MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

EXCAVATIONS AT LA 58973, NEAR CORRALES, NEW MEXICO

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ADMINISTRATIVE SUMMARY

Between June 29 and July 10, 1987, the Office of Archaeological Studies, Museum of New Mexico, conducted excavations at LA 58973, along New Mexico State Highway 528 near Corrales and Rio Rancho, New Mexico.

Data from the testing phase of this project (March 17-20, 1987) suggested that there were substantial archaeological remains within the proposed right-of-way, consisting of several hearth features and artifacts associated with a possible pit structure. Excavations indicate the presence of three basin-shaped unlined hearth features and an associated scatter of ground stone and fire-cracked rock. The pit structure depression, on private land, was not investigated. Two ephemeral charcoal stains and a scatter of isolated artifacts within the right-of-way were determined to be surficial.

Submitted in fulfillment of Joint Powers Agreement DO4322 between the New Mexico State Highway and Transportation Department and the Office of Archaeological Studies, Museum of New Mexico.

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INTRODUCTION

At the request of Mr. William L. Taylor, environmental program manager, New Mexico State Highway and Transportation Department, archaeological remains located within the NMSHTD right-of-way adjacent to NM 528 in Sandoval County, New Mexico, were investigated (Fig. 1; Appendix 1, removed from copies intended for public circulation).

This project was conducted in two phases: the testing program and the data recovery program. During the testing program, the extent of subsurface materials was evaluated. These materials were then fully excavated during the data recovery program. A summary of this work is presented below.

The Testing Program

Limited test excavations were conducted at LA 58973 between March 17 and March 20, 1987. Highway shoulder grading activities along New Mexico State Highway 528 in March 1986 exposed a series of charcoal stains and associated artifacts along the east and west margins of the highway. One site, LA 54147, excavated by Bradley Vierra in 1986, appears to be a Spanish campsite (Vierra 1989). LA 58973 was recorded as a separate site by Stephen C. Lent in 1987. This report describes data recovery carried out at LA 58973, on lands administered by the state of New Mexico.

The archaeological test excavations were performed by Stephen C. Lent and Peter Bullock. David A. Phillips, Jr., served as principal investigator.

LA 58973 was initially tested to evaluate the site's composition, spatial integrity, and potential to yield archaeological information. At that time, the data recovered through the test excavations suggested that there were significant archaeological resources within the right-of-way. These consisted of hearth features, a scatter of fire-cracked rock, and artifacts associated with a possible pit structure. Analysis of the lithic artifacts recovered during testing suggested a pattern of expedient reduction of locally available materials with little or no biface manufacture or curation. The presence of ground stone in association with hearth features indicated food processing, while routine maintenance activities were suggested by the tool assemblage. Based on the results of the testing phase, further investigation was recommended (Lent 1987).

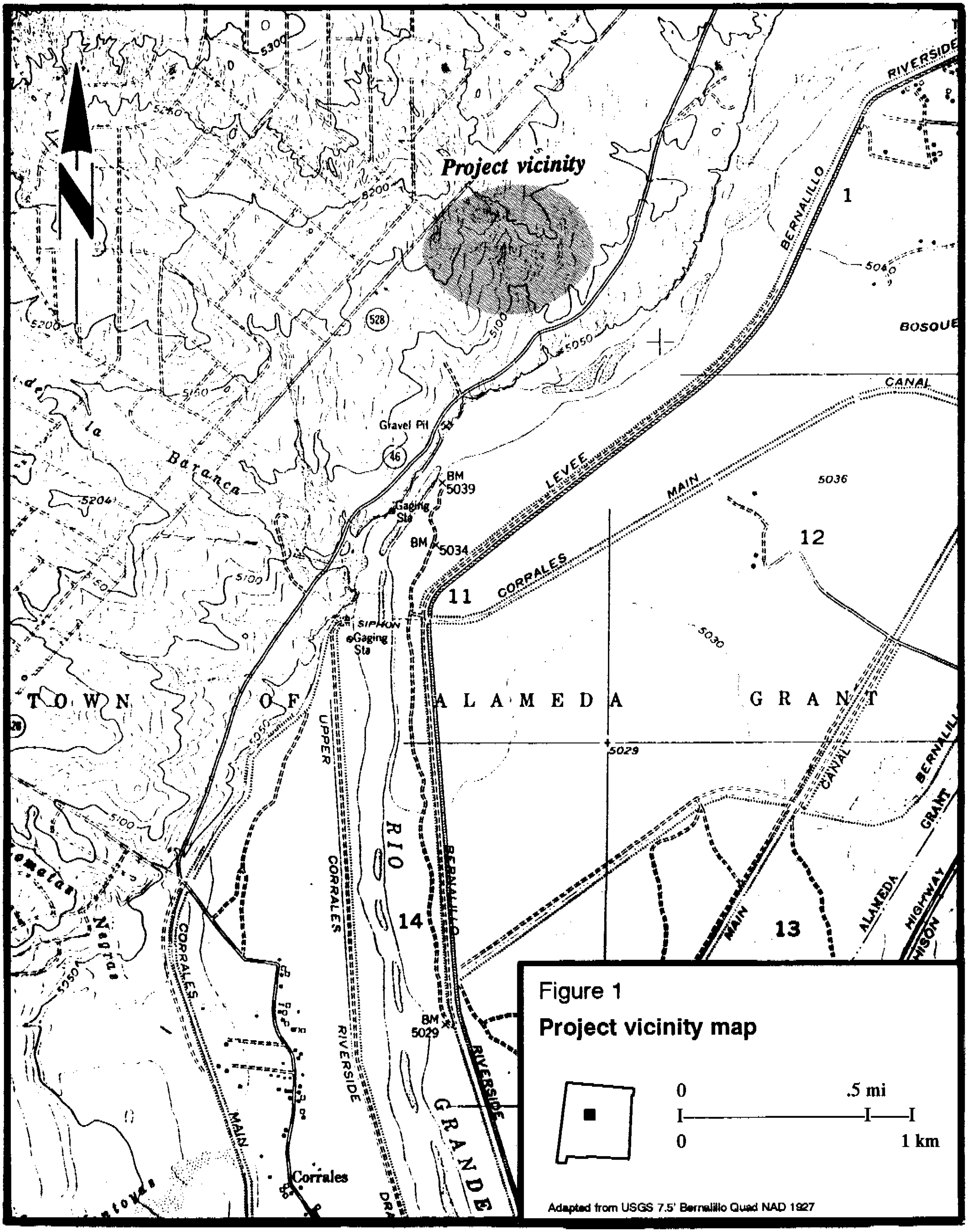

Figure 1
Project vicinity map

The Data Recovery Program

The data recovery phase of LA 58973 occurred between June 29 and July 10, 1987. It consisted of reexcavating portions of the grid system established during the testing phase and excavating down to sterile soil. An additional six units were excavated during the data recovery phase to expose cultural features and activity areas (Fig. 2).

Ephemeral charcoal stains and several isolated artifacts were noted north of LA 58973 during a survey of AMREP Corporation lands by Matt Schmader, principal investigator for Rio Grande Consultants. These resources were brought to the attention of the NMSHTD and investigated. A visual inspection and shovel testing determined these resources to be surficial.

LA 58973 is located in the NE 1/4, NE 1/4, SW 1/4, Sec. 2, T 12N, R 3E, USGS 7.5' quadrangle, Bernalillo, New Mexico. The UTM coordinates are Zone 13, E355040, N3906820. The site is located on lands administered by the state of New Mexico, Sandoval County.

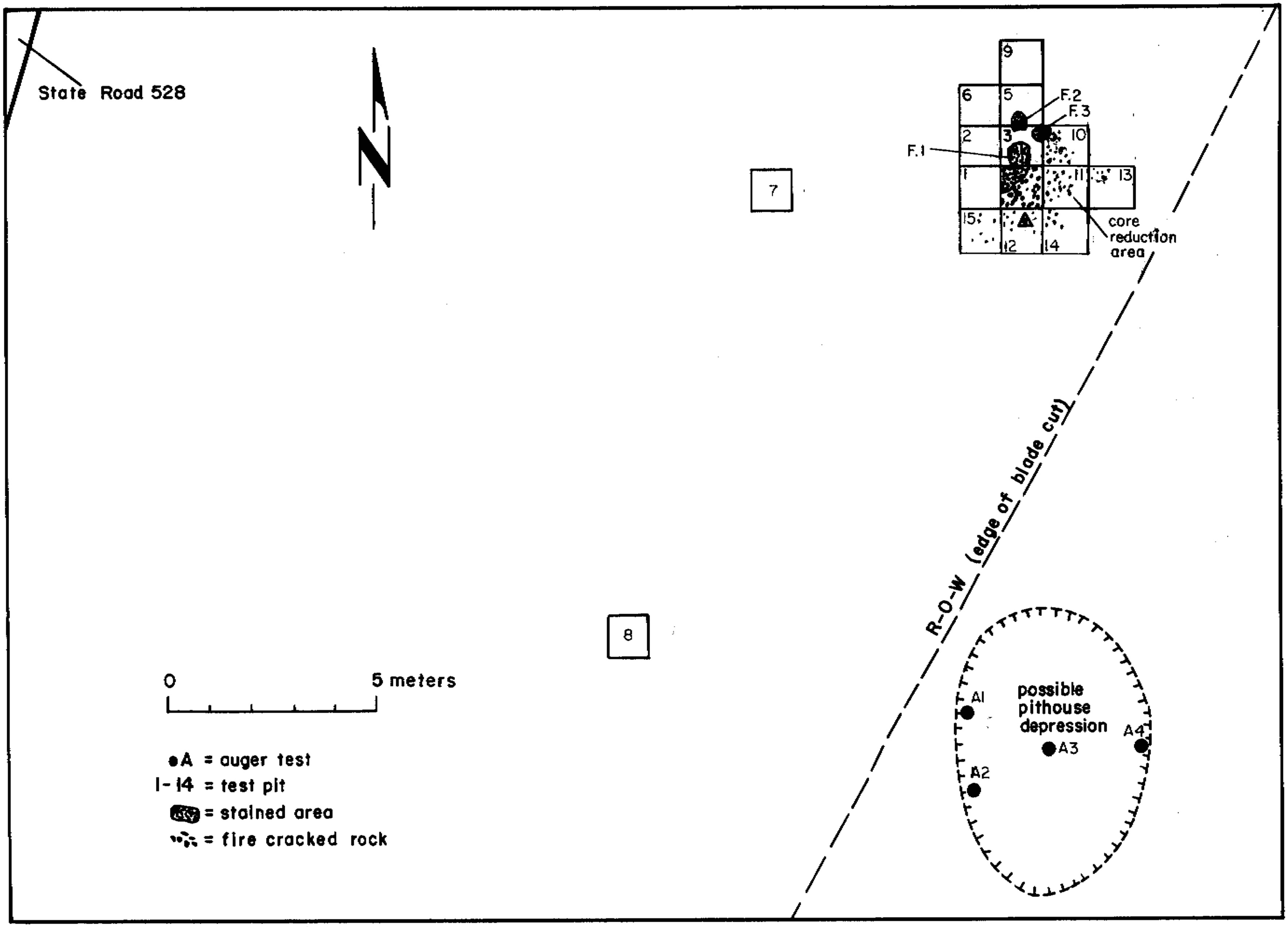

Figure 2. Site map, LA 58973.

NATURAL ENVIRONMENT

Physiography and Geology

LA 58973 lies about 0.81 km (0.5 mi) northwest of the Rio Grande drainage at an elevation of 1,578.9 m (5,180 ft). The Rio Grande constitutes the principal drainage of the Albuquerque Basin, which was defined in the early Tertiary period by the uplifting of the Sandia and the Manzano Mountains (Kelley 1977). The Albuquerque Basin is approximately 144 km (90 mi) long and 48 km (30 mi) wide. The basin is filled with poorly consolidated Cenozoic elements eroded from the uplands (Joestring et. al. 1961:148) and containing gravels of the Santa Fe formation -- an excellent source of prehistoric lithic materials. On the floodplain, the beds are formed by Quaternary alluvium, while the soils are primarily derived from the Gila-Venton-Glendale association (Maker et al. 1971). Lateral alluvial fans of sedimentary, crystalline, and volcanic rocks and eolian, playa, and fluvial facets are also found (Kelley 1977). Higher up on the floodplain, the current geomorphology consists of exposed strata of Santa Fe formation gravels, eroded alluvial terraces, playas, semi-consolidated dune features, and dissected arroyos. LA 58973 lies on the west slope of a semi-consolidated dune feature.

