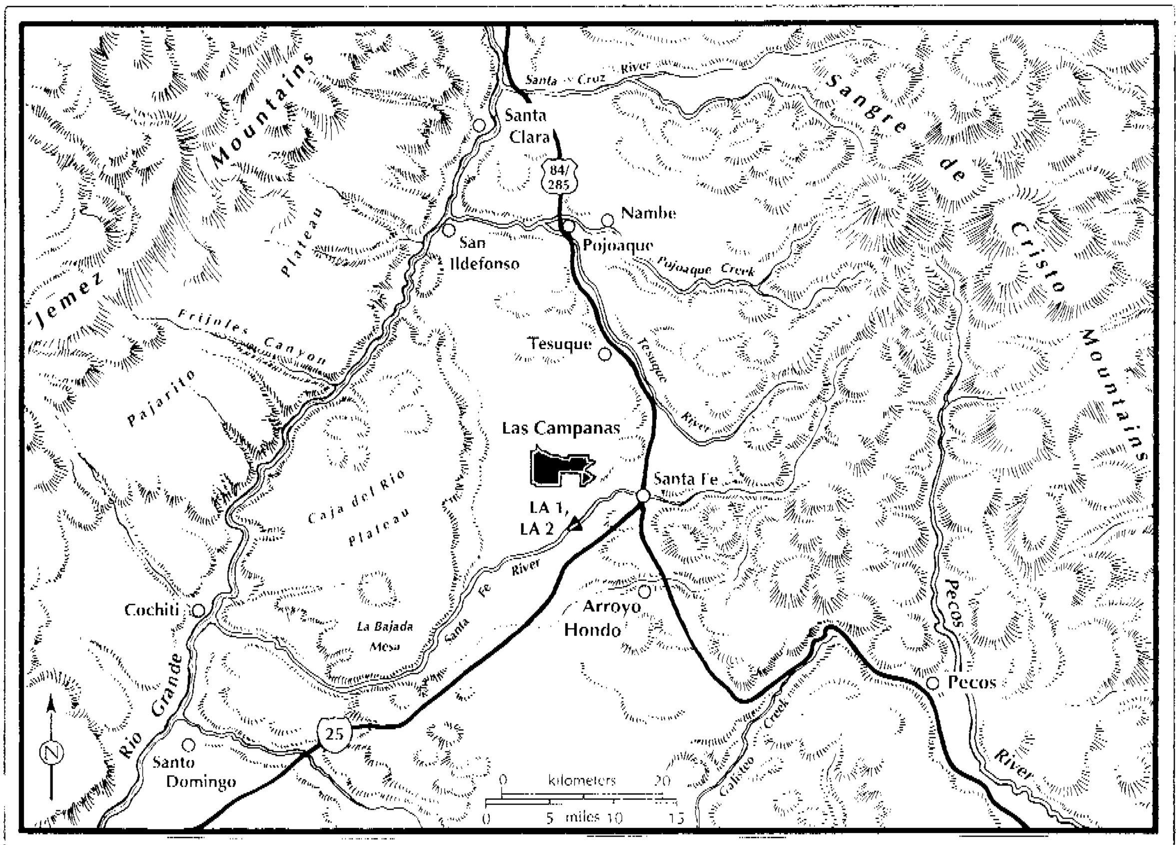
LAS CAMPANAS DE SANTA FE

SUNSET GOLF COURSE, AND ESTATES IV, ESTATES V, AND ESTATES VII EXCAVATIONS

STEPHEN S. POST



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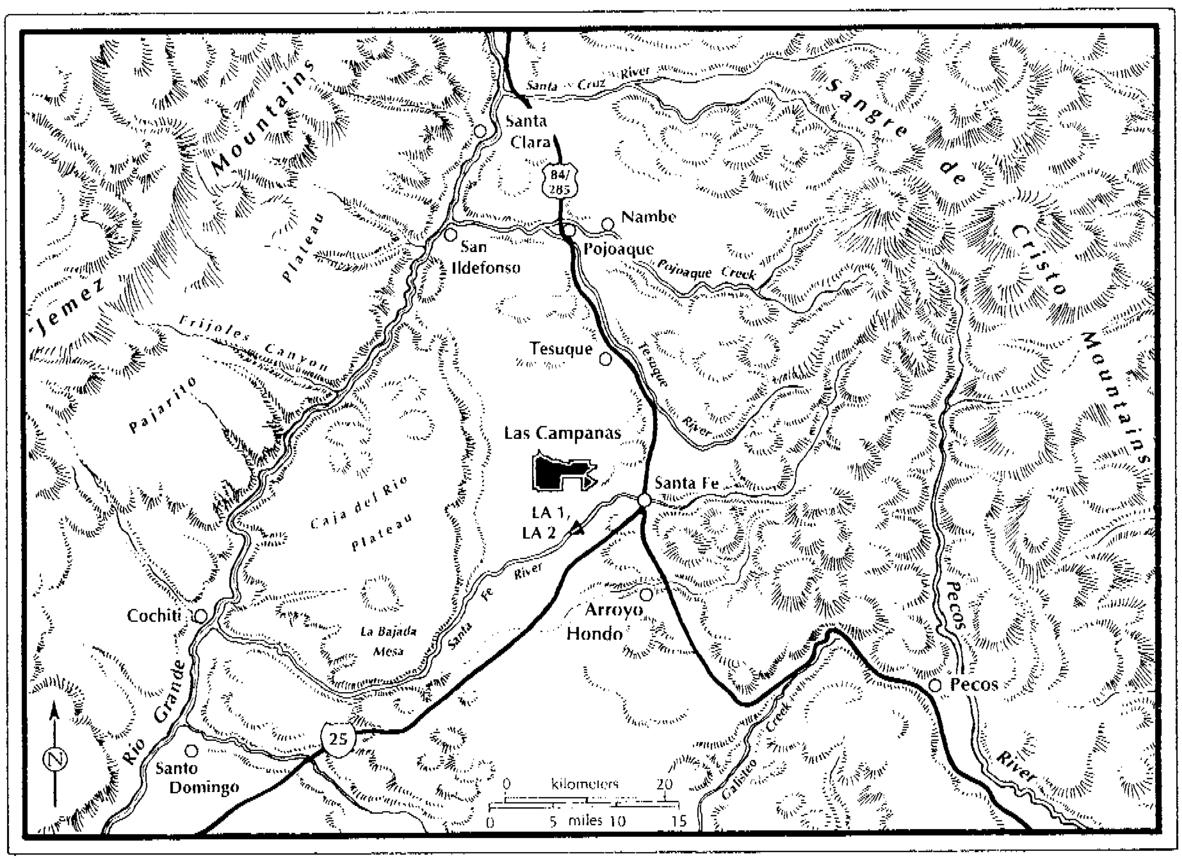

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LAS CAMPANAS DE SANTA FE SUNSET GOLF COURSE, AND ESTATES IV, ESTATES V, AND ESTATES VII EXCAVATIONS: SMALL SITES IN THE PIÑON-JUNIPER PIEDMONT NORTH OF THE SANTA FE RIVER, SANTA FE COUNTY, NEW MEXICO

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ADMINISTRATIVE SUMMARY

This is a final report on the archaeological investigations conducted by the Office of Archaeological Studies (OAS), Museum of New Mexico, for Las Campanas de Santa Fe in Santa Fe County. Archaeological work was completed for the Sunset Golf Course and Estates IV, Estates V, Estates VII, Estates VIII, and Ranch Estates subdivisions between September 1992 and October 1994. The data recovery plans were approved and archaeological investigations were conducted in compliance with Santa Fe County Land Development Code Article VI, Section 3.

The Sunset Golf Course data recovery project was begun in February 1993. It entailed the excavation or detailed recording of six prehistoric and one historic period site. Five sites (LA 84758, LA 84759, LA 84775, LA 85036, LA 98861) located along the proposed West Golf Course were previously identified by Southwest Archaeological Consultants, Inc. (SAC) in April 1992 (Scheick and Viklund 1991). The seventh site (LA 98680) was located outside the Sunset Golf course, in the Estates VII subdivision (Post 1992). The research effort was completed according to an approved data recovery plan (Post 1993a).

The Estates IV testing and data recovery project was begun in May 1993. Six sites that were previously identified by SAC (Scheick and Viklund 1992) were evaluated for their data potential. Four sites, LA 86146, LA 86147, LA 86149, and LA 86151, were test excavated and the results were included in the Estates IV testing report and data recovery plan (Post 1993b). Two sites, LA 86148 and LA 86150, were investigated according to the treatment plan outlined in the Estates IV data recovery plan (Post 1993b).

The Estates V, Units 1, 2, and 3, testing project included sites within the subdivision and to the southwest of the subdivision in what is part of Estates VII. The investigation focused on 11 sites that were selected from a sample of 45 sites that had previously been identified by SAC (Scheick and Viklund 1991; Scheick and Viklund 1992). Eight sites, LA 84773, LA 84777, LA 86131, LA 86134, LA 86139, LA 86152, LA 86155, and LA 86156, were determined to have no further data potential and no further investigation was necessary. Three sites, LA 84787, LA 86159, and LA 84793, were determined to have significant cultural deposits and they were recommended for data recovery. The testing results from these three sites were included with the data recovery plan that guided the excavation and analysis phases (Post 1994a).

The Estates VII excavation project was conducted in May, June, September, and October 1994. The investigation focused on two sites, LA 98688 and LA 98690, that were identified by OAS (Post 1992). LA 98690 was excavated according to the treatment plan provided in Post (1994a) and LA 98688 was excavated according to the treatment plan provided in Post (1994b).

This final report contains the site descriptions, excavation methods and results, artifact, chronometric and specialist analyses, and interpretations and conclusions based on the research questions proposed in the data recovery plans. All of the studies are linked to a common theme of subsistence production and land use for populations living in the Santa Fe drainage from 1800 B.C. to A.D. 1940.

This report fulfills Las Campanas de Santa Fe requirements under Santa Fe County Land Development Code Article VI, Section 3, for archaeological investigations. This report and past inventory completed by the Office of Archaeological Studies provide clearance for the following subdivisions and other developments shown on the provisional master plan: Estates IV, Estates V, Units 1 and 2, Estates VII, Units 1 and 2, Estates VIII, Ranch Estates, the Equestrian Center, the Wastewater Treatment Plant, Sunset Golf Course, and planned residential areas peripheral to Sunset Golf Course that are presently unnamed.

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CHAPTER 1
INTRODUCTION

At the request of Las Campanas Limited Partnership, Inc., of Santa Fe, the Office of Archaeological Studies (OAS), Museum of New Mexico, completed a series of archaeological investigations for the Las Campanas de Santa Fe development in Santa Fe County, New Mexico. Between September 1992 and October 1994, the OAS completed archaeological work within the Sunset Golf Course and Estates IV, Estates V, and Estates VII subdivisions. The archaeological investigations were conducted in compliance with Santa Fe County Ordinance 1988-8.

The archaeological projects resulted in test excavations of 8 archaeological sites and excavation of 13 archaeological sites. Table 1.1 provides a list of the sites by subdivision, the archaeological work that was completed, and the reference for the appropriate data recovery plan. The legal descriptions for these sites are recorded in the New Mexico Cultural Resource Information System (NMCRIS) files, at the Archeological Records Management Section (ARMS) of the State Historic Preservation Division in Santa Fe. Figure 1.1 shows the limits of the Las Campanas project area and the subdivision and Sunset Golf Course locations. A site location map is provided in Appendix V (removed from copies in general circulation).

The principal investigator was Timothy D. Maxwell. The project director was Stephen S. Post. The project director would like to acknowledge the efforts of OAS staff members Guadalupe Martinez, Steven Lakatos, John Zachman, Natasha Williamson, Susan Moga, Deborah Johnson, Warren MacNaughton, Erin Tyler, Desiree Downing, Heather Bixler, Cindy Laughlin, Carolyn Count, Marcy Snow, Vernon Lujan, and Sam Sweesy. Special thanks go to Roland and Martha Mace for their contributions to the excavation of LA 84787 and LA 86159. More special thanks go to the OAS production staff, Robin Gould, Ann Noble, Tom Ireland, and Robert Turner, for their gracious acceptance and meeting of short deadlines.

This document complies with the final report requirement for data recovery efforts as outlined in the Santa Fe County Archaeological Ordinance 1988-8. The archaeological ordinance requires that a final report be submitted within a year of completing the field phase of a data recovery effort. Obviously, the Sunset Golf Course, Estates IV, and Estates V testing phases are overdue by more than a year. This situation was created by the staged scheduling of the Las Campanas subdivision plans. When one excavation project was completed it was usually followed by another within three months. It was agreed by State Historic Preservation Division staff (representing Santa Fe County), Las Campanas Limited Partnership representatives, and the OAS project director that the final report for all phases would be delayed until the excavations were completed. This decision allowed all excavation data to be combined into a single synthetic report; the value of which would offset any archaeological scheduling requirement improprieties.

Another effect of the staged scheduling was the need to write phase and site-specific research designs. The different research designs are integrated in the following report so that they can be applied to the full range of functional and temporal site types. This strategy is intended to result in a more useful and meaningful document.

The report is organized into three main parts: the cultural and environmental overviews, which apply to all projects; the excavation results organized by developmental phase; and a synthetic section, which provides interpretation and conclusions from a project and regional perspective. Site-specific research questions are addressed within the excavation results through the use of certain common methodological and theoretical approaches, which are then used to structure the synthetic section.

Table 1.1. Subdivision, LA Number, Work Completed, and Reference

Subdivision and LA Number	Archaeological Work Completed	Reference
Sunset Golf Course		
LA 84758	Excavation	Post 1993a
LA 84759	Excavation	Post 1993a
LA 84775	Excavation	Post 1993a
LA 85036	Excavation	Post 1993a
LA 98861	Excavation	Post 1993a
Estates IV		
LA 86148	Excavation	Post 1993b
LA 86150	Excavation	Post 1993b
Estates V, Units 1, 2, and 3		
LA 84773	Testing	Scheick and Viklund 1991
LA 84777	Testing	Scheick and Viklund 1991
LA 84787	Excavation	Post 1994a
LA 84793	Excavation	Post 1994a
LA 86152	Testing	Scheick and Viklund 1992
LA 86155	Testing	Scheick and Viklund 1992
LA 86156	Testing	Scheick and Viklund 1992
LA 86159	Excavation	Post 1994a
Estates VII		
LA 86131	Testing	Scheick and Viklund 1992
LA 86134	Testing	Scheick and Viklund 1992
LA 86139	Testing	Scheick and Viklund 1992
LA 98680	Excavation	Post 1993a
LA 98688	Excavation	Post 1994b
LA 98690	Excavation	Post 1994a

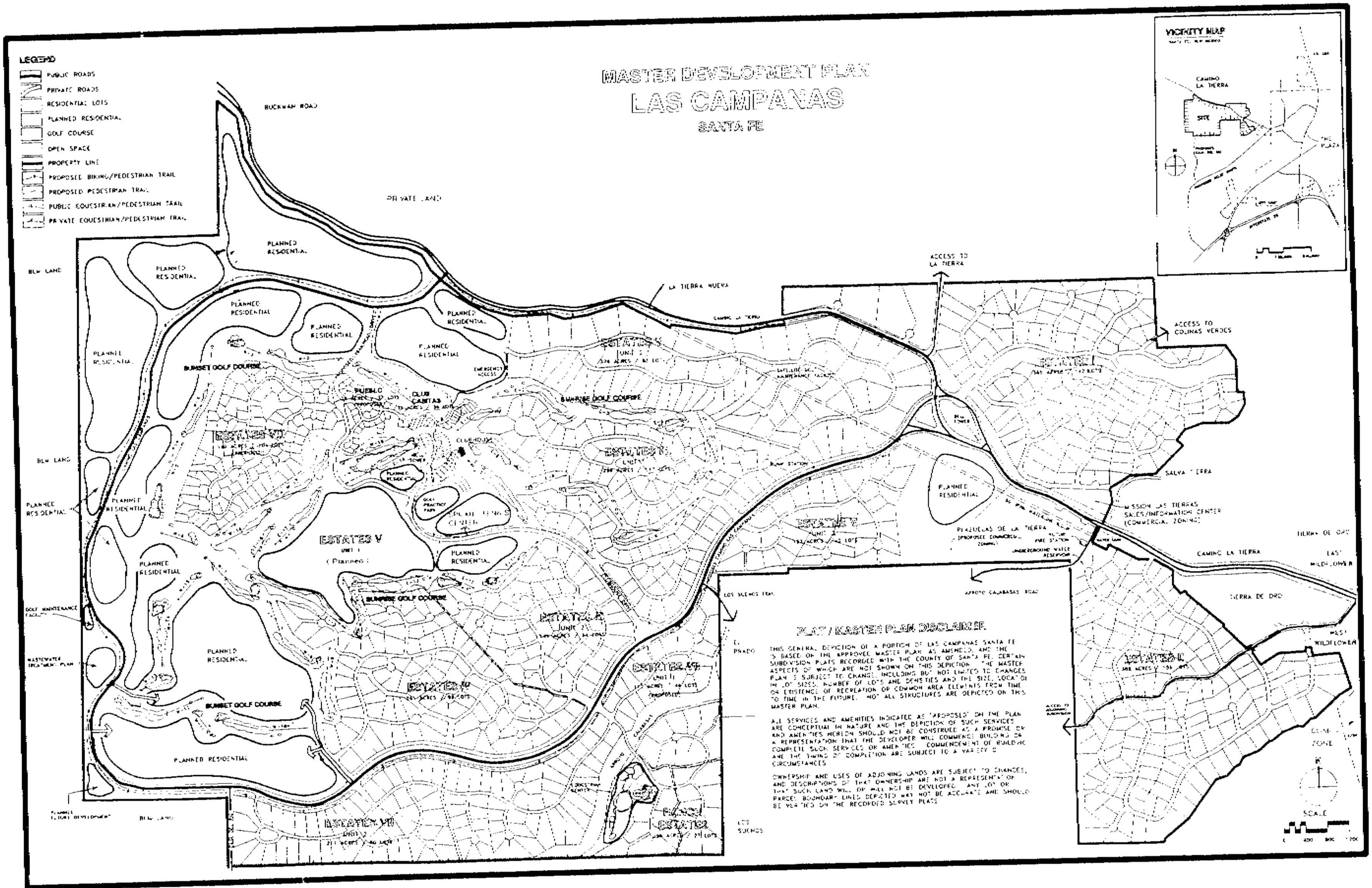

Figure 1.1. Las Campanas de Santa Fe master development plan.

CHAPTER 2
CONTEMPORARY ENVIRONMENT

The contemporary environment of the Santa Fe Basin has been thoroughly reviewed in a study by Kelley (1980) as part of the Arroyo Hondo Archaeological Project. The reader is referred to this monograph for the wealth of detail it contains. Maxwell (1988) and Scheick and Viklund (1992) concisely summarize the contemporary environment for the northwest Santa Fe and Las Campanas area.

Topography

The project area is within a structural subdivision of the Southern Rocky Mountain physiographic zone (Folks 1975:110). The basin is bounded on the west by the Jemez Mountains and to the east by the Sangre de Cristo Mountains. An alluvial plain, dissected by many arroyos, stretches westward from the foothills at the base of the Sangre de Cristos. This alluvial plain forms the piñon-juniper piedmont within which the entire project area is located (Fig. 2.1). The piedmont includes the Santa Fe-Tesuque divide, which decreases in elevation to the west-southwest, and includes the Las Campanas area at its westernmost edge. The piedmont ends at an extensive drainage trough that extends to the Cerros del Rio to the northwest, the edge of La Bajada to the west, and the Cerrillos Hills and La Cienega to the southwest. The project elevations, which range from 1,910 m to 2,252 m, are higher than the surrounding areas to the southwest, west, and northwest.

Local topography alternates among nearly level piedmont tableland, rolling gravel terraces, and steep, rocky slopes. The major drainage is the Santa Fe River, with two major tributaries, the Arroyo Calabasas and Arroyo de los Frijoles draining much of the eastern half of the Las Campanas area. The western half of the Las Campanas area drains into a series of medium-sized tributaries of Cañada Ancha, which drains into the Rio Grande to the northwest. Smaller tributary arroyos within the Arroyo Calabasas, Arroyo de los Frijoles, and Cañada Ancha drainage systems have cut deeply into the alluvial plain, forming steeply sided valleys.

Alluvial materials of ancient and modern gravel are found in all the arroyos and in slope wash and terrace deposits. Tertiary volcanic deposits, Cenozoic sediments, and Precambrian rock are exposed in surrounding areas and, combined with local alluvium, provide most of the materials needed for prehistoric lithic artifact production. In particular, chert is available in the Ancha formation (Kelley 1980:11-12), and sandstone, siltstone, andesite, basalt, and silicified wood occur in nearby formations (Hannaford 1986:4). Small amounts of obsidian are found scattered along the basalt-capped mesas to the west (Kelley 1980:12). The primary obsidian source for the study area was probably the Jemez Mountains.

Soils

Las Campanas soils are typical of the dissected piedmont plains (Folks 1975:3-4). Six major soil associations of the piedmont plains occur within the Las Campanas area: Pojoaque Panky rolling, Pojoaque rough broken Land, Panky fine sandy loam, Cerrillos fine sandy loam, and Fivemile loam.

Pojoaque Panky rolling is the predominant soil association. It covers the ridge tops and slopes separating the Arroyo de los Frijoles, Arroyo Calabasas, and Cañada Ancha drainages. It is interspersed with patches of Pojoaque rough broken land. It consists of 60 percent Pojoaque sandy clay loam on slopes of 5 to 25 percent, and 35 percent Panky loam on slopes of 0 to 9 percent (Folks 1975:43). Bluewing, Cerrillos, and Agua Fria soils make up the remaining 5 percent. Pojoaque soil has moderate permeability, effective rooting depth of 152 cm (60 inches), and water-holding capacity of 20 to 24 cm (8 to 9.5 inches). The Panky soil will be described separately.

Pojoaque rough broken land soils occur south of the Arroyo de los Frijoles and in a small patch on the north side of the arroyo where it is crossed by Buckman Road. The Pojoaque soils make up 50 percent of the association and are well-drained, occur on upland terraces with

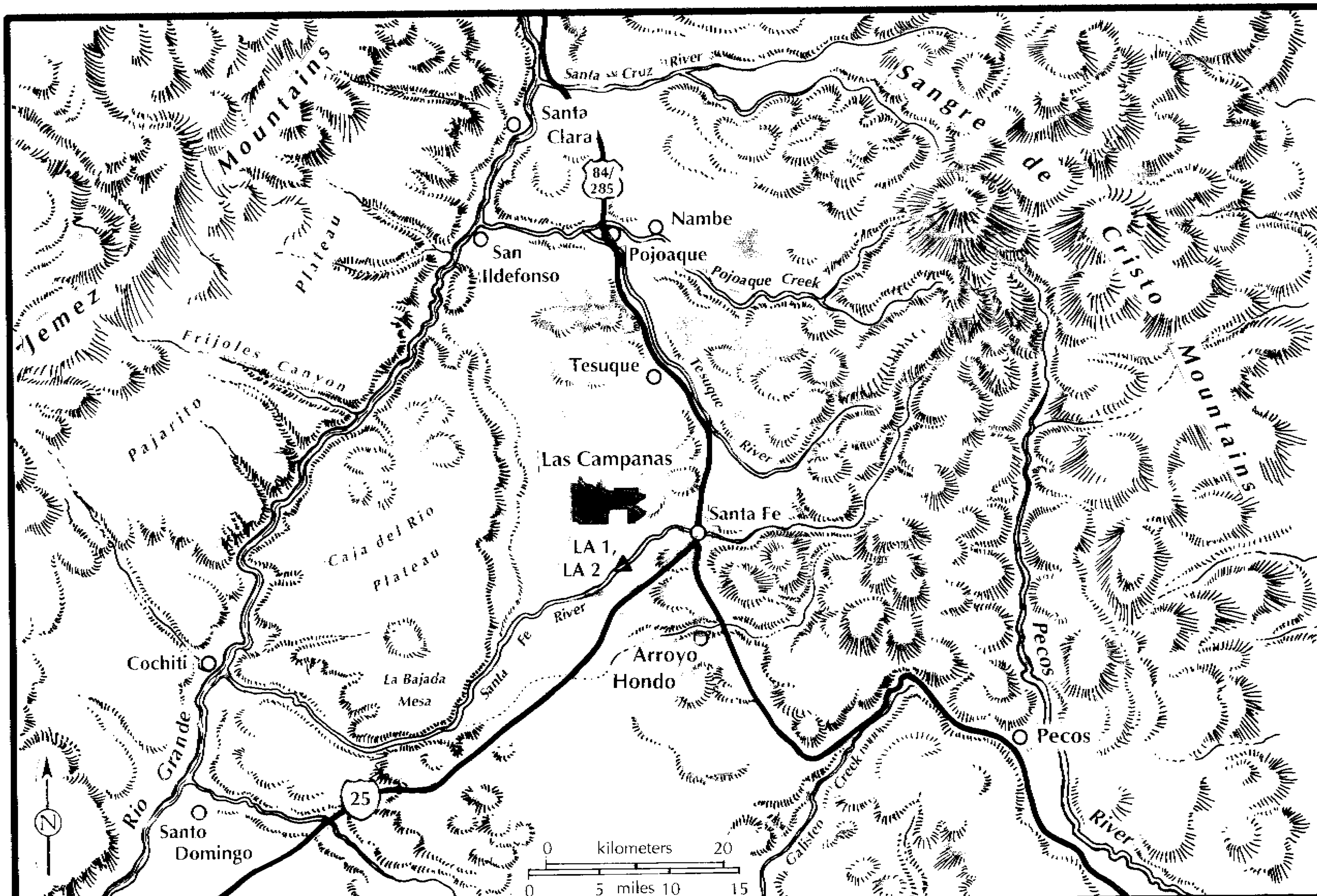

Figure 2.1. Physiographic map of the Santa Fe area.

a 20-cm (8 inch) thick surface layer of reddish brown sandy clay loam. The substratum is a light reddish brown gravelly sandy clay loam with a mild calcareous content and is 85 cm (32 inches) in thickness (Folks 1975:43). The rough broken land soils are on steep slopes, have shallow depth, and consist of sandy to sandy loam. The colluvium at the base of rock slopes are the deepest deposits. These soils are heavily eroded and the ridges are deeply dissected.

Panky fine sandy loam occurs on level to gently sloping surfaces. Patches of this association occur at the base of the broad ridge tops along the secondary and tertiary tributaries of the Cañada Ancha and the gentle slopes of the transition between the piedmont and grassy juniper plains south and southwest of the Las Campanas area. It has a shallow cap of fine sandy loam that lacks plasticity. The loam content increases with depth to 15 cm (6 inches) below the surface. From 15 to 85 cm (6 to 32 inches) the soil increases in clay content and becomes increasingly calcareous. It has slow permeability with slow to medium run-off and a rooting depth of 1 m (39 inches). Available water-holding capacity is 10 to 25 cm (4 to 10 inches) (Folks 1975:39-40).

Cerrillos fine sandy loam occurs as a small patch south of Arroyo de los Frijoles along Buckman Road, and north of Buckman Road between Arroyo de los Frijoles and Arroyo Calabasas. Its slope is describe as moderate to rolling. Permeability is moderate with moderate run-off, having an effective depth of 25 to 50 cm (10 to 20 inches). High lime content is present below the 10 to 20 cm (4 to 8 inch) level. Effective water-holding capacity is 5 to 10 cm (2 to 4 inches) (Folks 1975:19).

Bluewing sandy gravel loam and Fivemile loam are in the floodplain of Cañada Ancha, Arroyo Calabasas, and Arroyo de los Frijoles. These soils have a water-holding capacity from 8 to 25 cm (3 to 10 inches) deep and an effective rooting depth of 40 cm (16 inches). These soils have poor to moderate irrigation potential, but the Fivemile loam will support farming (Folks 1975:87). Dry-farming potential is poor, though under optimal conditions these soils could have been farmed.

Most of the archaeological deposits occur within the modern or A Horizon of the predominant soil associations. The common and abundant occurrence of prehistoric and historic deposits on similar soil horizon surfaces suggest that the project area has not undergone radical geomorphological change in the last 3,000 years. Deeply buried late Archaic period deposits at LA 84758 and LA 84787 indicate that microenvironments within the project area have experienced substantial alluvial deposition. However, even in these areas the cultural deposits were marked by surface remains that were roughly contemporaneous with the subsurface cultural deposits. This does not suggest that the depth and content of the A soil horizons have not changed. It is clear that the majority of the cultural remains occur on deflated surfaces that have been reworked over the last 3,000 years. The predominant pattern of soil deflation on the slopes and ridgetop margins has served to expose the archaeological deposits and has mitigated against soil deposition and the formation of stratified cultural deposits. In fact, it is probable that the tendency of the piedmont to have large areas of exposed gravel and cobble deposits influenced prehistoric use of the area in collecting raw material for the stone tool industry.

Flora and Fauna

The Las Campanas area plant communities consist of two main classes common to the piedmont plains (Kelley 1980). These are the piñon-juniper woodlands and the rabbitbrush community. At the edge of the piedmont is the grassland community that extends to the edge of La Bajada. These plant communities combined with the riparian environment of the Santa Fe River would have been the main source of floral resources for prehistoric populations with the rabbitbrush community confined to Arroyo Calabasas and Arroyo de los Frijoles and their tributaries.

In the Las Campanas area the piñon-juniper woodland is the dominate plant community covering an estimated 80 percent of the land. The piñon-juniper woodland near Arroyo Hondo, as surveyed by Kelley (1980:59-60), was fairly homogeneous in stand composition and would have provided abundant fuel wood and piñon nut crops. The Las Campanas area is slightly lower than the Arroyo Hondo area and may be less productive. It is also possible that modern piñon-juniper woodland characteristics and distribution may not have been completely analogous to the prehistoric setting. Piñon germination is susceptible to ground cover characteristics with a thick grama grass cover retarding propagation. Grazing throughout the Santa Fe area over the last 150 years may have reduced the grama grass cover and increased the ability of piñon to propagate. Under cooler, moister conditions, healthy grama grass cover during prehistoric times may have dramatically altered the piñon-juniper woodland productivity and distribution (Kelley 1980:9-10). Piñon nuts and fuel wood may have been abundant but their distribution may have been more restricted.

Piñon-juniper woodlands had 135 of the 271 plant species observed within the Arroyo Hondo Pueblo catchment (Kelley 1980:60). Of these, 63 species are edible or have medicinal qualities. However, with the exception of piñon, most of the species are not abundant or are most productive in disturbed soils. Economic plant species besides piñon found in the piñon-juniper woodland and in archaeological context include yucca, prickly pear and pin cushion cacti, *Chenopodium* sp., *Amaranthus* sp., and Indian ricegrass. Wetterstrom (1986) suggests that intensive gathering of these species might off-set years of moderately poor agricultural production. However, consecutive years of poor moisture would affect the productivity of wild plants and cultigens alike, rendering their buffering potential unpredictable. Total available economic plant species of the piñon-juniper woodland project high wild resource productivity, but conditions that favor grasses and shrubs might off-set piñon-juniper productivity.

The rabbitbrush community of the arroyo channels and terrace slopes might provide the abundance and variability in plant species that is unpredictable for the piñon-juniper woodland. Through run-off, flooding, and erosion arroyo channels and terraces are more disturbed and support the grasses, shrubs, and succulents that favor disturbed conditions. The arroyo channels or terraces also may have been dry farmed, which would have left disturbed soils while lying fallow. Plant species of the rabbitbrush community include prickly pear, yucca, *Chenopodium* sp., *Amaranthus* sp., and Indian ricegrass.

The open, shortgrass plains occur at 1,525 to 2,050 m (5,000 to 6,700 ft). This area has the longest growing season, but receives the lowest mean annual precipitation (Kelley 1980:112). Under optimal conditions this community would be highly productive with abundant edible grasses and shrubs. Especially important is the ability of certain grass species to respond to intermittent rainfall by producing seeds when suitable conditions occur. Therefore, a dry season with a few intensive rain showers might trigger seed propagation (Wetterstrom 1986). This could be critical in years when crops do poorly and wild plants were the difference between survival and starvation. Indian ricegrass was common at Arroyo Hondo Pueblo, suggesting that it was commonly used as a supplement. Ricegrass gathering could have been staged from the Las Campanas area, which borders the shortgrass plains.

The fauna of the piedmont have been described in Wetterstrom (1986), Lang and Harris (1984), and Kelley (1980). Mammals most abundant on the piedmont would have been cottontail and blacktailed jackrabbit, a variety of squirrels, rats, mice, and gophers, prairie dogs, coyote, and mule deer. Pronghorn antelope would have roamed the shortgrass plains. Distribution and abundance of these species would have depended on available forage and prey species. It is likely that in good years a full range of small, medium, and large mammals would have been available. However, during the Pueblo period, Lang and Harris (1984) suggest that Arroyo Hondo residents became more reliant locally on small mammals and staged long-distance hunting trips for large game.

Precipitation and Temperature

The Santa Fe area has a semiarid climate. Most of the local precipitation occurs as intense summer thunderstorms that produce severe run-off and reduce usable moisture. The area receives an average of 229 to 254 mm of precipitation per year and a mean snowfall of 356 mm (Kelley 1980:112). The growing season ranges from 130 to 220 days and averages 170 days. The last spring frost usually occurs in the first week of May and the first fall frost occurs around the middle of October. The mean yearly temperature is 10.5 degrees C.

Precipitation and temperature combined with soil type are three environmental factors that influence plant and animal productivity and distribution, and the probability of success for irrigation and dry-farming techniques. Prior to A.D. 1050, low population density permitted mobility as an option when crop and wild resource productivity were low. After A.D. 1050, settlement along the Santa Fe River and in other major drainage basins of the Northern Rio Grande increased, and mobility options may have decreased. The effects of unpredictable climate may have strongly conditioned the timing and rate of community growth and the ability to maintain the highest population levels.

Rainfall and temperature ranges similar to modern patterns may have been sufficient to maintain small populations along the Santa Fe River. Consecutive years or long periods of better than mean spring and summer rainfall may have increased crop production and supported larger populations. Between A.D. 1050 and 1450, five periods of greater than average spring precipitation occurred: A.D. 1050 and 1080, A.D. 1195 and 1210, A.D. 1290 and 1340, A.D. 1390 and 1415, and A.D. 1430 and 1435 (Rose et al. 1981:98-99). These would have been periods when agricultural productivity could have surpassed the average, and established villages could have increased population. By the same token, settlement in the best-watered areas may have occurred when rainfall was low and surface water availability was critical to survival. Between A.D. 1250 and 1290 there were more bad years than good; this is the time that a small settlement was established at Pindi Pueblo (Rose et al. 1981; Ahlstrom 1989).

During the Coalition period (A.D. 1175 to 1350) rainfall and temperature fluctuation would have affected settlement and subsistence patterns. The piedmont hills of Las Campanas would have been used as resource abundance permitted. Consecutive good years may have boosted piñon nut crops resulting in intensive gathering. Poor years might have hampered piñon, but still supported cheno-am production resulting in gathering in the grasslands between piñon-juniper woodlands and on the short-grass plains. Severity of drought and the effect on productivity may have regulated distances traveled for foraging and the strategies for procuring and transporting resources. Environmental conditions undoubtedly had an effect on hunting-gathering practices and the formation of the Las Campanas archaeological record. Timing of environmental effects and the formation of sites may be difficult to correlate, but clearly they were strongly intertwined.

CHAPTER 3
ARCHAEOLOGICAL BACKGROUND

This section provides the archaeological background for the OAS excavations and the synthesis of the Las Campanas archaeological project area. The regional overview will focus on the broad settlement and subsistence patterns of populations that occupied the Upper Middle Rio Grande Valley. Regional and Santa Fe area site data will be used to provided a context for description and interpretation of the Las Campanas sites. This overview section is not intended to be exhaustive of all available data, but uses the most informative data or data from the largest projects. Sources for general information used in this overview of Upper Middle Rio Grande Valley culture history include Cordell (1978), Stuart and Gauthier (1981), Biella and Chapman (1977), Lang and Scheick (1989), McNutt (1969), and Stubbs and Stallings (1953).

Paleoindian Period

A striking characteristic of Santa Fe culture history is the paucity of evidence for occupation during the Paleoindian period (9500 B.C. to 6000 B.C.). The two reported occurrences are isolated late Paleoindian Cody complex artifacts from the Galisteo Basin near San Cristobal (Lang 1977) and the Galisteo Reservoir (Honea 1971).

In New Mexico, the most extensive and spectacular evidence for Paleoindian subsistence are the remains from the killing and butchering of large mammals (Stuart and Gauthier 1981). Evidence for hunting smaller mammals and plant gathering is rare and largely inferential (Judge 1973). Kill and butcher sites have the highest archaeological visibility, and therefore are reported most often.

The lack of reported Paleoindian remains may be a visibility problem instead of a lack of occupation. Paleoindian remains from hunting and gathering activities may be masked by later Archaic and Anasazi components. Geomorphological factors also may contribute to low visibility. Surfaces or strata containing the earliest remains may be deeply buried and exposures that contain Paleoindian remains may be difficult to identify or may be missed using traditional pedestrian survey methods (Cordell 1978:6).

The discovery of a Clovis period site in the Jemez Mountains suggests that Paleoindian populations used montane environments, where large game was available (Acklen 1993). The two identified Cody complex components may be evidence for a changing adaptation that was focused more on hunting smaller mammals and plant gathering than in previous periods. Use of the Middle Rio Grande Valley for hunting and gathering forays may have resulted in site or component distributions that were masked by later occupations or by deep, natural soil deposition.

Archaic Period

In the northern Southwest the Archaic period (5500 B.C. to A.D. 400 or 600) is generally described in terms of two major material culture traditions: the Oshara tradition (Irwin-Williams 1973) and Cochise tradition (Sayles 1983). These traditions are characterized by a hunting and gathering adaptation based on seasonal availability of critical resources, such as edible plants, game animals, and water. These traditions are divided into phases or stages based on temporal changes in material culture, site structure, and settlement patterns. Mostly the Oshara and Cochise phases are recognized by temporally diagnostic projectile point styles.

In the Upper Middle Rio Grande, sites with projectile points that are similar to Oshara and Cochise materials have been identified (Lang 1977; Thoms 1977). Early and middle Archaic period materials are similar to the Jay (5500 to 4800 B.C.), Bajada (4800 to 3200 B.C.), and San Jose (3200 to 1800 B.C.) phases of the Oshara tradition (Irwin-Williams 1973). The late Archaic-Basketmaker II period materials are similar to Armijo (1800 to 800 B.C.) and En Medio (800 B.C. to A.D. 1) phases of the Oshara tradition (Irwin-Williams 1973) and Chiricahua (6000 to 1000 B.C.) and San Pedro (1000 B.C. to A.D. 1) stages of the Cochise tradition (Sayles 1983).

Few sites from the Jay and Bajada phases

(6000 to 3200 B.C.) have been identified in the Upper Middle Rio Grande. Their low number reflects seasonal use of the Upper Middle Rio Grande by a small population. The occupations were brief and resulted in low amounts of refuse and the use of informal or shallow facilities. Recent excavations south of Santa Fe within the Dos Griegos Subdivision yielded obsidian hydration dates from the late portion of the Bajada phase (Lang 1992:103-110). These dates could not be associated with a specific component of the artifact assemblage. They demonstrate the potential for masking early Archaic period manifestations by late Archaic and Pueblo period occupations.

Two middle Archaic period sites (San Jose phase, 3200 to 1800 B.C.) have been identified in the eastern Galisteo Basin (Lang 1977). These San Jose phase components reflect brief occupations and based on the tool assemblage, were primarily focused on hunting. The chipped stone assemblages had higher percentages of obsidian than later assemblages. Lang interprets the San Jose phase occupation as one of "relatively limited, seasonal, upslope-downslope movement of San Jose microbands between different communities and biomes of the basin, and a more expansive seasonal movement of specialized hunting groups corresponding to deer population movements" (Lang 1977:16).

In the Santa Fe River Basin San Jose phase sites are rare. A single hafted San Jose scraper was recovered from LA 75686 in the Dos Griegos Subdivision (Lang 1992:107). Similar to the Bajada phase artifacts from the Dos Griegos Subdivision, the San Jose phase materials were mixed with late Archaic and Pueblo period materials. The San Jose phase obsidian hydration date from LA 75686 could not be associated with a discrete component of the chipped stone assemblage.

The Armijo phase is dated between 1800 and 800 B.C. based on sites excavated in the Middle Rio Puerco River Valley (Irwin-Williams 1973). Two major changes were observed in settlement and subsistence. The settlement pattern showed the first evidence of seasonal aggregations as indicated by the dense and extensive occupation floors at the Armijo Shelter (Irwin-Williams 1973:10). A change in subsistence is evidenced by the first indications of corn use and the presence of a stone tool kit that exhibited a wider selection of plant processing implements. The temporal indicator is the Armijo-style projectile point, which has an ovate blade, shallow corner notches, and a concave or slightly indented base.

Few Armijo phase sites have been identified in the Santa Fe drainage basin. The most recent evidence for Armijo phase occupation of the Santa Fe River Valley comes from the Tierra Contenta project between the Santa Fe Airport and the Santa Fe Country Club. Two sites, LA 54749 and LA 54751, yielded structures with radiocarbon date ranges from the late Armijo or early En Medio phases (Schmader 1994). One other site, LA 61282, located near Tierra Contenta, yielded three radiocarbon dates ranging between 1870 and 1450 B.C. (two sigma, 95 percent probability), but no definite structures (Post n.d.a).

The excavation of LA 61282, the Airport Road site (Post n.d.a), which yielded the 1870 to 1450 B.C. date, is the earliest and best-dated Armijo phase site in the Santa Fe area. Excavation yielded 22 pit features, an intensively used activity surface, and abundant core and biface reduction debris. Suggested activities that can be inferred from the feature and artifact assemblages include food and resource processing, production, and food consumption. This artifact and feature abundance and diversity indicate that the site may have been a residential or limited base camp. The accumulation and superimposition of features indicate that this base camp may have been reused, resulting in the higher artifact density (Post n.d.a).

At Tierra Contenta, LA 54749 yielded two radiocarbon dates from Structure 2 (Schmader 1994:41). The sample collected from the central hearth yielded a 1440 to 1140 B.C., two sigma calibrated date range (95 percent probability). The sample collected from Feature 9 yielded a two sigma date range of 1300 to 920 B.C. These two dates clearly show the problem with radiocarbon dates derived from charred wood recovered from late Archaic period contexts. The two radiocarbon samples are from the same occupation context, yet they have end dates that are 240 years apart. Schmader (1994:41) suggests that Structure 2 was occupied around 1200 B.C. However, because the wood species is not reported, the old wood effect cannot be assessed, although a 100- to 250-year later occupation date is possible (Schmader 1994:96). Therefore, the occupation could have occurred sometime between 1300 and 700 B.C., which is a significantly less fine-grained date estimate than the 1200 B.C. date suggested in the report. It is important to address the potential discrepancies in date ranges in order to reach a better understanding of the late Archaic occupation of the Santa Fe area.

LA 54751 yielded radiocarbon dates from Structures 1, 3, and 5 that collectively range from 1930 to 830 B.C. Two other structures did not yield radiocarbon dates. These structures could have been occupied at any time during the Armijo phase. Structure 1 had the earliest date range of 1930 to 1520 B.C. (two sigma, 95 percent probability) strongly indicating an Armijo phase occupation (Schmader 1994:92). Structure 1 was heavily eroded and did not yield ethnobotanical remains. Structure 3 yielded a two sigma date range of 1130 to 830 B.C. and Structure 5 yielded a two sigma date range of 1070 to 910 B.C. These two date ranges are close, but do not strongly support the concurrent occupation suggested by Schmader (1994:97). These dates are later than the Structure 1 dates, suggesting an occupation hiatus.

Structure 3 from LA 54751 has the most formal architectural features. It was 3 m long by 2.5 m wide with a 1-m-long east-oriented entry and a perimeter outlines by six postholes inside the shallow, sloping walls. The postholes indicate a semipermanent construction. A semipermanent shelter with a formal entry would be most probably built for cold weather habitation. An expected interior hearth is missing, though numerous extramural thermal features in close proximity to the structure yielded late summer or early fall seeds.

Structures 1, 2, 4, and 5 from LA 54751 are less formal than Structure 3 (Schmader 1994:49-68). Structure 1 was too eroded to provide information on subsistence and season of occupation. Structure 2 was also heavily eroded, but yielded a metate fragment and possible postholes. The presence of charred pigweed and purslane seeds suggest processing and consumption during the late summer or early fall occupation. Structure 4 was roughly 2 m in diameter with ephemeral stains of postholes and a single interior basin-shaped metate. Structure 5, located 1 m west of Structure 3, was roughly 2 m in diameter with an interior hearth and five postholes. The presence of an interior hearth may indicate a cold weather occupation.

In summary, Structures 1, 2, 4, and 5 are small pit structures that would have accommodated one or two individuals comfortably, while Structure 3 may have accommodated a small family. None of the features was associated with heavy concentrations of chipped stone debris. Low numbers of projectile points and hunting-related tools and no faunal remains were recovered from the site. The structures are differentiated by presence or absence of hearths and postholes and floor contact artifacts. The differences in hearth and posthole occurrence may reflect season of occupation or function. The differential distribution of metates on structure floors may result from reuse of site furniture by subsequent occupants.

The data from the Tierra Contenta and Airport Road sites suggest that during the Armijo phase the Santa Fe drainage was occupied seasonally for short periods by small groups during episodes of abundant subsistence resources during the Armijo phase and early En Medio phase. The clustered distribution of these sites indicates that a periodic, semipermanent water source was available. Undoubtedly more Armijo phase sites exist in the Santa Fe area, however the small artifact assemblages associated with the Tierra Contenta sites suggest that Armijo phase population impact on the Santa Fe area was limited. These sites were found in eroded areas where drainages cut through stained deposits buried by clean alluvial overburden. While eroded settings have a strong effect on the preservation of nondurable goods, they may be the only available window on Armijo phase and earlier occupation.

Between 800 B.C. and A.D. 400-600 during the En Medio to Basketmaker II periods in the northern American Southwest, important changes in settlement patterns and subsistence strategies are recognized in material culture and subsistence data, site structure, and site distributions. Changes in mobility and the gradual adoption of cultigens were the strongest conditioners of settlement and subsistence strategies (Wills 1988; Vierra 1985). As a result of a less mobile lifestyle and an increased dependence on cultigens, occupation duration increased, technological organization focused more on expedient tool manufacture, and more formal facilities, such as pit structures and storage pits, were constructed (Vierra 1990; Stiger 1986; Fuller 1989; Vogler et al. 1983; Irwin-Williams 1973; Schmader 1994). Chipped stone technology, which was dominated by biface manufacture before the En Medio phase, included increasingly more evidence of local raw material use and manufacture of expedient or less formal tools (Kelly 1988; Andrefsky 1994). How and when these changes occurred in the Upper Middle Rio Grande Valley is poorly understood because of the small number of excavated sites with reliable absolute dates. Currently, most explanations and interpretations of Upper Middle Rio Grande settlement and subsistence patterns rely heavily on the data from the Middle Rio Puerco Valley (Irwin-Williams 1973; Biella 1992).

Ten late Archaic period and Basketmaker II period sites were identified in the San Cristobal area of the eastern Galisteo Basin by Lang (1977). The sites had projectile point styles of Oshara and Cochise traditions. Lang (1977) suggested that populations from the south used the San Cristobal area between 800 and 400 B.C. as evidenced by one site with a Chiricahua dart point and one site with a San Pedro dart point. The occupation pattern of San Cristobal during this Cochise tradition intrusion evidenced small, specialized activity sites, reflecting short duration seasonal occupation (Lang 1977:317-326).

Lang (1977:327-328) assigns the span from 380 B.C. to A.D. 400 to the Basketmaker II period for the San Cristobal sites. He suggests that there was a shift from hunting-dominated occupations during the early part of the Basketmaker II period to more generalized hunting and gathering (1977:342). Some sites were reused, a practice that was not evident for earlier or later sites until A.D. 900. Evidence of reuse during the latter portion of the Basketmaker II period includes a site with eight hearths, grinding implements, and a greater focus on flake tool production and use (Lang 1977:345-346). According to Lang's (1977:328-329) climatic reconstruction, the periods from 50 B.C. to A.D. 200 and from A.D. 250 to 400 may have been the best for a hunting and gathering adaptation. These periods had precipitation patterns similar to or above modern precipitation averages combined with warmer than modern temperatures during the early period and equal to or cooler than modern temperatures during the later period. Warmer temperatures combined with above average precipitation would have supported a more abundant and perhaps diverse plant community and larger herds of large game mammals. Possibly, this year-round habitation could have been supported in the eastern Galisteo Basin and the Santa Fe drainage basin during these periods.

Farther south, at Cochiti Reservoir, Biella and Chapman (1977:201) suggest late Archaic period dates for most of the 90 nonstructural artifact scatters with hearths. These sites represent the first recognizable and most intensive use of the Cochiti Reservoir area. There were no conclusively identified early to middle Archaic period occupations. The large number of Cochiti Reservoir late Archaic sites is a marked contrast to the low numbers of late Archaic period sites in the eastern Galisteo Basin (Lang 1977). The Cochiti Reservoir site analysis addressed variability in site placement relative to diverse biotic resources. It was expected that site locations would reflect variability in residential group sizes, variability in activity performance, and variability in tool manufacture relative to raw material distribution (Chapman and Biella 1979:386-393).

Estimates of residential group size were based on the number of and spatial relationship between hearths, and the spatial distribution of hearths relative to artifacts. There was a consistent co-occurrence of hearths, fire-cracked rock, milling stones, and chipped stone densities that suggested mini-camps used by a single commensal group. The spatial pattern created an arc that enclosed a 3 to 4 m area of open space. At the apex of the arc were hearths associated with fire-cracked rock concentrations. Whole pieces of ground stone were commonly associated with the hearth. Fragmentary pieces were associated with the arc. Sites with more than one hearth that experienced larger group occupation or had multiple occupations were not located near areas with potentially higher vegetative diversity.

Investigation of variability in activity performance was based on a functional dichotomy of base camp and location. Base camps had a hearth with ground stone and chipped stone debris. Base camp assemblages consisted of a full range of core reduction debris distributed in the discard arc outside the hearth area. Smaller-sized core reduction and biface manufacture debris were clustered near the hearth and larger-sized debris formed the discard arc. The distribution of tools and manufacture debris indicated that manufacture and processing activities were not spatially segregated. Locations had chipped stone debris distributed in a circular pattern, which reflected a single occupation or activity. Early stage reduction debris was most common. Locations were used for generalized activities or for such a short time that formal tools were not used, broken, and discarded, nor was abundant flake debris generated by intensive production or the use of expedient tools.

Technological variability was strongly conditioned by locally abundant and suitable lithic raw material. Most tools were made from local material using a core-flake reduction technique. Obsidian mainly occurred as formal tools that were worn out or broken. If core reduction debris was present, it often exhibited waterworn cortex indicating that it was obtained from river gravel sources. There was little evidence of formal tool production or gearing up using local material. This suggests that the small mobile commensal groups commonly moved between areas where raw material for tools was available. Abundant raw material also allowed for a less efficient and more expedient technology, which generated considerably more waste than finished or used products.

The archaeological evidence for the late Archaic period at Cochiti Reservoir was summarized (Chapman 1979:72) as:

> . . . [a] picture of short-term residential occupations by very small complements of commensal groups, which characterize the late Archaic adaptation within the Cochiti Reservoir locale. Considerable redundancy for site location is evident in all aspects of subsistence-related behavior, including strategies of food resource processing and consumption; strategies of raw material selection for tool manufacture; reduction trajectories involved in tool manufacture; and the character of site space utilization.

Archaeological evidence for seasonal movement within and between different environmental zones was scarce because floral and faunal remains were poorly preserved or absent (Chapman 1979:73). The late Archaic Cochiti Reservoir inhabitants appear to have been residentially mobile, since the sites, except for hearths, lacked permanent structures or facilities. The distance between moves could not be determined, though it was probably determined by the distance between seasonally abundant resource patches. The lack of evidence for gearing up or an intensive biface manufacturing industry suggests that the group(s) moved to areas where raw material was available. The limited evidence for biface production also suggests that anticipated activities and tool needs between base camps could be supported by flake tools, existing formal tools, or by minimally reduced cores or nodules of material available from the river gravel.

An explanation of the difference in Archaic period site frequencies in the eastern Galisteo Basin and the Cochiti Reservoir locales is lacking. The different spatial-temporal distribution could result from changes in the paleoenvironment that required periodic shifts in subsistence strategies. The difference may arise from settlement behavior; sites along the Rio Grande were reoccupied often, resulting in greater artifact and feature accumulations. Less frequent reoccupation and a more dispersed settlement pattern would result in sites with lower archaeological visibility, like those sites in the eastern Galisteo Basin.

In the Santa Fe area, the most abundant pre-Pueblo period sites are from the late Archaic and Basketmaker II period. Recent projects have identified late Archaic-Basketmaker II components southeast (Viklund 1989; Lang 1992), southwest (Hannaford 1986; Lent 1988; Schmader 1994), and east (Lang 1993) of Santa Fe. A review of the NMCRIS files for eight USGS 7.5' quadrangle maps that include and surround the Santa Fe area yielded 31 sites or components from the late Archaic and Basketmaker II-III periods as of 1993 (Table 3.1).

The sites summarized in Table 3.1 are primarily dated with diagnostic projectile point styles. They are all open-air sites consisting of lithic artifact scatters with or without hearth complexes or fire-cracked rock concentrations. Site clusters in the Airport Road area (Hannaford 1986; Schmader 1994) southwest of Santa Fe, along the Cañada de los Alamos to the south of Santa Fe (Lang 1992), and along the Santa Fe River suggest that certain lowland locations were repeatedly occupied for short periods by small groups over a long period of time. Basketmaker II sites are reported in all environmental zones from the Santa Fe River Valley to the foothills of the Sangre de Cristo mountains. This distribution suggests that late Archaic-Basketmaker II populations exploited resources available in all environmental zones. Because the Santa Fe River Basin and the surrounding montane and piedmont environments offer considerable resource diversity, it is possible that late Archaic-Basketmaker II groups were the first to occupy the area year-round. A vertical mobility pattern was suggested by Chapman (1980) from the Cochiti Dam and Reservoir data. This spatially less extensive settlement pattern is in direct contrast to large area mobility patterns suggested for San Juan Basin late Archaic-Basketmaker II populations (Elyea and Hogan 1983; Vierra 1990; Fuller 1989).

Most of the sites from the Santa Fe area were identified as limited or temporary base camps and limited activity sites. Characteristics typical of these two site types are low numbers or no processing facilities and equipment, a low-

Table 3.1. Late Archaic-Basketmaker II Period Sites in the Santa Fe Area

LA No.	Quadrangle	Date Range	No. of Components	Setting	Size (m)	Site Type	Artifact Count	Ground Stone MA MT GF	Other Tools B S H O	How Dated?
81382	Agua Fria	1500-500 B.C.	1	Hill slope	15 x 8	Dispersed artifact scatter	17		2	D
84772	Agua Fria	100 B.C.-A.D. 500	1	Ridge top-hill slope	120 x 85	Dispersed artifact scatter	10s		1	D
84775	Agua Fria	1500 B.C.-A.D. 300	1	Hill slope	63 x 25	Dispersed artifact scatter	18		1	D
84787	Agua Fria	100 B.C.-A.D. 400	1	Ridge top-hill slope	40 x 40	Concentrated lithic scatter	10s		1	D
86148	Agua Fria	1000 B.C.-A.D. 400	1	Ridge top-hill slope	55 x 80	Concentrated lithic scatter	10s	1	4	D
75683	Seton Village	1000 B.C.-A.D. 400	1	Hill slope	18 x 25	Lithic scatter	15		1	D
75686	Seton Village	A.D. 400-1540	1	Hill slope	270 x 165	Dense sherd & lithic scatter	100s			D
75687	Seton Village	1000 B.C.-A.D. 400	1	Hill slope	42 x 45	Concentrated lithic scatter	10s		1	D

LA No.	Quadrangle	Date Range	No. of Components	Setting	Size (m)	Site Type	Artifact Count	Ground Stone MA MT GF	Other Tools B S H O	How Dated?
88335	Seton Village	late Archaic	1	Bench-arroyo edge	50 x 20	Lithic scatter-processing center	low 100s		1 1	D
54755	Turquoise Trail	800 B.C.-A.D. 400	1	Arroyo-wash	100 x 75	Lithic scatter-special purpose site	10s		1	D
54761	Turquoise Trail	800 B.C.-A.D. 400	1	Arroyo-terrace	120 x 55	Lithic scatter-special activity site	100s		1	D
65206	Santa Fe	800 B.C.-A.D. 600	1	Hill slope		Lithic procurement-processing site	1000s		1 11 101	D
76546	Santa Fe	1000-100 B.C.	1	Ridge top	136 x 32	Special activity-processing center	100s	1	* * *	D
84744	Santa Fe	Basketmaker- style point	1	Ridge top	37 x 29	Special activity-processing center		2	1	D
21547	Montoso Peak	BM II	1	Hill slope	100 x 100	Lithic artifact scatter	500±		*	D
75136	Montoso Peak	BM II	1	Low rise		Lithic artifact scatter			1	D

LA No.	Quadrangle	Date Range	No. of Components	Setting	Size (m)	Site Type	Artifact Count	Ground Stone MA MT GF	Other Tools B S H O	How Dated?
79652	Montoso Peak	1800-800 B.C. 100 B.C.-A.D. 400	2	Hill slope	60 x 50	Lithic procurement	100s	1 1 1	1 2	D D
79657	Montoso Peak	1 B.C.-A.D. 550 or A.D. 500-1230	1	Hill slope	24 x 29	Lithic/-sherd scatter w/possible work station	10s	1	1 1 1	D
44835	Agua Fria	Archaic-BM II	1	Flat plain	30 x 25 dispersed area/50 x 20 core area	Lithic scatter	low 100s	1	2 1	D
44836	Agua Fria	Archaic-BM II	1	Flat plain	45 x 30 dispersed area/120 x 120 core area	Lithic scatter/ seasonal camp(?)	low 100s	1 1	3	D
54752	Agua Fria	Archaic/En Medio-/Trujillo	1	Arroyo/ wash	95 x 66	Lithic scatter/ hunting camp (?)	100s	1	6	D
80723	Agua Fria	500 B.C-A.D. 400	1	Arroyo/ wash-flood-plain	640 x 396	Artifact scatter	10s		1	D
29791	White Rock	BM II	1	Arroyo/ wash	25N 32E 35S 55W	Lithic scatter		1	1	D
29797	White Rock	BM II	1		15N 35E 25S 0W	Sherd & lithic scatter			1	D

LA No.	Quadrangle	Date Range	No. of Components	Setting	Size (m)	Site Type	Artifact Count	Ground Stone MA MT GF	Other Tools B S H O	How Dated?
64629	White Rock	BM II	1	Plain	25 x 15	Lithic scatter			1	D
65022	White Rock	BM II	1	Mesa	45 x 30	Sherd & lithic scatter/ probable short-term camp	40-50	1	1	D
82572	White Rock	Archaic	1	Mesa	100 x 30	Dispersed lithic scatter	40-50		1	D
82613	White Rock	late Archaic	1		245 x 150	Concentrated lithic scatter	100s		1	D
75680	Seton Village	1458 B.C. 400-700 B.C.	2	Ridge	100 x 27/42	Lithic scatter			1 1	O D
75681	Seton Village	A.D. 310-508 A.D. 379-573 1800-800 B.C.	3	Knoll		Lithic scatter			1 1 1	O O D
75687	Seton Village	1000 B.C.-A.D. 400	Five 1	Hill slope	28 x 14	Repetitive use/special activity site	350		1 2 6	D
			2		30 x 26		14		1	D
			3		114 x 41		203		9 5 4	D
			4		36 x 20		37		2	D
		1500 B.C.-A.D. 300	5		27 x 17		62	1 1	2 4	D

density artifact scatter or small artifact cluster, and very few unbroken tools. Brief occupation is suggested by low artifact counts and limited artifact variability. A number of characteristics that would suggest longer, more permanent settlements are lacking from the survey data. Facilities and equipment are usually associated with longer occupations or planned reoccupations (Binford 1980; Vierra 1980; Elyea and Hogan 1983; Camilli 1989; Nelson and Lippmeier 1993). Formal tools, which are minimally reported, can be considered personal gear, which was highly curated and rarely deposited at limited activity sites (Binford 1979; Kelly 1988). Reuse of a limited base camp or activity area may result in overlapping or refurbishment of features and a higher artifact density (Camilli 1989). Reoccupation may result in a more scattered feature and artifact distribution, but higher artifact counts. Most sites exhibit low surface artifact density with evidence of multiple occupation resulting in spatially extensive sites with low artifact densities.

The best evidence for longer duration seasonal occupation comes from the Tierra Contenta sites. It could be argued that the Tierra Contenta sites (Schmader 1994) are En Medio phase and not Armijo phase sites, though they have been presented in the Armijo phase discussion of this section. Another pit structure from Tierra Contenta, Feature 8, LA 54752, yielded a two-sigma radiocarbon date range from 190 B.C. to A.D. 80, making it the best dated En Medio phase structure in the Santa Fe area.

A small number of unexcavated, late Archaic-Basketmaker II period sites that have not been excavated also may be residential base camps, including LA 88335 (Seton Village 7.5' Quad), LA 21547 and LA 79657 (Montoso Peak 7.5' Quad), LA 44835, and LA 88436 (Agua Fria 7.5' Quad). These sites have artifact assemblages that occur in high density clusters and tend to be more diverse, reflecting the greater number of site activities. These sites have lithic artifact concentrations with diagnostic projectile points, ground stone, and a small assemblage of formal tools. If reused or reoccupied, these sites can be very difficult to interpret unless the deposits are spatially distinct. If they are residential sites, late Archaic-Basketmaker II use of the Santa Fe River Valley and surrounding environs may have been more intensive than previously believed.

In the Sangre de Cristo foothills east of Santa Fe, LA 76546 yielded obsidian hydration dates between 100 B.C. and A.D. 300 (Lang 1993:94). Mixed, multicomponent deposits contained a stone tool assemblage that had debris from core reduction, biface tool manufacture, expedient and formal tool production and use, and grinding implements. However, no thermal or habitation features were identified. This site is strategically located near a large chipped stone raw material source (LA 65206), above a major tributary of the Santa Fe River, and with immediate access to montane environments. The lack of structures and thermal features may indicate a relatively brief, warm weather occupation with LA 76546 used as a staging area for hunting, gathering, and processing. The accumulation of chipped stone debris and tools could have resulted from reoccupation over a 300-year period. Future investigations in the foothills may yield a greater number of foothills camp sites providing stronger support for vertical mobility models.

Excavations of artifact scatters, LA 75680, 75681, and LA 75686, on the terraces of the middle reaches of Cañada de los Alamos, have yielded evidence of mixed Archaic and Pueblo period chipped stone assemblages. Estimated occupation dates are derived from temporally diagnostic projectile point styles, obsidian hydration, and pottery. The early and middle Archaic period components already have been presented. This discussion focuses on the En Medio, Basketmaker II, and early Basketmaker III period materials (Lang 1992). Each site yielded surface distributions indicative of palimpsest deposition over a long period of time. The artifact frequencies are low, but the assemblage diversity is moderate to high. Assemblage distributions reflect many brief occupations primarily related to hunting and small-scale gathering. A general absence of features and facilities combined with low artifact frequencies supports this observation. Obsidian hydration dates ranging from 100 B.C. to A.D. 700 suggest use by small groups or individuals for resource procurement and processing with the resources transported to a base camp or habitation for final processing, consumption, or storage. It is possible that Cañada de los Alamos served as a migratory route for medium and large game mammals during the fall. The presence of burned bone and the evidence of multiple occupations strongly suggests successful hunting expeditions from these sites.

The Cañada de los Alamos sites appear to represent the limited activity sites of a logistically organized subsistence strategy. To date, late Archaic period habitation sites have not been identified at the eastern edge of the Galisteo

Basin or in the rugged canyons of Apache Canyon or Glorieta Pass. Potentially, the late Archaic to Basketmaker II use was staged from the lower elevation residential sites of Cochiti Reservoir and the Tierra Contenta area.

Pueblo Period

Pueblo period developments are presented in the chronological framework devised by Wendorf and Reed (1955) and modified by Dickson (1979) for the Northern Rio Grande.

Developmental Period (A.D. 600-1200)

The Developmental period (Wendorf and Reed 1955) is divided into early (A.D. 600 to 900), middle (A.D. 900-1000), and late (A.D. 1000 to 1200) subperiods. This temporal framework roughly corresponds to the Pecos Classification system developed by Kidder (1924).

Early Developmental period sites are uncommon in the Northern Rio Grande (Wendorf and Reed 1955:138; Stuart and Gauthier 1981). Archaeological survey at Cochiti Reservoir found only 12 sites that could be assigned to this period (Biella and Chapman 1977:203). McNutt (1969:70) located no early Developmental period components north of La Bajada and White Rock Canyon. In the eastern Galisteo Basin only five components may date to this period (Lang 1977; Scheick and Viklund 1989). One suggested explanation for the late development of a sedentary, agricultural-based adaptation is that hunting and gathering sufficiently supported Northern Rio Grande populations into the A.D. 800s. This continued focus on hunting and gathering may be partly attributed to the rich resource diversity of the Northern Rio Grande Valley, forestalling an early reliance on small-scale farming (Cordell 1979:2, 1989:314).

As discussed for the late Archaic period, excavation data from sites along Cañada de los Alamos suggest use of the Santa Fe River drainage to support a residential lifestyle elsewhere. Low frequency artifact scatters with a relatively high proportion of hunting-related implements are indicative of a logistically organized subsistence strategy. If populations living outside the Santa Fe River drainage, presumably at lower elevations where agricultural production was more predictable, came into the area to hunt, then logistical organization would have been the most efficient strategy. An assumed logistical organization is partly supported by the dominance of obsidian at the Cañada de los Alamos sites. Transport and use of nonlocal material indicates a knowledge of the local material availability, anticipated the needs and uses of raw material, and conscious decision-making regarding the transport of obsidian on the foray to support the anticipated activities. As more dates from the A.D. 400 to 800 period sites that lack pottery are reported, a better understanding of early Developmental period subsistence organization should be possible.

