recovered for every five buckets. While artifacts were recovered from nine (50 percent) of the 18 tests, only five are prehistoric Native American sherds and flakes. Three patinated glass fragments suggest a turn-of-the-century date, though none are purple. All the rest of the artifacts are pieces of recent glass, plastic, leather, concrete, asphalt, road tar, and wire nails.

Diagnostic artifacts include both prehistoric and historic materials (Table 1). The prehistoric items, mostly pottery types dating to the main occupation of Hilltop Pueblo, are all surficial. The historic items date mostly to the twentieth century, though a few pieces of purple glass and transfer-print china indicate turn-of-the-century occupation as well.

Interpretation. Because the prehistoric and turn-of-the-century historic artifacts are all mixed with the more numerous, obviously recent items, the deposits west of U.S. 285 are clearly displaced to depths of 1 m or more. This fact, plus the presence of old road surfaces and grades below the surface, indicate that the cultural materials and deposits in this part of LA 66288 have no potential for productive research.

LA 105710 (Morada and Store)

At the outset of this project, LA 105710 was considered a historic site with the remains of an old road scar (discussed under LA 66288), a morada, and a store (Marshall 1995), all dating to the early and mid-twentieth century (Fig. 2). The morada is at the north end of the site, and the store is over 200 m away at the south end. The road scar actually lies within the bounds of prehistoric site LA 66288, which abuts LA 105710 on the north. According to local informants, both the morada and the store were abandoned in the mid-twentieth century. Before they could fall into ruin, most of the building materials from both structures were removed for use elsewhere, resulting in the low mounds that we see today. Cultural materials (glass, metal, china, etc.) other than recent roadside trash are virtually absent on the site surface.

The site is situated at the back of the first terrace and at the foot of the second, high terrace discussed earlier (LA 66288). In fact, LA 105710 is separated from the south area of LA 66288 by a small drainage that heads on the slope of the second terrace. The dune in the south area of LA 66288 continues onto the north end of LA 105710 and terminates 30 m south of the morada. Because of human activities and wind deflation patterns around the structure, the morada sits in a small, bowl-like depression in the dune.

At the time LA 105710 was recorded, no prehistoric cultural materials were noted.

During testing, however, abundant prehistoric materials were recovered from the subsurface by augering. Because these materials are primarily Biscuits A and B pottery sherds and were recovered from the south end of the dune at LA 66288, it is clear that they are part of that site. Historic materials were surprisingly rare in the auger tests.

Methods. The procedures used at LA 66288 were also used at LA 105710. The main datum at LA 66288 was also used at LA 105710. The square designations at LA 105710 were grid south numbers. Our activities at LA 105710 were limited to surface artifact inventory and intensive, systematic augering.

Surface artifact inventory and augering were limited to the vicinity of the morada. One of the three parallel lines of auger tests was extended south of the morada to investigate a large patch of wolfberry (*Lyceum* sp.). In some parts of New Mexico, this plant is an indicator of prehistoric habitation. The morada itself was not tested because it will be fenced and protected during construction.

Only roadside trash postdating the occupation was noted at the store location, and these materials were restricted almost exclusively to the highway bar ditch and embankment. Visual evaluation of the store foundation provided information sufficient for planning purposes and precluded the need for testing. According to Mrs. Flora Trujillo (pers. comm., April 8, 1996), a long-time resident of the area, the store carried general merchandise and was operated by Manuel and Candido García (brothers) from 1930 to 1934.

Results. Twenty-four surface artifacts were recorded in the vicinity of the morada (Fig. 6). All but two date to the prehistoric period. Three Biscuit A and four Biscuit B sherds indicate an affiliation with the south area of LA 66288, immediately north of LA 105710. That site belongs to the late prehistoric Tewa of the Rio Grande Classic period. The LA 105710 materials date to ca. A.D. 1375 to 1500.

Most of the surficial historic artifacts are along the U.S. 285 bar ditch and berm and were not inventoried because they are more recent than 1950 in origin. A lap-seam milk can and a piece of window glass, judging by their extremely rusted/patinated conditions, probably belong to the late 1800s or early 1900s, when the morada was in use.

The 49 auger tests, spaced 3 m apart and placed north-south along grid lines 5W, 9W, and 13W showed the subsurface soil to be the same fine sandy silty clay loam as in the south area of LA 66288 (Fig. 7). In fact, most of the area augered is part of the same large dune or "sand" mass, which covers all of the south area of LA 66288 and the north part of LA 105710. The south end of the dune is marked by a small water channel that runs through grid points 42S/5W and 45S/9W.

Auger line 5W was extended an additional 30 m south across a stabilized level area to examine the subsurface deposits in the vicinity of a wolfberry (*Lyceum* sp.) patch. The same fine sandy silty clay loam soil was encountered, even though this area lies south of the dune. Although an artifact or two was noted south of the water channel, it is clear that the bulk of the

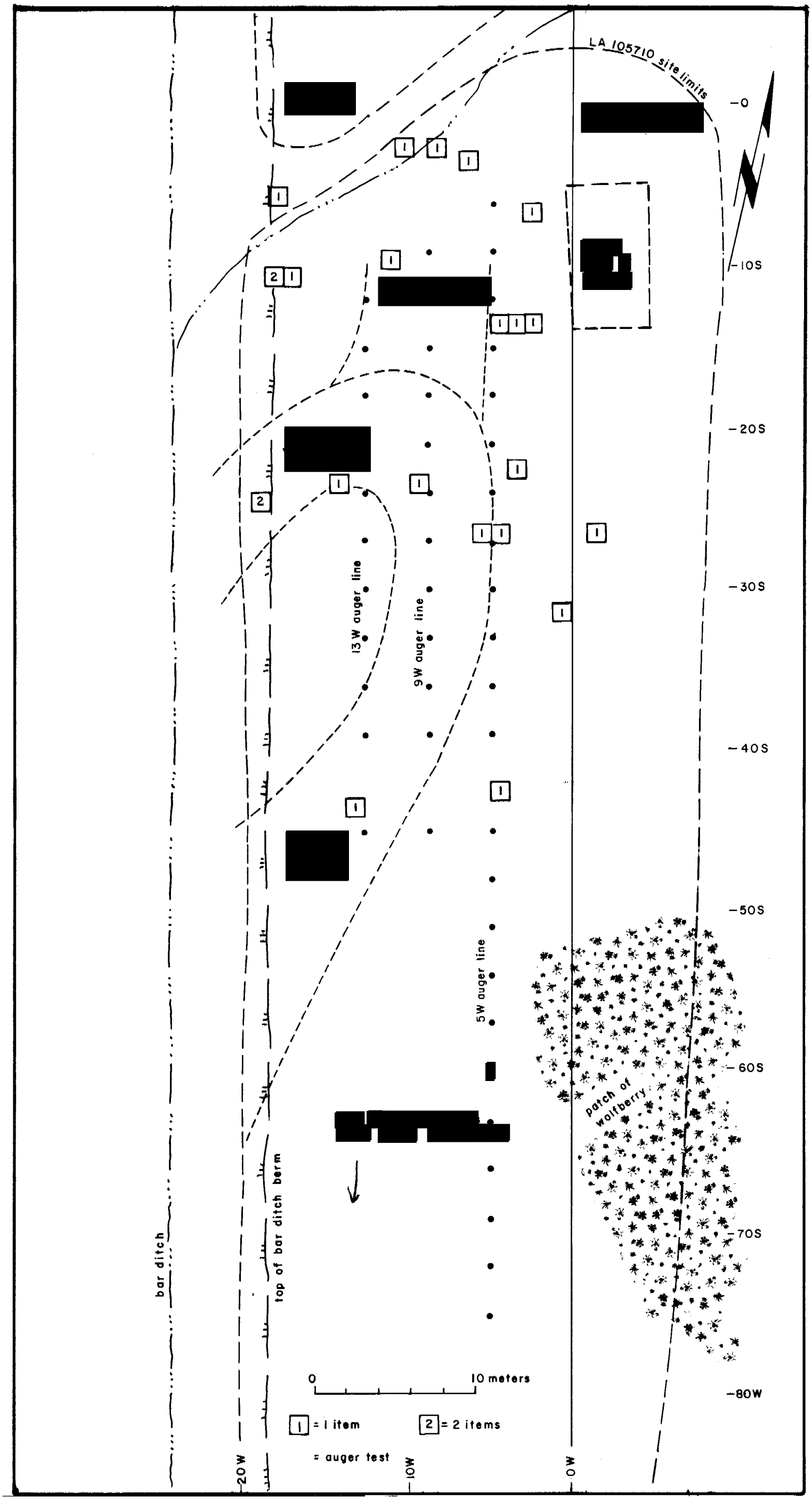

Figure 6. Surface artifact density plot, LA 105710.

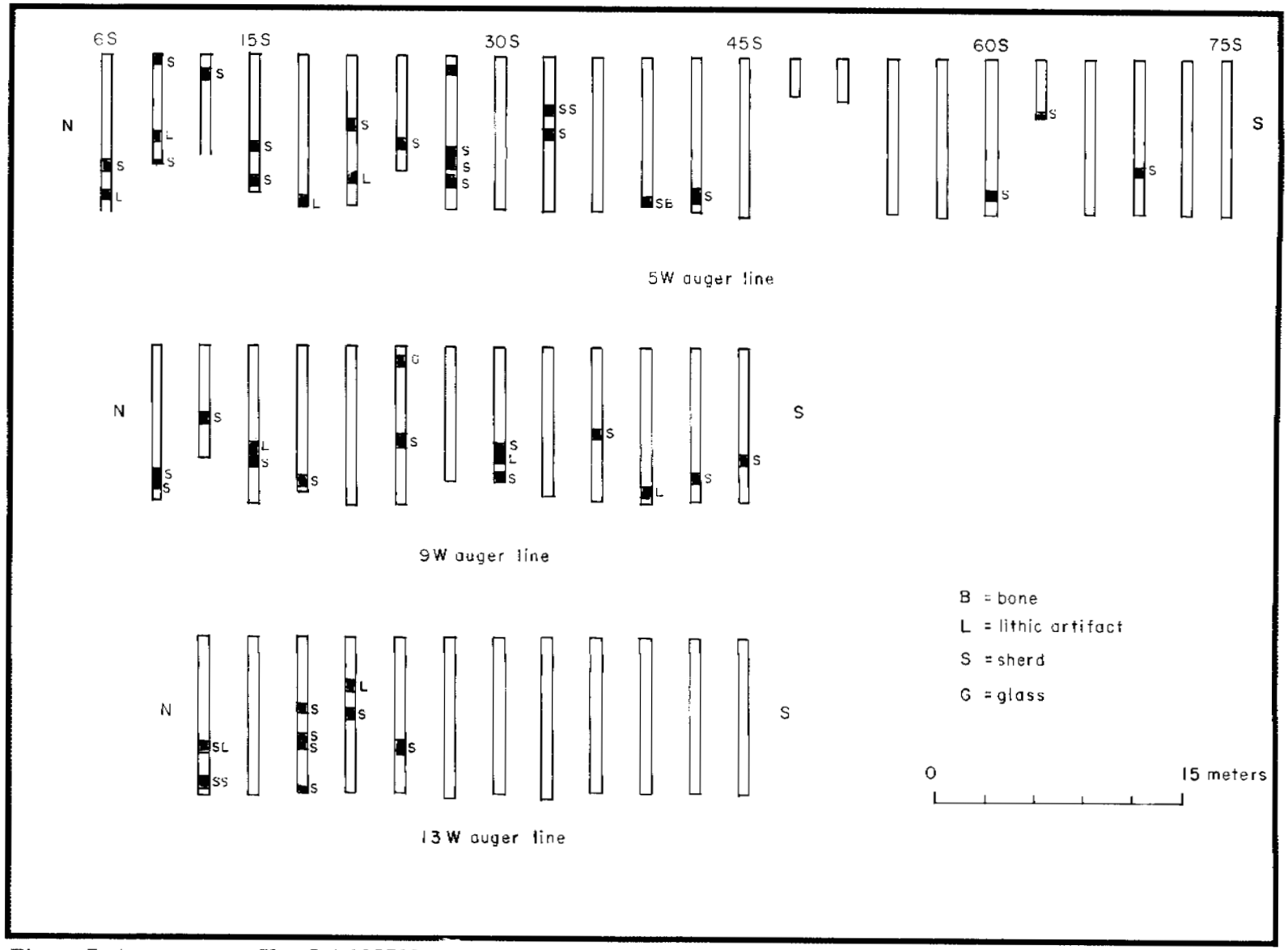

Figure 7. Auger test profiles, LA 105710.

artifacts, both on the surface and in the ground, correlate strongly with the dune.

Forty-eight artifacts, mainly pottery sherds and lithic artifacts, came from all depths (average 0.98 items per test; range = 0-4). Twenty-eight (57 percent) of the 49 tests recovered artifacts. In terms of auger buckets excavated (740 buckets), about one artifact was recovered for every 15 buckets, a moderate rate.

As with the surface artifacts, the artifacts recovered during augering are primarily prehistoric pottery sherds and lithic artifacts. The pottery belongs entirely to the early Tewa sequence. Of the diagnostic types, Biscuit A and Biscuit B, here, as at LA 66288, are the dominant pottery types (Table 2). Four sherds of the earliest recognized Tewa type, Wiyo Black-on-white, were also recovered, all from depths of 90 cm or deeper. All but one were clustered west of the morada at the north end of the site.

Conversely, a single sherd of probable Tewa Polychrome was recovered from a depth of 15-25 cm in Test 12S/5W. This sherd could represent Native American (Tewa) or Spanish Colonial occupation of the site, but it is too old to have been associated with the morada.

Only one sherd of thin brown bottle glass was recovered by augering. This post–A.D. 1950 fragment of a no-deposit bottle came from within 20 cm of the surface.

Table 2. Diagnostic artifacts from all proveniences within project area, LA 105710

Artifact Type	Morada Vicinity	
	Surface	Auger
Prehistoric		
Wiyo Black-on-white	-	3
Wiyo-Biscuit	-	1
Biscuit A	3	7
Biscuit B	4	1
Sapawe Micaceous Washboard	-	6
Historic		
Tewa (?) Polychrome	-	1
Clear window glass	1	-
Thin brown bottle glass	-	1
Lap-seam milk can	1	-

Interpretation. Three aspects of the testing results are striking. First, virtually no historic materials other than post–A.D. 1950 trash is present on top of or below the ground surface in the

vicinity of the morada. The same is true of the surface surrounding the García store at the south end of the site. The store location was not tested, but the nearby bar ditch for U.S. 285 has only post-A.D. 1950 roadside trash. No prehistoric material is present near the store, either on the surface or in the bar ditch.

Second, the material culture recorded at the north end of the site, surface and subsurface, is dominated by prehistoric pottery and lithic artifacts. These materials date to the same period as those at nearby LA 66288 (Hilltop Pueblo), a late prehistoric ancestral Tewa village. Because the materials at LA 105710 are restricted to a extension of the large dune that comprises the south area of LA 66288, it is clear that the prehistoric component of LA 105710 is actually part of that site. The separate site number in this instance is artificial, and the two areas (south area of LA 66288 and morada area of LA 105710) should be treated as the same site.

Third, the large numbers of pottery sherds and lithic artifacts at all depths in the dune indicate aboriginal activities of a sort not formally defined or investigated at late prehistoric sites in the region. It is perhaps best to think of the dune and associated cultural materials as some form of outlier to the main village. Although our tests did not identify architecture within the dune, we still lack sufficient information with which to accurately characterize aboriginal use of the dune and to relate it in other than a general way to the village. Are ephemeral structures (ramada) or activity areas (hearths, processing pits, storage pits, etc.) present? Or was the dune used for intensive gardening, as some dunes are used at Hopi for special crops, especially beans? Whatever the case, more intensive work is warranted prior to highway construction.

LA 105712 (Spanish Colonial Site)

LA 105712 is small, ephemeral Spanish Colonial site consisting of the cobble outlines of two presumed jacal structures, a small refuse area, and a segment of the old road (Fig. 8). The site, which sits on a low gravel terrace where Arroyo de la Cruz enters the east side of the Ojo Caliente Valley, is covered by an overgrazed native-grass turf. Diagnostic artifacts, primarily Tewa Polychrome (?) pottery and associated utility wares indicate that the site dates to the eighteenth century.

The south structure has the outlines of two square rooms placed corner to corner. One room measures 6 by 6 m, and the other 4 by 4 m. The north structure is circular and 4 m in diameter. Both structures have little or no mounding. This, plus the fact that the single-cobble-wide (10-20 cm) "foundations" are clearly visible on the surface, indicates that these features are only embedded a few centimeters into the ground surface and had walls of jacal or similarly light construction. It is possible that one or both structures were animal pens, not human habitations. This possibility is enhanced by the fact that the cobbles of the west room of the south structure follow the topography of a convex, west-facing slope. Only a dozen or so artifacts could be found on the surface of the refuse area at the south end of the site.

The old Ojo Caliente road scar, running along the east side of the structures and refuse area, is a slight trough that deepens at the south end, where it drops into the arroyo. Although the

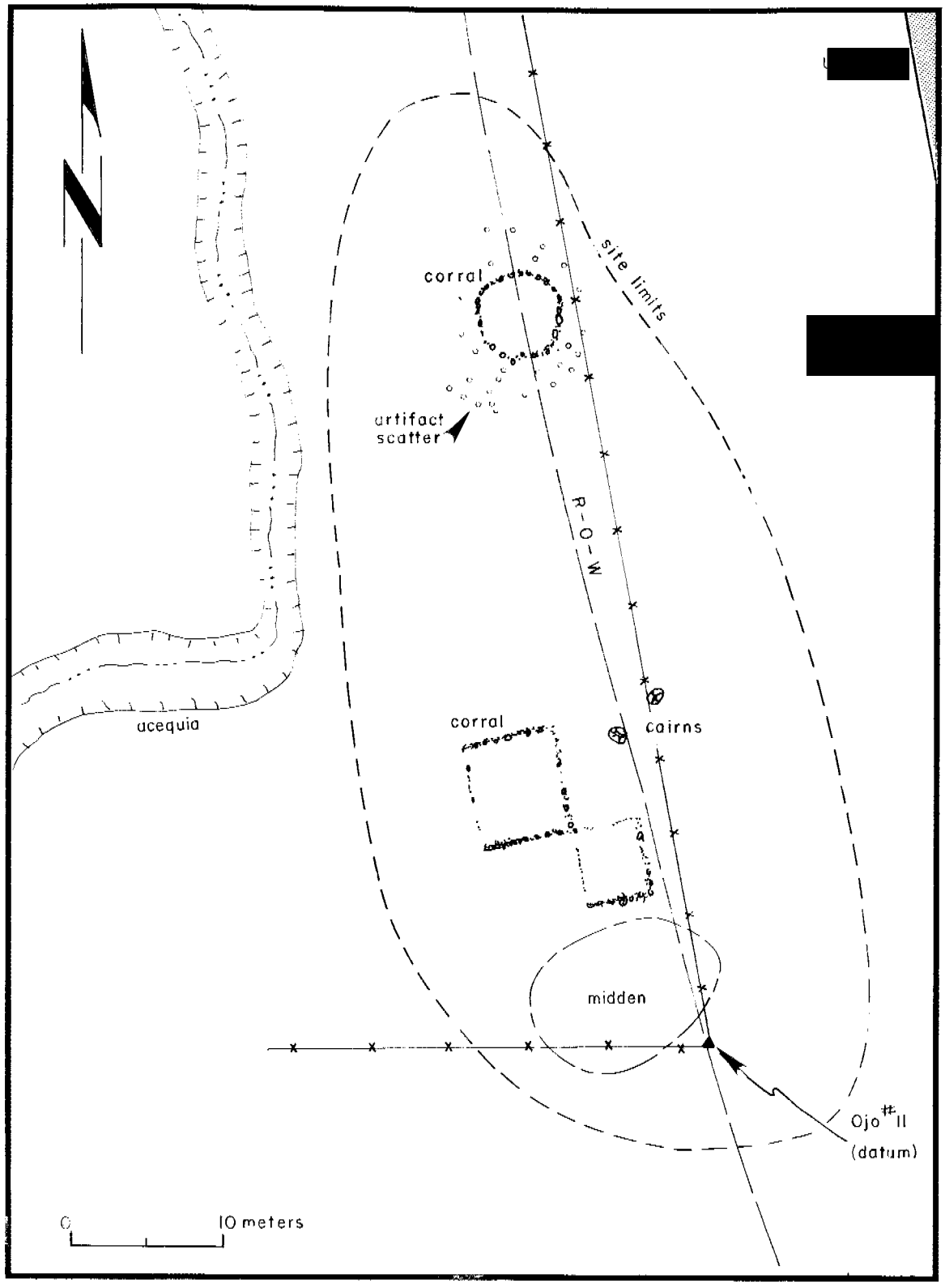

Figure 8. LA 105712 site map.

path of the old road is fairly obvious, the shallower parts of the scar, as well as the adjacent land surface, were modified during construction of the present embankment and grade for U.S. 285. The old road, marked by rotted wood posts strung with rusted wire, runs just inside (east of) the current right-of-way fence.