Climate

The average annual temperature of the project area ranges from 10 degrees C (50 degrees F) in the valley to 13.9 degrees C (57 degrees F) in Albuquerque. In the vicinity of Corrales, the highest recorded temperature is 40 degrees C (104 degrees F); the lowest recorded temperature is -33.9 degrees C (-29 degrees F). The temperature reaches 32.2 degrees C (90 degrees F) on an average of 34 days a year, and the average frost-free season lasts 190 days, from mid-April to late October. Summer is the rainy season, with half of the average annual precipitation falling from July to October, typically as brief but heavy thunderstorms. An average of 44 such storms occur each year, mostly during this period. The average number of days having 0.1 inch or more precipitation ranges from 22 in the valley to 54 in the mountains. Precipitation averages fluctuate, and recent years have seen a period of higher effective moisture. The average relative humidity in the Corrales area is 43 percent, and the average annual wind speed is 9 miles an hour. Sunshine occurs more than 75 percent of the daytime hours, or nearly 3,400 hours a year (U.S. Department of Agriculture 1977:95-97).

Flora and Fauna

The project area is in the Upper Sonoran life zone (Bailey 1913) near the interface of the riparian zone along the Rio Grande. While Upper Sonoran vegetation is characterized by desert scrubs, cacti, yucca, and short grasses, riparian zones are much more diverse, consisting of large species such as cottonwood and tamarisk. The Corrales bosque, where the northern edge of the Chihuahua desert meets the Great Basin, has the highest degree of biological diversity in the Rio Grande area and represents an outstanding example of Rio Grande cottonwood forest and its wildlife. One hundred and eighty-three bird species have been recorded in the Corrales bosque, including blue heron, bald eagle, redheaded woodpecker, hawk, falcon, dove, quail, and roadrunner. Resident mammals include the yellow-bellied cotton rat and the nocturnal desert shrew, which occupy the cattails and tall grasses along the river (Minge 1986).

The Rio Grande forest may include all of the major woody plants that were present in presettlement times. Palynological data indicate that the biotic structure of the Corrales area has not changed significantly in the last 2,000 years (Frisbie 1967 and this report). The two dominant indigenous trees are the Rio Grande cottonwood and the Goodings willow. Rare plant species include silverleaf buffaloberry, New Mexico olive, three-leaved sumac, and false indigo. Additional plant species observed in the project area include juniper, saltbush, snakeweed, grama grass, yucca, prickly pear, sand dropseed, desert three-awn, giant dropseed, and Russian thistle.

CULTURE HISTORY

To better evaluate the significance of the cultural resources at LA 58973, results of past archaeological research in the Corrales area are summarized below. For overviews of the culture history of the Middle Rio Grande drainage, the reader is referred to Stuart and Gauthier (1981) and Cordell (1979, 1984).

Archaeological data from the Middle Rio Grande Valley suggest a continuous occupation since Paleoindian times, approximately 12,000 years before present. Paleoindian materials have been recovered in association with extinct species *Bison antiquus*, mastodon, mammoth, and other characteristic Rancholabrian megafauna. While big-game hunting may have been a significant component of Paleoindian economy, gathering and foraging also contributed to subsistence. Paleoindian remains have been reported south of the project area by Judge (1973), Judge and Dawson (1973), Hibben (1941), and Roosa (1956).

The Archaic period (7000 B.C.-A.D. 400) refers to a broad-based, mixed hunting and gathering economy (Irwin-Williams 1973:4) culminating in an increased reliance on limited horticulture. Archaic sites in the Corrales-Bernalillo area have been reported by Grigg (1981), Campbell and Ellis (1952), Irwin-Williams (1967, 1973), and Frisbie (1967). Continuity in artifact assemblages between Archaic and Anasazi/Basketmaker sites has been researched in the Bernalillo-Corrales area by Reinhardt (1962, 1967) and includes the Rio Rancho phase, which he considered the local manifestation of Basketmaker II. This appears to be approximately contemporaneous with Irwin-Williams's (1973) En Medio phase. Radiocarbon samples from features investigated during the Rio Rancho project date to 962 $\pm$ 162 B.C. and 108 $\pm$ 206 B.C.

The Developmental sequence in the Albuquerque district is marked by a number of significant changes. These include settlement patterning, population growth, and the appearance of pottery. While it is true that the settlement pattern of this period is characterized primarily by small sites containing pit structures, early Pueblo materials may be more numerous than excavations have indicated (Cordell 1979:43). The Developmental period in the middle and northern Rio Grande dates to between A.D. 600 and 1200 and may be correlated with Late Basketmaker through middle Pueblo III in the Pecos classification. Structural sites dating to the Early Developmental (A.D. 600-900) are rare and tend to be associated with Lino Gray, Kana's Neckbanded, San Marcial Black-on-white, and various plain brown and red-slipped ceramics.

Settlement of the Rio Grande drainage is typically attributed to immigration of southern groups, based on the presence of Mogollon-style brown wares (Bullard 1962; Jenkins and Schroeder 1974). One site adjacent to Kuaua Pueblo (Coronado National Monument-Bernalillo), LA 4955, consists of pit structures more characteristic of

Mogollon architecture than other Basketmaker III pit structures in the vicinity. The two most obvious traits are ramp entries (post lined with adobe flooring) and numerous postholes and subfloor pits. The few associated ceramics consist almost entirely of brown wares (Wiseman 1976; Kayser, personal communication, October 1987). McNutt (1969:101) believes that pit structures were "introduced" into the Rio Grande area by groups from the Chaco-San Juan area, while Peckham (1957), Schorsch (1962), and Wetherington (1968) consider Albuquerque a "frontier" area between the Anasazi and the Mogollon. Although LA 4955 may represent an intrusion of southern groups into the area, indigenous groups may have already been present. At the Artificial Leg site (Frisbie 1967), brown wares form a small fraction of the overall ceramic assemblage. Local cognates of Mogollon ceramics are common (e.g., Corrales Red), as well as brown wares with local tempering materials (Marshall, personal communication 1987). Excavation unit houses can be located on low terraces and sandy hills west of the Rio Grande (Reinhardt 1967; Skinner 1965; Vivian and Clendenen 1965; Vytlacil and Brody 1958; Frisbie 1967; Sullivan and Lent 1987), on hilltops (Oakes 1977), or at the base of gravel terraces east of the Rio Grande floodplain (Lent 1991). Horticulture appears to have occurred along the tributary margins, and not in the major valley bottoms. Water, access to arable land, and elevated terrain may also be significant factors determining site location.

Additional sites containing Early Developmental components in the Middle Rio Grande area include those reported by Allan and McNutt (1955), Allan (1975), Allen (1970), Hammack et al. (1983), and Skinner (1965). The later portion of the Developmental period (ca. A.D. 1100-1200) is usually characterized by Kwahe's Black-on-white. This pottery type, viewed as the first indigenous black-on-white ceramic type, may be derived from Chacoan Black-on-white types (Gauthier et al. 1982).

During the Coalition period (A.D. 1200-1325), both the number and the size of sites tend to increase in the Rio Grande area. Concurrent with a spread into previously unoccupied areas, the Pajarito Plateau and the Chama Valley were first settled early in this period by Puebloan groups. This population increase has been attributed to internal population growth rather than immigration from the Chaco and Mesa Verde areas (Frisbie 1967; Wendorf and Reed 1955). At this time, carbon-painted Santa Fe Black-on-white pottery makes its appearance, superseding the previous mineral paint decorated pottery. In the Middle Rio Grande drainage, Coalition-period sites are known in the vicinity of Tijeras Canyon (Cordell 1975; Wiseman 1980) as small to medium surface pueblos with kivas. However, in some areas of Tijeras Canyon, pit structures were still in use (Wiseman 1980). During the later subperiod of the Coalition, several changes occur, notably the introduction of pottery types (e.g., Galisteo Black-on-white) that closely resemble wares from the San Juan River and Mesa Verde areas. Along with a local increase in population, many archaeologists have postulated wholesale migrations from these areas. Masonry pueblos became the dominant architectural forms in several areas, although adobe pueblos were still common. Large Coalition-period pueblos have been documented in the Corrales area by Bandelier (1882), Fisher (1931), Vivian (1932), Mera (1940), and Marshall and Walt (1985). Elyea (1985) excavated a portion of a large pueblo (LA 288, Pueblo de Corrales) along Highway 46. Fisher (1931) identified LA 288 with the pueblo of Analco, although that pueblo may actually be further north.

The Classic period, which postdates the abandonment of the San Juan Basin by sedentary agriculturalists, is characterized by Wendorf and Reed (1955:13) as a time when local populations may have achieved their greatest levels and large communities with multiple plaza and room block complexes were established. The beginning of the Classic period in the northern Rio Grande coincides with the appearance of locally manufactured red-slipped and glaze-decorated ceramics in the Santa Fe, Albuquerque, Galisteo, and Salinas districts after ca. A.D. 1315 (Mera 1935; Warren 1980). In the Santa Fe area, the Galisteo Basin saw the evolution of some of the Southwest's most spectacular ruins. Many of these large pueblos were tested and excavated by N. C. Nelson in the early part of the twentieth century (Nelson 1914, 1916). Most Classic-period sites were established between A.D. 1280 and 1320, but by the late 1400s, there was a substantial decline in population. Sites from this period are characterized by a bimodal distribution: very large accretional pueblos tend to be associated with small, agriculturally oriented fieldhouses. This contrasts with the preceding Coalition period, in which a greater range of site types characterized the settlement pattern.

In the Albuquerque district, both adobe and masonry were used in pueblo construction, although masonry appears largely restricted to areas east of the Sandia Mountains (Wendorf and Reed 1955). Above-ground, rectangular kivas at some of these sites, such as Kuaua (Dutton 1963) and Pottery Mound (Hibben 1955, 1975) and great kivas are reported. The aggregated communities in the Albuquerque district are not exclusively associated with low-elevation settings (Cordell 1979). Tijeras Pueblo (Cordell 1980) and other settlements in the canyon are associated with seeps and springs at varying elevations. Major Classic-period habitation loci in the Tijeras Canyon area, including Paa'ko (Lambert 1954) and San Antonio (Dart 1980), appear to have been unstable occupations through the mid-fourteenth century and were abandoned by A.D. 1425. Tonque Pueblo (LA 240), however, may have been occupied during Coronado's entrada, abandoned shortly thereafter, and briefly reoccupied during Glaze F times (Lent et al. 1986:40).

The historic occupation of the Rio Grande Valley began with the first Spanish entradas of the sixteenth century, in particular Coronado's expedition in 1540 and Juan de Oñate's colonizing expedition in 1598. A recently excavated site along NM 528 (LA 54147) may represent a Spanish expeditionary campsite (Vierra 1989).

The region in which the project area is located was referred to by the Spaniards as the Tiguex province, comprised of the 12-20 Southern Tiwa-speaking pueblos. Because of Coronado's depredations at the pueblos of Kuaua, Arenal, and Moho, the Tiwas abandoned the province, and their deserted pueblos were burned by the Spaniards, who finally left the area in 1542. In 1581-1582, the Rodríguez-Chamuscado expedition found the Tiguex province repopulated (Elyea 1985). Two more expeditions passed through the Tiguex province in 1582 (Espejo) and 1591 (Gaspar Castaño de Sosa).

The nearby pueblo of Sandia was identified by name and its present location in 1617 when it was established as a seat of the mission of San Francisco. Lesser missions were later established at nearby Alameda and Puaray pueblos. With the exception of Isleta, the Tiwa pueblos participated in the 1680 Pueblo Revolt. The beleaguered colonists and the wounded Governor Otermín sought refuge at Isleta Pueblo in September of 1680. During his retreat, and again during his unsuccessful attempt at reconquest in 1681-1682, Otermín burned numerous pueblos, including Sandia, Alameda, Puaray, Cochiti, and Isleta. However, the area was peaceful and partly repopulated during De Vargas's reconquest in 1592.

In 1704, Governor de Vargas led a campaign in the Sandia Mountains against the Apaches and, falling ill, was brought to Bernalillo, where he died on April 4, 1704. By 1710, numerous ranches had been settled up and down the banks of the Rio Grande in Corrales and Bernalillo. Bernalillo by this time was a parish with its own church, friary, and cemetery. Numerous Colonial sites have been reported in the Bernalillo, Corrales, and Placitas areas (Fisher 1931; Marshall and Walt 1885; Mera 1940; Bandelier 1882; Marshall 1982; Ferg 1984). Families continued to move from the west side of the Rio Grande to the east side of the river, north of Sandia Pueblo, in the early nineteenth century.