Successful farming of the Santa Fe River Valley may have occurred by the early A.D. 800s. Farming was successfully practiced in the Albuquerque area to the south by the early A.D 400s (Cordell 1979; Reinhart 1967). In the Santa Fe area, temperature and precipitation may have been too unpredictable to sustain an agriculturally focused economy prior to A.D. 800. North of the Santa Fe River, small villages were established along the Tesuque and Nambe rivers after A.D. 800 (Wiseman 1995; Lent et al. 1994). These areas are at lower elevations, have predictable water supplies, and presumably could sustain agriculture. It is possible that small family-sized agriculturally sustained groups did occupy the Santa Fe River drainage at this time, but these sites have not been found.

During the middle Developmental period (A.D. 900 to 1000), site frequency increased in the Northern Rio Grande area. Excavations in the Santa Fe and Tesuque river valleys revealed pithouses associated with contiguous surface rooms, and perhaps a kiva (Honea 1971; McNutt 1969:58). The pottery was mineral painted in the Red Mesa style and neckbanded utility wares occurred. These sites do not necessarily suggest that population increased, but may reflect a change in the settlement and subsistence pattern to a more sedentary lifestyle. Sedentary occupations tend to leave more visible structural remains and artifact accumulations. The general settlement pattern was still one of low population density. Few sites dating to this period have been identified for the Santa Fe area.

The late Developmental period is assigned to the span A.D. 1000 to 1200. This period is roughly contemporaneous with the late Pueblo II and early Pueblo III of the Pecos Classification. In the Northern Rio Grande there is an increase in site numbers and size that suggests population growth (Wendorf and Reed 1955:140-141). Site size in the Northern Rio Grande area ranges from 1 to 100 rooms. Some researchers suggest that the increased population represents overflow from the Anasazi heartland (Cordell 1979). This hypothesis is partly based on the predominant pottery type, Kwahe'e Black-on-white, which was originally identified by Mera (1935) as a local Rio Grande variant of Chaco-style pottery. Kwahe'e Black-on-white is a mineral-paint pottery that favors hatchured and solid design elements. It has been suggested that the spread of this decorative style coincided with the growth of the Chaco system in the San Juan Basin in northwestern New Mexico (Toll et al. 1992).

Known sites near the project area include LA 114 (Arroyo Negro), LA 15969 (Wiseman 1978), and a minor component at Pindi Pueblo (LA 1) (Stubbs and Stallings 1953). The Pindi Pueblo component shows that some large Coalition period sites had their origins in this period (Stubbs and Stallings 1953:14-15).

Arroyo Negro (LA 114) was originally recorded by Mera in the 1920s. It has seven small (less than 10 rooms) to medium (11-25) room blocks constructed of adobe with cobble foundations (NMCRIS file). In 1934, W. S. Stallings collected 95 tree-ring samples from pothunted rooms and four kivas (Smiley et al. 1953:27-29). The tree-ring dates indicate an occupation span between A.D. 1050 and 1150, with less reliable A.D. 950 to 1000 dates for Kiva C. Two construction episodes occurred between the A.D. 1050s and A.D. 1130 to 1145 (Smiley et al. 1953:29). Identified pottery types at LA 114 included Kwahe'e Black-on-white, Santa Fe Black-on-white, Socorro Black-on-white, and Wingate Black-on-red.

LA 15969 was identified by Wiseman (1978:8) on top of the gravel terrace overlooking the north prehistoric floodplain of the Santa Fe River. The site included a U-shaped 14-room structure with a kiva. It is estimated to have been occupied between A.D. 1100 and 1150, making it contemporaneous with the later occupation of LA 114.

The late Developmental component at Pindi Pueblo (LA 1) had two jacal structural remnants, a pithouse, and sparse refuse (Stubbs and Stallings 1953:9). The refuse was in the central portion of the site on a knoll. Identified pottery types included Red Mesa Black-on-white, Kwahe'e Black-on-white, and Puerco and Wingate Black-on-red (Stubbs and Stallings 1953:14). Stubbs and Stallings observed that the pre-Pindi material was very sparse and the deposit ranged from 2 to 50 cm deep (1953:15). These deposits were underneath the later Coalition period occupation.

Coalition Period (A.D. 1200-1325)

The Coalition period is marked by three major changes in the archaeological record in the Northern Rio Grande: (1) a significant increase in the size and numbers of sites, suggesting an increase in population and an extension of the early village-level organization noted in the late Developmental period; (2) pithouses as domiciles were replaced by contiguous arrangements of adobe and masonry surface rooms; and (3) a change in pottery-making technology from mineral paint to organic-based painted pottery. These changes were sufficiently distinct from the late Developmental period to warrant a new period in the Northern Rio Grande cultural sequence, which was divided into two phases: Pindi (A.D. 1220-1300) and Galisteo (A.D. 1300-1325) (Wendorf and Reed 1955). The decorated pottery was divided into Santa Fe Black-on-white and all of its local variants (Stubbs and Stallings 1953) for the Pindi phase and Galisteo Black-on-white (Mera 1935) for the later phase. Most of the large sites were established during the Pindi phase. The largest sites continued to grow into the Galisteo phase, anticipating the large villages of the Classic period. Site sizes ranged from 2 to 200 rooms; 15 to 30 rooms was the most frequent size (Stuart and Gauthier 1981:51). Site frequencies in all areas of the Northern Rio Grande increased enormously at this time (Biella and Chapman 1977:203; Orcutt 1991; McNutt 1969; Lang 1977).

In the Santa Fe River Valley large villages on the prehistoric floodplain near the river channel were established during the early Coalition period. The only reported excavations are at Pindi Pueblo (LA 1) (Stubbs and Stallings 1953) and the Agua Fria Schoolhouse site (LA 2) (Lang and Scheick 1989). LA 1, LA 2, LA 109, LA 117, LA 118, and LA 119 have Santa Fe and Galisteo Black-on-white, and at least a small amount of glaze-paint pottery, suggesting that all six sites are roughly contemporaneous. These villages formed a large continuous community that was 3.2 km (2 miles) long. Sites in the Santa Fe River Valley recorded by Carter and Reiter (1933), but not by Mera, include CR (Carter-

Reiter) 178, 180, 182, 183, and 185. These sites may have Coalition and early Classic period components, since LA 1 (Pindi Pueblo) and LA 2 (Agua Fria Schoolhouse) were recorded by Carter and Reiter as historic sites.

Pindi Pueblo was excavated by Stubbs and Stallings in 1933 and the monograph on the excavation results was published in 1953. Based on Stubbs and Stallings's (1953) site map, 210 rooms, 2 plazas, 4 subterranean kivas, and 2 surface kivas were excavated. Stubbs and Stallings recognized two ceramic periods and three building periods (1953:155).

The first ceramic period and first building period were contemporaneous. The first ceramic period was dominated by Santa Fe Black-on-white and sand-tempered utility pottery (Stubbs and Stallings 1953:155). The first building period occurred between A.D. 1270 and 1305 (Ahlstrom 1989:369). The building was made of adobe, consisted of 40 rooms, and had an irregular shape. It was built on top of the central ridge that crosses the site. All or part of four kivas date to the first building period. The wall abutments shown on the site map indicate that the first building period resulted from erratic small-scale accretional construction. Most walls are two rooms long and there are few double corner abutments from simultaneous construction.

The second ceramic period dated between A.D. 1305 and abandonment in A.D. 1350 (Ahlstrom 1989:376). It includes Stubbs and Stallings (1953) Building Periods 2 and 3. Building Period 2 occurred between A.D. 1305 and 1340 and it included two periods of growth (Ahlstrom 1989:375). The early portion of Building Period 2 dated from A.D. 1305 to 1320. It was a period of slow growth with a possible occupational hiatus occurring between A.D. 1316 and 1321 (Ahlstrom 1989:375). During the latter portion of Building Period 2, Pindi Pueblo experienced rapid growth with an estimated 200 rooms constructed between A.D. 1320 and 1340 (Ahlstrom 1989:376). The pottery types were dominated by Galisteo and Pindi Black-on-white, western glaze polychromes, and a few Rio Grande Glaze A wares (Stubbs and Stallings 1953:155). Based on the tree-ring dates, the third building period is suggested to have occurred late in the A.D. 1340s.

Pindi grew rapidly from A.D. 1320 to 1339. Building Period 1 rooms were remodeled or razed and numerous room blocks were added to the village plan. The buildings were estimated to be one to four stories tall (Stubbs and Stallings 1953:31). The enlarged village enclosed two plazas, two surface kivas, and six specialized rooms that may have been kivas. While size and population may be correlated, Stubbs and Stallings (1953:10) are careful to mention that as room conditions deteriorated, rooms were abandoned, then trash or dirt filled these rooms and new rooms were constructed. This process is described in detail by Stubbs and Stallings (1953:10), but the implications for pueblo growth and population estimates are not explored.

The material culture of Pindi Pueblo indicated that corn agriculture was a major subsistence pursuit. Turkey pens were excavated showing that animal domestication was practiced. Stubbs and Stallings (1953) observed that there was little evidence of a stone tool industry, though this is in references to formal tools and not tool manufacture debris. Obsidian and local chert, chalcedony, silicified wood, and quartzite were the most common raw materials. Most of the illustrated tools were for heavy-duty use, such as mauls, hammerstones, adzes, hoes, and axes. A large number of manos and metates were also recovered.

A review of the material culture lists and illustrations show that the Pindi Pueblo inhabitants used an array of natural resources typical of the local ecozones. Faunal remains included 9 species of bird and 15 mammal species. The most abundant species was turkey, which was used for food, feathers, and as raw material for bone tools and ornaments. Large game mammals could have been obtained from the Galisteo Basin and the piñon-juniper piedmont. Curiously, no elk or bison bones were identified. This suggests that Pindi hunters had fairly restricted hunting ranges. Yucca was used for sandals, baskets, and mats. Macrobotanical specimens included the cultigens corn, beans, and squash, and wild plants included yucca, cactus, and amaranth.

Reasons for the abandonment of Pindi Pueblo are not offered by Stubbs and Stallings (1953). Lang and Scheick (1989:197), using dendrochronological data from Rose and others (1981), suggest that boom periods at LA 1 and LA 2 corresponded with variable moisture periods, while slow growth was associated with too much water. Too much water may have caused a contamination of the water table that affected agricultural productivity. In the middle A.D. 1340s, there was a brief drought period that corresponds to the decline and eventual abandonment of Pindi Pueblo. Poor soil quality, variable precipitation, and perhaps degraded living conditions may have all combined to force the abandonment of Pindi Pueblo.

Limited excavations at the Agua Fria Schoolhouse site (LA 2) yielded more information on the prehistoric Santa Fe River community that appears to have flourished during the middle to late Coalition and early Classic periods. Similar to LA 1, LA 2 was established sometime between A.D. 1275 and 1310 (Lang and Scheick 1989:189), which contradicts Stubbs and Stallings's (1953:155) notion that as LA 1 was abandoned, LA 2 was established. Clearly, both villages were inhabited concurrently during the Coalition period.

During the Coalition period, LA 2 was a coursed adobe pueblo with at least three plazas and an unknown number of rooms (Lang and Scheick 1989:191-192). The site size was estimated at 4.3 ha (11 acres) and may have housed between 1,000 and 2,000 people by the late A.D. 1300s (Lang and Scheick 1989:196). How many rooms were built, and by inference how many people occupied the village during the Coalition period, is unknown.

The LA 2 artifact assemblage has similarities with LA 1. Temporal change in pottery style frequency from Santa Fe Black-on-white to Wiyo Black-on-white to Galisteo Black-on-white was comparable (Lang and Scheick 1989:192). Trade wares from the Zuni-Acoma areas were the most common. The chipped stone industry showed a reliance on obsidian for formal tools and a heavy reliance on locally available materials for ground stone, large chipped stone hand tools, and expedient utilized flakes (Lang and Scheick 1989:192). Subsistence data showed a reliance on cultivated squash and corn, cattails and probably other riparian plants, wild plants, small fauna, and the consumption of domesticated turkey (Stiner 1989:187). People from both communities probably relied heavily on the initially abundant resources of the Santa Fe-Tesuque divide and the rolling piñon-juniper woodlands of the Caja del Rio. A definite increase in use of these areas is suggested by the large number of isolated occurrences and undiagnostic lithic artifact scatters recorded by recent surveys (Wiseman 1978; Maxwell 1988; Hannaford 1986; Viklund 1990).

Classic Period (A.D. 1325-1600)

Wendorf and Reed (1955) mark the beginning of this period (A.D. 1325-1600) by the appearance of Glaze A and locally manufactured red slipped pottery (see also Mera 1935; Warren 1979a). Characterized by Wendorf and Reed as a "time of general cultural florescence," regional populations reached their maximum size. Large communities with multiple plaza and room block complexes were established. Although the reasons for the appearance and proliferation of the glaze wares are debatable, many researchers, including Eggan (1950), Hewett (1953), Mera (1935, 1940), Reed (1949), Stubbs and Stallings (1953), and Wendorf and Reed (1955), believe that the similarity of the new pottery to White Mountain Redware is evidence for large-scale immigration into the area from the San Juan Basin and Zuni region. Steen (1977) argues, however, that the changes seen during this period resulted from rapid indigenous population growth. Steen believes that the population growth was enabled by favorable climatic conditions that allowed Rio Grande populations to practice dry farming in previously unusable areas. Steen also suggests that there was "free and open" trade between the Northern Rio Grande region and other areas, accounting for the observed changes in Classic period material culture.

It is therefore unclear how much of the population increase during this period resulted from immigration or from intrinsic growth. Besides populations migrating from the west, it has also been suggested that some population growth was due to the arrival of people from the Jornada branch of the Mogollon to the south, and perhaps from northern Mexico (Schaafsma and Schaafsma 1974).

Large villages of this period found in the Santa Fe vicinity include the Aqua Fria Schoolhouse site (LA 2), Arroyo Hondo (LA 12), Cieneguilla (LA 16), LA 118, and LA 119. The latter portion of Building Period 2 and Building Period 3 at Pindi Pueblo are early Classic period occupations. When Glaze C pottery appeared (ca. A.D. 1425), however, only Cieneguilla was still occupied and the size of its population is unknown. Dickson (1979) believes that abandonment of the large villages was due to the drought conditions revealed by tree-ring studies (Fritts 1965; Rose et al. 1981) and subsequent agricultural failure.

To the south of the project area in the Santa Fe River Valley, LA 1 and LA 2 are the best known Classic period sites. LA 1 was occupied between A.D. 1325 and 1350, which is the early part of the period (Stubbs and Stallings 1953:155). This may have been a time of population movement and village reorganization. Pindi Pueblo experienced a short interlude of decreased occupation before A.D. 1325, but by A.D. 1330 there was new building and renewed use of older parts of the pueblo (Stubbs and Stallings 1953:14). A similar pattern was suggested for LA 12 (Arroyo Hondo Pueblo) (Lang and Scheick 1989:196). A change in kiva function may be indicated by a change in their frequency (four to two) within villages and a change in their location from subterranean to surface placement. Perhaps as kiva function became more specialized, the number decreased. Plazas were more conspicuous at this time suggesting a more centralized social organization that may have required larger community areas for social or ceremonial functions. It is known that the large villages of the Galisteo Basin, the Rio Grande, and Rio Chama showed the same trends in the construction of fewer kivas and the use of larger, more centrally located community space, as early Classic period Pindi Pueblo. The full florescence of the Classic period was not realized at Pindi Pueblo because it was abandoned in A.D. 1350, just as the larger villages were being established.

The limited excavation data for LA 2 suggests an occupation that lasted until A.D. 1420, which corresponds to Arroyo Hondo Pueblo and La Cieneguilla. Little is known about the early Classic period at LA 2. The abundance of Glaze A pottery suggests that the residents were engaged in regular social or economic interaction with the more southern Classic period villages (Lang and Scheick 1989). Lang and Scheick (1989:195) surmise that LA 2 was the largest village in the Santa Fe River Valley until A.D. 1420. If the village did house between 1,000 and 2,000 people as suggested by Lang and Scheick (1989:196), then the smaller surrounding villages (LA 117, LA 118, and LA 119) may have been abandoned by A.D. 1350 with the local population coalescing at LA 2. An untested hypothesis suggests that this coalescence may have been brought on by a change in social organization, and not environmental conditions. The resources of the Santa Fe River could have been successfully exploited by many little villages. Success notwithstanding, sometime after A.D. 1350, everybody may have moved into one large village. If economic resources were equally available to all, then there must have been other social or religious factors that contributed heavily to population aggregation (Cordell 1978:58).

After A.D. 1420, Santa Fe River Valley east of Agua Fria was mostly abandoned. The large settlement at La Cieneguilla increased in size and was still occupied by Native Americans until the Pueblo Revolt in A.D 1680. The settlement pattern that prevailed throughout the Rio Grande, Rio Chama, and Galisteo Basin was a decrease in the number of small villages or large farmsteads. The remaining large villages in the Galisteo Basin, in the Cochiti area and in the Tewa Basin dramatically increased in size (Stuart and Gauthier 1981). Presumably these large villages had extensive subsistence catchment basins and extensive networks of social and economic interaction. The pattern of few or no Native American sites dating between A.D. 1420 and 1680 in the Santa Fe area is reflected in the survey results from large parcels near the Santa Fe River Valley (Hannaford 1986; Maxwell 1988; Wiseman 1978; Gossett and Gossett 1989; Lang 1980).

The Historic Period (A.D. 1540 to 1940)

The Historic period in the Santa Fe area spans more than 400 years of interaction among Native American, Spanish, and Anglo-American cultures. A detailed summary of historical events and trends for the Middle Rio Grande and the Santa Fe area is beyond the scope of this report. Interested readers are referred to the many sources that detail the events and patterns of the historical period (Jenkins and Schroeder 1974; Lamar 1966; Larson 1968; Bannon 1979; Noble 1989; Pratt and Snow 1988; Wilson 1981; Kessell 1979; Twitchell 1925; Swadesh 1974; Athearn 1989).

Except for the period of Spanish exploration, the Historic period is divided into time spans that reflect changes in political control in New Mexico. The Spanish exploration period includes the period between Coronado's *entrada* into New Mexico in 1540, and 1598 when Don Juan de Oñate arrived at San Juan de los Caballeros along the Rio Grande at modern San Juan Pueblo. The early Spanish Colonial period spans 1599 to 1680, which includes the founding of Santa Fe (1609-1610) and the beginning of the Pueblo Revolt. The return to Native American self-determination spanned 1680 to 1696. Beginning in 1696 and ending in 1698, Don Diego de Vargas recaptured New Mexico and returned political and economic control to Spain. The late Spanish Colonial period spanned A.D. 1698 to 1821, the year of Mexican independence from Spain. It was a time of settlement growth and expansion in New Mexico. The Mexican period lasted from A.D. 1821 to 1848. This period was a short interlude with minor changes in New Mexico social and political life, except for the initiation of trade with the United States and the official opening of the Santa Fe Trail. The Territorial period began in 1848, with the end of the Mexican-American War and the signing of the Treaty of Guadalupe Hidalgo. The Territorial period continued the expansion of the Anglo-American social, economic, and political system into the American Southwest that had begun with the opening of the Santa Fe Trail. The Territorial period ended with Statehood in 1912. From statehood to World War II (A.D. 1912 to 1945), New Mexico continued to become more integrated into the national political, economic, and social system. Education and economic opportunity outside New Mexico and the steady flow of Anglo-Americans into New Mexico combined to crystallize the tricultural traditions that are a recognized part of New Mexico's past and present.

A detailed history of the Agua Fria area and west Santa Fe are in Post and Snow (1992). Cordelia Snow's historical study of the Santa Fe River communities of Cieneguitas and Agua Fria is based on historical documents, including land titles, land grant documents, family genealogies, photographs, maps, and Spanish, Mexican, and American period archives. The following discussion (taken from Post and Snow 1992:21-22) will focus on the Historic period sites that are near the project area (Post and Snow 1992:21-22).

The earliest Spanish Colonial (A.D. 1650 to 1750) sites are the remains of ranchos that are located along the Santa Fe River floodplain between the west end of the project and Cieneguilla. These sites include the nine Spanish Colonial sites recorded by E. Boyd (1970). Their foundations and melted adobe walls were indicative of small casas, accompanied by possible torreons (defensive structures or granaries) and outdoor work areas. The middens were composed of Native American ceramics, rare Mexican or Spanish majolica pottery, chipped and ground stone artifacts, and a faunal assemblage including wild and domesticated species. To date only four remain intact (Fallon et al. 1978), and one of the nine sites, LA 16769, has been partly excavated and reported (Levine et al. 1985). The excavation revealed house and corral foundations and a midden. Other features with surface indications were a well, torreon, miscellaneous cobble alignments (outbuildings), and a midden. Native American ceramics included Tewa and Kapo Black, Tewa Plain, all types from the Tewa Polychrome series, and micaceous utility wares. Less than 10 artifacts of Euro-American manufacture that could be traced to before A.D. 1750 were recovered. Domestic fauna included cattle, sheep, and chicken. Wild fauna included deer, cottontail rabbit, bison, and antelope. The inhabitants of LA 16769 were herders and farmers, who maintained a self-supported, subsistence-level lifestyle (Levine et al. 1985:93).

Two other sites closer to the project area may have components that date from A.D. 1650 to 1750: LA 69996 (Gossett and Gossett 1989) and LA 2 (Lang and Scheick 1989). LA 69996, as mentioned before, is an extensive artifact scatter associated with an ash and charcoal stain and many cobble concentrations or alignments. Tewa series plain ware pottery and Sankawi Black-on-cream pottery from the site date between A.D. 1650 and 1750. Site size and the abundant cultural material indicate that this site had a domestic or residential component. It was probably established after A.D. 1700 when many smaller ranchos were established along the Santa Fe River (Simmons 1979:106-107).

LA 2 (the Agua Fria Schoolhouse site) excavations revealed buried foundations and adobe melt associated with Tewa series plain and polychrome pottery (Lang and Scheick 1989:197). The rancho was located along the Camino Real, the main road from Chihuahua to Santa Fe, as were the other settlements located farther downstream. The exact age and extent of the early Spanish Colonial remains at LA 2 was not determined, but they seemed to pre-date a later component that was dated between A.D. 1790 and the middle A.D. 1900s (Lang and Scheick 1989:197). The construction of the foundation resembled Native American technologies, but was different enough to suggest a later, more European handiwork (Lang and Scheick 1989:197).

Carter and Reiter (1933) identified 12 sites with historic components based on the presence of Tewa series plain and polychrome pottery. Five of the sites, as previously mentioned, also had prehistoric components and clustered around the east end of Agua Fria village, near the San Ysidro church. The other seven sites are located to the east on both sides of the river. The site maps show from one to six mounds with the dimensions ranging between 30-by-30 m and 80-by-240 m. The site plans are irregular, with two sites (CR 182 and CR 184) possibly having enclosed plazas. No other information about when the sites were occupied or their layout is available.

One other site near the project area, LA 1522, was recorded by Mera between 1922 and 1935 (NMCRIS files). There is no information about its size or content. Mera only identified the surface pottery as Tewa Polished, Tewa Polychrome, and Tsia Polychrome. These types date to the eighteenth century.

These site data show considerable occupation of the Santa Fe River Valley between A.D. 1750 and 1850 and that occupation was probably continuous into the twentieth century. Sites that post-date A.D. 1850 have not been recorded for the project area except the Component V excavation at LA 2 (Lang and Scheick 1989:197-198). The interest of researchers in Spanish Colonial and Mexican period sites was not great in the 1920s and 1930s. It is likely that sites from this period were ignored unless they were large. Some of the best archaeological evidence for occupation in the nineteenth century are the remains of the acequia system. Ditches and laterals of the Acequia del Pino and the Acequia Publica (Snow 1988) were still visible in 1912 and are partly visible within and near the project area today. These accequias reflect the long-standing status of the Agua Fria and West Alameda area as an agricultural area.

Site data for the late nineteenth and early twentieth century are nonexistent. The Las Lomas Subdivision survey (Mullany and Viklund 1988) identified the area as an extensive dumping site. The foothills on the edge of the Santa Fe River floodplain were used as a dump because they could not be farmed, lacked surface water, and were difficult to build on with early twentieth-century technology. Much of the land between the river and the tributary arroyos to the north was homesteaded with the domestic unit of the homestead located closer to the river. The foothills were used for resource procurement and trash disposal.

In summary, the Santa Fe River Valley and its surrounding environment was inhabited almost continuously from A.D. 1050 to today. There was a hiatus between A.D. 1420 and the middle A.D. 1600s or early 1700s. Prehistoric and historic inhabitants farmed the Santa Fe River, and they used the foothills for hunting and gathering and livestock grazing. Since proximity to water and arable soils was an important determinant of settlement, villages, ranchos, and homesteads were located near springs and on or near the fertile floodplain. The archaeological record of the past 1,900 years is incomplete, but obviously very rich with the potential for important future study.

CHAPTER 4
RESEARCH DESIGN

Introduction

OAS investigations for the Sunset Golf Course, Estates IV, Estates V, and Estates VII by OAS and the SAC investigations for Estates I, II, III, and the Sunrise Golf Course by SAC have resulted in numerous research designs and treatment plans. The research designs reflect an increasingly better understanding of the data potential of the sites and an attempt to focus research on site-specific questions and more general questions that would have project and regionwide relevance. SAC data recovery efforts were focused on documenting small site artifact scatter variability. OAS data recovery efforts used the results of the SAC data recovery efforts to target sites that might amplify patterns in the SAC data and fill in gaps that might reflect a different range of behaviors.

SAC (Scheick 1991b) developed a broad-based research design encompassing all 75 excavated sites. Research focused on small site variability in terms of artifact assemblages, site formation, structure, and function, and the economic and environmental factors that contributed to site location and function. This variability was to be studied from geographical and chronological perspectives. Small site excavations provided data that could be analyzed at site, intersite, microregional, and regional scales.

OAS submitted four research designs and treatment plans determined by the construction developmental phases (Sunset Golf Course [Post 1993a]; Estates IV [Post 1993b]; Estates V and part of Estates VII, LA 98690 [Post 1994a]; Estates VII, LA 98688 [Post 1994b]). Generally, the OAS data recovery efforts were based on test excavation results or at sites with unusually large or diverse artifact assemblages.

Sunset Golf Course Sites

The Sunset Golf Course sites were selected for excavation because they had a temporal and functional range that was under-represented in the SAC 75-site sample. LA 84758 was recorded as a small artifact scatter with ground stone. LA 84759 had a ceramic assemblage with a broad temporal span (A.D. 1175 to 1600), diverse vessel forms, and it was located along the most prominent sandstone exposure in the Las Campanas area. LA 84775 was a very low frequency artifact scatter with an associated En Medio or Basketmaker II style projectile point. LA 98861 was identified as a possible agricultural feature from the early Classic period of the Rio Grande sequence (A.D. 1325 to 1450). LA 85036 was a spatially extensive erosion and water control complex with a suggested time depth spanning the eighteenth, nineteenth, and twentieth centuries A.D. LA 98680, which is located within Estates VII, was a lithic artifact concentration associated with a rock configuration. Each site was selected for unique temporal, material, or physiographic qualities.

Estates IV Sites

The Estates IV sites, LA 86148 and LA 86150, were selected after a preliminary field evaluation that did not entail test excavation. LA 86148 was recorded as an En Medio phase artifact concentration. It also had one of the highest artifact densities known for the Las Campanas site assemblage at that time. LA 86150 was a spatially extensive sherd and lithic artifact scatter with at least five soil stains, ground stone, and relatively discrete subsite artifact distributions. All sherds were Santa Fe Black-on-white pottery (A.D. 1175 to 1400) suggesting LA 86150 was a repeatedly occupied campsite used by Coalition or early Classic period Santa Fe River inhabitants. Archaic period sites and reoccupied sites with discrete use areas were relatively rare for the Las Campanas site assemblage.

Estates V Sites

The Estates V sites, LA 84787, LA 84793, and LA 86159, were selected from 11 sites that were test excavated. The 11 tested sites were selected from a sample of 45 sites that had been identified by SAC. LA 84787 was a large lithic artifact scatter with six discrete concentrations, four of which dated to the Archaic period and were selected for excavation. LA 84793 yielded a shallow thermal feature associated with a Santa Fe Black-on-white pottery concentration. LA 84793 was tentatively interpreted as a pottery firing feature based on feature morphology and associated sherd breakage patterns. LA 86159 test excavations revealed three thermal features and artifact concentrations from at least two periods. One concentration of Santa Fe Black-on-white pottery was similar to waste sherds associated with pottery firing features located in Mesa Verde National Park, Colorado.

Estates VII Sites

Estates VII excavations focused on two spatially extensive artifact scatters. LA 98690 had at least five discrete artifact concentrations distributed over a 25,000-sq-m area. The pottery was Santa Fe Black-on-white. One fire-cracked rock concentration was similar to Archaic period thermal features. LA 98690 appeared to be a reoccupied camp site dating to the Archaic and late Coalition and early Classic periods. The LA 98688 artifact concentration covered an estimated 18,000 sq m. Pottery dates indicated an occupation span from A.D. 1050 to 1700. LA 98688 was potentially the most complex multicomponent site of the Las Campanas project.

The preceding brief data potential justifications illustrate the OAS goal to amplify patterns first seen in the SAC data and fill in gaps that might reflect a different range of behaviors. The sites were from the Archaic period or exhibited strong evidence of reoccupation by contemporaneous groups, were spatially extensive multicomponent sites, or they contained thermal features associated with unusually high artifact concentrations. The judgmental selection of sites for excavation using survey descriptions, field evaluation, or test excavations appears to have been a successful tactic.

The down side of the OAS effort was that all treatment plans could not be integrated from the beginning. The SAC treatment plan (Scheick 1991b) was considered too broad to address site-specific questions or problems that were related to a specific behavior or period. On the other hand the SAC treatment plan is broad enough that all data recovery results can be used to construct a descriptive and diachronic model of subsistence production and land-use patterns. The OAS treatment plans are strong in their treatment of site-specific research and methods, but weak in project and region level research orientation. However, general integrative themes of chronology, site structure and formation, occupation patterns, and subsistence production and technology are in all OAS research designs. These topics are used to organize the following sections. Our goal is to be able to integrate Las Campanas into a regional level interpretation yielding a more holistic view of past human occupation of the Santa Fe drainage basin.

Theoretical Orientation

The OAS Las Campanas research primarily follows a processual approach. The processual approach views cultural systems as organized at many scales and it can be applied to a wide range of problem areas (Binford 1979:202). Processual methodologies may be empirical or scientific and may include replication, ethnoarchaeological observation, or detailed ethnographic and cross-cultural comparisons. Observations drawn from processual methods may result in hypothesis testing or the formulation of propositions about relationships between the dynamics of human behavior and the static archaeological record (Binford 1980:5). Often, processual studies employ statistical model building useful for prediction and sampling. Though the theory behind the processual approach is unclear and often eclectic (Rindos 1984), processually oriented studies tend to be highly explicit in terms of definition, classification, middle range operationalization and theory building. Contributions by processual archaeology in the 1970s and 1980s have focused on describing and explaining the organization of human cultural systems, identifying the archaeological consequences of these systems, and the effect of natural and cultural processes on the formation of the archaeological record.

The processual approach strives to understand the culture change and process in terms of organizational frameworks or structural properties of systems within which behaviors or cultural dynamics occurred (Binford 1981:202). The best processual definition of "culture" is that it is the "extra-somatic means of adaptation for the human organism" (White 1959:9). The processual approach is concerned with evolution as processes that are responsible for changes and diversification in organization. The human extrasomatic means of adaptation extends to physical and social environments. While recognizing the importance of social and ritualistic systems, the bulk of processual studies have focused on the organization of economic systems as adaptations to the physical environment.

A major focus of processual studies has been on bridging the gap between general theories of human behavior and the statics of the archaeological record. This focus on middle-range theory is primarily concerned with the formation processes of the archaeological record (Binford 1977:7). The archaeological record is often defined as "a static pattern of associations and co-variations among things distributed in space" (Binford 1980:338). Middle-range theory building seeks "to understand the relationships between the dynamics of a living system in the past and the material by-products that contribute to the formation of the archaeological record remaining today" (Binford 1977:6). "Formation of the archaeological record is an ordered consequence of levels of adaptive organization . . ." (Binford 1977:6) and therefore may result from a set of behaviors that are more complex than the material remains may indicate. Furthermore, the archaeological record may represent a palimpsest of materials left from many separate episodes that may or may not be organizationally related (Binford 1981:197).

Recently, the processual approach has been used to examine and interpret patterns within the archaeological record at the scale of landscape (Camilli 1989; Ebert 1992; Rossignol and Wandsnider 1992; Nelson and Lippimeier 1993; Hunter-Anderson 1979, 1986). An archaeological landscape is the patterned record of the material remains left by populations that inhabited and used a region (Rossignol and Wandsnider 1992; Binford 1982). The archaeological landscape reflects the organization of social and economic subsystems. As the organization of these subsystems changed, so should the content and structure of the archaeological landscape. Geomorphological processes that differentially expose and bury archaeological materials may have a strong effect on perception and analysis of the archaeological landscape (Ebert and Kohler 1988:123-128). Materials from early occupations may be mixed with later deposits in surface contexts, confounding our interpretation of land-use patterns. Early materials may be deeply buried and only visible in eroded contexts, resulting in an underrepresentation in the archaeological record.

The Las Campanas Archaeological Project resulted in the identification of 1,500 isolated occurrences of artifacts or features and 255 sites representing over 5,000 years of occupation. The isolated occurrences generally consisted of an isolated feature or a concentration of fewer than 10 artifacts of different material types or functions within a 100-sq-m area. Sites were defined as 10 or more artifacts of different material types or functions in an area of less than 100 sq m or fewer than 10 artifacts associated with an architectural or thermal feature. While recognizing the drawbacks of the concept of "site" (Dunnell 1992), site and the associated terms, component and activity area, are useful to identify different organizational aspects of a system (Binford 1992:50). Site, as defined for the Las Campanas Project, was also a necessary administrative unit that was used to make determinations of significance and guide the development of treatment plans and execution of data recovery efforts.

The Las Campanas Archaeological Project documented the material remains left by different cultural systems and the organization of their economic or subsistence subsystems. The different patterned aspects of the archaeological record reflect elements of stability and change in these subsystems in response to social and environmental factors. In the truest sense, the Las Campanas area is a small sample of a larger archaeological landscape used by populations that moved through the Santa Fe drainage basin over 5,000 years. The occupation patterns were different in length, intensity, and organization. The Las Campanas Archaeological Project focused on identifying the range of temporal components represented by the sites and isolated occurrences, the study of subsistence production strategies that were employed by the different groups, and the land-use and settlement patterns that resulted from different subsistence strategies. The main site-specific questions concentrated on chronology, subsistence production, and occupation history. Regional problems related to large-scale land-use patterns north of the Santa Fe River. The discussion of the research design is divided into the broad Archaic, Pueblo, and Historic periods.

Archaic Period Sites

Previous study of Archaic period sites in the

Santa Fe area has focused on site-specific and regional problems. The Cochiti Reservoir study examined relationships between site locations and vegetative diversity, site size and artifact density, group size and feature frequency, and subsistence remains and seasonality (Chapman 1979). The Airport Road site (LA 61282) study focused on problems of population increase through immigration or indigenous growth, comparisons between logistical and residential sites using artifact assemblages and site structure, regional Archaic settlement patterns as reflected by nonlocal materials, the relationship between artifact assemblage and site function, and interregional differences in site structure and artifact assemblage reflecting use of different environments (Lent 1988:17-18). The Las Campanas research design (Scheick 1991b:26-27) focuses on land-use patterns on the piedmont slope including variability through time, site function, and changes in regional socioeconomic organization. Within these broad issues are more site-oriented problems of occupation history, technological organization and subsistence production, and site structure. Problems of a more project-wide scope include determining and reconstructing settlement and subsistence strategies of the piedmont slopes and their role within regional adaptations.

Four late Archaic-Basketmaker II period sites were excavated, including LA 84787, LA 84758, LA 86148, and LA 84775. LA 86139 was test excavated during site evaluation for Estates V. These sites were occupied between 1800 B.C. and A.D. 400, as determined from diagnostic projectile points recovered during survey and testing. The site specific research questions for the OAS excavations focus on chronology and site function, which subsumes issues of occupation history, technological organization, and subsistence production. The data from this small sample of Las Campanas Archaic period sites will be integrated into problems that pertain to the Santa Fe drainage basin and lower Northern Rio Grande areas.

Chronology

Diagnostic projectile points recovered during inventory and testing indicate that Archaic period occupation of Las Campanas may have occurred between 1800 B.C. and A.D. 400 A.D. This span includes the Armijo and En Medio phases of the Archaic period and the Basketmaker II phase of the Pueblo period. Changes in settlement and subsistence patterns occurred at different rates across the northern Southwest in response to environmental, economic, and social factors. The Northern Rio Grande Archaic period record suggests that many of these changes occurred slower and later than elsewhere in the Southwest.

Temporal data are important for studying changes in social and economic organization that may be related to past environmental variability. Periodicity in precipitation and temperature may have affected abundance and distribution of natural resources used by local populations. As biotic conditions changed, the social and economic organization of groups living in an area may have altered subsistence production strategies. While these strategic shifts can be viewed as responses, they more likely entailed a change in the emphasis on existing or past strategies. These strategic shifts altered group size or composition, length of occupation, location of residential sites, or even resulted in periodic or permanent abandonment of an area. One of the strongest independent variables that conditioned shifts or responses is the environment. Refinement of chronological data is needed to determine if changes in social or economic organization corresponded with improved or deteriorated environmental conditions. Examination of such correlations is possible only if chronological data are refined beyond phase or period date ranges.

Improving on temporal data based on projectile point typologies will provide a better foundation for understanding the Northern Rio Grande Archaic adaptation within a broader spatial and cultural framework. To achieve the finer temporal resolution, data recovery efforts focused on obtaining as many chronometric dates using as many methods as possible. For Archaic period sites three possible chronometric dating methods had the greatest potential: carbon-14 dating, archaeomagnetic dating, and obsidian hydration dating. The advantages and drawbacks of these methods are briefly evaluated.

Radiocarbon dating is most often used because carbonized material tends to be abundant or at least present on sites in a wide range of environmental and geographic settings. As Smiley (1985) pointed out, the error factors that affect radiocarbon dates are multitudinous. Many of the factors cause only small error and can be more or less ignored. However, factors such as use of old or inner wood results in errors of up to 500 years. Because these large error factors can heavily skew an absolute date, care is necessary in selecting carbon samples for processing. Charcoal was collected whenever it was abundant or came from a well-controlled provenience, such as the bottom of a feature. The charcoal samples were sorted in the laboratory. Seeds, twigs, or annuals were given first priority for processing. If only small quantities were available, then extended count or accelerated methods were considered. When only old wood was available, then a small number of samples were processed, but with the knowledge that the results might be too early.

Archaeomagnetism does not have as fine a resolution as dendrochronology, but it does have other advantages because the samples are collected from a fixed context. Archaeomagnetic samples were collected from burned features or contexts with adequate iron content to allow polar calculations. Because the samples came from spatially fixed features, they were not affected by reoccupation, reuse, or post-occupation disturbance. Therefore, the sample dates the last use of a feature and by association, the occupation level or surface. Problems with archaeomagnetism include obtaining a reliable polar curve for a particular period and area. The quality of the curve affects the accuracy of the date range. The polar plot may have from 1 to 4 degrees of standard error, which translates into about a 10-year per degree error. This is a good date range when compared with obsidian hydration and some carbon-14 results. However, the 4 degree radius may include two parts of the curve yielding dates from two unrelated periods. In this case, other dating methods are needed to determine which is the correct or best date.

Obsidian hydration can be useful for dating, but the error estimates tend to be large (200 to 400 years), which provides poor resolution. The quality of the hydration dates depends on the sample depth, the length of time it was subjected to corrosive processes, and the care with which samples are selected. Clearly, surface samples or samples that were on the surface for a long time are suspect because of rime deterioration. The deeper the context, the better the chance for a "good" date. Care in sample selection is important because obsidian in certain situations may have a very long "use-life." Recycling and scavenging of artifacts at residential, base camp, and quarry sites may result in reworked edges or flake scars of very different ages. Each will have its own rime thickness and the average of an Archaic and Pueblo period date is really no date.

Datable material and samples were scrutinized and evaluated in terms of spatial integrity, origin, and number. In this way dates were not indiscriminately assigned, leading to erroneous interpretations.

Site Function

The study of Archaic period site function will focus on material and spatial studies that provide information on technological organization, subsistence production, and occupation history. Technological organization is inferred from artifact morphological, functional, and frequency data that relate to raw material procurement and reduction and strategies of tool production, maintenance, and transport. Subsistence production is inferred from technological organization, feature morphology, content, and distribution, the spatial relationships among artifacts and features, and site locations relative to critical subsistence resources. Occupation history combines elements of site and assemblage structure that relate to occupation duration, group size, and multiple occupation or reuse.

Technological Organization

Technological organization for Las Campanas Archaic period sites primarily relates to lithic tool manufacture, use, maintenance, and discard. Chipped stone artifacts are by far the most common artifact type found by the Las Campanas inventories. Chipped stone and ground stone industries represent a small percentage of the activities conducted and materials used by past populations, but they can be powerful tools for understanding past activities and behaviors.

In regard to technological organization, Binford states that, "Within this framework it is consistent to view technology, those tools and social relationships which articulate the organism with the physical environment, as closely related to the nature of the environment" (Binford 1962:218). Basically, the tools should fit the requirements of the environment. Furthermore, Binford asserts that artifacts should not only be studied as technology, but should be understood in terms of there "primary functional context in the social, technological, and ideological subsystems" (Binford 1962:218). Binford suggests that there are three major classes of artifacts within the primary functional contexts: technomic, sociotechnic, and ideotechnic (1962:219). The processual approach has been most successful at dealing with technomic cultural remains, which have their primary functional context in coping directly with the environment (Binford 1962:219). Sociotechnic and ideotechnic artifacts are more difficult to recognize and correctly interpret without having direct knowledge of sociological and ideological systems in which they operate or by finding them in their original functional context.

Chipped stone as an indicator of subsistence activities relies heavily on inferred technological trajectories that involved raw material procurement, core reduction, tool production, use, and maintenance. As mobile hunter-gatherers, Archaic period groups may have employed situation-dependent lithic technologies (Binford 1979; Kelly 1988). Factors that might condition lithic technologies include but are not limited to the following:

1. Distance from residential sites to the resource area determines duration of the foray and supplies that will be needed to successfully accomplish anticipated activities. Binford distinguishes between daily foraging activities and logistical or long-distance activities in suggesting how lithic technologies may be organized. The nearer to the residential site activities occur, the less planning would have been necessary, as broken or depleted tools could be easily replenished. As distance from the residential site increased, toolkit composition needed more careful consideration of raw material availability, caching, or recycling of materials previously discarded at locations (Binford 1979).

2. Access to suitable raw materials allows production or replacement of tools, which may be exhausted during the processing activities. Availability of suitable raw materials requires less planning and transport of fewer curated or formal tools. Long-distance or long-duration forays may not result in debris and discard patterns that are different from residential or brief foraging forays if suitable raw materials are available (Andrefsky 1994). Lack of suitable raw materials may require transport of more specialized tools or cores resulting in chipped stone assemblages dominated by tool manufacture debris and discard of exhausted tools (Kelly 1988; Binford 1979).

3. The range of activities that occurred on a site heavily influence the lithic technology and the diversity and frequency of manufacture debris, tool use, and tool maintenance. Debris from base camps should be markedly different from daily foraging sites or logistical hunting camps. Debris from temporary base camps may resemble base camp patterns with differences in frequency and diversity of debris, tools, and material types (Binford 1979; Vierra 1980; Ebert and Kohler 1988; Ebert 1992).

To interpret chipped stone patterns, many lithic specialists define two chipped stone reduction strategies that are based on expectations of forager and collector subsistence models proposed by Lewis Binford in the early 1980s (Binford 1980). Curated strategies are characterized by the manufacture of bifaces that served as the source of flakes or blanks for informal and formal tools and as formal tools. Expedient strategies focused on the production of flakes for use as tools with limited or no modification. Curated strategies were suggested to be associated with residential mobility, while expedient strategies were associated with long-term residential stability. Each strategy may result in debitage and tool morphology and frequency patterns that are relatively distinct.

Curated strategies emphasize production of the maximum length of usable edge per core (Moore 1994:287). Flintknappers maximized the number of usable flakes per core with the added potential of using the core as a tool. By more efficient tool production, waste was reduced and raw materials were more effectively used, reducing the amount of raw material that needed to be transported to or obtained from a base camp. Expedient strategies were not conditioned by transport costs, therefore raw material did not have be used as efficiently (Bamforth 1991; Andrefsky 1994). Flakes were removed from cores as needed.

Curated and expedient strategies are defined as mutually exclusive. However, it is more likely that these different reduction strategies operated on a continuum. Reliance on one or the other strategy would have been relative and conditioned by availability of suitable raw material, occupation duration, range of tasks, potential for reuse of existing materials, and distance from the residence in the case of logistical or daily foraging sites. Chipped stone assemblages undoubtedly represent a mix of these reduction strategies with subtleties masked by more abundant artifact classes.

Since it is most probable that assemblages will possess aspects of both strategies, it may be proportions of different debitage or tool classes that will be the most informative. A way to interpret relative proportions of debitage attributes and artifacts is to quantify or describe the assemblage in terms of the reduction stage or sequence. Classifying assemblages in terms of early, middle, or late stage core or biface reduction assumes that different processes may combine within the technological organization. Assemblages with a preponderance of early stage core reduction debris may indicate the presence of suitable local raw material. An abundance of nonlocally available biface reduction debris may indicate a logistically organized subsistence strategy for which local materials were not considered suitable, or a lack of knowledge of local raw materials existed. Examining assemblages in terms of reduction stage or sequence can be useful for understanding technological organization and contributes to identifying the range of activities that occurred.

Attributes that can inform on the factors that affect lithic technological organization are material type and texture, the percentage of dorsal cortex present, the number of dorsal scars, artifact condition, and dimensions that can be applied to all chipped stone artifacts, and flake striking platform and termination, which can be applied to core flakes and biface flakes. The definitions and information potential for these attributes are discussed in the Office of Archaeological Studies Lithic Artifact Manual (OAS Staff 1994) and will not be reiterated in this study.

Subsistence Production

Subsistence production can be directly inferred from dietary evidence and indirectly investigated by studying the technology used to procure and process foods. Dietary evidence includes faunal and floral remains. Technological evidence is inferred from the study of chipped and ground stone manufacture and use. Lithic technology was addressed in the previous section and will be referred to briefly. This section will focus more on feature morphology, contents, and distribution, and the relationship between artifact assemblage and feature distribution.

Subsistence production can be understood in terms of site types and distributions that result from different strategies. Forager and collector hunting and gathering models are used to identify site types and explain their distribution across a landscape (Binford 1980; Elyea and Hogan 1983; Fuller 1989). Foragers are characterized as residentially mobile and collectors are logistically mobile. A combination of foraging and collecting may be used to exploit a broad spectrum of subsistence resources, but rely on different ways to procure and process resources. Groups that use both strategies have been termed serial foragers (Binford 1980; Hogan and Elyea 1983). Both models define a functional site typology that includes a residential base camp, limited base camp, special activity sites, and resource extraction sites (Binford 1980; Vierra 1980, 1985; Elyea and Hogan 1983; Ebert and Kohler 1988; Ebert 1992). Usually, Archaic period hunter-gatherers are described as having a flexible subsistence strategy, varying according to season and resource distribution. In other words, foraging and collecting were employed as environmental conditions required. For the Upper Middle Rio Grande, use of the forager-collector models has been limited by a lack of data from large contiguous areas and an absence of a synthesis of existing data. Las Campanas Archaic period sites will be examined from the perspective of forager-collector models, although the strength of the conclusions are affected by a small site data base and the limited number of absolute dates.

Subsistence and changes in subsistence strategy can be addressed using floral and faunal remains, features, the artifact assemblage, and their spatial relationships. Floral and faunal remains are most commonly recovered from processing and residential features. Initially, Las Campanas sites showed limited potential for yielding a wide range or high frequency of features, but excavation proved that sites were more complex and better preserved than was expected. Floral and faunal remains typically have not preserved well in open-air contexts, therefore any floral or faunal remains reflect a very small part of what was actually used. West Golf Course and Estates IV excavation strategies required recovery of 1 liter of soil from each feature or discrete context within a large feature. Low recovery rates for floral and faunal remains resulted in the collection of all or at least 50 percent of the fill from each thermal feature.

Increased sample size increases the probability of recovering charred remains or provide a stronger argument for nonplant processing and light animal processing functions for features.

Feature size, shape, condition, and associated materials and artifacts were monitored or recorded. Binford (1983) suggested that different sizes and depths of thermal features were used to process foods or to produce heat for warmth. Deeper small pits were most commonly associated with heating, while open, shallower pits were commonly associated with processing and cooking. Furthermore, late Archaic period sites from the Cochiti area had consistent occurrences of fire-cracked concentrations or fire-cracked rock associated with features (Chapman 1979). Use of rock in stone-boiling or roasting plant resources is commonly reported in ethnographic literature, and charred plant remains are found with fire-cracked rock in archaeological contexts. Feature attributes and associated materials will be compared within and between Archaic period sites for variability that may result from differences in subsistence production.

The presence of ground stone, such as manos and metates, can be used to infer processing activities. Metates, which are large, nonportable items, would be expected at residential sites or temporary base camps that were used for more than a day. Metates at temporary base camps might indicate caching in anticipation of future visits (Binford 1979:273-274). Manos are smaller and more portable and may have been discarded at temporary base camps or limited activity sites. In an area where cobbles are abundant, a mano would not be an indispensable piece of personal gear.

Lancaster (1983) has suggested that different mano and metate shapes and sizes provide optimal grinding for certain types of seeds or grains. Manos and metates from Las Campanas can be examined from the perspective of functional differentiation. Use of manos for food processing, storage, or immediate consumption may be examined using Lancaster's assumptions.

Occupation History

Occupation history can be investigated at the scale of activity area, component, site, landscape, and region. Occupation history is reflected in the content, frequency, distribution, and spatial relationships of artifacts, facilities, and deposits. Differences in artifact, facilities, and deposits at all scales result from occupation intensity, duration, extent, and function. Site structure is the spatial associations that result from these occupation behaviors and that can be studied by the archaeologist.

The OAS study of Las Campanas occupation history focuses primarily on sites. As such the patterns of site structure and formation, which are strongly influenced by occupation history, are conditioned by the social and economic organization of a cultural system that used the place (Binford 1982; Ebert 1992). The purpose for which a site was used or the site function has a strong effect on the cultural deposits that are left behind. The distribution of artifacts and features may result from numerous cultural and natural processes. Site formation studies assume that different levels of social and economic organization within and between cultural systems will result in distinctive, though potentially complex, artifact and feature distributions and associations. Occupation history and the resulting site structure is conditioned by the complex interplay between human variables of group size, occupation duration, the range of activities conducted and the technological and logistical organization of subsistence production.

Group Size. Group size is an obvious conditioner because the more people that occupy a site, the greater likelihood more domestic activities will be conducted. Implicit in a greater range of activities would be the need for more facilities, processing, and consumption of biotic resources, and more geologic sources. Residential sites would have been occupied by the largest groups. Small, task-specific sites might have been occupied by a segment of a larger group, so group size might affect the distribution of small sites and isolated occurrences in an area. Residential sites will be more complex than task-specific sites regardless of group size. However, the number and distribution of task-specific sites within an area should reflect the proximity of a residential site and the size of the local population. Another implication of group size is that a larger group may produce a more mixed artifact assemblage than a small group, if occupation length and activity were held constant (Vierra 1985; Ebert 1992; Binford 1980:16). If a small group occupied a site for an extended period and reoccupied the site many times, however, the resulting site structure might resemble a large group occupation. An example of this problem in interpretation was described for a large project in northwestern New Mexico (Reher 1977; Moore and Winter 1980; Hogan and Winter 1983).

Group size for Archaic period hunter-gatherers is difficult to estimate for the northern Southwest. A large group may be the minimum number of people necessary for a viable hunting and gathering adaptation. Based on ethnographic sources this number ranges from 18.6 to 25 people (Vierra 1985:106). In the Northern Rio Grande region, there are few if any Archaic period residential sites that can be confidently attributed to even the minimum group size of 19 individuals. Therefore, either viable, commensal groups did not inhabit the Northern Rio Grande during the Archaic period or group size estimates are too high. In the Cochiti area, late Archaic period sites were estimated to have one to four commensal groups using a site at any given time. These estimates were based on the number and spacing of fire-cracked rock concentrations and hearths. The distribution pattern suggests that each group had a discrete occupation area, but the lithic debris from each group overlapped. Hearths that were spaced 4 m apart were interpreted as contemporaneous. Hearths that were closer than 3 m were considered to reflect reoccupation. Based on the Cochiti data, general observations about group size may be made for the Las Campanas Archaic period sites if hearths are not present or discrete, but contemporaneous artifact distributions can be defined.

Occupation Duration. Occupation duration has the obvious effect of accumulation of debris and facilities as the length of stay increases. Just as an increase in group size would increase the grain or resolution of the site structure and content, so would an increase in length of occupation. While it might be convenient to consider the relationship between artifact accumulation and occupation duration as linear, there are too many other factors that could affect the relationship. Even if group size were held constant, environmental factors that could affect the relationship between accumulation and duration might include abundance and distribution of food resources, season of occupation, type of activities, types of tools required for activities, and the technology used to make the tools.

Even with the obvious limitations, different spatial patterns of activity and discard areas may reflect duration of occupation and group size and composition. Short-term diurnal occupation or special activity sites, limited base camps, and residential base camps should have had distinct site structure (Binford 1980; Vierra 1980; Stiger 1986; Camilli 1979). Recognizing these distribution patterns is important for sorting out activity area and site occupation sequence.

Short-term occupation with a restricted activity focus may result in unpatterned association among features, activity areas, and discard areas (Binford 1980; Vierra 1980). Limited base camps may have had a wider range of activities and longer occupation duration. These sites may have a patterned distribution such as that defined for many of the Cochiti Reservoir lithic artifact scatters with features and fire-cracked rock concentrations (Chapman and Biella 1979; Camilli 1979). Residential base camps that were occupied for weeks or months during a season should have a combination of artifact assemblage diversity, formal feature construction, and accumulated discard areas. In situations where these kinds of occupation patterns are single-episode, they should be recognizable.

In situations where a site has multiple occupations, mixing occurs with the longer duration occupation masking the shorter duration, more ephemeral occupation. Mixing of residential base camp and shorter duration occupations masks the shorter occupations and increases the intra-assemblage variability and spatial distribution noise (Vierra 1980; Camilli 1979, 1989). Residential occupation should still be recognizable under these conditions. The same general observation should hold true for mixed limited base camp and special activity assemblages and distributions. Special activity occupations that spatially overlap may not be distinguishable. Monitoring the distribution of large reduction debris or discarded hand or grinding tools may provide some indication of occupation sequence (Camilli 1979). Overlapping special activity occupations may form high density artifact deposits that look like an accumulation from a longer occupation.

The study of occupation duration and site formation will use patterns of artifact density and artifact type distribution to map occupation episodes. Data needs for this study were straightforward. Sites and activity areas or components were excavated and the artifacts collected so density plots and distribution maps could be generated. Excavation focused on contiguous blocks rather than transects across the activity areas to allow spatial analysis using a 1-by-1-m grid system for collection and excavation. Piece-plotting of large artifacts such as manos, metates, or concentrations of fire-cracked rock, aided in identifying activity and discard areas. Density maps were generated with feature overlays showing distribution patterns that can be related to occupation intensity, duration, and complexity.

Regional Context

Regional synthesis focused on comparing the Las Campanas Archaic period sites and then examining the Las Campanas Archaic period patterns in terms of Archaic period site assemblages from within the Santa Fe Basin. The Cultural History section provides background information on Archaic period occupation in the Santa Fe Basin. Areas that have been investigated included the eastern Galisteo Basin (Lang 1977), middle Cañada de los Alamos (Lang 1992), the Cochiti Reservoir area (Chapman 1979), the middle Santa Fe River (Schmader 1994), and the Sangre de Cristo foothills (Lang 1993; Post 1993). These areas represent a wide range of environmental zones, biotic resources, and geological sources. Excavation results suggest considerable differences in occupation history and duration, resource exploitation, and regional mobility patterns. The synthesis focuses on identifying patterns that relate to changes in Archaic period occupation and the use of the Santa Fe Basin through time and in response to changing climatic conditions.

The Pueblo Period Sites

Pueblo period sites make up the largest group of sites that yielded temporally diagnostic artifacts during inventory and excavation phases. OAS investigated 21 sites with 26 datable components. The 26 components were identified based on the presence of temporally diagnostic pottery types. Pottery manufacture dates indicated a temporal range from A.D. 1000 to 1600. Twelve sites were test excavated and nine sites were included in the data recovery efforts. Results from test excavation of LA 86147, LA 86149, LA 86151 (Post 1993b), LA 98682, LA 98683, LA 98687, LA 98689, and 98691 (Post 1992) were provided in earlier reports. Test excavation results from LA 86131, LA 86134, LA 84773, LA 86155, and LA 86156 are presented in this report. Interpretation of the testing results are guided by the data recovery plans submitted for the excavated sites. Excavated sites with Pueblo period components include LA 84775, LA 84759, LA 84793, LA 86150, LA 86159, LA 98680, LA 98688, LA 98690, and LA 98861. Investigations focused on chronology, site function, land tenure, and cultural affiliation. More specific problems were investigated for some sites because unique features or artifact assemblages were identified. The following provides the general research background and orientation for the Pueblo period site investigations.

Chronology

Chronology or site/component dating is an important first step toward understanding site function within a cultural system. During the life of a cultural system, different site types or occupation patterns may reflect responses by populations to changes in their social and physical environment. Based on excavation data from village sites along the Santa Fe River, at Arroyo Hondo, and the Cochiti Reservoir area, it is understood that subsistence system organization during the late Developmental or early Coalition periods was different from subsistence production during the late Coalition or Classic periods. During the Pueblo period it is generally agreed that populations along the Santa Fe River Valley relied heavily on agricultural production. Between A.D. 1000 and 1500 it has also been documented that population increased and settlement patterns changed from dispersed, small settlements to aggregated, large villages. Skirting the argument of the ultimate cause of change in cultural systems, changes in population frequency and distribution undoubtedly affected how agricultural land was used. Cultural factors combined with independent environmental conditions to determine which land could be farmed. Just as farming strategies and locations may have changed, use of the piedmont landscape may have changed as more people depended on the available natural resources and the distribution of people in relation to natural resources changed.

Excavations of village sites have provided a temporal framework for studying material culture and architectural change and their inferred relationship to Pueblo period social and economic dynamics (Stubbs and Stallings 1953; Allen 1973; Creamer 1993). Abundant dendrochronological dates were used to seriate pottery assemblages and document building and remodeling episodes and pueblo establishment, growth, and abandonment (Creamer 1993; Ahlstrom 1989; Stubbs and Stallings 1953). Ethnobotanical and faunal remains and artifact assemblages have been used to reconstruct Pueblo period subsistence and model changing reliance on agricultural and natural resources. The Las Campanas study provides an opportunity to look at changing social and economic patterns from evidence recovered from small sites scattered across the landscape that contained the natural resources supplementary to an agricultural lifestyle.

Refining the Las Campanas Pueblo period site dates becomes an important function of the data recovery effort if patterns observed in data from village excavations and small site data and patterns are to be compared. Possible avenues for refining the site or component dates include dendrochronological, radiocarbon, obsidian hydration, archaeomagnetic, and ceramic dating. The advantages and limitations of radiocarbon, archaeomagnetic, and obsidian hydration were discussed for the Archaic period. These issues are no different for the Pueblo period. Dendrochronological and ceramic dating are two methods that also can be applied to the Pueblo period.

Dendrochronology. Dendrochronology has been used extensively and successfully in dating sites from the Pueblo period in the Santa Fe area. Excavations at Pindi Pueblo (LA 1; Stubbs and Stallings 1953; Ahlstrom 1989), Arroyo Hondo Pueblo (LA 12; Lang 1993), and the Pojoaque Grant Site (LA 835; Wiseman 1995) yielded abundant samples that were used to document pueblo establishment, growth, and abandonment.

Dendrochronology may be the best method when reliable samples are available. Reliable samples should have 15 to 20 years of rings with attached inner or outer bark. Dendrochronology samples are best when collected from structural remains because their final context is known, although construction material reuse and stockpiling can cause inaccuracies (Graves 1983; Crown 1991; Ahlstrom 1989).

The prospect of obtaining suitable samples from Las Campanas sites was not encouraging. The open-air and surficial nature of the majority of the Las Campanas sites decreased the likelihood that suitable tree-ring samples would encountered. The lack of retrieval of dendrochronology samples from a hearth or roasting pit context was tempered by the same "old wood" problem that affects Carbon-14 samples (Schiffer 1987:309-312).

Ceramic Dating. Ceramic dating is the least desirable dating method, but proved to be the most effective for refining Las Campanas site and component occupation dates. In the Santa Fe and Galisteo Basin areas, ceramic dating has a long history starting with Nelson's early stratigraphic and seriation studies in the Galisteo Basin (1914). Ceramic typology and dating in the Northern Rio Grande was continued by Mera in the 1920s, 1930s, and 1940s (Mera 1935, 1940). The tradition continues today with archaeologists cross-dating ceramic types to provide a date range for small sites that lack other means for obtaining objective dates.

Obviously, even with their individual limitations, chronometric dating methods should be used if possible. If ceramics and chronometric samples were present, then they were used together to refine occupation dates. In the absence of chronometric dates, ceramic dating was used. The most obvious limitations on ceramic dating was the small sample sizes, multicomponent assemblages, and the reliance on cross-dating with other methods that have their own limitations. These limitations notwithstanding, ceramic dating was the primary method available for refining the Las Campanas Pueblo period site and component dates.

Different techniques of ceramic dating have been developed and of these, mathematical seriation methods have the longest and most widespread use. Temporal ordering of assemblages using dendrochronological data provides ranges for assemblage frequencies (Lang 1993). Using established assemblage profiles requires relatively large assemblages, which were not recovered from the Las Campanas sites. Other more objective and less reliable methods relied on identification of temporally sensitive paste or design attributes that have been chronometrically dated for assemblages from other sites in a particular area. Seriation requires fairly large sample sizes, presence of pottery types that are known to be temporally sensitive, and unmixed components. Based on the survey and testing observations, small pottery assemblages of low typological diversity are expected. This limited the utility of ceramic seriation, although considerable diversity in paste and surface treatment characteristics within small assemblages were used to assign a tentative or relative date to a site or component.

Paste and surface treatment characteristics that are temporally sensitive were derived from assemblage descriptions from village excavations. Reporting on the village assemblages were uneven and lacked direct comparisons between characteristics and the absolute dates. However, trends or tendencies are often cited that were valuable. For Northern Rio Grande ceramics, temper, paste texture, and rim form and decoration are temporally sensitive (Stubbs and Stallings 1953; Warren 1979a; Habicht-Mauche 1993). Ceramics recovered from Las Campanas sites are analyzed to provide descriptive and quantitative data comparable with large, dated assemblages that have provided chronological sequences.

Site Function

Twenty-six components from 21 sites were assigned to the Pueblo period. Occupations occurred between A.D. 1050 and 1500 with the assumed bulk of the occupations occurring between A.D. 1250 and 1350, when the Santa Fe River Valley villages were built and inhabited. All Pueblo period sites were artifact scatters and none had recognizable architectural remains. Within this site assemblage there was a range of artifact frequency, diversity, and distribution. Further differences were evident in the presence and frequency of thermal features. The degree of artifact and feature variability implied different site functions, though a formal site typology was not developed from the survey data. Definition of a site typology would have required preconceptions about the range of activities conducted at the site, length and intensity of occupation, and function of thermal features. Thus, an explicit goal of the investigations was not necessarily to define a typology, but to assign a site function. Inferring a site function would result in a framework that could be used to create a typology in terms of Pueblo subsistence strategies and land-use practices.

Site function can be inferred from variability in artifact types and attributes, feature morphology, remains of subsistence items, such as animal and plant remains, spatial relationships between features and artifacts, and site location relative to abundant or critical subsistence resources. Frequency, diversity, and distribution of features and artifacts may directly or indirectly reflect subsistence strategies as well as occupation duration and intensity, group size, and condition and structure of past environments.

Studies that contribute to defining site function and perhaps creating a site typology are technological and quantitative analysis of the artifacts, morphological and content analysis of features, and spatial analysis of artifacts and features. Technological analysis was conducted on ceramic, chipped stone, and ground stone artifacts.

Ceramic analysis identified pottery types, characterized paste and surface finish, described design elements, and identified vessel form and portion. Analyses conformed to previous studies of Rio Grande pottery (Warren 1979a; Mera 1935, 1940; Habicht-Mauche 1993; Lang and Scheick 1989; McKenna and Miles 1990). Paste analysis was supplemented by petrographic analysis.

Chipped stone analysis focused on attributes that reflect material procurement, reduction sequence and strategy, and tool production, use, and maintenance. Chipped stone analysis conformed with Office of Archaeological Studies' analysis procedures (OAS Staff 1994). These analysis standards were designed to provide information on lithic reduction sequences and strategies. They were especially useful for segregating formal tool production from expedient tool production and core reduction. The analysis standards allowed flexibility in material identification, so that generalized material categories could be supplemented by site or regional specific raw material sources. Use of these standards ensured compatibility with other OAS projects so that regional and temporal data bases can be compared.

Ground stone analysis evaluated technologies geared to processing agricultural or wild plant products. Artifacts were monitored for manufacture method, raw material type and form, size and shape, condition, and wear. A large assemblage of ground stone was recovered from Pueblo period sites. The presence of ground stone might reflect a wider range of activities or domestic-related activities, as would be expected for a day-use field site. Office of Archaeological Studies' standardized ground stone analysis format was used for the Las Campanas assemblage.

Morphological and content analysis of features provided information on the range of activities as inferred from the facilities that were constructed and used. Features are described individually according to size, shape, construction, and condition. Feature content is assessed through ethnobotanical analysis of charred plant remains. At least 1 liter of soil was collected from every feature for ethnobotanical analysis. Presence of economic plant species was interpreted as direct evidence of plants that were processed or consumed by site occupants. Inter- and intra-site comparisons were made for thermal features. Comparison of features yielded criteria that was used to more accurately assess feature function and by association, site function.