Interpretation. No tests were conducted at this site since all but the old road scar lies outside the proposed construction zone. As currently proposed, the new U.S. 285 right-of-way limit lies about 2 m west of the current right-of-way fence. To protect the site, a fence will be built along the right-of-way limit prior to construction.

Agricultural Sites

The eight agricultural garden sites (LA 105703–LA 105709 and LA 105713) are very similar in outward appearance. They consist of very low mounds of gravel outlined by rectilinear alignments of river cobbles. The heights of the mounds, as well as their gravelly nature, are accentuated by the relatively barren ground surrounding them. This effect was created when surface gravels were collected from the surrounding ground surface and placed within the cobble outlines, causing a stark contrast between the gravelly gardens and the gravelless soil surrounding them. Cobbles for the garden borders were mined from pits along the terrace edge next to the gardens.

All gardens are situated on top of the high terrace that forms the eastern boundary of the Rio Ojo Caliente floodplain or else on eroded, hilly remnants of that terrace. Diagnostic pottery normally associated with grid gardens consists mainly of Biscuit A and Biscuit B, indicating temporal and cultural affiliation with the large Biscuit sites of the area like Hilltop Pueblo.

Because of the known nature of the gardens, testing is inappropriate. Past projects in similar sites have shown them to be relatively shallow, and their extent can be accurately judged from observation of the ground surface (Fiero 1978; Anschuetz and Maxwell 1987; Anschuetz et al. 1985). Moving directly to data recovery is appropriate once the sites are recorded and their relationship to the proposed construction project is defined. The most appropriate data recovery activities combine intensive surface artifact inventory and collection, mapping of each garden in its entirety, and limited excavation and soil sample collection within the gardens. Proposed treatments for each site are discussed following brief site descriptions. Marshall (1995) gives more detailed descriptions of each site.

LA 105703, Prehistoric Grid Garden

This series of grid gardens, cobble borrow pits, and scattered artifacts is situated on remnants of the lower terrace on the east side of the Ojo Caliente Valley (Fig. 9). The site, bifurcated by U.S. 285, measures 300 m north-south by 100 m east-west (including the highway). Five grid gardens (in whole or in part, a total area of 875 sq m), four cobble borrow pits, and two thin scatters of artifacts are within the proposed highway project.

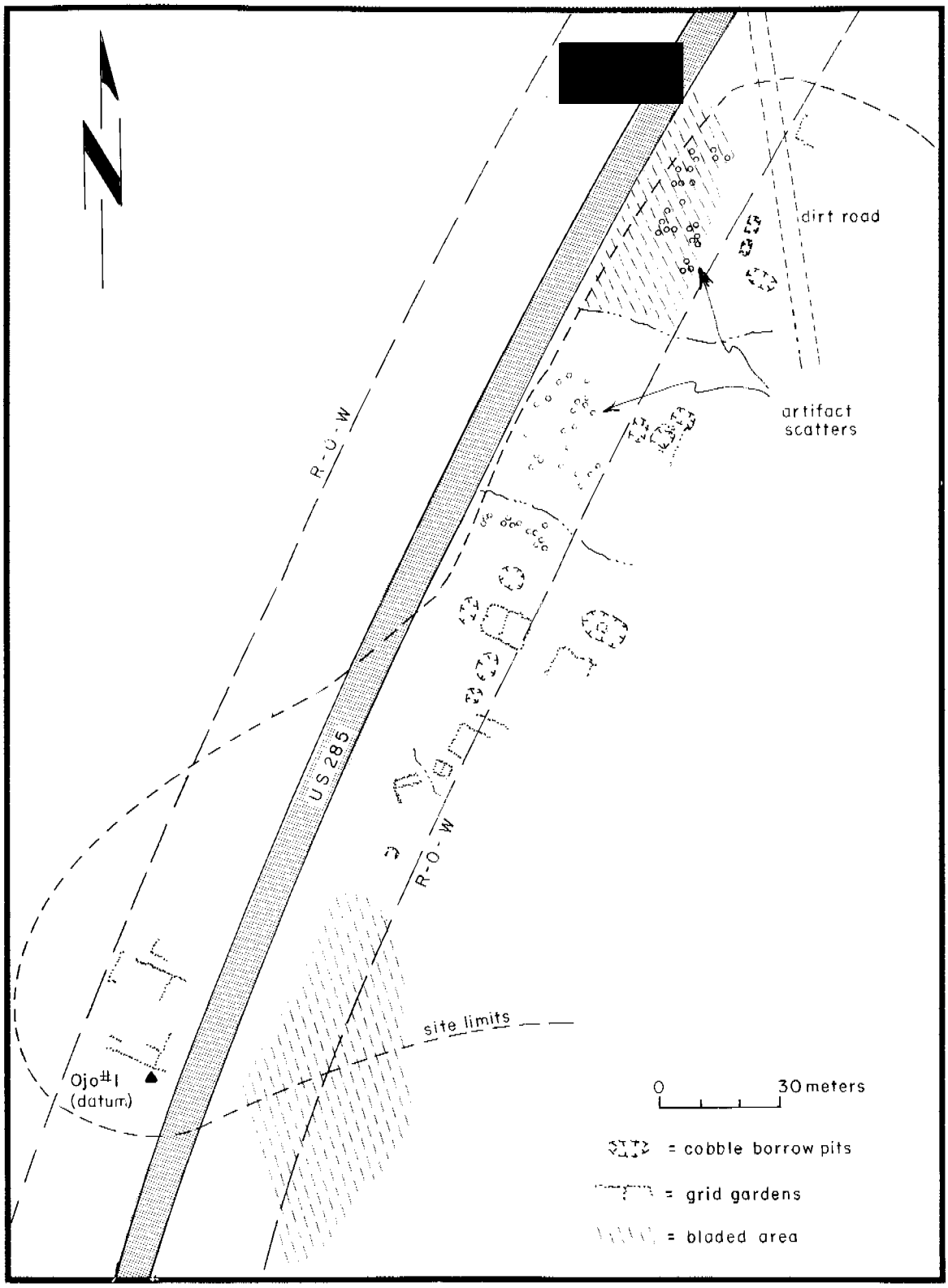

Figure 9. LA 105703 site map.

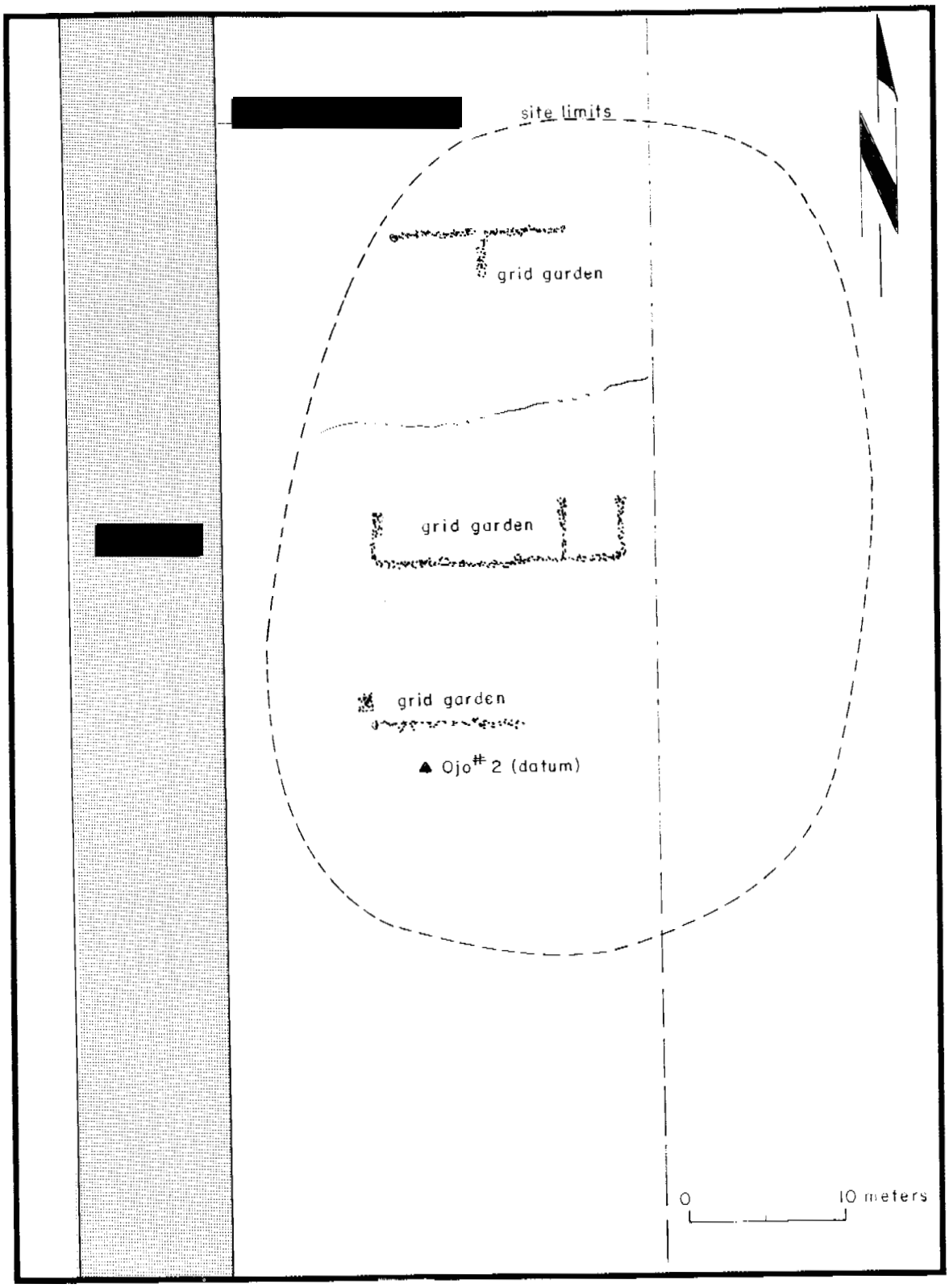

Figure 10. LA 105704 site map.

LA 105704, Prehistoric Grid Garden

This small series of grid gardens and a few scattered artifacts are on the remnants of the lower terrace on the east side of the Ojo Caliente Valley (Fig. 10). The site, east of U.S. 285, measures 40 m north-south by 25 m east-west. All three gardens (total area of 200 sq m) in this site are within the proposed highway project.

LA 105705, Prehistoric Grid Gardens

This extensive series of grid gardens, cobble-borrow pits, and thin scatter of artifacts is situated on top of the high terrace on the east side of the Ojo Caliente Valley (Fig. 11). The site, located east of U.S. 285, measures 125 m north-south by 40 m east-west. Three cobble-borrow pits (in whole or in part) and a few surface artifacts are within the proposed highway project. All grid gardens lie outside the proposed highway project.

LA 105706, Prehistoric Grid Gardens

This small grid garden site composed of three gardens, three cobble-borrow pits, and a thin scatter of artifacts is situated on top of the high terrace on the east side of the Ojo Caliente Valley (Fig. 12). The site, east of U.S. 285, measures 40 by 50 m. Part of one grid garden (total area of 20 sq m), two cobble-borrow pits, and a few artifacts lie within the proposed highway project.

LA 105707, Prehistoric Grid Gardens

This large grid garden site is composed of at least two extensive gardens, three cobble-borrow pits, and a thin scatter of artifacts (Fig. 13). It is situated on top of the high terrace on the east side of the Ojo Caliente Valley and east of U.S. 285. The survey archaeologists documented only the part of the site near the proposed highway project. It measures 55 by 55 m. Only one cobble-borrow pit and no grid gardens lie within the proposed highway project.

LA 105708, Prehistoric Grid Gardens

This large grid garden site is composed of at least four extensive gardens, one very large and two smaller cobble-borrow pits, and thin scatter of artifacts (Fig. 14). A Kapo Gray pot-drop indicates historic period visitation and/or use of the site, in addition to the presence of Biscuit ware, representing the typical age of grid garden sites. The site is on top of the high terrace on the east side of the Ojo Caliente Valley and east of U.S. 285. The survey archaeologists documented only the part of the site near the proposed highway project. It measures 90 m north-south by at least 50 m east-west. Only the large cobble-borrow pit and one of the smaller ones lie within the highway project. No grid gardens lie within the proposed highway project.

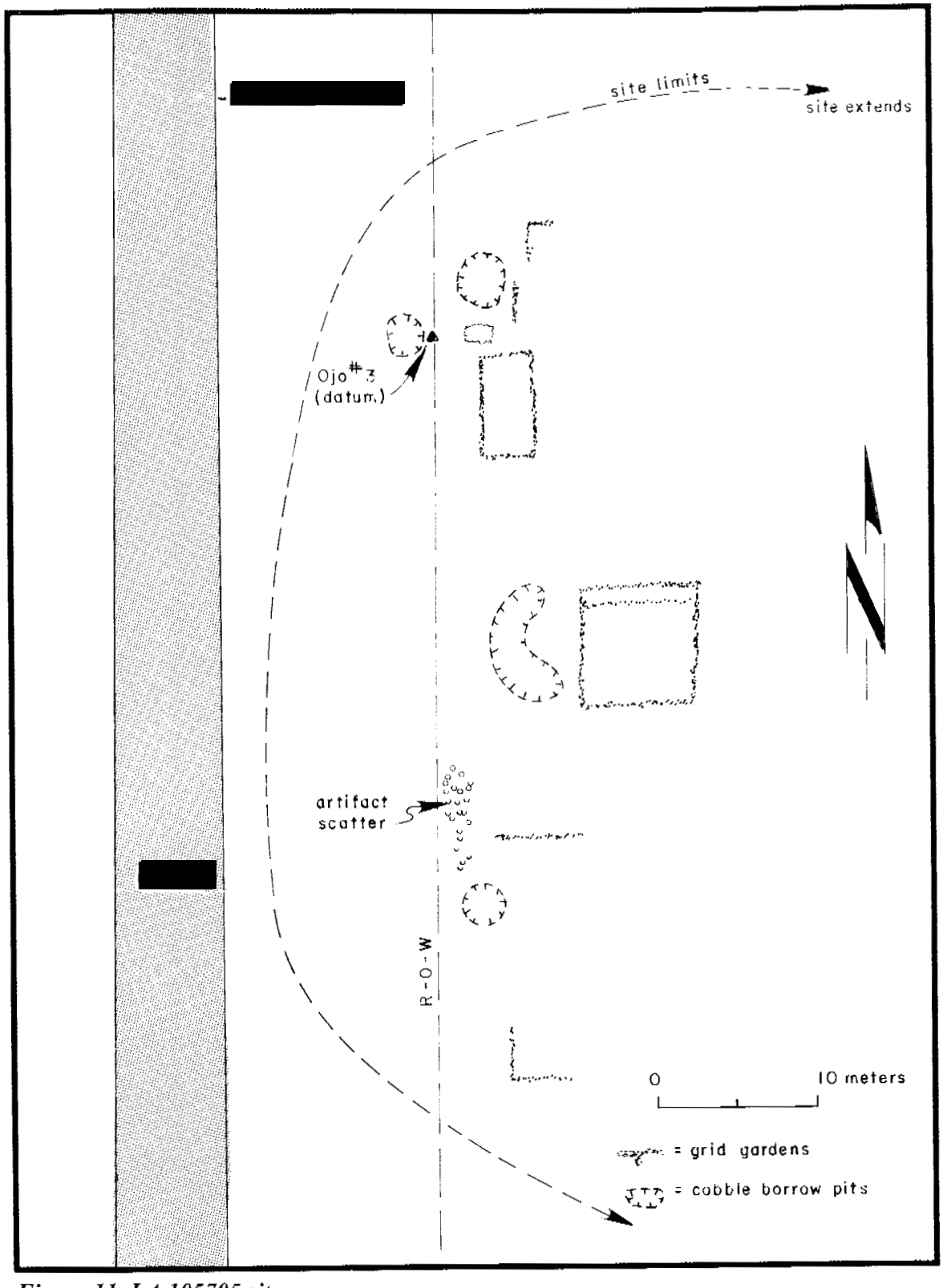

Figure 11. LA 105705 site map.

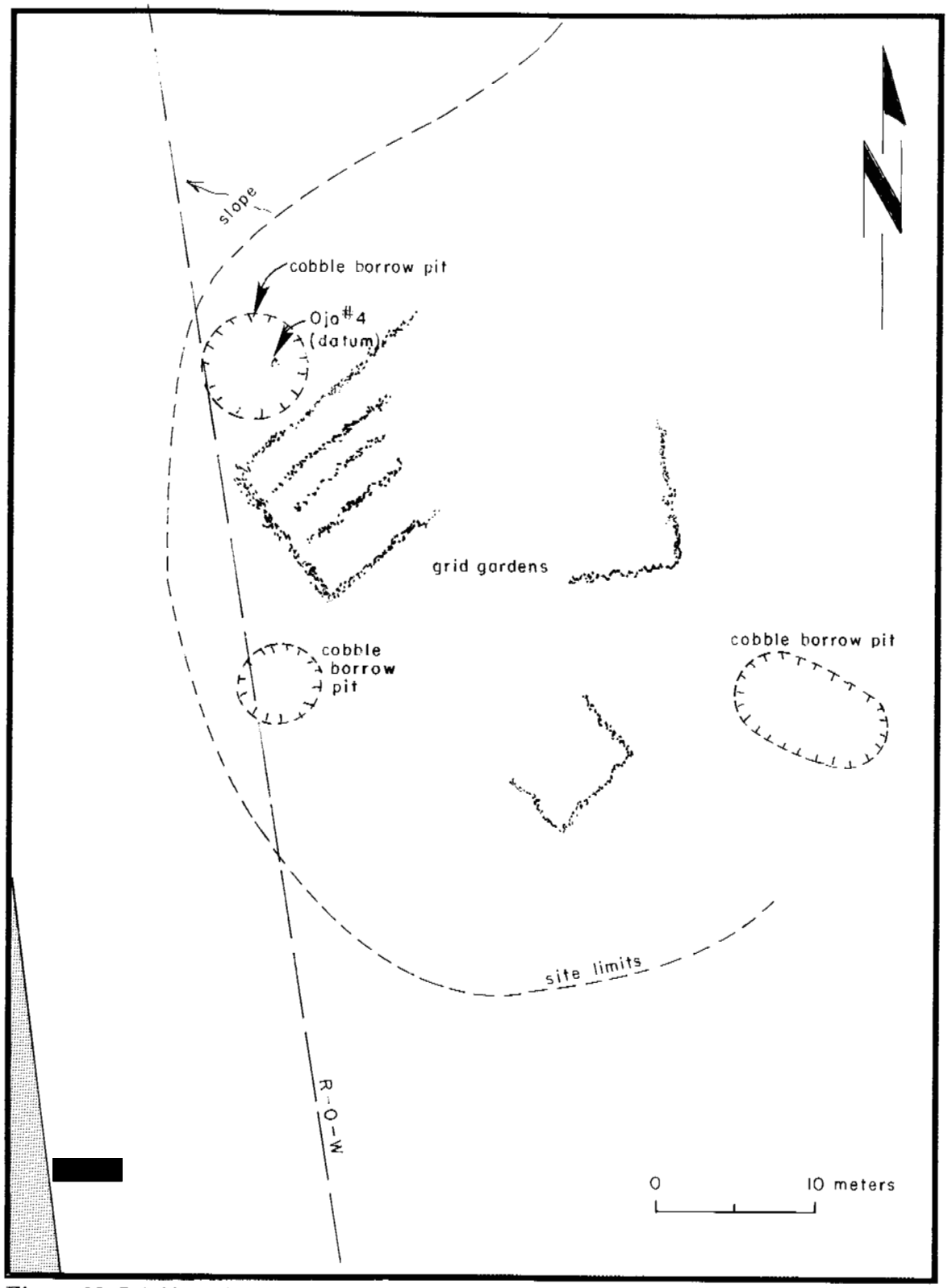

Figure 12. LA 105706 site map.