With the signing of the treaty of Cordova on August 24, 1821, Mexico secured its independence from Spain, and New Mexico became part of the Mexican nation. However, the Mexican period was to last only until August 19, 1846, when General Stephen Kearny raised the American flag at Santa Fe, and New Mexico became a United States territory. Sandoval County was first created as part of Bernalillo County by the New Mexico Territorial Legislature on January 9, 1852. Local residents prospered, and the area became known for its extensive gardens and cultigens, especially grapes (Chávez 1957). The railroad linking Bernalillo to Las Vegas in 1880 brought an influx of people to the area. In the fall of 1929, a major flood destroyed many of the smaller settlements along this portion of the Middle Rio Grande, including the plaza at Bernalillo. Although ranching, farming, and fruit growing are still very evident, the expansion of the Albuquerque metropolitan area is rapidly absorbing large tracts of the West Mesa.

EXCAVATION METHODS

At the start of the project, the site perimeters were defined, and areas of potential subsurface remains were identified. To determine the relation of the site to the existing State of New Mexico Highway and Transportation Department right-of-way, the boundaries were measured with a metric tape. These measurements ensured that MNM activities did not encroach on private lands controlled by AMREP Corporation. The portion of the site on private land was left undisturbed except for limited augering activities.

Horizontal and vertical controls were maintained with reference to a main datum established at an arbitrary 10-m height near the center of the site. All elevations were recorded as meters below datum (mbd). Subdatums B and C were also created when the site was expanded during the data recovery phase. Fifteen excavation units were excavated within the right-of-way to test the extent of subsurface deposition, spatial integrity, and areal distribution. Areas designated for excavation were stratified to reflect observed surface features. The placement of the excavation units was subjective, rather than random, because the purpose of the program was to define specific features rather than to document settlement over a broad area. Consequently, excavation units were placed in areas of artifact concentrations and charcoal stains to maximize recovery potential.

Seven excavation units were excavated in a large area of charcoal staining that had been graded during road construction. These units were excavated to determine if a subsurface feature were present. The remaining excavation units were placed in two areas where light artifact concentrations were observed. The dimensions of the recovery units were 1 by 1 m, and all fill was screened through 1/4-inch wire mesh. Excavation of the excavation units began by stripping off the loose eolian surface overburden and then proceeded in 10-cm arbitrary levels. Cultural strata were excavated in depositional layers. In addition, four auger holes were placed in an area containing a suspected pit structure. Auger holes were typically excavated to a maximum depth of 1.5 m below the ground surface.

All collected artifacts and samples were bagged individually. These materials were cleaned, cataloged, and analyzed at the Office of Archaeological Studies, Museum of New Mexico, and curated at the Museum of New Mexico's archaeological repository. Field notes, maps, profiles, and plan views were used to document relevant cultural information. All documents and photographs are on file at the Museum of New Mexico in Santa Fe. A technical report documenting the results of the testing phase at LA 58973 is available for reference (Lent 1987).

EXCAVATION RESULTS

Excavation Units

Excavation Unit 1

Excavation Unit 1 was in an area of dense charcoal concentration where several artifacts were exposed on the surface. It consisted of a 1-by-1-m square oriented to magnetic north. Levels were established in relation to the ground elevation of the northeast corner, 10.15 mbd. Surface artifacts were collected, and the unit was surface stripped. The surface consisted of the first 2-3 cm of eolian sand with fire-cracked rock and associated artifacts. A summary of the stratigraphy exposed at this feature is presented below.

Level 1 (10.16-10.26 mbd) contained scattered cobbles with localized areas of heavy burning, primarily on the northeast quarter of the grid. The artifact density decreased towards the base of the level. To evaluate the stratigraphic sequence of the deposition in the vicinity of the feature, the strata on the west half of Excavation Unit 1 were exposed. The staining noted earlier in the east half of the unit ended at 10.33 mbd. Several lithic artifacts in association with fire-cracked rock were recovered from this stratum. Level 3 (10.33-10.40 mbd) consisted of a sterile horizontally bedded substratum, probably representing the original surface prior to heavy equipment grading. In Level 4 (10.40-10.49 mbd), Stratum 100 was defined. It consisted of a dark, mottled charcoal-stained lens, redeposited feature fill from Feature 1. The lens, which extended approximately halfway down the exposed profile (ca. 10.35 mbd), was intersected by a large rodent burrow and underlain by a thin stratum of gravel. During testing, work on Excavation Unit 1 ceased at the base of Level 4. During the data recovery phase, Excavation Unit 1 was reexcavated, and Stratum 100 was exposed. This stratum was excavated for subsurface deposition, and all artifacts and samples were provenienced and collected. Sterile soil (Stratum 105) was directly underneath Stratum 100.

Excavation Unit 2

Excavation Unit 2 was excavated in three stratigraphic units: surface, Stratum 102, and Stratum 105. The surface stratum was partially removed by road grading operations. The remaining stratigraphy consisted of eolian and colluvial deposits containing ground-stone artifacts, lithic artifacts, and fire-cracked rock. Level 1, defined as Stratum 102, consisted of feature fill associated with Feature 1. It was excavated as a single unit approximately 14 cm thick, ending at 10.37 mbd. Two flakes were recovered from the feature fill. During data recovery, Excavation Unit 2 was reexcavated, and Stratum 102 was exposed. Excavation of Unit 2 was halted when sterile soil (Stratum 105) was encountered.

Excavation Unit 3

The surface stratum of Excavation Unit 3, partially removed during road grading operations, contained a significant amount of colluvial overburden eroding from the dune feature to the east. The stratum, 4 to 5 cm thick, was confined to the east half of the grid. There were no artifacts recovered from this level. The ash stains present in test Excavation Units 1 and 2 (contiguous to the south with Excavation Unit 3) were better defined within this unit.

Whereas redeposited fill from Feature 1 was present within Excavation Units 1 and 2 as a series of mottled, discontinuous charcoal lenses, the perimeter of a well-defined hearth or roasting pit was exposed within Excavation Unit 1 (Figs. 3-4). Feature 1 and portions of Features 2 and 3 were excavated within Excavation Unit 3 (see description, Features 1, 2, and 3, below). Excavation Unit 3 was tested for subsurface deposition. Sterile strata were exposed at 10.75 mbd.

Excavation Unit 4

During the previous testing phase, Excavation Unit 4 ended at 10.02 mbd when a stratum of fire-cracked rock associated with Feature 1 was exposed. Several lithic artifacts were recovered from this stratum, in addition to large quantities of ground stone.

During the data recovery phase, a portion of Feature 1 was exposed along the north edge of Excavation Unit 4. Approximately three-quarters of this grid consisted of fire-cracked rock and associated artifacts (Stratum 100). This was underlain by the sterile substratum, Stratum 105.

Excavation Unit 5

During the previous testing phase, Excavation Unit 5 was excavated to a depth of 10.04 mbd. It consisted of eolian sand overlying a more highly compacted substratum. The excavation of Level 1 (10.02-10.21 mbd) exposed a heavily burned circular area along the southern portion of this unit, which appeared to match a stain in the adjacent Excavation Unit 3. A core and a fire-cracked rock were associated with the top of this feature.

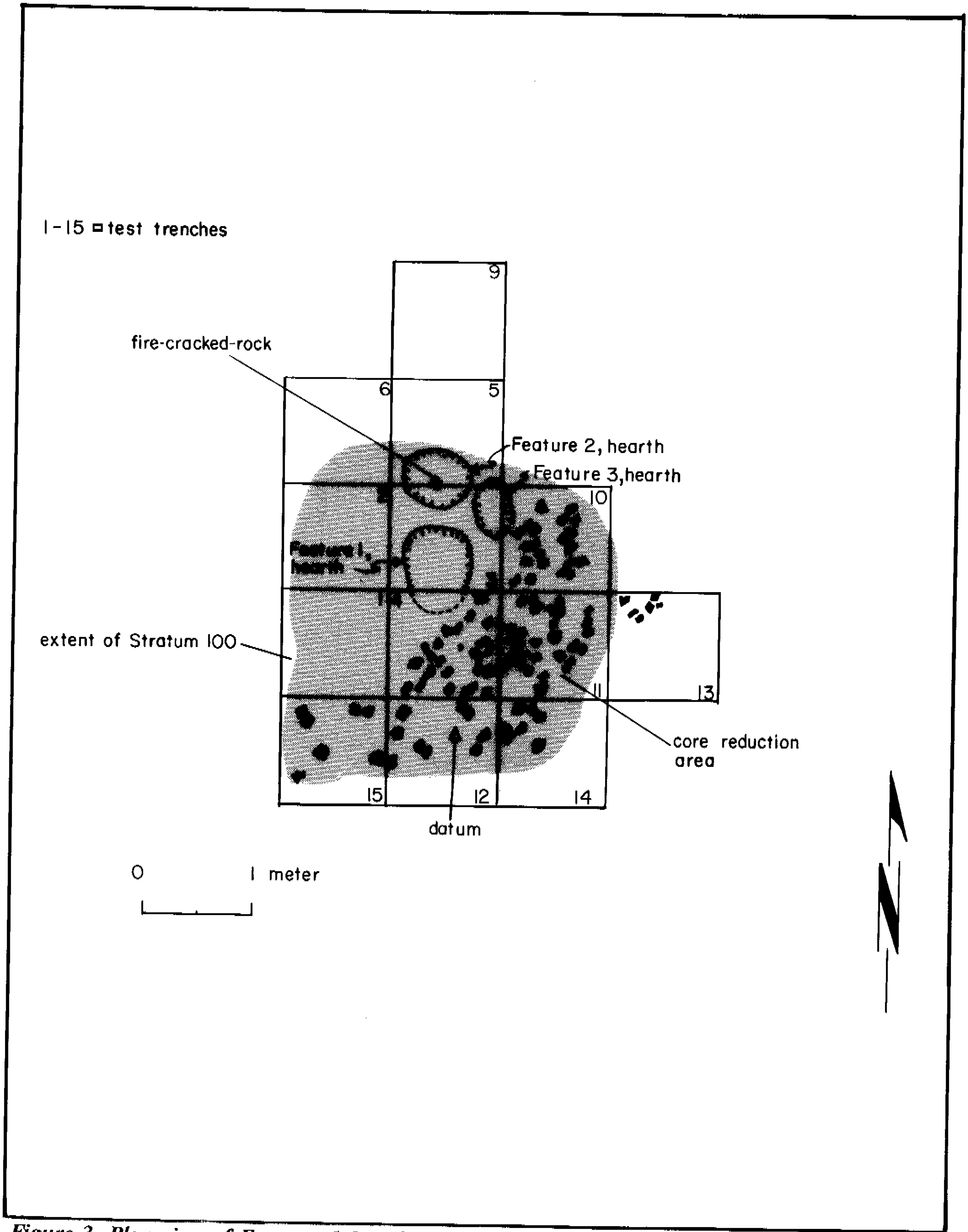

Figure 3. Plan view of Features 1-3 and Stratum 100.