Spatial analysis of artifacts and features allowed sites to be sorted into functional and temporal components. Sites, such as LA 86150, LA 86159, or LA 98690, had multiple features and associated artifact concentrations. These components were segregated and compared for differences that reflected function. Artifact count or attribute density plots were used to identify patterns that relate to different activities.

Land Tenure and Cultural Affiliation

Who used the Las Campanas area during the Pueblo period? This question suggests that the Las Campanas area could have been used by residents of more than one area and that through time there were changes in who used the Las Campanas area.

The Santa Fe River Valley and the Pajarito Plateau were settled by A.D. 1050. Settlements were dispersed, unit pueblos or pit structures, and population levels were low compared to the thirteenth and fourteenth centuries. Until A.D. 1250 the river valleys and adjacent environmental zones would have been sufficient to support populations without intensive use of more distant areas, and competition for land and resources would have been minimal. Use of the Las Campanas area would have been periodic and probably only by people living on the terraces above the Santa Fe River.

After A.D. 1250, population increased in the Santa Fe River Valley and the southeast Pajarito Plateau. With an increase in population, land and resources were subjected to more intensive and extensive use. Increased competition for resources beyond the main agricultural zone of the Santa Fe River Valley may have resulted in tighter control of traditional common lands. Extension of foraging territories into the piedmont from multiple villages would result in reuse of primary resource areas and exploitation of previously untapped areas. Traditional land use patterns may have fluctuated with groups from the Santa Fe River Valley and the southern periphery of the Pajarito Plateau and Tewa Basin using the Las Campanas area. Between A.D. 1250 and 1350, residents of Pindi Pueblo, Agua Fria Schoolhouse site, and Cieneguitas would have extended their foraging range into and beyond the Las Campanas area. To the north, along the edge of the Caja del Rio and the southern periphery of the Pajarito Plateau, Coalition period villages such as LA 174 (Caja Del Rio Pueblo) and LA 211 (Sankawi), may have extended their foraging ranges south along the Cañada Ancha drainage and into the piedmont.

The Las Campanas area is 5 to 7 km from the Santa Fe River Valley. The Pajarito Plateau and Caja Del Rio villages are 17 to 21 km distant. Based on distance alone, the Santa Fe River residents would be expected to be the most frequent users. However, the presence of tuff-tempered sherds on Las Campanas area sites preliminarily suggested that Pajarito Plateau and Caja del Rio villagers also used the area (Post 1992:97). Analysis of paste attributes for Santa Fe Black-on-white from Las Campanas sites allows a general assessment of geographic origin of groups that most frequently used the Las Campanas area during the Coalition and early Classic periods.

Inventory data show a marked decrease in sites and isolated occurrences that post-date A.D. 1350. This pattern corresponds with a probable change in foraging strategies that accompanied a decrease in population and eventual abandonment of the Upper and Middle Santa Fe River Valley. Middle to late fourteenth-century populations using the Las Campanas area would have traveled from Cieneguilla Pueblo, the Galisteo Basin or the lower Pajarito Plateau. Pottery from the A.D. 1400 to 1600 period provide an indication of the origin of the Las Campanas inhabitants.

For Santa Fe Black-on-white pottery, temper and paste were examined for characteristics indicative of Santa Fe River Valley or Pajarito Plateau manufacture. The Santa Fe River Valley pottery had fine-grained paste and subrounded quartz and feldspar temper (Lang and Scheick 1989:62). Santa Fe Black-on-white pastes from the Pajarito Plateau are also fine, but contain tuff fragments in combination with quartz, feldspar, hornblende, biotite, or muscovite (Lang and Scheick 1989:62). Frequency and distribution of the different paste types were examined for consistent patterns. These were used to make statements about land use and tenure.

For Classic period glaze and matte-paint pottery, temper and paste attributes of pottery from LA 2, LA 5, LA 16, and Cochiti Reservoir sites were compared with Las Campanas assemblages. Detailed pottery analysis of the glaze paint sherds recovered from LA 2 (Lang and Scheick 1989) and the Cochiti Reservoir (Warren 1979a) Classic period sites were available for this study.

Examination of the pottery paste and temper entailed microscopic and petrographic analyses. Existing descriptions of temper and paste were used to identify and characterize the Las Campanas assemblages. The identified suite of minerals and nonplastic inclusions were compared with information on geological sources of temper and clay. The identification of raw materials combined with descriptions of pottery from major village sites provided information on where Las Campanas pottery was made and by inference the origin of the site occupants.

The Historic Period Sites

The Historic period sites, LA 85036, LA 84754, and LA 84776, were within the Sunset Golf Course project area. These sites were identified by SAC during the Sunset Golf Course inventory (Scheick and Viklund 1991). LA 84754 and LA 84776 were placed in protective easements and will be preserved within the golf course.

The LA 85036 research design was presented in Post (1993a) and will not be restated in detail. Investigation of LA 85036, a water and erosion-control complex, focused on site chronology and function and a detailed description of the complex. These goals were accomplished through field investigations that included excavation, written and photographic recording, and mapping, personal interviews with former owners and employees of the Soil Conservation Service, and archival research into the location and activities of local Civilian Conservation Corps camps during the 1930s and 1940s.

Besides the investigation of LA 85036, an ethnohistorical study of Las Campanas and the Santa Fe Ranch was undertaken. The ethnohistorical study provides a historical background that focuses on important events in regional history and how they affected land-use patterns. The study begins with the Spanish *entrada* and briefly summarizes Spanish land-use patterns and their impact on Native American practices with an emphasis on the Spanish land grants. Discussion of the Territorial period (1848 to 1912) emphasizes early homesteading and the Denver and Rio Grande Railway, "The Chili Line." Early statehood to recent times (1912 to 1984) focuses on the history of the Santa Fe Ranch. The Santa Fe Ranch study combines archival materials and interviews to provide a chronology and anecdotal account of ranching practices and early residential development.

CHAPTER 5
ETHNOHISTORY OF LAS CAMPANAS

by Janet Spivey

Introduction

A brief ethnohistoric study of Las Campanas was conducted from April to July 1995 by the author. During that time, data were collected to determine land-use history, economic activities of owners, past land-use strategies, and the placement of this site in a larger sociocultural context. Research methods included site visits, a study of land title records, historical documents, and archival records, a review of pertinent published resources relating to the general history of the Santa Fe area, and interviews with knowledgeable individuals.

Historic Overview

The Historic period in the Santa Fe area spans more than 400 years of interaction among Native American, Spanish, and Anglo-American cultures. A detailed summary of historical events and trends for the Middle Rio Grande and the Santa Fe area is beyond the scope of this report. There are many sources that detail the events and patterns of the historical period (Jenkins and Schroeder 1974; Lamar 1966; Larson 1968; Bannon 1979; Noble 1989; Pratt and Snow 1988; Wilson 1981; Kessell 1979; Twitchell 1925; Swadesh 1974; Athearn 1989).

Exploration, Colonization, and the Pueblo Revolt (1540-1692)

The historic period began with Coronado's *entrada* in 1540. Coronado did not pass through the present location of Santa Fe, nor did the four expeditions that passed through New Mexico between 1581 and 1590 (Bannon 1979; Jenkins and Schroeder 1974; Kessell 1979). Don Juan Oñate planned a settlement expedition to the area in 1595, but in-fighting, administrative delays, and financial problems prevented the expedition from leaving before 1598 (Bannon 1979:34-36; Kessell 1979:69-76). In 1609, don Pedro de Peralta, armed with specific instructions for establishing the settlement and with the aid of Indian labor, constructed the seat of Spanish administration in Santa Fe (Bannon 1979:36-40; Kessell 1979:79-93). Santa Fe was the only established "villa" in the north. The settlement pattern developed from the assignment of lots around the plaza and along the Santa Fe River to the south (Simmons 1979:102-103). There was increasing settlement along river drainages since those locales provided the water resources and soils for subsistence farming. Ultimately, it was the proximity to a source of water that dictated the use of land. Lands around the settlement not suitable for irrigation were to be held in common for grazing, wood lots, and future growth.

Under Spanish rule, the *encomienda* system led to economic hardship for Pueblo groups. The *encomienda* was a grant to a Spaniard for the fruits of Indian labor (Ebright 1994:14). During the early years of the first permanent settlement of New Mexico, the faithful followers of Oñate were rewarded for their loyalty with *encomiendas*. Although *encomenderos* were forbidden by law from living on the lands granted to them in *encomienda,* most ignored this law. There was a great deal of encroachment on Indian lands, and *encomenderos* often levied excessive tribute on the Indians. Coupled with the suppression of native religious practices, discontent with Spanish government grew among local tribes and finally resulted in the Pueblo Revolt of 1680 (Jenkins and Schroeder 1974: Kessell 1979). Since the archives of New Mexico were destroyed in the Pueblo Revolt, little information exists concerning pre-Revolt land grants. Also, historical documentation of the 12 years following the Pueblo Revolt is nonexistent (Ebright 1994:22-23).

Spanish Colonial Period (1693-1821)

After three unsuccessful attempts by Spanish governors to reclaim New Mexico, don Diego de

Vargas returned Spanish rule to New Mexico in 1692. The second era of Spanish administration, missionization, and settlement began with Vargas's second return with Franciscans and a large group of settlers in 1693 (Bannon 1979:88). Since one of the major reasons for the Pueblo Revolt was the abuses connected with the *encomienda,* this practice was not followed after the Revolt.

Settlement Patterns. A new settlement pattern appeared with increasing population size. Before the Pueblo Revolt the settlement configurations focused on a hacienda system, with Santa Fe as the only villa. The new settlement pattern incorporated small land holdings and a greater number of small settlements called ranchos (Maxwell and Post 1992:13). The settlement of Cieneguitas provides us with an excellent example of a rancho, which Simmons (1979:1050) defines as "one or more Spanish households located adjacent to farm and orchard lands." Cieneguitas was separate, yet administered from the Villa of Santa Fe. This small settlement, a rancho, was first settled around 1790 (Post and Snow 1992:25). It was centered around seeps and springs, which allowed a higher population density within a smaller area and more intensive agriculture on smaller plots.

Settled as early as the seventeenth century, Agua Fria is an example of a plaza or placita, small town or village. Because abundant ground water augmented the river and *acequias*, Agua Fria grew rapidly. A good example of early land use in Santa Fe occurred in 1695, when Ignacio de Roybal requested three noncontiguous parcels from Vargas. One parcel was located in the northeast quadrant of the villa, the second was located south of the river along the road to Pecos. Roybal's house and garden lot were located adjacent to the *cienega* (Post and Snow 1992:25).

Land Grants. The first land grants in New Mexico that we know of were made by Governor Diego de Vargas after his reconquest of the province in 1692. Many of these grants were made to loyal followers of Vargas and to individuals who had possessed land grants previous to the revolt and who were willing to resettle them (Ebright 1994:23). Regulation of the granting of land was based as much on custom as on written law, especially during the Spanish period. A private grant was made to an individual who would own the entire grant and could sell it after the possession requirement was met. In the eighteenth century, land grants were mostly private grants. Community grants became more common in the nineteenth century. In the case of a community grant, individuals from a group of settlers would each receive an allotment of land for a house, an irrigable plot, and the right to use the remaining unallotted land on the grant in common with other settlers. The settler would own his allotment free and clear after four years and could sell it as private property. The common lands were owned by the community and could not be sold (Ebright 1994:23-25).

By the mid-eighteenth century, New Mexico practice and custom made it clear that local officials, citizens, and the Pueblos themselves all believed that each of the New Mexico pueblos actually owned four square leagues, usually measured from the cross at the center of the Pueblo cemetery (Briggs and Van Ness 1987:76). The New Mexicans considered the Pueblos as the owners of their four-square-league tracts on the basis of those property-like transactions, land grants made in 1689 by the Spanish governor, acting for the crown, to each pueblo (Briggs and Van Ness 1987:77). Many of the Hispanic land grants encroached upon the Pueblo Indian land grants in spite of governmental protection. The Jacona, Cieneguilla, Santa Fe, and Caja del Rio grants all form boundaries around Las Campanas.

The Jacona Grant is to the north of Las Campanas. It is named for the Indian Pueblo of Jacona, which once existed on the present-day site of the grant. This small Tewa Pueblo on the south side of the Pojoaque River was abandoned for unknown reasons in 1696, when its inhabitants left and settled among the other Tewa Pueblos. This left a choice piece of land available for Spanish settlement. The first Spaniard to ask for some of this land was Captain Jacinto Pelaez, who was given two *fanegas* of corn-growing land (enough land to plant about four bushels of seed corn) within the old pueblo (Ebright 1994:249).

The first Spaniard to leave a lasting mark on Jacona was Ignacio Roybal, who in 1702, requested a grant of the remainder of the Jacona Pueblo, excluding the Pelaez land. Governor Pedro Rodriguez Cubero granted Roybal's petition. The grant was entered in the corporation book of Santa Fe on September 7, 1713. After Roybal received the Jacona Grant, he acted swiftly to consolidate and expand his holdings. In 1705, Roybal purchased one and a half *fanegas* of corn-growing land east of the Jacona Grant from Captain Juan de Mestas for 50 pesos. Also, Roybal was given a grazing permit in 1704 that bounded San Ildefonso Pueblo. San Ildefonso took Roybal to court to contest their mutual boundary in connection with this grazing grant, initiating a series of court battles over land and water (Ebright 1994:250).

Roybal came to New Mexico at the request of don Diego de Vargas, who went to Spain in 1693 and recruited him from his native Galacia, to help in the reconquest of New Mexico after the 1680 Pueblo Revolt. Although he kept a house in Santa Fe for most of his life, Roybal in 1702 had settled at Jacona. Settlement on the Jacona Grant grew steadily. After Ignacio Roybal's death in 1756, the grant was partitioned between his sons. In 1782 a son, Mateo Roybal, asked Governor Juan Bautista de Anza to give him possession of that part of the Jacona Grant which had been received under the earlier partition. By complying with the request, the governor acknowledged the validity of the 1702 grant to Ignacio Roybal. It also showed that the grant was still being treated as a private claim (Ebright 1994:249-255).

By 1846, there were at least 50 families living in the Town of Jacona. The inhabitants of the Town of Jacona, as the heirs and legal representatives of Roybal and Pelaez, petitioned Surveyor General James K. Proudfit on January 5, 1874, seeking the confirmation of the two grants. Proudfit, in an opinion dated June 10, 1874, found the Jacona Grant papers to be genuine and recommended the grant be confirmed. A preliminary survey of the grant was made in September 1878 for 46,341.48 acres. However, Congress took no action on the claim. With the creation of the Court of Private Claims, the inhabitants of the grant filed their petition on September 21, 1892 (Bowden 1969:535-36). By a decision dated August 23, 1893, the court confirmed all the grant but excepted from its confirmation all lands lying within the Pueblo of San Ildefonso, Tesuque, and Pojoaque. The court held that while there was no documentary evidence that possession had been delivered to the original grantee, the long continuous possession of the premises raise a presumption that the ceremony had been performed. The government appealed the decision to the Supreme Court on the grounds that the court was not justified in presuming that possession had been delivered and would not be a grant that should have been recognized by the United States.

If the original grant was involved, then the confirmation should be limited to the tract described in the 1782 proceedings. For some unexplained reason the Solicitor General of the United States, on February 1, 1897, requested the United States Supreme Court to dismiss the appeal, and the court entered a decree dismissing the appeal. The grant was surveyed in July 1898. The survey showed the grant contained 6,952.84 acres after excluding the areas, which conflicted with the Pueblo grants of Tesuque, Pojoaque, and San Ildefonso. The grant was patented on November 15, 1909 (Bowden 1969:538-39).

The Caja del Rio Grant bounds Las Campanas on the southwest. In 1742 Captain Nicolas Ortiz petitioned Governor Gaspar Domingo de Mendoza for a grant that covered the tract of land called Caja del Rio. Captain Ortiz described the land as being bounded on the north by a large tableland standing in front of the cultivated lands of San Ildefonso; on the east, by the Cañada Anela; on the south, by the source of the Santa Cruz Spring; and on the west by the Rio Grande. Ortiz requested the grant as a reward for the services he had performed and monies he had expended over the previous 49 years in the reconquest of New Mexico and the pacification of the Indians (Bowden 1969:530). After examining the contents of the petition, Mendoza granted the tract to Ortiz on May 30, 1742, subject to royal grants, and with the understanding that the "pasturage and watering places be in common." Mendoza directed the Alcalde of Santa Fe, Antonio de Ulibarri, to place Ortiz in royal possession of the grant. On June 18, 1742, Ulibarri checked with Captain Ignacio Roybal, Juana Lujan, and the governor and three oldest inhabitants of the Pueblo of San Ildefonso and advised each of them of the grant. After learning they had no objections, Ulibarri went to the Caja del Rio where he performed the customary ceremony for the delivery of possession of the grant to Ortiz. Ulibarri also notified Ortiz that the pastures, woods, and watering places were to be held by him as commons (Bowden 1969:531). On May 7, 1871, descendants of Nicolas Ortiz presented their claim to Surveyor General T. Rush Spencer. Three witnesses were examined by Surveyor General James K. Proudfit in November 1872. Proudfit recommended that the grant be confirmed by Congress to the heirs and legal representatives of Nicolas Ortiz, deceased. A preliminary survey of the grant was made in November 1877 for 62,343.01 acres. When Congress did not act on the claim, Felipe Delgado filed suit in the Court of Private Land Claims on October 14, 1892, seeking confirmation of the grant (Bowden 1969:532-33). The court's decision dated August 30, 1893, confirmed the grant in accordance with the description contained in the grant papers but left the boundary questions to be resolved by the survey that was required by law. Deputy Surveyor Sherrard Coleman surveyed the grant, and it included 68,070.36 acres with the north boundary just south of the Mesa de San Ildefonso. This included 1,221.58 acres, which conflicted with the Pueblo of Cochiti Grant. Delgado relinquished any claim to lands held in dispute. The court approved the survey and a patent was issued on February 20, 1897 (Bowden 1969:533-34).

The Cieneguilla Grant, which is south of Las Campanas, was made to Francisco de Anaya Alamazan by Governor Vargas in 1693. Prior to the Pueblo Revolt, Captain Francisco de Anaya Alamazan and his family lived on his rancho, which was located about 11 miles west of Santa Fe at the place known as Cieneguilla. He was on patrol on August 11, 1680, when the Santa Clara Indians attacked the rancho and killed his entire family. Anaya had accepted Governor Vargas's incentive to resettle New Mexico and receive the lands which they held prior to the rebellion. Vargas, by a decree dated November 2, 1693, granted Anaya one *fanega* of corn-planting land together with a sufficient amount of land to pasture 200 head of small stock plus his military horses and oxen for his field and cart. Since this did not include all of the lands he had owned prior to the Pueblo Revolt, Anaya once again petitioned Vargas for a grant covering all of his previous land. There is no documentary evidence that possession was formally delivered to Anaya, however, it is known that he occupied and used the land at Cieneguilla prior to his death in 1714 (Bowden 1969:428). After Anaya's death, his widow and two children sold the grant to Andres Montoya in 1716. Montoya's heirs and legal representatives petitioned Surveyor General Henry M. Atkinson on October 25, 1878, for confirmation of the grant. Atkinson, on March 19, 1879, found the title papers to be genuine, but had serious questions as to the quantity of the land. Therefore, he recommended the approval of the grant to the extent of one *fanega* of planting land for a total of 491 acres (Bowden 1969:430-431). Since Congress had not acted upon Atkinson's report, the grant was one of the claims re-examined by Surveyor General George W. Julian. By Supplemental Opinion dated May 7, 1886, Julian held that the description of the grant was so vague and indefinite that the lands could not be located. Julian recommended the recognition of the grant to the extent of land actually occupied by Montoya's heirs (Bowden 1969:431-32). Feliciano Montoya, who claimed interest in the grant by inheritance, filed suit for its confirmation in the Court of Private Claims on March 3, 1893. The case came up for trial on June 2, 1897. By decision dated October 5, 1897, the court held that the grant, which was one of the oldest filed for consideration, was entitled to confirmation for some amount but there was considerable obscurity in the grant papers concerning the boundaries. The court held that the southern boundary of the grant was located along the crest of the ridge lying between the Santa Fe River and the Arroyo Hondo. Since the Rancho de Alamo, or Juan Miguel Maes Grant, which was also mentioned in the documents, had been occupied by John B. Lamy for an extended period of time, the court held that the eastern boundary of the grant should extend northward from the ridge along Lamy's west line or an extension thereof. The western line was fixed as a line extending northward from the ridge along the foot of the tablelands of Santo Domingo. For the northern boundary the court noted that two arroyos united at a point near the northwest corner of the Rancho de Alamo and opposite the southern edge of the Debonocandos Woods. The court also believed that in 1714 an old road to Cochiti probably ran near this point. Therefore, the court established the northern boundary as an east-west line running through this point (Bowden 1969:433-434). The grant was surveyed in November 1898, by Deputy Surveyor George H. Pradt and found to contain 3,202.79 acres. A patent was issued to the heirs and assigns of Andres Montoya on April 24, 1916 (Bowden 1969:435).

Mexican Period (1821-1846)

The beginning of the Mexican period is defined by Mexico's political independence from Spain in 1821. The historical documentation of the Mexican period is poor due to the deterioration of a centralized bureaucracy which had previously generated many records of government operations (Abbink and Stein 1977:160). During this time more land was granted than during the Spanish Colonial period, with more lands made to communities rather than individuals. In addition, Governor Armijo illegally granted land to Americans (Jenkins and Schroeder 1974:44). In 1822, the total population of New Mexico approximated 40,000 persons in 26 Indian villages and 102 Hispano plazas (Bloom 1913-1914:29, 31). Trade, agriculture, and livestock raising were important economic activities during this time.

Under the new administration of 1821, New Mexico was open to foreign trade, and a booming trade was established along the Santa Fe Trail from Missouri to Mexico. Possibly more important than the Santa Fe Trail trade in local economics was the Comanchero trade, an outgrowth of the Taos trade fairs of the 1780s (Kenner 1969:52). The resulting trade proved essential for rural Hispanos and Pueblos, as the Plains Comanches maintained trade relations with eastern tribes having access to American manufactured items.

Despite the boom in trade activity, the local New Mexico economy remained dependent upon herding and agriculture. Sheepherding was engaged in primarily by Hispanos. Herds were owned by rich *(ricos)* landholding patrons who generally lived in larger settlements. The actual work of herding was done by the poorer, rural residents. These people interacted economically and socially with the owners and clients in a well-developed patron-client system (Abbink and Stein 1977:161-162). By 1830 these wealthy sheep owners were driving several hundred thousand sheep each year to supply meat to the mining areas of northern Mexico. Santa Fe merchants opened a wool trade with California between 1821 and 1846, but the population explosion, brought by the discovery of gold on the West Coast, opened a new market for the meat of New Mexican sheep (Williams 1986:121). During the 1850s flocks ranging in size from 5,000 to 25,000 head (peaking at 200,000 in 1856) were driven to the California mining camps. By 1860 the Territory of New Mexico was the principal sheep area of the United States. Although the flocks would range over large areas of the territory during the summer, the Rio Grande Valley and its tributaries remained the area for winter grazing (Williams 1986:121).

The Republic of Mexico held sovereignty for only 25 years but had critical importance for Pueblo Indian grants. Mexican rule determined what rights the United States agreed to follow when it took over sovereignty in 1846.

United States Territorial Period (1846-1912)

In August of 1846 the United States forces under the command of Brigadier-General Stephen W. Kearney, met little resistance as they marched into New Mexico. On August 19, from the plaza in Santa Fe, Kearney officially claimed New Mexico as a territory of the United States (Abbink and Stein 1977:161). With the signing of the Treaty of Guadalupe Hidalgo in 1848, and the conclusion of the Mexican-American War, Mexico relinquished to the United States claim to almost half of its land mass, which included the present state of New Mexico. In addition, in 1853, the United States purchased from Mexico a large tract of land extending the international boundaries of Arizona and Utah to the south (Abbink and Stein 1977:162).

On the eve of the arrival of the United States in New Mexico in 1846, existing Mexican rule had only deepened and widened the confusion about Pueblo land grants. Under its rule, Mexico had altered the status of Pueblo lands by authorizing the sale of Pueblo lands to non-Indians and permitting individuals as well as the Pueblo community as a whole to convey land. Clearly, Mexican rule had not changed the status of Hispanic land holdings on the Pueblo leagues that were granted by the Spanish crown. During the period, Hispanic purchasers and Hispanic grantees of lands within the formal boundaries of the Pueblo leagues became more entrenched in what they regarded as their natural birthright. The Hispanic homelands swelled; the Pueblo land base shrunk. By 1846, the Pueblo land grants had become home to Hispanics and Indians alike (Briggs and Van Ness 1987:93-94).

With the Treaty of Guadalupe Hidalgo, the United States had agreed to respect property rights under Spanish and Mexican control. Congress created the Office of Surveyor General in 1854 to survey and clarify title for New Mexico's land grants. While many claims were filed, few were confirmed by Congress prior to the establishment of the Court of Private Claims in the 1891 (Westphall 1983:241). Surveys of the grants soon revealed a high incidence of overlap in grant boundaries, which in many cases resulted in unresolvable confusion (Abbink and Stein 1977:165).

The Pueblos under Mexican rule were considered emancipated citizens of Mexico. Although the United States agreed through the Treaty of Guadalupe Hidalgo to respect the rights of all citizens of Mexico, the Pueblos were considered as enclaved dependent nations and, therefore, were administered according to United States Indian Policy (Spicer 1962:353). Regarded as wards of the Federal government, the Pueblos were least affected by the influx of Anglos (Spicer 1962:348). However, neighboring Hispano communities were greatly affected by large-scale land speculation. Many Hispanos were alienated from their land by aggressive Anglo land speculators. In addition, an unfavorable precedent had been set by the courts by not recognizing community ownership of vast tracts of common lands (Jenkins and Schroeder 1974:9). In 1897 the Supreme Court paved the way for exploitation of the Hispano land grants by upsetting traditional land policy when it decided that the common lands of Spanish and Mexican community grants belonged to the United States public domain (Westphall 1983:138). With their primary resource base removed, many Hispano communities could not survive. Vast areas outside the Rio Grande Valley were open to settlement both by Hispanos moving out of the valley and by Anglos entering the region from the east and the west.

By 1850 New Mexico supported the largest number of sheep in the west (Carlson 1969:25). By 1867 the banning of peonage began the gradual decline of the wealth and power of the patron. At that time merchants and businessmen who through debt financing began acquiring large herds of sheep which they then rented on share contracts to herders (Carlson 1969:36). This modified version of the *patrón* system was called the *partido* system and persisted until around 1905. Events after the Civil War, which included a change in market need from wool to meat, increasing control of the range by homesteading, a rise in wage labor, and overgrazing of the range, eventually resulted in the decline of the *partido* system (Charles 1940:33; Carlson 1969:37). Sheep ranching in the late nineteenth century was affected by American merchants and the arrival of the railroads. The merchants began to invest in breed stock, acquire herds, and establish contracts with the *ricos*. The merchants (particularly the Ilfelds in Las Vegas and Bonds in Española) began developing wool-scouring mills at a number of towns serviced by the railroads (Williams 1986:122). Although the sheep industry dominated the cattle industry in 1880, the railroad was the stimulus for the expansion of the cattle industry. The 1880s witnessed the rise of large cattle empires throughout the eastern half of New Mexico. Ranching and rangeland began to diminish by 1900. Although the railroad opened up major stock towns and shipping places, the herd sizes did not increase during the early part of the twentieth century (Williams 1986:122).

The arrival of the railroad in the 1880s brought mobility, economical exploitation of bulk resources, and jobs to support the growth and maintenance of the new system. The railroad created new towns such as Domingo (Wallace), Boom, Bland, Waldo, Hagen and Buckman (Abbink and Stein 1977:167). The Atchison, Topeka, and Santa Fe Railway out of Kansas had entered New Mexico in 1878 over Raton Pass, continuing to Las Vegas and Albuquerque, bypassing Santa Fe. Albuquerque, because of its Kansas connections and the unsuitable terrain south of Santa Fe, had won the railroad terminus (Lamar 1966:177). Santa Fe was no longer an economic center, but only a stop at the end of a spur on the Atchison, Topeka, and Santa Fe. From 1880 to 1912, economic growth in the Santa Fe area began to lag as other areas of the state such as Las Vegas and Albuquerque, grew in importance. Much of the economic slowdown can be ascribed to the lack of a through railroad (Elliott 1988:40). The Denver and Rio Grande (D&RG) entered New Mexico in 1880 by two routes: one from Alamosa, Colorado, to Española (the Chili Line), and the other from Antonito, Colorado, to Chama across the Cumbres Pass. The route that reached Española in 1880 was extended only to Buckman on the western bank of the Rio Grande River. It did not cover the 15-mile difference to Santa Fe until 1886 (Williams 1986:123). Although Santa Fe was the terminus of the D&RG, which had local and regional significance, it did not tie in directly to the east-west transportation corridor (Pratt and Snow 1988:419).

In 1850 the United States had no survey record of the land in New Mexico. The first U.S. Surveyor General arrived in the territory in 1855 charged with the responsibility of surveying the land and establishing suitable areas for farming, ranching, and town locations. The survey was also to set aside land to support public institutions and to provide preemption rights to residents who occupied the land prior to the survey. The surveyor was to plat accurately the private land claims that originated prior to the Treaty of Guadalupe Hidalgo in 1848 (Williams 1986:126). From 1855 to 1873 over 4.8 million acres were surveyed with only 63,000 acres allocated to landowners. Only 30,000 acres during this period were allocated to people by patented homesteads.

During this same period laws were implemented to open the public domain to settlement. In 1854 the U.S. government passed the Donation Land Act, which allowed all white males over the age of 21 to acquire 160 acres of designated public land if they could show "intent" of becoming U.S. citizens. This was a method to pass on land to Mexican citizens who wished to stay in New Mexico (Williams 1986:126). The Homestead Act of 1862 was established to stimulate settlement of the frontier (Williams 1986:126). Because U.S. surveyors promoted their own interests rather than promoting settlement, only 89 families had successfully settled on public land by 1880 (Williams 1986:126).

In 1885, a surveyor general named George W. Julian and a newly developed Bureau of Immigration promoted homesteading, but even with this improvement, a complete breakdown of the surveyor general system was apparent by 1889. A backlog of 116 grants awaited Congressional action, while Congress had not confirmed any grants since 1879. In March 1891, a law establishing a five-judge Court of Private Land Claims was signed by President Benjamin Harrison. More than 95 percent of the land brought before the Court of Private Land Claims was rejected between 1891 and 1900 (Westphall 1983:271). This land was returned to the public domain where it became available for open settlement.

Prior to the late nineteenth century most of the land subject to cultivation was in areas claimed as private grants. The number of farms increased by 176.2 percent in the 1890s, and 189.8 percent during the decade ending in 1910 (Westphall 1983:271). Also during the 1880s and 1890s the railroads provided access to newly designated areas of dryland farming. By 1910 the prairies and plains of the territory were swarming with odd collections of tents, roofed dugouts, and small houses constructed from sod, stone, adobe, and pine boards imported from Texas. By 1912 the presence of windmills and barbed-wire fence evidenced the change from the open range of the cattle empires (Williams 1986:128).

New Mexico Statehood to Modern Period (1912-1970s)

On January 6, 1912, statehood was granted to the Territory of New Mexico. With statehood came representation and participation in the United States national political system. As in the Territorial phase, Santa Fe remained the focus of political activity between the region and the nation. During the statehood phase, the population increased dramatically with a steady influx of Anglos. Hispano communities diminished due to the Anglo land speculation and deterioration of the range. Many members of rural communities were forced to relocate to growing urban areas (Abbink and Stein 1977:166-67). The Pueblo communities were affected differently. With statehood the United States policy toward the Pueblos became more consistent with federal attitudes toward all confined Indian nations. The Pueblos became directly administered through Washington (Cohen 1942:389). In 1935 with the establishment of the United Pueblo Agency, an attempt was made to create a more efficient liaison institution between the Pueblo community organization and the Federal Government on an administrative level (Lange 1959:25).

In the Santa Fe area, Pueblo population distribution remained stable during early statehood due to federally guaranteed land grants and the general unsuitability of the land for anything but subsistence farming and herding. Hispano settlement distribution was affected by the Sandoval Decision of 1913, in which 12,000 persons, mostly Hispanos, were removed from Pueblo lands (Cohen 1942:389). The short-lived Anglo communities of Bland and Boom disappeared by the 1920s. Only Buckman remained as a small railroad stopover between Santa Fe and Española, and with the discontinuation of the Chili Line, Buckman was abandoned in 1941 (Abbink and Stein 1977:170).

The economic patterns established toward the end of the Territorial phase persisted well into the present century and were not changed until World War II. World War II brought many changes that profoundly affected the region. At this time great technological advances in transportation and communication systems as well as the participation of the local populations in the armed forces served to accelerate New Mexico into the national system (Abbink and Stein 1977:170). The development of the automobile had a great deal of influence. By the mid-1930s the automobile had replaced the railroad in importance, and with the construction of an efficient network of highways, many rail lines were abandoned. The abandonment of the D&RG occurred in 1941 (Abbink and Stein 1977:170).

The establishment of Los Alamos and White

Rock represented a new kind of community for New Mexico. The settlement was not dependent upon local resources. The community has provided a nearby source of employment for wage laborers from San Ildefonso and other rural communities.

The establishment of Bandelier National Monument in 1916 foreshadowed the increasing use of the area for recreational purposes. After World War II, the widespread availability of land and the corresponding boom and improvement of transportation systems served to facilitate many of the economic and settlement patterns of the Southwest. Locally, the automobile encouraged much movement out of the rural areas into the cities, which provided economic opportunities. The automobile also increased commuting from the rural areas into cities for employment (Abbink and Stein 1977:170, 171). Wage labor has replaced agriculture and herding as a source of employment for all populations.

In addition to recreational and development programs the presence of United States government has become more pronounced. Large tracts of land have been acquired by the federal government (USDA Forest Service and Bureau of Land Management) for conservation purposes. The Caja del Rio Grant is administered by the USDA Forest Service and portions of the Frijoles and Ramon Vigil grants are incorporated into Bandelier National Monument. The vast amount of acreage acquired by the federal government has resulted in limiting and regulating use of land by local populations (Abbink and Stein 1977:171).

Historic Trails, Roads, and Railroads

The Santa Fe road network evolved out of 700 years of travel and transportation needs. Prehispanic trail locations may have been determined by several factors. Scurlock (1988:38) suggests that trail locations were primarily determined by environmental factors such as potable water, fuel, food availability, the presence of geographical barriers, and the presence of prominent nearby landmarks. In the Southwest, most reputed ancient trails follow major watercourses (Scurlock 1988). However, as populations became more densely packed and territorial control became important, social factors may have determined who used trails and locations as much as the environment. Passage may have been dictated by trade alliances, and as alliances changed, so may have long-distance travel routes (Maxwell and Post 1992:22).

In the northwestern borderlands, El Camino Real, between Santa Fe and Chihuahua, was the first non-Native American road carrying low-frequency but regular economic traffic consisting of *carretas* and heavy-duty transport wagons pulled by oxen and other domesticated animals (Moorhead 1957:108). With Francisco Vasquez de Coronado's *entrada* between 1539 and 1542, followed by the colonization of the northwestern Spanish borderlands by don Juan de Oñate in 1598, trails and roads acquired new importance. For the first time, their existence is documented in the explorer's narratives and the legal documents of the Spanish Colonial government. As land was divided into individual and community land grants, roads were important boundary markers, recognized by all, and more permanent than a pile of rocks or a grove of trees. Roads were one key to the political and military control of the region. The mode of travel changed as the Spaniards brought horses and mules for riding, mules and burros as pack animals, and oxen to pull the first wheeled conveyances (Maxwell and Post 1992:25).

Inferences about roads and settlement can be drawn from the land grants records, however it is beyond the scope of this report to go into detail concerning the history of the trails and roads in the Santa Fe area. Local travel was by horse, and transportation of goods from farms to market was usually by burro (Moorhead 1957:108). These roads may have been narrow dirt tracts. When wagons were used a wider road would have been used such as the wagon road to Santa Fe from Pecos and Galisteo. Most of the local roads around Santa Fe during the Spanish and Mexican periods were horse paths (Maxwell and Post 1992:34). The official opening of the Santa Fe Trail in 1821 changed long-distance transportation modes. The Conestoga wagons used by American traders were soon put into use by the Mexican traders. In 1846, when General Stephen Kearney and the Army of the West rode into Santa Fe, they followed the Santa Fe Trail.

The Civil War briefly interrupted commercial traffic along the Santa Fe Trail. Traffic was reduced to local traffic until the defeat of the Confederates at Glorieta Pass in 1862. The end of the Civil War also signaled the quiet end of the Chihuahua Trail trade (Maxwell and Post 1992:36). After the 1860s commercial traffic increased to Santa Fe. Mail delivery and civilian travel developed hand-in-hand (Twitchell 1925). Contracting for mail delivery became a lucrative business. Mail and stage lines provided necessary spur transportation from the main roads and often followed the system of interfort roads that had developed (Scurlock 1988:87).

Just as the opening of the Santa Fe Trail had been the catalyst for major changes in the structure of the Spanish and Mexican borderlands and the United States Southwest, the coming of the railroad changed the structure of the New Mexico Territory. By railroad, goods and people could be transported faster, safer, cheaper, more comfortably, and in greater quantities than wagon and coach (Maxwell and Post 1992:37). In 1880, the railroad was completed to Santa Fe (a branch line 18 miles from Lamy) and within 10 years the Atchison, Topeka, and Santa Fe Railroad had replaced the Santa Fe Trail as a major intracontinental route (Taylor 1971:181-182).

The narrow-gauge branch of the Denver & Rio Grande Railroad (D&RG) called the "Chili Line" ran through the current Las Campanas-Santa Fe Ranch study area. The name "Chili Line" came from the strings of bright red chiles, called *ristras,* hanging outside the adobe homes of the stationworkers and the fact that much chili was transported along the D&RG. The story of the Chili Line began with one man's vision to build a railroad along the eastern foothills of the Rockies south from Denver to El Paso. General William Jackson Palmer began construction of the Denver & Rio Grande (D&RG) south of Denver in 1871 (Gjevre 1969:1). The turning point came for the entire system in 1878 at the celebrated battle with the Atchison, Topeka and Santa Fe for Raton Pass. The defeat and loss of Raton Pass forced the D&RG to use the La Veta Pass as the route to Santa Fe. Contracts were let in 1878 to prepare about 145 miles of grade from Alamosa, Colorado, to the Santa Fe area. However, agreements that had to be made with the AT&SF and Union Pacific railroads known as the "Boston Treaty" forced the D&RG to construct only 90 miles of track south of the New Mexico-Colorado border. The end of the tracks would be at Española, New Mexico (Gjevre 1969:2). Before building the AT&SF or the D&RG across Indian lands the railroads had to acquire rights-of-way. In 1877, in the case of United States v. Joseph, the Supreme Court, citing the unique cultural and social background of the Pueblos, held that they were not an "Indian Tribe" within the meaning of the Indian trade and intercourse laws and, therefore, were not subject to government control. The Pueblos could and did deal with their land as they wished. The acquisition of rights-of-way for railroads' use over Indian lands, including Pueblo lands of New Mexico, is controlled by 25 U.S.C. (United States Congress). The rights-of-way granted under these regulations are in the nature of an easement and may be without limitation as to term of years (Hisenberg 1979:46).

Obviously the citizens of Santa Fe did not feel very kindly about being 34 miles south of the railroad in Española. The Texas, Santa Fe and Northern was incorporated in Santa Fe on December 10, 1880 (Gjevre 1969:5). Refused the use of the D&RG's graded portion of White Rock Canyon in 1881, the TSF&N began the preparation of its line north of Santa Fe, which was designated the San Juan Division. The TSF&N crossed the Rio Grande at Otowi. The site for the Otowi trestle, constructed in 1886 by the Union Bridge Company, was a part of the 66-ft right-of-way conveyed to the railroad by the Pueblo of San Ildefonso on June 14, 1882. Completed in January 1887, the San Juan Division operated unprofitably until August 1, 1908, when it was bought by the expanding Denver and Rio Grande Western Railroad and incorporated as part of the D&RG Chili Line (McCachren 1974, continuation sheet 1). An agreement made in 1917 by Ashley Pond, the founder of the Los Alamos Boy's School, with the D&RG provided for the establishment of a stop at the Otowi crossing with a siding of eight cars, where freight and mail for the school would be unloaded. The freight and mail station consisted of a converted boxcar. In 1921 the New Mexico State Highway Department built a single-lane wooden suspension bridge with concrete towers a short distance from the railway trestle. Shortly after a general store and a gasoline pump were added (McCachren 1974, continuation sheet 2).

Several people came to this location to run the station, but perhaps one of the best known was Edith Warner. Edith Warner was a 30-year-old school teacher from Pennsylvania who had come to New Mexico in 1922 for her health. Unable to secure a job in the year she stayed at the Boyd Ranch in Frijoles Canyon, she returned to the East only to become ill again. Upon returning to New Mexico in 1928, she met A. J. Connell, the director of the Los Alamos Ranch School, who offered her the job of managing the Otowi freight depot. She repaired the residence, and with the help of San Ildefonso Pueblo, built a tearoom. During this time many tourists stopped at the tearoom. By the late 1930s it was a popular place to stop on the way to Frijoles Canyon. In 1934 she built a guest house to accommodate her visitors. During this time, scientist J. Robert Oppenheimer visited the tearoom and a friendship developed (McCachren 1974, continuation sheet 2).

The Chili Line tracks were removed in 1941, but the entry of the United States into World War II resulted in the establishment of the Manhattan Project on the site of the Los Alamos Boy's School early in 1943. This provided for more traffic across the wooden bridge and continuing activity for the "House at Otowi." Director Oppenheimer permitted small groups from "The Hill" to eat at the tearoom. In 1947, Ms. Warner learned that a new steel highway bridge would be built and the new road would pass right through her front yard and thus ended the tearoom. Miss Warner relocated within a mile of the old residence. Her new house was built by the San Ildefonso Pueblo Indians. She died in 1951 (Church 1960).

The Chili Line ran from 1881 to 1941, a 60-year period of catering to the settlers along the railroad. In a countryside barren of potable water, the Chili Line performed as a public utility in more than one way by hauling water in tank cars for distribution at strategic points along the way. Before 1916, cattle from southern New Mexico and Arizona were shipped north on the line to the grazing lands of Colorado's forests. From 1916 to 1924 large amounts of hogs were forwarded from the San Luis Valley to Santa Fe to be shipped to California (Gjevre 1969:18). Servilleta was one of the largest sheep shipping points, and Española was the headquarters for Frank Bond and Son (one of the large commission houses along the line). Until the late 1920s there were sheep transfer facilities in Santa Fe. Apples in excess of 200 carloads a year were transported annually from the Española Valley until 1925 when trucks were used to ship the apples (Gjevre 1969:18).

Two movies were filmed during the last three years of Chili Line operation. "Texas Ranger" was filmed on location in the Española area in 1938. The other film was "The Light That Failed," filmed between San Ildefonso and Buckman.

By 1935 the D&RG was bankrupt and in the hands of a receiver. Cars, trucks, roads and the Great Depression all served to kill the Chili Line. On September 1, 1941, after many years of profitless operation and litigation, the Chili Line was abandoned (Lent 1991b:15). Clean-up trains followed, with Joseph Pepper Construction Company of Denver doing the actual dismantling. The material from the road was stored and sorted at Antonito, Colorado, during late 1941 and 1942. Several of the locomotives were sold to the army in 1942 and sent to the Yukon for use on the White Pass and Yukon railways. Eventually they were sold by the War Assets Administration for scrap during World War II (Gjevre 1969:94).

History of Las Campanas de Santa Fe

A brief land-use history of Las Campanas was compiled from archival records, such as Homestead Patents from the National Archives in Washington, D.C., historical documents, land title records, and interviews in 1995 with knowledgeable individuals, such as former and current landowners.

Las Campanas was a common lands area bounded by four land grants: Santa Fe, Jacona, Caja del Rio, and Cieneguilla. Common or unclaimed lands in this area were used primarily as pasture for grazing before the late 1800s. Since the late 1800s this land has been used for homesteading, limited agricultural interests, for ranching involving sheep and cattle, and most recently the development of homesites. The following narration is a brief account of these land uses and some of the people who were involved in the Las Campanas land-use history.

The Homesteaders (1900-1950)

The Homestead Act of 1862 was established to stimulate settlement on the frontier. However, by 1880 only 89 families had successfully settled on public lands in New Mexico. In March, 1891, a law establishing a five-judge Court of Private Claims was signed by President Benjamin Harrison. The court was mainly established to adjudicate land grant claims. More than 95 percent of the land brought before the Court of Private Land Claims was rejected between 1891 and 1900. This land was returned to the public domain where it became available for open settlement (Westphall 1983:271). Homestead

Patent records from the National Archives in Washington, D.C., provide examples of homestead activity within Las Campanas. One of the earliest homesteaders was Leandro Tapia. Mr. Tapia stated in his Final Proof testimony for patent application that he was 72 years old and he had been living on the land for over 30 years. Since the Final Proof Testimony is dated September 30, 1931, it is probable that he had started living on the land around 1900. He stated that he settled on the land before the survey was made and his house was built about 25 years ago. He had resided on the land six to seven months out of the year. Mr. Tapia had made Application for a Homestead Entry in 1921 but was unable to make satisfactory proof on the land. In March of 1926, he made an application for a Second Entry for the S½ SE¼ of Section 10 and the NE¼ SE¼ of Section 15 of Township 17 North, Range 8 East. He stated that he was unable to make satisfactory proof because of sickness, five years of dry weather resulting in crop failures, and poverty. In 1926, Mr. Tapia filed an affidavit that stated there was no spring or water hole of any kind on the land. Jose Montoya, a witness for Final Proof, stated that he had known the claimant "for a lifetime." Abelino Rivera, another witness for Final Proof, stated that Mr. Tapia "goes to Cienegitas during the winter months to sell wood." In his 1931 Testimony for Final Proof, Mr. Tapia stated that he was native born and married with one child. He stated that he had about 40 or more acres broken and ready for planting. He had cultivated about 30 acres each year, planting corn and beans. Most years he harvested about 12 wagon-loads of corn and about 1,200 pounds of beans. He averaged twenty head of stock grazed each year. Because Mr. Tapia had submitted his Final Proof after the due date, an examination was conducted by M. G. Livermore on May 20, 1932. Mr. Livermore stated that Mr. Tapia was an old man, over 70, still resided on the land during the summer months, and did his own cultivating. Mr. Tapia had 30 acres under cultivation at the time of investigation. There was a 16-by-20-ft stone house, two good dirt tanks, 2 miles of two-wire fence, and over a ½ mile of four-wire fence. Mr. Tapia's Homestead Patent was approved on October 11, 1932, and granted November 7, 1932.

According to land title records, Mr. Tapia, a widower, sold on September 16, 1938, to Emilio and Manuelita G. de Delgado the 320 acres of patented land described above. Mr. Delgado died intestate in 1943. His widow, Manuelita Gonzales de Delgado was appointed administratrix of the estate. On October 16, 1944,. Manuelita G. de Delgado sold the land to Frank Bond & Son.

Another example of homestead activity on Las Campanas is Jose Montoya. Mr. Montoya, under the Enlarged Homestead Act of 1909, made entry for a patent to the S½ SE¼ in Section 3 and the NE¼ N½ SE¼ of Section 10 of Township 17 North and Range 8 East for 320 acres on March 21, 1921. In a Petition for Designation, Mr. Montoya stated that there were no streams or springs, the land was not under irrigation, or adjacent to any irrigation ditch or canal. A water supply obtained by damming the arroyo was sufficient to irrigate 10 acres profitably with the balance of the homestead parcel only suited to grazing. Mr. Montoya established residence on the land in April of 1921 but stated he took possession of the land in 1919. In 1921, when Mr. Montoya was establishing residence, he thought he was making application under the Stockraising Homestead Act of 1916. Since the land was not agricultural and there was little rainfall, in March of 1926, Mr. Montoya requested that the area of cultivation be reduced. In the Testimony of Claimant for Final Proof dated March 1926, Mr. Montoya stated that he was "native born, 55 years old, married with seven children." He built a stone and adobe house in 1921. Also, in 1921, he planted 4 acres of beans and corn with a harvest of 4,000 pounds of corn and 1,000 pounds of beans. Twenty acres of corn and beans were planted in 1923 but there was no harvest due to excessive drought. The years 1923-1925 were apparently very dry years, and in 1935 Mr. Montoya planted only 7 acres, and stated there had been an excessive drought that year and previous years. He had made the following improvements to the land: two fences, an earth reservoir, and two corrals. Mr. Montoya's Homestead Patent was issued October 4, 1926.

Land title records showed that Jose Montoya owned this land until 1950. On November 28, 1950, Jose Montoya and Isabelita Gallegos de Montoya sold the 320 acres to Frank Bond & Son.

Stanley W. Fletcher provides another example of homestead activity on Las Campanas. On May 5, 1923, Mr. Fletcher made Entry under the Stockraising Homestead Entry Act of 1916 for lots 1, 2, 3, and 4 of S½ N½ and S½ of Section 1 in Township 17 North, Range 9 East.

In the Testimony of the Claimant for Final Proof dated July 1, 1926, Mr. Fletcher stated he was 25 years old and married with one child. He had begun actual residence on the land in November 1923. There was no cultivation for the years 1924 and 1925. In 1926, he planted 20 acres of corn, but had no harvest yet. He had grazed on the average 30 head of cattle and horses yearly from 1923 to 1926.

Mr. Fletcher had built his two-room house of lumber in October of 1923, for a value of $225. The following improvements had been made: a barn, 10-by-30 ft; a two-wire fence for 2 miles; a corral covering 1 acre; a 5-ft-high reservoir; a 410-ft-deep well that had 40 ft of water; an 8-by-10 ft concrete tank; a brush corral; a picket corral; and a drain tank. Mr. Fletcher stated that he had grubbed 30 acres of brush at a cost of about $50.00 on the NE¼ of the claim. He also stated that he did not make proof on the date advertised for the reason that he was confined to bed with a broken leg. Mr. Fletcher's Homestead Patent was approved October 8, 1926.

Land Title records showed that Stanley W. Fletcher was in bankruptcy in April 1927, but claimed the homestead as exempted property. In September 1928, Stanley Fletcher and his wife Mildred sold the land to Pedro B. Pino and his wife, Carlota Alarid de Pino. In January of 1933, Pedro and Carlota Pino sold the land to Frank Bond & Son.

During the early 1900s historical records of homestead activity indicate that the struggle of the homesteader to live on the land was complicated by periods of severe drought and soil erosion. The cyclical long-term droughts of the 1930s were a final blow to many of the homesteaders. In order to improve range conditions, a study of erosion and soil with recommended control methods was conducted by the USDA Soil Conservation Service. The Tewa Basin Study was conducted in the mid-1930s. This survey showed widespread misuse of range and agricultural lands with resultant severe erosion. The southern boundary of the study area in relation to Las Campanas begins 2½ miles north of Santa Fe and extends to the junction of Frijoles Canyon into the Jemez Mountains (Isaacson and Lovald 1935:31).

In order to attempt to control erosion and improve soil conditions, the Soil Conservation Service (SCS) and the Civilian Conservation Corps (CCC) worked together in camps located on private and public lands. One such example was the Santa Fe-SCS-ECW-5-N (FLY). This area consisted of 3,000 acres of small, privately owned, suburban tracts, located in Santa Fe County, in the Santa Fe Grant adjoining the town of Santa Fe. This camp was occupied as an SCS Camp on April 1, 1935, by CCC Company #836, with a total enrollment of 222. Prior to April 1, 1935, this camp was operated under the administration of the US Forest Service. The work included checkdams and fencing. Ten miles of fencing was constructed during 1935 (Calkins 1937:111).

Another example of erosion control was the Caja del Rio-Majada Sub-Project #23. This project included the Caja del Rio and Majada grants in eastern Sandoval and Santa Fe counties. A regular SCS subproject camp was set up during the summer of 1936. The work included development of stock water, fencing, water spreading, range revegetation, tree planting, repair and improvement of administrative roads and trails, brush and rock gully detentions, and brush and rock spreaders (Calkins 1937:146-47).

Frank Bond and Son (1933-1961)

During the 1930s and 1940s, Frank Bond & Son acquired much of what is today Las Campanas and the Santa Fe Ranch. The examples of homesteading in the area also serve to show that most homesteaders were unsuccessful and eventually sold out. The one name that is consistent in buying this land is Frank Bond & Son. Frank (Franklin) Bond was born on a farm in Argenteuil County, Province of Quebec, Canada, on February 13, 1863. After he married May Anna Caffal, he decided to join his older brother George W. Bond in New Mexico (Grubbs 1960:172-73). Frank Bond arrived in Santa Fe in September of 1883 and later recalled:

> The plaza had board walks and balconies overhead, full of saloons and a wide-open town, gambling going on in most of the saloons if not all of them, and Motley's dance hall was going full blast. . . . I recall the drive to Española, the driver quite picturesque in his blue shirt, broad-brim hat, with buckskins on the seat and knees of his trousers. The country seemed to me to be a perfect desert, and the people met, with their few burro loads of wood and

> sacks of grain in tanned buffalo sacks, seemed so poor that I was by no means very favorably impressed with my new home.

George W. Bond had arrived in New Mexico previously and after having worked as a timekeeper for the D&RG Railroad went to work for Sam Eldodt, who operated a general store in Chamita (Grubbs 1960:174). Frank Bond joined his brother in Chamita the afternoon of the same day he arrived in Santa Fe, and just two weeks later they bought a very small mercantile store operated by Scott and Whitehead. The original Bond business was established in Española in 1883, and it is generally understood that financial support was arranged by the way of loan from the boys' father, G. W. Bond of Beech Ridge, Quebec, Canada (Grubbs 1960:174).

Española was from the very beginning the headquarters of the Bond interests. The original store, established as G. W. Bond & Bro. Mercantile Store, soon developed profitable trading activity in sheep and wool. The first move toward expansion was made nine years later at which time a second G. W. Bond store was opened at Wagon Mound, New Mexico. The new business was essentially a twin of the old one dealing in sheep, wool, and merchandise. Although Frank and George Bond developed a large system of partnerships, they retained sole ownership of their businesses for the first twenty years. The firm name G. W. Bond & Bro. was carried to each different location as the system expanded (Grubbs 1960:62). Until just before the turn of the century they operated only the two stores with Frank in Española and George in Wagon Mound. They had prospered during this time and in the nine years from 1892 through 1900 they earned total net profits of more than $246,000, their combined merchandise inventory had grown to about $60,000 and they had 48,225 sheep out on rent with *partidarios*. Frank Bond was personally worth more than $132,000 at the end of 1900 (Grubbs 1960:62).

In 1906, the general merchandise activities were taken over in Española by the Bond and Nohl Company thus leaving G. W. Bond & Bro. to concentrate most of the effort toward sheep and wool. Sheep were rented out in the fall on *partido* contracts, which normally ran for three years, although the Bonds preferred to set up five-year agreements. The wool rent paid by the *partidarios* generally amounted to 2 pounds of wool per rented sheep. Most of the sheep were rented near Española and Taos, although some were placed on rent in Southern Colorado. They were usually run in small herds on the public range and grants (Grubbs 1960:299-300). Wool purchases were generally financed by receiving advances from Eastern wool dealers on clips yet to be shorn. Normally the loan was conditioned on the wool being consigned or sold to them. For many years the Bonds dealt almost exclusively with the Boston wool house of Brown and Adams. Brown and Adams handled from one to three million pounds of wool per year. In later years the Bonds also placed their business with Hallowell, Jones and Donald, another Eastern consignment house (Grubbs 1960:303-306).

The first few years of the new century were probably the most active in the Bond history. The mercantile stores had expanded to Roy and Cuervo, and by 1903, Frank and George Bond joined Fred Warshauer in the Forbes Wool Company, a scouring mill in Trinidad, Colorado. About the middle of 1903 the Bonds became associated with C. L. Pollard & Company in the lumber business. The Trampas Grant, east of Española was also purchased in 1903. In 1904, the Bonds had joined J. H. McCarthy and Gerson Gusdorf in Taos and opened another mercantile store. In 1907 the Bonds sold the Trampas Grant to the Las Trampas Lumber Company. In 1910 the Bond & Nohl Company acquired control of the Española Milling and Elevator Company (Grubbs 1960:65).

By 1910, George Bond was spending considerable time in San Diego, California, and his investment interests were spreading more and more away from New Mexico. The mercantile stores were being handled by a separate corporation and the partnership became a complication, so a decision was made to dissolve the partnership. The final close of business was June 6, 1911, for the G. W. Bond & Bro. Company after almost 28 years of successful business. At the dissolution of the partnership, Frank Bond owned 37,296 sheep on rent, and he took full interest in the ranch property at Wood River, Nebraska, which had been acquired in 1909. Frank Bond's personal net worth at this time was over a half million dollars (Grubbs 1960:197-99).

In 1912, Frank Bond joined Edward Sargent and A. H. Long to organize the Rosa Mercantile Company in Rosa, New Mexico, a typical Bond store dealing in sheep and wool as well as merchandise. In 1913 the Trampas Grant was returned to Bond control due to legal complications in the land titles, and Frank Bond became president of the Las Trampas Lumber Company. In 1914 Frank Bond, R. C. Dillon, Andy Weist, and J. H. McCarthy joined together with Walter Connell to organize the Bond-Connell Sheep and Wool Company in Albuquerque (Grubbs 1960:66).

The Bond mercantile system was an important source of supply not only to the *partidarios* but also to the general public, and the stores were steady income-producers for the Bonds. However, the Bonds' first love was sheep and wool. There appear to have been 150,000 sheep under control of the Bond system at the end of 1915, but it is likely the actual count could be twice this number. Franks Bond's assets in 1915 were almost a million and a half dollars (Grubbs 1960:68).

When Frank Bond first started the sheep business he owned almost no land to use as grazing. In the early teens of the 1900s he started acquiring various lands. The Baca property in the Jemez Mountains was one of the first acquired. It was a pivotal piece of property because it required other pieces of property to support it during the winter. Properties such as ranches and farms were acquired in Bernalillo, Valencia, Rio Arriba, Santa Fe, and what is now called Cibola counties.

Frank and Mary Anna Caffal Bond had a son, Richard Franklin, born in 1904 in Española, New Mexico. Richard Franklin Bond was the "Son" in Frank Bond & Son. When Richard Franklin Bond was about 18 years old, the family and business moved from Española to Albuquerque. The Depression years of the 1920s and 1930s nearly broke Frank Bond's health and created severe economic hardships. Frank Bond in the late 1930s and early 1940s lived in the Los Angeles area in a nursing care facility. In the early 1930s, Richard Franklin Bond started to take control of Frank Bond & Son. Before the Depression years, he had attended Brown University and had been at Colorado College two years before quitting to go home and help with the family business. By the time of the Stock Market Crash of 1929, he had already been active in the business.

Frank Bond died in 1943. The business was left to Richard Franklin Bond to run. The Bond name never blazed across the history books as did Solomon Luna or Thomas Catron. The influence of George and Frank Bond nevertheless spread rapidly across the northern half of New Mexico and much of southern Colorado. The business empire they established contributed importantly to the early growth of New Mexico. The Bond name is remembered with respect and affection by many throughout New Mexico. One of the foundations providing success for the Bonds was the strong ties of friendships that existed between them and their store managers. Frank Bond, when one of his store managers was sick and unable to work stated:

> I am not much of a hand to brag, but I have repeatedly said that we have the best men in New Mexico as managers of our stores. They can't be beaten anywhere and we have high regard for them. We consider their health above any business consideration of any kind. (Grubbs 1960:70)

For two decades, the 1930s and 1940s, Richard Franklin Bond was instrumental in rebuilding the economic health of Frank Bond & Son into a conglomeration which included oil jobberships and selling gasoline to retailers. When he saw the decline of the old-style mercantile stores giving way to the specialty stores, there was a greater shift toward agriculture. The mercantile stores probably started to become obsolete in the early 1950s. The specialty stores, such as groceries and dry goods, started about that time. Richard Franklin Bond actually put together more holdings than Frank Bond. In his own way he was more successful than Frank Bond, but Frank Bond had greater notoriety.

By the time the Santa Fe Ranch was acquired in the 1940s, the *partido* system had about come to an end and Frank Bond & Son were almost exclusively in the cattle business. By that time most people who had been struggling were able to maintain their own properties and cattle herds. To increase, their holdings Frank Bond & Son were able to acquire grant land from people who wanted to sell, such as the Baca Location No.1 in the Jemez Mountains.

According to Frank M. Bond, grandson of Frank Bond, the Bond Santa Fe Ranch was acquired to support the winter grazing on the Baca location. It was not a principle piece of property in terms of the Frank Bond & Son operation. The Santa Fe Ranch was named that to describe the location only. None of the ranches had specific names except the Alamo Ranch, which was named after the Alamo Chapter of the Navajo Nation. Everything came under the name of Frank Bond & Son. The Santa Fe Ranch was operated year-round but was only used for winter pasture from the first of October to May. Someone lived on the ranch year-round, but no family members ever lived at the ranch headquarters. There was a ranch house located on the property. One of the difficulties of reaching the Santa Fe Ranch was access. The ranch was blocked from having cattle drives because they could not cross the mountains from Los Alamos. Los Alamos was a closed community, which prevented them from using that area to reach the Santa Fe property. The cattle had to be moved by truck from the Baca Ranch to Jemez Springs to San Ysidro to Bernalillo and back up to Santa Fe, which was a tedious trip.

Bond & Son started making a shift from sheep to cattle in the 1940s, and were essentially out of the sheep business by the late 1950s and early 1960s. This was due to the livestock market shifting from sheep to cattle and a decreased demand for wool as synthetic products became available.

Richard Franklin Bond died in 1954, leaving a wife and three children. His only son, Franklin Moulton Bond, was 10 years old at this time. This left the Bond & Son business to be run by his wife Ethel Moulton Bond and Gordon M. Bond, the son of one of Richard Franklin Bond's sisters. When Gordon Bond's mother died he was adopted by his grandfather, Frank Bond. Ethel Moulton Bond began selling off properties in the late 1950s and early 1960s. That is the time when the Santa Fe Ranch was sold to Robert and Zannie Weil (Garcia). It took a decade for most of the properties to be liquidated. Some of them never were liquidated and Frank Moulton Bond took over the management after he graduated from Colorado College in the early 1970s. Ethel Moulton Bond died in 1994.

Santa Fe Ranch: Weil-Garcia (1961-Present)

The historic information concerning the Santa Fe Ranch was primarily obtained through oral interviews in 1995 with Zannie Garcia, owner of the Santa Fe Ranch.

As was previously noted, Ethel Moulton Bond began selling the Frank Bond & Son properties in the late 1950s and early 1960s. The Santa Fe Ranch was included in the properties listed for sale.

In 1960 Robert and Suzanne Weil (Zannie Garcia) had come to the Southwest in search of a ranch. Bob and Zannie met in college and married after graduation. They moved to St. Louis and lived there for several years until deciding to move West. The Weils and their children chose to live in Tucson, Arizona, while they looked for a ranch. During this time they also learned the physical part of ranch work. They made friends with Jim Ballard, who had formerly lived in Roswell, New Mexico. Jim Ballard had a ranch near Tucson and he taught Zannie about a working ranch. Zannie had been riding horses all her life. Zannie showed horses while growing up in New Jersey, during which time she qualified for the Olympics but chose to go to college. Because of Zannie's background, she learned to love and understand ranching life.

Bob and Zannie looked in Colorado, Nevada, Utah, New Mexico, and Arizona for a ranch. Although Arizona was their first choice, they did not buy a ranch there because it was too expensive. New Mexico ranches were less expensive and a large ranch could be purchased as an economic unit. Zannie was fortunate enough to have an inheritance that she could spend on the purchase of a ranch.

Howell (Hal) Gage was the real estate agent who sold the Santa Fe Ranch. In a blizzard on March 26, 1961, Zannie looked at the Santa Fe Ranch property. She decided to make a bid, and the bid truly reflected the amount of money available for the purchase. The price offered was not the asking price and to Zannie's surprise the Bonds accepted her offer. Zannie and Bob had chosen the Santa Fe Ranch property not solely because of its location near Santa Fe, but because the Santa Fe schools would be good for educating their children.

Apparently the City of Santa Fe had also wanted the Bond Santa Fe Ranch property, though they made little effort to acquire the land. The ranch would have connected to the city-owned land in the northwest quadrant. The ranch property would have provided for the City of Santa Fe a very large recreational park all the way to the Rio Grande River.

When the sale of the ranch closed on June 19, 1961, the family was still living in Tucson. The first attempts to find the ranch unaccompanied by a real estate agent were difficult. The road to the ranch was a two-track dirt road and it took several attempts to find the ranch headquarters.

When purchased, the Santa Fe Ranch contained 31,000 acres. The border of the ranch was the city limits of Santa Fe on the southeast, some deeded land and Tesuque Pueblo on the east, the Caja del Rio on the west, which was administered by the USDA Forest Service, and the remainder was Pueblo lands of Pojoaque, Jacona, and San Ildefonso on the north (Fig. 5.1).

The current Santa Fe Ranch headquarters is not the original headquarters. The original headquarters was located across from the game preserve, which was established in the 1970s. The original ranch house was built by cowboys, so it was not plumb or true and was built from cement instead of adobe. The house had one room, which was a living room measuring about 15-by-20 ft. There was no bathroom, kitchen, electricity, or running water. Instead, there was an outhouse, a well with a windmill, and an elevated tank. It was through gravity flow from the tank that water was made available to the house. There was a corral made of coyote fencing and very old barbed wire. The ranch had been open range until 1940 and had no fencing. In 1961 there was a perimeter fence with little interior fencing (Fig. 5.2).

Since the ranch was on the boundary of the Santa Fe city limits, great care was taken to maintain the fence. On one occasion, however, during the early years of the ranch, someone cut the fence, and before the broken fenceline was discovered, the cattle got out and walked all the way to the plaza in downtown Santa Fe. It made an interesting story in the newspaper in the 1960s (Fig. 5.3).

The Santa Fe Ranch is bordered by the lands of the Caja del Rio Grant, which was a Spanish land grant, but is now administered by the USDA Forest Service. About 25 Hispanic families run cattle there in common. These families have been good neighbors to the Santa Fe Ranch and have kept a careful eye on the cattle. The Santa Fe Ranch also borders Pueblo Indian land on the north and east. Tesuque and San Ildefonso Pueblo have always been great neighbors. One winter when a fence came down, about 50 head of cattle went onto the fields of corn stubble on Tesuque Pueblo land. The Tesuque Indians knew the cattle were there and who they belonged to but allowed them to winter in the field. When spring came, the Weils were called by Tesuque Pueblo to retrieve their cattle.