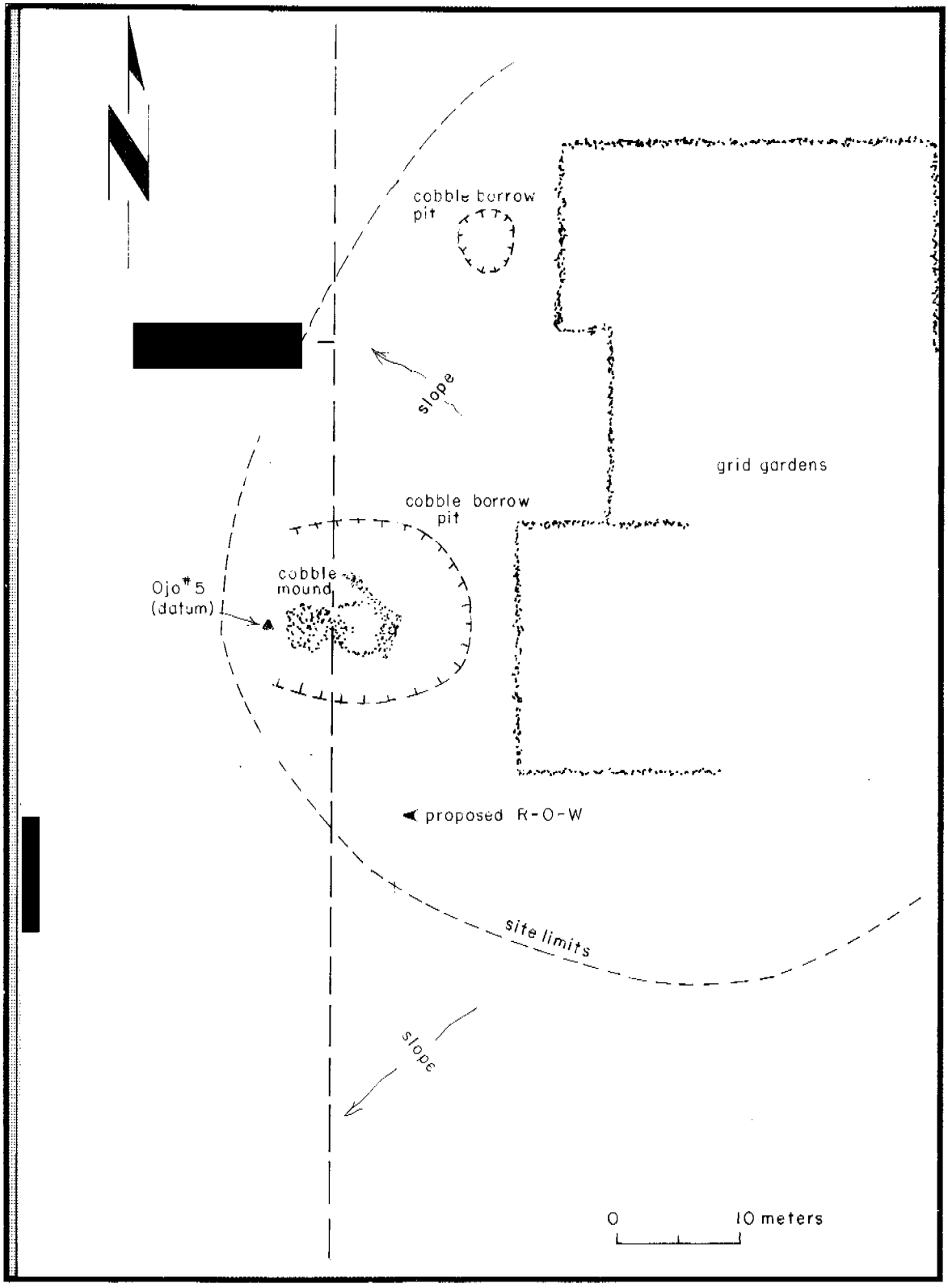

Figure 13. LA 105707 site map.

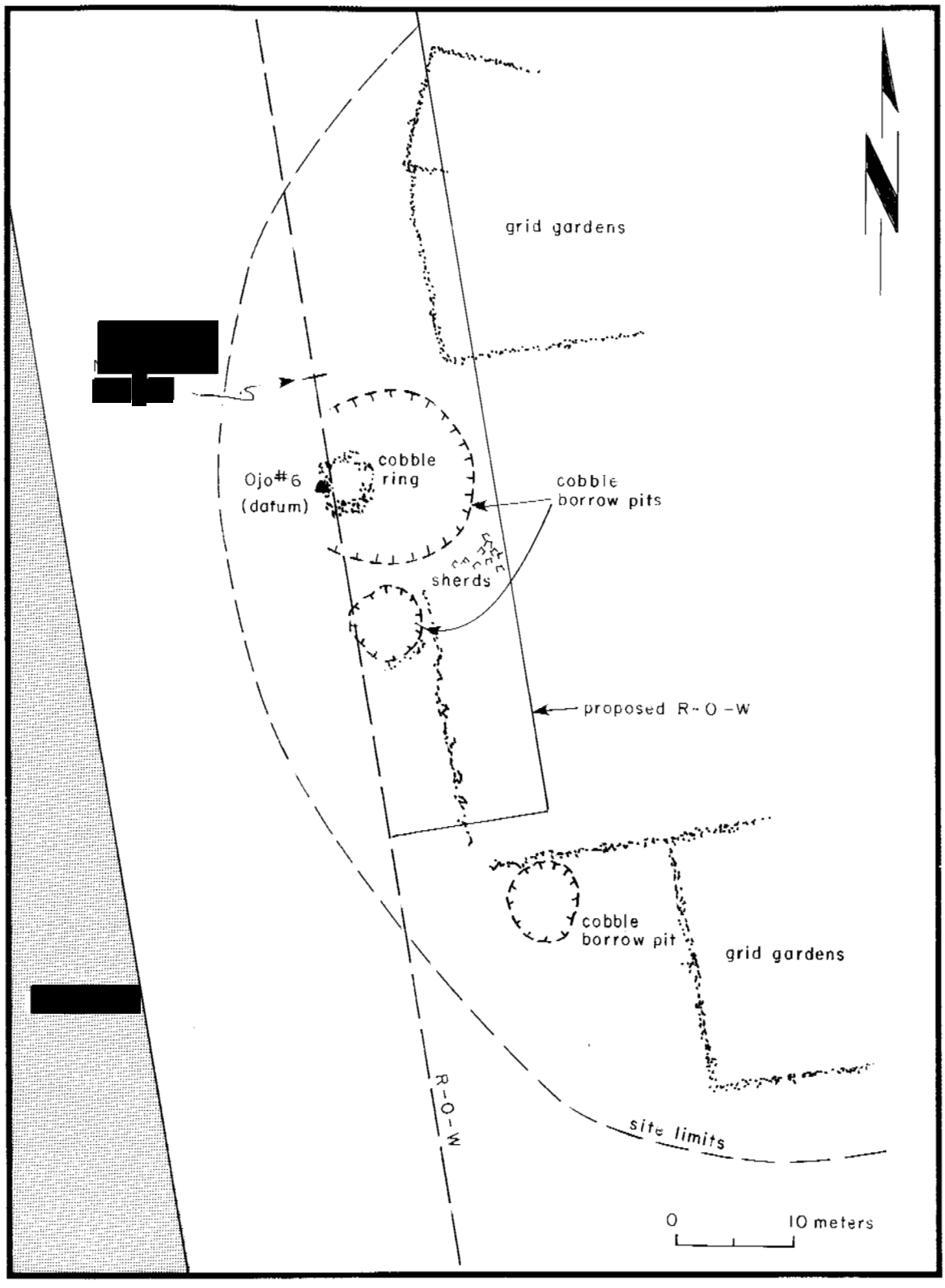

Figure 14. LA 105708 site map.

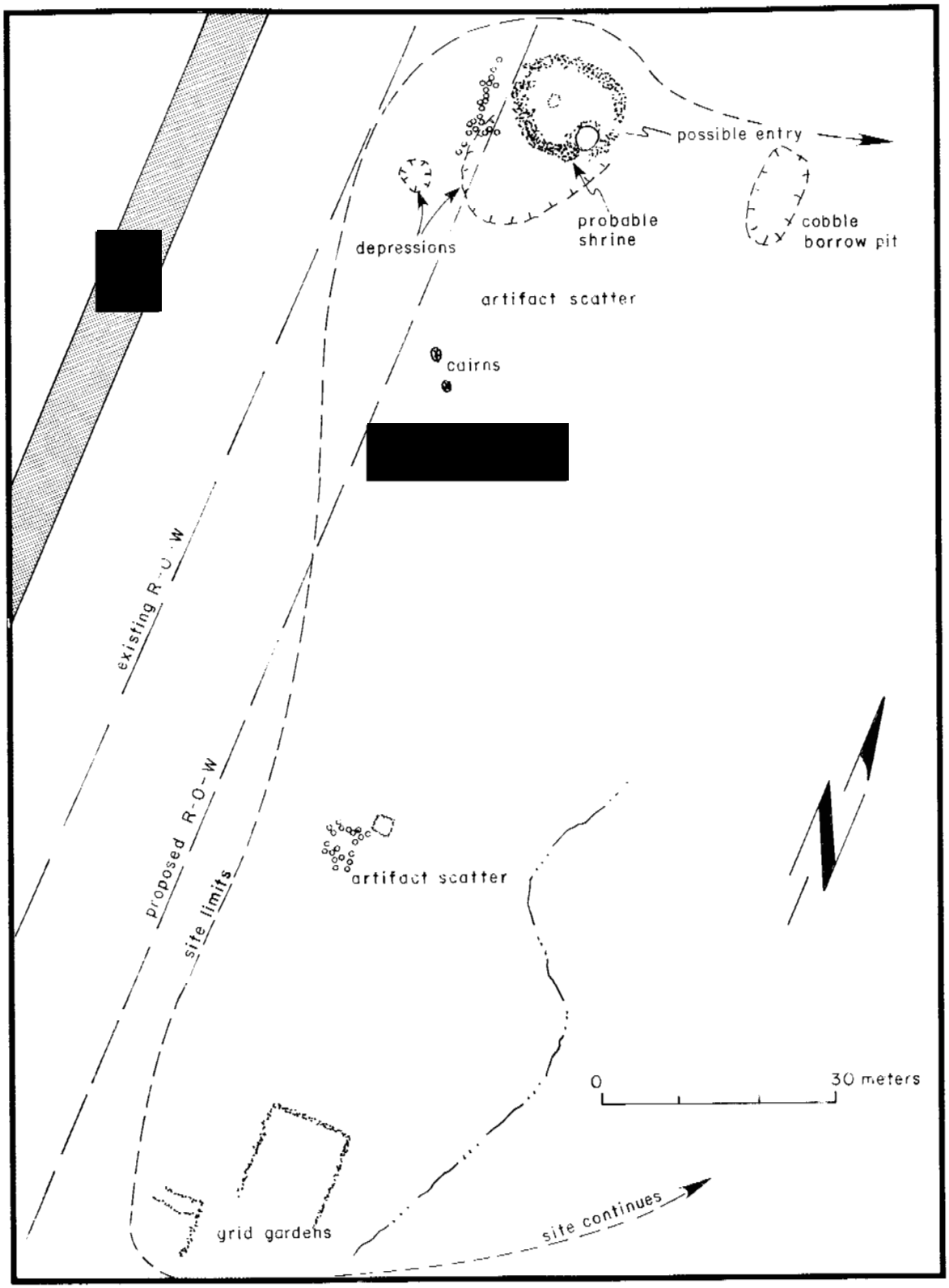

Figure 15. LA 105709 site map.

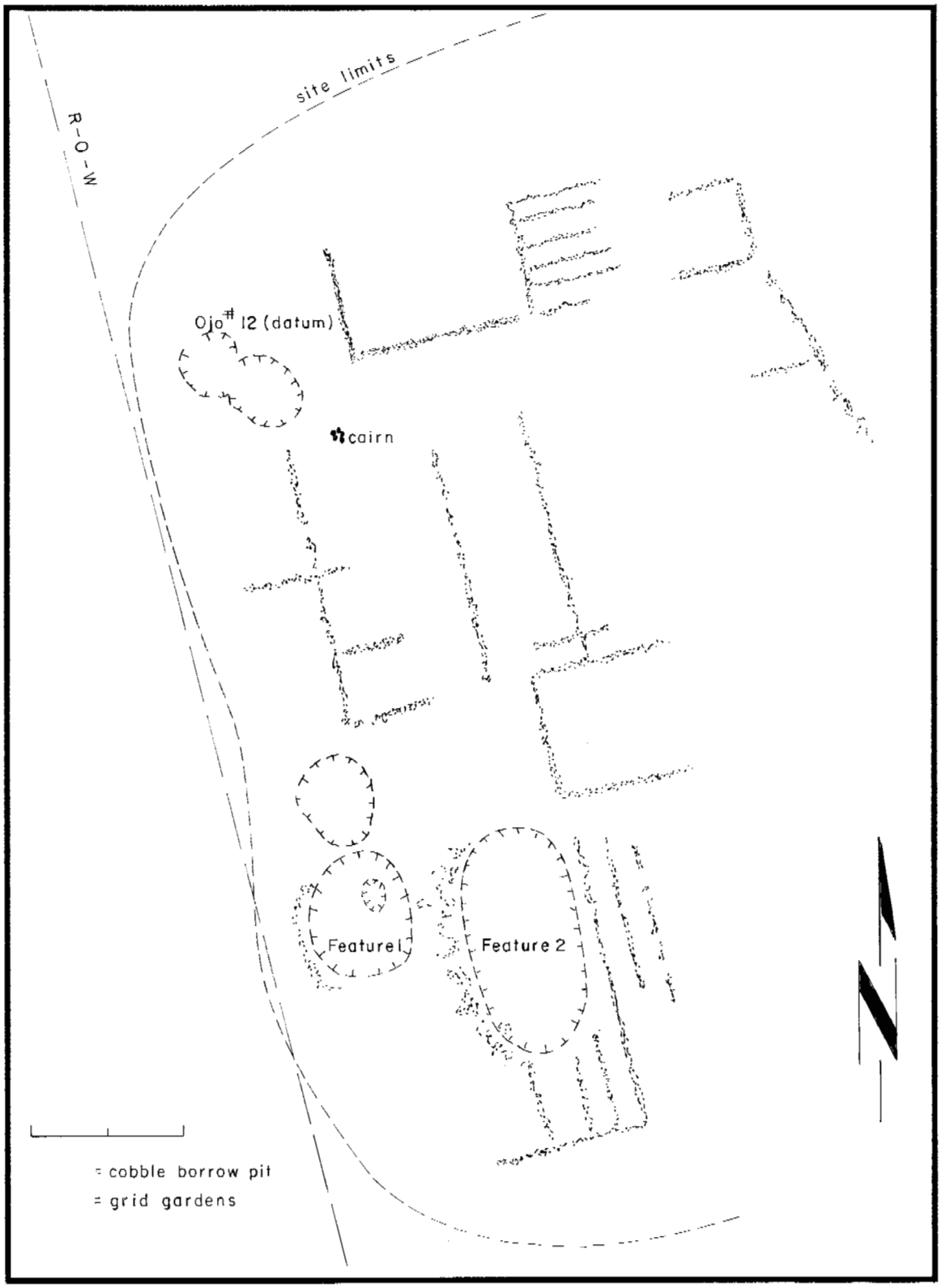

Figure 16. LA 105713 site map.

LA 105709, Prehistoric Grid Gardens and Shrine

The features of this large site--at least two grid gardens, a possible twentieth-century house foundation, a shrine, one very large and two smaller cobble-borrow pits, and a thin scatter of artifacts--are scattered along the edge of the high terrace on the east side of the Ojo Caliente Valley and east of U.S. 285 (Fig. 15). The site measures 170 m north-south by 50 m east-west. The feature identified as a shrine is a low, 10 m diameter circle of stones with an opening in the east arc. It does not appear to have been used in recent times, though appearances could be deceiving in view of Pueblo secrecy about such matters. One small cobble-borrow pit, part of the large cobble-borrow pit, and approximately 25 percent of the shrine lie within the highway project. No grid gardens lie within the proposed highway project.

LA 105713, Prehistoric Grid Gardens

This extensive series of grid gardens, cobble-borrow pits, and thin scatter of artifacts is situated on top of the high terrace on the east side of the Ojo Caliente Valley (Fig. 16). The site, east of U.S. 285, measures 70 m north-south by at least 50 m east-west. Parts of three cobble-borrow pits and a few surface artifacts are within the proposed highway project. All grid gardens lie outside the proposed highway project.

Recommendations

Table 3 presents the recommended actions for each of the eleven sites in the project area.

Table 3. Recommended actions at Gavilan project sites

Site Number and Type	Recommended Actions
LA 66288 (Hilltop Pueblo) South area (east of U.S. 285)	Data recovery (excavations) of extensive subsurface remains.
West area (west of U.S. 285)	No further work; deposits badly mixed; data potential exhausted by survey and testing.
LA 105710 Morada and store	Interviews with knowledgeable local people and archival documentation.
Prehistoric remains	Data recovery (excavations) of extensive subsurface remains.
LA 105712, Spanish Colonial farmstead (?)	Protect and avoid by fencing.
LA 105703, grid garden site	Map entire site. Collect surface artifacts. Excavate sample of gardens within project area.
LA 105704, grid garden site	Map entire site. Collect surface artifacts. Excavate sample of gardens within project area.

Site Number and Type	Recommended Actions
LA 105705, grid garden site	Map entire site. Collect surface artifacts. Excavate sample of gardens within highway project.
LA 105706, grid garden site	Map entire site. Collect surface artifacts. Excavate sample of gardens within project area.
LA 105707, grid garden site	Map entire site. Collect surface artifacts. Measure and photograph cobble borrow pits within project area.
LA 105708, grid garden site	Map entire site. Collect surface artifacts. Measure and photograph cobble borrow pits within project area.
LA 105709, grid garden site Shrine	Map entire site. Collect surface artifacts. Measure and photograph cobble borrow pits within project area. Build temporary protective fence prior to construction.
LA 105713, grid garden site	Map entire site. Collect surface artifacts. Measure and photograph cobble borrow pits within project area.

PLAN FOR DATA RECOVERY

At the request of the New Mexico State Highway and Transportation Department, the Office of Archaeological Studies, Museum of New Mexico, tested and evaluated 11 prehistoric and historic cultural resource sites for U.S. Highway 285 near Ojo Caliente, Taos County, New Mexico. The work was completed over the winter of 1995-96. Ten of the sites (LA 66288, LA 105703–LA 105710, and LA 105713) were found to have potential for contributing information important to the prehistory and history of the region. For discussion purposes, the sites have been divided into two groups: habitations (prehistoric and historic) and prehistoric agricultural grid gardens.