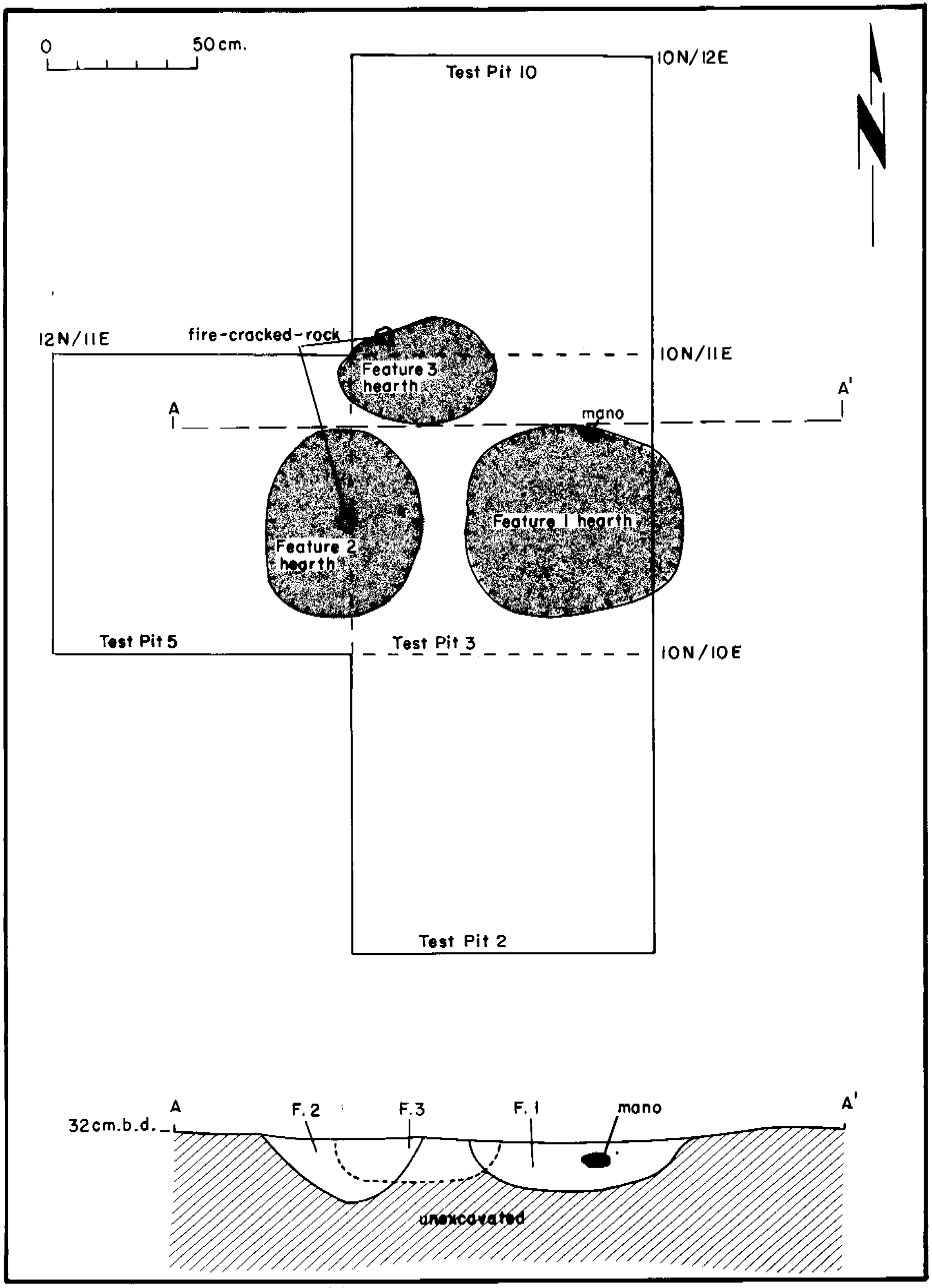

Figure 4. Plan view and profile, Features 1-3.

When excavated during the data recovery program, the feature consisted of a basin-shaped hearth along the southern boundary of Excavation Unit 5, extending into Excavation Unit 3 (see feature description, Feature 2, below). The northernmost edge of Feature 3 (see feature description, Feature 3, below) is also in the southeastern corner of the test excavation unit. Sterile soil (Stratum 105) was found beneath Features 2 and 3 and Stratum 100.

Excavation Unit 6

Excavation Unit 6 was excavated in two stratigraphic levels, surface and Level 1. The excavation of the surface stratum (10.27-10.28 mbd) exposed a charcoal stain in the southwest quarter of the unit, about 9 cm higher than similar stains in adjacent Test Excavation Units 2 and 4. The stain was excavated with Level 1 (10.28-10.35 mbd). Several pieces of associated fire-cracked rock were encountered. It was concluded that the stain may have represented redeposited ash and charcoal from Feature 1. No artifacts were recovered from this unit. Excavation ended when Stratum 105 was encountered.

Excavation Unit 7

Excavation Unit 7 was excavated to the west of Feature 1 to test an area of light staining and artifact concentration. Two mano fragments were recovered from the surface stratum (12.29-12.31 mbd). Level 1, at 12.28-12.35 mbd, consisted of a moist red-tan sandy loam containing no cultural material. This stratum occupied the east and west portions of the unit, while in the center (at approximately 12.28 mbd) a gravel stratum was exposed. This stratum resembles Level 2 in Excavation Unit 1, Feature 1. Below the gravel lens, at 12.35-12.40 mbd (Level 3), a stratum of moist red clay with gray clay inclusions was present. It contained no cultural material. Level 4 consisted of sterile tan sand with occasional calcium carbonated inclusions.

Excavation Unit 8

Excavation Unit 8 was excavated to investigate an artifact concentration southwest of Feature 1. The stratigraphy in Excavation Unit 8 was identical to that of Excavation Unit 7. This unit was excavated to a depth of 10.22 mbd. Two pieces of fire-cracked rock were recovered. The test excavation unit ended when Level 4 (10.22 mbd) was encountered.

Excavation Unit 9

Excavation Unit 9 was the northernmost test excavation unit excavated. Some ashy soil (similar to Stratum 100) was present between 10.14-10.16 mbd, located along the south side of grid. No artifacts were recovered from this unit, and work ceased at 10.28 mbd.

Excavation Unit 10

The surface of Excavation Unit 10 consisted of tan, sandy soil from the dune to the east. Some ash mottling of undetermined origin was encountered between 9.89 and 10.09 mbd; this mottling appeared to trend in a SE-NW direction. The eastern edge of Feature 3, a basin-shaped hearth, was located in the northeastern corner of the grid at 10.15 mbd (see feature description, Feature 3, below). Stratum 104 consisted of redeposited fill from Feature 3, which covers most of this unit at 10.09-10.19 mbd. Ground stone and lithic artifacts were recovered from this stratum. Ash was confined to the west half of the unit, extending west of the scatter of cobbles and fire-cracked rock. Sterile soil was encountered at 10.50 mbd.

Excavation Unit 11

The surface level of Excavation Unit 11 was identical to that of Excavation Unit 10. Fire-cracked rock and dense ash redeposited from Feature 1 (Stratum 100) occurred between 9.86 and 10.10 mbd. All but the southeast corner of the unit was covered by this stratum, which trended from the southwest to the northeast, like the adjacent Test Excavation Units 4 and 10. Several items of ground stone were present, although no lithic artifacts were recovered. Mottling occurred underneath Stratum 100 in decreasing frequency. Stratum 105 was reached at 10.25 mbd.

Excavation Unit 12

The surface of Excavation Unit 12 was similar to those of Excavation Units 11 and 12. Fifteen to twenty centimeters of Stratum 100 was encountered between 9.95 and 10.33 mbd. Two fire-cracked manos and a flake were recovered from this level. A localized pocket of ash, probably a rodent burrow, was located in the northwest corner. Mottling continued down to the base of Level 2, with gravels in the northeast corner. No cultural material was recovered from this level. Excavations were continued in the northwest corner only. Some staining, probably rodent transported, was present at Level 3, with sterile gravel inclusions. Sterile soil was encountered at 10.60-10.66 mbd.

Excavation Unit 13

The surface of Excavation Unit 13 was covered with backdirt from road-grading operations. The dirt from this level was not screened. Level 1 consisted of laminated layers of sand becoming increasingly moist and compact towards the base of the level (at 10.13 mbd). The top of Stratum 100 was exposed in the northwest corner of Level 2. The remainder of the level consisted of light colored sand. Several lithic artifacts and fire-cracked rocks were recovered from the vicinity of Stratum 100. Sterile soil (Stratum 105) was encountered at 10.25 mbd.

Excavation Unit 14

The surface of Excavation Unit 14 consisted of tan, sandy soil with gravel and artifact inclusions. Stratum 100 was encountered between 9.68 and 10.15 mbd (northeast corner) with lithic artifacts in association. The northern one-third of the grid was composed of Stratum 100, which decreased towards the base of the level. Sterile soil was encountered at 10.25 mbd.

Excavation Unit 15

The surface of level of Excavation Unit 15 was tan colored eolian soil. Some ash was evident in the corner of the grid at 10.19 mbd. Level 1 contained dense ash and fire-cracked rock in random orientation in association with cultural material (Stratum 100). The mottling gradually decreased throughout the level, until Stratum 105 was exposed at 10.25 mbd.

Auger Tests

Four auger holes were excavated in an area suspected of containing a pit structure. However, the possible structure depression is located outside of the NMSHTD right-of-way on private land controlled by AMREP Corporation, and only limited augering was possible. Auger holes were placed in areas most likely to yield deposition. These were excavated to a maximum depth of 1.5 m below the ground surface. The fill encountered during augering consisted of loose, sandy fill becoming increasingly compact towards the base of the test. Auger Hole 2 yielded charcoal specks at a depth of approximately 1.20 m, suggesting the presence of subsurface cultural stratigraphy within the tested area. No augering was performed during data recovery.

Stratigraphy

LA 58973 was excavated in arbitrary and depositional layers. Arbitrary levels were excavated until subsurface cultural deposition was encountered, at which point excavations proceeded according to depositional strata. The stratigraphic sequence of LA 58973 was primarily defined within Excavation Units 3, 4, and 5, and within Features 1-3.

Surface

Grading activities have significantly altered the original ground surface of LA 58973. The present surface stratum consists of an eroded, graded cutbank with exposed charcoal stains and associated artifacts. Post-occupational eolian and colluvial factors have deposited a thin mantle of unconsolidated sand. This stratum overlay more compacted sandy clay substratum. The surface stratum was approximately 1-3 cm thick.

Level 1

Occurring throughout the excavation, this arbitrary level was typically 7-10 cm thick and ended at approximately 10.20 mbd, except in the west half of Excavation Unit 3, where it extended to 10.37 mbd. It consisted of a convoluted layer containing a mix of artifactually sterile post-occupational deposition and cultural strata. The sterile inclusions were composed of reddish-tan sandy clay. The cultural strata within Level 1 included localized areas of dark, mottled charcoal staining that probably represented redeposited charcoal and ash from Features 1-3, as well as the tops of Features 1-3. Cultural strata associated with these features occurred towards the base of the level, as well as fire-cracked rock and ash-stained soils.

Level 2

Level 2 consisted of a sterile reddish clay with gray clay inclusions. The level contains very few artifacts and is present in association with and slightly below the gravel stratum described below, and below Stratum 100 in Excavation Unit 12. Level 2 occurs at between 10.20 and 10.50 mbd in Excavation Units 1, 7, 10, and 12.

Level 3

Level 3 occurs below cultural strata in Excavation Units 1, 2, 7, 8, and 12. It consisted of a horizontal gravel bed approximately 5-10 cm thick. It was artifactually sterile and may have represented a natural stratum associated with the original paleosol. This stratum occurred at 10.40 mbd within Test Excavation Units 1 and 2, at 12.28 mbd within Excavation Unit 7, between 10.12 and 10.22 mbd in Excavation Unit 8, and at 10.48 mbd in Excavation Unit 12.

Level 4 (Stratum 105)

Level 4, equivalent to Stratum 105, defined as sterile, marked the end of excavation when encountered. It was originally defined in Excavation Unit 1 at 10.50 mbd (northwest corner) and consisted of a compacted tan sandy/clayey loam with occasional calcium carbonate inclusions.

Stratum 100

Stratum 100 was defined as redeposited feature fill from Features 1, 2, and 3. These stains occurred within Level 1 east, south, and west of the features. The discontinuous areas of charcoal, fire-cracked rock, and associated artifacts appeared to represent secondary deposits, perhaps discard piles or eroded ash lenses. Stratum 100, which is horizontally bedded and approximately 10 cm thick, probably coincides with the original occupation surface. The stratum was documented within the site at 10.15-10.25 mbd. Corn pollen was present in this stratum (see Dean 1987, Appendix 2, this report) in Excavation Unit 2, at 10.4N/9.24E, 10.17 mbd (Sample 92).

Stratum 102

Stratum 102 was defined as fill from Feature 1, consisting of dense ash, charcoal inclusions, and associated lithic artifacts. It was located at an elevation of 10.27-10.44 mbd. A mano was recovered, imbedded in the east wall. A single radiocarbon sample was present in the fill at an elevation of 10.30 mbd. A calibrated C-14 date (Beta 23887) of 1047-790 B.C. was obtained (Appendix 3). Macrobotanical samples recovered from the fill indicated the presence of carbonized juniper and antelopebrush (Appendix 4).

Stratum 103

Stratum 103 was defined as the fill from Feature 2. The contents of this basin-shaped hearth consisted of a charcoal-stained, mottled matrix with occasional inclusions of charcoal occurring between 10.25 and 10.48 mbd. A large core-flake was recovered from the base of the fill. There were fewer chunks of charcoal and a smaller volume of feature fill in Feature 2 than in Feature 1. A pollen sample obtained from the fill at 10.32-10.35 mbd (Sample 52) contained a poorly preserved specimen of corn pollen (Appendix 2). No identifiable macrobotanical remains were present (Appendix 4).