When the ranch and headquarters were bought in June 1961, major improvements had to be made on the ranch house to make it liveable (Fig. 5.4). In the interim, the Weils leased the Gerald Cassidy house on Canyon Road. At that time, Alan Stamm was building the Casa Solana subdivision, and the family looked at Stamm's houses and house plans. Mr. Stamm was able to build a new ranch house in eight weeks. However, a delay in moving out to the ranch was caused by the lack of electricity. The situation was remedied by hiring an independent contractor who strung electric and phone lines overhead for a couple of miles from the junction at Tano Road along the section line to the headquarters. It took several months to accomplish this, but in October of 1961, the family moved to the ranch.

The ranch had one cowboy, Blackie Nabors, and 600 head of cows and calves. The ranch brand was IK. The ranch originally had four wells that had been drilled in the 1930s; the Headquarters, Dead Dog, McKinley (renamed Midway), and an artesian well by the current Buckman Well Field. The Buckman Well had a tremendous natural flow and was drilled to a depth of 300 ft. The original declaration papers state that the well would irrigate 70 acres at a rate of 5,000 gallons per minute (in possession of the owner). However, the well casing was 7 inches and the inside was 6 3/4 inches, so it could not flow 5,000 gallons per minute. There is a second well in the same area that has an interesting history and is known as the "Movie Well." The Movie Well was drilled in 1939 for the making of a film called "The Light That Failed." As previously mentioned, Paramount Pictures Movie Company actually dammed the Rio Grande River to make it look more like the Nile River for the movie (Gjevre 1969:19).

Numerous improvements to the ranch were needed. Zannie Garcia wrote to the federal government for corral designs. After receiving a stack of 100 designs, she chose one to use in building the corrals. The corral designs proved to be the best and prevented many accidents, especially cuts on people and animals. The corrals and fences were constructed from old railroad ties that had been abandoned on the ranch by the dismantling of the Chili Line in the 1940s. Young teenage San Ildefonso Indians were hired during the summer to pick up the railroad ties and help build the corrals. Today these teenage boys are leaders of San Ildefonso Pueblo. During this same time a hay barn, sheds, a shop, and a tack room were added to the ranch (Fig. 5.5).

In 1961, the Santa Fe Ranch bought hay from Dooley Feeds. Eloy Garcia was the driver of the first semitractor trailer that brought hay to the ranch. The first winter on the ranch was survived without loss of cattle or calves. The

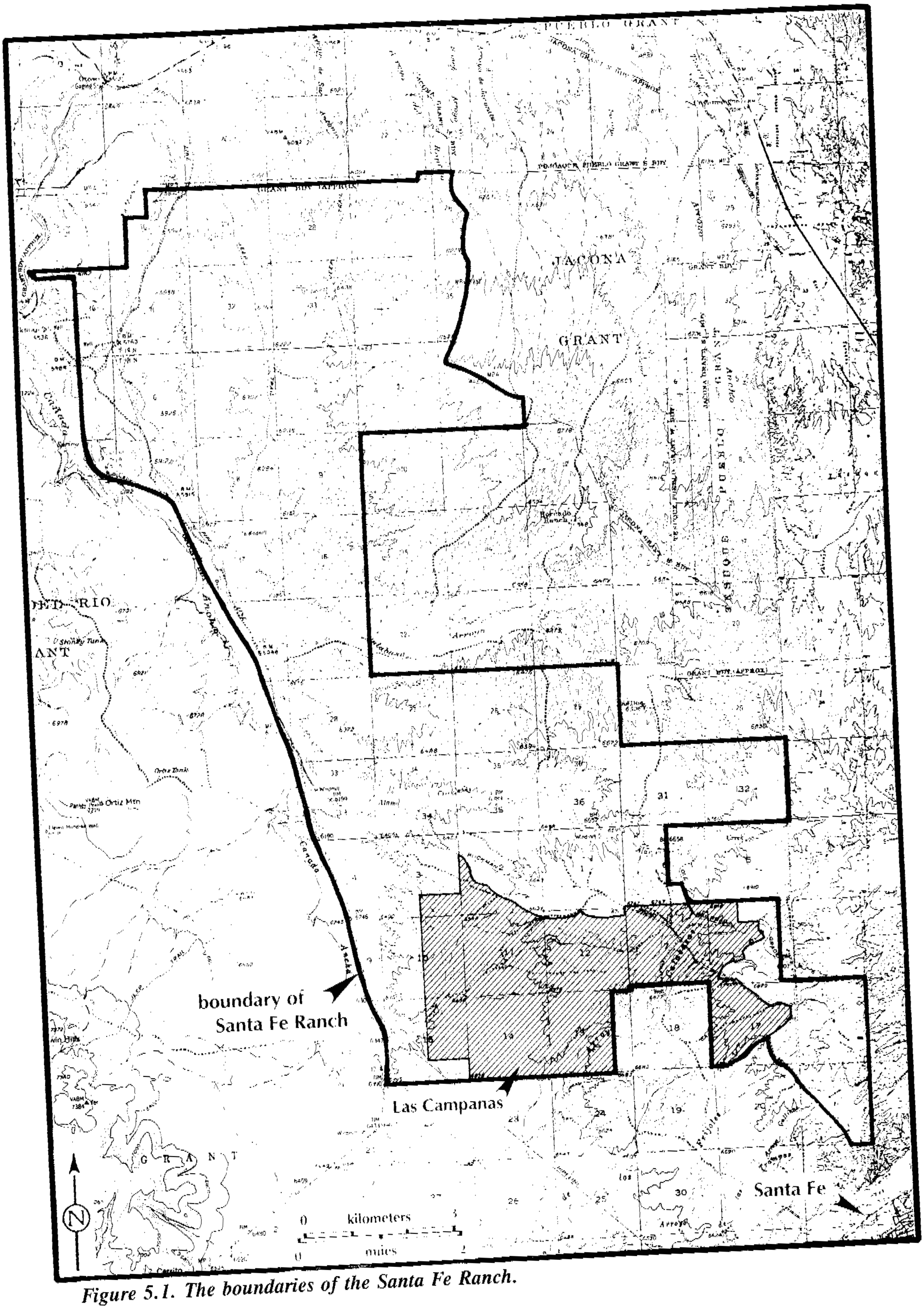

Figure 5.1. The boundaries of the Santa Fe Ranch.

Figure 5.2. The original Santa Fe Ranch house, ca. 1961.

Figure 5.3. Santa Fe Ranch original corral, ca. 1961.

Figure 5.4. Santa Fe ranchhands with new house in background.

Figure 5.5. New corrals, ca. 1971.

Figure 5.6. Cheesey-Dearing cattle truck.

Figure 5.7. Cattle on the range, Santa Fe Ranch, ca. 1971.

calves were sold and the Cheesey-Dearing Trucking Company was used to transport them (Figs. 5.6, 5.7).

In 1962, the State Land Commissioner, Johnny E. S. Walker, decided to sell off state lands in order to help schools. The Santa Fe Ranch state land lease came up for sale. The original ranch was composed of deeded land, and state and Bureau of Land Management leases. In order to preserve the ranch, Zannie and Bob Weil, with Zannie's father's money, made a bid at the auction. The auction for state lands was held in front of the Santa Fe County Courthouse. There were other interested parties, including a group composed of three lawyers. These lawyers had approached the Weils before the sale and suggested a partnership to ensure none of them would lose the state land to other bidders. An agreement was made to a set dollar amount at the bidding. If the bidding went higher, the partnership would dissolve and each party would be on their own. The lawyers dropped out after the set amount, while the Weils continued to bid and were successful in buying the state land.

After the purchase of the state lands in 1962, the ranch had 13,000 deeded acres, a state lease of 640 acres, and the BLM permit of 18,000 acres. About a year later the same group of lawyers made the claim that the original contract to purchase the state lands was vague and that the partnership was still valid. The lawyers went to court in order to establish a legal claim to the partnership. The Weils hired Harry Bigbee, the most successful litigating lawyer in Santa Fe, to represent them. Mr. Bigbee won the case using a strategy of discrediting the contract and the lawyer's involvement in it. The importance of the acquisition of the state land was that this deeded land became the basis for the development of La Tierra and other subdivisions, and eventually Las Campanas.

The Santa Fe Ranch holdings were expanded in 1963 by the acquisition of a feedlot in Moriarty. It began with 10,000 head of cattle and grew to a 35,000-head feed lot that was able to supply cattle to the ranch (Figs. 5.8, 5.9).

In the early 1970s the cattle market became more and more marginal. The price of calves remained constant, but the price of gas, labor, and taxes went up. Also at this time, people began eating less beef. These factors, combined with the terrible droughts of 1971 and 1972, caused a hardship in ranching. The City of Santa Fe was especially hard hit and almost ran out of water. The city considered drilling wells in the Rio Grande. The city had to pump the water up the length of the Santa Fe Ranch to pressure tanks located behind the Radisson Hotel (formerly the Plaza Picacho Hotel). Since the city needed the water immediately, Santa Fe Ranch offered the land in exchange for the water rights to 3,000 taps for 3,000 homesites. With the cattle market down, the suggestion to sell some of the ranch land was proposed by David Ater, president of First National Bank of Santa Fe. The subdivision plan focused on the deeded land at the middle of the ranch that had been acquired in the state land purchase. With the help of Tom Via, who was a subdivider from Tucson, Arizona, suitable property was identified for development. After a period of intensively looking at other subdivisions and reviewing HUD regulations, La Tierra Ltd. was formed, and development was initiated.

La Tierra was the first large subdivision on the hillsides in Santa Fe County. This subdivision had large lots with good views. The roads exceeded county regulations and were placed in the valleys so they could not be seen from the homesites. Whatever Santa Fe County regulations required, the Weils did more. The water rights were not used and water was obtained for the homesites by wells. This was allowed by county regulations. The phones and electric lines were underground. When a homesite was purchased, it had a guarantee that water would be found. If a drilled well proved dry, La Tierra would buy the lot back.

In 1975, 42 lots, from 10 to 20 acres each, were put on the market in the first phase of La Tierra. This happened only after the infrastructure was in place. The lot prices began at $17,500. The first phase was so successful that a second phase of 33 lots was offered at around $33,000 dollars each. This phase was also successful and was followed by a third phase that included 40 additional lots.

The second major project was called La Tierra Nueva. La Tierra Nueva had 78 lots on the market in one block and did not have phases. It was also different in that it had a security gate. These lots sold by 1980, and Salva Tierra and Tierra De Oro were developed. Salva Tierra Unit I and De Oro Unit I were developed at the same time. De Oro Unit I had county roads and no gate. Salva Tierra Unit I had a gate and private roads. At this time, La Tierra Ltd. used some of the 3,000 taps or water rights they had with the City of Santa Fe. The 1.5 to 5-acre lots in De Oro and Salva Tierra are served by the

Figure 5.8. Santa Fe Ranch cattle and landscape.

Figure 5.9. Zannie Garcia at the corrals, ca. 1971.

Figure 5.10. Cattle branding at the Santa Fe Ranch, ca. 1971.

Figure 5.11. Zannie Garcia on the Santa Fe Ranch in 1995.

Sangre de Cristo Water Company, which was at this time called PNM. The water contract was with the City of Santa Fe and PNM. The roads were paved and the La Tierra concept of being sensitive to the surrounding area was followed.

All the subdivisions had strict covenants. The purpose of the covenants was to make homes blend in with the environment. When over 80 percent of the lots were sold, homeowners associations were established and architectural control committees were formed.

For the original La Tierra and La Tierra Nueva phases, Buckman Road had to be upgraded. At that time it was a gravel road, without a base course. Later, with cooperation of the county, Buckman Road was upgraded with a base course. To receive approval from Santa Fe County to build De Oro and Salva Tierra, the roads were paved. The City of Santa Fe specified an alignment that was different from the original La Tierra Ltd. plans. This plan was to realign and pave the original Buckman Road and to come in behind the Radisson Hotel. The city wanted Camino la Tierra to become a northern loop that would provide access to city-owned land in the area. In 1980 it cost La Tierra Ltd. five million dollars to improve the infrastructure before they could sell a lot in De Oro or Salva Tierra.

The selling of the La Tierra lots was a family affair, and everyone participated. Zannie Garcia recalls that "sometimes the family was just fresh out of the swimming pool showing lots." They would even invite potential buyers to dinner.

In 1983, the Weils decided to dissolve their marriage. Because of the divorce, it became clear that it was best to sell the partnership. La Tierra Ltd. at that time consisted of De Oro Phases II and III, Salva Tierra Phases II and III, the property between De Oro and the city limits of about 490 acres, and a 4,600 acre area known as "Dutch Meadows." The Weils were approached by a partnership composed of PNM, who would provide the infrastructure, E. F. Hutton, the financing, and Lyle Anderson, the subdivider. Lyle Anderson was building a subdivision in Scottsdale that was sensitive to the environment, similar to La Tierra. The focal point for the proposed Santa Fe development was the inclusion of a state-of-the-art golf course. Jack Nicklaus was not involved in the original proposal. La Tierra Ltd. was sold to a consortium known as Santa Fe County Ranch Resorts on September 30, 1987. The partnership also wanted to buy the Santa Fe Ranch, but Zannie Garcia would not sell. When there was a need to find a new name for the proposed subdivision, Lyle Anderson came up with Las Campanas. Zannie Garcia was very pleased with that choice because La Tierra Ltd. had originally been zoned for a commercial building that would look like an old mission with a bell tower, with the bell tower as the symbol for the area. The Las Campanas partnership dissolved soon after they had purchased La Tierra Ltd. Lyle Anderson was left as the sole owner. Mr. Anderson brought in Jack Nicklaus to help with the design of the golf course and this changed the original package presented to La Tierra Ltd.

On August 12, 1984, Zannie married Eloy Garcia. Mr. Garcia had been foreman of the Santa Fe Ranch since 1967. They were married on horseback at the top of the hill in front of the current ranch headquarters.

Over the years, cows, calves, and bulls have been run year-round on the ranch. Currently the Garcias run cows and calves. The BLM has a significant impact on the ranch now because of the extensive regulations. The BLM permit depends on the adherence to their regulations on the 3,000 acres of deeded land and wells. The Garcias love the Santa Fe Ranch and the ranching life and plan on keeping the ranch to live and work on (Figs. 5.10, 5.11).

CHAPTER 6
SUNSET GOLF COURSE EXCAVATIONS

The Sunset Golf Course data recovery project was conducted between February and May 1993. It entailed the excavation or detailed recording of six prehistoric and one historic period site. Five sites (LA 84758, LA 84759, LA 84775, LA 85036, LA 98861) located along the proposed West Golf Course were previously identified by Southwest Archaeological Consultants, Inc. (SAC) in April 1992 (Scheick and Viklund 1991). The seventh site (LA 98680) was located outside the Sunset Golf course, in the Estates VII subdivision (Post 1992). The LA 98680 excavation results will be reported in the Estates VII section.

LA 84758

Introduction

LA 84758 was originally identified by SAC during the Estates III and West Golf Course inventory (Scheick and Viklund 1991:16). Excavation was conducted by OAS during March and April 1993. The site was originally described as two artifact concentrations with ground stone. Early in the excavation it was clear that the site had been intensively occupied and the two concentrations were within the same occupation area. A more extensive excavation than was originally planned was conducted. The proposed data recovery effort outlined in the Sunset Golf Course treatment plan focused on recovery data from a small site (Post 1993a). Adjustments in field methods and research orientation accommodated the new findings.

Setting

LA 84758 was located in the western one-quarter of the Las Campanas area where numerous drainages and lower elevations converge. Elevations in the immediate area range between 6,400 and 6,500 ft. The local topography has rolling ridges heavily dissected by arroyos that drain to the southwest and are a major component of the headwaters of the Cañada Ancha.

The site is in a southwest-facing crescent-shaped drainage area. The drainage area is bounded on the northwest and southeast by moderately steep slopes. The slopes rise up 16 to 25 m to a northeast-trending ridge that separates two secondary arroyo floodplains. The drainage area is sheltered and has a gentle (8 percent) slope that is cut by six shallow drainages. The shallow drainages empty into a broad alluvial plain that is a major topographic features of the immediate area.

The extensive alluvial floodplain is formed by the confluence of four secondary and tertiary arroyos that drain the western portion of Las Campanas. These arroyos flow into a secondary tributary of Cañada Ancha that drains to the southwest until it leaves the piñon-juniper piedmont, where it flows north-northwest into the Cañada Ancha. This drainage pattern may be geomorphologically and hydrologically significant as this confluence collects a major portion of the water and soil moving out of the piedmont. These conditions may have combined to provide suitable conditions for a diverse and abundant riparian environment.

Soils consist of Pojoaque-Panky, Bluewing, and Fivemile loam series. These soils are described in more detail in the Contemporary Environment section of this report. Only the Fivemile loam is considered suitable for irrigation and agriculture (Folks 1975:25-26).

Flora is dominated by piñon-juniper overstory on the ridge top and slopes. Grasses are sparse with galleta and grama observed. Shrubs include narrowleaf yucca, rabbitbrush, and prickly pear and cholla cactus. Abundant in the arroyo channels is yellow matchweed, which often grows in abandoned fields associated with historic period homesteads.

Pre- and Post-Excavation Description

LA 84758 was recorded as two lithic artifact concentrations and a dispersed chipped stone scatter that covered 1,000 sq m. Concentration 1 had 22 artifacts consisting mostly of chert core flakes and pieces of angular debris. Also present were two metate fragments, a few cores, and a hammerstone. The second concentration had 17 chert core flakes. No temporally diagnostic artifacts were observed. It was suggested that the ground stone artifacts might indicate the presence of buried thermal features.

Excavation revealed that the extent and depth of the cultural deposit was underestimated by the inventory. Based on the surface artifact distribution the site limits were extended to 123 m north-south by 61 m east-west, covering a 7,503-sq-m area (Fig. 6.1).

The northern 85-by-40-m portion of the site was on the moderate to steep slope of the drainage area and gravel and cobble ridge slopes. This area had a dispersed scatter of 29 pieces of chipped stone debris that reflected low intensity raw material reduction. This assemblage was similar to other chipped stone scatters on gravel slopes that may be from the Pueblo period and not necessarily contemporaneous with the main cultural deposit.

Excavation yielded a complex multicomponent cultural deposit that was estimated to cover a 350-sq-m area in the southern one-third of the site. Excavation focused on the central and densest portion of the cultural deposit, and 103 1-by-1-m units were excavated within a 20 m north-south by 9 m east-west area (Figs. 6.2, 6.3). Excavation yielded 12 thermal or processing features, concentrations of fire-cracked rock, a probable pit structure, a cultural deposit that was 15 to 90 cm deep, and an artifact assemblage consisting of 1,163 pieces of chipped stone, 45 ground stone artifacts, and 18 pieces of nonhuman bone.

The limits of the cultural deposit were determined by placing auger tests and eight 1-by-1-m units outside the main excavation area. One of the excavation areas yielded a rock-filled hearth (Feature 13) 10 m south of the main excavation area. Feature 13 was not associated with an artifact concentration or the dark-stained cultural fill. These indicators suggest that it is a separate occupation component.

Excavation Methods

Site limits were defined by pinflagging the surface artifacts. Once this was completed, a grid system was superimposed across the site. The surface artifacts were collected in 2-by-2-m units. The area with the highest density artifact concentration was selected for excavation.

A 3-by-5-m area on a gentle east-facing slope along a shallow erosion channel was selected and gridded into 1-by-1-m units (Grids 71-75N/93-95E). These units were excavated in two 10-cm levels. The units closest to the erosion channel had 10 cm or less of cultural fill. As excavation moved upslope to the west, the cultural fill was heavily charcoal-stained, contained artifacts and fire-cracked rock, and was more than 20 cm deep. To ascertain the extent of the dark, cultural deposit, a 2-by-3-m area was added to the west and excavated to 20 cm below the modern ground surface (Grids 73-75N/91-92E). The stain continued farther upslope, and a 1-by-4-m area was excavated to define the western extent of the stained cultural deposit (Grids 74N/87-90E). Additional 1-by-1-m units were excavated to the north showing that the cultural deposit extended to at least Grid 85N/93E.

The limit of the cultural deposit was not reached to the north and west, so the excavation area was expanded to define the cultural deposit limit and expose subsurface features. All fill was excavated in 10-cm levels and screened in all but 28 units. Arbitrary levels were used because breaks in the natural stratigraphy were difficult to define due to the permeability of the sandy soil. The 28 units that were not completely screened bordered excavation areas where a uniform deposit of top soil above the cultural deposit could be defined and removed as overburden. Screening of the fill from these units was resumed when Stratum 2 (the cultural deposit) was reached.

Vertical control of the excavation levels was maintained using strategically located datums. All elevations were relative to a point designated as 5.0 m. Combining arbitrary level designations and relative site elevations allowed for comparison of the vertical distribution of features and artifacts across the site.

Features were excavated by first stripping the surrounding area until the feature outline was exposed. A cross section of the feature was excavated to expose the fill profile. The profile was examined for stratified deposits and for the best contexts for sample collection. Feature 1, the remains of a pit structure, was excavated in 1-by-1-m units. Two arbitrary levels were used as control for removal of the feature fill. The lower 10 to 12 cm was treated as floor fill.

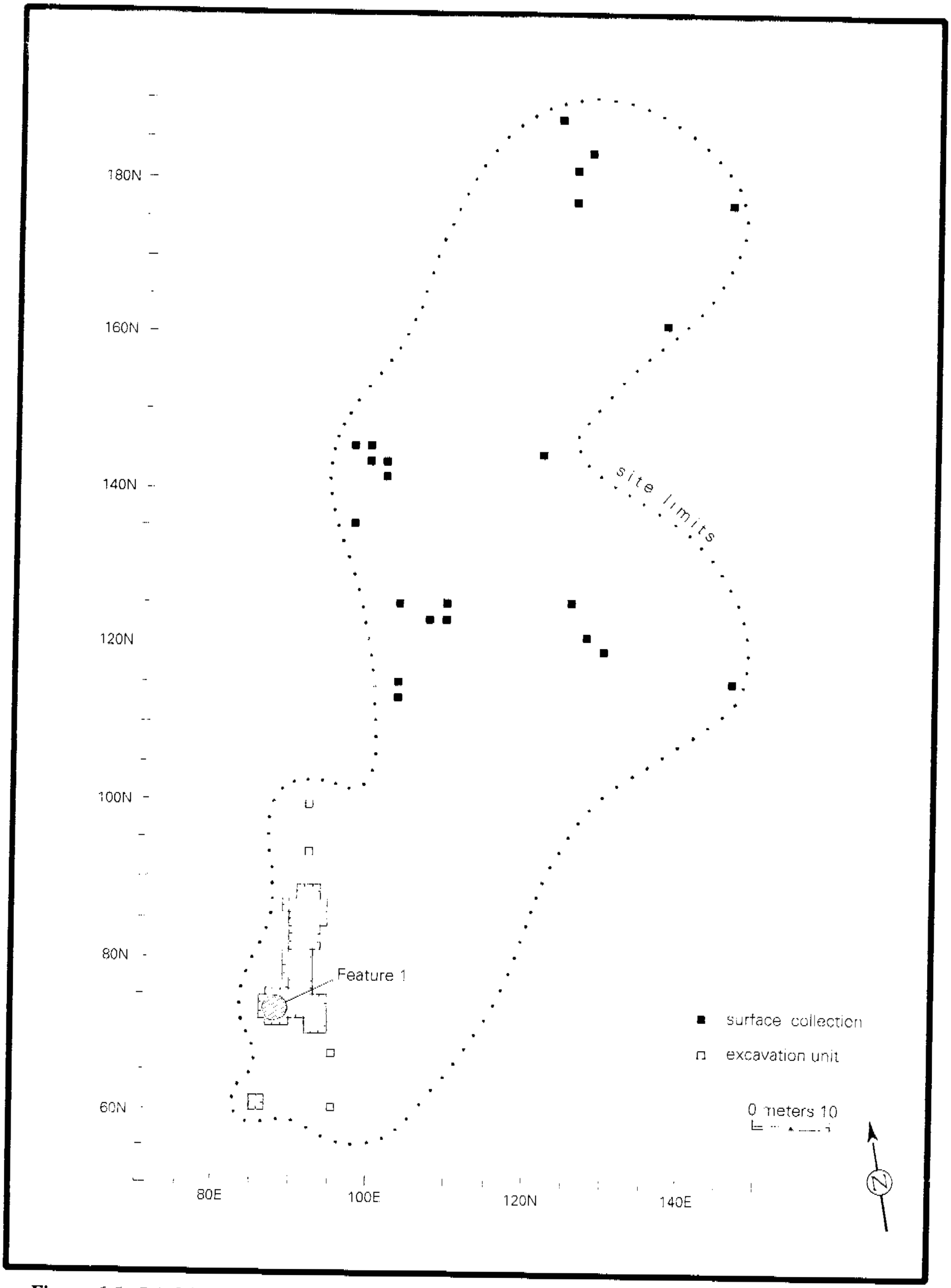

Figure 6.1. LA 84758 site plan.

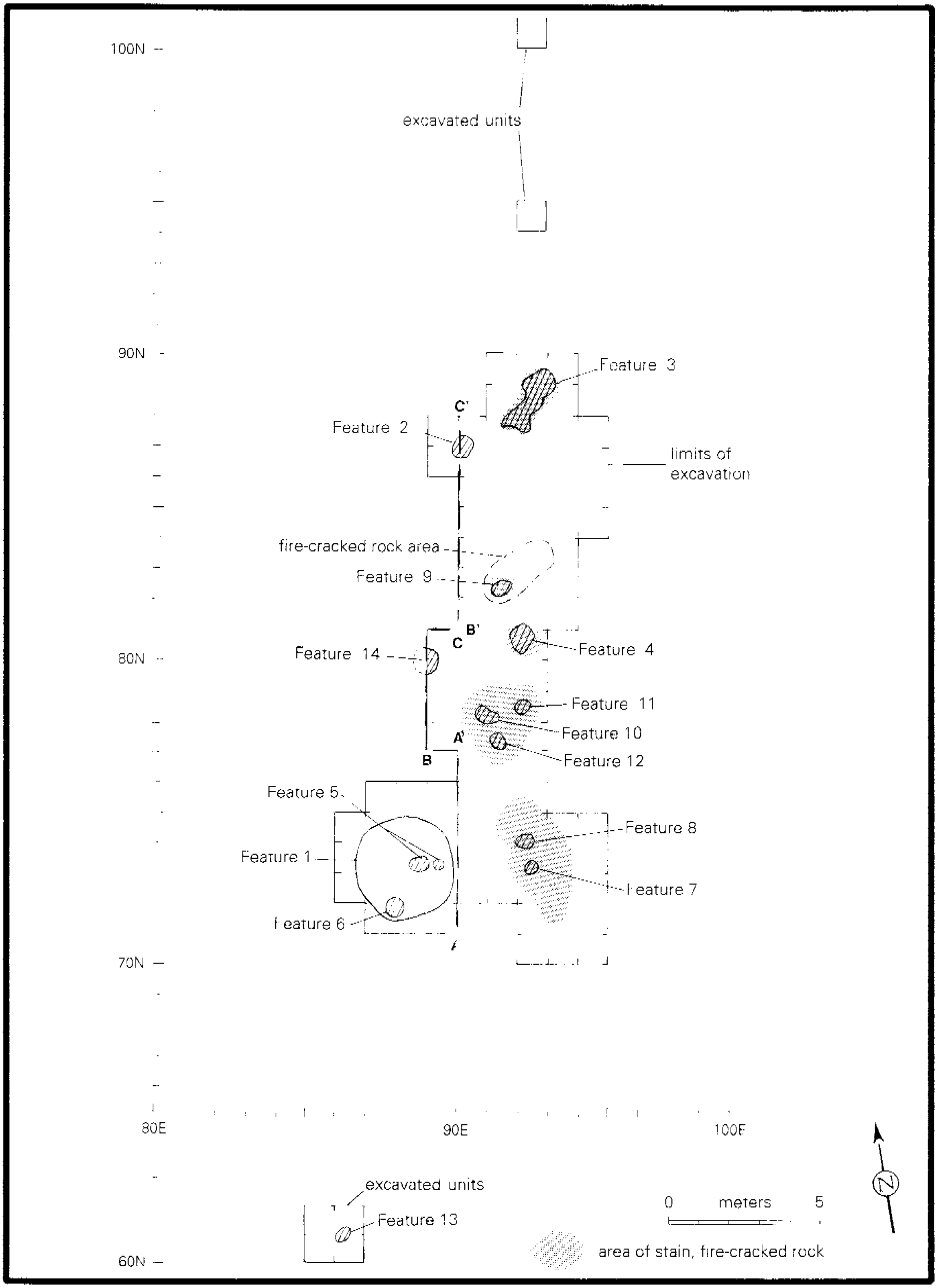

Figure 6.2. LA 84758, main excavation area showing feature locations.

Figure 6.3. Main excavation area looking north across Feature 1.

For all features, radiocarbon and ethnobotanical samples were collected if the soil was darkly stained or charcoal flecks were visible. After the feature was excavated, recording consisted of a written description, drafting a plan view and profile map, and taking photographs.

In the northern part of the excavation area, features were often excavated into deeper cultural deposits, so excavation was continued below the excavated feature. As large rocks, fire-cracked rock concentrations, or diagnostic artifacts were encountered, they were located on an excavation plan. Different occupation levels could be defined with this information, even though the cultural deposit was excavated in arbitrary levels.

The limits of the main cultural deposit were defined using 11 auger tests and eight 1-by-1-m units. The auger tests reached a depth below the main cultural deposit. The soil was described and the depth of charcoal and artifacts was tracked.

Two 1-by-1-m excavation units (101N/93E and 95N/93E) were excavated to define the limits of the cultural deposit. Grid 101N/93E yielded a few pieces of chipped stone but none of the darkly stained soil, and was beyond the northern limit of the main cultural deposit. Grid 95N/93E yielded a darkly stained deposit similar to the main cultural deposit between 55 and 85 cm below the modern ground surface indicating that the deep deposit defined in the northern excavation area extended 6 to 10 m beyond the excavation limit.

Excavation units were placed at Grids 61N/96E and 61N/88E. These units were excavated in two 10-cm levels. No evidence of the darkly stained cultural deposit was encountered. These units were beyond the southern extent of the main cultural deposit. However, a rock-filled thermal feature was exposed in Grid 62N/88E. This unit was expanded to a 2-by-2-m unit and the feature (Feature 13) was defined and excavated. The lack of artifacts and cultural deposit outside Feature 13 suggested that it was not contemporaneous with the occupation of the main excavation area.

Once excavation was terminated, the site was mapped with a transit and stadia rod. Elevations were taken across the site area and important erosion channels were mapped. The site elevations were tied into an arbitrary elevation of 5.0 m.

Stratigraphy

Four stratigraphic levels were defined by excavation or auger tests. These levels represent post-occupation deposition (Stratum 1), the main cultural deposit (Stratum 2), a transition from the cultural deposit to the noncultural stratum (Stratum 2/3), and a noncultural material-bearing stratum (Stratum 3) (Fig. 6.4).

Stratum 1 was the loose, sandy loam top soil that occurred throughout the excavation area, except in the southeast portion where there was an erosion channel. Stratum 1 was from 0 to 50 cm thick. The deepest soil deposits were in the north portion of the excavated area. Deposit thickness decreases from north to south. Stratum 1 contained cultural material from the latest occupation of the site and the main cultural deposit (Stratum 2). Features 2, 3, and 13 were excavated into Stratum 1 suggesting that they were from a later occupation.

Stratum 2 was an unstratified, gray-brown to dark gray-brown, mottled, loose sandy loam that was relatively homogeneous in color and texture and was geomorphologically similar to Stratum 1. The distinctive stained soil color remains from large amounts of ash and charcoal generated by the use and maintenance of the thermal features and the apparent burning of Feature 1. Charcoal flecks were rare and soil samples taken from the features yielded very low charcoal counts.

Stratum 2 occurred throughout the excavation area as a 15 to 50 cm thick layer. Greatest thickness was found in the north 6 m of the excavation area where it was capped by a by 40 to 50 cm layer of Stratum 1. An early occupation is indicated by a thicker deposit with artifacts and fire-cracked rock 80 cm below the modern ground surface in Grids 87-88N/91-93E and 89-90N/92-93E. This level occurred between 3.85 and 3.05 below datum--20 to 40 cm lower than the occupation levels encountered in the southern three-quarters of the excavation area. Stratigraphically there are no soil texture or assemblage content differences between this early level and the later occupation levels within Stratum 2.

Stratum 2 was thinnest in the south half of the excavated area. In Grids 71-75N/93-95E the cultural deposit occurred immediately below the surface and was 10 to 15 cm thick. This area is on the western edge of a shallow drainage channel, which has reduced the thickness of the deposit. Stratum 2 is a combination of fill from the pit structure and the resultant use of the pit structure.

Stratum 2 in the central portion of the excavation area had variable thickness. The area between Grids 78N and 84N had the densest cultural deposit as well as six thermal features. The deposit has mixed primary and secondary discard from extramural activities associated with the pit structure occupation, and perhaps reoccupations from the same general period. Fire-cracked rock was most abundant in this area, and ground stone artifacts were associated with at least two features.

Overall, Stratum 2 was a mix of fire-cracked rock, chipped stone in densities ranging from 1 to 30 per sq m, scattered ground stone artifacts, and occasional flecks of charcoal. Eleven of the 14 features were excavated into Stratum 2, and charcoal-stained fill from these features has contributed to the dark color of deposit.

Stratum 2/3 was a transitional soil layer between the dense cultural layer and the underlying noncultural material-bearing soil (Stratum 3). Stratum 2/3 was mottled brown, loose sandy loam mixed with decreased numbers of artifacts and fire-cracked rock and root and insect intrusions. Rather than a cultural deposit, Stratum 2/3 exhibited downward movement of artifacts and charcoal-stained soil from the overlying Stratum 2. No features were found in this layer. This stratum was observed throughout the excavation area and was 10 to 40 cm thick.

Stratum 3 was yellow-brown to brown sandy alluvium with occasional lenses of gravel and coarse-grained sand underlying the site. Calcareous deposits occurred on pebbles and in the soil as the depth of excavation increased. Stratum 3 was reached in all auger tests. The auger tests indicated that it was at least 50 cm thick and as much as 70 cm thick around the excavation area. This was the noncultural material-bearing deposit; at which point, excavation was halted.

Feature Descriptions

Fourteen features were identified by the excavation. Thirteen features were completely excavated. Feature 14 was defined in the cross section of an excavation unit wall. The feature types included a pit structure, one irregular-shaped pit, three fire-cracked rock-filled pits, two basin-shaped pits associated with fire-cracked rock,

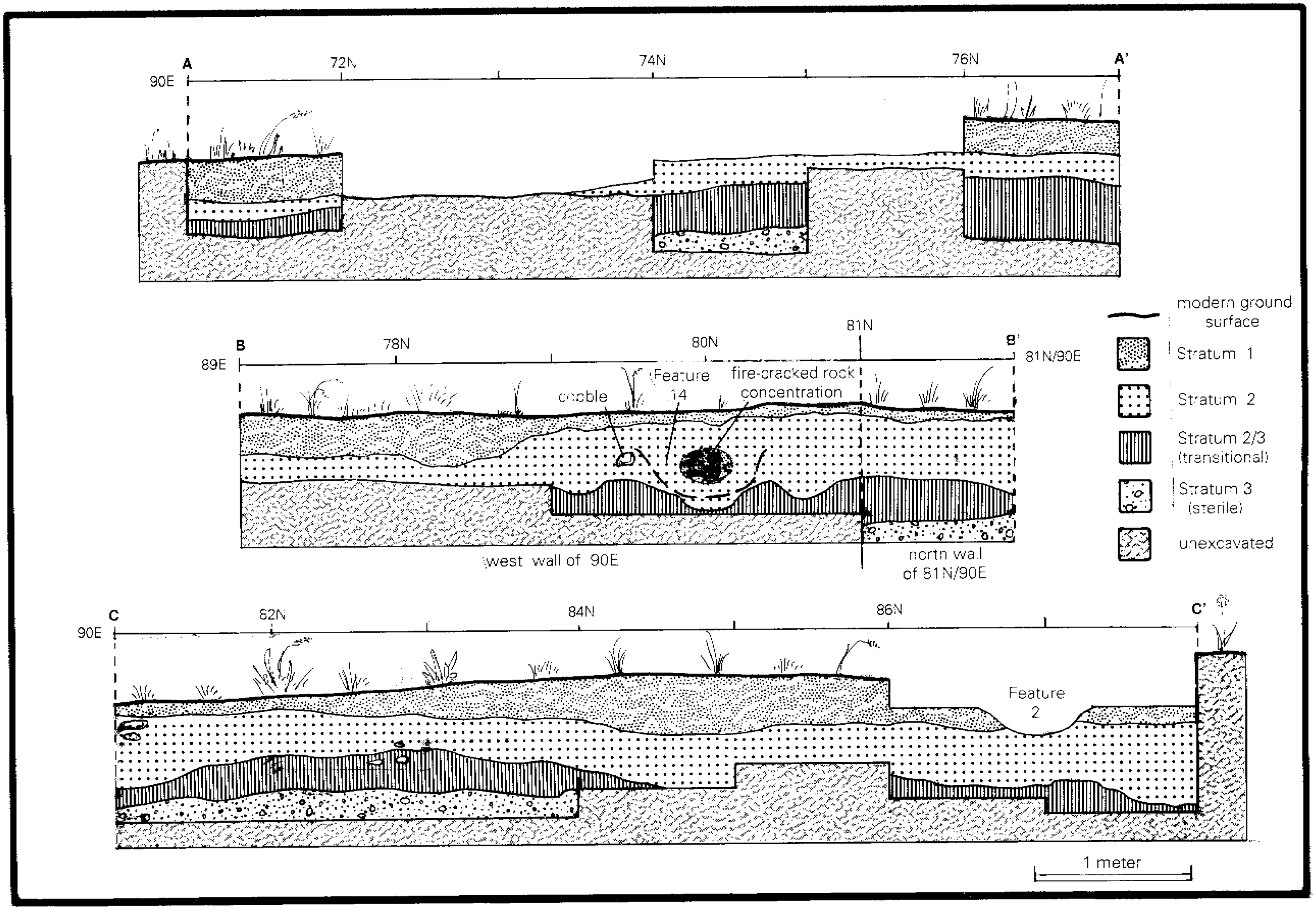

Figure 6.4. LA 84758, stratigraphic profile of the excavation area.

Figure 6.5. LA 84758, Feature 1, excavated.

and seven basin-shaped pits. Features 5 and 6 were within the pit structure (Feature 1). The other features were part of extramural activity areas. Table 6.1 provides basic location and descriptive data for each feature.

Pit Structure

Feature 1 was a circular pit structure foundation with shallow, moderately sloping walls (Fig. 6.5). Pit structure limits were defined by the dark, charcoal-stained interior fill. Migration of the stained soil into the walls made the walls difficult to identify. Definition of the pit structure limits was hampered by the informal and ephemeral nature of the walls. The walls had not been modified or stabilized. The pit structure measured 3.3 m north-south by 2.9 m east-west (Fig. 6.6).

Superstructure elements were poorly preserved or absent. No definite postholes were identified. The floor showed no evidence of preparation and was identified by the vertical limit of the dark stained soil. The walls were sloped and may have functioned to anchor a temporary superstructure. There was no definitive evidence of an entryway or interior partitions.

The pit structure floor and floor fill contained low numbers of primary and de facto refuse (Schiffer 1987). Eleven pieces of ground stone lay on the floor in fragmentary condition. These fragments appear to have been left in the feature at abandonment. The metate may have fractured as a result of excessive heat when the feature burned. Artifacts left on the floor that were directly associated with intramural activities were rare. Chipped stone microflakes from tool production and small nonhuman bone fragments from cooking and consumption were not recovered in concentration within the pit structure. Absence of minute artifacts may be partly explained by the recovery technique which used ¼-inch screen, allowing the smaller artifacts to slip through.

Two features (Features 5 and 6) were within the pit structure. Feature 5 was two closely associated pit features located in the east-central portion of the pit structure. These pits were tentatively identified as the hearth and ashpit. The hearth fill was darkly stained but mixed, and the feature interior was not heavily burned or oxidized. The possible ash pit, which was 10 cm east of the hearth, contained a few charcoal flecks and lightly stained fill. The identification of the second pit as an ashpit is based on its

Table 6.1. Feature Data, LA 84758

Feature	Grid	Type	Shape	Dimensions	Matrix	Condition	Artifacts	Samples
1	73-74N/87E, 72-75N/88E, 72-75N/89E, 73-75N/90E	Pit structure	Circular with sloping walls	3.30 m N-S, 2.90 m E-W, 20-30 cm deep	Stained native loam with lithic and ground stone artifacts	Slumping walls, possibly burned	Lithics and ground stone	None
2	87-88N/90E, 87-88N/91E	FCR-filled pit	Shallow, circular basin with sloping sides	75 cm N-S, 66 cm E-W, 20 cm deep	Stained native sandy loam	Intact	None	Flotation
3	88-90N/92E, 88-90N-93E, 88-90N/94E	Stained area and pit	Rough figure-8 with sloping sides	2.24 m N-S, 1.30 m E-W, 4-12 cm deep	Stained native sandy loam with lithics	Intact	Lithics	Flotation
4	81-82N/92E, 81-82N/93E	Stained area and pit	Oval-shaped with sloping sides	1 m N-S, .60 m E-W, 35 cm deep	Native sandy loam with dark charcoal staining and lithics and ground stone	Intact	Lithics and ground stone	Two flotations
5	74N/89-90E	Hearth and Ash pit	Shallow, circular basins with sloping sides	Hearth: 60 cm N-S, 40 cm E-W. 16 cm deep Ash Pit: 44 cm N-S, 34 cm E-W, 10 cm deep	Hearth: Dark brown stained, mottled sandy loam, no charcoal or artifacts Ash pit: Brown mottled and stained sandy loam, no charcoal or artifacts	Redeposited fill but intact	None	Flotation from hearth
6	72-73N/88E, 72-73N/89E	Circular pit	Shallow, circular basin with sloping sides	53 cm N-S, 50 cm E-W	Dark brown stained and mottled sandy loam, no charcoal or artifacts	Intact, but not burned	None	None
7	74N/93E	Pit	Steep sided pit with basin shaped bottom	40 cm N-S, 43 cm E-W, 25 cm deep	Dark gray-brown loam with pebbles and a few specks of in situ charcoal and redeposited eolian soil	Eroded-on a slope above a small erosion channel	None	Flotation
8	73-74N/92E, 73-74N/93E	Pit	Steeply sloping sides with a basin shaped bottom	55 cm N-S, 68 cm E-W, 16 cm deep	Dark gray brown sandy loam with occasional very small flecks of charcoal, pebbles and ash	Outline is intact but probably slightly eroded, not burned	None	None
9	83-84N/92E, 83-84N/93E	Possible hearth	Steeply sloping sides with a basin shaped bottom	18 cm N-S, 20 cm E-W, 25-35 cm deep	Redeposited darkly stained sandy loam	Intact	Lithics	Flotation

Feature	Grid	Type	Shape	Dimensions	Matrix	Condition	Artifacts	Samples
10	79N/90-91E	Possible hearth	Irregular shape with sloping sides and basin shaped bottom	55 cm N-S, 77 cm E-W, 37 cm deep	Mottled brown-yellow sandy loam with a dark brown to black center	Intact	None	Flotation
11	79N/92-93E	Possible hearth	Roughly circular with sloping sides and basin shaped bottom	53 cm N-S 52 cm E-W 16-18 cm deep	Fine dark sandy loam with roots	Intact	None	Flotation
12	78N/92E	Hearth	Oval-shaped with steeply sloping sides and an irregular bottom	60 cm N-S 45 cm E-W 7-15 cm deep	Probably redeposited sandy loam	Intact	None	Flotation
13	61-62N/86E, 61-62N/87E	Rock-filled hearth	Oval-shaped with sloping sides and a fairly flat bottom	80 cm N-S, 60 cm E-W, 25 cm deep	Very dark grayish brown sand with abundant FCR and charcoal stained cobbles	Intact	Lithics	Flotation
14	80-81N/90E	FCR-filled pit	Appears to be oval with a basin-shaped bottom	30 cm N-S; E-W unable to ascertain; 10-20 cm deep	Darkly stained sandy loam with FCR in fill	Intact	None	Flotation

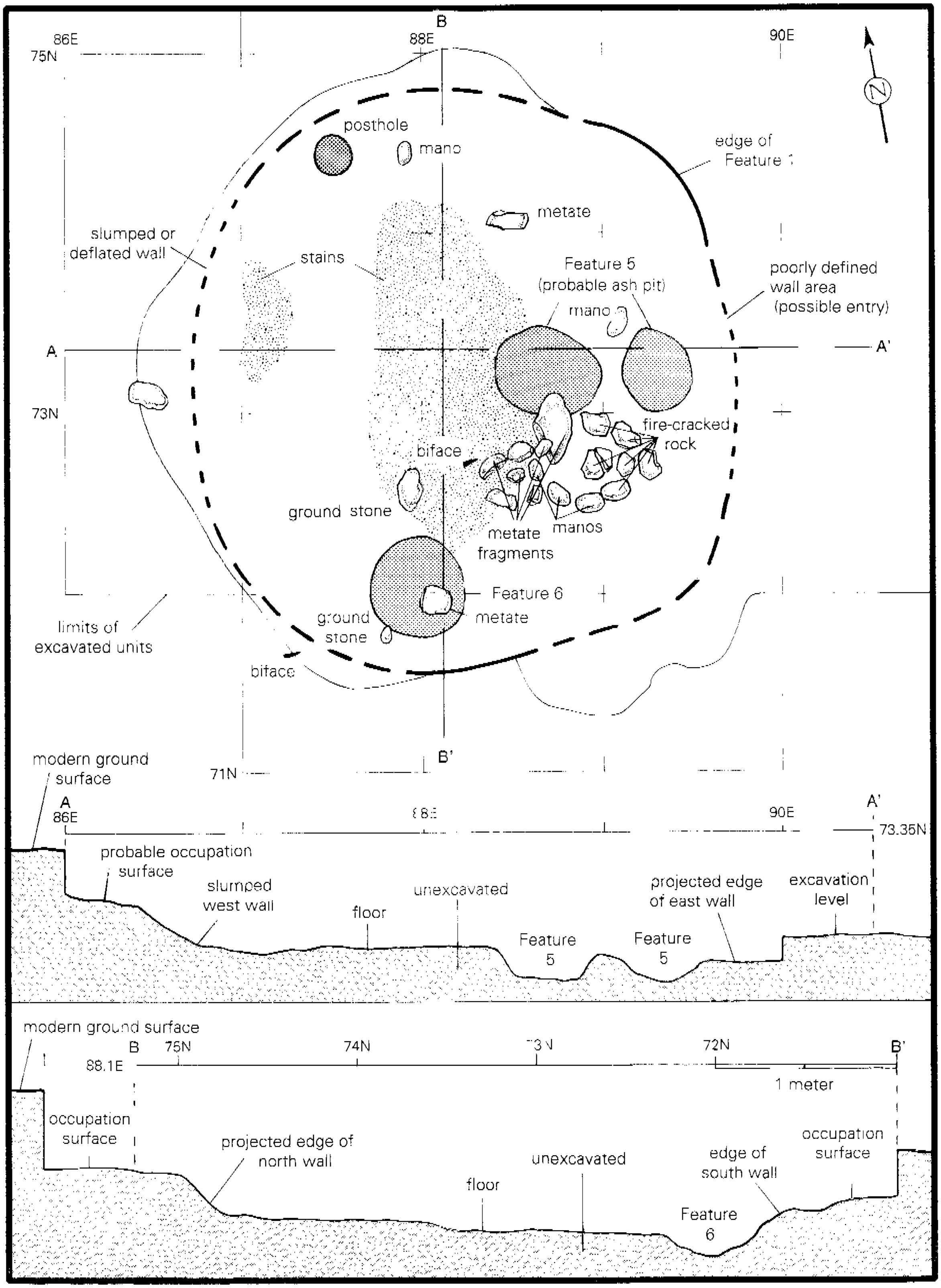

Figure 6.6. LA 84758, Feature 1, plan view and profile.

Figure 6.7. LA 84758, Feature 2, excavated.

proximity to the hearth. However, functional identification for either pit is difficult given the mixed nature and lack of ethnobotanical remains in the feature fill.

Feature 6 was located along the south wall of the pit structure. It was basin shaped with sloping walls. The feature fill was mottled and stained, but lacked abundant charcoal. A ground stone concentration was located on the perimeter of the pit suggesting the pit may have been used in food processing.

Within Feature 1 there was heavily charcoal-stained fill that contained few artifacts. The intensity and consistent presence of the staining and the low artifact count suggest that the pit structure burned rather than the stained soil resulting from trash-filling or post-abandonment use. The consistent presence of the stain and the lack of unstained pockets within the feature reflected the burning of a superstructure that spanned the feature. The lack of burned structural elements is difficult to account for, but their absence may reflect poor preservation of large charcoal in exposed sandy soil or that the majority of the structural elements were relatively insubstantial. Though it is difficult to ascertain, it does appear that the structure burning and abandonment were contemporaneous. The low frequency of artifacts in the pit structure fill suggests that the immediate site area was not reoccupied subsequent to the burning--an event that could have led to trash-filling of the structure.

Pits Filled with Fire-Cracked Rock

Three features, 2, 13, and 14, were pits filled with fire-cracked rock (Table 6.1; Figs. 6.7-6.10). These features were spread out across the excavation area. Feature 2 was in Grid 88N/91E area and was stratigraphically above the excavated features and activity area in the southern three-quarters of the excavation area. Feature 13 was 9 m south of the main excavation area in the Grid 61N/87E area. Feature 14 was located in the profile of the west edge of the excavation area in the Grid 78N/90E area. All three features may date to the latest occupation period based on stratigraphic location. These features were unlined, excavated into Stratum 2, and contained from 40 to 120 pieces of fire-cracked cobbles and darkly stained, sandy soil. They were oval shaped and ranged in size from 75 to 80 cm long, 60 to 66 cm wide, and 20 to 25 cm deep. Flotation samples collected from the features

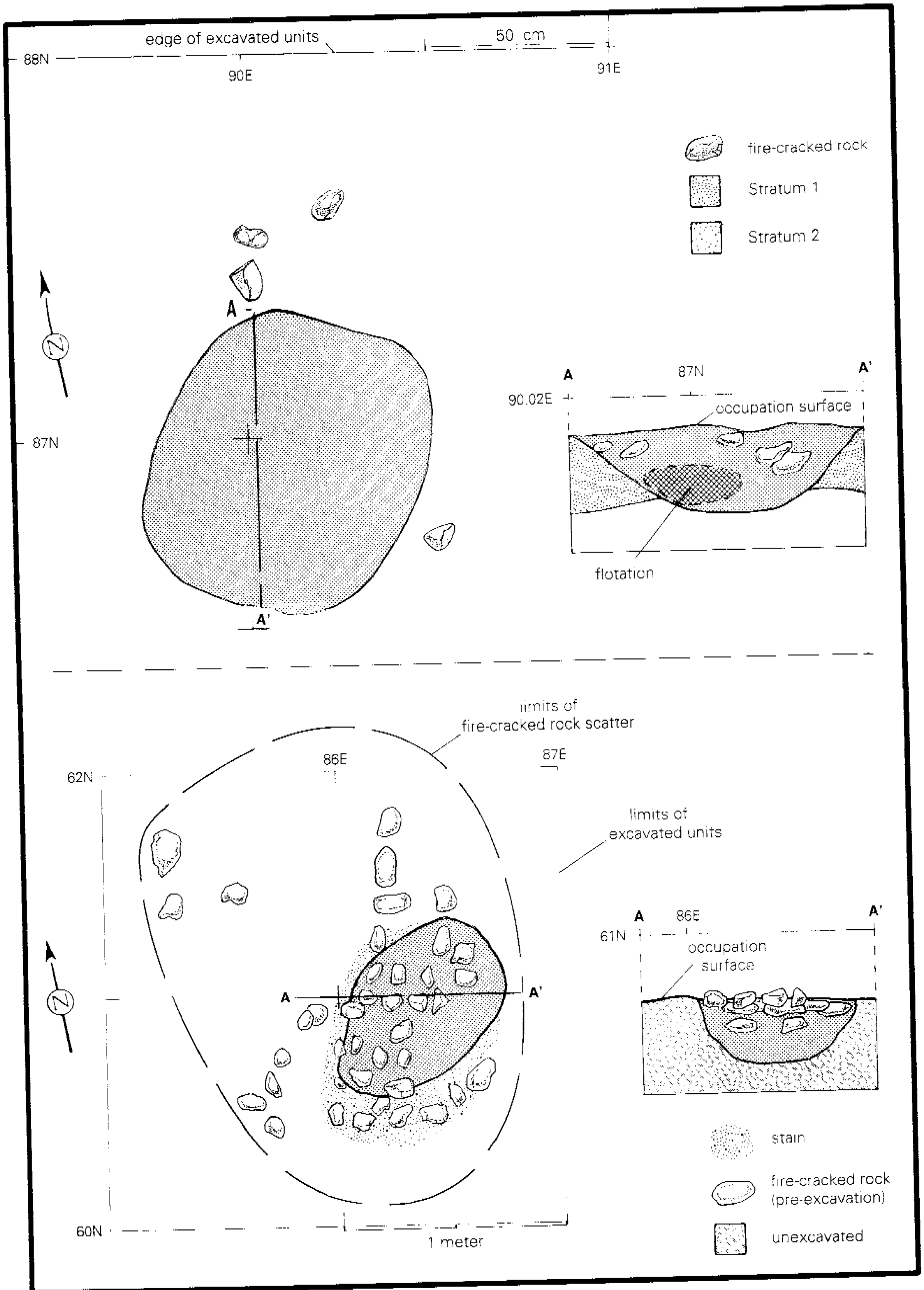

Figure 6.8. LA 84758. Plan view and profile of Feature 2 (top); plan view and profile of Feature 13 (bottom).

Figure 6.9. LA 84758, Feature 13, excavated.

Figure 6.10. LA 84758, Feature 14, excavated.

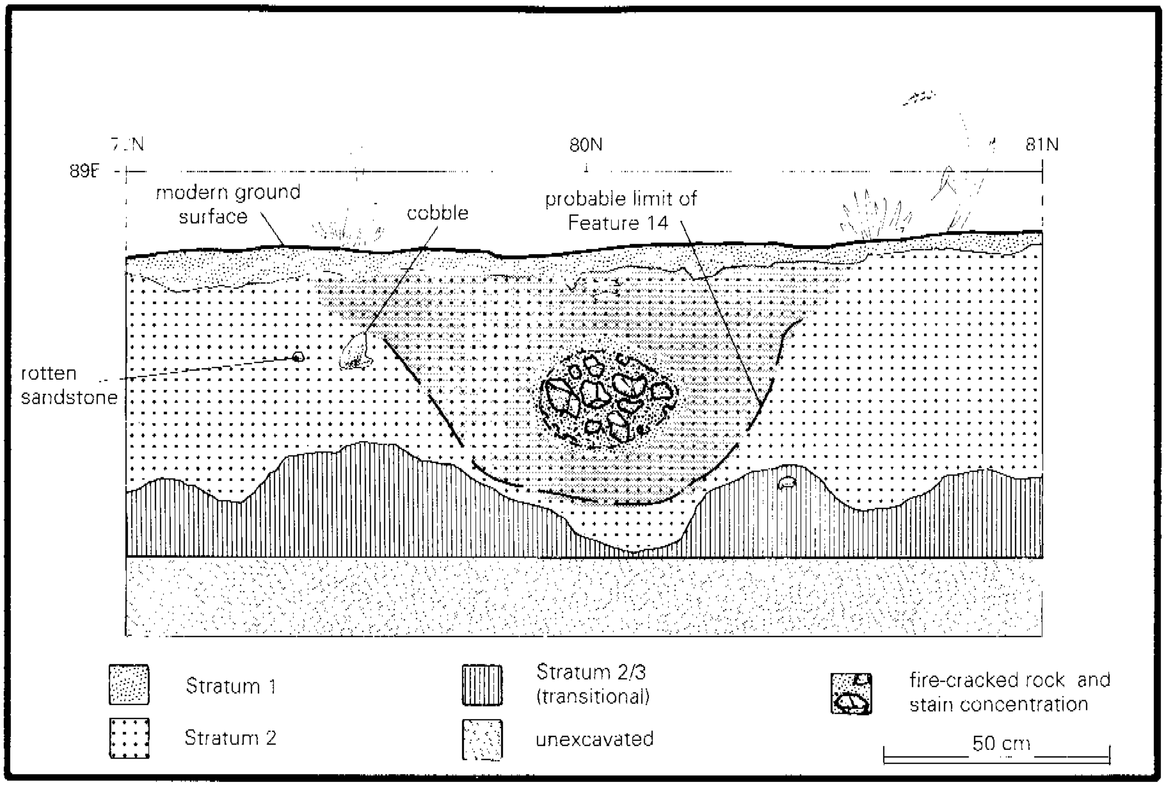

Figure 6.11. LA 84758, Feature 14, profile.

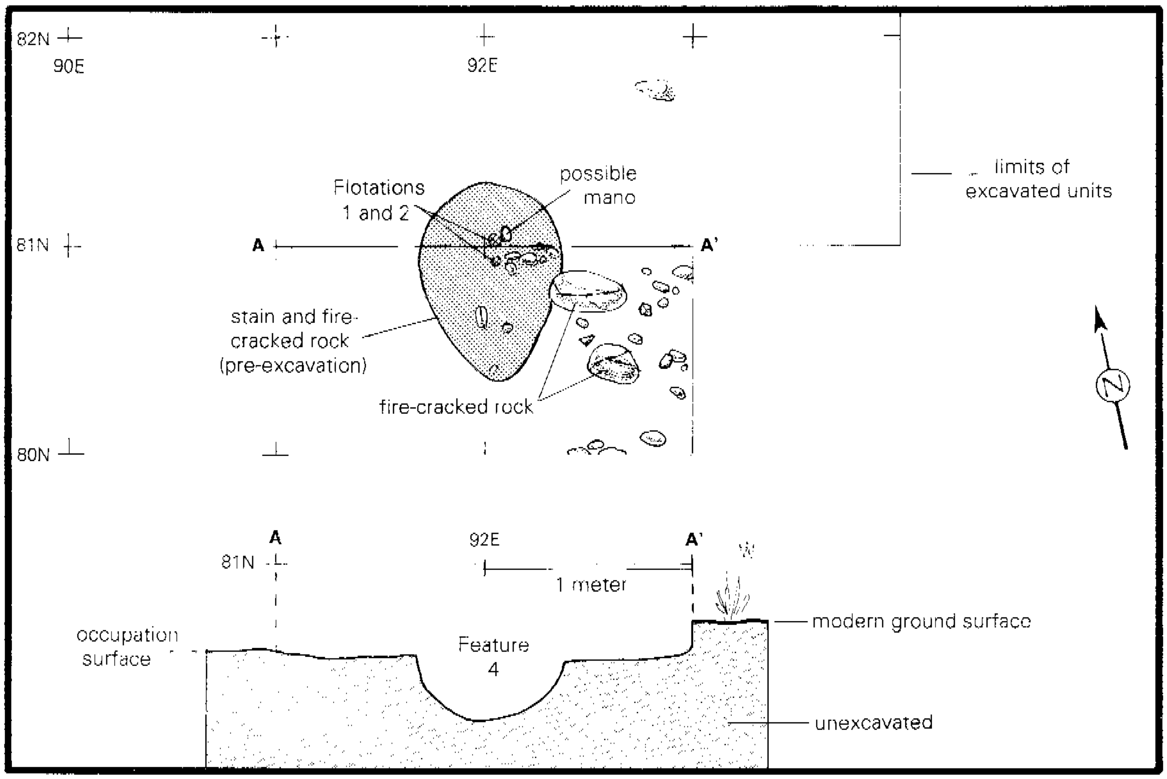

Figure 6.12. LA 84758, Feature 4, plan and profile.

Figure 6.13. LA 84758, Feature 9, excavated.

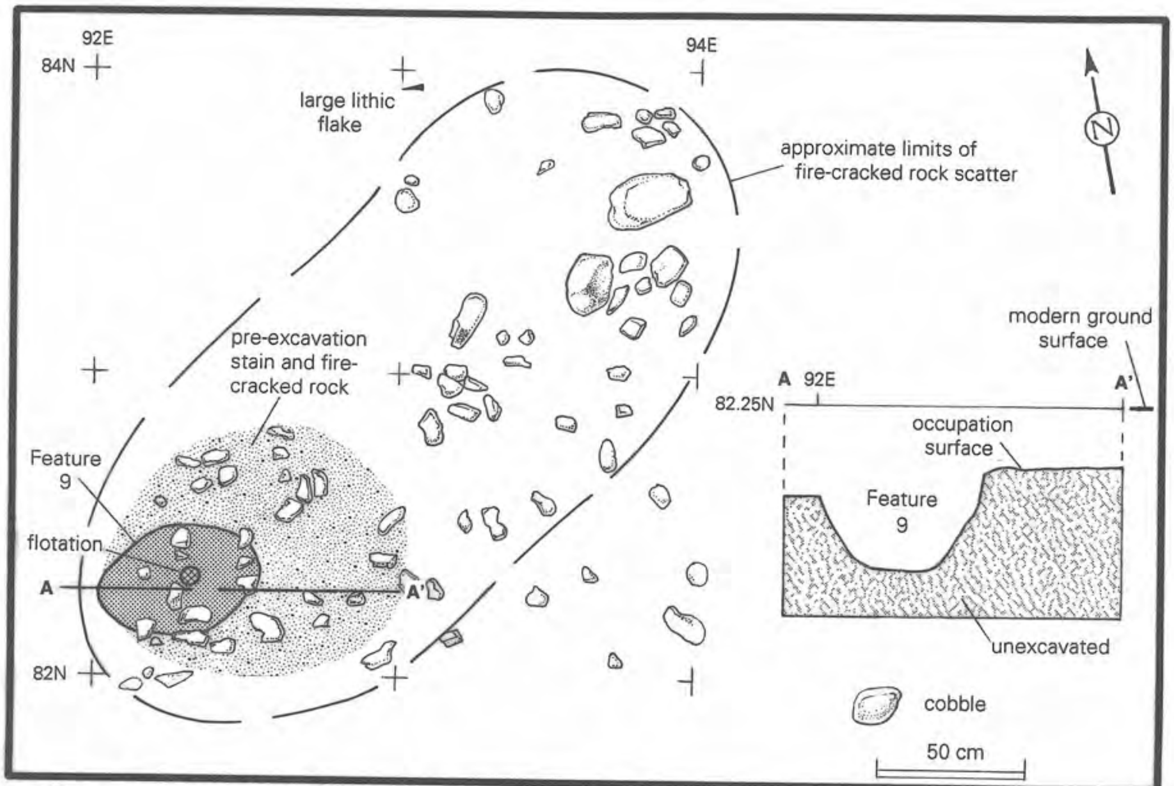

Figure 6.14. LA 84758, Feature 9, plan view and profile.

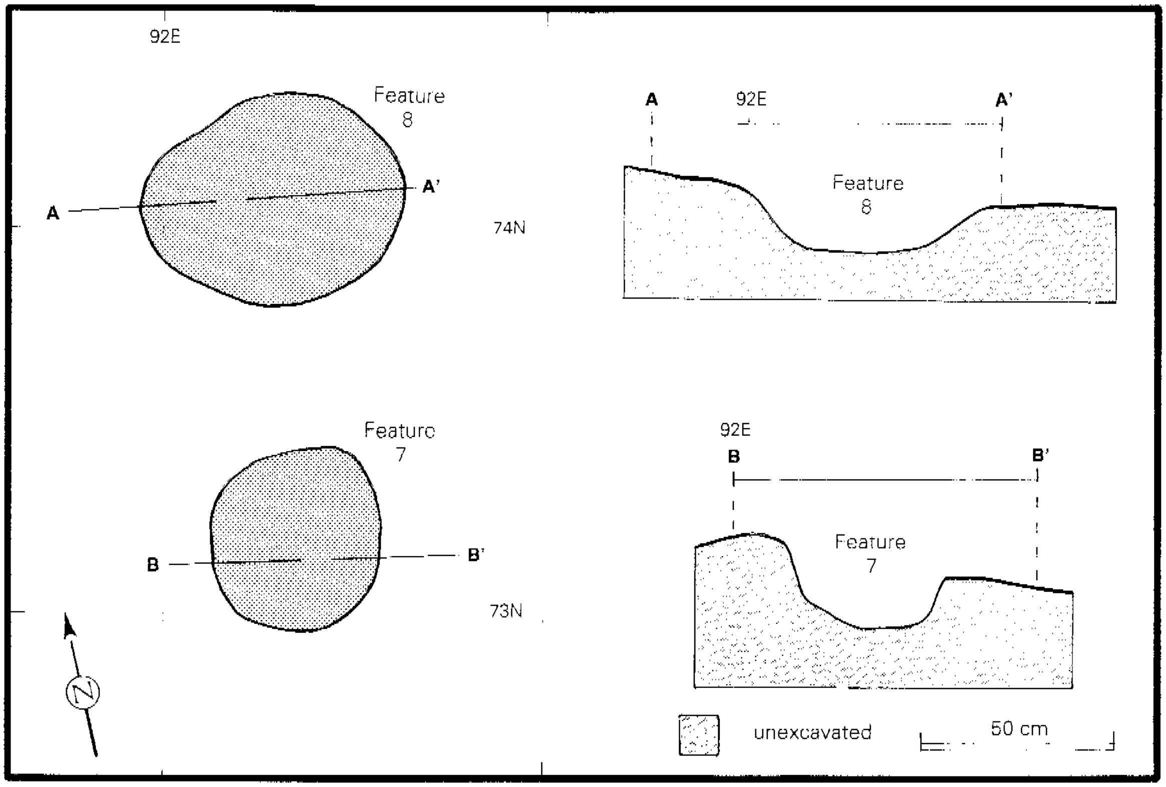

Figure 6.15. LA 84758, Feature 7 and 8, plan view and profile.