Habitation Sites: LA 66288 and LA 105710

The project area includes two habitation sites. LA 66288 is a prehistoric ancestral northern Tewa (Biscuit Ware) site called Hilltop Pueblo. The highway project involves only an outlying, lower part of this site, the south area. LA 105710 has prehistoric and historic components. The prehistoric component is an extension of the south area of LA 66288 and will be discussed with that site. The historic component is a morada and store on the northern outskirts of the Hispanic American village of Gavilan.

Prehistoric Components

Archaeological manifestations at Hilltop Pueblo (LA 66288) include the mounds of a large, single-plaza adobe pueblo and cultural refuse. Abundant pottery sherds and pieces of lithic debitage are scattered on the surface of the high terrace on which the pueblo sits, as well as down the natural terrace face and onto the lower terrace. The south area, on the lower terrace, consists of a single large dune. The north (morada) end of LA 105710 is also on this dune. No outlier roomblocks are evident at LA 66288, nor do we know of any fieldhouses in its vicinity. Even though Hilltop Pueblo is close by, it is possible that one or the other of these types of structures (outlier roomblock or fieldhouse) is present within the dune.

The testing results from the dune demonstrate the presence of numerous subsurface prehistoric artifacts. Aside from the elevational difference, this dune is within 50 m of Hilltop Pueblo. The pottery sherds from the dune date to the same general time period as Hilltop Pueblo (ca. A.D. 1375-1500), indicating contemporaneity between the dune and the pueblo and the probability that a formal relationship existed between the two. No evidence of architecture was noted in the extensive augering, but this does not mean that architecture is absent. More thorough investigation will be necessary to confirm the presence or absence of architecture and determine more precisely the sources of the artifacts.

A brief survey of the archaeological and ethnobotanical literature reveals several possible uses of the dune: a fieldhouse location overlooking nearby fields, outdoor activity areas

associated with the pueblo, and a garden or agricultural field.

Late prehistoric and early historic pueblos in the Southwest are often characterized by one or more large, centralized house blocks surrounded by several small, scattered outlier blocks of rooms (Reid 1974). This pattern has not yet been found at Biscuit Ware (ancestral northern Tewa) sites. However, another late prehistoric/early historic pueblo pattern--a central pueblo with numerous, outlying one-to-two-room fieldhouses--has been documented at the ancestral northern Tewa of Sapawe (Skinner 1965). Fieldhouses, beside individual fields, can take a number of forms, including windbreaks, ramadas, or more substantial structures such as adobe or masonry rooms (Wiseman 1977). It is entirely possible that the LA 66288–LA 105710 dune covers some form of architecture associated with nearby agricultural fields.

Two aspects of the dune and its cultural materials suggest possible use as an outdoor activity area. One is the situation of the dune between the village and what must have been the primary domestic water source for the inhabitants, the Rio Ojo Caliente. The dune provides easy access between the village and the river and contrasts sharply with the steep high-terrace slopes.

The other aspect is the proximity of the dune to the village and the ease with which it could have become incorporated as an outdoor activity locus for village residents. Easy digging in the dune would be advantageous for erecting ramadas or shades, under which a variety of tasks could be performed during much of the year. Such activities might include pottery making, food preparation and consumption, equipment manufacture and repair, child rearing, resting, visiting among friends, and the like. The soft sediments of the dune provide a sharp contrast to the thin soils and hard ground surfaces of the terraces. In short, we suggest that many activities already documented at pueblo plazas (Creamer 1993) may also have taken place in suitable areas close by.

Dunes are also potential field or garden locations. During late prehistoric times, the Ojo Caliente Valley supported a large population distributed among six closely spaced, very large villages (Ponsipa-akeri, Nute, Posi, Hupobi, and Howiri, in addition to Hilltop). In the aggregate, these villages contain several thousand rooms. Assuming corn was a major, if not primary, foodstuff for the peoples occupying these villages, arable land would have been at a premium.

The Ojo Caliente Valley possesses good alluvial bottomland and reliable water, but the amount of available arable land (about 1,416 ha) appears to have been insufficient for long-term farming by large numbers of people. In his study of the Hopi, Maitland Bradfield (1971) estimates that about one hectare of land is required to grow enough corn to feed one individual for a year. At first glance the Hopi example might seem inapplicable to Ojo Caliente. However, when we consider the rain-shadow position and low average annual precipitation of the Ojo Caliente Valley, the comparison between the two regions is probably valid (Fig. 17).

It is also instructive in this regard to examine reconstructions of prehistoric and historic climate for the Ojo Caliente area (Fig. 18). The data for this figure were interpolated from the appropriate figures in Dean and Robinson (1977). The points are indices of temperature and precipitation calculated decade by decade from tree-ring data. The 0.00 line is the mean for the

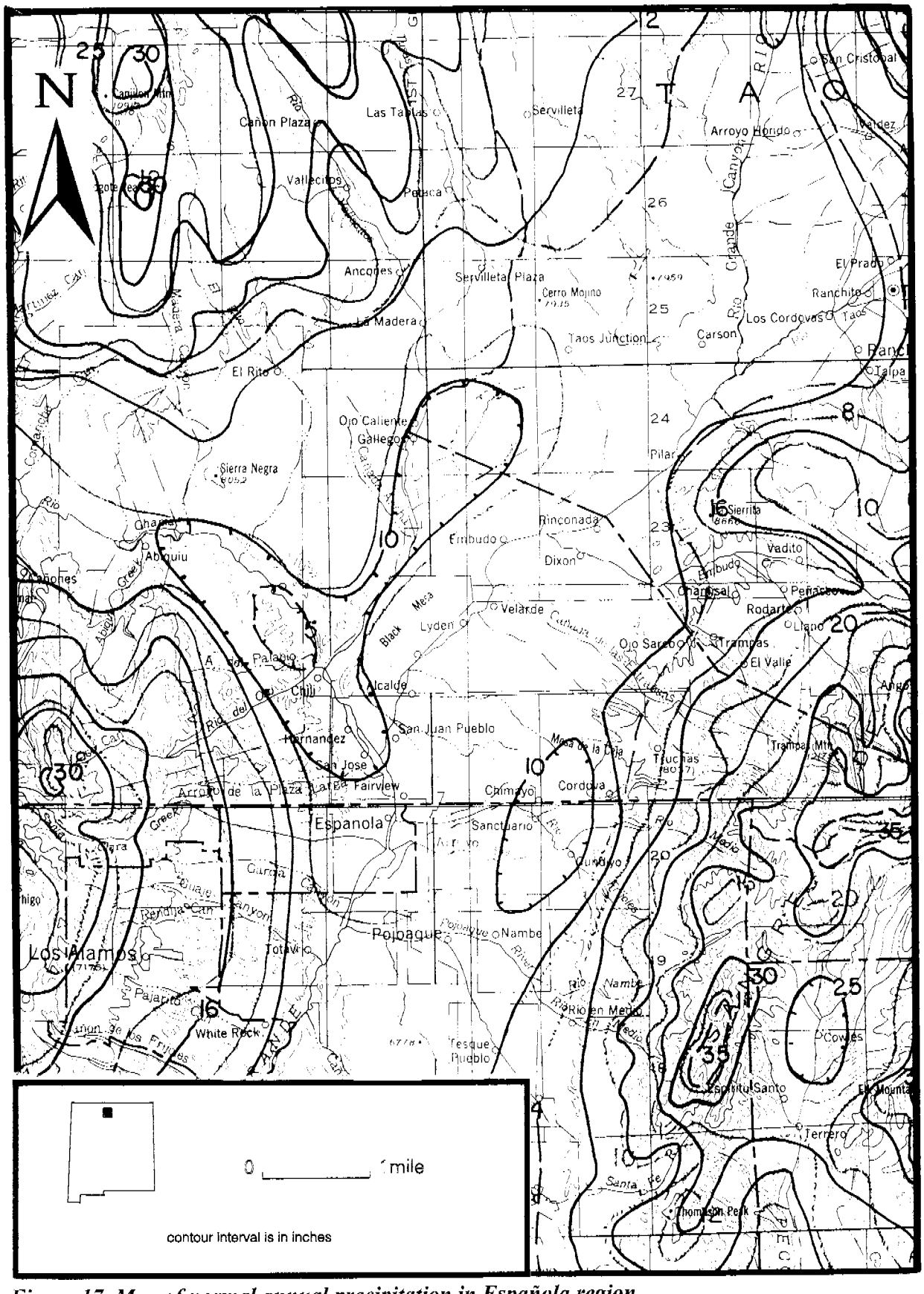

Figure 17. Map of normal annual precipitation in Española region.

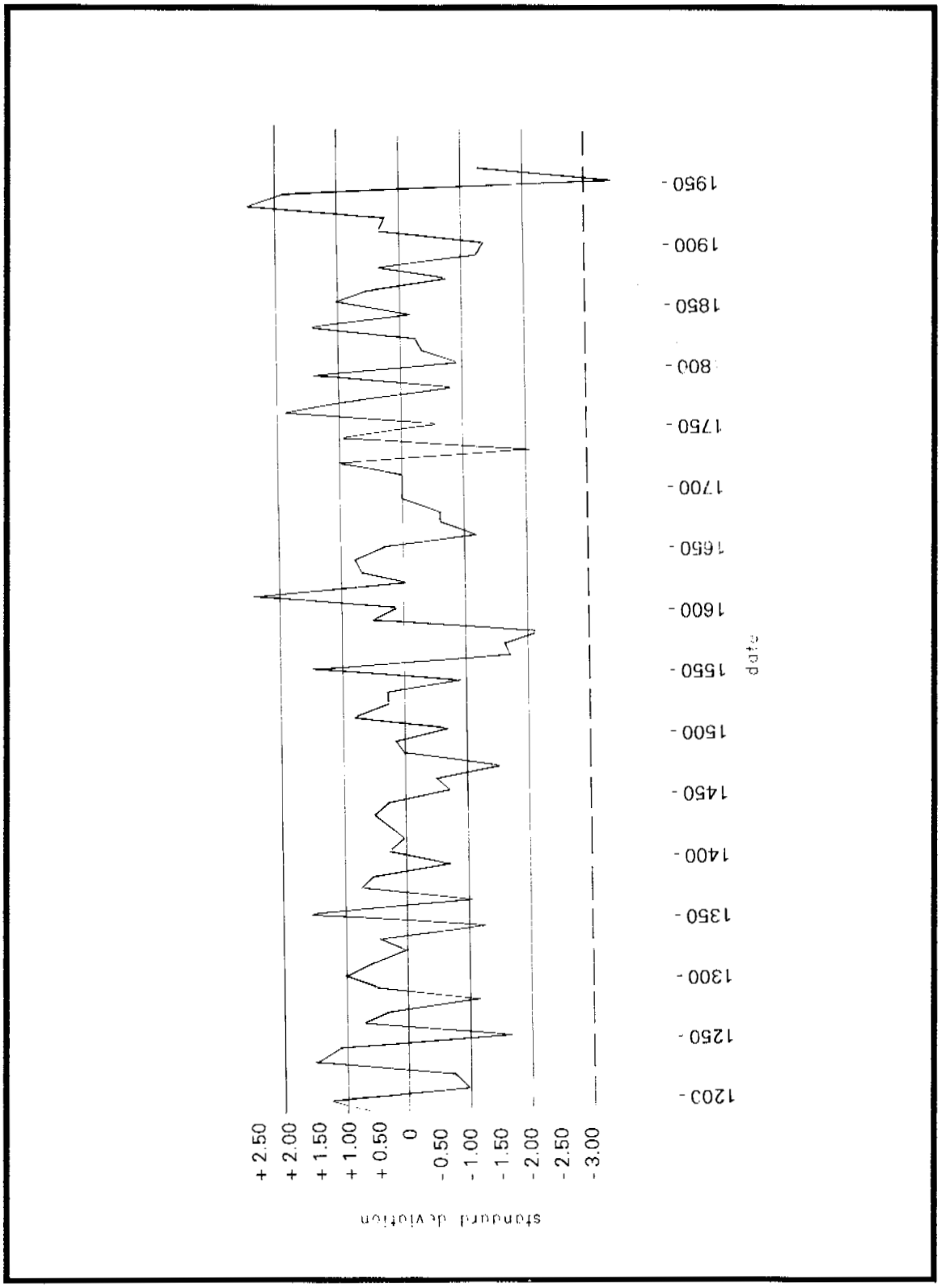

Figure 18. Reconstructed climate of Ojo Caliente area, temperature and precipitation, A.D. 1200-1970 (data from Dean and Robinson 1977).

entire period of study, and the points are presented as standard deviations from that mean. Although warm periods are not always dry periods, and cool periods are not always moist periods (refer to data for the 1930s), one can generally assume that negative departures (below mean line) represent warm/dry periods and positive departures (above mean line) represent cool/moist periods.

Periods with departures exceeding one standard deviation probably placed a strain on prehistoric adaptation, especially given the agricultural technology of the times and the fact that the Ojo Caliente Valley was and is in a rain shadow. Departures greater than two standard deviations probably had disastrous consequences for plants, animals, and humans (Dean and Robinson 1977). Perspective on the severity (or mildness) of the departures can be gained by examining the departures for the 1930s, 1940s, and 1950s. In the Ojo Caliente area, the "dustbowl" days of the 1930s were decidedly cool/dry (in this instance), with a slight lessening in severity through the 1940s. The 1950s were strongly warm/dry and clearly represent the severest drought for the entire period of A.D. 1200 to 1970.

It is clear in Figure 18 that the climate in the first half of the fifteenth century, when the large Biscuit Ware villages were probably founded, was the mildest period in the entire span from A.D. 1200 to 1970. That is, from about A.D. 1410 to 1450, temperatures and precipitation in the Ojo Caliente area hovered uncharacteristically close to the mean and were comparatively even throughout the period. This is not to say that there were no years of drought or cold. But on the whole, the weather during these decades was quite mild compared to most of the rest of the decades covered by the graph. The only series of decades that exceeded A.D. 1410-1450 for mildness was A.D. 1700-1720, which matched the mean.

During the second half of the fifteenth century, the climate in the Ojo Caliente area became warmer and drier. While the drought, especially during the 1470s, was not the most severe of those recorded in the Figure 18 period of record (A.D. 1200 to 1970), it undoubtedly led to the development of the high-terrace grid gardens up and down the Ojo Caliente Valley. If the dune in the south area at LA 66288 was farmed, we would expect that this happened during the late fifteenth century as well.

Climate changes in the Ojo Caliente Valley appear to have been met, at least in part, by the numerous grid or mulch gardens situated on the high terrace on the east side of the valley. These gardens, including several to be investigated during the current project, are so sophisticated that their development and widespread use are believed to exemplify extraordinary measures required for sustaining a farming way of life.

But other potential field sites are also present in the Ojo Caliente Valley. We know from Hopi examples that dunes are useful cropping locations, especially for beans (Beaglehole 1937; Hack 1942). While Bradfield (1971) notes that the Hopis generally avoid true sands because they are too porous for good water retention at rooting depth, those containing clay loam are well suited for agriculture, even in environments that are drier than the Ojo Caliente Valley. The LA 66288–LA 105710 dune is a fine sandy silty clay loam that should hold water quite well, attested by the abundant wild plants that grow there today.

Prehistoric Problem Domains and Research Strategies

The south area of LA 66288 and the prehistoric component of LA 105710 are clearly enigmatic as far as our knowledge of the late prehistory of north-central New Mexico are concerned. Our perception of the cultural remains in the dune at these sites, based on surface and limited testing data, is incomplete and requires further investigation. Several possibilities concerning the nature and content of these hidden remains have been outlined above. In this section we present our proposed research in terms of problem domains to be investigated.

Research Issue 1: Genesis and structure of the dune. One key to understanding prehistoric use of the dune of the south area of LA 66288 and the north end of LA 105710 lies in the origin and structure of the dune. Only by learning how the dune formed and the details of its internal structure and relationships can we correlate the deposits and the cultural materials in them. We expect that at least some, and perhaps much, of the dating of the cultural manifestations will rely on stratigraphic relationships within the dune.

The origin of the sediments comprising the dune is another important aspect of the research. The accumulation of aeolian sediments can occur only when land is denuded elsewhere, making sediment available for transport by wind. If that denudation takes place in agricultural field areas, then it is likely that the growing potential of those fields is lessened or precluded, thereby creating the need for the development of other fields and perhaps alternative kinds of fields and farming strategies. The use of the dune for cropping and the construction of grid gardens on the high terrace are two potential answers to this problem.

Determining the origin of the dune sediments, regardless of whether the dune itself was used for farming, will inform us about general soil conditions in the valley and give us insight into one or more of the following: (1) whether grid gardens derived from a need for additional fields because of human population increase in the valley; (2) the need for replacement fields because of the loss of other fields to erosion; (3) general denudation of the landscape, either from natural or man-made causes; and/or (4) some combination of 1, 2, and 3.

Research Issue 2: Pedestrian pathway. It is a virtual certainty that the dune that constitutes the south area of LA 66288 and the north end of LA 105710 was used as a major pathway between Hilltop Pueblo and the fields and water of the Ojo Caliente Valley. Although preservation of a pathway would be serendipitous, we would be looking for evidence in the form of a broad, shallow, U-shaped depression in a stratigraphic cross section of the dune. We would expect the profile of this depression to be .5 to 1 m across and 10 to 20 cm deep. Ideally, additional evidence would include a slightly compacted surface that could be traced horizontally in an east-west (upslope-downslope) trend. Evidence for two or more paths may be found, given the likelihood that, once off the rim of the terrace, the people would have taken different directions according to the locations of their fields and other destinations in the valley.

Our conception of this pathway is greatly aided by my experience at the Biscuit Ware pueblo of Sapawe in the nearby El Rito drainage. In 1968, as part of the University of New Mexico's archaeological field school (Florence Hawley Ellis, director), a backhoe trench was

placed across an outdoor pathway between two buildings. The depression created by pedestrian activity could be clearly seen in the profile, though time did not permit tracing of the pathway to explore its other characteristics.

Research Issue 3: Outdoor activity area. The quantities of cultural debris (sherds and lithic debitage) demonstrated by the surface and subsurface evidence are too great for us to believe that it all derives from random, unintentional scattering of trash from the pueblo. The fairly consistent spread of items from near surface to depths reached by the auger (and probably deeper) indicate the accumulation of the dune and the associated cultural debris over a period of time, probably decades or even a century or more.

If we are correct in assuming that the cultural materials are the product of trash accumulation in the vicinity of activity areas, then we should be able to find other evidence of these activities, such as hearths, structural remains (ramada postholes, pits, compacted use-surfaces, and the like).

Research Issue 4: Fieldhouses(s). Again, the quantities of cultural debris indicate various uses of the dune. These activities might have involved the construction of more substantial structures than ramadas or shades. If one or more fieldhouses were built and used on the dune, we should be able to find and excavate the remains. In this case, we would be looking for remnants of walls constructed in any of a variety of ways, including jacal (lines of vertical poles seated in postholes and daubed with mud or adobe), linear arrangements of cobbles (ideally also daubed with adobe), adobe, and possibly even part masonry, part adobe walls. All of these techniques are known to have been used in late prehistoric sites of the region, though adobe construction is the best known. If we do find walls, then we will probably also be able to define the outlines of the room(s) and the floors (whether prepared or not), use-surfaces, and associated floor features (hearths, etc.), if any. Given the slope of the dune, the floors of the fieldhouses would also probably be partly excavated on the uphill side to create a level surface.

Research Issue 5: Gardens. Finding verifiable evidence for the use of the dune for gardens would be very difficult. The best and perhaps only evidence would be demonstrating the presence of high concentrations of pollen of cultigens such as corn, beans, and squash. These plants produce exceptionally large pollen grains. Finding these grains, even in active modern fields, is difficult simply because so little of it gets to the ground surface. Systematic soil sampling, both horizontally and vertically (stratigraphically), and looking for changes in pollen presence and absence would provide clues about the probability of gardening on the dune.