Stratum 104

Stratum 104 was feature fill from Feature 3, at 10.25-10.40 mbd (adjusted for Datum C). The matrix consisted of mottled, charcoal-stained hearth fill with miniscule amounts of charcoal and occasional fire-cracked rock inclusions. Four flakes were recovered from the fill. Portions of Stratum 100 on the east side of the site may have originated from Feature 3. The scatter of fire-cracked rock located in Excavation Unit 10 appeared to have been redeposited from this feature. No palynological remains were recovered. A single carbonized juniper seed was detected in the macrobotanical sample (Appendix 4).

Features

Feature 1

Feature 1 consisted of an oval, basin-shaped simple hearth measuring 0.64 m N-S by 0.60 m E-W. It was 11 cm deep and occurred at an elevation of 10.27-10.44 mbd. Two other similar features, Features 2 and 3, were associated. Stratum 100 represented a de facto occupation surface containing redeposited fill from Feature 1 (with deposits from Features 2 and 3 mixed in). The fill from Feature 1, Stratum 102, is described in the section on stratigraphy. Feature 1 was probably excavated into sterile soil by the occupants of the site and, despite substantial quantities of burned fill, was not oxidized. A burned mano appeared to be in situ along the east wall. Substantial quantities of fire-cracked rock indicate roasting or stone-boiling. A calibrated radiocarbon date of 1047-790 B.C. (Beta 23887) was obtained from this hearth (Appendix 3).

Feature 2

Feature 2, the smallest of the three features, consisted of an oval, basin-shaped hearth 0.14 m north of Feature 1. It was approximately 15 cm deep and extended vertically from 10.25 to 10.48 mbd. The dimensions were 0.63 m N-S by 0.58 m E-W. It is likely that at least a portion of Stratum 100 north and east of the feature was the result of "cleaning out" the hearth. The hearth fill (Stratum 103) appeared nearly identical to that of the other two features, although it contained less charcoal. Intrusive corn pollen was present in a sample taken from this hearth (Appendix 2).

Feature 3

Feature 3 was 12 cm northeast of Feature 1 and 8 cm southeast of Feature 2. It consisted of an oval, basin-shaped hearth measuring 0.55 m N-S by 0.39 m E-W, 15 cm deep, at 10.25-10.40 mbd. The hearth fill and structural characteristics were identical to those of Features 1 and 2. No diagnostic materials, pollen, or botanical remains were present in the samples.

Summary

Features 1, 2, and 3, a series of basin-shaped hearths, appeared to represent the remains of a specialized activity area, part of a larger site outside the right-of-way. Stratigraphic data suggest that Features 1-3 were contemporaneous. Deposits to the east and southeast are probably the result of redeposited fill from these features.

Radiocarbon dates suggest that the features date to 1047-790 B.C. (Beta 23887) (Appendix 3), an unlikely age for the type of features present at this site. The C-14 date is probably the result of "old wood" being introduced onto the site as firewood. The interested reader is referred to Ahlstrom (1985) and Blinman (1990) for discussions and critiques of absolute dating methods.

Although traces of corn pollen were present in the secondary deposition and Feature 2, the macrobotanical materials do not confirm agricultural activities in direct association with the features of the activity area. Thermal features are not favorable to the preservation of corn pollen (Dean in Lent 1991, Appendix 2). However, given the short range of wind-transported corn pollen (approximately 10 feet from the parent plant), *Zea* may have been present in the immediate vicinity or occurred intrusively on the site. Alternatively, corn may have been introduced onto the site by the site occupants themselves. The radiocarbon date is unusually early for the presence of pit structures or cultigens in this area. However, the date is almost certainly not accurate. The site is located within arable land along a floodplain, and the excavated features strongly resemble roasting pits, which may be used to process corn. Although corn pollen was not directly associated with a specific feature, these factors suggest that maize may have been present in the vicinity of the site.

LITHIC ARTIFACTS

Methods

A total of 139 lithic artifacts were recovered for analysis from LA 58973 (Table 1). Included in this analysis are materials from the testing phase (Lent 1987). Debitage, tools, and ground stone artifacts were coded on Fortran sheets. The edges of debitage were examined under an 80-power binocular microscope for possible wear patterning.

Debitage

Variables monitored on individual artifacts during the analysis of the lithic artifact assemblage included material type, artifact type, percentage of dorsal cortex, portion, flake dimension, presence of retouch, presence of utilization, platform type, texture, recycling, and heat treatment.

Biface flakes were defined using a polythetic set (Dunnel 1971) developed primarily through experimental observations (Acklen and Doleman, personal communication, 1982). The following outline lists the variables monitored for flakes with platforms present and those on which the platforms were collapsed or missing. Flakes meeting 70 percent or more of the criteria listed were considered to represent some later stage (also referred to as tertiary) of lithic reduction: biface thinning, tool manufacture, or retouch.

Flakes with Platforms

1. Platform type is:
    a. Multifacet
    b. Prepared (retouched and/or abraded)
2. Platform is lipped
3. Platform angle is less than 45 degrees
4. Dorsal scar orientation is:
    a. Parallel
    b. Multidirectional
    c. Bidirectional
5. Dorsal topography is regular
6. Edge outline is even
7. Flake is less than 5 mm thick
8. Flake has a relatively even thickness from proximal to distal end

9. Bulb of percussion is weak
10. There is a pronounced ventral curvature

Flakes with Collapsed or Missing Platforms

1. Dorsal scar orientation:
    a. Parallel
    b. Multidirectional
    c. Bidirectional
2. Dorsal topography is regular
3. Edge outline is relatively even
4. Flake is less than 5 mm thick
5. Flake has a relatively even thickness from proximal to distal end
6. Bulb of percussion is weak
7. There is pronounced dorsal curvature

Because the lithic artifact data set was comparatively small, only basic statistical methods (such as cross-tabulations, ratios, percentages, and chi-square) were used. A tertiary index and a core reduction (manufacturing) index (Chapman 1982) were calculated. In the core reduction index, tertiary flakes are not included. The tertiary index is derived by dividing the frequency of biface flakes by the sum of core flakes and angular debris. The core reduction index is computed by using the formula

$$\frac{F\text{-}AD}{C}$$

where F represents the percentage of unutilized core flakes, AD the percentage of unutilized angular debris, and C the percentage of unutilized cores. Tertiary flakes are excluded from this equation. This process is similar to the manufacturing index as defined by Chapman (1982) and tested by Acklen et al. (1983), but it may monitor the type of core reduction more accurately.

Material Selection and Reduction Strategies

Material Types: Frequencies

The dominant material type of the lithic debitage at LA 58973 is chalcedony (64.0 percent), followed by chert (23.0 percent) and quartzite (9.0 percent) (Table 1). Small amounts of quartzitic sandstone, petrified wood, and basalt are also present in the assemblage. The primary lithic source appears to be the gravels of the Santa Fe formation, which are common near LA 58973. Only the petrified wood may have been derived from an extralocal source. The majority of the tools (including ground stone) at the site were manufactured from quartzite (61.5 percent). The remainder are composed of granite (15.3 percent) and igneous unknown (10.25 percent). The quartzite apparently derives from river cobbles located nearby in the Rio Grande drainage, and the cherts and chalcedonies were procured from the local gravel terraces of the Santa Fe formation. Granite sources have been documented throughout the Sandia Mountains (Kelley 1977:50) but are less frequent on the west side of the river.

Table 1. Lithic artifacts, LA 58973 (combined testing and data recovery)

Material type	*Chalcedony*	*Chert*	*Quartzitic Sandstone*	*Petrified Wood*	*Basalt*	*Quartzite*	*Igneous Unknown*	*Granite*	*Obsidian*
Debitage									
Flakes > 50% cortex	22	9				4			
Flakes < 50% cortex	34	12	1	1	2	3			
Angular debris	7	2				2			
Blade	1								
Tools									
Chopper		1				2			
Biface/ notched tool		1							
Side-scraper						1			
Uniface						1			
Ground stone									
Undifferentiated						2	2	5	
Mano						13			
Metate fragment							1		
Pestle						1			
Cores									
Core (multi-directional)		1				1			1
Tested material		1							

APPENDIX 1: SITE LOCATION MAP

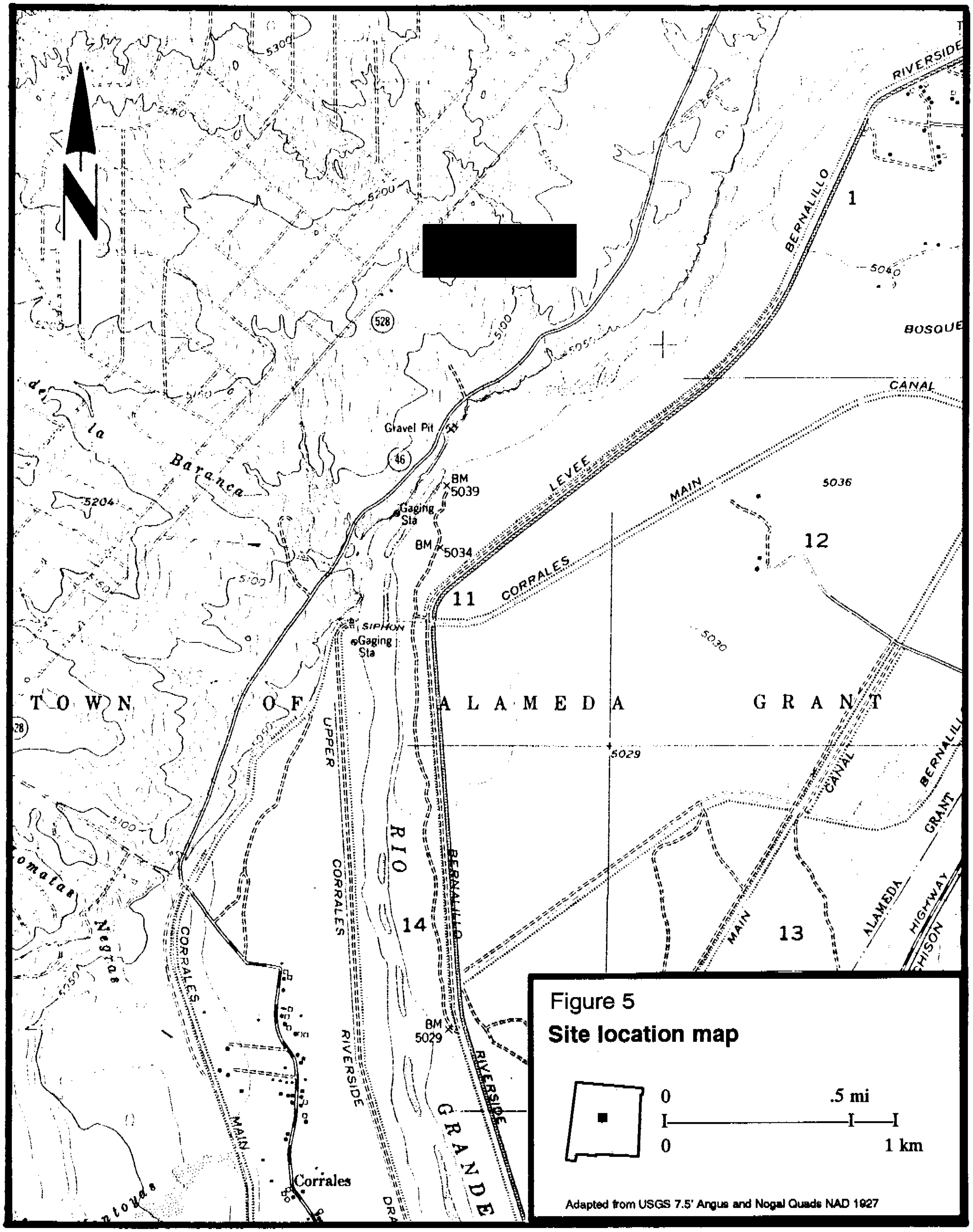

Figure 5

Site location map

Adapted from USGS 7.5' Angus and Nogal Quads NAD 1927

Reduction Strategies

Within the sample of debitage collected during testing of LA 58973, the flake to angular debris ratio was 7.14:1, while the cortical to noncortical debitage ratio was 0.35:1. The results of the analysis from the data recovery phase showed a flake to angular debris ratio of 7.69:1 and a cortical to noncortical debitage ratio of 2:1. Eleven-percent utilization was noted on debitage, 88 percent of which was chalcedony. Five percent of the assemblage was retouched, primarily on chalcedony flakes. Heat treatment was noted on a significant portion of the lithic artifacts, although it was not determined at what stage thermal alteration occurred or whether it was unintentional. A concentration of flakes was recovered from Excavation Units 12 and 15 (9N/11E and 9N/12E) in association with Stratum 100. This area appears to represent a locus of primary reduction.