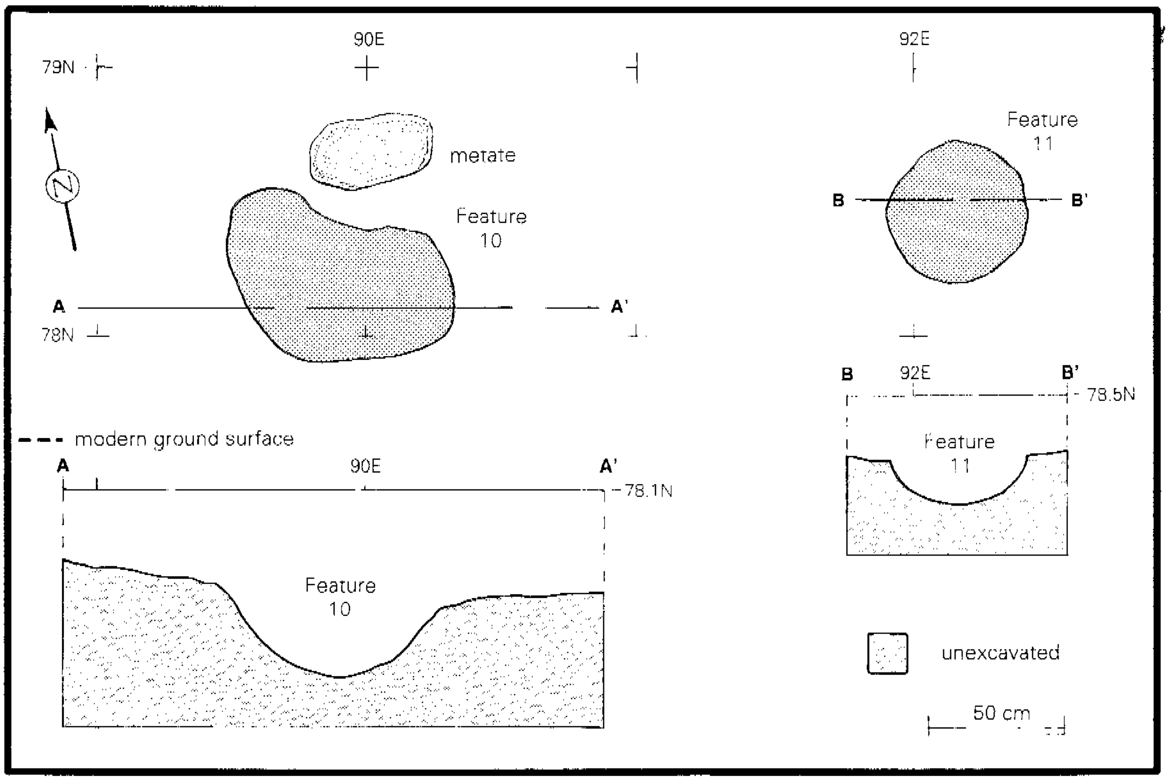

Figure 6.16. LA 84758, Feature 10 and 11, plan view and profile.

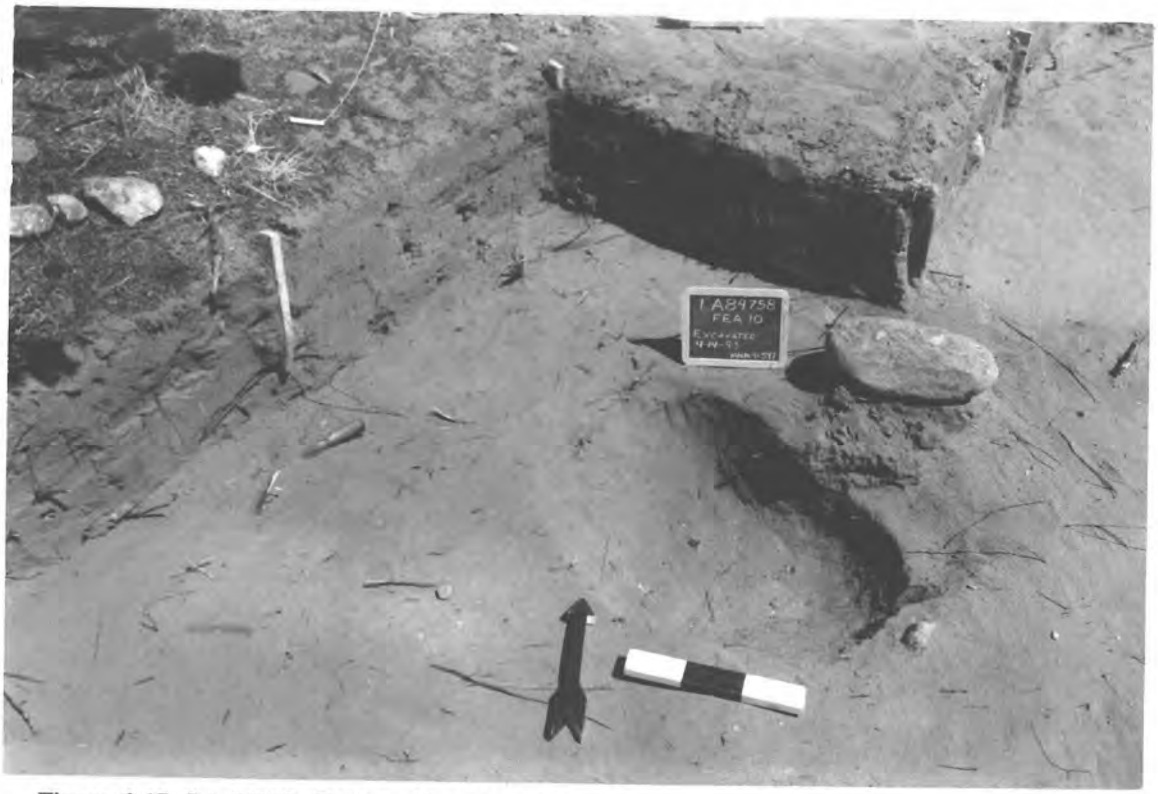

Figure 6.17. LA 84758, Feature 10, excavated.

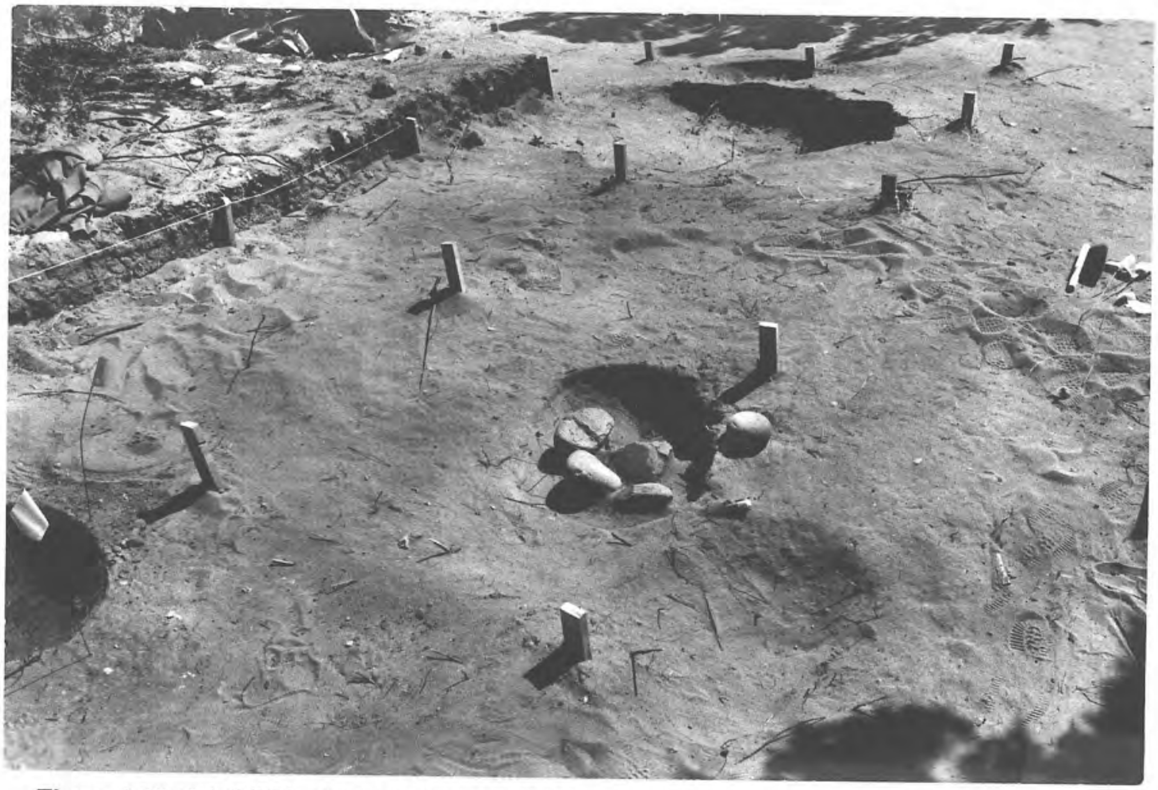

Figure 6.18. LA 84758, Feature 12, excavated.

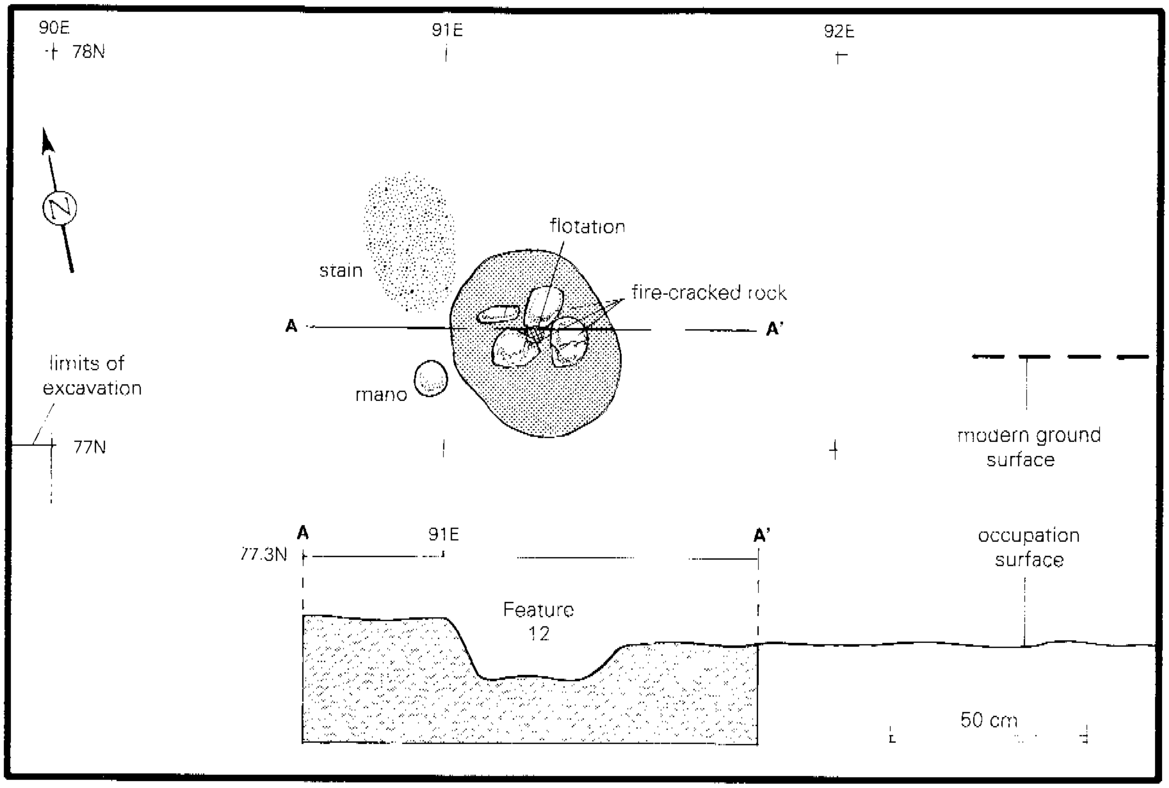

Figure 6.19. LA 84758, Feature 12, plan view and profile.

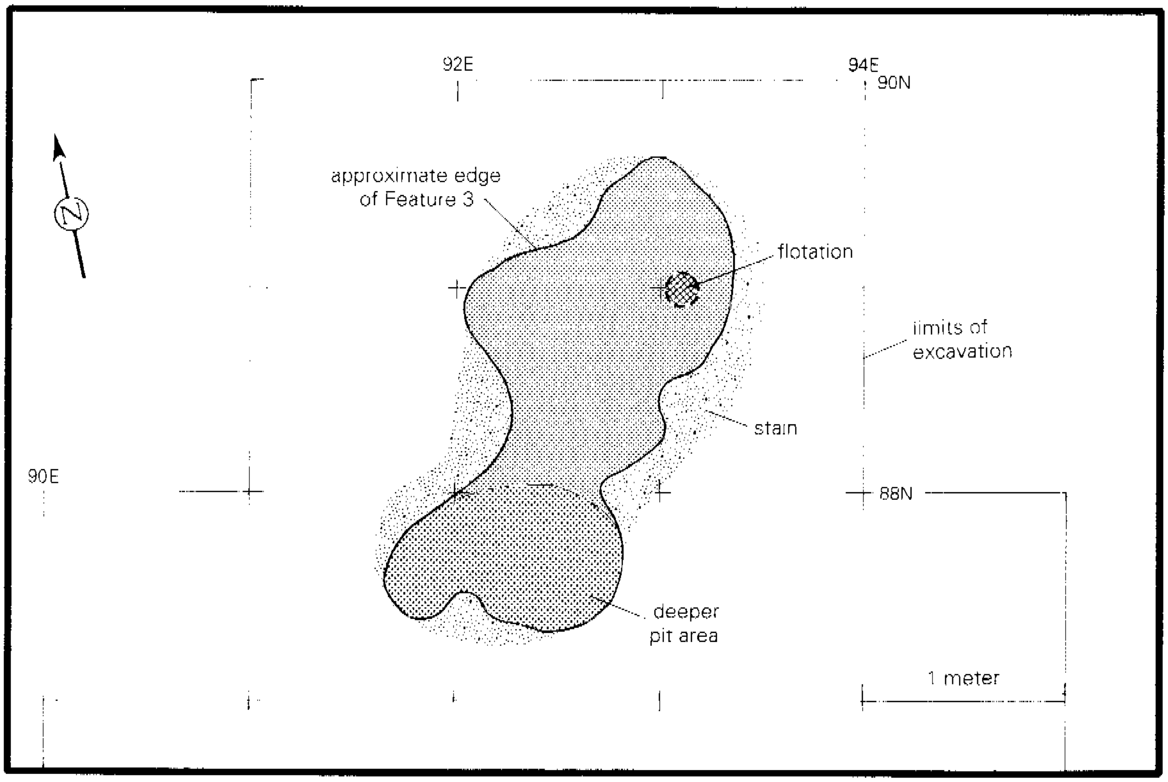

Figure 6.20. LA 84758, Feature 3, plan view and profile.

yielded no charred economic plant remains. Artifact densities associated with these features were low compared to feature areas from lower portions of Stratum 2.

Two features, 4 and 9, were pits associated with fire-cracked rock concentrations (Figs. 6.12-6.14). These were oval shaped with moderately to steeply sloped walls. A small amount of fire-cracked rock was recovered from within the features. A scatter of fire-cracked rock extended from 1 to 2 m northeast of the features within a .75 to 1-m-wide area. The fire-cracked rock concentrations may remain from cooking or stone boiling. These features contained dark charcoal stained fill. Feature 4 fill contained nine pieces of chipped stone, including seven core flakes, one biface flake, and one piece of angular debris. Both features are associated with high artifact density areas. Features 4 and 9 are similar to the pits filled with fire-cracked rock, except that Features 4 and 9 were cleaned out and possibly reused.

Five features, 7, 8, 10, 11, and 12, were basin-shaped pits (Figs. 6.15-6.19). These features were located in the south-central and southeast portion of the excavation area at a stratigraphic level consistent with the pit structure occupation. The features ranged in size from 50 to 77 cm long, 37 to 55 cm wide, and 15 to 30 cm deep. The feature fill consisted of dark stained sandy loam, an occasional fire-cracked rock, and few charcoal flecks. Feature 8 fill had a light deposit of ash and a few flecks of charcoal. No artifacts were recovered from within the features, but they were associated with moderate to high densities of chipped stone debris and ground stone artifacts. Feature 10 had a metate resting along the west edge. Feature 12 had a one-hand mano resting along the southwest edge. The presence of complete ground stone tools associated with these two features suggests they were used in plant processing. Flotation samples collected from the five features yielded no charred economic plant remains.

Feature 3 was a large, shallow, irregularly shaped stain. The southwestern portion of the stain was defined as a possible pit that was 12 cm deep. Northeast of the pit is the shallow (6 cm deep) stain (Fig. 6.20). This feature covered a 2.24 m north-south by 1.3 m east-west area. The soil was a mottled, charcoal-stained sand. No artifacts were recovered from within the feature, but the surrounding area had a low artifact density. Feature 3 is stratigraphically related to Feature 2 and together they may represent a later occupation of the site.

The fourteen features represented a wide range of processing and consumption associated with residential and limited activity occupations. The cluster of features near Feature 1 are the best evidence for a residential occupation in the Las Campanas area. Feature 1, the pit structure, is comparable to pit structures recently excavated at Tierra Contenta near the Santa Fe Airport (Schmader 1994). The Tierra Contenta pit structures were shallow, had few internal features, and were associated with low numbers of extramural hearths, roasting pits, and general purpose pits. Low artifact counts from the Tierra Contenta sites suggest that they were occupied for a shorter duration or that LA 84758 was reoccupied numerous times, perhaps for longer periods.

Occupation subsequent to the pit structure abandonment are represented by the three pits filled with fire-cracked rock, Features 2, 3, and 14. These features are formal processing features that may have been used during short-term logistical foraging and hunting forays from residential sites located outside the Las Campanas project area. Rock-filled pits are common on late Archaic period sites from the Cochiti area (Chapman 1979).

Artifact Assemblage

The excavation recovered 1,192 chipped stone and 41 ground stone artifacts. Eighteen faunal specimens were recovered from six proveniences. The assemblages are divided into two broad spatial proveniences: the site scatter (Area 1) and the main excavation area (Area 2). Within Area 2 the analysis focused on artifacts recovered from within the excavation area as shown in Figure 6.3. Four components within Area 2 were defined for the lithic artifact analysis using spatial criteria. Component 1 includes Grids 70-79N/85-95E. Component 2 includes Grids 80-86N/85-95E. Component 3 includes Grids 87-90N/88-95E, Levels 1-4. Component 4 has the same grids as Component 3, but is restricted to Levels 5-10. The formulation of these internal components within Area 2 is partly judgmental. It is an attempt to partition a relatively complex distribution of artifacts and features into components that can be compared for differences in artifact type or attribute frequencies. Differences may reflect division of the occupation area into work spaces or they may reflect overlapping evidence from temporally discrete occupations that resulted from a different subsistence strategy and technological organization.

Chipped Stone Artifacts

The 1,192 chipped stone artifacts were recovered from surface and subsurface locations. The Area 1 sample of 28 artifacts comes from surface locations peripheral to Area 2. The majority (1,099) of the 1,164 artifacts from Area 2 were from Components 1-4 within the main excavation area.

Area 1. Twenty-eight artifacts were recovered from Area 1 grids. All grids were north of Area 2. The chipped stone artifacts were all debitage including angular debris, core flakes, and biface flakes. A wide range of raw materials were used, including chert, chalcedony, obsidian, basalt, and siltstone (Table 6.2).

Raw Material Selection. Raw materials were dominated by locally available chert; 59 percent were fine-grained, 8 percent were medium-grained, and 1 percent were coarse-grained. All of the material textures can be found in the local material and all were commonly used. Nonlocal materials included obsidian and basalt. These materials originated in the gravel deposits along the Rio Grande or from the south slope of the Jemez Mountains. Obsidian and basalt usually occur in low frequencies on Las Campanas sites.

Debitage. All artifacts from Area 1 were core reduction or tool production debitage. Core flakes were the main artifact type and can be described in more detail. The biface flakes primarily were of obsidian and were concentrated northeast in Area 1. They appear to be from a single, short occupation.

The core flakes exhibited attributes of early or middle stage core reduction. These attributes include a 60 percent occurrence of dorsal cortex, a predominance (95 percent) of dorsal scar counts of three or less, a high percentage (80 percent) of whole core flakes, and 65 percent of the assemblege having cortical or single-faceted platforms. Whole core flakes had a mean length of 40 mm, a standard deviation of 14 mm and a range of 24 to 65 mm; a mean width of 39 mm, a standard deviation of 18 mm and a range of 13 to 87 mm; and a mean thickness of 11 mm, a standard deviation of 5 mm and a range of 6 to 23 mm. The core flake dimensions suggest that a wide range of debitage was produced. Medium to large, thick, blocky flakes were the most common by-product. This pattern is consistent with early or middle stage core reduction.

Area 1 chipped stone represents a dispersed distribution of core and biface reduction debitage. The main focus is on early or middle stage core reduction of local material. The local material was probably obtained from the gravel hill slopes along the northern site limit. The scattered distribution suggests that the debitage was left from many occupations, rather than as debris from material procurement related to the Area 2 occpation. If Area 2 material procurement or testing did occur on the slopes, higher artifact counts would be expected given the length and intensity of the occupation. The obsidian biface flake cluster in Area 1 suggests that raw material procurement and reduction were not the only low intensity activities conducted in Area 1.

Area 2. A total of 1,164 chipped stone artifacts were recovered from Area 2. Of these, 1,099 were recovered from Components 1-4 within the main excavation area. Table 6.3 shows the distribution of artifact type by material type for Components 1-4. Samples from Components 1-4 are described and compared.

Raw Material Selection. All chipped stone assemblages from Components 1-4 were dominated by locally available chert. Obsidian was the second most common raw material; lower frequencies of quartzite and chalcedony are present. The occurrence of 29 cores, some of which were exhausted, and a low percentage of core flakes with 60 to 100 percent dorsal cortex indicates that some of the chipped stone raw materials were obtained from nearby sources. Obsidian only occurred as debitage and tools, indicating that it was brought to the site in finished or substantially reduced form. Obsidian also had the highest percentage of biface flakes, indicating that it was used more for biface tool production than the other raw materials. The raw material selection was consistent for all components suggesting no change in source or focus of lithic technology between the components.

Consistency in raw material selection is also displayed by the material texture distribution. All components have a majority of medium-grained materials; Component 2 exhibited almost equal

Table 6.2. LA 84758, Area 1, Artifact Type by Material Type

Count Row Pct Column Pct	Chert	Chalcedony	Obsidian	Basalt	Siltstone	Row Total
Angular debris	5 100.0 22.7					5 17.9
Core flake	17 85.0 77.3	1 5.0 100.0		1 5.0 100.0	1 5.0 100.0	20 71.4
Biface flake			3 100.0 100.0			3 10.7
Column Total	22 78.6	1 3.6	3 10.7	1 3.6	1 3.6	28 100.0

Table 6.3. LA 84758, Inside Main Excavation Area, Artifact Type by Material Type by Component

Count Row Column	Chert	Chal- cedony	Silic. Wood	Obsidian	Basalt	Sandstone	Siltstone	Quartzite	Quartzitic Sandstone	Massive Quartz	Total
Component 1											
Angular Debris	58 87.9 17.6	2 3.0 9.5		2 3.0 4.8			1 1.5 100.0	3 4.5 10.0			66 15.2
Core Flake	245 78.3 74.5	18 5.8 85.7	5 1.6 100.0	17 5.4 40.5		1 0.3 50.0		23 7.3 76.7	3 1.0 100.0	1 0.3 100.0	313 72.1
Biface Flake	16 42.1 4.9	1 2.6 4.8		18 47.4 42.9				3 7.9 10.0			38 8.8
Unidirec- tional Core	2 100.0 0.3										2 0.5
Bidirec- tional Core	1 100.0 0.3										1 0.2
Multidi- rectional Core	6 75.0 1.8					1 12.5 50.0		1 12.5 3.3			8 1.8
Cobble Tool	1 100.0 0.3										1 0.2
Undiff. Biface				1 100.0 2.4							1 0.2
Late Stage Biface				4 100.0 9.5							4 0.9
Total	329 75.8	21 4.8	5 1.2	42 9.7		2 0.5	1 0.2	30 6.9	3 0.7	1 0.2	434

Count Row Column	Chert	Chal- cedony	Silic. Wood	Obsidian	Basalt	Sandstone	Siltstone	Quartzite	Quartzitic Sandstone	Massive Quartz	Total
Component 2											
Angular Debris	51 91.1 15.9		2 3.6 33.3	1 1.8 10.0				2 3.6 5.7			56 14.5
Core Flake	247 82.3 77.2	7 2.3 77.8	4 1.3 66.7	5 1.7 50.0	2 0.7 100.0			32 10.7 91.4	3 1.0 100.0		300 77.9
Biface Flake	12 75.0 3.8	1 6.3 11.1		3 18.8 30.0							16 4.2
Hammer- stone Flake	1 50.0 0.3							1 50.0 2.9			2 0.5
Undiff. Core		1 100.0 11.1									1 0.3
Unidirec- tional Core	3 100.0 0.9										3 0.8
Multidi- rectional Core	6 100.0 1.9										6 1.6
Late Stage Biface				1 100.0 10.0							1 0.3
Total	320 83.1	9 2.3	6 1.6	10 2.6	2 0.5			35 9.1	3 0.8		385
Component 3											
Angular Debris	6 66.7 10.1	3 33.3 60.0									9 11.5
Core Flake	50 80.6 83.3	1 1.6 20.0		3 4.8 60.0	1 1.6 100.0			7 11.3 100.0			62 79.5
Biface Flake	3 50.0 5.0	1 16.7 20.0		2 33.3 40.0							6 7.7
Hammer- stone Flake	1 100.0 1.7										1 1.3
Total	60 76.9	5 6.4		5 6.4	1 1.3			7 9.0			78
Component 4											
Angular Debris	23 85.5 14.4			1 3.8 11.1							26 12.9
Core Flake	110 79.7 68.8	3 2.2 100.0		3 2.2 33.3	1 0.7 100.0						138 68.3

Count Row Column	Chert	Chal- cedony	Silic. Wood	Obsidian	Basalt	Sandstone	Siltstone	Quartzite	Quartzitic Sandstone	Massive Quartz	Total
Biface Flake	19 70.4 11.9			2 7.4 22.2			1 3.7 100.0	1 3.7 100.0			27 13.4
Undiff. Core	1 100.0 0.6										1 0.5
Unidi- rectional Core	2 100.0 0.6										2 1.0
Bidirec- tional Core	2 100.0 1.3										1 0.5
Multidi- rectional Core	2 100.0 1.3										2 1.0
Cobble Tool	2 100.0 1.3										2 1.0
Biface				1 100.0 11.1							1 0.5
Late Stage Biface				1 100.0 11.1							1 0.5
Rework- ed Biface				1 100.0 11.1							1 0.5
Total	160 79.2	3 1.5		9 4.5	1 0.5			1 0.5			22

frequencies of fine and medium-grained materials. This raw material texture frequency distribution suggests use of similar source materials across components and little differentiation in the use of fine and medium-grained local materials.

Debitage. Debitage from core reduction and biface manufacture make up the vast majority of the chipped stone assemblage from all components (95 to 98 percent of each sample). Within debitage, core flakes consistently were the most abundant by-product. Percentages ranged from 68 percent in Component 4 to 80 percent in Component 3. Therefore, core flakes are the best indicator of the reduction strategy.

Figures 6.21-6.26 show the attribute distribution for dorsal cortex percentage, dorsal scar counts, flake portion, and whole flake dimensions. Close similarity in the distributions are shown for all components and attributes. Cortical/noncortical core flake ratios ranged from 2.3:1 for Component 1 to 3.9:1 for Component 4. These relatively high ratios indicate that cores were extensively reduced. Dorsal scar counts partly support the dorsal cortex pattern. Roughly equal proportions of flakes have 0 to 1 dorsal scars and 2 to 4 dorsal scars. Just as Area 1 had a high percentage of whole core flakes, Components 1-4 show a much higher rate of core flake breakage. Whole core flakes are from 40 percent of the Component 3 sample to 47 percent of the Component 2 sample. As core reduction progresses, more broken flakes are expected as the flakes become thinner and less resilient. Another strong pattern is the core flake dimensions. Mean dimensions by the most abundant material types are shown in Figures 6.26, 6.27, and 6.28. Except for the obsidian core flakes, which were much small than the other material types, all components were dominated by medium-sized debris. This is in contrast with other Las Campanas assemblages, including the LA 84758,

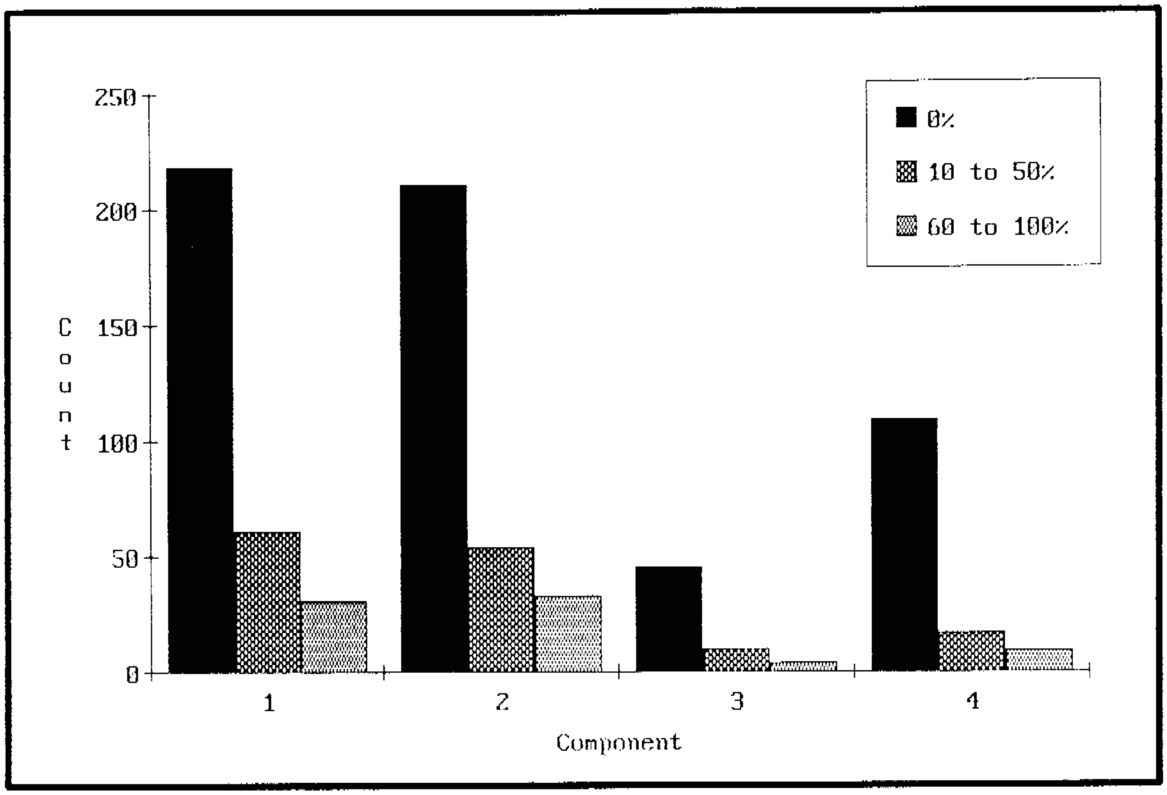

Figure 6.21. LA 84758, Components 1-4, Core Flake Dorsal Cortex Percentages.

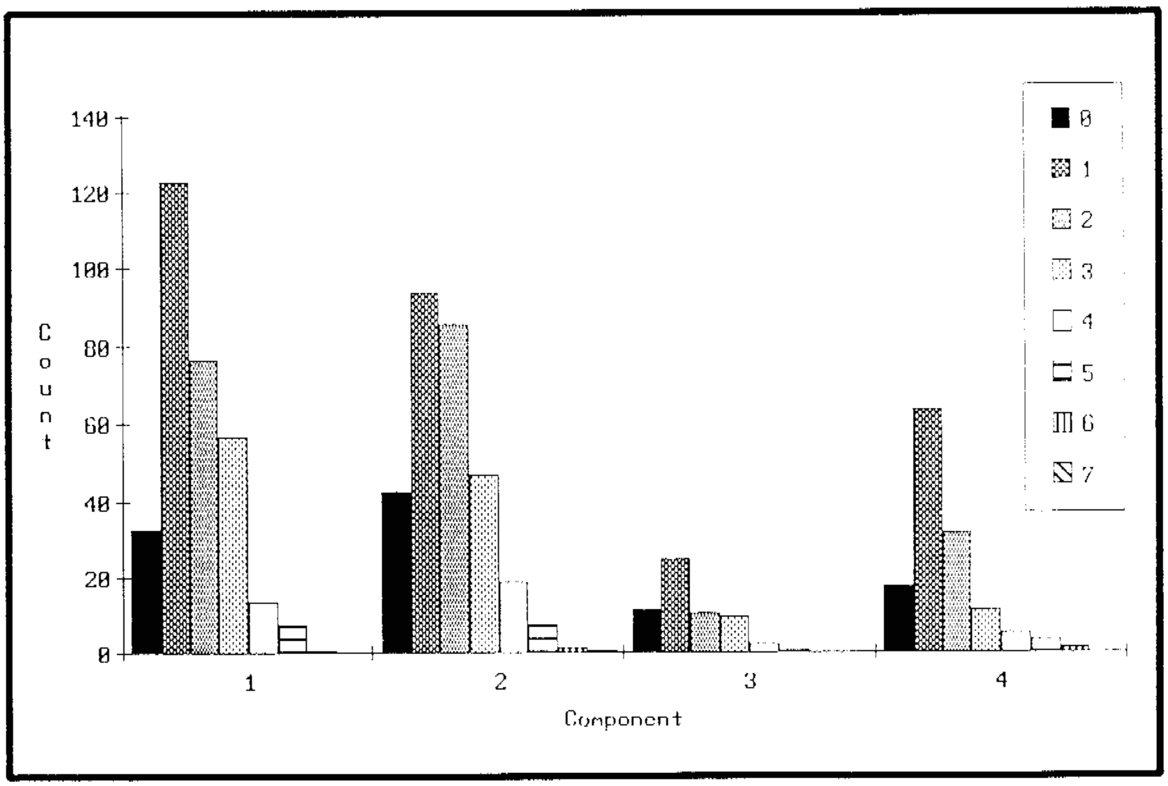

Figure 6.22. LA 84758, Components 1-4, Core Flake Dorsal Scar Counts.

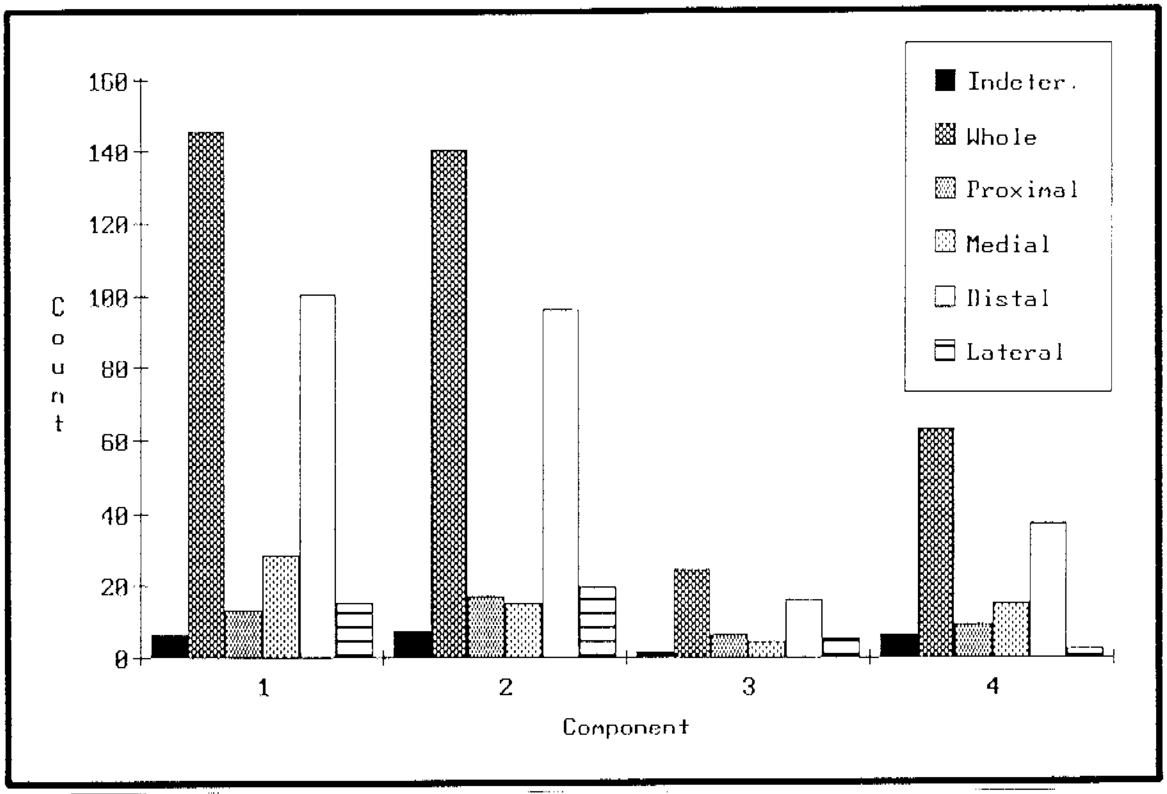

Figure 6.23. LA 84758, Components 1-4, Core Flake Condition.

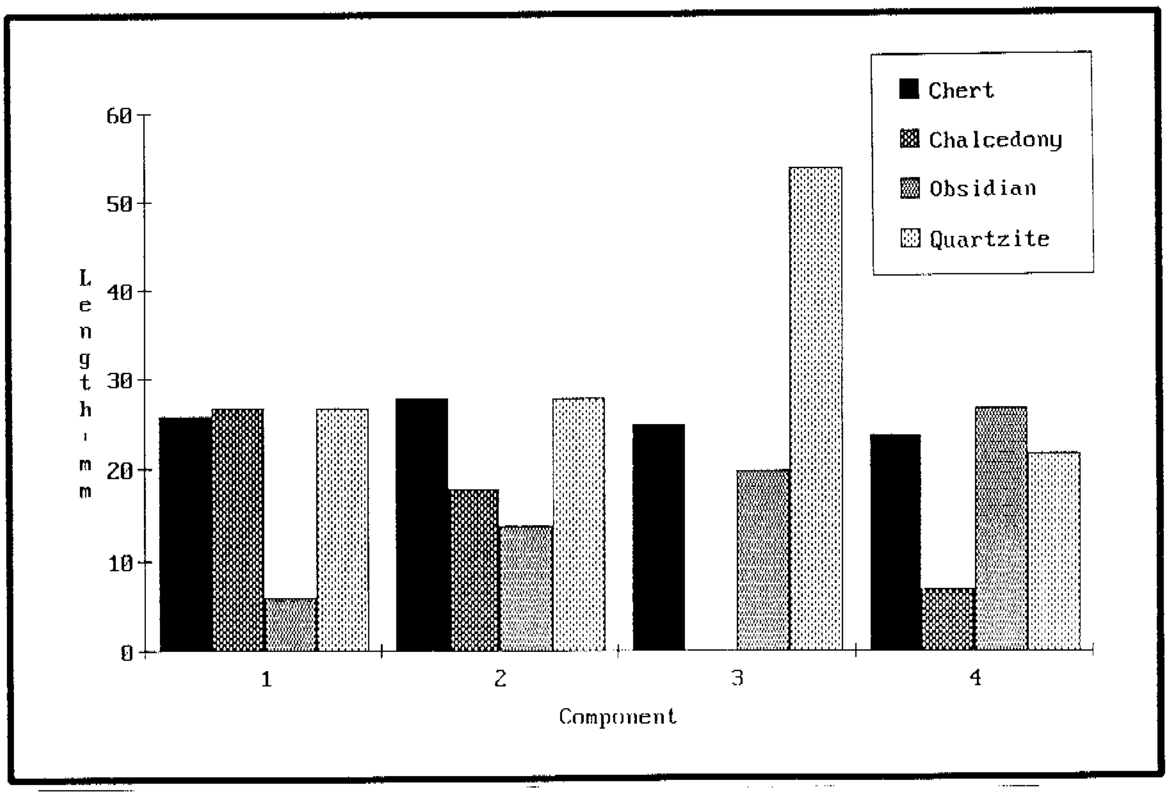

Figure 6.24. LA 84758, Components 1-4, Core Flake Mean Lengths.

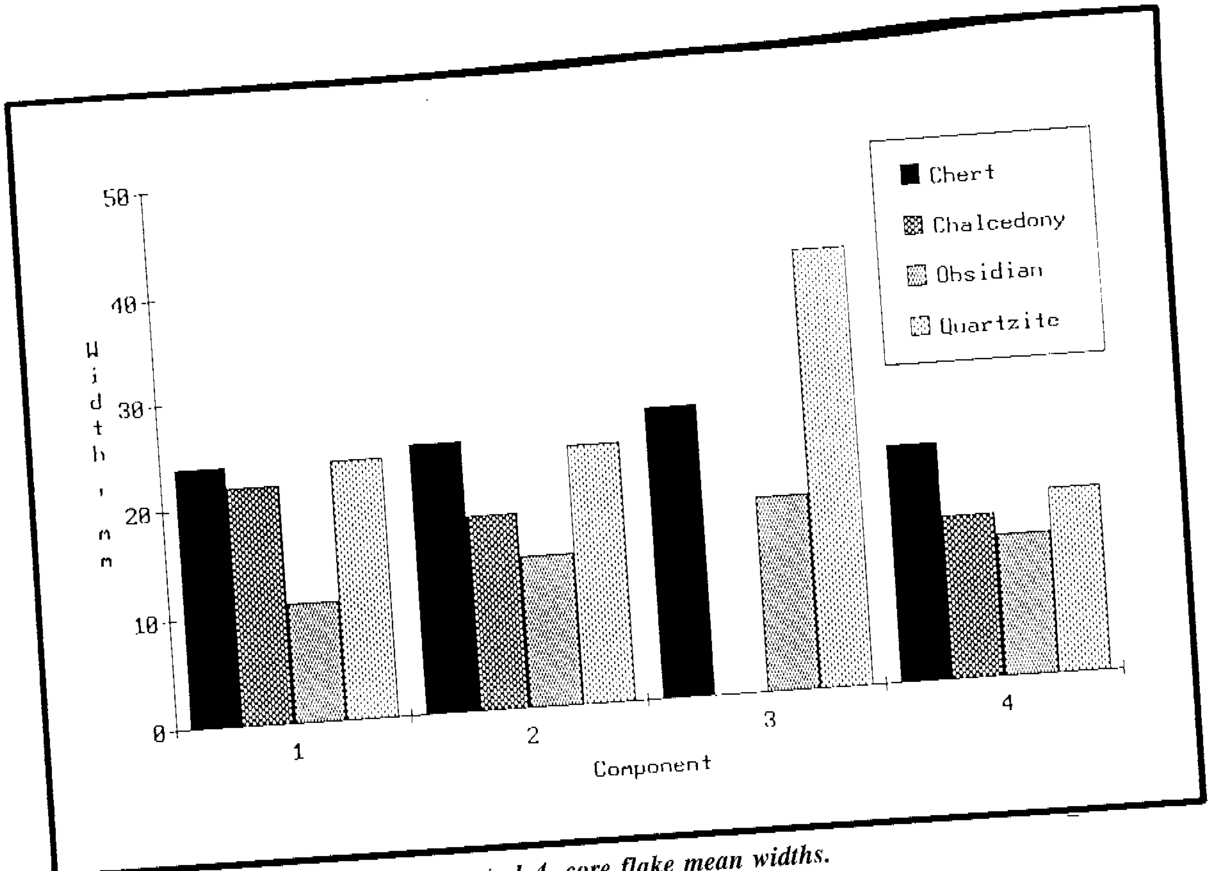

Figure 6.25. LA 84758, Components 1-4, core flake mean widths.

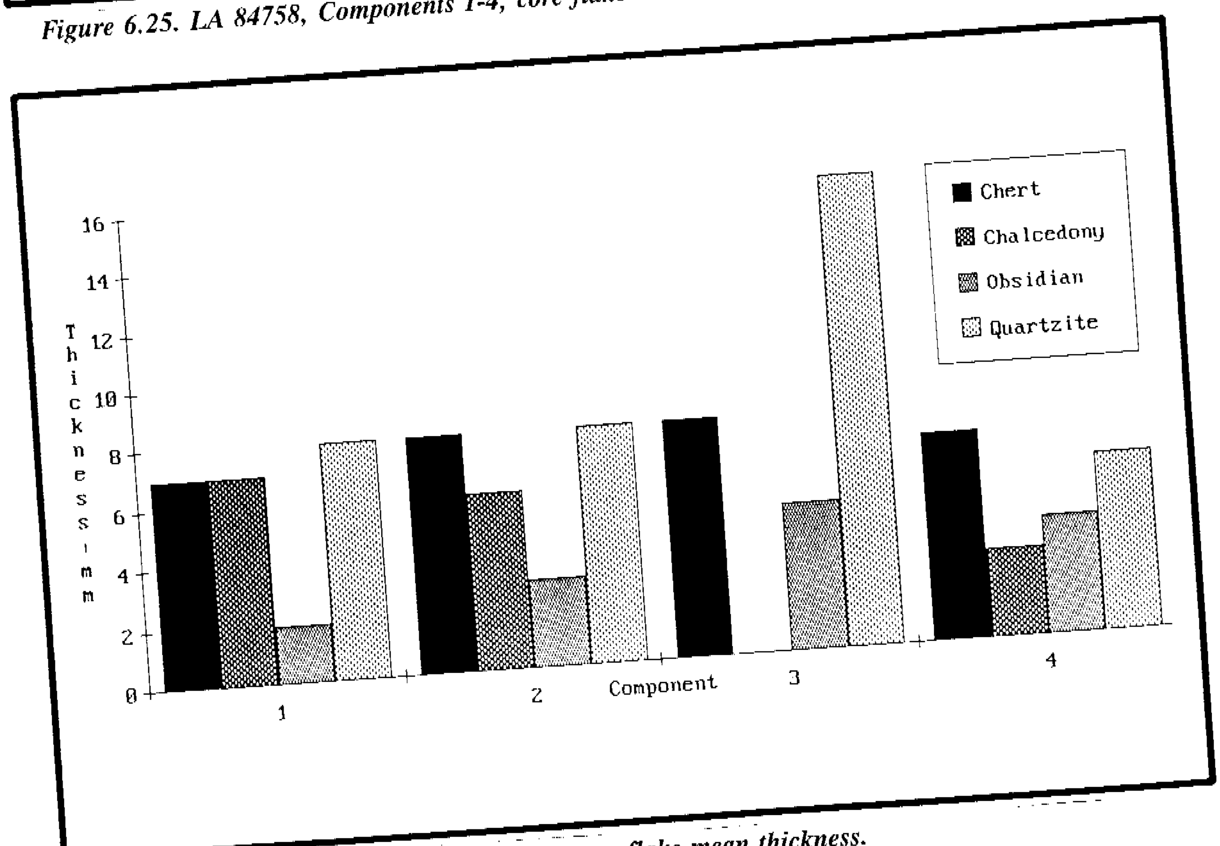

Figure 6.26. LA 84758, Components 1-4, core flake mean thickness.

Area 1 assemblage, where medium to large core flakes predominate. The smaller core flakes within Area 2 reflect more intensive reduction, and perhaps, smaller raw material size.

Biface flakes occur in low numbers in all components. Chert and obsidian were the primary materials used in biface manufacture. Components 2, 3, and 4 exhibit a higher percentage of chert over obsidian biface flakes. Component 1 shows a slightly higher percentage of obsidian over chert, while Component 4 has an unusually high percentage of biface flakes (19 percent). Because of the small sample sizes the importance of these differences are difficult to determine. Typically, the biface flakes are smaller than core flakes, have almost no dorsal cortex, and exhibit greater dorsal scar counts.

Cores. A total of 29 cores were recovered from Area 2 (Table 6.4). Twenty-seven cores were from Components 1, 2, and 4. Component 3 did not have any cores. The great majority of the cores were chert, reflecting the abundance of chert debitage. Material texture distribution was also very similar to the debitage: 11 were fine-grained, 13 were medium-grained, and 3 were coarse-grained cores. In general, the 18 multidirectional cores reflect an expedient or core to flake reduction trajectory. Unidirectional cores tend to be thinner than multidirectional cores, suggesting a more tabular parent form, rather than a more systematic reduction sequence. Cores display a wide dimension range: mean length is 66 mm, standard deviation of 23 mm, and a range of 28 to 125 mm; mean width is 51 mm, standard deviation of 19 mm, and a range of 22 to 89 mm; and mean thickness is 34 mm, a standard deviation of 13 mm, and a range from 15 to 61 mm. A wide size range indicates that minimally reduced cores and exhausted cores were discarded. The tendency toward a small to medium size core, however, suggests intensive reduction of the local raw material.

Utilized Flakes. Utilized flakes were recovered from Components 2 and 4. The utilized flakes are chert and obsidian.

FS 148 was recovered from Grid 86N/92E, Level 5, 41 to 50 cm below the modern ground surface. It is a lateral portion of a red chert core flake. An 18-mm-long margin exhibits unimarginal retouch and unidirectional wear. The edge is convex and the edge angle is 65 degrees. The artifact was probably used for scraping. It measures 46.4 mm long by 15.8 mm wide by 7.5 mm thick.

FS 186 is a medial portion of an obsidian core flake recovered from Component 4, Grid 88N/92E, Level 5, 41-50 cm below the modern ground surface. The partial edge exhibits bimarginal retouch. The edge is sinuous and measures 8.3 mm long. The edge angle is 30 degrees. The artifact measures 9.3 mm long by 20.5 mm wide by 2.6 mm thick.

Early Stage Biface. FS 156 is an early stage biface recovered from Component 2, Grid 85N/94E, Level 4, 31-40 cm below the modern ground surface. It is made from mossy chert, exhibits a thick undulating profile, and measures 43.6 mm long by 27.3 mm wide by 14.6 mm thick.

Biface Fragments. Five obsidian biface fragments were reco,vered from Components 1 and 4. These artifacts appear to be temporally undiagnostic blades, tips, or basal portions of projectile points.

From Component 1, FS 122, FS 190, and FS 280 were recovered. FS 122 is the medial portion of a triangular blade projectile point. It has a plano-convex cross section and straight edges. The bifacial retouch is diagonal and parallel. The edge is slightly serrated as though platform preparation was completed but flake removal was interrupted by the projectile point breaking. It measures 19 mm long by 13 mm wide by 4.1 mm thick. It was recovered from the activity area east of Feature 1 that contained a mixed trash deposit and Features 7 and 8.

FS 190 is the tip from a triangular blade biface. The tip is not blunted, indicating that it was not broken by impact. The tip measures 11.5 mm long by 9.8 mm wide by 3.7 mm thick. It was recovered from the floor fill of Feature 1, the pit structure in Grid 73N/89E.

FS 28 is a basal fragment from an obsidian biface. The base is convex with a slight remnant of a broad, shallow notch. The fragment is 10.6 mm long by 10.1 mm wide by 3.6 mm thick. It was recovered from the north limit of Component 1 within Grid 79N/91E, 10 cm below the modern ground surface.

Two biface fragments were recovered from Component 4. FS 234 is the tip of a reworked Polvadera obsidian biface fragment. The tip appears to be from a triangular blade. A portion of the margin was snapped and had been bidirectionally retouched. The tip fragment measures 16.2 mm long by 14.8 mm wide by 3.4 mm

Table 6.4. Core Attributes, LA 84758

Material	Texture	Type	Length (mm)	Width (mm)	Thickness (mm)	North/East; Level
Chert	Fine	Multidirectional	52	45	29	72/96; S/SS
Chert	Coarse	Multidirectional	125	110	66	74/96; S/SS
Chert	Fine	Multidirectional	48	33	23	78/94; S/SS
Chert	Fine	Multidirectional	38	35	32	74/92; L.1
Quartzite	Fine	Multidirectional	125	89	37	73/93; L.1
Chert	Coarse	Multidirectional	76	66	45	74/95; L.1
Sandstone	Fine	Multidirectional	65	48	28	76/93; L.1
Chert	Medium	Unidirectional	70	40	28	76/93; L.2
Chert	Fine	Multidirectional	28	27	20	80/93; L.2
Chert	Fine	Bidirectional	76	51	40	72/92; L.2
Chert	Coarse	Unidirectional	99	73	48	74/90; L.4
Chert	Medium	Multidirectional	101	77	41	86/93; L.4
Chert	Medium	Undifferentiated	58	39	37	89/92; L.5
Chalcedony	Medium	Undifferentiated	52	49	32	85/92; L.4
Chert	Fine	Multidirectional	40	36	18	86/95; L.4
Chert	Fine	Multidirectional	45	27	15	85/94; L.4
Chert	Fine	Multidirectional	48	44	17	85/93; L.4
Chert	Medium	Unidirectional	72	68	53	88/91; L.7
Chert	Medium	Multidirectional	65	62	40	88/91; L.8
Chert	Fine	Unidirectional	67	60	49	87/93; L.8
Chert	Medium	Multidirectional	54	37	32	72/89; L.4
Chert	Medium	Multidirectional	57	30	22	90/93; L.7
Chert	Medium	Bidirectional	32	22	22	90/93; L.8
Chert	Medium	Unidirectional	60	43	27	84/91; L.1
Chert	Coarse	Unidirectional	75	54	26	84/91; L.3
Chert	Fine	Unidirectional	61	44	28	83/93; L.3
Chert	Medium	Multidirectional	91	83	58	77/91; L.2
Chert	Medium	Multidirectional	92	78	61	77/92; L.1
Chert	Medium	Multidirectional	78	60	48	81/90; L.3

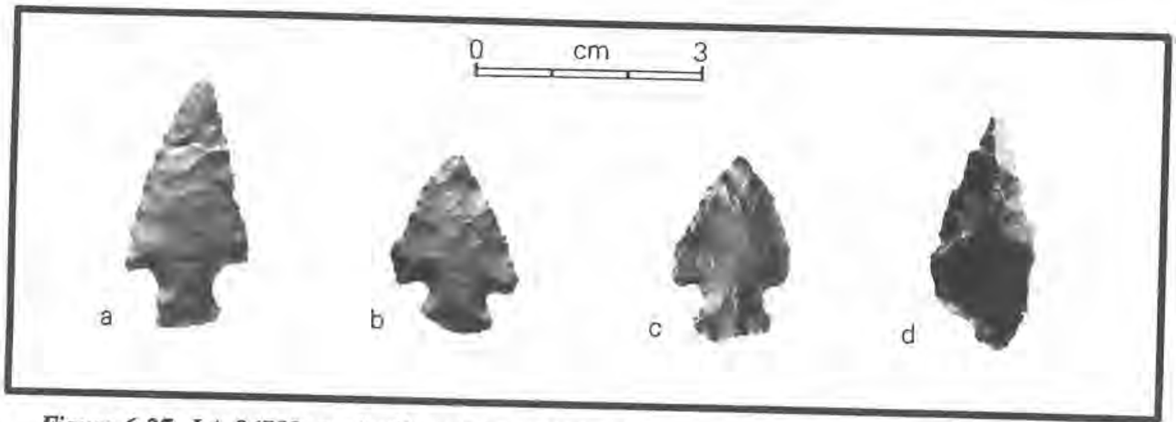

Figure 6.27. LA 84758, projectile points and graver.

thick. It was recovered from Grid 90N/92E, Level 7, 60-70 cm below the modern ground surface.

FS 206 is a reworked Polvadera obsidian biface fragment. It appears to have been a medial blade fragment from a large triangular biface. The blade was broken and reworked into a knife or cutting tool. Abrasion on one surface may come from the tool lying on the surface.

Projectile Points. Three mostly complete obsidian projectile points were recovered from subsurface contexts. FS 185 and FS 68 were recovered from Component 1. FS 266 was recovered from Component 2 (Fig. 6.27).

FS 68 was recovered east of Feature 1 from Grid 74N/93E, Level 2, 11-20 cm below the modern ground surface. This area was a mixed trash deposit overlying small pit features (Features 7 and 8). The projectile point is stylistically similar to the Lumbre-Narrow Base type described in Thoms (1977:150). It is a complete specimen with an elongated triangular blade (27.1 mm long by 16.2 mm wide by 6.9 mm thick) (Fig. 6.27a). The blade has a plano-convex profile that is slightly curved. The stem is narrow (7.3 mm wide) and moderately long (6.8 mm) with broad and deep corner notches. The base is slightly convex. The overall length of the projectile point is 32.7 mm. The projectile point was made from a thick obsidian flake and exhibits a lamellar flaking pattern. The Lumbre-Narrow Base style is suggested to date to the Basketmaker III period, A.D. 350 to 800.

FS 185 was recovered from the floor fill of Feature 1, the pit structure within Grid 72N/88E. The projectile point is complete and is similar in style to the Chimayo-Shouldered style described by Thoms (1977:149). It has a short, leaf-shaped blade (17 mm long by 13.8 mm wide by 5 mm thick) (Fig. 6.27b). The blade has a plano-convex profile that is slightly curved. The stem is 7.3 mm wide and short with broad and shallow corner notches. The base is irregular and may be fractured. The overall length of the projectile point is 22.4 mm. The projectile point was made from a thick obsidian flake and exhibits an irregular flaking pattern. The Chimayo-Shouldered style is suggested to date to the Basketmaker and Pueblo periods, A.D. 500 to 1200 (Thoms 1977:149).

FS 266 was recovered from Grid 85N/91E, Level 3, 21-30 cm below the modern ground surface, and is associated with a debitage concentration in the northern part of Component 2. The projectile point is stylistically similar to the Lumbre-Narrow Base type described in Thoms (1977:150) (Fig. 6.27c). It is a complete specimen with a triangular blade (17.8 mm long by 15.1 mm wide by 3.5 mm thick). The blade has a sinuous profile that is slightly curved. The stem is narrow (7.8 mm wide) and of average length (6.2 mm) with broad corner notches. The base is irregular, but tends toward straight. The overall length of the projectile point is 24 mm. The projectile point was made from an obsidian flake and exhibits bimarginal retouch. The Lumbre-Narrow Base style is suggested to date to the Basketmaker III period, A.D. 350 to 800.

Graver. FS 341 is an obsidian core flake that was bimarginally and unifacially retouched to form a graver (Fig. 6.27d). It was recovered from Area 2, Grid 68N/98E, Level 1, 0-10 cm below the modern ground surface, south of the main excavation area. The graver has a triangular cross section and an elongated triangular outline. The edges have angles ranging between 45 and 80 degrees. There is no evidence of excessive wear or fracturing that would have ended its utility. It is possible that it was collected from the site during a later occupation, used as an expedient tool and discarded. It measures 30 mm long by 13.4 mm wide by 7.1 mm thick.

Hammerstones. Two hammerstones were recovered from Area 1. FS 4 was recovered from the surface of Grid 60N/98E. It is a tabular nodule of medium-grained chert with extensive battering on dorsal ridges. The fragmentary hammerstone may have been broken during use. It measures 51.4 mm long by 48 mm wide by 26.8 mm thick.

FS 208 is a red chert cobble that exhibits battered ridges. The amount and extent of the battering indicate it was heavily used. It was recovered from outside Feature 1 in Component 1. It may have been used to maintain or form grinding tools. It measures 75.4 mm long by 67.9 mm wide by 40.4 mm thick.

Ground Stone Artifacts

Forty-one ground stone artifacts were recovered from Area 2. The tool types include one-hand manos, slab and basin metates, and undifferentiated ground stone. The artifacts are summarized by functional class and component.

Manos. Eighteen whole or fragmentary manos were recovered from Area 1. Table 6.5 lists manos according to provenience and functional and morphological attributes.

Manos were made from cobbles of fine, medium, or coarse quartzite, sandstone, quartzitic sandstone, and undifferentiated igneous. Ten manos were whole, three were end fragments, two were medial fragments, one was an edge fragment, and two were indeterminate fragments. Except for FS 207, which was circular, the whole manos were oval-shaped, usually with two ground surfaces. All whole manos were one-handed. The whole manos ranged in length from 97 to 137 mm, in width from 87 to 114 mm wide, and in thickness from 51 to 78 mm.

The majority of the tools occur within Component 1; fewer occur Components 2 and 4 and in Area 2 south of the main excavation area. Within Component 1, four whole and one fragment occur within Feature 1, indicating use of the pit structure for plant and food processing. Four fragments were recovered south of the main excavation area within a 4-by-4-m area suggesting a separate component. Component 2 had two whole manos associated with thermal features. Their association suggests plant processing for Features 4 and 9. The presence of a whole mano and a fragment in Component 4 suggests that a similar range of plant processing and domestic activities were conducted throughout the occupation span.

Metates. Three whole metates and 13 fragments were recovered from Components 1, 2, and 4. Metates were used to process food and raw materials. Metates are indicators of domestic activities that would be expected of base camp or residential occupations. Metate morphological data are presented in Table 6.6.

The metates were made from quartzite, sandstone, quartzitic sandstone, and vesicular basalt. All materials were fine or medium grained, and except for the vesicular basalt, could have been obtained from local cobble deposits. In addition to the whole metates, end, edge, and internal fragments were identified suggesting that a minimum of seven metates were used at the site. Basin-type metates predominate with only one slab metate fragment recovered. The complete specimens provide dimension ranges of 305 to 360 mm long by 153 to 245 wide by 68 to 124 mm thick. All specimens exhibit evidence of grinding and pecking.

Spatial distribution of the metates and fragments show a strong association with features. Two whole metates and eight fragments were associated with Component 1. The two whole metates were recovered from the periphery of the feature cluster including Features 10, 11, 12, and 14. Two metates represented by six fragments were recovered from inside Feature 1, the pit structure. The fragments were mostly clustered near the interior hearth, Feature 6, suggesting that domestic activities were conducted inside the pit structure, rather than the metates being deposited within the pit structure after abandonment. A whole metate (FS 277) was associated with Component 2. The metate was located at the edge of the Feature 9 fire-cracked rock concentration suggesting a functional and temporal association. Two metate fragments were associated with Component 4. The presence of

Table 6.5. LA 84758, Manos

FS	Material	Texture	Weight	Portion	Plan View	Type	Length	Width	Thickness	North /East	Level	Feature
1	Quartz sandstone	Fine	0.25	Medial	Indet	Indet	93	74	34	62/98	0	
1	Quartz	Medium	0.15	Indet	Indet	Indet	58	56	39	62/98	0	
2	Quartz sandstone	Fine	0.25	End	Indet	Indet	80	43	47	62/96	0	
5	Igneous	Fine	0.30	End	Indet	Indet	113	71	63	64/98	0	
50	Quartz	Medium	1.20	Medial	Oval	One-hand	155	95	55	75/95	1	
60	Sand-stone	Coarse	0.10	Indet	Indet	Indet	58	45	36	73/95	1	
119	Sand-stone	Medium	1.00	Whole	Oval	One-hand	97	94	78	86/94	1	
125	Sand-stone	Fine	1.40	Whole	Oval	One-hand	135	111	59	75/90	3	
181	Quartz	Fine	0.95	Whole	Oval	One-hand	121	94	53	75/88	4	1
190	Sand-stone	Fine	0.74	Edge	Indet	Indet	122	59	58	73/89	4	1
206	Igneous	Fine	0.30	Whole	Oval	One-hand	117	108	51	88/93	8	
207	Quartz sandstone	Fine	1.65	Whole	Oval	One-hand	157	128	58	73/89	5	1
207	Sand-stone	Medium	1.62	Whole	Circular	One-hand	127	114	54	73/89	5	1
214	Sand stone	Medium	0.75	End	Oval	Indet	93	106	53	87/92	6	
287	Quartz	Medium	0.94	Whole	Oval	One-hand	111	99	61	78/91	2	
303	Quartz	Fine	1.15	Whole	Oval	One-hand	115	101	61	78/92	3	
326	Quartz	Medium	1.20	Whole	Oval	One-hand	128	87	67	81/90	3	
355	Quartz	Fine	1.30	Whole	Oval	One-hand	137	94	4	-		

Table 6.6. LA 84758, Metates

FS	Material	Texture	Weight	Portion	Type	Length	Width	Thickness	North /East	Level	Feature
15	Vesicular basalt	Fine	0.42	Internal	Indet.	114	83	37	78/96	0	
19	Sand-stone	Fine	0.66	Edge	Slab	116	112	37	80/94	0	

FS	Material	Texture	Weight	Portion	Type	Length	Width	Thickness	North /East	Level	Feature
56	Vesicular basalt	Fine	0.05	Indet.	Indet.	47	45	27	74/93	1	
103	Quartz sandstone	Fine	0.06	Internal	Indet.	79	50	45	74/90	3	
177	Quartz sandstone	Medium	3.30	End	Basin	243	101	91	75/89	3	1
185	Quartz sandstone	Fine	0.39	Edge	Indet.	89	87	47	72/88	4	1
190	Quartz sandstone	Coarse	0.56	Internal	Indet.	79	72	68	73/89	4	1
195	Quartz	Medium	2.00	Indet.	Indet.	203	108	78	88/92	8	
206	Quartz	Fine	2.75	End	Indet.	77	49	65	88/93	8	
207	Sand-stone	Medium	1.88	Edge	Basin	155	115	66	73/89	5	1
207	Sand-stone	Medium	0.91	Edge	Indet.	144	88	56	73/89	5	1
207	Sand-stone	Medium	5.10	Missing corner	Basin	360	198	68	73/89	5	1
218	Quartz	Medium	0.89	Internal	Indet.	116	91	61	87/91	7	
275	Quartz	Medium	7.10	Whole	Basin	334	245	79	75/93	4	
277	Quartz	Medium	8.20	Whole	Indet.	305	153	108	84/93	3	
286	Quartz	Fine	13.60	Whole	Basin	365	205	124	79/91	2	

metates within three of the four components indicates a strong focus on plant processing throughout the site occupation.

Faunal Remains

The faunal remains are reported by Mick-O'Hara in Appendix II. A total of 18 animal bones were recovered from subsurface contexts. The majority (10 of 16 fragments) of the bone was assigned to small, medium, and large mammal categories. Two identified species were Plains pocket mouse and mule deer. The Plains pocket mouse was intrusive and the mule deer bones may have been associated with Component 1. Seven fragments from all three general mammal categories were burned from meat roasting and discard of the bone into an active fire. Distribution of bone fragments indicates association with Feature 1, the pit structure, and Features 10, 11, and 12, which was the main extramural domestic area within Component 1. Low frequency of faunal remains may partly result from the practice of burning the discarded bone, the near-surface context of the material from Components 1, 2, and 3, and perhaps excavation of a site area that housed more plant processing and consumption than meat processing and bone discard.