The interpretation of pollen data as representing gardens can be complicated if the dune was used as an outdoor activity area or fieldhouse. Distinguishing between the two situations would have to rely on sampling for pollen across the dune and determining the contexts of the samples (whether or not activity areas and/or structural remains are also present). A fairly even distribution of pollen evidence and an absence of cultural features should indicate use as a garden, while spotty pollen evidence, coupled with activity area features (hearths, pits, etc.) and/or structures (ramadas or one- to two-room fieldhouses) would indicate domestic uses of the dune.

Research Issue 6: Dating the prehistoric occupations. Although we can generally date the sites through associated pottery, we still need to date the specific features that we will find within our site. This is not only necessary for placing our findings in the regional context, but just as important, we need to develop an internal chronology for the dune deposits. The chances of discovering multiple occupations within the dune are good. Good dating of our finds is critical to our understanding of the uses and changes in uses of the dune and to relating them to the rest of LA 66288.

We will date the remains in the dune by every means available to us. We expect to discover stratigraphic associations, ceramic information, and possibly tree-ring samples from hearths, pits, and general refuse. Depending on our success along these lines, we may also obtain radiocarbon materials for dating from the same sources.

Prehistoric Site Treatment Recommendations

The two prehistoric habitation sites--LA 66288, south area; and the subsurface component of LA 105710--are on and within a single large dune. Cultural materials evidently extend at least 1 m and probably more below the surface. Auger testing did not encounter structural remains, but in spite of the fact that the tests were systematically arranged, we cannot be certain that structures are absent. Consequently, we recommend the following intensive measures be followed to discover which of the domains discussed above are responsible for deposition of the cultural remains in the dune.

The prehistoric components of LA 66288, south area; and LA 105710 will be subjected at least to the following data recovery procedures:

1. The surface contours of the dune will be mapped with a total station or an optical transit and stadia rod.

2. The artifacts on the surfaces of both sites will be systematically pinflagged, mapped, and collected by grid square.

3. Two series of backhoe trenches will be excavated to expose the stratigraphy and determine the ultimate depth of the dune and associated cultural materials. One series of trenches will be oriented across the slope (north-south), and the other will be oriented down the slope (east-west), at right angles to the first series. These placements will expose the growth sequences along the two dimensions. Stratigraphic relationships will be worked out, and profiles will be drawn to document them.

4. A geomorphologist will study the dune to determine the origin of the sediments, the growth sequence of the dune, and the structure of the internal deposits. The results will be used to stratigraphically date cultural manifestations within the dune and answer questions about and/or provide guidance for assessing prehistoric agricultural conditions in the valley. Specifically, were the grid gardens and possibly the dune developed as complements, alternatives, or

replacements for valley-bottom fields?

5. Features exposed in the trench faces will be uncovered by opening horizontal excavations. These excavations will proceed in 1 by 1 m squares until the extent of each feature is exposed, artifacts and appropriate soil samples are collected, and associational relationships are defined both horizontally and vertically. This work will be done with hand tools, and all fill will be screened through one-quarter-inch wire mesh to recover associated artifacts.

6. We do not anticipate finding prehistoric or historic human burials. However, if human burials are discovered, consultations with appropriate parties will be initiated through the NMSHTD and the State Historic Preservation Office according to established procedures. The remains will be treated in accordance with the Museum of New Mexico Policy on Sensitive Materials and applicable state laws (Appendix 6).

If the remains are to be excavated and interested parties express no specific excavation treatment, standard archaeological excavation techniques and procedures will be employed. These include definition of the burial pit if possible, use of hand tools to expose skeletal materials, mapping, photographing of the position of the skeleton and any grave goods, and retrieval of soil for pollen studies. Unless otherwise stipulated during the consultation process, all bones, associated grave goods, and artifacts incidental to the grave fill will be collected and returned to the laboratory for study.

No person will be allowed to handle or photograph the remains except as part of scientific data recovery and documentary efforts. Photographs of sensitive materials will not be allowed by, or released to, the media or general public. If the parties consulted have no specific desires for treatment of the remains, the remains will be submitted to the Museum of New Mexico's Archaeological Research Collection (ARC) for storage at the Department of Anthropology, University of New Mexico.

7. Two basic types of soil samples will be collected. Columns of pollen samples will be taken from trench faces at appropriate intervals across the site to recover evidence of possible gardens. Pollen samples will also be taken from bottom and floor contact situations in nonburned pits and structures.

Soil samples for flotation recovery of plant and animal remains will be taken from all burned contexts, including hearths, instances of trash fill associated with features, and stratigraphic situations that can be related to features and other dated contexts.

8. Record keeping and documentation will involve 35 mm black-and-white photography, standard OAS field forms, a daily field journal, and drawing of stratigraphic profiles and individual feature maps.

Ojo Caliente, El Rito (Rito Colorado), and Abiquiu, situated in the valleys of the Ojo Caliente, the El Rito, and the Rio Chama, respectively, were the first three outposts established during Spanish Colonial times to protect the northwestern frontier of the Rio Grande settlements. Started as land grants to settlers in the 1700s, these small settlements had a checkered history of successive occupation and abandonment throughout the eighteenth century because of intermittent raids by Comanches, Utes, Jicarilla Apaches, and Navajos. Once these tribes were subdued in the late eighteenth and early nineteenth centuries, steady occupation of the valleys became possible.

To date, scholarly study and archaeological work in this northwestern frontier have focused mainly on the Abiquiu (Swadesh 1974; Kutsche and Van Ness 1988; Kutsche et al. 1976) and El Rito (Quintana and Snow 1980) valleys. The Ojo Caliente Valley has received less attention, though an unpublished manuscript by Jenkins (1991) discusses the aspects of land tenure and irrigation in the valley from Ojo Caliente northward to Tusas.

Archaeological, ethnographic, and archival investigation of historic structures and sites within highway project areas is a relatively new undertaking in New Mexico. A number of historic projects have now been conducted throughout the state, but most have focused on homesteads like Ontiberos (Oakes 1983), Cavanaugh (Maxwell 1989), and Butcher and Wyatt (Seaman in prep.).

In north central New Mexico, excavations and archival documentation have been undertaken for sites west of San Ildefonso Pueblo (Moore 1989) and at La Puente at the confluence of El Rito with the Rio Chama east of the village of Abiquiu (Moore et al. in prep.). Few have involved commercial establishments (Wildcat Springs Trading Post [Post and York 1992]), and none have involved religious architecture. In the work proposed for LA 105710, the store and morada will be the first turn-of-the-century structures to be investigated in north-central New Mexico.

The village of Gavilan, like the neighboring villages of Duranes and Gallegos, evidently is an extension of the village of Ojo Caliente. We believe this to be reflected in the fact that the Ojo Caliente post office is (or was in 1953) actually located in Gallegos, the Ojo Caliente school is (or was) located in Duranes (USGS Ojo Caliente, N.M., 7.5' topographic map, 1953), and the Ojo Caliente morada is at Gavilan.

Confusion notwithstanding, the situation suggests that the villages of Gallegos, Duranes, and Gavilan were settled primarily by people from Ojo Caliente, probably as the population there increased and the people, preferring to live closer to their fields, moved downstream (south) from Ojo Caliente. This expansion became possible in the late 1800s, when the Navajos, Utes, and Comanches were placed on reserves to prevent them from raiding. The actual details of the founding of these small villages, including their interrelationships and their relationship to Ojo Caliente, are currently unknown.

García Store. The one-room García Store is east of U.S. 285 at the south end of LA 105710, as the site was defined by the survey archaeologists. No LA number has been assigned to the entire community of Gavilan, though this should probably be done at some future date.

The García store, which is represented today only by a cement-capped foundation of unknown construction, measures 3 by 6 m. According to informed sources, the structure was built specifically as a store about 1930. It was used as a general store for about four years and then went out of business. The owner dismantled the building about 1937. No artifacts other than recent roadside trash occurs in the vicinity of the foundation. Although the foundation and surrounding ground surface are covered with vegetation, numerous rodent burrows would normally bring at least a few items to the surface, suggesting that little or no material culture belonging to the store period lies below ground at this location.

The importance of the García store is that it was owned and operated by a local Hispanic man. According to Kutsche and Van Ness (1988), this situation was unusual in small rural villages of northern New Mexico for two reasons: (1) local people were poor and generally lacked capital for starting businesses; and (2) it was generally believed that store owners exploited their customers. In close-knit communities where cooperation was literally essential for survival, a local proprietor could seriously disrupt the social and economic welfare of the community if it was perceived that they caused fiscal hardship and/or indebtedness for family, friends, and neighbors. How, then, did the Garcías and their store fit into the community?

Ojo Caliente morada. A low mound and standing corner buttresses are all that remain of the Ojo Caliente morada, the local chapter house of the Hermandad de Nuestro Padre Jesús Nazareno (Brotherhood of Our Father Jesus the Nazarene) of the Catholic faith, popularly known as the Penitentes. Prior to the establishment of the Archdiocese of Santa Fe in the mid-1800s, the Catholic Church was sporadic and ineffectual in rendering spiritual guidance to rural northern New Mexicans. The Penitentes filled these and various other needs of the community, including protection. Formally known as La Morada de Nuestro Padre Jesús, the Ojo Caliente morada was the only morada in the Ojo Caliente area. Some information suggests that it was built in the late 1800s, but we believe that it was built much earlier or built on the site of another, as yet unidentified, morada.

Marshall (1995) was informed that, upon abandonment of the Ojo Caliente morada, some of the religious items that had been kept there were taken to a morada in the village of La Madera, 15 km north of Ojo Caliente. Other items were sold in Española, some perhaps to the Taylor Museum of Colorado Springs, Colorado. The adobes and roofing timbers of the morada were removed for use elsewhere soon after the structure was abandoned.

Protective fencing will be erected around the morada prior to construction. Artifacts dating to the use of the morada (late 1800s to ca. 1960) are rare on the site surface. Most of those noted (scraps of milled lumber, window glass) are fragments of the structure. Subsurface testing revealed virtually no materials relating to the morada period.

Preliminary indications from recent interviews conducted by OAS staff indicate that a

large number of details about the morada and its associated features (*oratorios*, Via Crucis, Calvario, etc.) can still be gained from informed local sources. Because these individuals, including the last surviving member of the morada, are quite elderly (all in their eighties), these interviews must be arranged for and conducted as soon as possible.

Abandoned wood-haul road. The road scars passing east-west along the north side of the morada were used by wood-hauling wagons to gain access to the high terrace and timber resources along the east side of the Ojo Caliente Valley. It is obvious from the numerous, often parallel tracks (now mostly denoted by slight linear depressions and gullies) that this access point to the terrace was used over a number of years. As one track got too deep or start gullying, the wood haulers would simply move over to start a new road. According to a local source, this road was used only for wood hauling and did not provide access to the Rio Grande or other villages.

Stock corral. A discrete concentration of wolfberry bushes (*Lycium* sp.) measuring 15 m in diameter is on the first terrace against the base of the high terrace and between the morada and the García store. Since this plant produces a bright red, edible berry known to have been used by Native American, Hispanic, and Anglo children in some areas of New Mexico, a line of auger tests was extended to the vicinity of this patch to learn its derivation. The tests were uninformative, and no surficial artifacts or other remains associated with the wolfberry patch are present to facilitate interpretation.

Preliminary inquiry of local sources, however, indicates that the patch is the location of an early twentieth-century livestock corral. Consumption of the berries by livestock would occur during browsing. After the tiny seeds passed through the animals' digestive tracts, they would be deposited with the manure in the corrals--an especially fertile place to germinate. The wolfberry patch lies entirely outside the proposed highway project.

Ojo Caliente Morada: Problem Domains and Research Strategies

Religion is a vital part of rural northern New Mexico communities. Much scholarly and nonscholarly attention has been paid to the Penitentes and the role they played in the daily and yearly lives of peoples tucked away in remote valleys, far from Santa Fe, Albuquerque, and Las Vegas. While these studies tend to center on the ceremonies and activities of Holy Week, less attention has been paid to architecture and physical organization of the associated outdoor features such as the Via Crucis (Way of the Cross) and the Calvario (Calvary).

The one notable exception to the Holy Week focus is the lengthy paper by Bunting et al. (1983), which synthesizes construction details of two dozen moradas across the state of New Mexico. However, the Ojo Caliente morada was not among those documented. Since over 200 moradas were in use or recently abandoned at the time of the Bunting study, much more work remains to be done to fully document this critical aspect of the human experience in early New Mexico. While the morada will be protected by a temporary fence during highway construction, it will not be excavated. However, we will be able to gain a large amount of information about its interior layout and furnishings through interviews with knowledgeable local people.

Research Issue 7: Dating the morada. We now have only vague dates for the construction and abandonment of the Ojo Caliente morada. Marshall (1995) reports a ca. 1870 construction date. If true, it seems likely, given the eighteenth-century establishment date for the Ojo Caliente Grant, that this was not the first morada in the area. Interviews with local people, especially with the one known resident *hermano*, Benjamin Gallegos, may clarify this point.

The construction details of the morada may also help to date the construction. Bunting et al. (1983) outlines several criteria that help establish when a given morada was built. Building materials (adobe, logs, railroad ties, milled lumber), wooden beams (hand-hewn versus milled), hardware (or the lack of it), roof (flat earthen, terneplate, gabled metal), floor (earthen, wooden), windows (wooden shutters, window glass), and manner of heating (open fireplace, wood stove, converted metal drum, cast-iron cook stove, etc.) are all useful in this regard. Although moradas were occasionally modernized in various ways, careful questioning may provide clues to the original construction details and furnishings, hence to the date of initial construction.

Research Issue 8: Internal organization of morada. The morada was so completely dismantled that internal details cannot be ascertained by examining the ruin. The number, internal organization (placement of heating facilities, benches, etc.), and function of rooms must be documented. In the absence of excavation, the only option for learning these details is through interviews with knowledgeable persons.

Research Issue 9: Location and construction details of the Calvario. The Calvario, or large cross at the far end of the Via Crucis, is a focal point during the rituals of Holy Week. Calvarios were often placed on high points not far from the moradas. The location and method of construction of the Calvario belonging to the Ojo Caliente morada are not known and can only be learned through interviews with local sources.

Research Issue 10: Location and organization of the Via Crucis. The procession route and the Stations of the Cross are another major feature of the morada complex. According to Bunting et al. (1983), the Stations of the Cross were not permanent, but set out each year for Holy Week. Since they were generally not permanent, it is not likely that they could be relocated through archaeological means. Here again, interviews with knowledgeable local individuals will be indispensable.

Research Issue 11: Oratorios. We already know that two different buildings, both physically separate from the morada, served as chapels in functions of the Hermandad. We need to obtain information on the location, construction details, ownership, and dates of use of both structures, one or both of which are no longer standing. Local interviews will be indispensable in this regard.

García Store: Problem Domains and Research Strategies

Commercial business is another important aspect of human communities. Small commercial enterprises in northern New Mexico are even less well studied than religion.

Although rural Hispanics were farmers and ranchers and could provide themselves with many of the necessities of life, certain items of hardware and equipment, as well as a few of the niceties that provide quality of life, had to come in from manufacturing areas outside the region. Three aspects are of special interest in the current project.

Research Issue 12: Construction details and interior organization of the store. The García store was so thoroughly dismantled that we can learn nothing from the ruin itself. Because the remains consist entirely of a foundation, with the floor level at what is now ground level, excavation would reveal little or nothing about the internal organization of the store. Interview data, on the other hand, could provide many of the details, such as the number of rooms, placement of doors and windows, and location of counters and shelves. Interviews with informed sources will provide much of this information.

Research Issue 13: Specific types of goods sold and their points of origin. Rural northern New Mexicans have long been nearly self-sufficient because of their farms and domestic stock. By growing their food and using the natural resources available in the vicinity of their communities, they provided themselves with most of the things required for survival.

Some items, however, could not be made under frontier circumstances and had to be brought in from outside the region. Metal items such as knives, shears, bridle bits, harness hardware, firearms, wagon furnishings, and the like are perhaps the best examples. Such items, because of their relative scarcity and great value, were often worn to small, unusable pieces before being discarded. During the early American Territorial period, stores filled with these and other goods (fancy clothing, toys, specialty foods, etc.) became more numerous, especially in the rural areas.

Learning the types of goods offered by the García store would be useful in several ways. They would reflect the greatest needs, the degree to which luxury items could be afforded, the comparative wealth (or lack of it) of the area, and the changes (if any) in that wealth through time. Archaeological work might assist in these matters, but as we have already noted, all types of refuse (metal, glass, china, Indian pottery, etc.) attributable to the store are rare to nonexistent on the surface in the vicinity of the foundation. Given the amount of earth turned up by rodents, this would appear to be the case with the subsurface as well. Once again, local interviews are the best way to answer these questions in any reliable way.

Research Issue 14: Social dynamics of the García store. Interest in the social aspect of the store derives from two facts: the proprietor was an Hispanic man, and Kutsche and Van Ness (1988) indicate entrepreneurial activities in rural northern New Mexican villages could cause social disruptions.

According to Kutsche and Van Ness (1988), there is a general belief among rural northern New Mexicans that store owners take advantage of their customers through various means such as high prices and low prices for local produce. In small communities, where families must cooperate for ditch cleaning, harvesting, and other activities, suspicions of taking advantage of people can create serious rifts that manifest throughout village life.

Thus, any information about the role of the García store and its owner's place in the social as well as economic spheres of the area will be useful in learning about community harmony and, ultimately, about community economic success. Interviews with local persons and archival studies may elucidate these aspects.

Prehistoric Agricultural Fields (LA 105703–LA 105709 and LA 105713)

The agricultural fields in the Gavilan project area are typical of late prehistoric grid fields in the Northern Rio Grande region, especially the lower Chama Valley (Ellis 1970; Fiero 1978; Anschuetz et al. 1985), the Ojo Caliente Valley (Lang 1980; Bugé 1984; Fallon and Wening 1987; Ware and Mensel 1992), and the northern Galisteo Basin (Lightfoot 1990). The fields, which typically date to the Rio Grande Classic period (ca. A.D. 1300-1600), contain rectangular cobble grids filled with pebble-size gravel mulch, and most fields are on high outwash gravel terraces some distance from the nearest permanent water.

Research History and Summary of Research Results

The earliest descriptions of agricultural features in the lower Chama Valley appear in Bandelier's journals of 1892. In the following decade, Edgar L. Hewett of the School of American Archaeology found an extensive agricultural field complex on Abiquiu mesa, which he mistakenly identified as wall footings for a pueblo that he estimated once had over 2,000 rooms (Hewett 1906). Hewett's error was duplicated in the next decade by Jeançon (1923), who interpreted various agricultural features in the vicinity of Poshuouinge as wall foundations and religious shrines.

Although subsequent archaeological surveys in the region accurately identified extensive garden plots and other agricultural features (Hibben 1937), detailed investigations of these features did not occur until the early 1950s. In his 1951 excavations at Leafwater Pueblo in the lower Chama Valley, Luebben (1953) identified a series of enclosed rectilinear alignments with interiors filled with small gravels of homogeneous size and numerous small pits resembling "kiva depressions" along the edge of the mesa that he thought were a source of soil and gravel for adjacent agricultural terraces (1953:16). Luebben excavated a test trench through one of the depressions but found no cultural materials.

In the 1960s, Florence Hawley-Ellis conducted extensive surveys of garden terraces and gravel-mulched fields in the vicinity of Sapawe on El Rito Creek, just a few miles north of its confluence with the Rio Chama. Although some of the extensive agricultural features around Sapawe were probably mistaken for fieldhouses (Skinner 1965), other fields and field systems were correctly identified. Ellis (1970) and Vivian (1974) were probably the first investigators to describe prehistoric gravel mulch as a water-conservation technique.

In the 1970s and 1980s, a number of contract archaeology projects in the lower Chama Valley began accumulating detailed information on the form and structure of prehistoric grid

fields in the region. The first detailed excavation of a gravel-mulched garden plot was conducted in 1977 by Kathleen Fiero of the Museum of New Mexico (1978). In the late 1970s, Richard Lang (1979) of the School of American Research investigated several large gravel-mulched field complexes in the lower Ojo Caliente Valley. Lang noted the presence of a number of large depressions associated with the gravel fields, and he speculated that the features had been used as growing pits: "There is every reason to suspect that these features were excavated as loci for limited water and soil retention and the planting of some cultigen" (Lang 1979:19).