Apart from a single blade, reduction strategies at LA 58973 appear to reflect expedient core reduction, with no tool manufacture or curation indicated. Flakes were occasionally used as informal tools, possibly during processing activities.

Tool Description

Combined tool assemblages from LA 58973 yielded 30 items of ground stone, 3 choppers, 1 side scraper, 1 biface/notched tool, 1 uniface, 3 multidirectional cores, and 1 item of tested material. The dominant material type for the tool assemblage was quartzite (62.5 percent), followed by granite (15 percent) and igneous unknown (10 percent).

Ground stone accounts for 75 percent of the combined tool category. Of these, there are 22 fragmentary manos, 6 undifferentiated ground stone, 1 fragmentary slab metate, and 1 pestle. Seventy-two percent of the manos are quartzite, 13.6 percent are igneous unknown, and 13.6 percent are granite. Diagnostic manos consist of the river-cobble, one-hand variety, ground on a single surface. All were substantially oxidized or fire cracked.

Six undifferentiated items of ground stone were also collected. The grinding on these artifacts was barely perceptible, since they were significantly fire altered and highly eroded. One item may have represented a pendant blank. Again, quartzite was the dominant material type. A single highly eroded granite slab metate fragment was present, as was a quartzite pestle. This tool may have been used to grind seeds or pigment.

Quartzite river cobbles were used exclusively as the raw material for the three choppers present in the collection. These artifacts were bifacially reduced at one end with and displayed a high degree of battering along their margins. These cobble tools do not appear to have been hafted, and they may have functioned as a hand axes, possibly for wood chopping or some processing task.

A bifacial tool (58 by 42 by 11 mm, pink chert) collected during the test excavations appears to be unfinished and may have been broken in manufacture. Bidirectional wear on the interior of a notch on one edge suggests that it served as a multipurpose/compound tool, perhaps a spokeshave.

A mottled chert core (66 by 40 by 22 mm) recovered from Excavation Unit 5 was bidirectionally reduced. Two additional multidirectional cores were recovered during excavation, one of local chert and the other of 1230 chalcedony (Warren 1979). Monitored platforms characterized these artifacts. A clear chalcedony cobble with a single flake scar removal suggests limited quarrying of local materials. A large uniface (130 by 90 by 10 mm, gray quartzite) collected from the surface of Excavation Unit 1 consists of a major decortification flake with unifacial retouch along its edges, giving it a discoidal appearance.

Summary

Analysis of the lithic artifacts recovered from testing and data recovery phases at LA 58973 indicate the results of localized activities. Reduction strategies suggest the expedient reduction of locally available materials with no indication of biface manufacture or curation. Primary core reduction is particularly apparent southeast of Feature 1. Significant quantities of ground stone in association with a hearth or roasting excavation unit indicate processing of cultigens or wild plant foods for consumption of storage. Limited maintenance activities are also suggested by the tools recovered at the site.

SUMMARY AND CONCLUSIONS

Current data suggest that the settlement of the Rio Grande may have occurred as an in situ development of indigenous groups rather than as the result of immigration from the south or the Four Corners area. The Corrales area may present a continuous record of occupation from Paleoindian times (ca. 12,000 B.P.) through protohistoric and historic times. The oral tradition of Sandia and Isleta pueblos asserts that pit structure villages along the first benches of the east and west banks of the Rio Grande represent ancestral southern Tiwa communities.

Because a component of LA 58973 is located within land controlled by AMREP Corporation, the Office of Archaeological Studies could not investigate the suspected pit structure. However, the portion of the site that falls within the NMSHTD right-of-way contains a series of features and associated activity areas that provide information on Late Archaic/Early Developmental settlement and subsistence within the project area.

Palynological data from the nearby Artificial Leg sites and this report (Appendix 2) suggest that the biotic nature of the Rio Grande floodplain has not changed significantly in the last 2,000 years (Frisbie 1967). Incipient horticultural of limited agricultural sites may provide significant information on the shift to agriculture, a subject that has occupied a central place in anthropological inquiry for decades. Because of the rapid growth of the Albuquerque metropolitan area, sites dating to this period are poorly represented in the archaeological record.

Ephemeral charcoal stains and several isolated artifacts were noted north of LA 58973 during a survey of AMREP lands by Rio Grande Consultants. These occurrences were brought to the attention of the NMSHTD and investigated. These manifestations were determined to be surficial.

Final results from the archaeological excavations at LA 58973 indicate the presence of three contiguous basin-shaped unlined hearth features and an associated ground stone and fire-cracked rock scatter. No diagnostic artifacts, pottery, or faunal remains were recovered. Limited maintenance activities were also suggested by the tools recovered at the site. The presence of significant quantities of ground stone in association with the thermal features suggests wild or domestic plant processing. No usable information was provided by the single radiocarbon date obtained from a hearth feature. Macrobotanical remains yielded carbonized seeds of juniper and antelopebrush, which were probably not used for subsistence. Corn pollen was recovered within a cultural context, suggesting that maize was present near or at the site at the time of its occupation.

Although the association of this site with the nearby pit structure is ambiguous, LA 58973 appears to represent a component of a larger residential site located east of the current NMSHTD right-of-way.

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APPENDIX 2: POLLEN ANALYSIS OF SIX SAMPLES FROM LA 58973, THE STAIN SITE, NEAR CORRALES, SANDOVAL COUNTY, NEW MEXICO

POLLEN ANALYSIS OF SIX SAMPLES FROM LA 58973, THE STAIN SITE, NEAR CORRALES, SANDOVAL COUNTY, NEW MEXICO

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INTRODUCTION

Test excavations were conducted at archeological site LA58973, the Stain Site, by the Research Section of the Laboratory of Anthropology, Museum of New Mexico. The site is located in the right-of-way of State Highway 528 just west of the Rio Grande and northeast of the village of Corrales, Sandoval County, New Mexico. Under the general direction of archeologist Stephen C. Lent, ash stains exposed by highway roadgrading activities were investigated in March of 1987. The tests revealed the presence of other subsurface features. These were investigated by further excavations in June and July of 1987 during mitigation of larger areas of the site. Three hearths, located in an area of scattered ground stone and burned rock, were subsequently examined in detail and sampled for pollen and other analyses. A probable pithouse located nearby on private property, and outside the area of impact, was not investigated. Although no diagnostic artifacts or ceramics were recovered from the excavations, the site is thought by the archeologists to date between Basketmaker II and Pueblo I times. (Lent 1987 and personal communication 1987). I did not visit the site during the excavations.

Proveniences of the pollen samples submitted to the Castetter Laboratory for Ethnobotanical Studies (CLES) for analysis are given in Table 1. Due to an oversight in the field, two subsamples from hearth Feature 1 were given the same sample number (44), and were placed in the same paper bag without any other distinguishing qualifications having been written on the plastic pollen sacks. Although one had been taken from beneath a mano found in the hearthfill, that sample could not be distinguished from the other sample from general hearthfill. The two pollen sacks were arbitrarily labeled "a" and "b" by CLES to facilitate discussion of the pollen results, but the exact provenience of either sample cannot be ascertained.

The results of the pollen analysis will be presented individually by feature, following a discussion of laboratory techniques and other pertinent considerations.

Laboratory Techniques

Chemical extractions of the samples were performed by CLES personnel using a procedure designed for arid Southwest sediments. This process involves chemical dissolution of carbonates and silicates, chemical acetolysis of organics and cellulose, and mechanical removal of fine

TABLE 1: PROVENIENCES OF SIX POLLEN SAMPLES ANALYZED FROM THE STAIN SITE, LA58973

CLES NO.	LA NO.	PROVENIENCE
87280	58	Fill of Feature 3, hearth
87281	92	Redeposited feature fill
87282	52	Fill of Feature 2, hearth
87284	44[a]	Fill of Feature 1, hearth (provenience lost in the field; qualifier added by CLES)
87285	44[b]	Fill of Feature 1, hearth (provenience lost in the field; qualifier added by CLES)
87283	12	Sample from modern surface 20m E of Feature 1

charcoal by short-centrifugation. The process is described in detail as follows:

1) Each sample was screened through a tea strainer (mesh openings of about 2 mm) into a beaker to a total screened weight of 25 grams. The sediments were dry. Each screened sample was "spiked" with three tablets of pressed Lycopodium (clubmoss) spores (batch 201890, Dept. Quat. Geol., Lund, Sweden), for a total addition of 33,900 +/- 400 marker grains.

2) Concentrated hydrochloric acid (38%) was added to remove carbonates, and the samples were allowed to sit overnight.

3) Distilled water was added to the samples, and the acid and dissolved carbonates washed out by repeated centrifugation at 2,000 RPM in tapered 50 ml tubes. The concentrated residues were transferred back into numbered beakers and more distilled water was added. The water-sediment mixture was swirled, allowed to sit 10 seconds, and the fines decanted off of the settled heavy residue into another beaker. This process, essentially similar to bulk soil flotation, differentially floated off light materials, including pollen grains, from heavier non-palynological matter. The fine "floated" fractions were concentrated by centrifugation at 2,000 RPM; the heavy fraction remaining in the beakers was discarded.

4) The fine fractions were transferred back into numbered plastic beakers and mixed with 48% hydrofluoric acid to remove smaller silicates. This mixture was stirred occasionally and allowed to sit overnight.

5) Distilled water was added to dilute the acid-residue mixture, which was transferred to the 50-ml centrifuge tubes again. Centrifugation and washing of the compacted residue with distilled water was repeated as above to remove acid and dissolved siliceous compounds.

6) Trisodium phosphate (5% solution), a wetting agent, was mixed with the residue and centrifuged. Repeated centrifuge-assisted rinses with distilled water subsequently removed much fine charcoal and small organic matter, and eventually made the samples taken from hearth fill feasible to count. The residue was washed with glacial acetic acid to remove remaining water in preparation for acetolysis.

7) Acetolysis mixture (9 parts acetic acid anhydride to 1 part concentrated sulfuric acid) was added to the residue in the plastic centrifuge tubes to destroy small organic particles. The tubes were heated in a boiling water bath for 5 minutes, followed by cooling in another water bath for about 5 minutes. The residues were compacted by centrifugation, the acetolysis mixture poured off, and the residues washed with glacial acetic acid. Multiple centrifuge-assisted washes with distilled water followed to remove remaining traces of acid and dissolved organic compounds. Total exposure of the residues to acetolysis mixture was about 15 minutes.

8) The samples were washed in warm dilute methanol, and small silicates, organic material, and charcoal were differentially floated off of the palyniferous residues by centrifugation at 2,000 RPM for time periods varying from 45 to 60 seconds. Remaining residues were stained with Saffranin O, mixed with liquid glycerol, and stored in 3-dram stoppered vials.

Microscope slides were made using liquid glycerol as the mounting medium under 22 x 22 mm cover slips sealed with fingernail polish. The liquid mounting medium allowed the grains to be turned over during microscopy, facilitating identifications.

The slides were counted using a Nikon Alphaphot microscope at a magnification of 400 X. Identifications were made to the family or genus level, as possible. Grains which could not be identified despite well-preserved morphological details were tallied as "Unknowns." Pollen grains too degraded (crumpled, torn, broken, or corroded) to identify further were tallied as "Unidentifiable." Grains which occurred as clumps were counted as a single occurrence (one grain), and notes were made of the number of grains visible in each clump. Following the pollen count, the remainder of each slide was scanned at 200 X in search of the larger grains of cultivated plants such as corn, cotton, and squash. No such remains were seen in scans of the samples reported here.

Only 18 pollen types were recognized from the modern and archeological samples, as listed in Table 2. Some of the arboreal types are clearly contaminants from the modern environment (most notably oak, alder, and elm), but these occur in such low numbers that they do not affect the counts in any significant way. The artificial category of juniper/cottonwood, however, reflects uncertainties in the identification of individual grains due to similarities of size and surface details. A flattened spherical grain with faint speckles on its exterior surfaces could be either a degraded cottonwood or juniper grain, or even a spore. The presence of spores in all of the pollen samples prompted caution in identifications of questionable grains, and the combination of juniper and cottonwood pollen grains in this analysis was thought to be a more useful compromise than counting the ambiguous grains among the Unidentifiables. The surface sample was taken in March of 1987 during the pollination season for juniper. The pollen spectrum for the sample (number 12) is calculated both with and without this seasonal dominant.