Research Questions and Results

Research questions for LA 84758 focused on chronology, occupation history, site function and subsistence, and regional context. The first three issues are site specific and will be addressed in the following section. Regional context will be addressed in the synthetic section.

Survey description provided limited information on the actual nature and extent of the LA 84758 cultural deposits. The two low density artifact scatters originally recorded expanded into a complex, multicomponent site dating from the late Archaic or Basketmaker II periods. The artifact assemblage and feature data allow for more detailed treatment of the research questions. Chronology can be addressed by the diagnostic artifacts. Occupation history may be reflected in the distribution of features and artifacts. Site function and subsistence can be inferred from feature variability and lithic artifact technology and functional information.

Chronology

No temporally diagnostic artifacts were observed during the surface inventory. It was suspected that LA 84758 might be late Archaic age because no ceramics were present, but there were ground stone fragments. The ground stone fragments were an indication of a more intensive occupation than would be indicated by a simple chipped stone scatter. Excavation revealed a cultural deposit that was complex, dense, mixed, and difficult to segregate into individual components. Temporally diagnostic projectile points were recovered from within or near the pit structure. Spatial distribution of features showed some stratification and separation. Charcoal was not abundant in the features and the ethnobotanical samples yielded no samples suitable for radiocarbon dating. This meant that temporally diagnostic artifacts and spatial positioning had to be relied on for relative dating of the different components.

What is the temporal range based on projectile point typology? Two projectile points recovered from LA 84758 are similar to the Lumbre-Narrow Base style. The temporal span suggested by Thoms (1977) for this style is A.D. 300 to 850. The dimensions of FS 68 and FS 266 dimensions are near the mean for the specimens analyzed by Thoms (1977). Unfortunately, there is no suggestion of transitional forms that might allow finer temporal distinction. FS 68 was recovered immediately outside Feature 1. FS 266 was recovered from the north end of Component 2. This spatial distribution suggests that Components 1 and 2 may be contemporaneous and that the pit structure dates A.D. 300 to 850.

FS 185 is a Chimayo-Shouldered style projectile point. It is in the upper quartile of the dimension range suggested for Chimayo-Shouldered projectile points by Thoms (1977:149). Thoms (1977:149) suggests a date range of A.D. 500 to 1200 based on the presence of this style on Developmental period sites. FS 85 was recovered from Grid 72N/88E in the floor fill of the pit structure.

The date ranges suggested for Chimayo-Shouldered and Lumbre-Narrow Base projectile points translate into a possible occupation range of A.D. 500 to 800 for LA 84758, if the span for which the two styles temporally overlap is used. This early Developmental period date range falls within the period with the least cultural historical information for the Santa Fe Basin. This period is represented by an increasingly more sedentary settlement pattern combined with greater reliance on agriculture and the production of pottery throughout much of the northern Southwest. In the Santa Fe area, there are few indisputable early Developmental period sites and none associated with a permanent or even a biseasonal occupation pattern. It has been suggested by investigators that a hunting and gathering subsistence adaptation persisted into the A.D. 800s or early 900s (Cordell 1979, 1989; Schmader 1994). Two radiocarbon dates from the A.D. 800s and 900s from a shallow pit structure from LA 54752 and an extramural hearth from LA 54744 (Schmader 1994:92) were associated with Archaiclike occupations. No early Developmental period ceramics were recovered from these contexts and the radiocarbon dates were not corroborated by other methods or cultural materials. Until more sites with better-dated contexts from this period are excavated, we will not be able to differentiate the late end of the Archaic occupation from the early manifestations of Pueblo occupations.

Occupation History

How many components are represented by LA 84758 features and the artifact distribution? The chipped stone analysis was partitioned into five components. One component is defined as the surface lithic artifacts located outside the main excavation area. Four spatial components were identified within the main excavation area. The component outside the main excavation area consists of at least two occupation episodes. The area at the foot and on the slope of the gravel terrace consisted of lithic artifact scatter. The majority of the chipped stone originated from procurement activities and early stage core reduction. It is possible that this procurement and early stage reduction debris were derived from the occupations present within the main excavation area. However, the scattered and low density nature of the distribution resembled the distribution pattern associated with other small sites in the Las Campanas area. The few temporally diagnostic artifacts associated with such diffuse artifact scatters in the Las Campanas area generally dated to the Coalition or early Classic periods.

The second component outside the main excavation area is represented by Feature 13, a rock-filled hearth. This feature is isolated from the main excavation area, is not associated with the dark cultural stain of Stratum 2, and yielded few artifacts. This feature was encountered only 5 to 10 cm below the surface, but in an area that may have been geomorphologically more stable than the main excavation area. No date could be assigned to this component, however the lack of chipped stone debris suggests that it remained from a later, short-lived foraging episode.

Within the main excavation area four spatial analytical units were defined. Three of the analytical units may be from distinct occupations. Component 3, which consists of the upper 40 cm of the cultural deposit in the north end of the main excavation area, included two features, a lower artifact density, and a lightly stained cultural stratum. The stratigraphic position suggests that this component post-dates the other components within the main excavation area.

The area south of Grid 88N consists of a single component with the pit structure, a variety of extramural features, and a full complement of chipped stone and ground stone tools. Artifact distribution maps show no patterning attributable to distinct occupations. Instead, the artifact distribution resembles a sheet trash deposit from a single, long-term, intensive occupation. The features and artifact assemblage from south of Grid 88N constitutes the main occupation component.

The mixed deposit below the upper component north of Grid 88N may be the earliest occupation component. The cultural deposit was heavily stained, contained an artifact assemblage similar in diversity to the main occupation component, but no features were defined. The similarities between this lower, earlier component and the main component suggests that they were not separated by a great amount of time and that they were functionally similar.

The spatial and artifact data suggest that LA 84758 was formed by at least five occupation episodes. Because only a sample of the site was excavated, the full extent of the occupations is not known. The close similarity between artifact assemblage and feature morphology within the main excavation area suggests that the occupations were contemporaneous within the same broad period.

Site Function

Site function can be addressed with feature and artifact data and their spatial relationships. Direct subsistence data from LA 84758 are limited to faunal remains. Ethnobotanical samples yielded no charred economic plant remains. The analysis of the feature, artifact, and faunal data allows general discussion of subsistence strategy.

The main occupation component that includes analytical Components 1 and 2 and the pit structure and Features 4-12 and 14 is the best evidence of semipermanent or seasonal occupation in the Las Campanas area. The pit structure contained two intramural features, ground stone artifacts, discarded tools, and debris from tool production and core reduction. The associated activity area contained similar artifact diversity and simple hearths and hearths associated with fire-cracked rock. Between the pit structure and the extramural activity area a full range of facilities and tools remained from a domestic occupation.

The pit structure with its interior features and de facto ground stone artifacts functioned as a shelter and locus for domestic activities during inclement weather. The 3-m-diameter pit structure had 8 sq m of floor space, which would accommodate a three to five person nuclear family or commensal unit. The amount of open, floor space and the subsurface construction of the floor and wall remnants suggest the pit structure functioned as more than a sun shade. The interior ground stone artifacts, including manos and metates, and the core reduction and tool manufacture debris indicate that some processing and manufacture activities occurred indoors. Their intramural location suggests occupation during periods of extended inclement weather, though tools may also have been stored in the structure when not in use. The pit structure with evidence for intramural activities is strong evidence of a semipermanent or seasonal occupation, such as would be associated with a logistically organized subsistence pattern (Binford 1980).

The extramural activity area with pit features, ground stone artifacts, fire-cracked rock concentrations, and core reduction debris was the locus of most of the processing and production activities. Ground stone tools associated with hearths or roasting pits suggest that plants, seeds, and nuts were an important part of the diet, although no charred plant parts were recovered. Piñon and juniper charcoal from the hearths indicates similarity between modern and prehistoric plant communities. Recovery of projectile points and bifaces from the pit structure and activity area contexts indicates that hunting occurred as small to medium mammals comprised the majority of the recovered faunal remains. The few large mammal bones may be intrusive, since they were recovered from near the surface and not in direct association with activity areas.

The chipped stone artifacts recovered from Components 1 through 4 in the main excavation area reflected a more generalized and expedient lithic technology. Core flakes with less than 50 percent dorsal cortex and fewer than six dorsal scars predominated. Discarded cores were small with high dorsal scar counts, suggesting intensive reduction of raw materials. Such abundant and diverse raw materials were not available in the immediate area. Therefore, raw materials had to be obtained along the Arroyo de los Frijoles or along the Rio Grande. Relatively abundant numbers of expedient tools should occur with extensive core reduction at a residential site, yet only two pieces of utilized debitage were identified. Low frequency count may reflect short duration use of flakes and low visibility wear patterns or that analytical criteria were not stringent enough to detect wear patterns.

Specialized use of obsidian was indicated in the LA 84758 assemblage. All of the discarded bifacially retouched tools were made from Polvadera and Jemez Mountains obsidian. These small tools were probably brought to the site; however, limited formal tool manufacture is indicated by the biface flake counts. Bifacial tools were also made from local material. Discarded or broken formal tools were not recovered, however. This dichotomy of obsidian tools and no local raw material tools suggests that obsidian tools were produced elsewhere and brought to the site, used, broken, and discarded. Obsidian tools were then replaced with local raw materials, which were taken off-site, used, and not returned to or discarded at LA 84758. This differential discard pattern may reflect a component of a logistical subsistence strategy that supported a longer duration occupation of LA 84758.

Summary

LA 84758 is a multicomponent site that was occupied at least five times during the period between A.D. 500 and 800. The distribution of features and artifacts suggests that occupation patterns ranged from short-term logistical use to longer duration seasonal or semipermanent occupation. LA 84758 is important because it has the first excavated pit structure and earliest evidence of semipermanent occupation of the area north of the Santa Fe River. The A.D. 500 to 800 date range suggests that Archaiclike subsistence and settlement patterns persisted into the ninth century, as proposed by previous investigators (Cordell 1978, 1989; Schmader 1994).

LA 84759

Introduction

LA 84759 was identified by SAC during the Sunset Golf Course survey (Scheick and Viklund 1991:21-22). OAS excavated two areas during March 1993. Area 1 was discovered during data recovery while defining the site limit. Area 2 was relocated from the survey description. The Sunset Golf Course treatment plan focused on Area 2, but also was applied to the Area 1 excavation (Post 1993a:15-20).

Setting

LA 84759 is on a rocky escarpment slope, just below a sandstone ledge. The escarpment is oriented northeast to southwest. Elevation ranges from 6,450 ft at the base of the slope to 6,510 ft on top of the escarpment. The upper 3 to 5 m of the slope is a sandstone outcrop and rocky talus. The lower slope is mixed colluvium, gravel, and sandstone blocks that have detached from the outcrop. The base of the slope is deep, sandy loam alluvium mixed with gravel and cobbles that have eroded out and washed downslope from the outcrop and upper talus slope. The slope averages 20 percent as it descends 20 m in a 100 m distance. This is one of the few rocky outcrops occurring within the project area.

The immediate area has two major topographic features: the sandstone escarpment and an extensive alluvial floodplain. The escarpment separates two of the main arroyos that drain the west portion of the project area.

The escarpment consists of loosely to moderately consolidated Pliocene/Pleistocene sedimentary deposits of the Ancha formation of the Santa Fe Group (Spiegel and Baldwin 1963). This coarse-grained sandstone contains cobbles and gravel that have been redeposited across the piedmont. At the base of the Ancha formation sandstone are red sedimentary clay deposits that are highly plastic when wet.

The extensive alluvial floodplain is formed by the confluence of four secondary and tertiary arroyos that drain the western portion of Las Campanas. These arroyos flow into a secondary tributary of Cañada Ancha. The dominant drainage pattern is southwestern across the piedmont. When the arroyo leaves the piedmont the channel turns north-northwest into the Cañada Ancha. This drainage pattern may be geomorphologically and hydrologically significant because it collects a major portion of the water and soil moving out of the piedmont. These conditions may have been suitable conditions for agriculture in or along the margins of the alluvial floodplain.

Soils consist of Pojoaque-Panky, Bluewing, and Fivemile loam series. These soils are described in more detail in the Contemporary Environment section of this report. Only the Fivemile loam is rated for irrigation and agriculture (Folks 1975:25-26).

The flora are dominated by piñon-juniper overstory on the ridge top and slopes. Grasses are sparse with galleta and grama observed. Shrubs include narrowleaf yucca, rabbitbrush, and prickly pear and cholla cactus. Abundant in the arroyo channels is yellow matchweed, which often grows in abandoned fields associated with historic period homesteads.

Pre- and Post-Excavation Description

LA 84759 was originally described as two lithic artifact concentrations associated with a dispersed scatter of chert core flakes, a Jemez obsidian flake, and two cores. There were scattered sherds of smeared indented corrugated, Abiquiu Black-on-gray, Cochiti Polychrome, undifferentiated black-on-white, and undecorated white ware pottery types. The artifacts covered a 3,500 square meter area. The pottery types indicated discontinuous occupation between A.D. 1325 and 1600.

Reexamination of LA 84759 revealed two distinct artifact concentrations within a dispersed lithic artifact scatter (Fig. 6.28). The artifact concentrations contained sherd and lithic artifacts. The site covered a 1,750-sq-m area, which was about one-half of the reported inventory size. The two artifact concentrations were designated Area 1 and Area 2. Excavation focused on the artifact concentrations.

Area 1 was a small artifact concentration within a larger artifact scatter defining the southern site limit. The artifact scatter covered an a 29-by-24-m area. The artifacts were located between the upper talus and lower, sandy colluvial deposits. Excavation and surface collection of Area 1 yielded 55 pieces of chipped stone, 5 pottery sherds, and 1 one-hand mano.

Area 2 was a sherd and lithic artifact scatter and artifact and feature concentration that was confined primarily to the middle and upper portions of the talus slope. The artifacts were mixed with the sandy clay, crumbling sandstone and cobbles, and gravel that eroded out of the sandstone. A total of 40 lithic artifacts and 100 sherds of Classic period pottery types were recovered. The artifacts were associated with two features and numerous small charcoal stains on the upper talus slope.

Excavation Methods

The site and artifact concentration limits were defined by pinflagging the surface artifacts. Once the site limits were defined, a north-south baseline was established at 30-m intervals, and excavation units were established tied to the baseline.

Area 1 had a 6 m north-south by 4 m east-west excavation area that was placed within the densest and upslope portion of the artifact concentration. The northeast corner of the excavation area was 110N/96E. The excavation area was surface collected and the 5 cm of loose top soil was removed in 2-by-2-m units to expose soil changes or rock alignments and to track the artifact

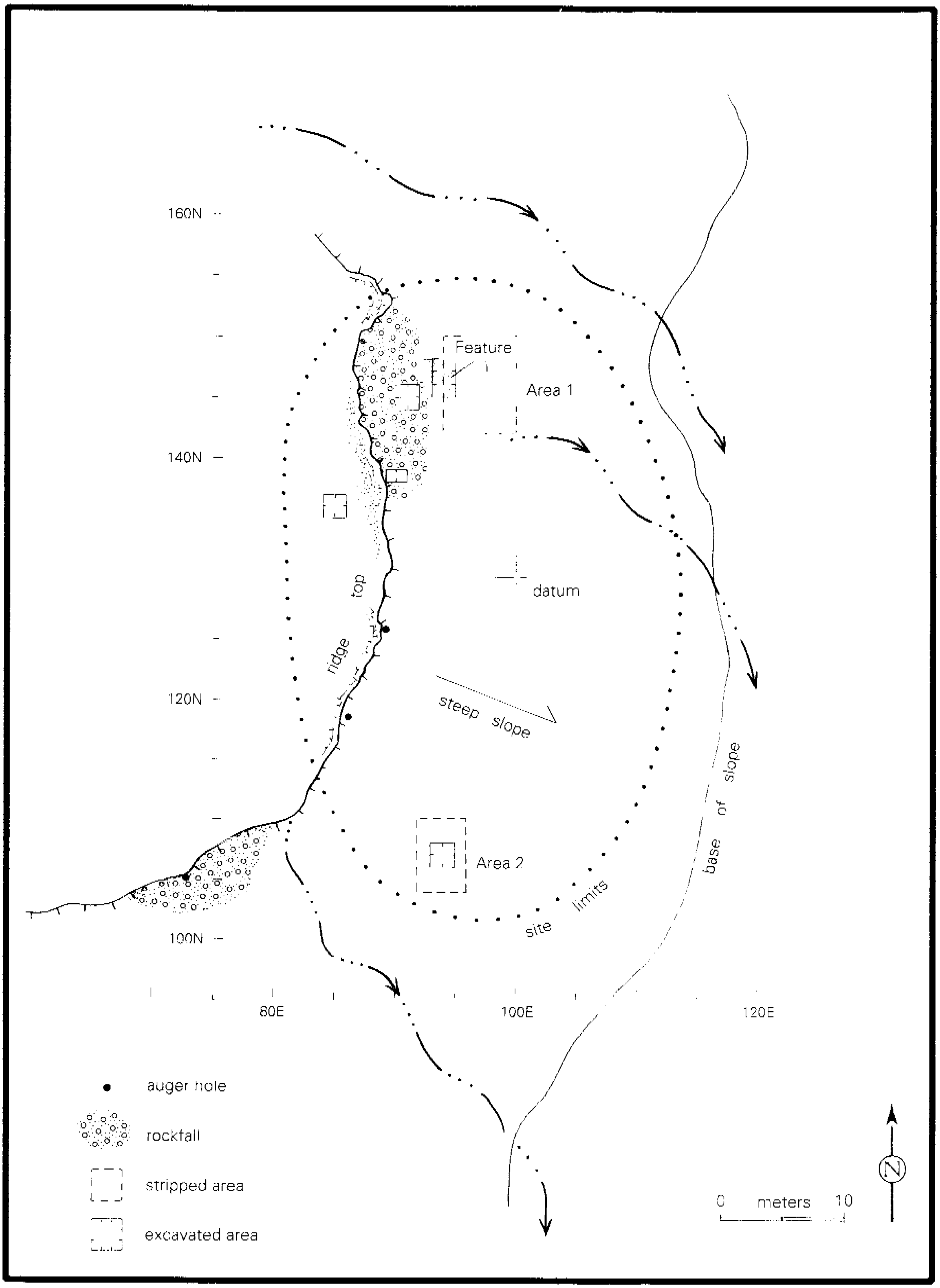

Figure 6.28. LA 84759, site map.

distribution. Artifact counts and types were used to select units for deeper excavation.

Grids 108N/94E and 108N/96E each yielded 10 lithic artifacts. A 2-by-2-m unit including those grids was excavated in 1-by-1-m units to the bedrock or into noncultural fill. The crumbly sandstone bedrock was encountered 10 cm below the surface strip within this area. No artifacts were recovered from the 10 cm level, so excavation was halted.

The Area 2 excavation area was an 8 m north-south by 6 m east-west area that included Grids 142-150N/95-100E. Area 2 excavation area was surface stripped in 2-by-2-m units removing the loose, rock-gravel top soil. Charcoal flecks and stained and oxidized soil occurred in the western half of the excavation area.

A 2-by-2-m unit with 147N/95E as the northeast corner was excavated in 1-by-1-m units. Excavation of one 10-cm level revealed a burned area of oxidized clay, charcoal, and stained soil mixed with sandstone and fire-cracked and unaltered cobbles. The excavation unit was expanded 1 m to the north and excavated to 20 cm below the modern ground surface exposing most of a rock concentration that was designated as Feature 1.

Feature 1 was a collapsed rock feature mixed with charcoal and burned soil and sherd and lithic artifacts. Excavation exposed and defined 150 to 200 fractured and intact cobbles. Excavation followed the slope contour, which was moderate to steep. Once the outline was defined, the feature was mapped, profiled, photographed, and described. A 1-by-1-m unit was excavated below the rocks to expose the feature in cross section and determine the cultural deposit depth. Charcoal samples were collected for radiocarbon dating. Soil samples were collected for ethnobotanical analysis.

Feature 1 indicated that the slope and ledge may have been an activity area or short-duration living area. Some artifacts may have washed downslope from upper activity areas. A 1-by-2-m unit (northeast corner of 139N/90E) was excavated directly beneath the overhang remnant and a 2-by-2-m unit (excavated as four 1-by-1-m units with 146N/92E as the northeast corner) was located 1 m west of Feature 1. Also a 2-by-2-m unit (excavated as a single unit with a northeast corner of 137N/86E) was placed in the loose sandy soil that covered the top of the sandstone ledge. These units were excavated in 10 cm levels to the noncultural material-bearing soil level.

The site was transit mapped showing the excavation areas, the upper and lower limits of the sandstone ridge, and the limits of the artifact scatter. The deep excavations were backfilled. The remainder of the areas were left to be reclaimed naturally.

From the excavation it was determined that LA 84759 had more extensive cultural deposits than were anticipated. Numerous features may be buried under the sandstone slabs that had collapsed from the overhang onto the talus slope. Las Campanas decided that Area 2 could be avoided by the Sunset Golf Course construction. The significant portion of Area 2 was placed in a protective easement as defined by the OAS project director. The limits were fenced with a single strand of wire, and the easement was plotted on the development plat and filed at the Santa Fe County Clerk's office.

Stratigraphy

Area 1

Excavation revealed a single soil stratum. Stratum 1 was a 15 to 20 cm thick layer of loose brown (7.5YR 5/4, dry) sand mixed with abundant gravel and modern organic matter. Near the bottom of the level, the gravel content decreases. Stratum 1 sits on top of the decomposing Ancha formation sandstone. Stratum 1 yielded chipped stone and ceramics in the upper 5 to 8 cm.

Area 2

Excavation within Area 2 revealed three strata that occurred throughout the middle and upper portions of the slope (Strata 1, 2, and 3). In addition to the three area-wide strata, four strata were observed in the 1-by-2-m excavation unit placed under the overhang at 139N/90E (Strata 4, 5, 6, and 7) (Figs. 6.29, 6.30).

Stratum 1 was the loose, dark brown (7.5YR 4/4, moist) colluvial clay sand top soil that covered the slope. This soil is mixed with abundant gravel, cobbles, and crumbling sandstone slabs that had exfoliated from the Ancha formation sandstone and is 10 to 15 cm thick. This layer contained a mix of charcoal, oxidized soil, and organic loam. The charcoal, oxidized soil, and artifacts were most common in the main

Figure 6.29. LA 84759, stratigraphic profile of area under overhang, Area 2.

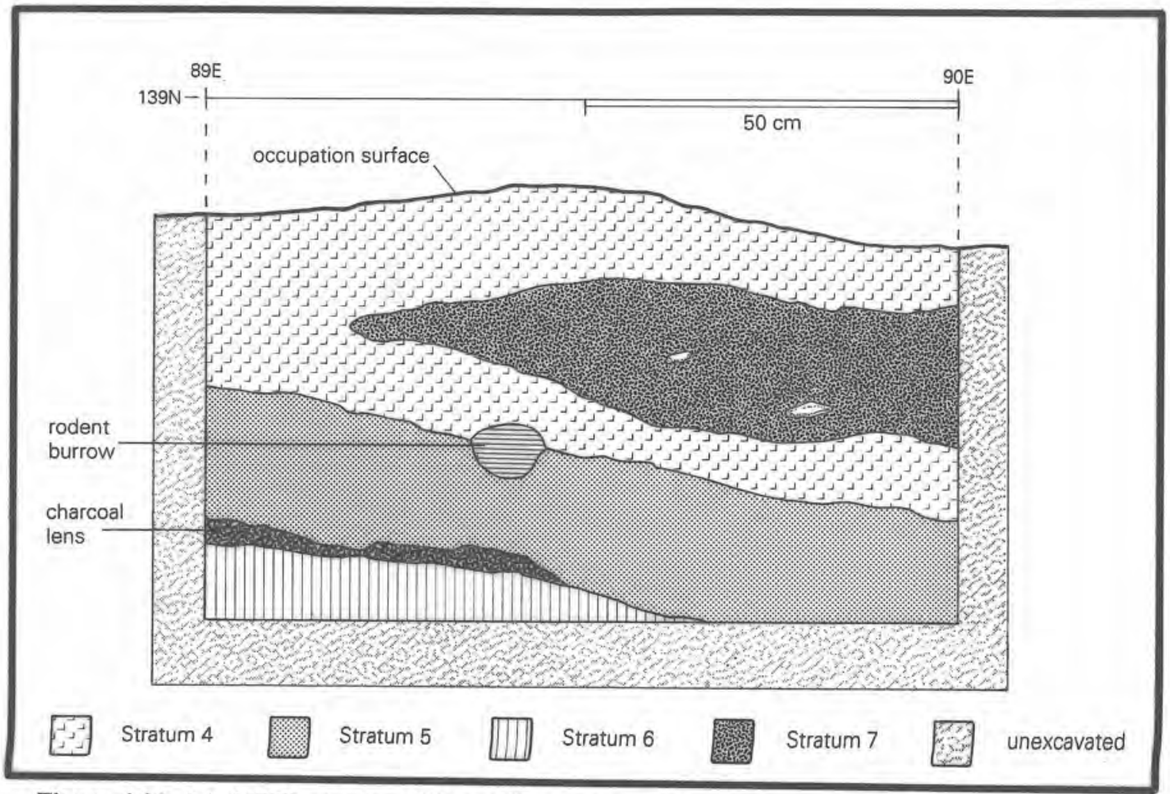

Figure 6.30. LA 84759, stratigraphic profile of area under overhang, Area 2.

portion of Area 2.

Stratum 2 was a compact, blocky, strong brown (7.5YR 4/6, moist) sandy clay. This colluvial deposit contained gravel, cobbles, and decomposing sandstone 10 to 30 cm deep. It had the greatest depth in the upper slope areas. This layer was heavily stained with charcoal and was oxidized within and immediately adjacent to Feature 1. Artifacts were recovered from the upper 10 cm of this layer in all excavation units excavated below surface strip. The artifact composition and distribution within this layer suggests Stratum 2 was the eroded remains of a cultural deposit.

Stratum 3 was a medium to coarse grained, unconsolidated layer of light brown (7.5YR 6/4, moist) clay sand with pebbles and an occasional cobble. This layer was 10 to 25 cm thick and overlays the sandstone bedrock. There were no artifacts recovered and it lacked oxidized soil and charcoal. Stratum 3 was a natural deposit.

Stratum 4 was a 22 to 35 cm thick layer of brown to dark brown (7.5YR 4/4, moist) eolian sand mixed with plastic, moist clay. A dense packrat midden covered the surface of the overhang. There were few cobbles and gravel within the soil matrix. Charcoal flecks were sparsely distributed throughout the deposit. Two lithic artifacts were recovered from Stratum 4.

Stratum 5 was a dense, consolidated, plastic layer of brown to dark brown (7.5YR 4/4, moist) clay that occurred from 22 to 50 cm below the modern ground surface. There were no cobbles or gravel in the matrix. Ceramic and lithic artifacts were recovered throughout this stratum. Large charcoal flecks were sparsely distributed and may have been deposited by rodent burrowing. A rodent burrow was visible in the west profile of Grid 139N/91E at the contact between Stratum 4 and 5. This stratum was encountered in the three auger tests placed along the base of the sandstone. This in situ deposit of sedimentary clay may be suitable for pottery-making.

Stratum 6 was a clean, fine-grained, strong brown (7.5YR 4/6, moist) sand. Stratum 6 was visible in the southwest quarter of Grid 139N/91E from 44 to 60 cm below the modern ground surface. Cobbles and gravel were absent from this matrix. Strata 5 and 6 were separated by a lens of charcoal-stained sandy clay that appeared to migrate into the excavation unit from the area immediately to the south. An auger test in the bottom of Grid 139N/91E revealed Stratum 6 to be at least 50 cm thick. The auger test also revealed a 16 cm thick layer of charcoal-stained sand from 70 to 86 cm below the modern ground surface. The charcoal-stained sand resembles hearth or roasting pit fill. Clean sand was encountered below this layer from 86 to 96 cm below the modern ground surface.

Stratum 7 was a dark, charcoal stained (10YR 2/2, moist) layer, 4 to 20 cm thick, of clay sand that intruded into Stratum 4. The deposit was basin-shaped and appeared to be a partial cross section of a thermal feature.

The stratigraphic evidence from Grid 130N/91E suggested that the overhang contained stratified deposits as indicated by the two layers of charcoal-stained soil. Artifacts associated with Stratum 7 indicated an occupation date during the Classic period, which was contemporaneous with the cultural deposits on the slope. The charcoal-stained stratum (Stratum 7) below Stratum 6 is of unknown age.

Feature Description

Three probable features were identified during the excavation. Two features were dark, charcoal-stained soil lenses exposed in the excavation of Grids 139N/90-91E. Only small portions of these features were exposed in the excavation profile or in the auger test. Feature 1 was encountered on the slope, was 90 percent excavated, and can be described in greater detail.

Feature 1

Feature 1 was a fire-cracked rock, cobble, and charcoal concentration (Fig. 6.31). It was on the midslope portion of Area 2 within Grids 146-148N/94-95E. There was no indication of Feature 1 on the surface. The midslope area was covered by Stratum 1.

Feature 1 measured 2 m long north-south by 1.5 m east-west (Fig. 6.32). Feature limits were defined by the extent of the fire-cracked rocks, cobbles, and stained soil. It is possible that the rock was formerly contained within a shallow, oval-shaped pit, but no definite pit limits were evident. The distribution of the rock debris over the 3-sq-m area resulted from deflation and water and slope erosion.

The feature soil matrix was a 12 to 30 cm deep, dense, plastic clay sand similar to Stratum

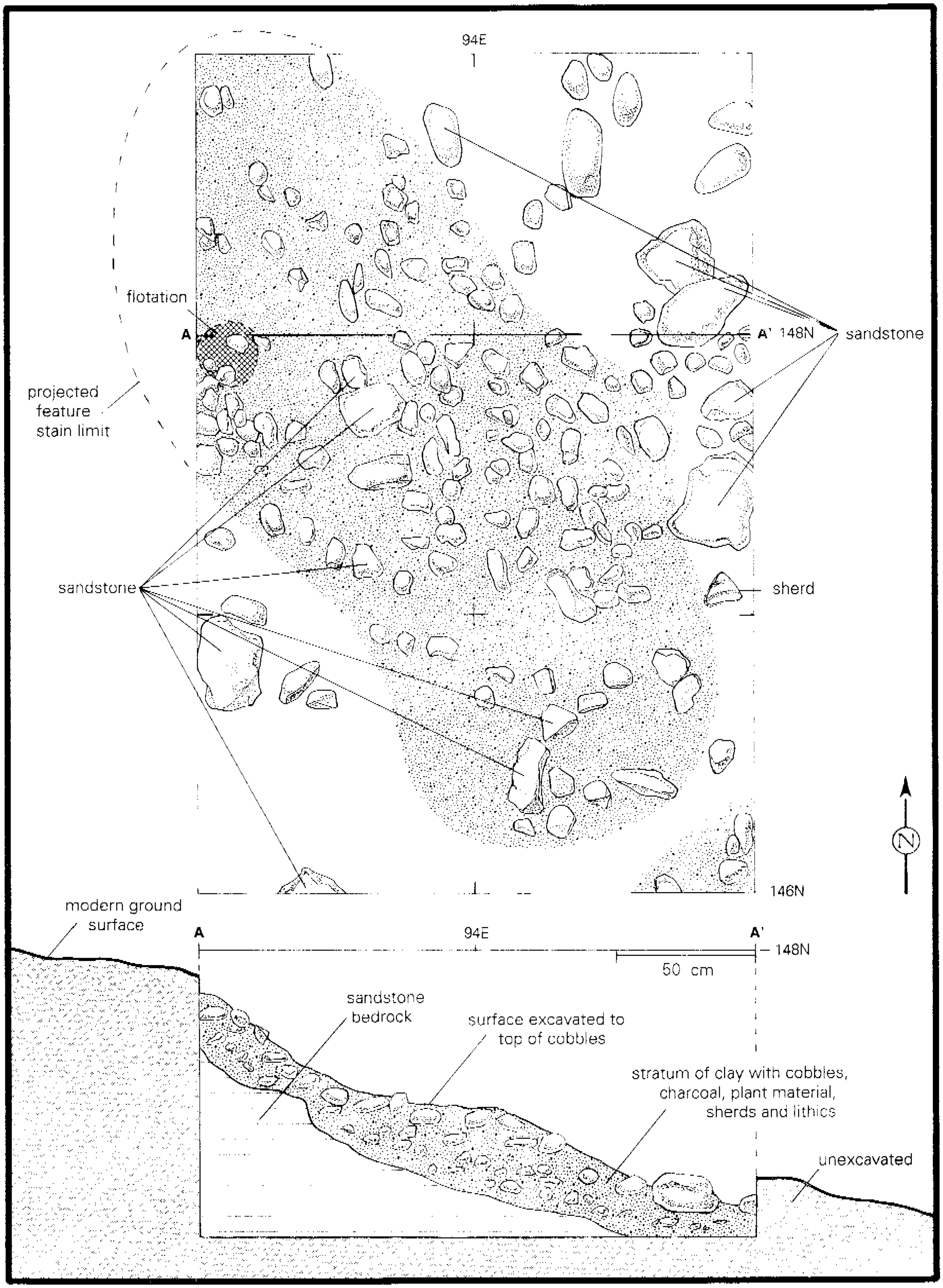

Figure 6.31. LA 84759, plan view and profile of Feature 1.

Figure 6.32. LA 84759, Feature 1, excavated.

2. The fill was mixed with 150 to 200 pieces of fire-cracked rock and cobbles, abundant charcoal flecks, patches of oxidized soil, and sherd and lithic artifacts. The rocks and cobbles were one to four pieces deep and ranged from 4 to 10 cm in diameter. Ethnobotanical analysis yielded juniper and piñon charcoal, but no other charred plant remains.

Artifacts recovered from within and around Feature 1 included five sherds and three pieces of chipped stone. The five sherds were bowl fragments of Biscuit B pottery. The chipped stone included two chert core flakes and one piece of chert angular debris.

The function of Feature 1 cannot be inferred from the excavation. The absence of definable limits excavated into the native soil suggests that Feature 1 was a relatively shallow basin-shaped pit. Rock-filled pits or thermal features are not common for the Las Campanas project, although thermal features are fairly common on Coalition and Classic period sites. From the amount of rock debris, it is suggested that Feature 1 was a roasting pit with cobbles placed on top of the fire as the seat for cooking or roasting.

Artifact Assemblage

A small artifact assemblage was recovered from Area 1 consisting of 5 pieces of prehistoric period pottery, 55 chipped stone artifacts, and a one-hand mano. The occurrence of 46 artifacts in an 8-by-10-m area suggests they result from a single occupation. Area 2 yielded a larger and more diverse assemblage including 40 sherds, 100 pieces of chipped stone, and 3 pieces of ground stone.

Pottery
by Steven A. Lakatos

A total of 45 pieces of prehistoric pottery were recovered from the surface and the 5 cm surface strip level of two defined areas. Decorated wares identified include Santa Fe Black-on-white, Abiquiu Black-on-gray (Biscuit A), Bandelier Black-on-gray (Biscuit B), glaze-on-yellow/-cream, and glaze-on-red. Utility wares identified include Indented Corrugated, Potsuwi'i Incised,

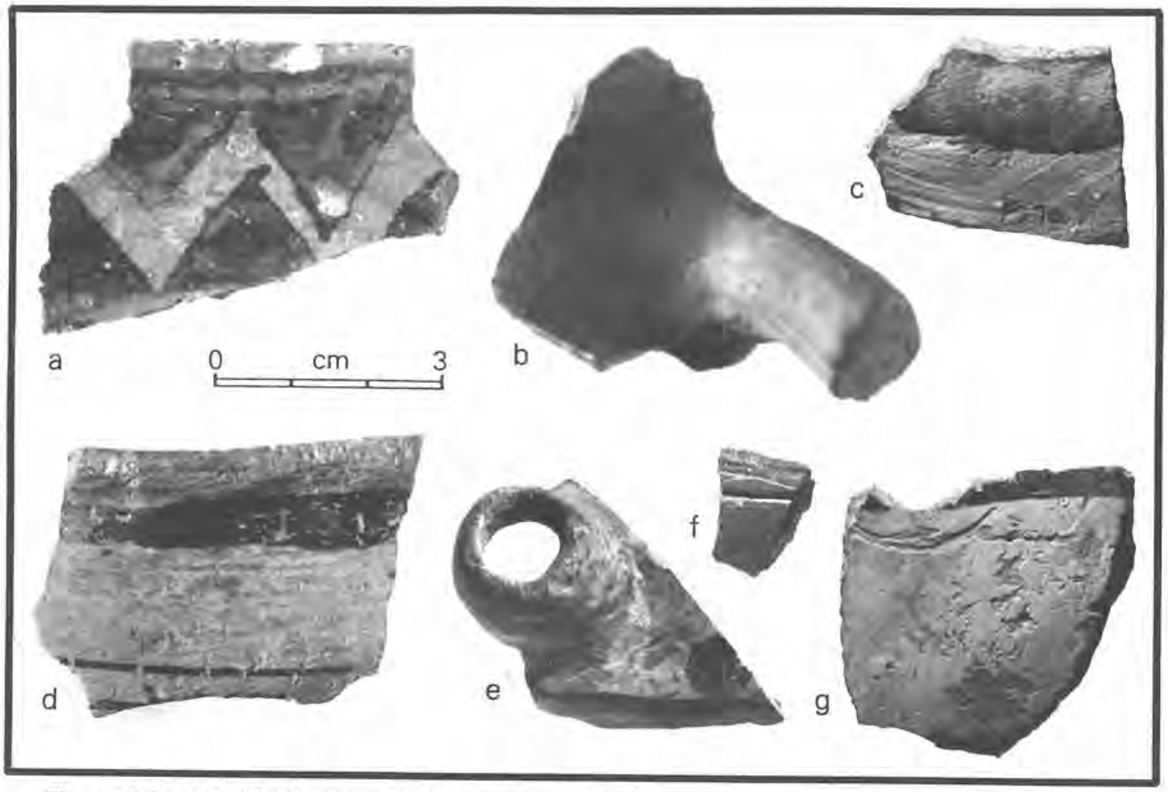

Figure 6.33. LA 84759, ceramics from Areas 1 and 2.

and Sapawe Micaceous. These pottery types were common during the Coalition and early Classic periods (A.D. 1175-1425) in the Northern Rio Grande.

Area 1

Three undifferentiated white ware bowl body sherds were recovered from Grid 106N/96E and are from Vessel 5. They exhibit a thin, white slip on the interior and exterior surfaces. The bowl interior was highly polished and the exterior exhibited a medium polish. The paste was gray (7.5YR 6/0-5/0), hard, and vitrified. The paste is self-tempered with fine quartz sand. The combination of attributes suggests that the sherds are from a well-made Santa Fe Black-on-white bowl.

One Santa Fe Black-on-white bowl rim was recovered from Grid 106N/94E. This sherd exhibits a floated interior with a smoothed exterior. The interior is highly polished and the exterior shows light polishing striations and is fire-clouded. The pigment is a thin black organic paint. The rim is tapered and flattened and exhibits wear on the outer edge. The wear cannot be assigned to a specific cause. The paste is hard, vitrified, and gray (7.5YR 6/0-5/0) with a fine self-tempered paste. Self-tempered Santa Fe Black-on-white pottery is common on Coalition and early Classic period sites of the Las Campanas area. The design layout consists of an encircling band of off-set triangles placed 5 mm below the rim (Fig. 6.33a), similar to Stubbs and Stalling's example (1953, fig. 43a). Encircling bands were the most common design elements for Santa Fe Black-on-white pottery from Pindi Pueblo (Stubbs and Stallings 1953:62).

One jar sherd of Indented Corrugated pottery was recovered from Grid 108N/94E. The paste is medium-grained, gray (7.5YR 6/0-5/0), with a friable texture. The temper is medium-grained quartz with mica. Quartz and mica are common minerals in the raw materials available in the foothills of the Sangre de Cristo Mountains (Habicht-Mauche 1993). Manufacture of quartz and mica-tempered utility wares could have occurred in the Santa Fe or Tesuque valleys.

The five sherds are common pottery types of the Coalition and early Classic periods of the Rio Grande sequence. Production of these pottery types could have occurred over a wide region. They are the most common decorated and utility wares found at Pindi and Arroyo Hondo pueblos

Table 6.7. LA 84759, Area 2, Pottery Types by Vessel Form and Portion

Count Row Pct Column Pct	Indeter- minate	Bowl Rim	Bowl Body	Jar Body	Lug Handle	Spout	Row Total
Indeterminate white ware			1 100.0 5.6				1 2.5
Plain, undifferen-tiated	1 25.0 50.0			3 75.0 21.4			4 10.0
Potsuwi'i Incised				1 100.0 7.1			1 2.5
Plain, micaceous	1 33.3 50.0			1 33.3 7.1	1 33.3 100.0		3 7.5
Sapawe Mica-ceous				3 100.0 21.4			3 7.5
Santa Fe Black-on-white		1 100.0 25.0					1 2.5
Biscuit A			5 100.0 27.7				5 12.5
Biscuit B		3 21.4 75.0	11 78.5 61.1				14 35.0
Glaze yellow/cream						1 100.0 100.0	1 2.5
Glaze-on-red (undifferentiated)			1 14.3 5.6	6 85.7 43.0			5 12.5
Column Total	2 5.0	4 10.0	18 45.0	14 35.0	1 2.5	1 2.5	40 100.0

during the early occupations though utility wares rarely occur on Las Campanas sites.

Area 2

A total of 40 sherds were recovered from the surface, excavation of Area 2, and Features 1 and 2. Twenty-three sherds were assigned to 6 vessels with 17 sherds not assigned to a vessel, including 1 undifferentiated jar handle (Fig. 6.35b). All vessels and sherds not assigned to a vessel were recovered from the north and north-east portions of Area 2. Vessels 1 and 3 were associated with Feature 1 and Vessel 4 was associated with Feature 2. Vessels 4 and 6 were recovered from single units located on the slope below these features. Utility wares included Potsuwi'i Incised and Sapawe Micaceous (Vessel 6). Utility wares produced by Anasazi potters on the Colorado Plateau are generally constructed by overlapping spiral coils towards the exterior of the vessel. One undifferentiated plain ware sherd recovered at this site exhibited overlapping coils towards the interior of the vessel (Fig. 6.33c). This interior construction technique is used by modern Pueblo potters in the Northern Rio Grande and may be indigenous to this region.

Decorated wares included Santa Fe Black-on-white, Biscuit A (Vessel 4), Biscuit B (Vessels 1 and 3), glaze-on-yellow/cream, and glaze-on-red (Vessel 2). The rim form and decoration on Vessel 1 is similar to Glaze B and Glaze C pottery of the early Classic period (Fig. 6.33d). Table 6.7 shows the distribution of these types by vessel form and portion.

Eleven utility ware sherds included portions of a Sapawe Micaceous vessel (Vessel 6) and a Potsuwi'i Incised vessel. The remaining micaceous sherds are probably part of one or both of these vessels. These are common utility wares on early Classic period (A.D. 1325-1450) sites in the Northern Rio Grande (Biella and Chapman 1979). Paste, temper, and surface treatment closely resemble the descriptions given by Harlow (1973), Shepard (1936), and Mera (1935).

A total of 29 decorated sherds included portions of one Biscuit A vessel (Vessel 4), two Biscuit B vessels (Vessels 1 and 3), and one glaze-on-red vessel (Vessel 2). The decorated wares are common on late Coalition (A.D. 1275-1325) and early Classic period (A.D. 1325-1450) sites in the Northern Rio Grande (Biella 1979). Decorated forms include bowls, jars, and a spoutlike opening, which may be from a canteen or a small water storage jar (Fig. 6.33e). Paste, temper, surface treatment, and decoration closely resemble the descriptions given by Habicht-Mauche (1993), Shepard (1936), Mera (1933, 1935), and Warren (1979a). Pumice and rhyolitic tuff were common tempering materials in the decorated assemblage indicating production on or near the Pajarito Plateau (Warren 1979a:194-195).

Use-wear and post-firing modification (worked sherds) were present in the assemblage. Use-wear included rim wear, erosion, and sooting. Rim wear and erosion were observed on sherds that could not be assigned to a specific vessel. Vessel 1 sherds exhibited rim wear, Vessel 3 sherds were eroded, and Vessel 6 sherds were sooted. Post-firing modifications include edge grinding, perforation, and surface incising. From Vessel 2, three sherds have a ground edge, one sherd has a rounded edge, one sherd is abraded into a small rectangular form, and one sherd is incised (Fig. 6.33f, g). One Biscuit B sherd may be a fragment of a spindle whorl based on evidence of perforation and circular striations. The high percentage of post-firing modifications on glaze ware pottery is similar to the findings from the Howiri (LA 71) ceramic assemblage (Fallon and Wening 1987:51). Use-wear and post-firing modifications were rare on the Coalition period ceramics from Las Campanas.

Biscuit, glaze, and micaceous utility ware bowls and jars are common on early Classic period sites in the Northern Rio Grande but early Classic period pottery is relatively rare in the Las Campanas site assemblage. Quantities of bowl and jar forms are nearly equal in the LA 84759 assemblage, suggesting small-scale domestic activities. Decorated jars, which are rare in the Coalition period, were revived in the early Classic period. This revival may be a reflection of expanding economic needs and a change in pottery production technology.

Chipped Stone
by Guadalupe A. Martinez

LA 84759, Area 1

Fifty-five pieces of chipped stone were recovered from the excavation area and surface collection. The chipped stone assemblage includes core flakes, angular debris, and multidirectional and unidirectional cores. Table 6.8 shows the artifact type by material type distribution.

Lithic Raw Material. Lithic raw material selection is limited. Only four material types are represented. Chert is the most common material; chalcedony, quartzite, and quartzitic sandstone occur in lower frequencies. These are the most common raw materials occurring within the Las Campanas area. All of these materials could have been obtained from Santa Fe formation gravel.

Debitage. Debitage is the main chipped stone category and represents the most abundant artifact type, consisting of core flakes and angular debris. None of these artifacts exhibit use-wear or modification, indicating they are waste products.

The core flakes reflect all stages of core reduction. Chert comprises 84 percent of the core flake assemblage. Only 38 percent of the core flakes lack cortex. Almost 30 percent of the core flakes have more than 50 percent dorsal cortex. These percentages are strong indicators of early

Table 6.8. LA 84759, Areas 1 and 2, Artifact Type by Material Type

Count Row Pct Column Pct	Miscellaneous Chert	Chalcedony	Obsidian	Quartzite	Quartzitic Sand-stone	Total
Area 1						
Angular Debris	13 92.9 27.7				1 7.1 20.0	14 25.5
Core flake	31 83.8 66.0	1 2.7 100.0		3 8.1 60.0	2 5.4 100.0	37 67.3
Unidirectional core					1 100.0 20.0	1 1.8
Multidirectional core	3 100.0 6.4					3 5.5
Area Total	47 85.5	1 1.8		5 9.1	2 3.6	55 100.0
Area 2						
Angular Debris	9 75.0 13.6		1 8.3 20.0	2 16.7 7.7		12 12.0
Core flake	47 62.7 71.2		3 4.0 60.0	23 30.7 88.5	2 2.7 100.0	75 75.0
Biface flake	3 60.0 4.5	1 20.0 100.0		1 20.0 3.8		5 5.0
Undiff. Core			1 100.0 20.0			1 1.0
Multidirectional core	7 100.0 10.6					7 7.0
Area total	66 66.0	1 1.0	5 5.0	26 26.0	2 2.0	100 100.0

Table 6.9. LA 84759, Area 1, Core Data

Material	Texture	Type	Cortex	Dorsal scars	Length	Width	Thickness	North/East
Chert	medium	multidirectional	60	3	62	44	35	110/86
Chert	fine	multidirectional	40	4	38	31	28	108/96
Chert	medium	multidirectional	30	7	51	40	25	106/96
Quartzitic sandstone	medium	unidirectional	40	4	62	50	40	126/115

and middle stage reduction of locally available raw material. Whole flakes comprise 70 percent of the assemblage. High whole flake percentages indicate early stage core flake production (Sullivan 1992:106). Early and middle stage core reduction are indicated by the dominance of single and cortical platforms, which comprise 65 percent of the assemblage. Core flake dimensions fall within the small to medium size range with mean a length of 33 mm, a mean width of 30 mm, and a mean thickness of 11 mm.

Cores. Four cores were recovered (Table 6.9). Three cores were chert with multidirectional platforms. The fourth core was quartzitic sandstone with a unidirectional platform.

The core attributes suggest that all materials regardless of grain size were treated the same. The chert core with seven dorsal scars suggests it was reduced more completely. Core sizes compare favorably with core flake dimensions suggesting that the local cobbles were medium sized with a maximum dimension of less than 100 mm.

Ground Stone

The one-hand mano was recovered from 108N/94E, which is within the main artifact concentration, and was probably associated with the activities conducted in Area 1. The mano is a rounded cobble of quartzitic sandstone. It is complete and measures 110 mm long by 100 mm wide by 51 mm thick. It has an irregular profile with one flat side. It exhibits evidence of grinding on a single surface. The flat grinding surface suggests it was used with a slab metate or base stone. Slab base stones are not temporally diagnostic, but may have been most commonly used to process wild seeds or nuts.

LA 84579, Area 2

One hundred pieces of chipped stone were recovered from the excavation area and the surface. The chipped stone assemblage includes core flakes, angular debris, multidirectional and undifferentiated cores. Table 6.8 shows the artifact type by material type distribution.

Lithic Raw Material. Lithic raw material selection includes the full range of local materials and obsidian. Chert is the most common material; chalcedony, obsidian, quartzite, and quartzitic sandstone occur in lower frequencies.

Debitage. Debitage is the main chipped stone category and represents the most abundant artifact type (see Table 6.8). The debitage assemblage consists of core flakes, angular debris, and biface flakes. None of these artifacts exhibited use-wear or modification indicating that they are waste products.

The core flakes result from all stages of core reduction. Chert comprises 63 percent of the core flake assemblage. Fifty-two percent of the core flakes lack cortex, and 77 percent of the core flakes exhibit less than 50 percent dorsal cortex. These percentages are strong indicators of middle and late stage reduction of locally available raw material. Whole flakes comprise 51 percent of the assemblage. High whole flake percentages indicate core flake production (Sullivan 1992:106). Early and middle stage core reduction are indicated by the dominance of single and cortical platforms (71 percent of the assemblage). Chert whole core flake dimensions fall in the small to medium size range with a mean length of 34 mm, a mean width of 30 mm, and a mean thickness of 10 mm. Quartzite whole flakes tend to be larger with means of 46 mm for length, 36 mm for width, and 14 mm for thickness. Obsidian core flake mean dimensions were smaller (19 mm length, 19 mm width, 6 mm thickness), indicating they were from late stage core reduction.

Cores. Seven cores were recovered. Six were multidirectional chert cores. The seventh was an undifferentiated obsidian core (Table 6.10). The core attributes suggest that all materials, regardless of grain size, were treated essentially the same. The chert core with seven dorsal scars and the obsidian core with eight scars suggest intensive reduction. Core size compares favorably with core flake dimensions, suggesting that the local cobbles were small to medium-sized with a maximum dimension of less than 80 mm. The small obsidian core reflects intensive use of obsidian to produce small flakes for tools. All the cores had less than 50 percent cortex, which is typical of middle and late stage core reduction.

Tools. One nondiagnostic biface of medium-grained chert was recovered from Grid 145N/91E. It measured 83 mm long by 68 mm wide by 30 mm thick.

Table 6.10. LA 84759, Area 2, Core Data

Material	Texture	Type	Cortex	Dorsal scars	Length	Width	Thickness	North/East
chert	fine	multidirectional	40	3	55	31	23	150/92
chert	fine	multidirectional	30	5	78	69	35	138/88
chert	medium	multidirectional	20	3	54	38	24	144/96
chert	medium	multidirectional	30	4	56	37	29	147/97
chert	medium	multidirectional	10	7	70	62	32	134/113
chert	coarse	multidirectional	10	4	60	46	34	150/100
obsidian	glassy	unidirectional	30	8	32	30	28	146/94

Ground Stone

Three pieces of ground stone were recovered from Area 2. Two were metate fragments and one was a mano fragment. The mano fragment and the two metate fragments were found in the vicinity of Feature 1. One metate fragment was basalt and was probably basin-shaped. The other metate fragment was quartzitic sandstone. They were probably associated with the activities conducted in Area 2. The quartzite mano fragment measures 120 mm long by 95 mm wide by 43 mm thick and has a circular cross section. The ground stone artifacts from Area 2 were used for wild seed or nut processing.

Research Questions

LA 84759 had two spatially and temporally discrete occupation components located on the slope and along the base of a sandstone ridge. The ridge separates the floodplains of four arroyos that join immediately south of the ridge. The floodplains join to form a relatively expansive alluvial plain that supported small-scale farming during the historic period. The two occupation components were designated Area 1 and Area 2. Area 1 dates to the Coalition period of the Rio Grande Sequence. Area 2 dates to the latter portion of the early Classic period. Areas 1 and 2 will be discussed in terms of chronology, function, and occupation history.

Area 1, Chronology

Area 1 chronological data are limited. Only four sherds were recovered in association with a concentration of core reduction debris. The single bowl rim sherd of Santa Fe Black-on-white pottery suggests an A.D. 1200 to 1425 occupation span. Self-tempered Santa Fe Black-on-white is common in the early deposits of Pindi Pueblo (Stubbs and Stallings 1953), Agua Fria Schoolhouse (Lang and Scheick 1989), and Arroyo Hondo Pueblo (Habicht-Mauche 1993). Tree-ring dates associated with the early deposits from these sites suggest an occupation between A.D. 1270 and 1315 for Area 1.

Site Function

Site function can be inferred from a combination of artifact attributes and type distributions and their spatial relationships. Even though a small, low diversity assemblage was recovered, general patterns can be recognized that may inform on site function within the broader Puebloan economic organization.

The lithic raw material procurement and reduction patterns presented in the descriptive section are strong. Raw material procurement indicators include material texture, dorsal cortex percentage, and dorsal scar counts. Reduction patterns are indicated by the assemblage distribution of dorsal cortex percentage and dorsal scar counts combined with flake portion and platform type.

Raw Material Selection. The large amount of gravel and cobbles that occur on the escarpment slope could be the source of the raw material. Material texture counts exhibit an unusual pattern. Medium-grained material is 54.5 percent of the assemblage, which is greater than was usually found on Pueblo period Las Campanas sites.

This suggests that high quality material was not brought to the site, but poorer quality material from a nearby source was used. Dorsal scar counts show a continuous distribution from 0 to 7, but artifacts lacking dorsal scars are 41.8 percent of the assemblage. A high frequency of low dorsal scar counts suggests that reduction occurred closer to the raw material source (Gossett and Gossett 1993).

The dorsal cortex percentage distribution strongly favors local raw material procurement. One indicator of a local raw material source is the presence of 90 or 100 percent cortex on three of four pieces of quartzitic sandstone. Early stage decortication debris corresponds with on-site raw material testing. For all chipped stone, 50 percent exhibit 10 percent or greater dorsal cortex. In comparison with other Las Campanas sites, this is a high percentage of dorsal cortex. This strongly suggests that the raw material came from the ridge slopes or another nearby source.

The material texture and dorsal cortex and scar count patterns strongly indicate that a nearby source was used, such as cobbles that were available in the colluvial slope deposits. From these data, Area 1 can be minimally characterized as a lithic procurement site. Raw material may have been procured, tested, and partly reduced for flakes and cores that could be used for off-site foraging.

Core Reduction Patterns. Evidence for reduction patterns can be inferred from core flake and core attributes. Area 1 strongly tends toward early and middle stage core reduction. This is evident in the high percentage of cortical and single-faceted platforms; the high percentage of whole core flakes; the high percentage of core flakes with fewer than three dorsal scars; and the relatively high percentage of cortical debris. The intended products of core reduction are unknown because no tools were found in the Area 1 assemblage. Based on the debitage attribute patterns, it is likely that flakes were produced to be used as tools off-site. This expedient reduction strategy should occur where suitable raw material is present and highly specialized tools were not needed (Binford 1979; Kelly 1988).

Summary. Lithic raw material procurement and reduction patterns suggest foraging activities occurred or were supported by core reduction at Area 1. Use of local material to produce flakes combined with the one-hand mano and the Santa Fe Black-on-white bowl fragments may have occurred in conjunction with gathering and initial processing of plant resources available along the sandstone escarpment and nearby arroyo floodplains. Discarded grinding implements are a relatively rare occurrence on the small Coalition to early Classic period sites in the Las Campanas area. Their rarity may indicate that most processing of gathered resources occurred at the village, and not on the landscape.

Evidence for processing invites the possibility that Area 1 and LA 84759 may be at or near the outer limit of a normal diurnal foraging range. Perhaps, as distance from foraging location to the village increased, more processing was necessary. Initial processing would have removed unneeded plant parts and reduced the load weight to be transported back to the village. This would maximize the yield gained from the energy used in transport. Therefore, Area 1 may have functioned as an intermediate site within a staged foraging strategy. Because of the unique environment of this area, more effort may have been expended to procure its resources.

Area 2, Chronology

Area 2 chronological data are derived from pottery manufacture dates for the decorated types. The pottery assemblage is a combination of glaze-paint and Biscuit ware types. This combination of types is common on early to middle Classic period sites in the Northern Rio Grande. Biscuit A and Biscuit B co-occurring with Glaze A and B pottery suggests an occupation between A.D. 1400 and 1450.

Area 2, Site Function

Area 2 is unique because it is an early fifteenth-century occupation and the artifact assemblage exhibits diversity that is unusual for Las Campanas Pueblo period sites. An unusual topographic setting combined with the artifact assemblage characteristics suggest that Area 2 was more than a casual or diurnal foraging camp. LA 84759 site function can be examined using the criteria for fieldhouse and foraging or gathering sites defined in the data recovery plan for LA 98688 (Post 1994b). This comparative model uses architectural, site location, and use or occupation pattern criteria for site classification. The data from LA 84759 can be matched with these criteria to provide an evaluation of site function.

The presence of architecture is often used to estimate occupation duration and group size. A fieldhouse occupied periodically during the growing season should have one to three rooms with one room large enough to comfortably accommodate at least one adult. If only one room was present, it would have to allow for sleeping and indoor domestic activities. Other rooms, if present would house storage or domestic activities. Seasonal foraging or gathering sites or diurnal farm shelters would have temporary structures for protection against inclement weather. No formal structure was identified during the excavation of Area 2. The sandstone ledge had collapsed and may have buried or destroyed any architectural remains. Since the whole component was not excavated, confirmation of a structure is problematic.

Site location is an important criterion because an extended use fieldhouse would have been located near the fields. Foraging or gathering sites might have been located in the same environmental zone because conditions that were suitable for farming would have supported more abundant or diverse plant and animal species. Furthermore, it is probable that fieldhouse residents would have exploited mature edible plants and available game. LA 84759 may be located near the best suited farm land within the Las Campanas area. As mentioned previously, the arroyos that join immediately south of the ridge were farmed during the historic period. The farming was not economically successful, but may have been viable at the subsistence level. The soils in this area are deep and well-drained and a large percentage of the western portion of the Las Campanas area drains into these arroyos, indicating that run-off would have been available. Proximity to arable land, increased available soil moisture from run-off, well-drained and permeable soil, and evidence for historic farming are strong evidence favoring prehistoric farming of this area.

LA 84759 is located 16 km (10 mi) from the nearest Classic period village, Cieneguilla Pueblo (LA 19). Assuming that the Las Campanas area was used by residents of the nearest villages, then LA 84759 was not within the diurnal foraging range. Overnight or extended stays would have been necessary to efficiently exploit resources or to farm. Therefore, distance to the primary residence or village should influence technological and domestic organization.

Expectations for fieldhouse use can be summarized by two basic patterns with a third pattern of occasional travel or hunting use, probably masked by the two main use patterns. A daily use pattern with overnight stays during critical planting and harvesting times would result in low diversity and frequency facilities, containers, and implements. The 16 km distance from LA 84759 to the nearest village eliminates daily use as a strong possibility. Biseasonal use resulting from continuous occupancy through the growing season to harvest may be difficult to distinguish from year round residential occupation. The diversity of facilities, containers, and tools would be similar to seasonal and permanent occupation. There would be a difference in quantity and the accumulation of debris. The use pattern left by foraging or gathering forays would depend on the length of time necessary to procure and process raw materials or natural resources for transport to the primary residence. The artifact assemblage and facilities would depend on the procurement and processing activities. Generally, a single intensive occupation might leave a hearth, tool manufacture debris, expended tools, and perhaps site furniture if repeated visits were anticipated.

The Area 2 artifact assemblage is one of the most diverse recovered from the Las Campanas sites considering the low artifact frequency. The sherds were assigned to a minimum of six vessels. This low vessel frequency included bowls, utility and decorated jars, and the neck of a small canteen. This vessel form collection is similar to those found with fieldhouses in the Cochiti Reservoir area (Biella and Chapman 1979). Utility and decorated pottery were present, but in greater numbers than LA 84759, suggesting a more permanent occupation or repeated occupations. Only LA 98688 has vessel diversity similar to the Area 2 assemblage. The vessel assemblage strongly suggests that domestic activities were conducted.

The chipped stone assemblage is dominated by core reduction debitage of local chert and quartzite. This is the typical pattern for Las Campanas sites regardless of age date range. There are exceptions, however. Although local material core reduction predominates, there are interesting departures in the Area 2 pattern. Five pieces of obsidian were recovered, including core flakes and an exhausted core suggesting transport of specialized materials besides pottery. Transport of obsidian suggests that anticipated tasks would require better raw materials than were locally available. The exhausted obsidian core was used to its maximum potential. This would occur if obsidian was in short supply or was difficult to obtain. Another interesting aspect of the chipped stone assemblage relates to the seven cores. Cores are common on Las Campanas sites, however it is rare for them to comprise 7 percent of the assemblage. This relatively high percentage demonstrates that the full range of reduction, tool manufacture, and use occurred on-site. Chipped stone data strongly support the inference made from the pottery assemblage that domestic activities were conducted at Area 2.

Three ground stone fragments were recovered. Ground stone might be expected in a fieldhouse or gathering site assemblage. The metate fragments appear to be basin types and may have been more suited to processing seeds or nuts. The ground stone data lend support to Area 2 use for gathering or foraging. However, foraging and processing activities may have occurred at a fieldhouse location. Ground stone is therefore not a strong indication of site function in this context.

Ethnobotanical and faunal remains were poorly preserved and occurred in low frequencies. Small and medium mammal bone and a probable domesticated species suggest mixing of early and more recent deposits. Additional excavation of Area 2 may have yielded more faunal or ethnobotanical remains since the upper slope contained a midden deposit.

The one extramural feature, Feature 1, was located on the slope below the most likely location for a structure. It was deflated, but consisted of a concentration of burned and unburned cobbles. It was associated with pottery and chipped stone debris suggesting a prehistoric age. It is unlikely that Feature 1 was used for heating because of its estimated size and the abundance of rock. It could have been used to process seeds or nuts, cook meat, or roast young corn. Without ethnobotanical evidence, the function of Feature 1 is undetermined. Extramural features would be expected at a site occupied for extended periods.

The preceding discussion illustrates the difficulty of assigning a function to small, somewhat ephemeral sites. Evidence can be used to argue for either a fieldhouse or a gathering function. The strongest evidence in favor of assigning a fieldhouse function to Area 2 is the artifact assemblage. The diversity in the pottery and chipped stone suggest that a wider range of activities were conducted than would be expected for a limited activity or gathering site. A wider range of activities would be most logically associated with domestic or residential occupation. The artifact distribution on a restricted portion of the ridge slope suggests that the deposit is a deflated midden. Midden deposits are expected for longer term occupations, where planned use of space is a consideration (Kent 1992). The low artifact frequency indicates that the occupation may have occurred over one or two seasons.

The question of who used Area 2 is interesting because of the intriguing results of the petrographic analysis. Biscuit ware pottery that is typically tempered with crushed tuff suggests Pajarito Plateau origins. A tentative cultural boundary between Tewa- and Keres-speaking villages has been posited for Frijoles Canyon on the Pajarito Plateau. To the south of Frijoles Canyon, the Keres Pueblos used and produced predominately glaze paint pottery. To the north of Frijoles Canyon, Biscuit ware pottery predominates. The predominance of Biscuit ware pottery at Area 2 suggests a northern Pajarito Plateau production source and origin for the Area 2 occupants. This is supported by the rhyolitic tuff temper identified in the undifferentiated glaze-on-red pottery. Rhyolitic tuff pottery is strongly tied to Pajarito Plateau or Cochiti area production, rather than the Galisteo Basin. In a glaze-paint pottery study, Warren (1979a) found little evidence of rhyolitic tuff in Glaze A or B pottery and generally associated rhyolitic tuff with later production areas. However, for Area 2 the combination of Biscuit ware pottery with the rhyolitic tuff glaze-on-red strongly suggest a Pajarito Plateau origin for the site occupants. Therefore, it is likely that site residents traveled farther than the suggested 16 km distance from Cieneguilla Pueblo. A greater that 16 km one-way travel distance lends additional support to a fieldhouse function.

Conclusions

Excavation of LA 84759 has demonstrated that it was a multicomponent site with primary occupations during the Coalition and Classic periods of the Rio Grande sequence. Coalition period occupation exhibited patterns in artifact distribution and assemblage traits that are typical of a diurnal foraging pattern. During the fifteenth century, the Classic period, there is evidence that the Las Campanas area was exploited through logistically organized strategies. Area 2 is an example of long-distance farming strategy that was tried, lasted for one or two seasons, and discontinued. The LA 84759 data demonstrate that different subsistence behaviors of prehistoric populations can be identified through the excavation of small sites.

LA 84775

Setting

The site description is derived from Scheick and Viklund (1991:21-22) and Post (1993a:4). The site is on a gentle north-facing hillslope above a drainage. A small ephemeral drainage runs through the eastern edge of the site. The site covers about 1,600 sq m. The vegetation is piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall and short grasses, and snakeweed. The surface is deflated and cut by numerous shallow erosion channels. An erosion channel drains to the east across the excavation area within the late Archaic period component. The soils are of the Panky-Pojoaque series, consisting of a sandy loam with gravel, pebbles, and an occasional cobble.