The late 1970s also saw intensive archaeological surveys of the Ojo Caliente Valley by Occidental College, which documented a varicty of agricultural features. The most common field type consisted of a rectangular grid averaging 30 m on a side and filled with pebble-size gravel (Bugé 1981, 1984). Bugé advanced yet another hypothesis for the shallow pits, which by then were recognized as a corollary of gravel mulched fields: he suggested that they may have functioned secondarily as fieldhouses--simple dugouts covered with brush.

There was a flurry of activity on agricultural fields in the lower Chama in the 1980s. As a result of road construction on U.S. 84 between Medanales and Abiquiu in 1985, the Museum of New Mexico mapped and excavated a series of late prehistoric agricultural fields and associated facilities (Anschuetz et al. 1985; Anschuetz and Maxwell 1987; Maxwell and Anschuetz 1987; Maxwell 1991; Moore et al. in prep.). The agricultural sites are on high gravel terraces above the Rio Chama floodplain, and a variety of field types were tested or excavated, including cobble-bordered fields with and without gravel mulch, check dams, several varieties of floodwater fields, miscellaneous linear rock features, rock piles, and the ubiquitous terrace-edge borrow pits.

By far the most ambitious study of gravel-mulch technologies in the northern Rio Grande to date was an investigation of the San Marcos gravel-mulch field system in the northern Galisteo Basin (Lightfoot 1990, 1993, 1994). Lightfoot's study was the first attempt to analyze an entire system associated with a single community and the first to combine extensive survey with sample excavation to address specific questions regarding field placement criteria, field construction techniques, and the hydrological characteristics of gravel-mulch technology. To assess the effectiveness of gravel as a mulch medium, Lightfoot collected plant biomass samples and soil moisture and temperature data from a random sample of gravel-mulch fields and off-field control sites. These controlled comparisons demonstrated that gravel-mulch fields support significantly more plant biomass than surrounding off-field control sites and as much as 3.5 times the soil moisture level of off-field controls.

Lightfoot analyzed field-siting criteria by plotting field locations against such landscape variables as soil group and vegetation pattern, and found a strong correlation between field sites and Pleistocene glacio-fluvial outwash gravel exposures. He used graded geological sieves to estimate the relative proportions of gravels of varying size and, from this, was able to postulate that gravel was derived from two primary sources: (1) borrow pits excavated at the edge of the fields, and (2) scraping and concentrating the surface gravels immediately adjacent to the fields. Using temporally diagnostic ceramics recovered from field surfaces and local landowner collections, Lightfoot concluded that the majority of San Marcos fields were constructed and

used during the early decades of the fifteenth century A.D., a period that coincides with a serious regional drought (Rose et al. 1981) and a major population growth spurt at San Marcos Pueblo. He concluded that investment in gravel mulch technology was probably a direct response to population-resource imbalances created by a decline in precipitation and local population growth.

Recent and, for the most part, ongoing and unpublished research on gravel-mulch fields in the northern Rio Grande include two doctoral dissertation projects (Maxwell 1991; Anschuetz 1992) and an aerial survey of prehistoric gardens on La Bajada Mesa, south of Santa Fe (Wills et al. 1990).

Rock-mulch fields of the northern Rio Grande typically consist of rectangular cobble-bordered grids subdivided into multiple rectilinear cells filled with a mixture of gravel and soil. Individual fields vary greatly in size and internal configuration. In one of the few intensive surveys of gravel-mulched fields, Lightfoot (1990) recorded an average field size of just over 440 sq m, but individual fields ranged from 32 to 3,150 sq m. On a single terrace field system in the lower Ojo Caliente Valley (LA 83117), two nearly adjacent fields covered 7 and 1,950 sq m, respectively (Ware and Mensel 1992).

Gravel-mulched fields are typically compartmentalized internally into rectangular cells or cobble alignments that may have functioned to concentrate moisture for use by individual plants. Patterns of internal grids and cobble alignments are often extremely complex, suggesting specialized functions, perhaps tied to crop mix (Maxwell and Anschuetz 1987:32).

There appears to be an almost perfect correlation between gravel-mulch fields and the natural occurrence of fluvial gravel deposits, which provide raw material suitable for use as mulch. Every field recorded thus far in the San Marcos Pueblo system in the Galisteo Basin is on or adjacent to glacio-fluvial outwash gravel exposures associated with the Panky-Pojoaque soil group (Lightfoot 1990:158). In the lower Chama Valley, field sites are similarly associated with Pleistocene terrace gravels overlying the Santa Fe group (May 1979). In virtually all recorded cases, fields are on the tops of gravel terraces between 15 and 60 m above the nearest floodplain and source of live water, and there are no indications in any fields recorded to date that a water source other than direct precipitation was available for the terrace-top fields.

Agricultural features are notoriously difficult to date because of the paucity of artifact associations, and the Rio Grande gravel-mulch fields are no exception. In the northern part of their geographic range, a few fields have recently been found in association with Santa Fe and Wiyo Blank-on-white (Beal 1987:33; Anschuetz 1995), suggesting that the development of the technology may date back to the thirteenth century. However, the most frequent ceramic associations in the lower Chama Valley are Abiquiu and Bandelier Black-on-gray (Biscuit A and B), which are usually dated between about A.D. 1350 and 1500. The San Marcos fields appear to be roughly contemporaneous, and ceramic associations suggest construction and use between roughly A.D. 1400 and 1500 (Lightfoot 1990:84).

Despite the difficulty of obtaining precise dates, the majority of fields appear to date to

the Pueblo IV or Rio Grande Classic period (Wendorf and Reed 1955), a time of significant population growth and aggregation throughout the northern Rio Grande following the structural collapse of Anasazi culture on the Colorado Plateaus to the west. Over 15 large Pueblo communities were occupied in the lower Chama Valley and eight pueblos of comparable size in the Galisteo Basin during the fourteenth and fifteenth centuries. Other areas of the valley saw a comparable increase in population and settlement density. Gravel-mulch fields were apparently part of a diverse mix of agricultural strategies designed to support this rapidly growing population (Anschuetz 1995).

Pollen analyses of gravel-mulch field sediments have turned up small frequencies of corn (*Zea mays*) and cotton (*Gosypium* sp.). Presumably, a wide mix of domestic and semidomestic plants were grown in the fields, consistent with the diverse crop mix typically found in Pueblo fields and gardens. Since cultivar pollen counts are typically very low, even in sediment samples from active agricultural fields (Martin and Byers 1965), new pollen scanning techniques such as intensive systematic microscopy (Dean 1991) hold considerable promise for identifying additional rare pollen types from the fields.

Problem Domains and Research Strategies

Research outlined above has identified a number of problem domains and research issues relating to prehistoric dry farming and gravel-mulch technology in the northern Rio Grande Valley. When were fields constructed and used? How were they constructed, and how did they function? What crops were grown, and what was the productive capability of gravel-mulch technology? Is prehistoric gravel mulch still functioning to retain moisture today? What was the purpose of different surface cell configurations and surface treatments? Why was the technology abandoned at the end of the prehistoric period? Research on the present project will attempt to build on the results of past excavations and analyses (e.g., Ware and Mensel 1992; Anschuetz et al. 1985) by focusing data collection and analysis strategies on four specific research issues and problem domains.

Research Issue 15: Dating and chronometrics. Agricultural features and facilities are notoriously difficult to date, and uncertainty about the age of agricultural fields and features in the northern Rio Grande frustrates a variety of processual studies. Hypotheses regarding issues such as field use-life, field system expansion through time, correlations between gravel-mulch technology and various environmental perturbations such as drought (Lightfoot 1990), and the climatic effects of the Little Ice Age (Anschuetz and Maxwell 1987) cannot be tested and refined without more precise dating of field construction, use, and abandonment events. The present project will probably not resolve these problems, but it is our objective to maximize the recovery of temporally diagnostic materials to enhance our understanding of when field systems were constructed, used, and abandoned.

Few if any chronometric dating techniques appear to be applicable to agricultural fields. Flaked stone artifacts and debitage are abundant on gravel terrace tops in the study area, in part because the terrace gravels were heavily exploited as a lithic raw material source. Unfortunately,

however, the gravels along the Rio Ojo Caliente consist primarily of cherts, quartzites, and rhyolites. Obsidian, which could be used for hydration dating, is extremely rare. Moreover, nonagricultural features are extremely rare in the vicinity of the Ojo fields, and so there is little hope of recovering materials suitable for other types of chronometric dating (e.g., radiocarbon, tree-ring, and archaeomagnetic).

Our best hope of dating grid fields in the Ojo Caliente Valley (and probably elsewhere in the northern Rio Grande) is to maximize the recovery of temporally sensitive artifacts--principally ceramics. Ceramic artifacts are by no means common on field surfaces in the northern Rio Grande, but Ware and Mensel (1992:96) have argued that artifact "visibility" may be low in fields due to high plant densities and surface reflective conditions (Ware and Mensel 1992:96). Consequently, artifact recovery rates appear to be positively correlated with survey intensity. In the lower Ojo Caliente Valley, Ware and Mensel (1992) were able to significantly increase artifact recovery rates by (1) intensifying pedestrian survey coverage (slowing the pace and shortening the transect interval); and (2) extending survey coverage beyond field surfaces to include field and terrace margins.

Attempts will be made at all agricultural fields and features at the Gavilan Project to recover buried obsidian samples for hydration dating, and if any buried cultural features are noted during the course of data recovery, a high priority will be placed on the recovery of chronometric samples (i.e., C-14, tree-ring, and archaeomagnetic). The primary focus of data recovery efforts, however, will be to intensify and extend survey coverage of field and off-field surfaces to maximize the recovery of temporally diagnostic artifacts. Recognizing that artifact visibility is extremely low on field surfaces, we will intensify pedestrian coverage of fields by slowing the pace of survey and shortening the transect interval. Artifacts will be flagged and piece-plotted, and areas of field surface that have higher than average artifact densities will be gridded and subjected to detailed examination. Optionally, a selected sample of grids will be stripped of surface gravel and screened to maximize artifact recovery. Intensive surveys will also be conducted of field margins and terrace slopes. Depending on artifact density, off-field areas and terrace slopes may also be mapped, gridded, and sample excavated.

Research Issue 16: Crop mix. What crops were grown in gravel mulch fields of the Ojo Caliente Valley? To date, both corn and cotton pollen have been recovered from gravel-mulch fields in the lower Chama Valley, but pollen frequencies are extremely low and, consequently, difficult to interpret. This is consistent with the observation that southwestern cultivar pollens tends to be extremely rare, even in sediment samples from active agricultural fields (Martin and Byers 1965).

Pollen analyses have proved useful in identifying cultigens associated with prehistoric fields. Corn and cotton pollen have been detected in samples from fields excavated as part of the Medanales Project and in test excavations northwest of Abiquiu (Moore et al. in prep.). Since cultigen pollen can be rare in these samples, standard 200 grain pollen counts must be augmented by systematic scans specifically for the cultivated types (Dean 1991).

In addition to using ISM to identify rare cultivar pollens, we propose to collect pollen

samples from on and off agricultural fields to evaluate the significance of on-site pollen frequencies. We also propose to collect pollen samples from a representative sample of borrow pits in the project area. Several investigators (Bugé 1981; Lang 1979, 1980; Lightfoot 1990) have suggested that these ubiquitous pits may have been used for localized water and soil retention and growing of some cultigens. We hope that ISM pollen analysis of sediments from a representative sample of borrow pits in the project area will help to resolve this issue.

Research Issue 17: Characterization of field Structure and dynamics. Questions about prehistoric field dynamics, how gravel-mulch fields were constructed, how they functioned, their potential productivity, their life expectancy, and other characteristics are important issues that have not been adequately addressed. Most modern investigators have relied on data from modern agricultural experiments on gravel mulch, especially Corey and Kemper (1968) and Fairbourn (1973), and simply extrapolated from these modern experiments to past field dynamics. However, none of these modern experiments were designed to replicate prehistoric field systems in northern New Mexico, and consequently, published experiments on gravel mulch can serve only as a general guide--and an important source of hypotheses--about prehistoric field dynamics.

We suggest that the best way to answer questions about field function and field dynamics is by experimental studies that simulate, as realistically as possible, field structures, soil types, and climate and radiation regime of late prehistoric fields in the northern Rio Grande. To design a simulation experiment, we need detailed data on field structure such as soil character and depth, gravel-mulch depth, gravel-size variation, gravel color, and other detailed field characteristics. One of the principal objectives of the current project will be to collect sufficient data to accurately characterize field form and structure so that experimental studies can be designed to investigate a variety of questions about field dynamics.

Preliminary studies along these lines were carried out with the support of the New Mexico State Highway and Transportation Department in 1993 at two prehistoric field sites (LA 83116 and LA 83117) in the lower Ojo Caliente Valley (Ware and Mensel 1992; Ware 1995), and preliminary data was collected on field construction sequences and methods, gravel size, raw material sources, and surface treatment variation. The results of these preliminary studies can be briefly summarized as follows:

1. How and from where was the raw material for field construction obtained? Field studies documented both surface concentration and borrow pit excavation to obtain suitable gravel and cobbles for field construction. Comparing raw material particle size between prepared field surfaces and marginal terrace deposits at LA 83117 demonstrated a close similarity between terrace and field deposits. The greatest observed difference was in the percentage of fine-grained materials in the sand/silt class, a difference that is probably attributable to postabandonment eolian deposition on field surfaces.

2. How was raw material processed and sorted, and what were the major steps in field construction? Field studies documented two levels of material sorting: (1) a first sort to recover large cobbles (>10 cm) for border and grid construction; and (2) a second sort to remove fine-

grained sediments from agricultural mulches. Following both sorts, unwanted large cobbles and sediments were apparently thrown back into the borrow pit excavations. Although it is impossible to know how extensive this discard behavior was without additional excavations, the behavior documented at LA 83117 certainly argues against a routine secondary function for borrow pit depressions, that is, growing pits and lean-tos (Lang 1980; Lightfoot 1990).

The first step in field construction involved laying out the borders and internal grid work of the field following the first sort of raw materials. Subsequent steps involved sorting and applying the gravel mulch bed. Other than removing fine-grained sands and silts from the mulch, there appears to have been very little intentional sorting and no evidence of mulch layering. Mulch deposits are nearly always poorly sorted and thoroughly mixed throughout their 10-15 cm cross section.

3. What technologies were used in the sorting of materials and the construction of the fields? Very few formal tools are associated with agricultural fields in the study area. Most of the chipped stone industry associated with terrace fields appears to be an "embedded" lithic quarrying activity and is incidental to field construction and use. Ceramic containers were used and occasionally broken in and around agricultural fields. All of the ceramics recovered from the Ojo Caliente fields were white ware bowl sherds and perhaps served as containers for transporting and serving food or other commodity. No utility ware sherds were recovered on or adjacent to the fields, and there is no other evidence of domestic activities associated with the field sites.

The best direct evidence of tool use consisted of hafted cobbles and choppers, which may have been used in the mining of terrace deposits or the preparation of planting beds. Nearly all of this category of tool recovered on the project consisted of preforms, so that use-wear evidence could not be examined. Presumably, finished tools were curated and did not become part of the archaeological record at the site of use. Another conjectural tool at the fields is open-weave baskets, which may have been used as sieves to remove fine-grained sands and silts from the mulch medium. Evidence for their use is entirely conjectural, although some form of sieve was more than likely employed in gravel sorting.

4. How much variation is there in field construction and surface treatment, and what accounts for this variation? Significant variation in surface treatment was observed at the Ojo Caliente fields and on other projects in the adjacent Chama Valley (Maxwell and Anschuetz 1987). In addition to reflecting variation in crop type and idiosyncratic behavior (Anschuetz and Maxwell 1987; Lightfoot 1990), surface treatment variation may also be attributable to incremental field growth and variation in raw material sources.

Data collection on the Gavilan Project will be designed to follow up on these preliminary investigations on site structure and function. Excavation strategies will utilize 2 by 2 m test units excavated by hand in natural stratigraphic layers. Studies of raw material proportions will concentrate on finer-grained materials than previous studies, the goal being to determine the source of the fine-grained sand and silt fraction within the field grid compartments. This can be accomplished by passing samples of field mulch through graded geological sieves and subjecting

the smallest sand and silt fractions to mechanical analyses that will help determine their depositional source (i.e., eolian or alluvial). Additional comparative studies of borrow pit and field materials will help to confirm the ultimate sources of field mulch and steps in the postulated material sorting sequence. In addition, we propose to make detailed stratigraphic studies of terrace edge borrow pits to collect additional data on field construction sequences.

Intensive data collection strategies at field sites will be supplemented by extensive mapping of field boundaries and grid alignments. It is important that entire field systems be mapped (including field segments that extend outside the project construction area) to assess total field area and details of field construction and use. It is also recommended that a field site be selected for testing the use of mechanical sweeping equipment to delineate internal cobble grid alignments. The tops of the internal cobble alignments are typically 5-10 cm below the present ground surface and are impossible to delineate without extensive hand excavation efforts. After all surface collections and controlled block excavations are conducted at the site, and controlled samples are taken, a mechanical sweeper could be brought in to remove the upper mantle of surface sand and expose large areas of the field surface in a short period of time. Such a procedure would, we believe, result in the loss of minimal data and the gain of significant information regarding large-scale grid and internal surface treatment patterns.

Research Issue 18: Imbedded lithic extraction and processing activities. In addition to supporting extensive agricultural features, gravel terraces in the northern Rio Grande frequently served as a source of raw materials for prehistoric flaked stone tool industries. Terraces in the study area investigated by Ware and Mensel (1992) were covered with deposits of waterworn cobbles and pebbles of metamorphic and plutonic origin, and the high frequency of primary core reduction debris scattered across the terraces suggests that the terrace gravel deposits were being heavily quarried.

The lithic assemblages from LA 83116 and LA 83117 (Ware and Mensel 1992) consisted almost exclusively of the by-products of the earliest stages of core selection and reduction, amounting to a fairly typical lithic quarry assemblage. Cores and cortical flakes comprised over 65 percent of the total assemblages from both sites, and core-debitage reconstructions were possible at both sites. Other attributes of the assemblages were consistent with early core reduction and core testing trajectories.

Ware (1995) concluded that lithic extraction and initial core processing was an important embedded activity of agricultural field construction and use in the lower Ojo Caliente Valley. To see if this pattern holds over a larger region, agricultural sites on the Gavilan Project will be intensively surveyed for evidence of lithic extraction and core processing behavior.

Site Treatment Recommendations

A total of eight prehistoric field sites are included in the present project (LA 105703–LA 105709 and LA 105713). Data recovery strategies at the agricultural sites on the Gavilan Project will be designed to collect data relevant to the four principal problem domains outlined

above: (1) dating and chronometrics, (2) crop mix, (3) field structure, and (4) lithic raw material extraction. Data recovery strategies at each site will vary, however, depending primarily on the nature and extent of field surfaces within the project construction zone.

All agricultural sites in the Gavilan project area will be subjected to the following minimal data recovery procedures:

1. All sites will be surface mapped in their entirety with the aid of an optical transit and stadia rod.

2. All sites will be subjected to an intensive pedestrian survey to identify and recover temporally sensitive artifacts. Recognizing that artifact visibility is extremely low on field surfaces, we will intensify pedestrian coverage of fields by slowing the pace of survey and shortening the transect interval. Artifacts will be flagged and piece-plotted, and areas of field surface that have higher than average artifact densities will be gridded and subjected to detailed examination. Intensive surveys also will be conducted of field margins and terrace slopes. Temporally sensitive artifacts identified outside the project boundaries will be recorded in the field and returned to their original location. All artifacts within the project area will be mapped and collected for identification and analysis in the laboratory.