The degree of preservation of the spines present on grains from the Compositae is also crucial to their identification. Grains bearing spines 2.5u or lower are classed as Low-Spine Composites, with the working assumption that these were produced by the primarily wind-pollinated genera of the family. Grains bearing spines longer than 2.5u are classed as High-Spine Composites, with the working assumption that these were produced by the primarily insect-pollinated genera of the family. Problems enter when the spines have been eroded down to the level of 2.5u, since even recognition of the forces of degradation cannot restore the spine's original length. For the present study, grains of primarily insect-pollinated snakeweed (Xanthocephalum/Gutierrezia) are probably included with the Low-Spine Composites because of the eroded condition of the spines .

Preservation of the pollen grains was fair to poor, with Unidentifiable grains ranging in the archeological samples from 19% to 30% of the total count. Two of the five archeological samples contained pollen grains too poorly preserved to warrant extensive counting (samples 44[a] and 58), and a third sample was unable to be concentrated sufficiently to

TABLE 2: POLLEN TYPES RECOGNIZED IN SIX SAMPLES FROM THE STAIN SITE, LA58973

Taxon	**Common Name**
Juniperus	Juniper
Populus	Cottonwood
Juniperus/*Populus*	Juniper and Cottonwood types, combined here due to uncertain identification of individual grains
Pinaceae	genera of the Pine family
Pinus	Pine
Quercus	Oak
Alnus	Alder
Ulmus	Elm
Cheno/Am	genera of the Goosefoot family (Chenopodiaceae) and species of the genus *Amaranthus* (pigweed)
Sarcobatus	Greasewood
Ephedra	Mormon Tea
Typha	Cattail (here seen only in monad form)
Gramineae	genera of the Grass family
Zea	Corn
Low-Spine Compositae	wind-borne genera of the Sunflower family
Artemisia	Sagebrush
High-Spine Compositae	insect-borne genera of the Sunflower family
Cleome	Beeweed

obtain a 200-grain count within the time frame for the analysis (sample 44[b]).

Limitations of Pollen Data

Two related but separate statistical considerations should be considered in order to evaluate the pollen data reported here. The first consideration is the "200-grain count" derived from the work of Barkley (1934), and expanded by Martin (1963: 30-31). Counting pollen grains to a total of 200 per sample allows the microscopist to produce results with a 0.90 coefficient of reliability. Taxa occurring in numbers too low to be seen at this level of accuracy are considered too minor to affect the analytical utility of the count. Counting more than 200 grains would increase the accuracy or "statistical validity" of the analysis, but at the expense of greatly increased time at the microscope. Fewer grains than 200 can certainly be counted, but with a sharp decline in accuracy in terms of the kinds of pollen present in the sample.

The second consideration is the "1000-grain-per-gram" rule summarized by Hall (1981: 202) and used as an indicator of the degree of pollen destruction in a sample. An estimate of the number of pollen grains present in a gram of sample is determined by the addition of known numbers of marker grains ("spike") to the sample at the beginning of the processing procedure (Benninghoff 1962; Maher 1981). Separate tallies are then kept of the spike grains and pollen grains counted under the microscope, allowing the proportion of available pollen grains actually seen to be estimated by means of a mathematical equation. Pollen grains can be recovered in the tens of thousands per gram in well-preserved sediments; amounts fewer than 1000 per gram are a signal to the analyst that the forces of degradation and destruction have probably been at work.

A further refinement of this observation is a categorization of the degree of degradation seen in the pollen grains which do remain for analysis in a sample. It is known that the pollen grains from different taxa do not degrade at the same rate, rather that degradation is differential (Holloway 1981, and references cited therein). Some pollen taxa are relatively resistant to destruction, remaining part of the pollen record long after other types have disappeared altogether. Many pollen types degrade beyond recognition, while others are so distinct in shape that they remain recognizable even when degraded to optically clear "ghost grains" lacking sufficient structure to take up stain. Thus, differential degradation is compounded by differential recognition. Cushing (1967) devised a six-step scale for preservation/degradation observations; Hall (1981) refined this to a four-step scale. The utility of such scales is that they provide quantifiable evidence of degradation independent of the goals of 200-grain counts or 1000 grains per gram. The amounts and degrees of degradation have direct implications for the representativeness of the pollen counted by the analyst.

Since "perfect" pollen grains are rarely seen in archeological samples, degrees of degradation in this analysis have been further collapsed into a single category, the Unidentifiables. These grains are included in the 200-grain count. If a pollen grain is well enough preserved to identify to genus or family, no special notes are taken of its condition and that identification is made. If, however, a pollen grain is too degraded to assign positively even to family, it is classed as an Unidentifiable with notes as to the cause(s) (degraded, crumpled, obscured). Grains which are too degraded to distinguish confidently as a pollen grain or as a spore are not counted at all. Thus, in this analysis, the Unidentifiable category is a direct measure of the absolute degradation observed during the count of a given sample, and is comparable across all samples.

In sum, three considerations must be weighed simultaneously for each pollen spectrum in the following report: statistical validity (200-grain count), relative abundance (1000 grains per gram, "rule of thumb"), and representativeness (degree of degradation). It is possible to have less than 1000 grains of pollen per gram of sample (as from an archeological context which biased the pollen rain, such as an enclosed room), which laboratory procedures could concentrate sufficiently to yield a 200-grain count. Use of such a count from a sample which also contained large numbers of degraded grains could lead to grossly erroneous conclusions on all fronts, since differential degradation of all taxa originally present in the sediment would result in altered proportions of those still present or in (differentially) recognizable condition.

Implications of Sampling Loci

Practically speaking, greater or lesser numbers of pollen grains are recoverable from probably any archeological context. Given this, it follows that the archeological implications of the sampled context become paramount for the interpretation of the recovered pollen spectrum. Just as one example, a pollen sample from pit fill provides pollen information on the fill of the pit. If research questions are directed at events connected with the filling of the pit, the recovered pollen spectrum probably will be appropriate. If, however, research questions are directed at the original function(s) of the pit before it filled, then the recovered pollen spectrum from this sample will probably not be appropriate.

Another example is pollen recovered from burned contexts such as hearths, as reported in this analysis. Since pollen grains are destroyed by heat (Ruhl 1986) as well as by exposure to fire, it is likely that few, if any, of the pollen grains recovered from these burned contexts relate to the use of the feature per se. Unusual circumstances are occasionally present in a specific hearth, such as sealing layers of adobe between separate fire basins in a remodeled hearth, which could conceivably allow pollen to be preserved in an interpretable context. Samples taken from less-oxidized locations, such as at the edge of the basin fill, could also yield pollen grains which are interpretable in an archeological sense. Precise sampling procedure is implied for both of these situations.

For most routine hearth samples, it is highly likely that the recovered pollen grains post-date the active (burning) use of the feature, and indeed were preserved by the very absence of burning. Research questions aimed at identifying vegetal foods cooked in the hearth will most likely not be addressable with the pollen spectrum recovered from hearthfill, and are instead the classic provenience of flotation analyses. However, since hearths are likely depositories for floor sweepings, questions aimed at identifying the plants which were present in the structure (or in the area if the hearth is not inside a structure) are reasonable and could justify the pollen analysis of hearthfill. Finely-tuned research questions are required. In all instances, pollen data should be integrated with flotation data, since each data set is usually preserved by different conditions.

Such considerations affect sampling decisions made in the field as well as in the laboratory. What questions are the recovered pollen grains expected to answer? Given that pollen grains are destroyed by fire, can pollen recovered from a burned feature be related to the use of that feature in an archeological sense? Does the fact that pollen grains are recoverable from burned areas especially enhance their ability to provide answers, or make those answers more pertinent to the understanding of the burned areas? Or is it more likely that pollen samples from unburned areas provide less biased data and more defensible interpretations?

Location-specific archeological considerations often dictate where samples will be taken. For example, the lack of preserved floor surfaces may require pollen samples to be taken from burned contexts or feature fill. Research questions formulated by the archeologist must be "field tested" to take into account the anticipated recovery of pollen grains from a sampling locus, and the implications of those recovered grains for site formation processes. In sampling situations where feature preservation is good, the decision as to where to sample is easier in one sense, but still requires forethought on the implications of the pollen grains expected to be recovered.

RESULTS OF ANALYSIS

As mentioned in the Introduction, samples from the in-situ and redeposited fill of three hearths and from the modern surface were submitted for pollen analysis. The recovered pollen spectra are presented in Table 3.

Surface Sample

Unlike the archeological samples which were taken during the mitigation work in June and July of 1987, surface sample 12 was taken in March of 1987 during the initial testing of the site. Spring-blooming juniper is a prolific producer of light pollen grains which can be carried some distance, and the recovered pollen spectrum is totally dominated by the grains of juniper. The immediate site area is not characterized by stands of juniper, but scattered plants on nearby lomas (Lent 1987: 4) could easily have produced the recovered pollen which was dropped over the site by the prevailing winds. Had the sample been taken a couple of months later, it would probably have been dominated by cottonwood.

The pollen spectrum is therefore presented in two forms: with and without the presence of juniper. This exclusion was made in an effort to see patterns in the remaining pollen types otherwise "swamped out" by the seasonal peak in juniper pollen production. It is possible that the combined juniper/cottonwood category should also have been excluded. It was retained because of the cottonwood grains unidentified within it, since by definition the category contains ambiguous grains of both types.

Excluding the presence of juniper, the dominant pollen taxa are shown to be juniper/cottonwood, Cheno/Am, Low-Spine Compositae, and pine. All of these are wind-borne pollen types produced in great numbers by their parent plants. The Cheno/Am category includes taxa such as saltbush (Atriplex) which is noted as present in the project area (Lent 1987: 4). As discussed in the Introduction, plants such as snakeweed may be included in the Low-Spine Compositae despite their primary insect pollination mode, because of the short length of the spines of their pollen grains.

TABLE 3. POLLEN SPECTRA FROM HEARTH FILL SAMPLES AND THE MODERN SURFACE, LA59873, THE STAIN SITE

expressed as percentages
( ) number of grains in pollen-deficient samples
* one or more clumps of 3 or more grains seen during count
/ percentages including/excluding _Juniperus_ seasonal high

Sample No.	surface 12	92	F-1 44[a]	F-1 44[b]	F-2 5	F-3 58
Juniperus	73/0	-	-	-	4	-
Populus	1/4	-	-	-	-	(1)
Junip/_Pop_	9/32	1	(2)	(2)	12	(1)
Pinaceae	0.5/0.5	-	-	-	3	-
Pinus	2/8	1	-	-	8	(1)
Quercus	-	-	-	-	0.5	-
Alnus	-	-	-	-	0.5	-
Ulmus	0.5/0.5	-	-	-	-	-
Cheno/Am	8/28*	45*	(5)	(2)	27*	(15)
Sarcobatus	-	2	-	-	-	-
Ephedra	1/3	10	-	-	4	(1)
Typha	-	2	-	-	-	(4)
Gramineae	0.5/1	2	-	(1)	2	-
Zea	-	0.5	-	-	0.5	-
Low-Spine Compositae	5/17	12	-	(6)	7	(4)
Artemisia	0.5/0.5	2	-	(1)	0.5	-
High-Spine Compositae	1/3	4	-	-	0.5	(3)
Cleome	-	0.5	-	-	-	-
Unknown	0	0	0	(1)	0.5	0
Unidentifiable	1/3	19*	(1)	(9)*	30*	(6)*
Total Pollen Counted	782	206	8	22	202	36
No. Spike Counted	168	449	28	27	95	132
No. Grains/gram (est.)	6,312	1,135	387	1,105	2,883	370

The presence of over 6,000 pollen grains per gram in the surface sample is indicative of the potential pollen concentration in samples from nearby archeological contexts. Greater or lesser numbers of grains per gram in the archeological samples could be reflective of degradation due to biological or soil chemistry factors, a possibility partially amplified by the percentage of Unidentifiable grains. Greater or lesser numbers of grains per gram could also be reflective of differential exposure of each archeological sampling locus to atmospheric pollen rain. The recovery of the archeological pollen spectra from hearthfill samples unfortunately complicates their interpretation, as discussed in the Introduction, but these factors will be explored as possible in the following sections.

Redeposited Hearthfill

The three identified hearth features were located within centimeters of each other, and evidenced some erosion (Lent 1987). During excavation of the features, at least one stained area indicative of redeposited hearthfill was found and sampled. A pollen sample from this redeposited hearthfill, sample 92, was submitted for analysis.