Pre- and Post-Excavation Description

LA 84775 was recorded as a dispersed lithic artifact scatter. The site assemblage observed during the survey had 18 lithic artifacts of chert, Jemez obsidian, and chalcedony. Artifact types include pieces of angular debris, secondary core reduction flakes, and bifacial thinning flakes. There was a Basketmaker II projectile point with a reworked tip.

Data recovery at LA 84775 revealed a more extensive distribution and a more numerous artifact assemblage than recorded during the survey. Two spatially separate occupation areas were defined in an area that covered 75 m north-south by 45 m east-west (Fig. 6.34). Area 1 was a dispersed artifact scatter of 24 items covering a 35 m north-south by 25 m area east-west (875 sq m) area. The surface artifacts included angular debris, core and biface flakes, a multidirectional core, and a Basketmaker II-III projectile point. The Basketmaker II-III projectile point is the basis for dating Area 1. Area 2 consisted of a chipped stone concentration within a dispersed sherd and lithic artifact scatter. A total of 83 pieces of chipped stone debris were recovered from the concentration. Five sherds of Biscuit B pottery and 18 pieces of chipped stone were recovered from the surface scatter. Area 2 is suggested to date between A.D. 1450 and 1550, based on the pottery manufacture dates.

Excavation Methods

The site was examined and all surface artifacts were flagged. Two excavation areas were defined by the artifact distribution. A 1-m grid system was extended across the site. Excavation was focused on the projectile point in Area 1 and the chipped stone concentration in Area 2.

Area 1, an 8 m north-south by 6 m east-west area, was divided into 2-by-2-m excavation units. The northeast corner of Area 1 was 100N/102E. In Area 2, a 6-by-6-m unit with a 2-by-2-m extension along the south grid line of the excavation area was divided into 2-by-2-m units (Fig. 6.34). The top soil within the 2-by-2-m excavation units was surface stripped to a depth of 5 to 10 cm below the modern ground surface. Then, the 2-by-2-m excavation unit with the highest artifact count within each area was excavated in 1-by-1-m units (Fig. 6.36). Each 1-by-1-m unit was excavated in 10-cm levels until noncultural material-bearing soil was reached. No significant subsurface cultural deposits were encountered in the excavation units, and the excavation areas were not expanded.

An auger test was placed in Grid 98N/100E in Area 1. It reached bedrock at 55 cm below the surface strip. In Area 2, bedrock was reached in each 1-by-1-m unit between 10 and 20 cm below the modern ground surface.

No features or subsurface deposits were encountered in either area, and excavation was stopped. The surface artifacts were piece-plotted and collected, and the site area was transit mapped.

Stratigraphy

Area 1 was located in a stand of piñon-juniper trees with sparse bunch grasses, yucca, and

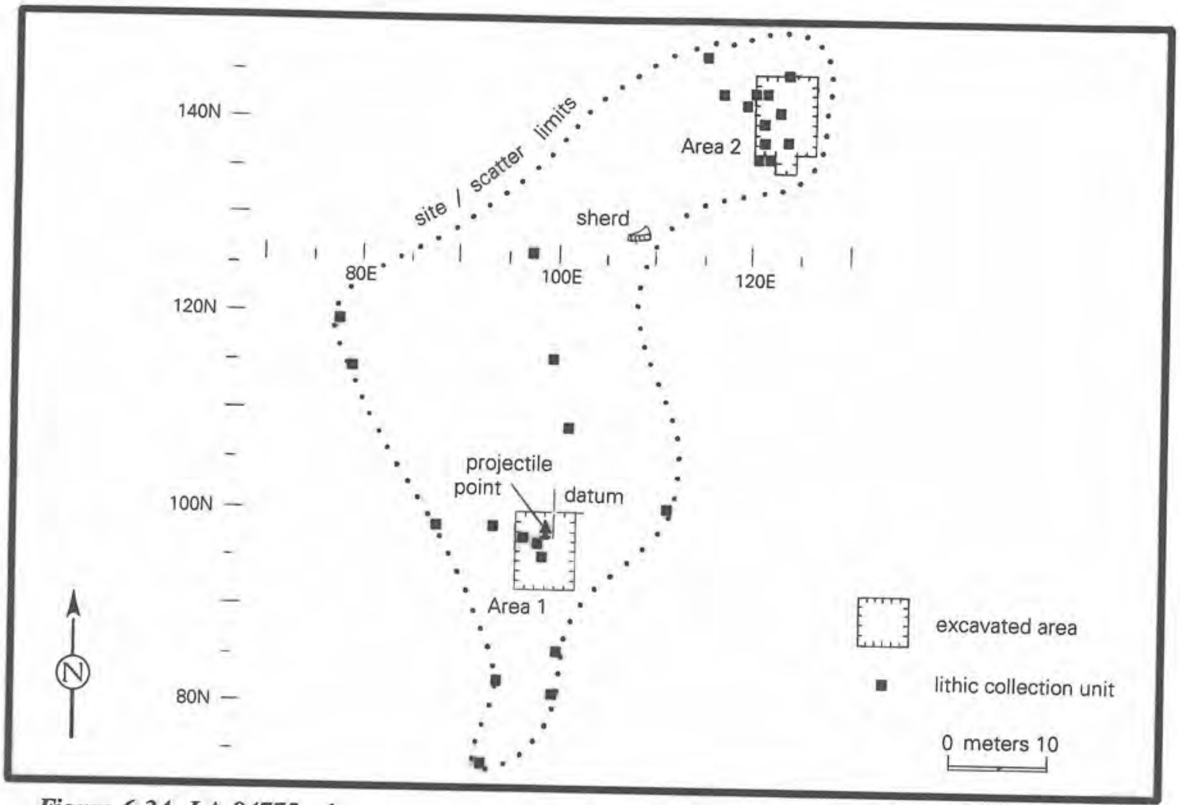

Figure 6.34. LA 84775, site map.

Figure 6.35. LA 84775, excavation area.

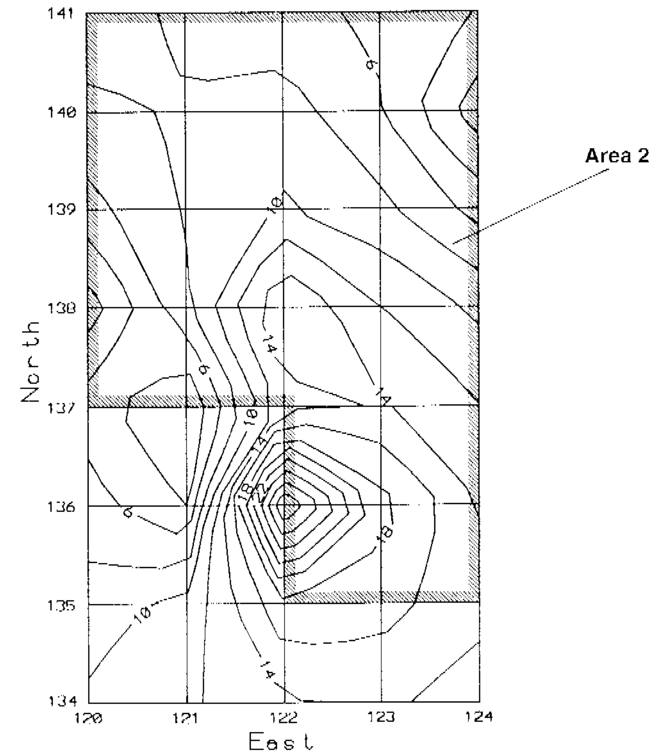

Figure 6.36. LA 84775, chipped stone artifact density map, Area 2.

prickly pear cactus. The top soil is Panky fine sandy loam (Folks 1975, map 39). The soil is mixed with abundant pea- to fist-size gravel and occasional quartzite and metamorphic cobbles. The soils are deflated and cut by numerous shallow erosion channels.

Stratum 1 was a continuation of the Panky fine sandy loam top soil. The soil was dark brown (10YR 4/4, wet). The gravel was subrounded quartzite and metamorphic pebbles and angular indurated sandstone. Stratum 1 continued to 40 cm below the modern ground surface. The soil did not become more calcareous with depth. Instead, the soil became a coarse granular, alluvially deposited sand, designated Stratum 2.

Stratum 2 was unconsolidated and lacked the gravel and cobbles of the upper level. Stratum 2 terminated at sandstone bedrock 55 cm below the modern ground surface. Differences between Stratum 2 and known lower levels of the Panky fine sandy loam indicate that the site area is eroded or that prehistoric soil formation was retarded. The presence of water-deposited sands indicate periods of soil deflation.

No cultural material was recovered from below the upper 5 cm of Stratum 1. The lack of subsurface cultural deposits indicates that the surface artifacts are associated with a deflated occupation surface. Water-deposited soils and erosion suggest that the cultural deposit was never stratified and that material from multiple occupations co-occur in a thin veneer of soil.

At 55 cm below the modern ground surface a consolidated sandstone bedrock was encountered. Bedrock is more common at 1 m or more below the modern ground surface in the Panky-Pojoaque soil associations. A shallow mantle suggests that the site has been subjected to erosion and deflation perhaps accounting for the dispersed condition of the surface cultural deposit.

In Area 2 the surface was stabilized by a moderate to heavy cover of grama grass and yucca. The Area 2 soil was more consolidated than the Area 1 top soil. Cobbles and gravel were visible on the surface. Only Stratum 1 was exposed in Area 2 and it was only 20 cm deep. Stratum 1 lay on top of the sandstone bedrock described for Area 1.

The different top soil depths in Areas 1 and 2 suggest that the gentle slopes of the LA 84775 area were geomorphologically active. The time depth of this activity was not investigated. Presence of cultural deposits on the surface and the lack of subsurface deposits suggest that this activity is a fairly recent occurrence.

The Artifact Assemblage

Chipped Stone
by Guadalupe A. Martinez

A total of 125 chipped stone artifacts were recovered from Areas 1 and 2. The chipped stone data from Areas 1 and 2 are presented separately because they appear to be from different periods and exhibit different technological characteristics. Table 6.11 shows the distribution of chipped stone artifacts by material types.

Area 1

A total of 24 chipped stone artifacts were recovered from Area 1. Area 1 artifact types are diverse considering the low number of artifacts. The 24 chipped stone artifacts are assigned to 6 artifact types. Table 6.11 shows the artifact type by material type distribution.

The chipped stone artifacts are debris from core reduction, biface manufacture or tool maintenance, and tool use. The raw materials reflect a use of local miscellaneous chert and obsidian from the Jemez Mountains, Rio Grande gravel deposits, and the Caja del Rio located to the west.

Lithic Raw Material. The chipped raw materials are mainly miscellaneous chert and obsidian. Miscellaneous chert encompasses fine- to medium-grained material that occurs in a wide range of colors. Miscellaneous chert occurs throughout the Santa Fe formation gravel. Its abundance is subject to considerable spatial variability.

The obsidian is the clear to smokey gray variety that originates in the Jemez Mountains and along the drainages that flow out of the Jemez Mountains. Obsidian is relatively scarce in Las Campanas assemblages (Post 1993a:25, 1992:61; Scheick and Viklund 1992:85-86).

Debitage. Debitage from core reduction accounts for 21 of the 24 chipped stone artifacts. The most common artifact type is core flake. Core flakes were made from all four raw material types. Early and middle stages of core reduction are represented by the distribution of dorsal cortex percentages. Nine core flakes had no dorsal cortex, two core flakes each exhibited 30 and 100 percent dorsal cortex, and one core flake had 50 percent dorsal cortex. Half of the core flakes were whole, and four distal and three medial fragments were recorded. Platform types primarily reflect early and middle stage reduction with single-faceted (n = 4) and cortical (n = 3) platforms predominating. Dorsal flake scars also reflect early and middle stage reduction with 10 of the 14 core flakes exhibiting three or fewer scars. Four core flakes exhibit five dorsal scars suggesting that the cores they were detached from were extensively used. Whole core flake dimensions had a mean length of 46 mm, a mean width of 29 mm, and a mean thickness of 12 mm. This suggests that medium-sized core flakes were the most common by-product of core reduction.

Biface flakes are the second most common artifact type and they were made from all of the raw materials, except quartzite. The biface flakes were of glassy to fine-textured material and they lacked dorsal cortex. Two biface flakes each were medial and distal fragments. One was whole, and one was a proximal fragment. The two platforms that remained were single-faceted and single-faceted with abrasion. Curiously, the dorsal scar counts for biface flakes were two (n = 1), three (n = 2), and four (n = 1). The biface flakes have a lower range of dorsal scars than the core flakes, which may result from small biface flake size. The only whole biface flake was 17 mm long by 14 mm wide by 2 mm thick.

Core. A miscellaneous medium-grain chert multidirectional core was recovered. It measures 79 mm long by 69 mm wide by 50 mm thick. Dorsal cortex covered 30 percent of the core. There were 11 flake scars, which suggests that the core was originally a large piece of raw material. The core is substantially reduced, but it was not exhausted. Multidirectional platforms are typical of expedient core reduction aimed at producing flake tools or blanks.

Projectile Point. A Jemez obsidian projectile point was recovered. It measures 24 mm long by 17 mm wide by 4 mm thick. The tip is broken but most of the blade still intact. The blade is triangular with biconvex edges. The base is convex with one broke lateral edge. The corner

Table 6.11. LA 84775, Areas 1 and 2, Artifact Type by Material Type

Count Row Pct Column Pct	Misc. chert	Chalcedony	Obsidian	Quartzite	Row Total
Area 1					
Angular debris	1 100.0 8.3				1 4.2
Core flake	9 64.3 75.0	1 7.1 33.3	3 21.4 37.5	1 7.1 100.0	14 58.3
Biface flake	1 16.7 8.3	2 33.3 66.7	3 50.0 37.5		6 25.0
Hammerstone flake			1 100.0 12.5		1 4.2
Multidirectional	1 100.0 8.3				1 4.2
Late stage biface			1 100.0 12.5		1 4.2
Column Total	12 50.0	3 12.5	8 33.3	1 4.2	24 100.0
Area 2					
Angular Debris	32 100.0 32				32 31.7
Core Flake	65 100.0 65.0				65 64.4
Biface flake	2 100.0 65				2 2.0
Hammerstone flake	1 100.0 1.0				1 1.0
Biface			1 100.0 100.0		1 1.0
Column Total	100 99.0		1 1.0		101 100.0

notches are relatively deep. The projectile point style is consistent with late Basketmaker II or Basketmaker III points described for the middle Rio Puerco (Irwin-Williams 1973) and the Northern Rio Grande (Thoms 1977:150-158; Lang 1992:93). This specimen is similar to the Tesuque Narrow Base (Thoms 1977:155) and Piedra Lumbre (Thoms 1977:150) projectile point styles.

Area 2

A total of 101 chipped stone artifacts were recovered from Area 2. Area 2 artifact types are not diverse considering the high number of artifacts. The 101 chipped stone artifacts are assigned to 5 artifact types. Table 6.11 shows the artifact type by material type distribution.

The chipped stone artifacts are mainly debris from core reduction. Biface manufacture or tool maintenance and tool use are represented by two biface flakes, a hammerstone flake, and one biface. The raw materials reflect a use of local chert and obsidian from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio located to the west.

Lithic Raw Material Selection. The chipped raw materials are mainly miscellaneous chert with one obsidian biface. Chert encompasses fine- to coarse-grained material that occurs in a wide range of colors. Chert occur throughout the Santa Fe formation gravels. Its abundance is subject to considerable spatial variability. The chert of the Santa Fe formation gravels were used extensively by the prehistoric inhabitants of the Santa Fe River Valley as a raw material source for chipped stone tools. Chert is by far the most common raw material identified on all Las Campanas area sites and as isolated chipped stone artifacts. The obsidian is typical of Jemez Mountain varieties.

Debitage. Debitage from core reduction accounts for 97 of the 101 chipped stone artifacts. The most common artifact type is the core flake. Core flakes are made from chert. Middle and late stages of core reduction are represented by the distribution of dorsal cortex percentages. Forty-two core flakes had no dorsal cortex. Eighty percent of the core flakes had less than 50 percent dorsal cortex. Twenty-eight of the core flakes were whole. Seven proximal, 9 medial, 18 distal, and 3 lateral fragments were recorded. Platform types primarily reflect early and middle stage reduction. Single-faceted (n = 31) platforms predominate. Dorsal flake scars also reflect early and middle stage reduction--57 of the 65 core flakes exhibit three or fewer scars. Whole core flake dimensions had a mean length of 33 mm, a mean width of 30 mm, and a mean thickness of 10 mm. This suggests that medium-sized core flakes were the most common by-product of core reduction. There were more fine-grained whole core flakes (n = 16) than medium-grained (n = 12). The fine-grained flakes were smaller with a mean length of 29 mm, a mean width of 26 mm, and a mean thickness of 9 mm. Medium-grained core flakes means were 38 mm in length, 35 mm in width, and 11 mm in thickness. Size differences may reflect raw material properties, raw material size, or more intensive reduction of fine-grained materials.

Summary of Results

Area 1 was a dispersed chipped stone scatter of 24 artifacts within an 875-sq-m area. The area was cut by small erosion channels, and the sparse ground cover contributed to an unstable surface deposit. The dispersed artifact distribution may result from geomorphic rather than cultural processes. No subsurface cultural deposits or features were encountered. The chipped stone assemblage exhibits a full range of core reduction, and tool production and use are represented on a small scale. The Basketmaker II-III style projectile point suggests an occupation between A.D. 400 and 800. Area 1 has the characteristics of a limited hunting camp.

Area 2 was a chipped stone cluster of 101 artifacts within a 28-sq-m area. The clustered distribution suggests that the artifact assemblage results from a single occupation. Only two or three cores or parent cobbles were reduced. Core reduction is represented on a small scale. LA 84775, Area 2, has the characteristics of a material procurement component.

Research Questions

The research questions for Area 1 and Area 2 focus on chronology, subsistence production, and occupation history. LA 84775 was originally recorded as a late Archaic period site. Excavation revealed that LA 84775 had at least two components designated as Areas 1 and 2. Area 1 was originally described as a late Archaic period component. The Area 1 artifact analysis suggests that Area 1 may actually date to the middle Developmental period. The implications of this observation are discussed below. Area 2 was not identified during the inventory and therefore was not included in the research design. However, the technological patterns evidenced in the chipped stone assemblage make the Area 2 assemblage an important addition to the Las Campanas study. Specific research questions will be addressed with the data from each area.

Area 1, Chronology

Based on the inventory description, LA 84775 was expected to be a dispersed, single-component chipped stone scatter with a single Basketmaker II-III style projectile point. In order to support the hypothesis, it was necessary to verify that the chipped stone debris and projectile point did result from a single occupation.

Excavation did not yield additional chronometric data beyond the projectile point. Obsidian hydration dating was not used because of the surface context for the projectile point. Therefore, component dating must rely on established projectile point typologies. Based on the active geomorphological characteristics of the site environment and the lack of evidence to suggest that the projectile point was a recycled artifact, it is assumed that the other chipped stone artifacts and the projectile point are temporally associated.

Another criterion in favor of Area 1 being a single component site was the lack of evidence for a later component. Closer examination of LA 84775 revealed a discrete core reduction locus (Area 2) 40 m northeast of Area 1, and five sherds of Biscuit B pottery 30 m north of the main portion of Area 1. Area 1 is outside the area of potential alluvial deposition from Area 2, so it is not possible that the Area 1 artifacts washed out from deposits associated with the core reduction area or the sherds. Furthermore, Area 1 is separated from the other deposits by 30 to 40 m, supporting the observation they are discrete components. Based on these criteria, Area 1 can be examined as a discrete, limited activity component.

Refining the Area 1 occupation date is problematic without independent chronometric data. Existing typologies must be relied on for a general date range. The most thorough reference for Northern Rio Grande projectile point typology is Thoms (1977). Two projectile point types described in Thoms (1977) have similar morphology to the Area 1 specimen. The Lumbre-Narrow Base projectile point has a wide triangular blade with a mean maximum length of 28.2 mm, a mean maximum width of 17.7 mm, and a mean maximum thickness of 4.6 mm. The base is straight to convex and narrower than the blade. The Area 1 point is smaller than the mean dimensions, but is within the lower size range of the Lumbre-Narrow Base size spectrum. Thoms (1977:150) suggests that this style was produced between A.D. 350 and 850. His date range is based on comparable examples recovered from dated contexts in the Middle Rio Puerco and the Rio Rancho area north of Albuquerque.

The other comparable point type described by Thoms (1977:155) is Tesuque-Narrow Base. This type is morphologically similar to, but smaller than the Lumbre-Narrow Base especially in the blade/maximum width. The maximum mean length of Tesuque-Narrow Base points is 24.4 mm, the mean maximum width is 13.5, and the maximum thickness is 2.72. These dimensions compare favorably with the Area 1 specimen. Based on similar examples from late Alameda phase sites near Rio Rancho and a middle to late Developmental phase site near Tesuque, New Mexico (McNutt 1969), Thoms (1977:155) suggests a date range from A.D. 500 to 1300. This date range appears to be too broad for small, corner-notched projectile points found in other regions of the northern Southwest. Lang (1992:93) suggests a date range between A.D. 500 and 850, which is similar to the Lumbre-Narrow Base date range (Thoms 1977:150).

Since pottery was not found within Area 1, there is no independent means to assess the end of the date spectrum in which this projectile point falls. The best date range for the Area 1 occupation is A.D. 500 to 850. This period is poorly understood for the Santa Fe area. Current interpretations suggest that the Santa Fe area was occupied by Archaic populations during this span. Another possibility is that the Santa Fe area was seasonally occupied by early Pueblo groups, who exploited the biotic resources using a logistically organized strategy.

Subsistence Production

In the data recovery plan (Post 1993a:8-9), LA 84775 was expected to date from the late Archaic to Basketmaker II period. Instead, as presented in the preceding chronology discussion, the Area 1 occupation is more correctly fixed between A.D. 500 and 950. From a strict Rio Grande cultural sequence perspective, this date range encompasses the early Developmental period.

Almost nothing is known of the early Developmental period occupation of the Santa Fe area. The most comprehensive review of the early Developmental period by Dickson (1979) for the Arroyo Hondo project listed no early Developmental components. These site data conformed closely to Wendorf and Reed's sequence (1955) in which there was limited, if any, settlement of the Northern Rio Grande between A.D. 600 and 900.

The regional site data show no settlement of the upper Santa Fe drainage before A.D. 1000. Earlier settlement occurs to the north along the Tesuque River (McNutt 1969; Allen 1972) and the south at the mouth of the Santa Fe River (Dickson 1979). An absence of identified sites does not mean there was no settlement of the upper Santa Fe River Valley before A.D. 1000. It may mean that settlement was on a very small scale and may have been seasonal. Given the probability that the prevailing settlement pattern was small-scale and seasonal, the piedmont area north of the Santa Fe River may have been a resource area that was exploited with a logistically organized strategy (Binford 1980; Elyea and Hogan 1983). Logistical organization would have allowed populations to procure and process piedmont resources and return to residential sites after sufficient resources were obtained. Viewing Area 1 as part of a logistical strategy allows it to be analyzed and interpreted using the same criteria for late Archaic period components.

Raw Material Procurement Patterns. Raw materials for the chipped stone industry were obtained from local and nonlocal sources. Local gravel deposits contain a variety of suitable chert, chalcedony, and quartzite. The majority of the local materials in the assemblage were fine-grained, suggesting discrimination against medium- and coarse-grained materials. If Area 1 chipped stone were used for long-distance resource procurement, then materials that would provide the most flexibility and predictability for tool production would have been used. This expectation is confirmed by the dominance of obsidian and fine-grained chert, chalcedony, and quartzite, which make up 71 percent of the raw materials. Poorer quality material would be obtained locally and used as needed. This pattern is evidenced by the multidirectional core and five core flakes of medium-grained chert that were recovered. The Area 1 assemblage, though small, does suggest that raw material procurement or selection was heavily conditioned by material texture and quality. Obsidian was used to produce formal tools and was brought to the site as a finished projectile point. Fine-grained chert was brought to the site in a partly reduced state. Medium-grained chert could have been obtained from nearby gravel deposits for more heavy-duty tasks than fine-grained or glassy materials.

Core Reduction and Tool Production Trajectories. The Area 1 assemblage is interesting because it evidences a full range of reduction and tool production. This range of debris and tools suggests that a number of activities were supported by curated and expedient strategies.

Core reduction is evident for all material types (Table 6.11). The early and middle stages of core reduction are represented by five core flakes that exhibit 30 to 100 percent dorsal cortex, seven core flakes with cortical or single-faceted platforms, and 10 core flakes with three or fewer dorsal scars. The multidirectional core of local material is another strong indicator of expedient or situational core reduction. Late stage core reduction is represented by the nine core flakes with no dorsal cortex, of which five have more than three dorsal scars. The core flake and core assemblage, which include local chert, chalcedony, and quartzite and nonlocal obsidian, suggest curated and expedient strategies. The tools made from local materials were probably supplemented personal gear, which included partly reduced cores or nodules of obsidian and chert, chalcedony, and fine-grained quartzite. Only a few flakes were removed from a core(s) of each material type. The lack of discarded cores of these fine-grained materials suggests they were retained for subsequent tasks.

Tool production is evidenced by the presence of an obsidian hammerstone flake and chert and obsidian biface flakes. The low numbers of biface flakes indicate that they were removed from cores to produce edges needed for cutting or scraping. The presence of a complete projectile point indicates that formal tools were brought from a residential site to fulfill anticipated needs. Further reduction of bifaces may have been in response to unanticipated needs.

Tool Use. Tool use is represented by an obsidian hammerstone flake and the obsidian projectile point. Damage on the hammerstone flake is not conclusive evidence for on-site use. A hammerstone could have been brought to the site as personal gear and a damaged ridge removed. The hammerstone may have been reduced removing the hammerstone flake and biface and core flakes for on-site use or in anticipation of future needs. At best, the hammerstone flake may represent maintenance of personal gear.

The projectile point has a broken tip that exhibits an impact fracture suggesting it was broken in use. Curiously, the point is in good condition and could have been reused. The edges do not exhibit wear from scraping or cutting indicating it was only used as a arrow tip.

Evidence of on-site tool use is ambiguous. Although it appears that tools were used or modified, there is no indication of how. Short duration, low intensity use may not have produced extensive wear patterns on tool edges or accumulations of debris from tool manufacture.

Occupation History

Investigation of the occupation history relies on the spatial relationships within and between artifact classes and features. No features were excavated, thus only artifact relationships and distribution can be examined.

Artifact distribution was dispersed and low in density. There is no clear spatial association among any of the artifacts. The dispersed, low density distribution reflects a brief occupation where debris from activities was probably discarded close to where it was produced or used. The artifacts may have been discarded in a more restricted area, but have been dispersed by the south to north drainage pattern. Low density and unstructured artifact distributions are most indicative of logistically organized activities.

The site structure resembles limited or special activity sites from the late Archaic period sites in the northwestern New Mexico (Vierra 1980; Eschman 1983). Limited activity sites probably reflect a part of early period subsistence strategy used to support a small group.

Area 2, Chronology

Excavation of Area 2 yielded no direct evidence that can be used to date the occupation. The location of five Biscuit B sherds from a single bowl fragment indicate that Area 2 may have been occupied between A.D. 1400 and 1550 (Breternitz 1966:70). Given the predominant pattern of site formation for the Las Campanas sites of artifact accumulation through repeated visits over a 3,000-year period, it would be premature to categorically attribute the Area 2 concentration to the Middle or Late Classic period of the Rio Grande sequence.

Occupation History

The occupation history of Area 2 appears to be simple. All but one of the chipped stone artifacts were recovered from a 28-sq-m area. The debris is discard from the reduction of one or perhaps two cores that were transported off-site. Figure 6.36 shows the artifact density distribution for the Area 2 concentration. The pattern shows an oblong cluster of debris that spread a relatively short distance since site abandonment. This concentration of core reduction debris is consistent with a single material procurement and core reduction episode.

Subsistence Production

The only evidence that can be related to subsistence production is the chipped stone artifacts. Area 2 chipped stone assemblage exhibits a combination of traits that suggest direct raw material procurement and early to late stage core reduction. These traits include high percentages of whole flakes, a mixed distribution of cortical and noncortical artifacts, and dorsal scar counts that range from 0 to 5. None of the chipped stone debitage exhibited use wear and only two biface flakes were identified. This suggests that the cores were reduced primarily to produce flakes as tools, however the core flakes were not used on-site. Expedient tool production is most commonly associated with a foraging strategy rather than a logistically organized subsistence strategy. The extensive core reduction does suggest that multiple core flakes were produced for transport. Production of numerous flake tools would indicate anticipated needs instead of production of tools to support immediate or situational needs.

LA 85036
by Guadalupe A. Martinez

Setting

LA 85036 is on a north-facing hillside with a deeply cut unnamed arroyo defining its northern boundary. The arroyo drains to the west. The arroyo is part of a large system of arroyos that drain the western portion of the project area. The system flows westward joining with the Cañada Ancha along the western border of the Caja del Rio Land Grant. The entire site is on Panky fine sandy loam surrounded by Pojoaque-Panky association (Folks 1975:39). The vegetation is piñon-juniper, grama grass, and chamisa. There is a stand of cholla on the hilltop just above the site.

Pre- and Post-Excavation Description

The site is a water-spreading system, originally recorded as a complex of 33 cobble alignments, an earthen berm located to the southeast of the edge of the site, and a dam and pond at the eastern end of the berm. The dam and the berm are constructed of stone and earth. The berm has two rock-lined "weeps" at the western end. Weeps are a nonmechanical means of releasing water from the berm across the hill slope. The possible age of the site was discussed by Scheick and Viklund (1991). They noticed a similarity with Spanish Colonial terraces in the Galisteo basin. A pre-nineteenth century date was posited for the site (Scheick and Viklund 1991:98). There is a wheel track that passes through the site and crosses six or seven of the cobble alignments. These were thought to be pre-nineteenth century also. OAS staff and former landowners believed the dam, berm, and alignments to be the work of the Civilian Conservation Corps during the 1930s.

Excavation and Research Methods

Excavation and recording different features focused on site function and chronology. Excavations were conducted using standard OAS field techniques. Recording was done on OAS feature forms. Profiles, plan maps, photographs, and maps were made of the site and the excavated features. The various features were examined for differences in materials and construction techniques that reflected chronology and construction sequence.

Excavation trenches were placed in the berm channel to ascertain if water had flowed for a prolonged period through the channel. Excavation units at the cobble alignments exposed soil profiles and differences that would result from erosion control or agriculture.

Detailed recording of cobble alignments included counting cobbles and measuring alignment length and width. Dimensions of every tenth cobble in an alignment were measured and material type was recorded. The alignment outline was classified as straight, sinuous, arced, or curved. Position on the slope was recorded as parallel, diagonal, or perpendicular.

The function, construction sequence, and dating of the site were the subject of many on-site discussions and inquiries of colleagues and informants. Consulted historical records included Soil Conservation Service records at Zimmerman Library, University of New Mexico, city planning maps at Santa Fe City Hall, historical maps at the Museum of New Mexico History library, and the New Mexico State Records Center and Archives. Informal interviews of local residents supplemented or confirmed the archival information.

Excavation and Recording Results

Thirty-seven rock alignments were recorded and the dam and berm were described and photographed.

Rock Alignments

Thirty-seven cobble alignments were identified, which is four more than were observed during survey (Fig. 6.37). There were two major material types among the cobbles, quartzite and limestone. Sandstone occurred in one alignment. This alignment also had a different shape than the rest (RA 22). Table 6.12 provides rock alignment data.

The alignments measured between 12.4 m and 247.8 m; mean length was 56 m. The number of

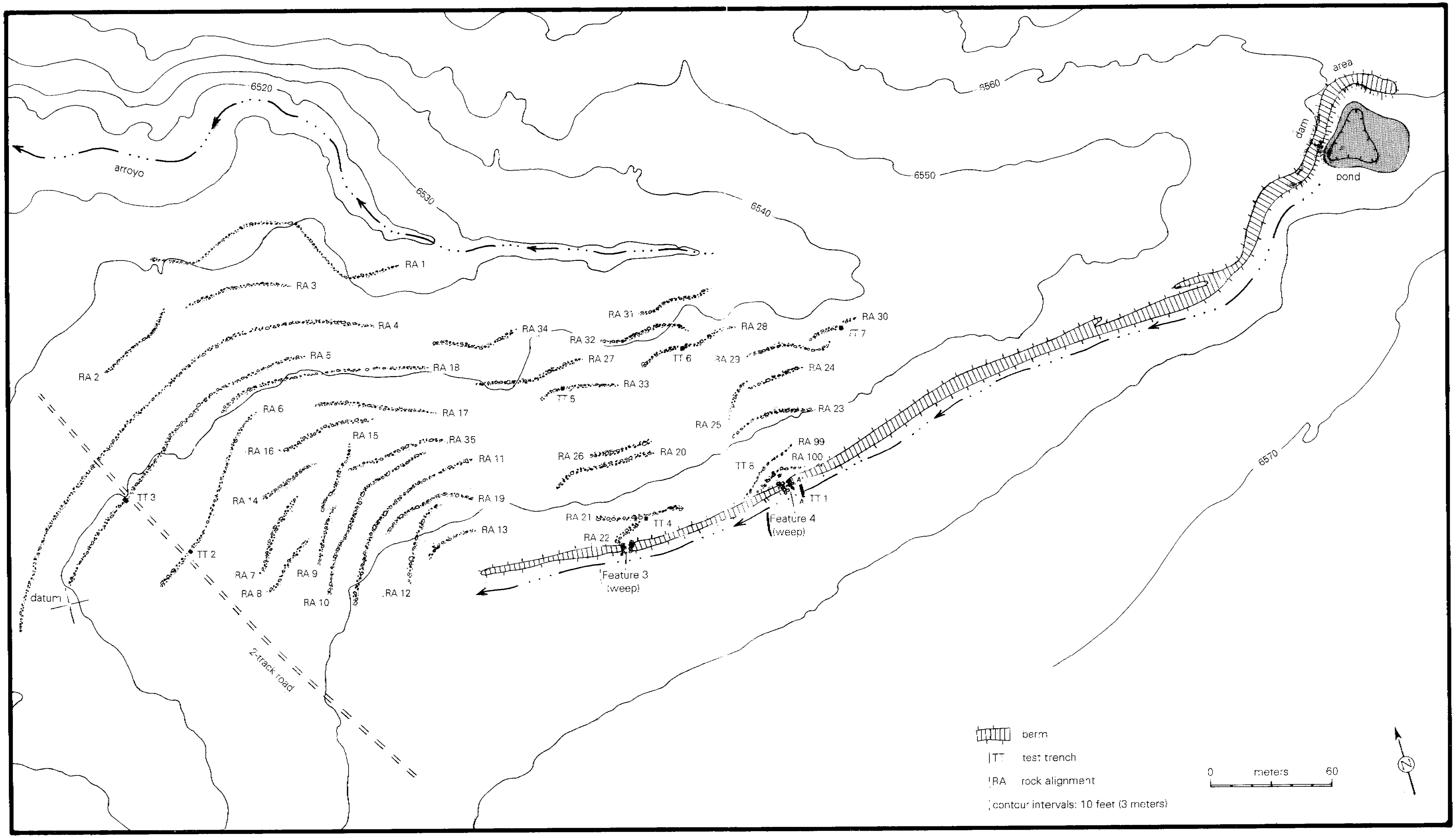

Figure 6.37. LA 85036, site map.

Table 6.12. Rock Alignment Data, LA 85036

RA #	# of Rocks	Material Type	Alignment Type	Slope Orientation	Length (m)	Comments
1	561	Limestone	Sinuous	Parallel	148.3	Rocks are slightly out of alignment due to erosion, bioturbation, or animal disturbance, but are basically intact.
2	60	Limestone	Straight	Parallel	19.3	The alignment is intact with the exception of a broken area between rocks 50 and 60, which may be due to erosion.
3	292	Limestone	Sinuous	Parallel	64.0	The alignment (occasionally double) is intact though slight misalignment occurs due to erosion, bioturbation, or animal disturbance. A 4-m break occurs between rocks 170 and 180.
4	1131	Limestone	Sinuous	Parallel	247.8	The alignment is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance. A 2-m break occurs between rocks 66 and 68.
5	714	Limestone	Sinuous	Parallel	168.4	The alignment (occasionally double) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance. A 3-m break occurs between rocks 424 and 425.
6	474	Quartzite cobbles	Sinuous	Parallel	96.6	The alignment (occasionally double, triple, and quadruple) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance.
7	217	Quartzite cobbles	Sinuous	Parallel	39.7	The alignment is intact.
8	194	Quartzite cobbles	Sinuous	Parallel	41.8	The alignment (occasionally double, triple, and quadruple) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance.
9	180	Quartzite cobbles	Sinuous	Parallel	33.3	The beginning and end of the alignment is dispersed. Dispersal is possibly due to erosion, bioturbation, or animal disturbance.
10	399	Quartzite cobbles	Sinuous	Parallel	90.5	The alignment (occasionally double, triple, and quadruple) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance. Between rocks 160-165 and 320-330 a 70 cm and 72 cm (respectively) break occurs.
11	483	Quartzite cobbles	Sinuous	Parallel	84.3	The alignment (occasionally double) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance. Breaks between rocks 140 and 150 perhaps were utilized for intentional channeling of water. Rocks 380-440 (11 m in length) exhibit changes in pattern and rock size. For 11 m, small stones are grouped together and aligned in a triple/quadruple pattern. This mosaic patterning is broken every 2-3 m by single cobble alignments.
12	137	Limestone/ quartzite cobbles	Gentle arc	Parallel	46.0	The lengths of the break intervals within the rock alignment is atypical. Break interval lengths were recorded as: 68 cm, 129 cm, and 92 cm.
13	53	Limestone/ quartzite cobbles	Arc	Parallel	17.6	Alignment occurs at weep.

RA #	# of Rocks	Material Type	Alignment Type	Slope Orientation	Length (m)	Comments
14	164	Quartzite cobbles	Straight	Diagonal	33.0	The alignment is intact. A 1.5 m break occurs between rocks 61 and 62, probably due to erosion, bioturbation, or animal disturbance.
15	130	Limestone/ quartzite cobbles	Sinuous	Parallel	31.2	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
16	275	Quartzite cobbles	Curved	Parallel	48.8	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
17	255	Limestone/ quartzite cobbles	Sinuous	Parallel	56.7	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
18	716	Quartzite cobbles	Sinuous	Parallel	105.0	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
19	208	Limestone/ quartzite cobbles	Arc	Parallel	49.5	Alignment disturbed by cholla.
20	238	Limestone/ quartzite cobbles	Straight	Parallel	45.2	Alignment disturbed by juniper.
21	138	Limestone	Curved	Parallel to berm	29.0	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
22	76	Limestone/ quartzite cobbles/ sandstone	Straight	Parallel	12.4	The rock alignment (occasionally double and triple) is directly associated with the weep. At rocks 40-44 a T-spar of 16 rocks juts perpendicular to the alignment.
23	177	Quartzite cobbles	Sinuous	Parallel to berm	42.7	Alignment disturbed by cholla.
24	75	Quartzite cobbles	Sinuous	Parallel	27.3	The alignment (occasionally double and triple) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance. The beginning 7 m of the alignment consists of a small assortment of rocks (3-9 in number) form a mosaic or pavement after which a single alignment of larger rocks occur for the next 4.5 m. The cobbles are significantly larger at the eastern end.
25	102	Quartzite cobbles	Sinuous	Parallel	19.8	A 76-cm break occurs between rocks 8 and 9.
26	187	Limestone/ quartzite cobbles	Curved	Parallel	34.8	Alignment disturbed by cholla.
27	300	Quartzite cobbles	Sinuous	Parallel	49.6	The alignment (occasionally double) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance.
28	211	Quartzite cobbles	Arc	Parallel	43.4	Alignment disturbed by cholla.
29	184	Limestone/ quartzite cobbles	Straight	Parallel	32.25	The alignment (occasionally double) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance.

RA #	# of Rocks	Material Type	Alignment Type	Slope Orientation	Length (m)	Comments
30	155	Quartzite cobbles	Sinuous	Parallel	35.1	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
31	184	Limestone/ quartzite cobbles	Straight	Parallel	37.9	Alignment disturbed by cholla, some cobbles almost buried in soil.
32	199	Quartzite cobbles	Sinuous	Parallel	39.0	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance. Large single cobble alignment ends at cobble 120 and a double alignment of cobbles begins.
33	214	Quartzite cobbles	Arc	Parallel	41.0	Alignment disturbed by cholla.
34	266	Quartzite cobbles	Sinuous	Parallel	45.1	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
35	270	Quartzite cobbles	Sinuous	Parallel	47.8	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.
99	153	Quartzite cobbles	Curved	Parallel	32.9	The alignment (occasionally double) is intact though occasional misalignment occurs due to erosion, bioturbation, or animal disturbance.
100	142	Quartzite cobbles	Sinuous	Parallel	32.9	The alignment is intact though misalignment occurs due to erosion, bioturbation, or animal disturbance.

rocks in an alignment ranged from 53 to 1,131 with a mean of 268 rocks. Alignment length had a strong positive correlation with the number of rocks; the longer the alignment the greater the number of rocks. This indicates that rock size and spacing were fairly uniform. Mean length of the measured rocks for all alignments was 20 cm. However, some of the alignments had a mean rock size as small as 14 cm, while one alignment had a mean size of 26 cm.

Twenty alignments were made entirely of quartzite cobbles, six were made of limestone and ten were made of a combination of quartzite and limestone cobbles. The quartzite cobbles were easily obtained from nearby outcrops and exposed strata in the arroyo bed. The limestone, however, had to be brought in from quarries in the Sangre de Cristo Mountains to the east. The alignments were usually a single line of cobbles, and 26 consisted entirely of a single line. Six alignments had occasional double lines and two alignments had occasional double and triple lines. Three alignments had occasional double, triple, and quadruple lines. The purpose of the multiple courses was not clear; however, one recorder noted that the quadruple lines were made of smaller cobbles. The multiple lines may have resulted from the builders compensating for the lack of larger cobbles. If cobbles were transported by truck or wagon load, large cobbles would have been used first with multiple, smaller cobbles used to maintain consistent alignment width. The majority of the rock alignments had sinuous outlines (n = 22), six had straight outlines, and nine had curved or arced outlines. RA 22 had a "T" or perpendicular arm of 16 cobbles.

The position of the alignments in relation to the hillslope or the berm was recorded with three positions noted. Thirty-four of the alignments were parallel to the slope, following the contours and grade of the hillside. Two were parallel to the berm, and one was diagonal to both the slope and the berm. Alignment orientation suggests that they functioned to spread water across the slope and slow downslope waterflow and soil erosion.

Six of the rock alignments were tested by digging a 1-m-sq unit that bisected the rock alignment (Fig. 6.38) . The units were excavated to an average depth of 34 cm. The excavations revealed no difference in the soils on either side of the rock alignments. There were no major soil changes between the excavated units.

The Berm

The berm is 500 m long, averages 4 to 6 m wide, and is 50 to 75 cm high. It extends from the dam to the westernmost end of the site. The berm has two limestone-lined weeps near the western end. A third weep is visible on the 1991 aerial photograph of the site area, but has been removed by recent construction. The western end of the berm is capped with limestone to prevent erosion.

A 6-m trench was excavated across the channel behind the berm. The trench bisected the channel exposing both sides of the channel interior. The trench had a maximum excavated depth of 80 cm (Fig. 6.39). The resulting profile of the channel exposed three distinct soil strata. The upper stratum was a grass-covered sandy clay that was determined to be the flow area of the channel. It averaged 10 cm in depth. The stratum below the flow stratum was clay. The lowest stratum was a caliche clay mixture.

The berm had two rock-lined weeps that opened onto the hillslope where the cobble alignments were located. These were cross-sectioned to document their construction technique and material. The weeps were constructed of a single layer of limestone slabs laid into the soil of the berm, three to four courses high. The west weep (Feature 3) was 2.5 m wide and 0.75 m deep (Figs. 6.42, 6.44). The east weep (Feature 4) was 3.25 m wide and .5 m deep (Figs. 6.43, 6.45). The weeps had slab floors that were most likely used to prevent erosion when water was released.

Dam and Pond

The dam was of earthen construction with cobbles lining the mouth of the headgate that emptied the pond's overflow into the channel created by the berm. The lining of the headgate was limestone and was probably placed there to prevent erosion when the pond water was released into the berm channel. The dam was 75 m long, 8 m wide, and 1 to 2.5 m high. The pond measured approximately 90 m long by 60 m wide. It collects water from an arroyo that drains in from the east.

The Wheel Track

The wheel track was determined to be earlier than the alignments. The alignments overlaid the wheel track indicating that they were created before the rock alignments were built. Purple or amethyst glass was observed in and around the track. The glass dates from 1880 to 1920, along with the wheel ruts, and is probably associated with homestead or ranching activities.

Archival Research Results

Archival research was conducted to provide information on site chronology and function. Based upon relative dating of the berm and wheel track, it became apparent that the complex post-dated 1920. Subsequent perusal of maps from the 1930s verified a post-1935 date for the construction of the dam, berm, and alignments. The previous landowner believed the Civilian Conservation Corps (CCC) had built the features. Initial research indicated LA 85036 was constructed by CCC work crews in the 1930s. The following section provides background on CCC for state and local levels, identifies the period when construction occurred, and explains CCC erosion control activities and methods and their relationship to LA 85036.

Background

The Civilian Conservation Corps (CCC) was created by Franklin Delano Roosevelt soon after his inauguration in March of 1933. The CCC was part of the "New Deal" plan to provide jobs, build public works, and improve the quality of the soil on public and private land across the nation. The agencies that were created along with the CCC were the Works Progress Administration (WPA), the Civil Works Administration (CWA), the Public Works Administration (PWA), and the Federal Emergency Relief Administration (FERA). The CCC was employed by the first three agencies on projects that did not involved large-scale construction. The CCC usually built small structures, many by hand and using local material (Kammer 1994:18-21).

By April of 1933 plans were being implemented in New Mexico to set up CCC camps and enlistment centers. The CCC was under the supervision of the Emergency Conservation Work (ECW) program. The Corps was set up to employ men between the ages of 18 and 25 by doing conservation work across the nation.
Eventually, veterans of World War I were included in the ranks of the CCC because of the

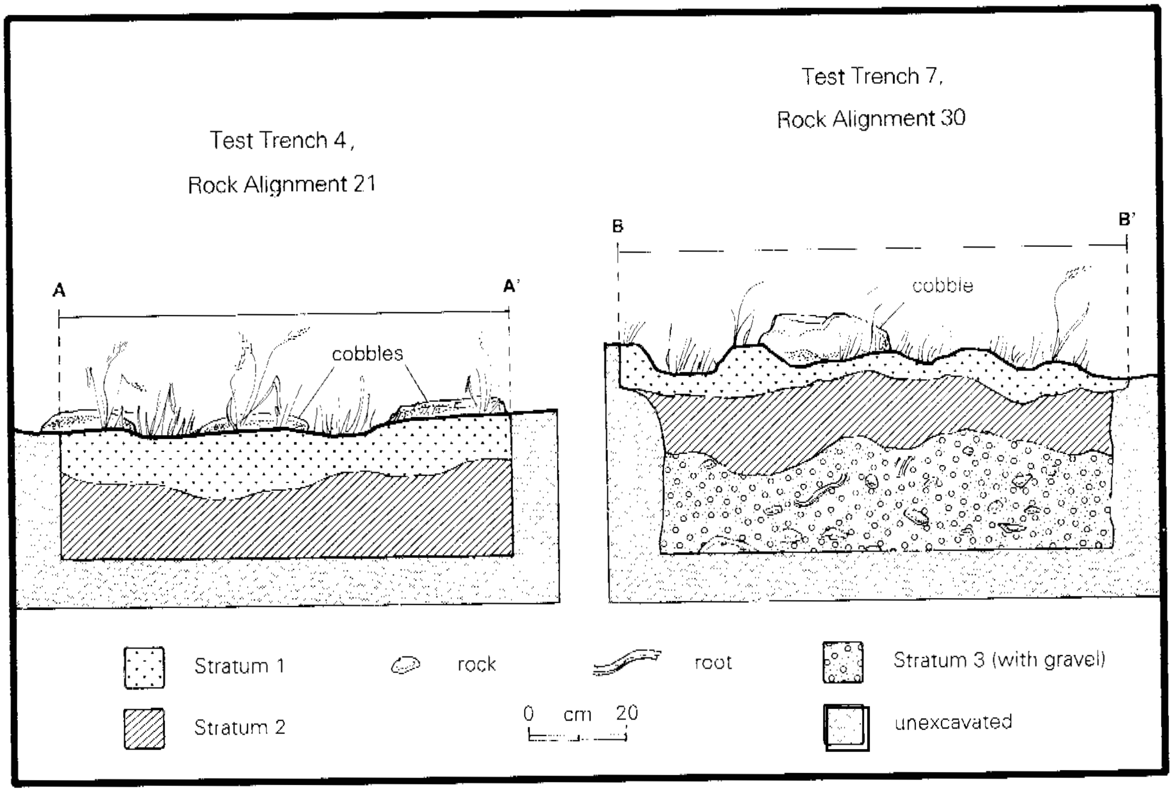

Figure 6.38. LA 85036, profiles of Test Trenches 4 and 7.

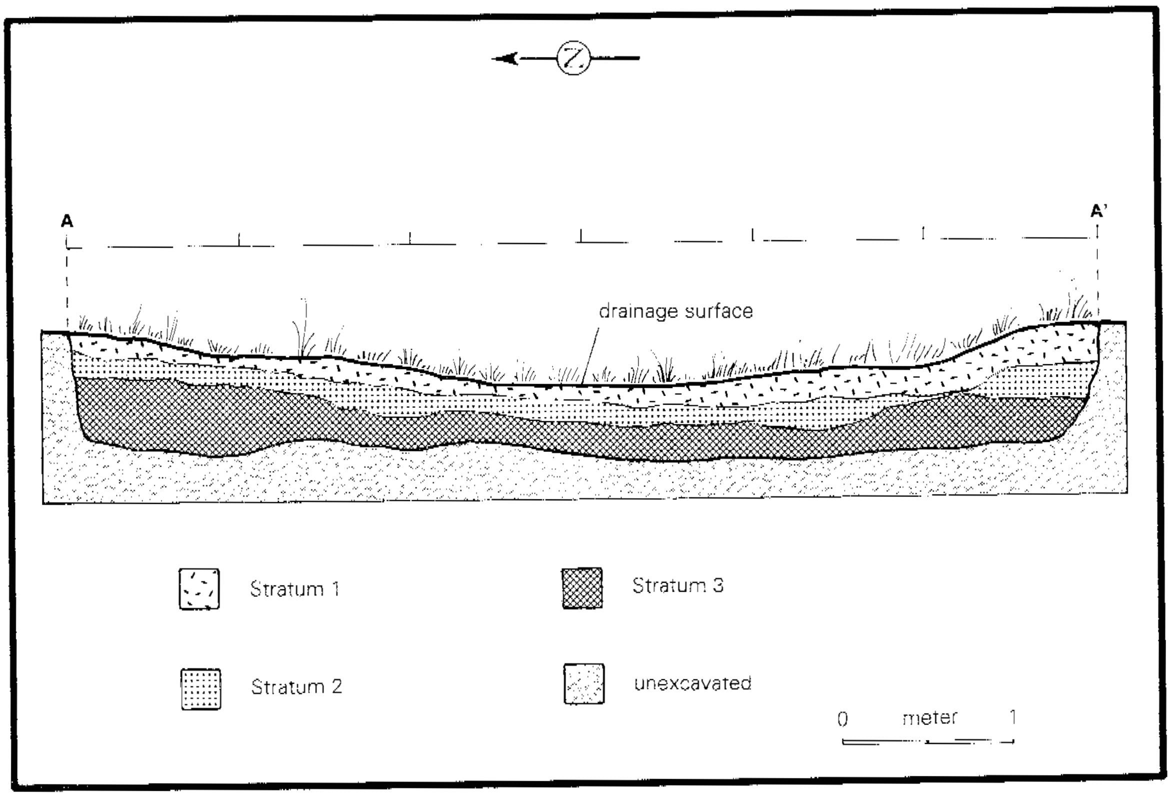

Figure 6.39. LA 85036, profile of trench across berm channel.

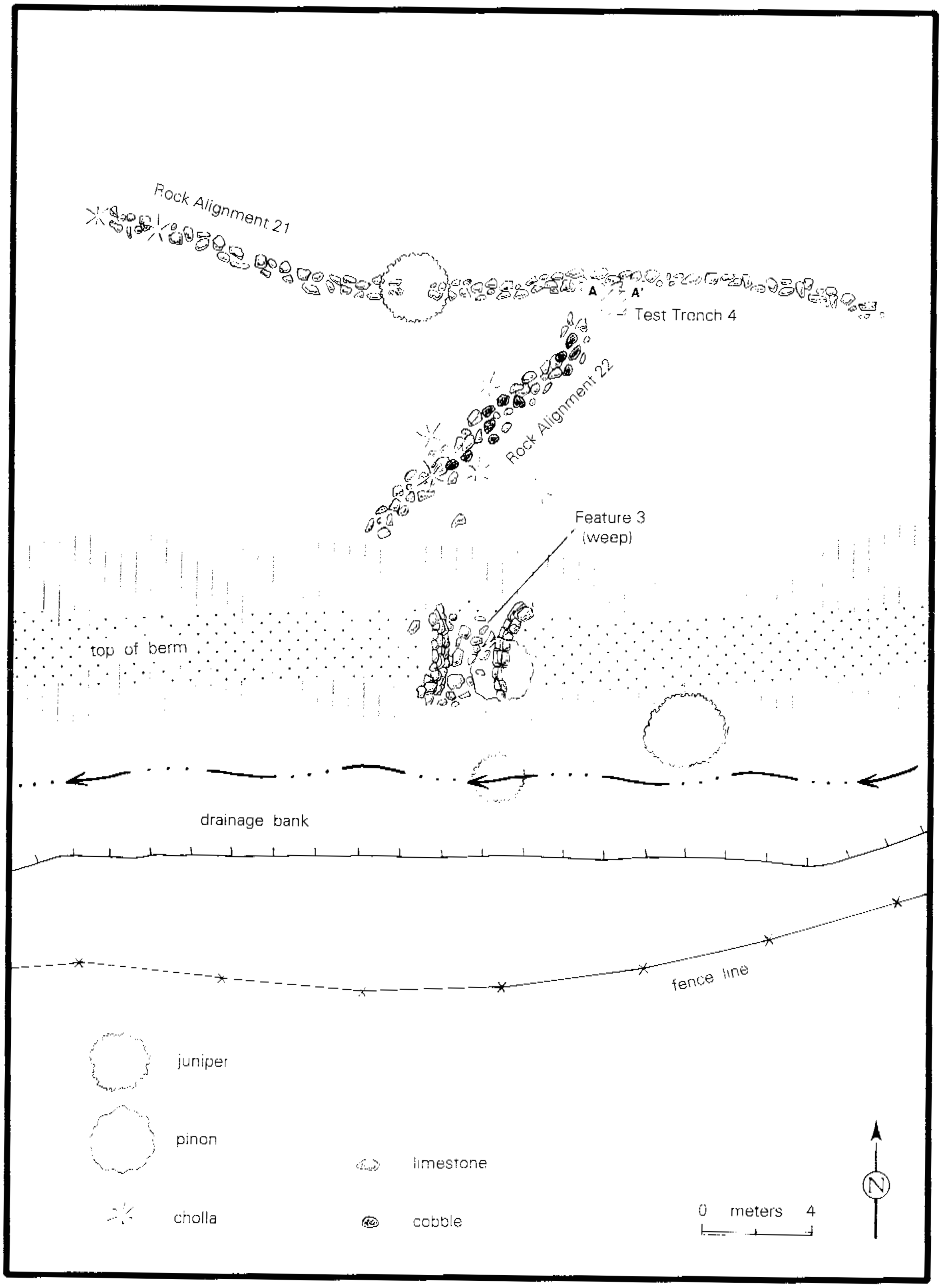

Figure 6.40. LA 80536, plan view of Feature 3.

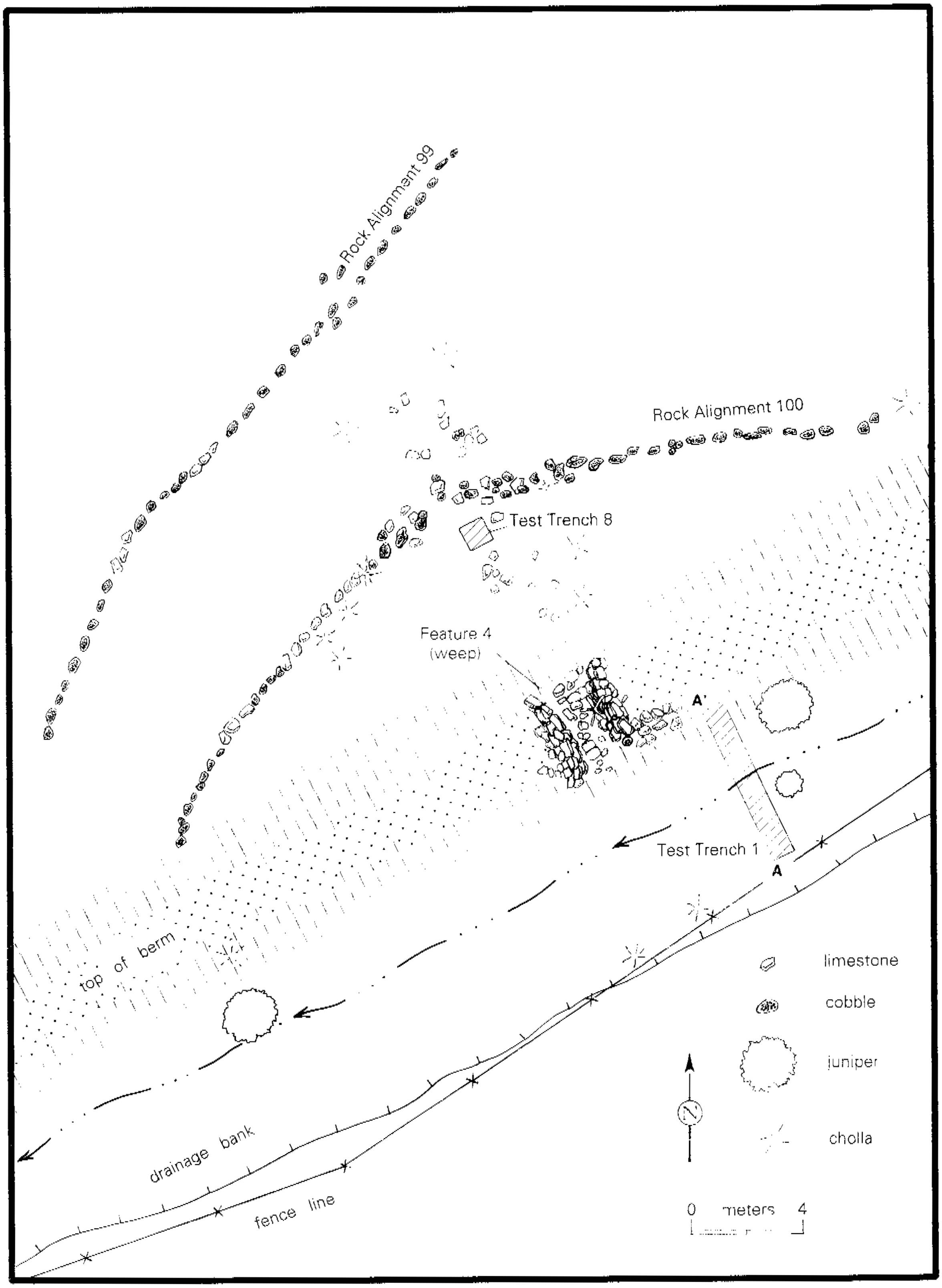

Figure 6.41. LA 85036, plan view of Feature 4.

Figure 6.42. Feature 3, rock-lined weep.

Figure 6.43. LA 85036, Feature 4, rock-lined weep.

high unemployment among them. The camps were administered by the U.S. Army and run along the lines of a military base (Seligman 1933; CCC 1936).

One of the major projects of the CCC was reforestation, which gave them the nickname of "the tree army" (Kammer 1994:68). Although it was a "make work" program, the CCC was responsible for many of the improvements and erosion control systems in parks and on private lands in the western United States. Private land owners signed a cooperative agreement with the state allowing the CCC to work on conservation projects on their land and agreed to maintain any structures they built for at least five years (Seligman 1933). The program provided training and jobs for over 2.5 million men nationwide between 1933 and 1942 (Kammer 1994:68). The CCC remained active until World War II.

New Mexico had a high number of CCC camps due to the large land holdings in the state by the federal government (Kammer 1994:68). There were so many projects in New Mexico that enlistees from other states were sent to the camps in New Mexico. In addition to the ECW, the Office of Indian Affairs operated CCC camps in New Mexico. In a summary of work done in New Mexico by 1938, it was estimated that 25,650 men were or had been employed in New Mexico camps (Fechner 1938). Also, CCC work done in a five-year period in New Mexico consisted of more than 2,300,000 water spreaders and 388,702 erosion control checkdams, among other projects.

CCC in Santa Fe

Soil Conservation Service records at Zimmerman Library, University of New Mexico, report that New Mexico had a large CCC program and that the Santa Fe area was the location of one of their camps. Local informants who lived in Santa Fe during the 1930s and CCC veterans aided in locating the camp and fly camps.

The CCC had established a camp in the foothills of Santa Fe by November of 1933 (Fig. 6.44). The camp was on the northwest side of Santa Fe between the Arroyo Rincon and the Arroyo Torreon, about 5 miles southeast of LA 85036 (Fig. 6.45). The campsite, according to informants, became a Japanese internment camp during World War II and after the war was converted into Veteran's housing (Fig. 6.46). Eventually, the area became the Casa Solana subdivision, and the location of the camp is approximately where the Casa Solana Clubhouse is now.

The CCC conducted many projects in and around the town, including major work on the Santa Fe River park and Hyde State Park. There were "fly" or side camps in different part of Santa Fe where smaller contingents from the base would set up to work in a particular area or on a particular project. A fly camp in the western part of Santa Fe County, designated SCS-CCC #7-N, is described as being in "portions of the Santa Fe and the Sebastian de Vargas Grants, consisting approximately of 5,000 acres. . ." near Santa Fe and occupying a portion of the watershed of the Santa Fe River. This camp would seem a likely candidate for the builders of the features at LA 85036 (Soil Conservation Service 1937:130).

Site Chronology

Dating LA 85036 was a process of elimination until a plausible time was determined. The earliest possible date for the site would have been 1933 since this is when the CCC was established. A 1936 or 1937 aerial map of the area shows that there were no structures built at that time. However, aerial photos of the area made in 1951 show the features. There is a record of dam construction and erosion control works being done around the Santa Fe area. An inventory of WPA-funded projects in of WPA-funded projects in New Mexico list Santa Fe as having a dam and small diversions constructed in September of 1941 (Kammer 1994:B-66). The latest date for construction is early 1942 due to the beginning of World War II and the subsequent disbanding of the CCC. Since LA 85036 appears to be a CCC project, the time range for its construction is 1936-1942, with the possibility that 1937-1941 is a reasonable time period.

The two-track road that runs through some of the deflection dikes is older than the water the waterspreader complex since the dikes are on top of the tracks. The date of the tracks is 1880-1920 based on shards of purple or amethyst glass found in association with the road. The road is probably from the time when the area was a cattle ranch or may be part of some homestead.

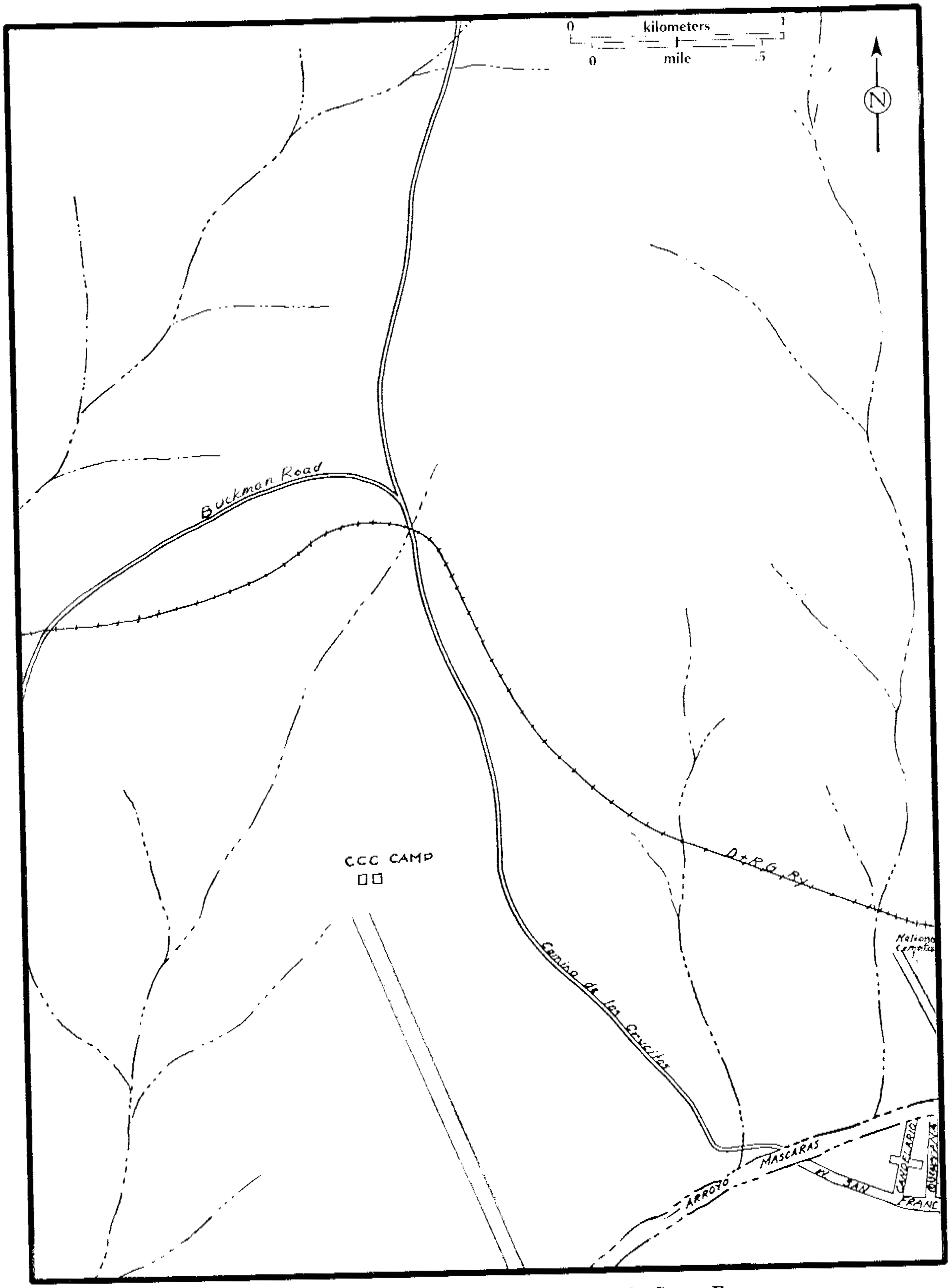

Figure 6.44. Turley map, 1935, showing location of CCC camp in Santa Fe.