3. Terrace surfaces and slopes will be monitored for evidence of lithic extraction and reduction activities. Lithic material and reduction stage attributes will be monitored in the field for all artifacts found beyond the project limits. Within the project limits, samples of lithic artifacts will be collected for laboratory identification and analysis.

4. Extensive photographic documentation of field edges and surfaces will be accomplished at all sites in the study area, and standardized field notes will be taken regarding variation in plant cover, surface gravel density, grid and cell dimensions, and so on.

In addition to these minimal recovery procedures, four sites in the project area (LA 105703–LA 105706) have extensive field surfaces and features within the project boundaries and will be subjected to intensive excavation. Excavation will be accomplished by hand in 2 by 2 m grids and natural stratigraphic layers. Both random and nonrandom grid locations will be selected to obtain representative samples of field surface treatments and investigate specific alignments and other surface features and anomalies. During excavation, particular attention will be paid to the alignment and orientation of cobbles on the surface, pollens at particular locations within the fields, soil textural differences within the soil profile, and general stratigraphy of the area. Data collection strategies will be designed to characterize both spatial and stratigraphic variation in field structure.

Samples of field surface layers will be passed through standard geological sieves to characterize size and material fractions. These data will be compared with samples from off-field borrow area excavations to quantify field construction and material sorting procedures.

In addition to controlled grid excavations, field stratigraphic structure will be examined

through the excavation of multiple linear test trenches. A backhoe will be used to excavate test trenches through field segments, and detailed profiles will be recorded, measuring such parameters as soil depth and constituency, gravel-mulch thickness, gravel-size variation, characteristics of soil chemistry and morphology, and soil moisture and temperature parameters. Trenches will bisect field edges and extend beyond field margins so that off-field soil and other profile characteristics can be measured to form a base line for estimating cultural modifications to the soil within the fields.

Besides the specific data recovery approaches outlined above, field excavation at agricultural sites in the project area will include almost all of the standard data recovery and recording procedures of the Office of Archaeological Studies. Preexcavation recording and preparation will include photographic documentation, establishment of mapping datums, construction of a 1 by 1 m surface control grid system over the entire site, and completion of a topographic map. Nonartifactual samples (soil, flotation, pollen, macrobotanical, faunal, C-14, and tree-ring) will be collected from all stratigraphic sections and any cultural features that might be encountered in association with the agricultural fields. Samples of undisturbed cultural fill will be screened through 1/4 inch mesh hardware cloth, and all artifacts and nonartifactual materials will be collected, bagged, and labeled by unit, stratigraphic level, date, excavator's name, and other appropriate provenience information. A site map will be prepared of the agricultural field with the aid of an optical transit and metric tape (or stadia rod) and will include plans and profiles of all excavation units and cultural features. Standard recording forms (feature, stratigraphic record, and field specimen record) will be completed for each excavation unit, and all cultural features will be photographed before, during, and after excavation. Excavators will maintain narrative records of excavation activities that will be cross-referenced with recording forms and provenience collections upon completion of the field phase of the project.

Analysis

Before analysis, all recovered materials will be cleaned and materials requiring conservation will be treated. Nonartifactual samples will be inventoried and prepared for shipment to appropriate analysis laboratories. The artifact assemblage will be analyzed by general artifact categories (lithic artifacts, ceramics, wood, bone). Artifact attributes will be coded for computerized cataloging and statistical analysis. Samples of representative artifacts will be photographed or drawn for inclusion in the final report. At the conclusion of the analysis, all artifacts, nonartifactual samples, and site documentation will be curated at the Archaeological Research Collection, Museum of New Mexico. Descriptions of analytical procedures for the major categories of artifactual and nonartifactual data follow.

Lithic Artifacts

Lithic artifacts will be classified according to tool form, function, and material type. Formal artifacts will segregated into formal or functional categories and subjected to detailed attribute analyses. Attributes to be monitored will include characteristics of the parent material

(material type, flake form, platform treatment), reduction techniques, retouch and edge angles, evidence of use-wear, and material alterations such as thermal treatment. Functional analyses of formal tool use will be conducted in an attempt to correlate tool forms and technologies with resource procurement strategies. Cores and debitage will be analyzed to characterize lithic reduction trajectories, expedient tool use, and raw material source localities. Special emphasis will be placed on identifying nonindigenous lithic materials for determining prehistoric and early historic trade and interaction networks.

Analyses of lithic artifacts relate directly to several specific research problems and issues identified in this report. Dating and chronology refinement are important objectives for all temporal components on the project--prehistoric and historic--and an important objective of lithic analytical design will be to recover obsidian flakes for obsidian hydration dating. This will be especially important for nonceramic sites and components that are not associated with charcoal and other datable organics.

Functional attributes of site and component lithic assemblages will be correlated with other economic data (macrobotanical specimens, pollen, and faunal remains) to arrive at a more comprehensive understanding of economic adaptations and changes in economic strategies in the study area. This will be especially important for the prehistoric components in the dune at LA 66288–LA 105710, where we anticipate finding stratified domestic remains and perhaps structures, hearths, and/or pits.

Analysis of lithic raw material types will provide important insights into regional trade and interaction, and settlement and mobility patterns. Analysis of lithic tools and debitage from agricultural sites will attempt to reconstruct the role of lithic tools in field construction and crop maintenance.

Ceramic Artifacts

Ceramic artifacts will be classified by ware, type, and vessel form. Other attributes to be monitored will include paste and slip color, temper type, surface treatment, design style and paint type, rim form, secondary alterations such as reuse and mending, and function. A variable-power binocular microscope will be used to measure all microscopic attributes. In addition, data will be collected from material sourcing and refiring experiments to identify potential clay, slip, and temper sources and local firing technologies.

Intrasite seriation studies will be conducted and correlated with chronometric and stratigraphic dates as an aid in determining construction and abandonment sequences at each site. Was the entire area within each grid garden built, used, and abandoned at the same time? Were all of the grid gardens contemporaneous, or were some earlier than others? Were the grid gardens contemporary with gardens on the dune at LA 66288–LA 105710, assuming that the dune was used for growing crops? These distinctions should be reflected in the both the types and relative frequencies of the types within the pottery assemblages in each site.

Seriation studies of specific ceramic types will help to identify trends in ceramic production, which can be compared to existing seriation studies to test hypotheses concerning relative dates of production and trade patterns outside the Chama Valley. We anticipate that a seriation study will be especially appropriate for the dune at LA 66288–LA 105710 because of the depth of the deposits and the indications that the dune was actively building during the prehistoric occupation.

Ceramic functional studies will attempt to discriminate between storage and nonstorage vessels and as an aid in determining site structure and function, length of occupation, and the nature of technology and resource procurement patterns at each site.

Floral and Faunal Remains

Faunal studies will focus on species identification and diversity, age and minimum numbers of individuals, butchering and processing methods, and other attributes that will aid in reconstructing faunal procurement and consumption patterns at the sites. Macrofloral specimens recovered using water flotation methods will be analyzed for species mix, collecting and processing methods, and seasonality. Special emphasis will be placed on determining species diversity and changes in species diversity through time. On- and off-site pollen samples will be examined and compared to provide a clearer picture of plant use and availability during the site occupations.

Economic plant pollen (corn, beans, squash, cotton) will provide information about what plants were grown in the grid gardens (LA 105703–LA 105706) and which were grown on the dune or in the valley or both. This information will permit a more comprehensive understanding of the field strategies, whether all field types and locations were used for all domestic crops, or whether field types were specialized by plant species.

Historic Artifacts

Only recent historic artifacts were noted during test excavations in the lower Ojo Caliente Valley. If historic artifacts belonging to the morada and García Store are recovered during data recovery phases of the project, they will be segregated into functional categories that will allow insights into the behavioral contexts in which the artifacts were used, maintained, and discarded. The following generalized functional categories will be used to sort artifacts into behaviorally meaningful groups: foodstuffs, indulgences, domestic routine, construction and maintenance, personal effects, entertainment and leisure, arms, animal husbandry, other, and indeterminate. These preliminary categories will be refined or expanded as necessary.

Human Remains

We do not expect to find human remains in any of the sites to be excavated on this

project, but if we do, we will proceed as follows.

The main goal of skeletal analysis will be the nondestructive study of the remains to add to general data on prehistoric human populations. This approach will include standard metric studies, aging and sexing, and documentation of pathologies.

It is possible that human remains from the sites will be sufficiently well preserved to permit carbon, nitrogen, and strontium isotope studies, allowing us to estimate the relative proportions of meat, corn, and wild plant foods in the diet of the sites' inhabitants. However, before this or any other destructive analysis is undertaken, the Office of Archaeological Studies will work with the State Historic Preservation Division to ensure prior consultation with all concerned parties.

Skeletal studies will provide information on aspects of the diet that can only be approximated through studies of other materials such as floral remains, faunal remains, chipped stone artifacts, ground stone artifacts, and pottery. Human remains, if recovered, will most likely come from the dune deposit of the south area of LA 66288 and the north end of LA 105710. Isotopic and pathology studies provide the best single source of information about subsistence success and the details about how that success was achieved.

Reporting and Storage

A final report on the excavation and analysis of all sites will be published in the OAS Archaeology Notes series. The report will present important excavation, analysis, and interpretive results. Included will be a narrative description of work performed, site and artifact photographs, maps, and data summaries in the form of tables, charts, and graphs.

All field notes, analysis notes, maps, and photographs will be deposited with the Archeological Records Management Section of the New Mexico State Historic Preservation Division, in the Laboratory of Anthropology in Santa Fe. Artifacts will be curated in the Archaeological Research Collection, Laboratory of Anthropology, Museum of New Mexico, Santa Fe. Human remains, if recovered, will be reposited in the manner prescribed through consultation between the New Mexico State Highway and Transportation Department, the State Historic Preservation Division, and all interested parties.

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APPENDIX 2: SURFACE ARTIFACT INVENTORIES, LA 66288 (HILLTOP PUEBLO)

Back of first terrace, below pueblo; does not include post–World War II roadside litter or any historic artifacts or materials within 5 m of the morada.

Artifact	No.	Square
South of Pueblo (East of U.S. 285)		
light purple rhyolite flake	1	0/17W
Pedernal flake	1	2N/11W
Sapawe Micaceous Washboard sherds	2	2N/15W
Sankawi jar sherd	1	"
Tesuque Smeared Indented sherd	1	"
micaceous utility sherd	1	"
Sapawe Micaceous Washboard sherd	1	2N/16W
Tesuque Smeared Indented sherd	1	"
dark gray chert flake	1	"
micaceous utility sherd	1	3N/13W
light gray rhyolite flake	1	"
biscuit sherd	1	3N/14W
Sapawe Micaceous Washboard sherd	1	"
dark gray chert flake	1	3N/16W
dark gray chert flake	1	9N/11W
black basalt flake	1	15N/5W
dark gray siltite flake	1	15N/7W
Biscuit B sherd	1	15N/20W
Sankawi sherds (includes one rim)	1	"
white ware sherd	1	"
brown-slipped gray ware sherd (collected)	1	"
Sapawe Micaceous Washboard sherd	1	16N/19W
biscuit jar sherd	1	16N/20W
Biscuit B sherd	1	"
Pedernal flake	1	"
Biscuit B sherd	1	16N/21W
biscuit jar sherd	1	"
dark gray chert flake	1	17N/10W
Sapawe Micaceous Washboard sherd	1	17N/19W
black basalt flake	1	"
Pedernal flake	1	17N/21W
Sapawe Micaceous Washboard sherd	1	"

black basalt flake	1	18N/18W
black basalt flake	1	18N/20W
Biscuit A sherd	1	18N/22W
Biscuit jar rim sherd	1	19N/8W
Biscuit A sherd	1	19N/15W
micaceous utility sherd	1	19N/17W
Biscuit "C" jar sherd	1	"
Sapawe Micaceous Washboard sherd	1	"
Biscuit A sherd	1	19N/19W
Biscuit B sherd	1	19N/20W
Sapawe Micaceous Washboard sherd	1	"
Pedernal flake	1	"
white ware sherd	1	"
Sapawe Micaceous Washboard sherd	1	20N/2W
white ware bowl sherd	1	20N/9W
nonmicaceous washboard sherd	1	20N/10W
Pedernal flake	1	"
nonmicaceous utility sherd	1	20N/11W
Biscuit B sherd	1	20N/13W
white ware sherd	1	20N/16W
black basalt flake	1	20N/18W
Pedernal flake	1	"
light orange chalcedony flake	1	21N/8W
nonmicaceous washboard sherd	1	21N/9W
Biscuit B sherds	2	"
quartz-tempered plain utility sherd	1	"
Pedernal flake	1	"
Sapawe Micaceous Washboard sherd	1	"
nonmicaceous utility sherd	1	21N/10W
black basalt flake	1	"
micaceous utility sherd	2	"
Biscuit B sherd	2	"
Biscuit B sherds	2	21N/13W
Pedernal flake	1	"
Sapawe Micaceous Washboard sherd	1	"
Pedernal biface fragment	1	21N/14W
Biscuit jar sherd	1	21N/15W
medium gray chert flake	1	21N/16W
black basalt flake	1	"
micaceous utility sherds	2	21N/17W
non-micaceous utility sherd	1	"
Biscuit A sherd	1	"
nonmicaceous washboard sherd	1	21N/18W
medium gray chert flake	1	"
Sapawe Micaceous Washboard sherd	1	"

black basalt flake	1	22N/9W
Sapawe Micaceous Washboard sherd	1	22N/10W
Sankawi jar sherd	1	"
micaceous utility sherd	1	"
Sapawe Micaceous Washboard sherd	1	22N/11W
dark gray chert flake	1	"
nonmicaceous utility sherds	2	"
Pedernal flakes	2	"
Biscuit A sherd	1	22N/14W
dark brown chert flake	1	"
micaceous utility sherd	1	22N/16W
nonmicaceous utility sherd	1	22N/17W
Sapawe Micaceous Washboard rim sherd	1	"
micaceous utility sherd	1	22N/19W
black siltite flake	1	23N/9W
Biscuit-Sankawi rim sherd	1	23N/10W
nonmicaceous utility sherd	1	23N/11W
medium gray chert flakes	2	23N/13W
micaceous utility sherd	1	"
Tesuque Smeared Indented sherd	1	"
Biscuit B sherds	2	"
Sapawe Micaceous Washboard sherds	3	"
medium gray rhyolite flake	1	"
Pedernal flake	1	"
white ware sherd	1	23N/14W
Biscuit A rim sherd	1	"
Biscuit B sherd	1	23N/16W
black basalt flake	1	"
Sapawe Micaceous Washboard sherds	2	23N/17W
Biscuit A sherd	1	"
Biscuit B sherds	2	"
dark gray coarse chert	1	24N/8W
white ware bowl sherd	1	"
white ware bowl sherd	1	24N/9W
white ware bowl sherd	1	24N/10W
Biscuit B sherd	1	24N/11W
Sankawi (?) sherd	1	"
dark gray chert flake	1	"
white ware rim sherd	1	25N/10W
dark gray basalt flakes	2	26N/12W
Biscuit B sherds	2	26N/13W
nonmicaceous utility sherd	1	"
Biscuit B sherd	1	27N/1W
Biscuit B rim sherd	1	27N/4W
rusted lap-seam oil can	1	27N/5W

Pedernal flakes	2	28N/2E
black basalt flakes	4	"
white ware sherd	1	28N/1E
medium gray coarse chert flake	1	28N/5W
Sapawe Micaceous Washboard sherd	1	28N/7W
rusted evaporated/condensed milk can	1	28N/8W
rusted lap-seam, pint-size sanitary can	1	28N/11W
medium gray chert	1	29N/2E
black basalt flake	1	"
Biscuit B sherds	3	29N/8W
Sapawe Micaceous Washboard sherd	1	"
Pedernal flakes	4	"
biscuit jar sherd	1	29N/9W
medium gray chert flake	1	29N/10W
medium gray coarse chert flakes	2	"
Biscuit B sherd	1	"
nonmicaceous utility sherd	1	29N/11W
white ware jar sherd	1	"
Pedernal flake	1	"
black siltite flake	1	"
Biscuit A rim sherds	2	"
Pedernal flake	1	29N/16W
white ware sherd	1	"
Pedernal flake	1	30N/0
medium gray chert flake	1	"
micaceous utility sherd	1	30N/1W
Biscuit B sherds	2	30N/3W
white ware sherd	1	"
Pedernal flake	1	"
Sapawe Micaceous Washboard sherd	1	"
micaceous utility sherd	1	"
black basalt flake	1	30N/4W
Biscuit A sherd	1	"
micaceous utility sherds	2	"
Sankawi jar sherd	1	30N/8W
Biscuit B sherd	1	"
black basalt flake	1	30N/9W
orange chalcedony flake	1	"
Biscuit A sherd	1	30N/11W
Sapawe Micaceous Washboard sherd	1	"
light and dark gray chert flake	1	30N/12W
transfer print "china" *sherds*	2	"
Biscuit B sherd	1	"
Pedernal flake	1	30N/13W
Biscuit B sherd	1	30N/14W

Biscuit B sherd	1	30N/16W
biscuit sherd	1	31N/10W
micaceous utility sherd	1	"
Biscuit B sherd	1	31N/11W
dark gray chert flake	1	31N/12W
medium gray chert flake	1	31N/13W
dark gray chert flake	1	31N/17W
light gray chert flake	1	"
Pedernal flake	1	"
Biscuit A sherd	1	31N/18W
medium gray chert flake	1	"
black basalt flake	1	31N/19W
Biscuit A sherds	2	"
Sapawe Micaceous Washboard sherd	1	"
Sapawe Micaceous Washboard sherd	1	32N/11W
medium gray chert flake	1	32N/16W
Biscuit A sherd	1	"
Sapawe Micaceous Washboard sherd	1	"
quartz-tempered utility sherd	1	"
black basalt flake	1	32N/17W
Pedernal flake	1	32N/18W
Biscuit B sherd	1	"
Sapawe Micaceous Washboard sherd	1	33N/1W
dark gray siltite flake	1	33N/8W
black basalt flake	1	33N/15W
Biscuit B sherds	2	33N/16W
micaceous utility sherd	1	"
Pedernal flake	1	33N/19W
black basalt flake	1	33N/20W
dark gray siltite flakes	2	34N/8W
light gray chert flake	1	34N/16W
non-micaceous washboard sherd	1	35N/0
dark gray basalt flake	1	35N/16W
medium gray chert flake	1	36N/11W
Galisteo (?) Black-on-white sherd	1	36N/16W
micaceous utility sherds	2	36N/21W
dark brown siltite flake	1	"
micaceous utility sherd	1	37N/18W
biscuit rim sherd	1	38N/17W
micaceous utility sherd	1	38N/18W
white ware sherd	1	38N/19W
Sapawe Micaceous Washboard sherd	1	"
light gray rhyolite flake	1	"
Pedernal flake	1	39N/1W
Pedernal flake	1	39N/15W

black basalt core	1	40N/6W
medium gray coarse chert flake	1	"
Sankawi (?) worked sherd fragment	1	41N/1E
black basalt flake	1	41N/3W
red chalcedony flake	1	"
Biscuit A sherd	1	"
Pedernal flake	1	41N/4W
dark gray chert/siltite flake	1	41N/18W
black basalt flakes	2	42N/14W
shell button, four-hole	1	43N/15W
coarse, light gray chert flake	1	43N/18W
Sapawe Micaceous Washboard sherd	1	"
Pedernal flake	1	44N/15W
obsidian flake	1	44N/16W
light gray rhyolite flake	1	45N/8W
micaceous utility sherd	1	45N/9W
white ware sherd	1	45N/19W
black basalt flake	1	46N/7W
Biscuit A sherd	1	"
black basalt flake	1	46N/8W
light gray rhyolite flake	1	46N/10W
nonmicaceous utility sherd	1	46N/12W
dark gray siltite flake	1	46N/16W
Pedernal flake	1	46N/19W
micaceous utility sherd	1	"
Biscuit B sherd	1	46N/20W
Sapawe Micaceous Washboard sherd	1	"
Biscuit A sherd	1	47N/8W
Sapawe Micaceous Washboard sherd	1	47N/17W
micaceous utility sherd	1	47N/18W
black basalt flakes	2	"
Biscuit B sherd	1	47N/19W
micaceous utility sherd	1	47N/20W
black basalt flakes	2	48N/1E
nonmicaceous washboard sherd	1	48N/17W
micaceous utility sherd	1	48N/19W
black basalt flake	1	"
Pedernal flake	1	49N/9W
Sapawe Micaceous Washboard sherd	1	49N/20W
white ware sherd	1	49N/21W
nonmicaceous washboard sherd	1	50N/7W
Sapawe Micaceous Washboard sherd	1	53N/2W
rusted quart-size lap-seam oil can	1	53N/7W
light gray chert flake	1	54N/0
Pedernal flake	1	54N/3W