As shown in Table 3, sample 92 contains over 1,100 pollen grains per gram of sample and yielded a 200-grain count. Most of these pollen types are representative of vegetation growing in the site area today. Despite the degradation (19%), a single grain of corn pollen was recognized in this sample from outside a hearth basin proper. The grain is not well preserved, and further evidence of the prehistoric presence of corn at the site should be sought in the macrobotanical and flotation analyses.

Three grains of cattail (Typha) pollen were also recognized in the sample, all of the single grain, monad type. The wind-pollinated plant could have grown near the Rio Grande which today is less than 1 km to the southeast of the site area. Cattail is known to have been an aboriginal foodsource, although most uses cite the starchy rootstocks (Castetter 1935: 53) which would be unlikely to introduce pollen grains into a site. As with the single corn pollen grain from this sample, the simple presence of the pollen grains of known foodstuffs cannot be used of itself as evidence of the cooking of those foodstuffs in a sampled hearth. More substantial data from the macrobotanical and flotation residues are necessary to explore these possibilities.

Feature 1

Two pollen samples associated with hearth Feature 1 were submitted for analysis, 44[a] and 44[b].

Neither sample 44 could be concentrated sufficiently to yield a 200-grain count, despite the relatively high number of grains per gram (1,105) for sample 44[b]. This is a common situation with hearthfill samples, resulting from the quantities of burned and partly-burned organic matter that are difficult or impossible to remove during chemical extraction of the pollen grains. The number of Unidentifiable grains in sample 44[b] is also about one-third the total number of pollen grains seen for the sample, suggesting considerable degradation of the deposits. The fewer than 400 grains per gram calculated for sample 44[a] are further evidence of degradation within the deposits.

Due to the loss of provenience information in the field, it is not known exactly which sample 44 was taken from beneath a mano buried under some 4 cm of hearthfill. Nor do I know at this writing whether the mano is burned or not. The presence of an unburned mano in hearthfill would strongly suggest use of the hearth basin as a trashdump following its last thermal use. It would logically follow that pollen recovered in association with such an unburned mano would similarly result from having been swept or dumped into the abandoned hearth along with trash.

The remaining pollen types present in both samples are those produced by taxa present in the general environment today. Poor preservation unfortunately prevents exploration of many questions from these pollen data, although the prospect may be brighter for data from the macrobotanical and flotation analyses.

Feature 2

A single pollen sample was submitted for analysis from hearth Feature 2, located only a few centimeters north of hearth Feature 1. The sampling locus was some two centimeters higher than those for samples 44 from hearth Feature 1. The contemporaneity of the features is not known at this writing.

As shown in Table 3, sample 5 yielded a 200-grain count and contains nearly 3,000 pollen grains per gram. These figures are tempered by the high number of pollen grains too degraded for further identification (30%

Unidentifiable). Among the identified grains is a single, poorly preserved grain of corn pollen. The sampling locus appears on a field profile as near one edge of the hearth some 4 cm below the upper surface, a location which could include pollen grains swept or blown into the hearth following its last thermal use. Presence of corn pollen within the hearth deposits cannot be used of itself to infer prehistoric use of the hearth to cook or roast corn, although evidence present in the macrobotanical remains and flotation residues could shed considerable light on the question.

The remaining pollen types recovered from hearth Feature 2 are those typical of the surrounding vegetation. The lower percentages of juniper and cottonwood pollen are probably more typical of the yearly average than the very high numbers seen in the surface sample, or the near-absence seen in redeposited hearthfill sample 92.

Feature 3

A single sample was submitted for analysis from hearth Feature 3, located a few centimeters to the east and inbetween both hearth Features 1 and 2. As shown in Table 3, sample 58 from hearth Feature 3 is estimated to contain fewer than 400 grains per gram. This figure, combined with the fact that one-sixth of the pollen grains were unidentifiable, suggests that the forces of degradation have been at work in the sampling locus.

The identified pollen grains are those typical of the surrounding vegetation. The four grains of wind-borne cattail pollen are of the single grain, monad type and probably reflect transport from plants located along the Rio Grande less than 1 km to the southeast. Few other conclusions can be drawn from this severely limited pollen spectrum, although further information may be present in the macrobotanical and flotation residues.

DISCUSSION

The interpretational constraints of pollen samples from hearthfill have been amply discussed in the preceding sections. The presence of a mano in the fill of hearth Feature 1, the context of sample 92 as "redeposited feature fill," and the lack of archeological evidence for a structure over the three hearth features, all suggest that the fill of the hearths was exposed to atmospheric pollen rain (probably along with trash or sweepings in the case of hearth Feature 1) following thermal uses of the hearth basins. The contemporaneity of the three features is unknown at this writing, as is the possibility of re-use of one or more of the features, all located within centimeters of each other.

With one exception, the recovered pollen taxa are reflective of the areal vegetation present today. The exception -- the two grains of corn pollen -- is open to further interpretation.

Corn is wind-pollinated, but the pollen grains only travel about 10 feet from the parent plant before falling to the ground (Raynor et al. 1972), so long-distance transport is not a consideration here. Experiments with washing various parts of corn ears, in the husk and without the husk, for pollen analysis have shown that corn pollen essentially travels with the ear (Bohrer 1968: 36, 47; Williams-Dean and Bryant 1975: 105-106), while Hevly's (1964: 89-91) recovery of corn pollen from metate grinding surfaces suggests that even shelled kernals carry at least some pollen. Thus, the recovery of corn pollen from hearth Feature 2 and redeposited hearthfill sample 92 indicates the presence of some part of the plant at the site, sometime during its history, in a condition able to shed at least a few pollen grains. That is not to say that the pollen evidence reflects the cooking of corn in any of the hearths. The results of the flotation and macrobotanical analyses will shed considerably more light on the origin of the two corn pollen grains seen here (whole ears grown locally? shelled kernals carried in from elsewhere?), with implications for the prehistoric activities conducted at the site.

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APPENDIX 3: CALIBRATED C-14 DATING RESULTS

A single radiocarbon date was recovered from LA 58973. This sample was obtained in association with Feature 2, one of three contiguous basin-shaped hearth features present at the site. The following text and calculations are from the radiocarbon analysis performed by Beta Analytic, Inc.

Calibrations of radiocarbon age determinations are applied to convert results to calendar years. The short-term difference between the two is caused by fluctuations in the heliomagnetic modulation of the galactic cosmic radiation and, recently, the advent of large-scale burning of fossil fuels and nuclear device testing. Geomagnetic variations are the probable causes of medium-term fluctuations, and long-term variations (greater than 8000 B.P.) are still unknown.

Radiocarbon dating laboratories have analyzed hundreds of samples obtained from known-age tree rings of oak, sequoia, and Douglas fir. Curves generated from data on the atmospheric carbon content at specific time periods have been incorporated into computer programs. The result of the calibrations analysis applicable to your research follows.

(Caveat: these calibrations assume that the material dated was short lived, i.e., living for less than ten years, such as leaves, small branches, some shells, food remains, some plants, ten tree rings, etc. For other materials, the "old wood effect" would produce uncertainties. Both the maximum and minimum ages of age possibilities could be understated if that error is significant. Also, in extreme cases they might turn out to be overstated.)

Calibration file(s): ATM10.14C
Beta-23887
Radiocarbon age B.P. 2700 ± 70
    Calibrated age(s) cal BC 888, 885, 832
    cal BP 2837, 2834, 2781, cal AD/BC (cal BP) age

Ranges obtained from intercepts (Method A):
    one sigma**   cal BC 969-963(2918-2912) 923-802(2872-2751).
    two sigma**   cal BC 1047-1045(2996-2994) 1010-790(2959-2739).

Summary of above:
    Minimum if calibrated age ranges (cal ages) maximum of cal age ranges:
    one sigma   cal BC 969 (888, 885, 832) 802
    two sigma   cal BC 1047 (888, 885, 832) 790
        cal BP 2996 (2937, 2834, 2781) 2739

** 1 sigma = square root of (sample std. dev. 2 + curve std. dev. 2).
2 sigma = 2 x square root of (sample std. dev 2 + curve std. dev. 2).

Reference for data sets (and intervals used):

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APPENDIX 4: FLOTATION RESULTS

Mollie Toll

FLOTATION FROM THE STAIN SITE (LA 58973)

WEST OF CORRALES, NEW MEXICO

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Highway roadgrading of State Road 528, west of the village of Corrales, NM, exposed three hearth stains in an area of scattered groundstone and burned rock. Soil samples were collected from each of the three features for flotation and pollen (Dean 1987) analyses. A carbon-14 date from Feature 1 places site occupation at approximately 880 B.C. A possible pithouse located outside the right-of-way to the southeast may be associated with the hearth features; this structure was not examined in the present excavations.

The 6 soil samples collected during excavation were processed at the Laboratory of Anthropology Research Section by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Each sample was first measured as to volume (ranging from 800 to 3500 ml) and then immersed in a bucket of water. A 30-40 second interval was allowed for settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The fabric was lifted out and laid flat on coarse mesh screen trays, until the recovered material had dried. Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh), and then reviewed under a binocular microscope at 7-45x.

From each flotation sample with sufficient charcoal, a sample of 20 pieces of charcoal was identified (10 from the 4 mm screen, and 10 from the 2 mm screen). Each piece was snapped to expose a fresh transverse section, and identified at 45x. Low-power, incident light identification of wood specimens does not often allow species- or even genus-level precision, but can provide reliable information useful in distinguishing broad patterns of utilization of a major resource class.

Feature 1

Of the three hearth stains encountered, Feature 1 was largest and least eroded. Charcoal from this feature produced a carbon-14 date of ca. 880 B.C. Flotation remains included carbonized seeds of antelopebrush (Purshia) and one-seed juniper (Juniperus monosperma; Table 1). Charcoal from samples #46 and 64 indicated juniper was the predominant fuel material, but greasewood was also used (Table 2).

Floral materials found in Feature 1 may relate only to fuel materials. Juniper berries, laced with strong aromatic resins, are noted as being utilized occasionally for flavoring or a starvation food (Castetter 1935:31-32). Their association here with wood of the same species makes accidental inclusion with firewood a more likely explanation for their presence than food use. Antelopebrush, a local shrub of the rose family, may also have been used for fuel, though it did not show up in the limited samples examined. The shrub tends to be small and much-branched, characteristics not handy for efficient fuel collection. The seeds have a very bitter taste, but are eaten by several small rodent species (Martin, Zim and Nelson 1951), providing an additional potential source for the one seed found at the site.

Feature 2

No identifiable seeds or other floral materials were present in this adjacent hearth stain. A single poorly preserved grain of corn pollen recovered from this hearth (Dean 1987) must be viewed as a potential post-occupation interloper, given the complete lack of larger corn remains in flotation samples from any of the features at the Stain site.

Table 1. Flotation results from the Stain site, LA 58973.

FS	Provenience	Juniperus	Purshia	Number of Taxa
FEATURE 1:				
20	TP 3, 11N/11E		1/1.3*	1
46	E 1/2, TP 3 10.21 - 10.40 cm BD			0
64	E 1/2, TP 3 10.21 - 10.40 cm BD	1/0.3*		1
101	TP 6, Strat 100			0
FEATURE 2:				
51	E 1/2, Strat 103 10.25 - 10.41 cm BD			0
FEATURE 3:				
60	E 1/2, TP 11-12 10.40 - 10.80 cm BD	1/0.4*		1

a/b: number before slash indicates actual number of seeds recovered, number after slash indicates adjusted number of seeds per liter of soil
*carbonized

Table 2. Charcoal Composition of Two Flotation Samples, LA 58973.

	Juniperus		Purshia		Total	
FS	#	g	#	g	#	g
46	20	0.6			20	0.6
64	19	0.9	1	<0.05	20	0.9
TOTAL:	39 98%	1.5 100%	1 2%	<0.05 <0.5%	40 100%	1.5 100%

Carbonized corn cob parts, reliably identifiable even in very fragmentary form, are ordinarily ubiquitous in sites where corn agriculture formed part of the subsistence base. There was insufficient charcoal present to examine a 20 piece sample.

Feature 3

A single, fragmentary carbonized juniper seed was recovered from Feature 3. This may again relate to fuel rather than food use.

SUMMARY

Flotation materials recovered at this site included carbonized seeds of juniper and antelopebrush. Both are potentially present as a byproduct of fuel use, though antelopebrush seeds may also have been brought in by small rodents. The preponderance of juniper charcoal (98% of pieces) is of interest considering the distance to the nearest source today for this taxon (13 km to the east in the foothills of the Sandias). No remains of cultivated or wild food plants were recovered.

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