medium and dark gray chert flake	1	54N/6W
Sapawe Micaceous Washboard sherd	1	54N/13W
biscuit jar sherd	1	54N/16W
Biscuit A sherd	1	56N/0
Biscuit B sherd	1	56N/6W
medium gray chert flake	1	56N/16W
dark gray chert core	1	57N/1W
white ware sherd	1	57N/7W
Sapawe Micaceous Washboard sherd	1	"
rusted lap-seam oil can	1	58N/0
Pedernal flake	1	58N/3W
black basalt flake	1	58N/4W
coarse light gray chert flake	1	"
biscuit jar sherd	1	58N/15W
black basalt flakes	1	59N/0
nonmicaceous washboard sherd	1	"
Biscuit A sherd	1	59N/2W
black basalt flake	1	59N/3W
Biscuit B sherd	1	59N/4W
Biscuit A sherd	1	59N/13W
white ware rim sherd	1	"
Biscuit B rim sherd	1	59N/16W
Sapawe Micaceous Washboard sherd	1	59N/19W
micaceous utility sherd	1	"
Pedernal flakes	2	60N/0
Biscuit B sherds	1	60N/1W
Pedernal flake	1	"
coarse light gray chert flake	1	"
micaceous utility sherd	1	60N/5W
Biscuit A sherd	1	60N/8W
black basalt flake	1	61N/0
Biscuit B rim sherd	1	"
Pedernal flake	1	"
micaceous utility sherd	1	61N/1W
micaceous utility sherd	1	61N/3W
dark gray (with black specks) chert flake	1	"
Biscuit A sherd	1	62N/2W
black basalt flakes	2	"
light gray rhyolite flake	1	62N/3W
micaceous utility sherd	1	"
Biscuit A sherd	1	62N/4W
light gray rhyolite flake	1	"
black basalt flake	1	62N/9W
black basalt flake	1	62N/17W
medium gray chert flake	1	63N/0

light gray chert flake	1	63N/1W
Biscuit A sherd	1	63N/12W
black basalt flake	1	64N/0
Biscuit B sherd	1	64N/2W
black basalt flake	1	65N/1W
medium gray chert flake	1	65N/5W
rusted lap-seam meat can	1	66N/5W
rusted one-pint paint can lid	1	68N/6W
Biscuit A sherd	1	69N/2W
black basalt flake	1	69N/5W
Sapawe Micaceous Washboard sherds	3	70N/7W
black basalt flakes	2	71N/3W
purple glass fragments	2	"
Sankawi Black-on-cream sherd	1	"
black basalt flake	1	71N/7W
Biscuit A sherd	1	"
purple glass fragments	2	73N/9W

Artifacts east of U.S. 285: 351 prehistoric, 12 historic, 363 total

West of Pueblo (West of U.S. 285)

Biscuit B sherd	1	88N/40W
red chalcedony flake	1	88N/41W
Pedernal flake	1	90N/38W
Pedernal flake	1	91N/39W
Pedernal flake	1	94N/37W
Biscuit A sherd	1	95N/38W
Biscuit A sherd	1	95N/39W
black basalt flake	1	103N/40W
massive quartz flake	1	104N/40W
Biscuit B sherd	1	106N/37W
medium gray rhyolite flake	1	107N/34W
transfer-print "china" *fragment*	1	107N/37W
Biscuit B sherd	1	110N/37W
biscuit ware bottom sherd	1	111N/38W
two-hand mano end fragment, three grinding surfaces, black vesicular basalt	1	112N/36W
Biscuit B sherd	1	112N/37W
black basalt core	1	112N/40W
Biscuit B sherd	1	113N/40W
Biscuit B sherd	1	115N/37W
Biscuit A sherd	1	116N/36W
Biscuit A sherd	1	117N/39W

Biscuit B/Sankawi rim sherd (collected)**	1	118N/40W
Biscuit B worked sherd (collected)***	1	128N/39W
Wiyo/Biscuit sherd	1	132N/40W
Biscuit A sherd	1	133N/37W
Biscuit B sherd	1	146N/36W
Biscuit A sherd	1	147N/37W
Biscuit B sherd	1	153N/33W
Biscuit B sherd	1	170N/36W

Artifact total, west of U.S. 285: 28 prehistoric, 1 historic, 29 total

** Light gray surfaces, very narrow line design, 5.5-6 mm thick.

*** Light gray surfaces, wide-line design, 4.5-5 mm thick, modern initials incised on interior surface.

Artifact totals, LA 66288 (east and west of U.S. 285): 379 prehistoric, 13 historic, 392 total

APPENDIX 3: ARTIFACT INVENTORIES FROM AUGER TESTS, LA 66288 (HILLTOP PUEBLO)

Back of first terrace, below pueblo.

Artifact	No.	Auger Test	Depth
		South of Pueblo (East of U.S. 285)	
Pedernal flake	1	12N/7W	0-10
Biscuit A (?) sherd	1	"	35-45
Pedernal flakes	2	"	75-85
micaceous utility sherd	1	"	"
Pedernal flake	1	"	90-95
medium gray chert flake	1	"	"
Biscuit B/Sankawi sherd	1	18N/7W	30-40
Sapawe Micaceous Washboard	2	21N/7W	10-20
Biscuit B sherd	1	"	30-40
micaceous utility sherd	1	"	"
Pedernal flake	1	"	50-60
red chalcedony flake	1	"	"
micaceous utility sherd	1	"	"
micaceous utility sherd	1	24N/7W	20-30
Sapawe Micaceous Washboard	1	"	110-120
Sapawe Micaceous Washboard	2	"	130-140
medium gray chert flake	1	"	"
piece of aluminum foil	1	27N/7W	30-40
Sapawe Micaceous Washboard	1	"	"
Biscuit B sherd	1	"	50-60
black basalt flake	1	30N/7W	0-10
micaceous utility sherd	1	33N/7W	20-30
white ware sherd	1	"	"
micaceous utility sherd	1	36N/7W	30-40

micaceous utility sherd	1	"	55-65
micaceous utility sherd	1	42N/7W	0-40
Sapawe Micaceous Washboard	2	"	40-50
Pedernal flake	1	"	50-60
medium gray chert flake	1	"	60-65
black basalt flake	1	"	"
black basalt flake	1	48N/7W	50-60
white ware sherd	1	6N/11W	50-60
micaceous utility sherd	1	"	60-70
micaceous utility sherds	1	9N/11W	0-10
Biscuit B sherd	1	"	10-20
micaceous utility sherd	1	"	"
micaceous utility sherd	1	"	40-50
Pedernal flake	1	"	50-60
micaceous utility sherd	1	12N/11W	25-35
dark gray chert flake	1	15N/11W	0-10
micaceous utility sherd	1	"	25-35
nonmicaceous utility sherd	1	21N/11W	0-10
brown chert flake	1	"	25-35
black siltite flake	1	24N/11W	10-20
Wiyo/Bicuit A sherd	1	"	"
micaceous utility sherd	1	"	50-60
nonmicaceous utility sherd	1	"	"
black basalt flake	1	"	60-70
micaceous utility sherd	1	"	"
micaceous utility sherd	1	"	80-90
micaceous utility sherd	1	"	125-135
micaceous utility sherd	1	27N/11W	40-50
dark gray chert flake	1	"	"
Biscuit A sherd	1	30N/11W	25-35
Pedernal flake	1	"	"
light gray chert flake	1	"	"
Biscuit B sherd	1	"	50-60
micaceous utility sherds	3	"	"
black basalt flake	1	"	70-80
micaceous utility sherd	1	"	95-105
Biscuit B sherd	1	"	105-120

black basalt flake	1	"	120-130
micaceous utility sherd	1	"	"
micaceous utility sherd	1	"	130-140
Biscuit B sherd	1	"	140-150
micaceous utility sherd	1	33N/11W	10-20
micaceous utility sherds	2	"	20-30
micaceous utility sherd	1	"	30-40
dark gray basalt flake	1	"	40-50
micaceous utility sherd	1	"	"
dark gray chert flake	1	"	50-60
yellow chalcedony flake	1	"	"
micaceous utility flake	1	"	60-65
nonmicaceous utility sherd	1	"	"
Biscuit B sherd	1	39N/11W	40-50
Biscuit ware sherd	1	"	"
micaceous utility sherd	1	"	50-60
white ware sherd	1	"	"
Wiyo (?) Black-on-white sherd	1	"	60-70
Pedernal flake	1	"	"
dark gray chert flake	1	"	70-75
micaceous utility sherd	1	"	"
dark gray chert flake	1	"	75-80
dark gray basalt flake	1	"	80-95
black basalt flake	1	"	110-120
micaceous utility sherd	1	"	130-140
Sapawe Micaceous Washboard	1	42N/11W	80-90
patinated glass fragment	1	45N/11W	0-10
dark gray chert flake	1	48N/11W	25-35
Biscuit A sherd	1	51N/11W	75-85
Biscuit B sherd	1	"	"
black basalt flake	1	0/15W	30-40
Pedernal flake	1	"	"
Pedernal flake	1	"	65-75
quartzite flake	1	"	"
micaceous utility sherd	1	"	"
small micaceous utility sherd	1	"	95-105
medium gray chert flake	1	3N/15W	0-15

Biscuit A sherd	1	"	"
Biscuit B sherds	2	"	35-45
micaceous utility sherd	1	6N/15W	20-30
tiny sherds	2	"	35-45
black basalt flake	1	"	45-55
small utility sherds	2	"	55-65
micaceous utility sherd	1	"	70-80
dark gray chert flake	1	9N/15W	20-30
tiny micaceous utility sherd	1	"	30-40
Biscuit A sherd (in two pieces)	1	"	40-50
micaceous utility sherd	1	"	50-60
piece of plastic	1	12N/15W	10-20
tiny utility sherd	1	18N/15W	0-15
micaceous utility sherd	1	"	50-60
obsidian core (Polvadera?)	1	"	60-70
micaceous utility sherd	1	21N/15W	0-10
micaceous utility sherd	1	"	25-35
tiny utility sherd	1	24N/15W	10-20
Biscuit A sherd	1	"	20-30
micaceous utility sherd	1	"	30-40
micaceous utility sherd	1	"	80-95
greenstone flake	1	"	125-135
micaceous utility sherds	2	"	"
Biscuit A sherd	1	"	135-140
Biscuit B sherd	1	"	"
white ware sherd	1	"	"
micaceous utility sherd	1	"	"
small micaceous utility sherd	1	27N/15W	60-70
Biscuit B rim sherd	1	"	70-80
gray-brown chert flake	1	"	"
Biscuit A sherd	1	"	90-100
micaceous utility sherd	1	"	"
micaceous utility sherd	1	"	110-125
biscuit ware sherd	1	"	135-145
tiny micaceous utility sherd	1	30N/15W	0-10
dark purple-gray rhyolite flake	1	"	20-30
biscuit ware sherd	1	"	30-40
micaceous utility sherd	1	"	"

Rio Grande glaze body (red)	2	"	40-50
Potsuwi'i Incised sherd	1	"	"
micaceous utility sherd	1	"	80-90
Wiyo (?) Black-on-white sherd	1	"	110-120
micaceous utility sherd	1	"	"
nonmicaceous utility sherd	1	"	"
tiny nonmicaceous utility sherd	1	33N/15W	10-20
Polvadera obsidian flake	1	"	30-40
black basalt flake	1	"	40-45
micaceous utility sherd	1	36N/15W	0-10
micaceous utility sherds	3	"	10-20
Pedernal flake	1	"	"
nonmicaceous utility sherd	1	"	50-60
light gray-brown chert flake	1	"	75-90
white ware sherd	1	"	"
Wiyo Black-on-white sherd (constricted mouth)	1	"	90-100
micaceous utility sherd	1	"	"
tiny sherd	1	"	135-145
Biscuit B sherd	1	"	145-150
micaceous utility sherd	1	"	"
patinated brown bottle glass fragment	1	42N/15W	20-30
micaceous utility sherd	1	"	"
dark gray chert flake	1	"	65-75
Wiyo Black-on-white sherd	1	"	75-85
Wiyo/Biscuit A sherd	1	"	110-120
micaceous utility sherd	1	"	120-130
Biscuit A sherd	1	45N/15W	10-20
nonmicaceous utility sherd	1	"	50-60
small micaceous sherd	1	"	60-70
Biscuit jar sherd	1	"	100-110
Biscuit A sherd	1	"	120-130
nonmicaceous utility sherd	1	"	"
small sherd	1	"	150-160
burned rock fragment	1	48N/15W	10-20
Biscuit B sherd	1	"	35-45
micaceous utility sherds	2	"	70-80
micaceous utility sherd	1	"	80-90
micaceous utility sherd	1	"	90-100
light tan chert flake	1	"	100-115

Biscuit A sherd	1	"	115-125
Sapawe Micaceous Washboard	1	"	"
decayed wood (most likely prehistoric)			
	-	"	"
Biscuit B sherd	1	"	125-140
Sapawe Micaceous Washboard	1	"	"
more decayed wood	-	"	"
micaceous utility sherd	1	"	140-150
Sapawe Micaceous Washboard	1	"	150-155
aluminum foil fragment	1	51N/15W	20-30
chert flake	1	"	30-40
Biscuit A sherd	1	"	"
micaceous utility sherd	1	54N/15W	20-35
micaceous utility sherd	1	"	50-60
basalt flake	1	"	70-80
micaceous utility sherd	1	"	"
Sapawe Micaceous Washboard	1	"	90-100
Wiyo Black-on-white sherd	1	"	110-125
Pedernal flakes	2	"	"
medium gray chert flake	1	"	"
micaceous utility sherd	1	"	125-135
micaceous utility sherd	1	"	135-145
Pedernal flake	1	57N/15W	35-45
Biscuit sherd	1	60N/15W	25-35
Wiyo/Biscuit sherd	1	"	45-55
medium gray chert flake	1	"	145-155
nonmicaceous utility sherd	1	63N/15W	40-50
Sapawe Micaceous Washboard	1	"	60-70
nonmicaceous utility sherd	1	66N/15W	30-40
micaceous utility sherd	1	"	40-50
nonmicaceous utility sherd	1	"	50-65

Artifact total, east of U.S. 285: 214 prehistoric, 5 historic, 219 combined

West of U.S. 285

black basalt flake	1	85N/40W	20-30
piece of plastic	1	90N/40W	0-10
plastic, tar, asphalt	3	"	40-50
brown glass, asphalt	2	"	50-60
plastic, asphalt	2	"	60-75
rusted nail	1	"	75-85
piece of plastic	1	"	85-100
dark gray chert flake	1	"	"
piece of concrete	1	"	115
leather strap fragment	1	95N/40W	20-30
micaceous utility sherd	1	100N/35W	55-65
brown glass fragments (one heavily patinated)	2	105N/35W	30-40
clear glass fragment	1	110N/35W	0-10
piece of asphalt	1	"	20-30
white ware rim sherd	1	"	30-40
bone	1	"	40-45
piece of electrical tape	1	115N/35W	0-10
brown glass fragments	3	145N/35W	0-15
green, fluted bottle fragment	1	150N/35W	20-30
dark gray siltite flake	1	"	30-40

Artifact totals, west of U.S. 285: 5 prehistoric, 22 historic, 27 total
Artifact totals, east and west: 219 prehistoric, 27 historic, 246 total

APPENDIX 4: SURFACE ARTIFACT INVENTORIES, LA 105710

Artifact	**No.**	**Square**
dark gray chert flake fragment	1	2S/8W
plain, nonmicaceous utility ware	1	2S/10W
condensed/evaporated milk can	1	3S/2W
biscuit jar sherd	1	3S/6W
medium gray rhyolite flake fragment	1	5S/18W
Biscuit A sherd	1	9S/11W
fingerprint chert/siltite flake	1	10S/17W
black basalt flake	1	10S/18W
biscuit jar rim sherd	1	"
Biscuit A sherd	1	13S/2W
indented corrugated sherd	1	13S/3W
micaceous utility ware sherd	1	13S/4W
biscuit jar sherd	1	22S/3W
biscuit jar sherd	1	23S/9W
Biscuit B sherd	1	23S/14W
melanocratic igneous (?) flake fragment	1	24S/19W
dark gray siltite core (?)	1	"
window glass sherd	1	26S/2E
coarse fingerprint chert flake	1	26S/4W
Biscuit A sherd	1	26S/5W
Biscuit B sherd	1	31S/0
massive quartz flake (?)	1	40S/16W
Biscuit B sherd	1	42S/4W
Biscuit B sherd	1	43S/13W

Artifact totals: 22 prehistoric, 2 historic, 24 total

APPENDIX 5: ARTIFACT INVENTORIES FROM AUGER TESTS, LA 105710

Artifact	No.	Auger Test	Depth (cm)
nonmicaceous utility ware	1	6S/5W	110-120
quartzite flake	1	"	140-150
Biscuit B sherd	1	9S/5W	0-12
dark gray siltite flake	1	"	80-90
Biscuit B sherd	1	"	110-115
Tewa Polychrome (?) sherd	1	12S/5W	15-25
Wiyo Black-on-white sherd	1	15S/5W	90-100
Biscuit B sherd	1	"	125-135
dark gray cherty siltite flake	1	18S/5W	145-155
micaceous utility ware sherd	1	21S/5W	65-75
dark gray basalt flake	1	"	120-130
Biscuit B sherd	1	24S/5W	85-95
small bone fragment	1	27S/5W	10-20
Sapawe Micaceous Washboard	1	"	105-115
micaceous utility ware sherd	1	"	125-135
small utility ware sherds	2	33S/5W	50-60
small utility ware sherd	1	"	75-85
Biscuit B sherd	1	39S/5W	145-155
rodent long bone fragment	1	"	"
Sapawe Micaceous Washboard	1	42S/5W	145
Sapawe Micaceous Washboard	1	60S/5W	135-145
micaceous utility ware sherd	1	63S/5W	60
Sapawe Micaceous Washboard	1	69S/5W	110-120
Wiyo/biscuit sherd	1	9S/9W	130-140
nonmicaceous washboard sherd	1	"	140-150

small utility ware sherd	1	12S/9W	70-80
dark gray basalt flake	1	15S/9W	100-115
nonmicaceous plain utility sherd	1	"	115-125
Biscuit B sherd	1	18S/9W	135-145
thin brown bottle glass sherd	1	24S/9W	10-20
Biscuit A sherd	1	"	90-105
Sapawe Micaceous Washboard	1	30S/9W	100-110
chipped stone	1	"	110-120
micaceous utility ware sherd	1	"	130-140
small white ware sherd	1	36S/9W	85-95
medium gray rhyolitic chert flake	1	39S/9W	145-155
Wiyo (?) Black-on-white sherd	1	42S/9W	130-140
small nonmicaceous utility ware	1	45S/9W	60-70
small micaceous utility ware sherd	1	12S/13W	110-120
massive quartz flake	1	"	"
micaceous plain utility sherd	1	"	145-155
Wiyo Black-on-white jar sherd	1	"	"
Sapawe Micaceous Washboard	1	18S/13W	70-80
micaceous utility ware sherd	1	"	100-115 (?)
Biscuit B sherd	1	"	"
small white ware sherd	1	21S/13W	75-85
small white ware sherd	1	24S/13W	105-120

Artifact totals: 47 prehistoric, 1 historic, 48 combined