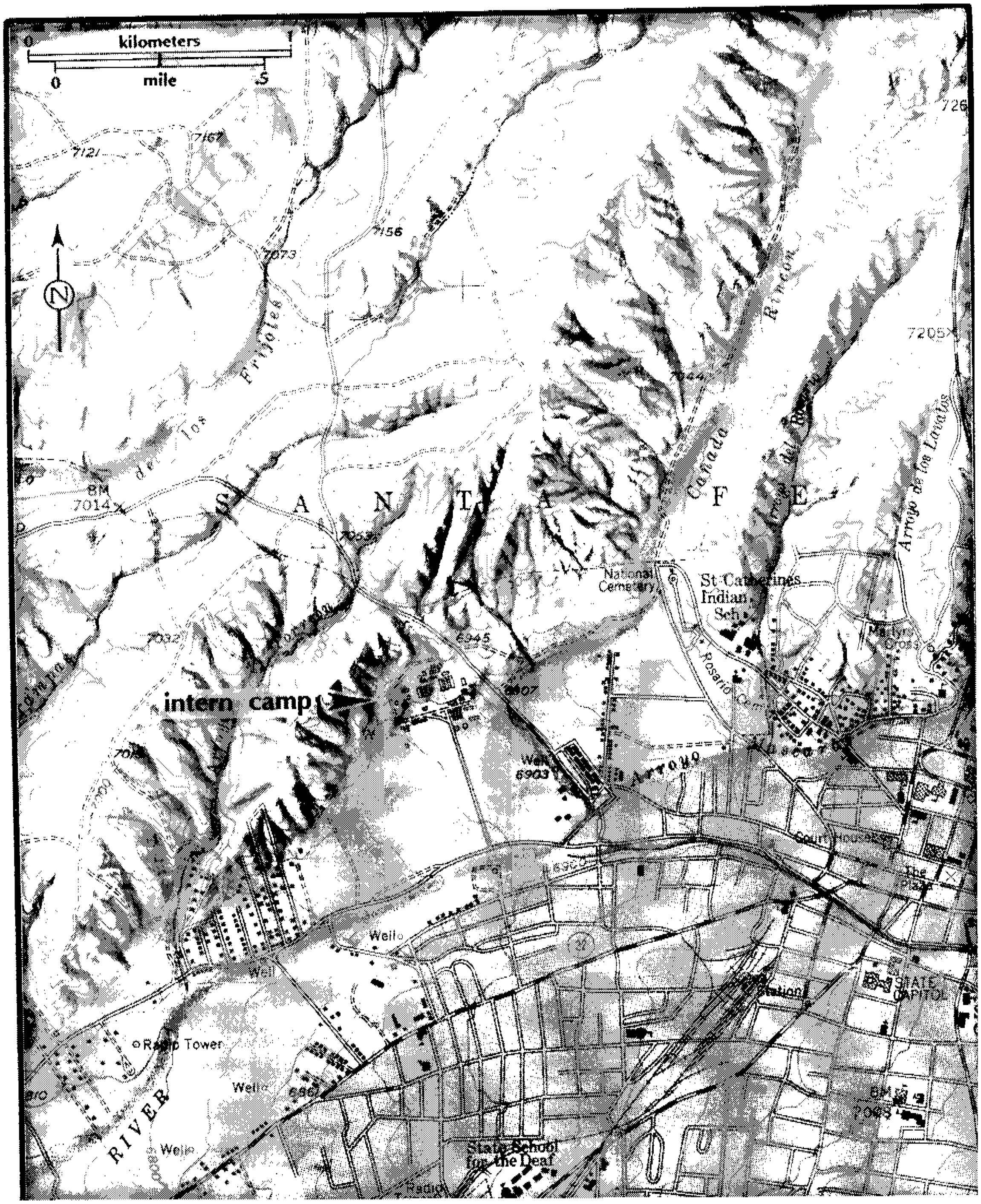

Figure 6.45. USGS map of Santa Fe, 1954, showing location of intern camp

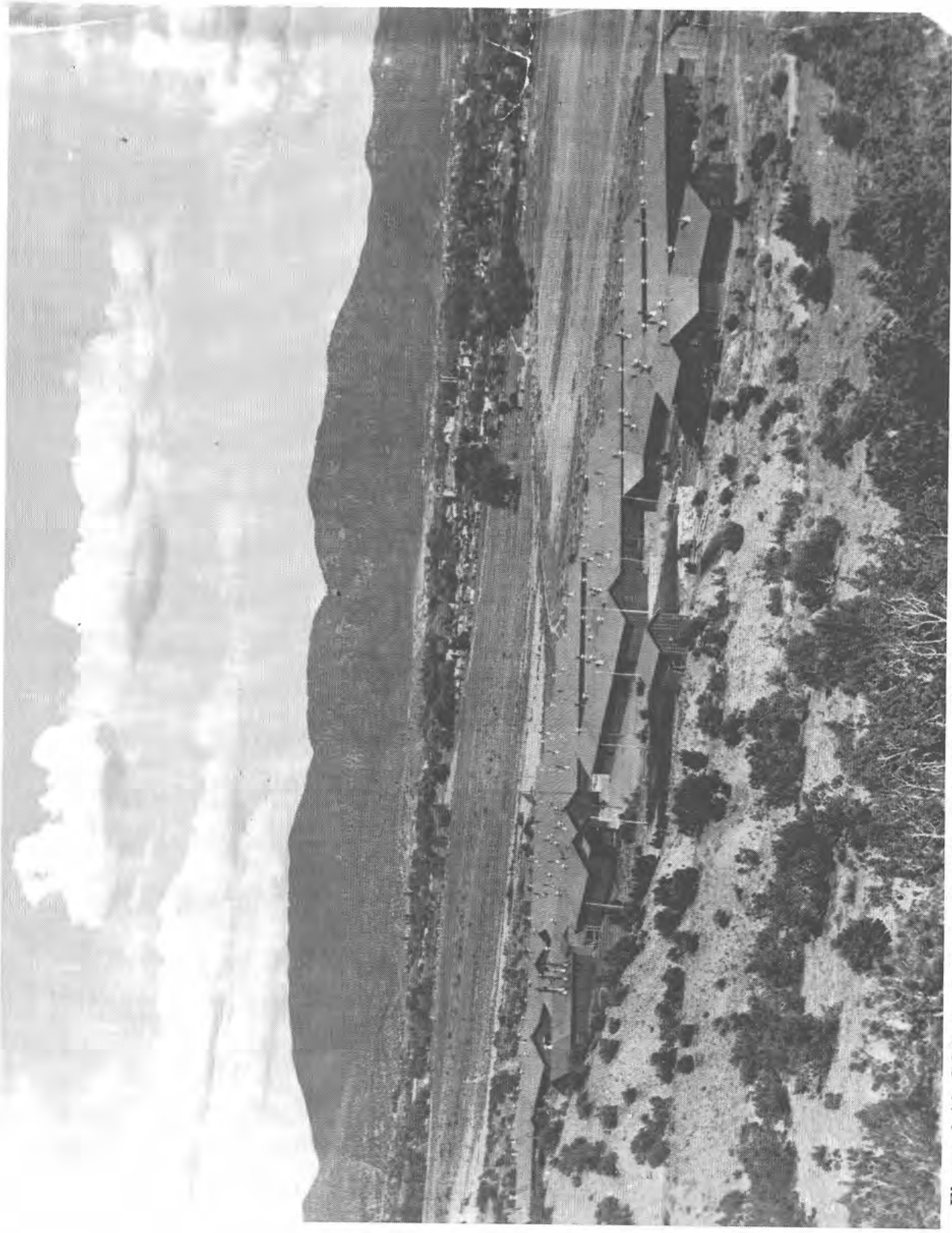

Figure 6.46. CCC camp, Santa Fe, 1935. (Courtesy Museum of New Mexico Photo Archives, neg. no. 147106)

Site Function

It appears that the function of the complex at LA 85036 is a water diversion system to prevent erosion from cutting a deeper arroyo. The features would have been used for erosion control and not to water livestock as was suggested during initial speculation about the function of the site. Overgrazing of livestock was probably responsible for the initial erosion problem in the first place.

The annual reports for 1936 and 1937 from the Soil Conservation Service describe water and erosion control devices and discuss appropriate measures for certain terrains. One device is seen in abundance throughout the Las Campanas area. The devices recorded as "checkdams" are referred to as "gully detentions." They are described as ". . . low structures built of rock or rock and brush," which are placed in arroyos to reduce the velocity of water flowing through the channel and to promote silting behind the dam (Soil Conservation Service 1937:90). These detention devices are in almost every drainage in the eastern three-quarters of the Las Campanas area. A method described as "water spreading" uses features similar to those present at LA 85036. This method diverts water from arroyos and spreads it across a gentle slope in order to prevent erosion from enlarging the arroyo cut (Soil Conservation Service 1936:31, 1937:90-92).

Though three types of spreading systems are noted, only one fits all the features present at LA 85036 (Soil Conservation Service 1936:131):

> **Total diversion of small flows:** This is used in cases where relatively small flows are diverted upon comparatively large spreading areas. An earthfill dam is constructed across the arroyo with an earth dike extending from the end of the dam to the point at which it is desired to deliver the flow and at a safe distance from the arroyo bank, otherwise deflection dikes to prevent head erosion will be necessitated. . . . In cases of long dikes weeps are used for irrigation of adjacent available spreading areas.

Rock-lined openings in earthen dams or canals are called "weeps." They divert water from the channels and release it across a wide, gentle slope. Cobble alignments are the "deflection dikes" and are used to prevent water from eroding arroyo banks after the water is released from the weeps.

The complex was probably built by both mechanical and hand methods. The berm or dike and the dam appear to have been dug with excavating machinery. The cobble alignments or deflecting dikes were placed by hand. The water spreader, dikes, dam, and pond are all a complex used for water control to prevent sheet erosion and arroyo cutting. Water spreading as a means of erosion control is now outlawed in New Mexico since water rights and diversion of water are very delicate issues in the state.

Excavation was intended to determine the water spreaders' mechanics. Unfortunately, excavation did not yield structural evidence of the workings of the dam, berm, or deflection dikes. In fact, it is difficult to say if the features ever functioned for the purpose they were built.

Conclusions

Excavations at LA 85036 was minimally useful for determining the site function. However, it did reveal that the water spreading complex was of twentieth-century manufacture. Whether or not the spreader was used extensively or at all could not be determined.

The archival research produced a history of the area of Santa Fe where the site is located. LA 85036 was a water-spreading system for total diversion of small flows as termed by the Soil Conservation Service. It was determined to be constructed by the CCC in the late 1930s or early 1940s. The complex was a large-scale attempt to modify the landscape and all the features were clearly built at the same time. The complex was part of a nationwide program to reforest and reclaim land that had been overgrazed to the point that erosion was dissecting the land so badly that it was no longer usable for any enterprise. The scope of the conservation program was nationwide and was aimed at preventing another "dustbowl" era, which had exacerbated the depressed economy of the 1930s.

LA 98861

Setting

LA 98661 is at an elevation of 1,970 m (6,640 ft) on a northwest-facing slope. The site is just below a ridge top of grassy tableland on the fringe of the piñon-juniper woodland. The ground cover is blue grama grass and rabbitbrush. The top soil is crytpogamic, which is an indicator of stabilized soils that have sustained little or no recent disturbance. The soil is a loose fine-grained clay sand mixed with abundant gravel and cobbles typical of Horizon A1 of the Panky-Pojoaque rolling association (Folks 1975:43).

Pre- and Post-Excavation Description

LA 98861 is a possible L-shaped rock-mulched plot with an associated single-cobble-wide checkdam that covers about 2,700 sq m. One quartzite flake and three core flakes are also associated. The rock-mulched plot is distinguished by a series of parallel linear arrangements of medium to large quartzite and granitic cobbles (Fig. 6.47). Two areas within the field alignment may have internal structure. The area in the northwest portion of the field is 5-by-4 m with medium and large cobbles evenly spaced at 40 to 50 cm intervals. Small cobbles and gravel fill the intervening spaces between larger cobbles. There are at least six alignments of this type. In the southeast portion of the field there are closely spaced medium-sized cobbles that form a close-knit grid. The internal structure of this area is similar to features reported along the Rio Chama north of Española, New Mexico (Anschuetz et al. 1985; Maxwell and Anschuetz 1992).

LA 98861 was therefore redesignated as a sherd and lithic scatter after the excavation results indicated the field was a natural feature. During the excavation, a concentration and scatter of lithic artifacts was identified that included core flakes, two cores, and a utilized core flake (Fig. 6.48). The concentration of 18 red chert core flakes was in the southwestern portion of the site. These were from a single core reduction episode. The artifact spatial distribution is typical of small sites in the Las Campanas area. Often there are one or two artifact concentrations with an associated dispersed scatter. These sites rarely have yielded subsurface deposits, therefore no excavation was conducted in the artifact concentration.

Excavation Methods

Prior to excavation, a 30-m radius around the possible garden plot was resurveyed. This careful reexamination resulted in the identification of more surface artifacts than were observed during the survey. These artifacts were flagged and their locations piece-plotted with a transit and stadia rod.

Excavation methods focused on confirming and characterizing the plot structure and stratigraphy. Two 1-by-2-m units were placed along and straddled the assumed border of the plot so that 1 m was within and 1 m was outside the plot. The soil and rock within the units were removed from the units in two 10 to 12 cm levels. The soil and rock were screened through ¼-inch and ½-inch mesh. The soil and rock that remained in each screen were weighed. The soil and rock that passed through the ¼-inch mesh into the wheel barrow was also weighed. This provided volume data for rocks that were larger than ½ inch, between ¼ and ½ inch, and rock and soil that were smaller than ¼ inch. These results were recorded for each level.

The excavation also exposed the stratigraphy and revealed the presence or absence of formal borders. The stratigraphy was recorded according to soil and rock content. A third 1-by-1-m unit was placed outside the plot to recover comparative soil and rock volumetric and stratigraphic data.

Stratigraphy

Exposing and documenting the soil levels within and outside the garden plot was a important aspect of the data recovery plan. Stratigraphic differences in soil, rock composition, and volume were expected if the garden plot interior had been modified. To expose the stratigraphy, two 1-by-2-m units were excavated along the garden plot border. Three stratigraphic levels were

Figure 6.47. LA 98861, pre-excavation. Note high gravel and cobble density.

identified (Fig. 6.49).

In the soil characterizations the following standards were used. Gravel or gravelly refers to coarse soil fragments that were up to 7 cm in diameter. Cobble was assigned to coarse fragments that were 8 to 20 cm in diameter. Boulders are classified as greater than 20 cm in diameter. These are the United States Department of Agriculture standards (Soil Survey Staff 1962:214).

Stratum 1 was a 12 to 16 cm thick, loose to compact, crumbly loam sand. The sand contains gravel and cobbles in similar volumes throughout the excavation units. Excavation Units 1 and 2 had more cobbles within the garden than outside, but the outside soil contain higher volumes of ½ inch or smaller gravel (Table 6.13). This is not the expected distribution of cobbles and gravel within fields as defined by Lightfoot (1990), who suggests that more small gravel and a lower cobble volume should be found inside the garden. OAS research suggests that there may be no dichotomy of particle size for interior and exterior soil matrixes (Ware 1995). Ware suggests that field interiors should reflect the natural gravel and cobble distribution. Therefore, a difference between interior and exterior soil matrixes would not be expected.

Stratum 2 was a compact, granular loam sand with abundant pebbles and pea gravel. The calcium carbonate levels increased with depth. Compared to Stratum 1 there were few to no cobbles present and the majority of the stratum was less than a ¼ inch of soil and gravel (Table 6.13). Roughly equal volumes of less than ½ inch materials occurred throughout Units 1 and 2. There were no differences between the interior and exterior soil and rock volumes.

Stratum 3 was a compact, granular loam sand with calcareous pebbles and gravel. There were no cobbles present and the gravel content had decreased to less than 2 percent. Stratum 3 was the typical noncultural level encountered during the Las Campanas excavations.

Artifact Assemblage

Pottery
by Steven A. Lakatos

One undifferentiated white ware sherd was

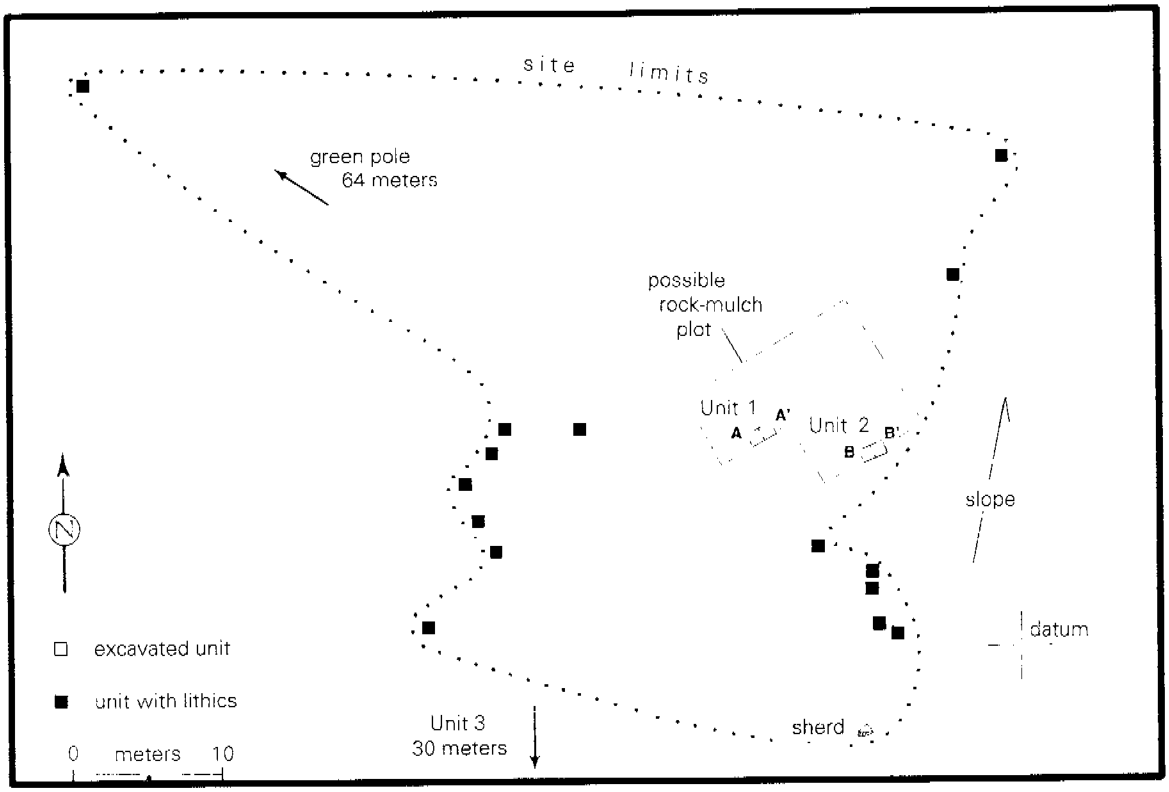

Figure 6.48. LA 98861, site map.

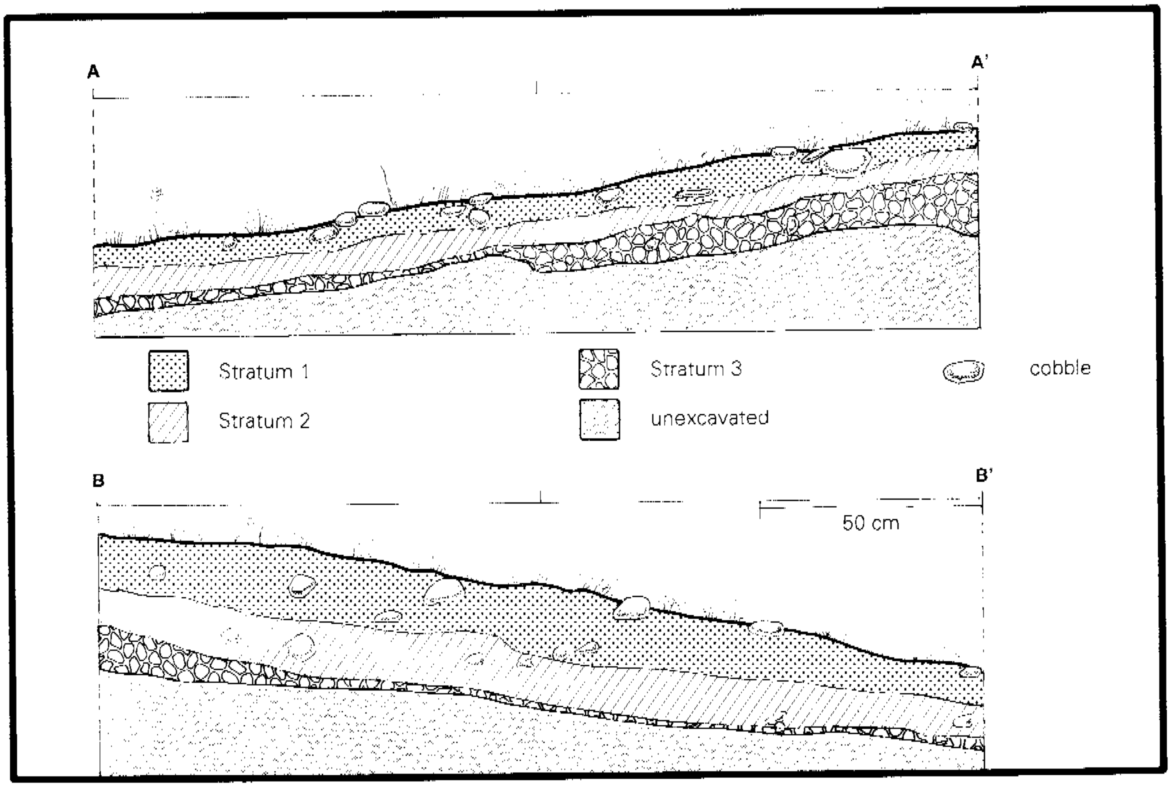

Figure 6.49. LA 98861, profiles of Units 1 and 2.

recovered from the surface. The sherd appears to be from a bowl body. The exterior and interior surfaces are smoothed and lack any other surface treatment. The paste, similar to Coalition and early Classic period white wares, is hard, with a dark gray exterior (7.5YR 4/0) and light gray interior (7.5YR 7/0), and a medium texture. Temper consists of fine sand.

Chipped Stone
by Guadalupe A. Martinez

A total of 28 chipped stone artifacts were recovered or field recorded from LA 98861. The 28 chipped stone artifacts are assigned to five artifact types (Table 6.14). The assemblage is not diverse, consisting mainly of core flakes and angular debris.

The chipped stone artifacts are debris from core reduction and raw material procurement. The raw materials reflect a use of local chert from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west.

Lithic Raw Material Selection. The chipped raw materials are mainly chert. Chert encompasses fine- to coarse-grained material that occurs in a wide range of colors. The majority of the lithics were fine-grained chert (n = 24), three were medium grained, and one was coarse grained. Cherts occur throughout the Santa Fe formation gravel. Its abundance is subject to considerable spatial variability. The cherts of the Santa Fe formation gravel were used extensively by the prehistoric inhabitants of the Santa Fe River Valley as a raw material source for chipped stone tools. Chert is by far the most common raw material identified on all Las Campanas area sites and as isolated chipped stone artifacts.

Debitage. Debitage from core reduction accounts for 25 of the 28 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types with counts of 13 and 12, respectively. The majority of the debitage was fine-grained chert. Early and middle stages of core reduction are represented by the distribution of dorsal cortex percentages. All twelve pieces of angular debris had no cortex. Six core flakes had no dorsal cortex, two core flakes exhibited 10 percent, two exhibited 20 percent, and there was one core flake each that had 30, 50, and 100 percent coverage. Four of the core flakes were whole. Five were proximal fragments, one was a medial fragment, and three were distal fragments. Platform types primarily reflected early and middle stage reduction with single-faceted (n = 3) and cortical (n = 2) platforms predominating. One multifaceted platform was recorded, the other seven flakes had collapsed, crushed, or missing platforms. Dorsal flake scars also reflect early and middle stage reduction with 10 of the 13 core flakes exhibiting three or fewer scars. Three core flakes exhibit dorsal scars of four, five, and eight, suggesting that the cores these flakes were detached from were extensively used. Whole core flake dimensions had a mean length of 47 mm, a mean width of 39 mm, and a mean thickness of 12 mm. Dimensional data suggest that medium to large-sized core flakes were the most common by-product of core reduction.

Tools. One late stage uniface was recorded as a side scraper of fine-grained chert. The dimensions of the uniface were 45 mm in length, 26 mm in width, and 8 mm in thickness. It had an unretouched convex edge with an edge angle of 46 degrees. The wear on the edge was unidirectional with even rounding. Damage to the edge consisted of crescent scars, feather scars, and nibbling.

Cores. One unidirectional coarse-grained quartzite core and one multidirectional medium-grained chert core were recovered. The quartzite core measured 135 mm long by 71 mm wide by 51 mm thick. Cortex covered 70 percent of the core. There were three flake scars, which suggest that the core was minimally used. The chert core measured 125 mm long by 58 mm wide by 57 mm thick. There was no cortex on the core. There were 12 flakes scars, which suggest that the core was originally a large piece of raw material. The core was substantially reduced, although its size indicates that it was not exhausted. Multidirectional cores are typical of expedient core reduction aimed at producing flake tools or blanks.

Research Design and Data Recovery

Research Questions

Cobble-mulched fields have been widely reported

Table 6.13. LA 98861, Rock and Soil Weights from Units 1, 2, and 3

Unit, Level, and Location	< ¼ inch (pounds)	> ¼ to < ½ inch (pounds)	> ½ inch (pounds)	Cobbles > 1 pound (pounds)
Unit 1				
Inside, Level 1	176	11	75	85
Outside Level 1	199	17	108	42
Inside Level 2	264	17	31	3
Outside Level 2	241	18	17	
Unit 2				
Inside Level 1	173	7	93	22
Outside Level 1	215	10	112	
Inside Level 2	240	11	24	
Outside Level 2	305	17	20	
Unit 3				
Level 1	176	23	187	38
Level 2	194	27	139	20

Table 6.14. LA 98861, Artifact Type by Material Type

Count Row Pct Column Pct	Misc. chert	Quartz-ite	Row Total
Angular Debris	12 100.0 44.4		12 42.9
Core Flake	13 100.0 48.1		13 46.4
Unidirectional Core		1 100.0 100.0	1 3.6
Multidirectional Core	1 100.0 3.7		1 3.6
Early Stage Uniface	1 100.0 3.7		1 3.6
Column Total	27 96.4	1 3.6	28 100.0

along the Rio Grande, the Ojo Caliente, and the Rio Chama. These features are assigned to the Coalition and Classic periods (A.D. 1175 to 1500). The fields of the lower Rio Chama have been interpreted as evidence of diverse farming strategies that were employed unevenly across space and throughout the Classic period occupation of the Rio Chama (Maxwell and Anschuetz 1992:67). Researchers argue that the fields reflect a dynamic response to change that may have helped to minimize productive risk, but also served to increase productive capacity.

Cobble-mulched fields have at least four benefits, outlined by Maxwell and Anschuetz (1992:44).

1. The cobble mulch may absorb heat during the day and radiate the heat at night, raising the ground temperature. This absorption and radiation cycle raises the soil and ground temperature and may lengthen the growing season by negating the effects of early or late frosts.

2. The cobble mulch allows rapid infiltration of surface runoff, which increases the water available to plants from summer-dominant precipitation.

3. The cobble mulch may increase soil moisture by retaining a greater percentage of winter and spring precipitation. This increases moisture available for seed germination and early plant growth.

4. The cobble mulch may reduce the air movement at the ground surface resulting in less evaporation.

These four factors may operate at varying levels of effectiveness, increasing potential agricultural production by ameliorating deleterious climatic factors throughout the plant growth cycle.

As an isolated feature, the field at LA 98861 does not imply the dynamism that is suggested for the Rio Chama. It does suggest that farming occurred along the margins of the larger arroyos in the Las Campanas area. This is important because some low density artifact scatters may result from part-time farmers who tended fields and took advantage of the vast piñon-juniper woodland.

With only one cobble-mulched field in the Las Campanas data base, the goals of the data recovery effort were modest. Many problem domains relating to functional differences of field types are better addressed with a larger sample. Data recovery efforts at LA 98861 maintained comparability with recent studies in the Galisteo Basin (Lightfoot 1990), lower Rio Chama (Anschuetz et al. 1985; Maxwell and Anschuetz 1992), and Ojo Caliente (Ware and Mensel 1992) areas. Long-term experimental and environmental studies were not be conducted, though they may provide the best avenue to understand field variation (Ware and Mensel 1992:98).

Site Confirmation

Is LA 98861 a cobble-mulched field? Authenticity as a cobble-mulched field must be confirmed as part of the excavation at LA 98861. From the literature (Lightfoot 1990:166-178; Anschuetz et al. 1985:75-76, 107-109), criteria for field identification can be outlined.

Criterion 1. The gravel should lie on top of the soil and not be intermixed with the soil substratum. This is a functional requirement of cobble or pebble mulches because a reduction in soil pore size and spacing increases evaporation. This combination of silty soil and cobble mulch creates a seal and increases the potential for crusting (Lightfoot 1990:166). Problems with this criterion are obvious: (1) the field may have been abandoned for over 500 years so that wind-blown soil has mixed with the cobble mulch; and (2) the gravel may deflate, erode, and compact on top of the underlying sediment. These actions would result in soil and mulch mixing. Mixing of soil and mulch may make it difficult to discern a difference between the cultural and natural deposit.

The use of this criterion involved excavation of test trenches that provided a cross section of the interior and exterior field. The profile was examined for differences in the vertical distribution of soil and gravel. Presumably, if the field was prepared with a soil substratum and a cobble overburden, some remnant of this arrangement should remain.

Criterion 2. The gravel and cobbles used in the field had to come from a source exterior to the field. Two potential sources are borrow pits and the surface surrounding the field (Lightfoot 1990:169). No borrow pit was observed at LA 98861, therefore the immediately available surface gravel is the most likely source. If this is true, then there should be a difference in the volume of gravel from within and outside the field. This difference should be apparent in the upper 20 cm of the mulch (Lightfoot 1990:173). It is also probable that the soil to gravel volume would be higher in the upper 5 to 10 cm level outside the field if removed gravel was replaced though erosion by soils and small pebbles.

The gravel volumes can be measured by screening the soil and gravel from within and outside the field. This can be done in gradations of < ¼ inch, < ½ inch, and > ½ inch. The amount of each gravel size will be weighed and the weights compared for inside and outside the field. Differences of two times or greater magnitude within the field would be a strong indicator of its authenticity (Lightfoot and Eddy 1995:466).

Criterion 3. The fields may exhibit patterning that define the limits of the growing area. These patterns may include field borders or dividers. Borders define the field exterior with a single tier of contiguous cobbles that may be upright or lying flat on the ground. Dividers are cobble alignments within the field that form compartments. The function of the compartments is unknown, but may relate to further slowing runoff, directing moisture to specific areas within the field, or to segregating crops that had different growth or maintenance requirements (Lightfoot 1990:169; Maxwell and Anschuetz 1992:61).

An excavation of a sample of the field would include a portion of the border and interior areas that show surface indications of structure. If a border or internal structure is defined, this would be confirmation of the authenticity of the field. Confirmation of a border may occur during testing Criteria 1 and 2.

Criterion 4. Nonstructural evidence of the field may remain. This evidence would be marker grains of pollen from economic plant species or an abnormally high count of weedy species that would thrive in the disturbed soil of an abandoned field. Species that produce low count pollen can be identified by Intensive Sample Microscopy (ISM [described in Dean 1991]). This technique has proved valuable for identifying economic plant pollen in field contexts (Moore 1992).

During the excavation of the test trenches for testing Criteria 1-3, pollen samples were collected from the gravel layer 5 to 20 cm below the surface. A pollen sample was collected from outside the field as a control. If economic pollen is identified, its presence would be a strong indication that the fields are authentic. Unfortunately, this confirmation may come after the excavation is completed, but it will provide a check of conclusions derived from testing Criteria 1-3.

Research Results

Three criteria based on excavation results within a potential cobble-mulch field were proposed. These criteria included stratigraphy, gravel sorting by size or volume, and the presence of borders or dividers. Excavation of two units provided data that could be used to evaluate the authenticity of the cobble-mulch field.

Criterion 1

Criterion 1 emphasizes the stratigraphic separation of the soil bed and the gravel mulch. Ideally, the gravel should occur as a layer on top of the soil. Natural geomorphic processes might have acted to blur the boundary between the gravel mulch and the underlying soil. Even with deflation and erosion, it was expected that some degree of separation would be visible in the excavated profile. Differences in stratigraphy should have been evidenced by different gravel volumes for the two strata.

The excavated soil profiles for Units 1 and 2 showed no clear or even blurry separation between a gravel and soil layer. The soil profiles showed a continuous distribution of soil and gravel inside and outside the field. Excavation did not reveal a break in the apparently natural soil and gravel deposit and a possible altered layer. Table 6.15 shows the gravel volumes by size for Units 1 and 2, Levels 1 and 2, inside and outside the field. Statistical significance of differences between Level 1 inside and outside, and Level 2 inside and outside, were examined using two chi-quare tests of significance. Table 6.15 shows the results of the chi-square tests. The null hypothesis was rejected for Units 1 and 2, Level 1, but the test failed to reject the null hypothesis for Units 1 and 2, Level 2. The difference in gravel distribution by volume for Level 2 was not statistically significant. The

Table 6.15. Chi-square Test of Significance for Gravel and Cobble Distribution, LA 98861

Hypothesis	Chi-value	Decision	Conditioner
Size distribution is similar for interior and exterior, Unit 1, Level 1	22.7161	reject	higher than expected cobble values for interior, lower than expected for exterior
Size distribution is similar for interior and exterior, Unit 1, Level 2	5.61026	fail to reject	
Size distribution is similar for interior and exterior, Unit 2, Level 1	26.1612	reject	higher than expected cobble values for interior, lower than expected for exterior
Size distribution is similar for interior and exterior, Unit 2, Level 2	2.1515	fail to reject	
Size distribution is similar for interior and exterior, Unit 3, Levels 1 and 2	11.4758	reject	less than expected < ¼ inch size in interior more than expected < ¼ inch size in exterior
Size distribution is similar for interior, Unit 1, Levels 1 and 2	112.2745	reject	more > ½ inch size in Level 1 and more < ½ inch size in Level 2
Size distribution is similar for exterior, Unit 1, Levels 1 and 2	101.6668	reject	more > ½ inch size in Level 1 and more < ½ inch size in Level 2
Size distribution is similar for interior, Unit 2, Levels 1 and 2	73.8396	reject	Same as Unit 1
Size distribution is similar for exterior, Unit 2, Levels 1 and 2	81.4805	reject	Same as Unit 1

DF = 3, critical value = 11.3449 (except for Unit 2, Levels 1 and 2 test, DF = 2, critical value 9.2103)
All critical values at .01 significance level

significant difference for Level 1 is driven by the difference in the occurrence of cobbles, which account for 77 percent of the chi-square value for Unit 1 and 96 percent of the chi-square value for Unit 2. Cobbles may be an important part of field construction, but they should not be abundant in the soil. Therefore, cobble volumes within the field would be expected to be lower than the surrounding area, unless the area was devoid of cobbles and they had to be transported to the field for border and matrix construction.

Gravel and cobble volumes were compared between Level 1 and 2 inside and outside the field for Units 1 and 2 using four chi-square tests of significance, the results of which are provided as the last four rows of Table 6.15. The null hypothesis was rejected for all four tests. This result suggests that the interior gravel and cobble volume for Levels 1 and 2 were different for both units. In other words, there is no similarity in the gravel and cobble volume within the alleged field as would be expected if the field were man-made. Instead, differences in volume distribution suggest difference in the gravel and cobble content of the slope.

Another way to view the results is that the four test results reflect a similar distribution of gravel and cobble volumes for Units 1 and 2. Regardless of the location of the sample (inside or outside the field) there was a significantly greater volume of > ½ inch material in Level 1 accompanied by a lower volume of < ½ inch material. For Level 2 the reverse was true with a significantly greater volume of < ¼ inch material and a significantly lower volume of > ½ inch material. The similarities in these distributions suggest that differences are due to the natural distribution of different sized material and not due to artificial manipulation or enhancement of one area over another.

Criterion 2 emphasizes original source of the mulching material. It was suggested that because no borrow pit was associated with LA 98861 that gravel used in the field would have been collected from the immediate area. Removal of the gravel was expected to change the ratio of small to large gravel in the upper 20 cm of soil on both sides of the field border.

As discussed for Criterion 1, the chi-square tests for significance indicate no differences in inside and outside volume distributions. The only difference is in the Level 1 distribution where cobbles were more abundant inside than outside the field. The difference in cobble distribution is not attributed to engineering activities because covering the gravel mulch with a layer of cobbles would defeat the purpose of having a gravel substratum. Benefits of soil and water retention and temperature enhancement would be gained from the cobbles not from the underlying gravel (Lightfoot 1990; Lightfoot and Eddy 1995). Therefore, no support for Criterion 2 is provided by the gravel and cobble volume data.

Criterion 3 is based on expectations about field morphology. Many fields exhibit cobble borders or internal divisions. Excavation units were placed where cobble alignments were visible on the surface. Excavation Units 1 and 2 did not reveal borders or any other evidence of field morphology or construction. Cobbles were randomly distributed throughout Level 1 of Units 1 and 2. Excavation Unit 3, which was placed on a separate finger ridge as a control, also yielded cobbles in Levels 1 and 2 in similar proportions to Excavation Units 1 and 2. Excavation did not provided any supporting data from Criterion 3.

The expectations outlined as Criterion 1, 2, and 3 were not supported by the excavation data. The gravel and cobble volume distributions seemed natural and not manipulated or enhanced. The presence of abundant cobbles mixed with and above the smaller materials could counter the effects of a gravel mulch according to Lightfoot's model (1990). Ware's recent research suggest that cobbles and gravel commonly co-occur in prehistoric fields near Ojo Caliente, New Mexico (Ware 1995) This difference of opinion between Lightfoot and Ware suggests that gravel and cobble variability is a reflection of local raw material not conscious attempts at size-sorting by prehistoric farmers. Ware suggests that the strongest evidence for fields is regular field borders and internal construction (Ware 1995). At LA 98861, the cobbles did not form outlines or borders, so that their presence could not be explained by field construction. The linear alignments observed during the inventory were not enhanced by excavation with alignments appearing to be part of the abundant cobble matrix. These results combine to weigh heavily against interpreting LA 98861 as a cobble-mulch field. From the excavation evidence it can be concluded that LA 98861 represents a natural deposit. Therefore, no further discussion of LA 98861 as a cobble-mulch field is presented.

CHAPTER 7
ESTATES IV, LA 86148 AND LA 86150 EXCAVATIONS

The Estates IV data recovery project was conducted between August and September 1993. It entailed the excavation of two prehistoric period sites, LA 86148 and LA 86150. These sites were previously identified by Southwest Archaeological Consultants, Inc. (SAC) in April 1992 (Scheick and Viklund 1992). Three other sites from Estates IV, LA 86147, LA 86149, and LA 86151, were test excavated and determined to have no additional data potential. The testing results were reported in the Estates IV data recovery plan (Post 1993b).

LA 86148

Setting

LA 86148 is at the end of a long ridge within a southwest-sloping ridge system that separates the Arroyo Calabasas from the Cañada Ancha. The site elevation is at an elevation of 1,994 m (6,540 ft). The ridge overlooks one secondary arroyo to the north and a minor drainage to the south-southwest. There is a commanding view of lower elevations to the west and southwest. The ridge location is proximate to three main drainage systems of the western portion of the project area as well as access to the microenvironments of the Cañada Ancha. The soils are of the Pojoaque-Panky rolling association (Folks 1975:39), consisting of a loosely consolidated sand mixed with gravel and cobbles. The vegetation is piñon-juniper, tall and short grasses, yucca, and occasional barrel cactus.

Pre-Excavation Description

During the survey, 102 surface lithic artifacts were recorded. Among these artifacts were 7 primary reduction flakes, 73 secondary core reduction flakes, 6 biface reduction flakes, 7 pieces of angular debris, 2 En Medio style projectile points, 3 tested cores, and 1 mano. A possible prehistoric checkdam, 3 m long and one course wide, was present. The artifact assemblage indicated that hunting, gathering, and processing may have occurred at the site. The En Medio phase of the Oshara Tradition dates between 800 B.C. and A.D. 1.

Surface collection and excavation of 120 1-by-1-m units defined the site limits as 31 m north-south by 50 m east-west covering 1,550 sq m (Fig. 7.1). The excavation area included one main artifact concentration in the western part and two smaller concentrations in the central and eastern parts. Six 1-by-1-m units selected for deeper excavation confirmed that the cultural deposit was restricted to the upper level.

A total of 327 lithic artifacts were recovered from the site, the majority of which were secondary flakes. There were also three early stage bifaces, one middle stage biface, nine cores, and one piece of ground stone. The two En Medio style dart points collected during the inventory came from near the central concentration. No features were encountered. There were no clear breaks in the artifact distribution that related to activity areas or occupation episodes.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the surface artifacts to locate activity areas that would have the greatest data potential. At other sites in the Las Campanas area, excavation of low density or empty space areas did not yield significant data. Excavation focused on the areas that had relatively high artifact density.

One data recovery goal was to recover spatial data for the analysis of site structure. A 1-by-1-m grid system was established to allow spatial analysis. Surface stripping within the 1-by-1-m grids removed the loose top soil and dense gravel and cobble deposit. Surface strip depth ranged from 8 to 12 cm (Fig. 7.2). All the excavated soil was screened through ¼-inch screen.

A running list of the artifact yield from each grid was maintained. After the surface stripping was completed, six areas with the highest artifact

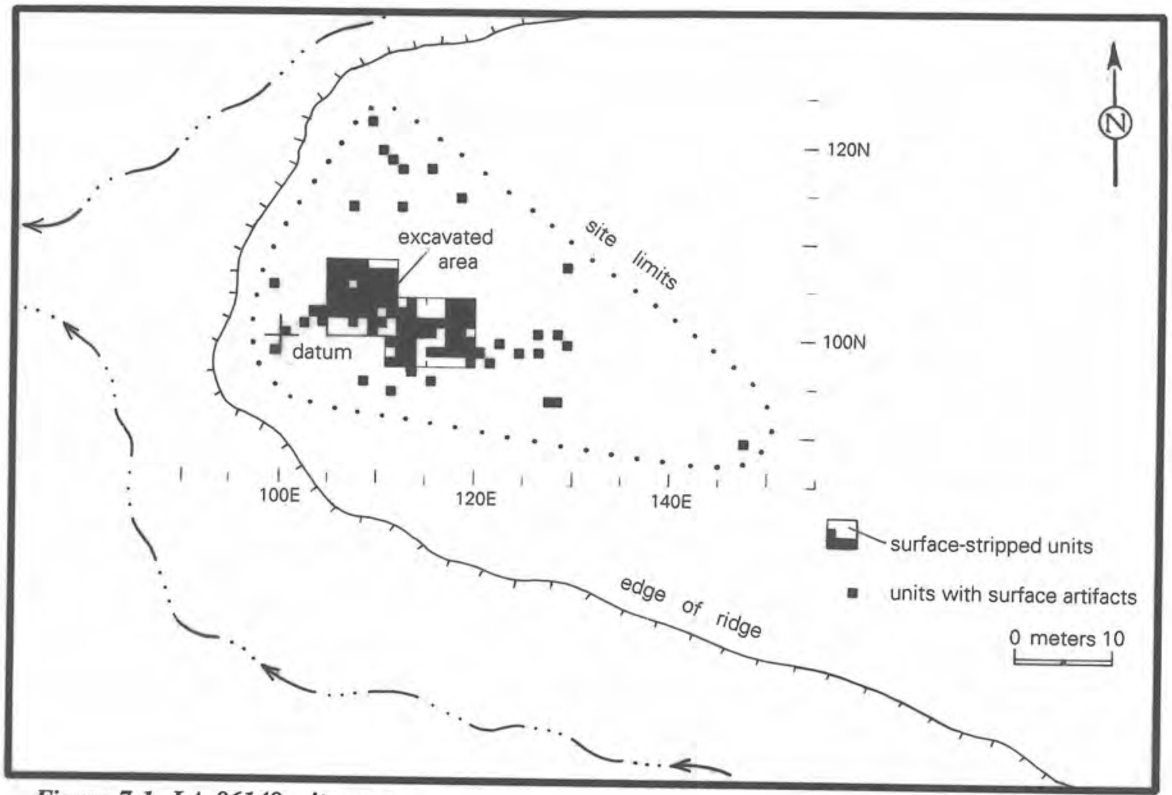

Figure 7.1. LA 86148, site map.

Figure 7.2. LA 86148, excavation area, looking southwest.

counts were excavated an additional 10 cm below the bottom of the surface strip level.

Recording consisted of soil characterizations for the excavated area and the artifact distribution data. Artifacts that were outside the artifact concentration were surface collected. Completion of the artifact collection and unit excavation was followed by site mapping with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

Two strata were encountered. Stratum 1 was a loose, brown (7.5YR 6/4) sandy loam mixed with gravel and cobbles. This layer contained the majority of artifacts recovered from the site. The cobble density of Stratum 1 decreased as one moved east from the edge of the ridge (western site limit). Stratum 1 was 5 cm thick. Stratum 2 was a reddish brown (5YR 4/3) sandy loam, mildly calcareous, mixed with gravel, alluvial deposits, and caliche. One artifact was recovered from this level. Stratum 2 was 10 cm thick. These strata correspond with the A1 and B1 horizons of the Panky soil series (Folks 1975:40).

The Artifact Assemblage

Chipped Stone
by Guadalupe A. Martinez

A total of 327 chipped stone artifacts were recovered from LA 86148. There were 10 artifact types (Table 7.1). The chipped stone artifacts are debris from core reduction, biface manufacture or tool maintenance, and tool use. The raw materials reflect a use of local chert from the Jemez Mountains, Rio Grande gravel deposits, and the Caja del Rio, located to the west.

Lithic Raw Material Selection

The chipped raw materials are mainly a red chert that is common to the Santa Fe area and has been designated Madera (Lang 1993). The diversity of quality and color of this material prompted the monitoring of the material types with a focus on the Madera chert spectrum. (See Table 7.2 for codes and material type descriptions used during analysis.) The chert encompasses fine- to coarse-grained textures.

There was only one artifact that was not a chert. One core flake of silicified wood was recovered. Silicified wood is not common in the Las Campanas assemblage, but is known to exist in the Rio Grande corridor (Warren 1979b:23).

Debitage

Debitage from core reduction accounts for 312 of the 327 chipped stone artifacts, although the entire range of lithic production is represented by the assemblage. The most common artifact type is core flake (n = 226) accounting for 69 percent of the assemblage. Core flakes were made from all but one of the raw material types (Table 7.2). Late stage core reduction is represented by the percentage of cortex on the dorsal portion of the core flakes. One hundred sixty-three of the core flakes had no cortex, indicating that these flakes had been removed from a core that had been significantly reduced. The remaining core flakes were evenly spread out from 10 to 100 percent cortex with slightly larger numbers at 10 and 20 percent.

Early, middle, and late stages of core reduction are represented by the distribution of dorsal scars on core flakes (Table 7.3). Fourteen core flakes had no dorsal scars, indicative of early stage reduction technology. Eighty-five percent of the core flakes exhibited between one and five scars. This percentage reflects a high incidence of early to middle stage core reduction with perhaps the objective of biface or tool production. The remainder of the core flake assemblage reflects late stage lithic reduction with six or more dorsal scars. Platform types are indicative of the stage of reduction and of biface production. Platform types on core flakes primarily reflect early and middle stage reduction with single-faceted (n = 57) and cortical (n = 12) platforms. There were 96 whole core flakes. The remaining flake fragments are relatively evenly represented, with distal fragments slightly more common. The whole core flakes had a mean length of 30 mm with a standard deviation of 12 mm and a range from 23 mm to 39 mm; mean width of 26 mm with a standard deviation of 10 mm and a range from 15 to 36 mm; and a mean thickness of 8 mm with a standard deviation of

Table 7.1. LA 86148 Material by Artifact Function

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Notching Flake	Hammer-stone Flake	Unidirec-tional Core	Bidirec-tional Core	Multidirec-tional Core	Biface Early Stage	Biface Middle Stage	Row Total
80 (chalcedony)		3 75.0 1.3	1 25.0 1.6								4 1.2
100 (silicified wood)		1 100.0 .4									1 .3
901		20 71.4 8.8	8 28.6 12.5								28 8.6
904								1 100.0 16.7			1 .3
905		5 71.4 2.2	1 14.3 1.6					1 14.3 16.7			7 2.1
906	2 11.1 9.5	14 77.8 6.2	2 11.1 3.1								18 5.5
908		16 94.1 7.0	1 5.9 1.6								17 5.2
915		6 100.0 2.6									6 1.8
916	1 16.7 4.8	5 83.3 2.2									6 1.8
921	7 8.5 33.3	55 67.1 24.2	12 14.6 18.8	1 1.2 100.0	1 1.2 100.0	1 1.2 50.0		2 2.4 33.3	2 2.4 66.7	1 1.2 100.0	82 25.1

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Notching Flake	Hammer-stone Flake	Unidirec-tional Core	Bidirec-tional Core	Multidirec-tional Core	Biface Early Stage	Biface Middle Stage	Row Total
922	2 8.0 9.5	14 56.0 6.2	9 36.0 14.1								25 7.6
923	1 4.5 4.8	12 54.5 5.3	9 40.9 14.1								22 6.7
924	2 9.1 9.5	15 68.2 6.6	3 13.6 4.7					2 9.1 33.3			22 6.7
925		8 88.9 3.5	1 11.1 1.6								9 2.8
926	2 18.2 9.5	8 72.7 3.5				1 9.1 50.0					11 3.4
927	3 9.4 14.3	21 65.6 9.3	7 21.9 10.9				1 3.1 100.0				32 9.8
928	1 2.8 4.8	24 66.7 10.6	10 27.8 15.6						1 2.8 33.3		36 11.0
Column	21	227	64	1	1	2	1	6	3	1	327
Total	6.4	69.4	19.6	.3	.3	.6	.3	1.8	.9	.3	100.0

* see Table 7.2 for description of material codes

Table 7.2. LA 86148 Material Characteristics

LA 86148 Material Types	
901	Dark gray with orange influence, chalcedony
904	Brown-gray chert
905	Brown-gray chalcedony
906	Purple-gray chalcedony
908	Yellow-brown chert-chalcedony
915	Medium-fine grained chert
916	Medium grained cream-colored chert
Santa Fe Reds Chert Spectrum	
921	Medium-grained red, gray, and orange banded
922	Fine-grained yellow-orange-pink, mottled
923	Medium-grained banded red-gray-pink, waxy
924	Smooth red-purple
925	medium-coarse grained red-gray
926	Fine-grained red with yellow-brown cortex, waxy
927	Medium-coarse grained purple-gray
928	Fine-medium grained pink, gray-white-orange

Table 7.3. LA 86148 Core Flakes by Material Type and Dorsal Scars

Count Row Pct Column Pct	0-2 Flake Scars	3-5 Flake Scars	6-11 Flake Scars	Row Total
80 (chalcedony)	1 33.3 1.1	2 66.7 1.8		3 1.3
100 (silicified wood)	1 100.0 1.1			1 .4
901	6 30.0 6.3	11 55.0 9.7	3 15.0 15.8	20 8.8
905	2 40.0 2.1	3 60.0 2.7		5 2.2
906	5 35.7 5.3	9 64.3 8.0		14 6.2

Count Row Pct Column Pct	0-2 Flake Scars	3-5 Flake Scars	6-11 Flake Scars	Row Total
908	7 43.8 7.4	8 50.0 7.1	1 6.3 5.3	16 7.0
915	4 66.7 4.2	2 33.3 1.8		6 2.6
916	1 20.0 1.1	4 80.0 3.5		5 2.2
921	27 49.1 28.4	24 43.6 21.2	4 7.3 21.1	55 24.2
922	6 42.9 6.3	8 57.1 7.1		14 6.2
923	4 33.3 4.2	8 66.7 7.1		12 5.3
924	5 33.3 5.3	7 46.7 6.2	3 20.0 15.8	15 6.6
925	2 25.0 2.1	5 62.5 4.4	1 12.5 5.3	8 3.5
926	6 75.0 6.3	2 25.0 1.8		8 3.5
927	12 57.1 12.6	7 33.3 6.2	2 9.5 10.5	21 9.3
928	6 25.0 6.3	13 54.2 11.5	5 20.8 26.3	24 10.6
Column Total	95 41.9	113 49.8	19 8.4	227 100.0

* see Table 7.2 for material code description

4 mm and a range from 4 to 13 mm. This suggests that small to medium-sized core flakes were the most common by-product of core reduction. The other 130 core flakes were fragments. The largest category was distal fragments.

Biface flakes are the second most common artifact type (n = 64) and are made of local chert. The biface flakes display technological attributes commonly associated with late stage reduction. Thirty-seven biface flakes had between three and five dorsal scars. Twenty-nine of the biface flakes had discernable platforms. Of these, 26 were abraded, multifaceted, or both, which is indicative of biface production. Only three biface flakes had dorsal cortex and these had less than 50 percent cortex. Low percentages of cortex suggest that raw material was brought to the site in a partly reduced state. High percentages of noncortical flakes are expected with biface manufacture. Biface flakes had a mean length of 25 mm, a standard deviation of 12 mm, and a range of 12 to 38 mm. Mean width was 18 mm with a standard deviation of 18 mm and a range from 9 to 33 mm. Mean thickness was 4 mm with a standard deviation of 4 mm and a range from 1 to 7 mm. The size of the biface flakes indicates that bifaces were either fairly large or that they were being reduced to a portable size to be finished at a later time or at another place.

Cores

Nine cores were recovered from LA 86148. All were Madera chert. The mean measurements were 71 mm in length, 54 mm in width, and 35 mm in thickness. Seven of the cores have less than 30 percent cortex the two remaining cores have 60 and 70 percent cortex (Table 7.4). The small size and low dorsal cortex percentages indicate that they were reduced extensively.

Tools

Twenty-one pieces of utilized debitage and bifacial tools were recovered. These 21 tools had a total of 36 used edges. Twenty-two utilized edges were recorded on 14 core flakes. Biface flakes and bifaces had six edges each. One piece of angular debris had two utilized edges. Tables 7.5 and 7.6 provide descriptive information for each artifact and used edge.

Among the 14 core flakes, the most common edge outline was straight. The core flakes also exhibited the greatest variety of edge damage. Other edge outlines recorded were concave, convex, and concave-convex. Edge damage that was monitored for all 36 edges were feather, crescent scarring, nibbling, step fractures, rounding, crushing, and various combinations of these. Rounding, unidirectional, and even occurred on every edge. Nibbling was the next most common type of damage, occurring on 16 of the 22 edges. Crescent scars occurred on 15 edges and step fractures on 8. Fourteen edges had anles ranging from 30-49 degrees, two were in the 0-29 degree range, and three were in the over 50 degree range.

There were three utilized biface flakes, each with two used edges. All of edges had crescent scars, nibbling, and rounding damage. Step fractures were on three edges, two on the same biface flake. Four of the edge angles fell in the 30-49 degree range and two were in the 0-29 degree range.

Three chert bifaces were recovered from LA 86148. All bifaces were made from Madera chert. The three bifaces had six modified edges. However, one biface accounted for three of the edges, oddly it was also the smallest, measuring 54 mm long, 50 mm wide, and 9 mm in thickness. This biface (FS 31-1) had two of the steepest angles in the entire assemblage, 54 and 59 degrees. Its edges were concave/convex, convex, and straight. All the edges had step fractures, even rounding, and marginal retouch. The convex edge had nibbling.

The other two bifaces had only one utilized edge each. One biface had marginal retouch on a convex edge (FS 22-2). It had the steepest recorded angle in the assemblage (88 degrees). Edge damage consisted of nibbling and even rounding. Measurements for FS 22-2 were 60 mm long by 53 mm wide by 18 mm thick. The remaining biface (FS 22-3) had a straight utilized edge with a 59 degree angle. It had step fractures, nibbling, and unidirectional rounding. The bifaces were not temporally diagnostic. Heavy edge damage suggests that the biface were intensively used. Perhaps they were brought to the site and discarded when suitable replacements could be made.

Twenty-one edges clustered in the 30-49 degree range. Edge angles within this range could have been used for a wide range of cutting and scraping tasks. The large number of edges with nibbling indicates that the edges were not used for prolonged periods. According to Schutt (1982) all the edge damage seen at LA 86148 reflects expedient sawing and scraping.

Ground Stone

Two pieces of ground stone were found at LA 86148. The pieces were recovered during the surface strip of the northwest area of the site. Both were end fragments of one-hand quartzitic sandstone manos.

Research Questions

LA 86148 was excavated to obtain data that could be used to refine the occupation dates, identify the range of subsistence activities, and

Table 7.4. Core Attributes, LA 86148

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thick-ness (mm)	North/ East
924	Medium	Multidirec-tional	20	10	97	80	69	104/107
927	Medium	Bidirectional	0	14	68	46	25	108/107
921	Medium	Multidirec-tional	0	9	80	61	28	106/110
924	Medium	Multidirec-tional	0	13	50	35	24	106/110
905	Medium	Multidirec-tional	0	11	75	56	29	106/111
921	Medium	Unidirec-tional	20	2	58	55	30	106/111
926	Fine	Unidirec-tional	60	2	47	38	24	
904	Medium	Multidirec-tional	70	7	82	52	35	103/119
921	Medium	Multidirec-tional	20	7	83	65	51	106/112

Table 7.5. LA 86148, Utilized Debitage

FS	Artifact Type	Modified Edges	Retouch	Edge Out-line	Edge Angle	Edge Damage
82-1	Core Flake	3	Absent	Concave	33	Crescent scars, step fractures, even rounding
			Absent	Convex	34	Crescent scars, step fractures, unidirectional rounding
			Absent	Convex	40	Crescent scars, unidirectional round
73-1	Core flake	2	Absent	Straight	55	Crescent scars, nibbling, unidirec-tional rounding
			Absent	Straight	23	Crescent scars, nibbling, even rounding
84-1	Angular debris	2	Marginal/ unidirection-al dorsal	Straight/ concave	61	Step fractures, even rounding
			Marginal/ unidirection-al dorsal	Straight	48	Nibbling, even rounding

FS	Artifact Type	Modified Edges	Retouch	Edge Outline	Edge Angle	Edge Damage
56-2	Core flake	1	Absent	Convex	49	Crescent scars, step fractures, nibbling, unidirectional and even rounding
65-2	Core flake	2	Absent	Straight	39	Crescent scars, nibbling, unidirectional and even rounding
			Absent	Convex	38	Nibbling, unidirectional rounding
108-1	Core flake	2	Absent	Concave	35	Nibbling, even rounding
			Absent	Convex	28	Crescent scars, nibbling, unidirectional rounding
39-2	Core flake	1	Absent	Convex	48	Crescent scars, nibbling, even rounding
109-1	Biface flake	2	Absent	Convex/ concave	27	Crescent scars, step fractures, nibbling, even rounding
			Absent	Convex/ concave	44	Crescent scars, nibbling, unidirectional rounding
96-1	Biface flake	2	Absent	Concave	30	Crescent scars, nibbling, even rounding
			Absent	Concave	25	Crescent scars, nibbling, even rounding
36-1	Core flake	1	Absent	Straight	50	Nibbling, unidirectional rounding
31-2	Core flake	2	Absent	Concave	38	Crescent scars, nibbling, unidirectional rounding
			Absent	Concave	26	Nibbling, unidirectional rounding
71-4	Core flake	2	Absent	Concave	28	Crescent scars, nibbling, unidirectional rounding
			Absent	Convex	29	Crescent scars, step fractures, nibbling, even rounding
32-9	Core flake	2	Absent	Convex	49	Crescent scars, step fractures, nibbling, unidirectional rounding
			Absent	Convex	34	Crescent scars, nibbling, even rounding
101-3	Core flake	1	Absent	Straight/ convex	55	Nibbling, unidirectional rounding
8-9	Core flake	2	Absent	Convex	46	Step fractures, nibbling, unidirectional rounding
			Absent	Convex	35	Nibbling, unidirectional rounding
1-2	Core flake	1	Absent	Concave	40	Step fractures, nibbling, unidirectional rounding
30-2	Biface flake	2	Absent	Convex	35	Crescent scars, step fractures, nibbling, even rounding
			Absent	Straight	48	Crescent scars, nibbling, unidirectional rounding

FS	Artifact Type	Modified Edges	Retouch	Edge Outline	Edge Angle	Edge Damage
97-1	Core flake	3	Absent	Convex	40	Crescent scars, nibbling, unidirectional rounding
			Absent	Convex	52	Crescent scars, nibbling, unidirectional
			Absent	Concave	57	Crescent scars, nibbling, step fractures, bidirectional rounding
11-1	Core flake	1	Absent	Concave	33	Nibbling, bidirectional rounding
57-1	Core flake	2	Absent	Convex	62	Crescent scars, step fractures, nibbling, unidirectional rounding
			Absent	Concave	69	Crescent scars, step fractures, nibbling, bidirectional rounding
162-1	Core flake	2	Absent	Convex	43	Crescent scars, step fractures, nibbling, bidirectional rounding
			Absent	Concave	40	Crescent scars, step fractures, nibbling, unidirectional rounding
45-1	Core flake	1	Absent	Straight	55	Crescent scars, nibbling, bidirectional rounding
148-1	Core flake	1	Marginal/ unidirectional	Concave/ convex	79	Crescent, step fractures, nibbling, unidirectional rounding

Table 7.6. Biface Data

FS	Artifact Type	Modified Edges	Retouch	Edge Outline	Edge Angle	Edge Damage
31-1	Biface	3	Marginal, bidirectional	Convex	34	Nibbling, step fractures,even rounding
			Marginal, bidirectional	Straight	54	Step fractures, even rounding
			Marginal, bidirectional	Concave/convex	59	Step fractures, even rounding
22-2	Biface	1	Marginal bidirectional	Convex	88	Step fractures, even rounding
49-6	Biface	1	Absent	Concave	43	Crescent scars, nibbling, even rounding
22-3	Biface	1	Absent	Straight	56	Step fractures, nibbling, unidirectional rounding

to determine site function within late Archaic period subsistence organization. These research domains would be addressed with chronometric, artifact attribute and distribution data, feature, and site structure data. Excavation yielded an artifact concentration consisting of debris from core and biface reduction, discarded flake and formal tools, and the distribution and spatial relationships between the reduction and processing debris. Excavation did not yield chronometric samples, features, or cultural deposits that could be sampled for subsistence information. This section briefly focuses on the research questions using the available data. LA 86148 will be placed in a more appropriate functional context in the synthetic section of this report.

Chronology

Site chronology was based on two En Medio style projectile points that were retrieved during the inventory (Scheick and Viklund 1992:24). No additional chronometric data were yielded by the excavation.

The two projectile points were made from the same white chert and were stylistically identical suggesting that they were from a single occupation. The En Medio style is characterized by a triangular blade with shallow to deep corner notches. It is assigned to a broad time span of 800 B.C. to A.D. 1. This date range, however, has not been tested or refined for the Northern Rio Grande.

Site Function

LA 86148 consists of a chipped stone concentration and scatter. The majority of the artifacts were recovered from a 118-sq-m area. Artifact types and attributes are examined from technological, functional, and spatial perspectives to assess the site function and occupation history.

LA 86148 includes a concentration surrounded by a gradually more dispersed artifact distribution radiating out from the concentration. The artifact concentration (Grid 101-109N/106-112E) contains 182 artifacts within a 56-sq-m area, a 3.25 artifact-per-square-meter density. This high density area can be compared with the more dispersed distribution to the southeast (Grid 96-104N/113-120E). This second area contained 89 artifacts within a 56-sq-m area for a 1.6 artifact-per-square-meter density. These two distributions could result from two separate occupations or represent the gradual dispersion of a concentration from a single occupation. A chi-square test was used to assess if the null hypothesis: that the concentration, more dispersed distribution, and the general site scatter had similar artifact composition. The critical value of 6 degrees of freedom at the .01 significance level is 16.8119. The chi-value for the matrix of area by artifact type (angular debris, core flakes, biface flakes, and core/tools) is 7.325664. The chi-square test failed to reject the null hypothesis. Therefore, the concentration, dispersed scatter, and general site scatter probably result from a single occupation with the extent of the scatter caused by post-abandonment actions.

Artifact type diversity is consistent for the concentration and the more dispersed area. Both areas have utilized debitage, bifacially modified tools, cores, and similar proportions of core and biface reduction debris. The concentration had ground stone fragments and may have had the projectile points, though their exact location is not known. This homogeneity suggests that all artifacts resulted from a single occupation.

Artifact distribution is shown in Figure 7.3. The density map shows the high density area already described. The elongated shape of the distribution resembles the arc-shaped pattern described for the late Archaic period sites excavated at Cochiti Reservoir (Chapman and Biella 1979). The relatively clustered distribution suggests that there was an activity or living area south of the concentration. Concentrated discard patterns result from longer term occupations, where management of activity space was necessary (Kent 1992).

The discard pattern of different sized artifacts may also indicate a purposeful discard pattern as opposed to a more arbitrary discard pattern (Camilli 1979). Figure 7.4 is an isopleth of mean artifact length. It shows mean artifact lengths ranging between 15 and 65 mm. The largest artifact mean length occurs at the edge and to the north of the main artifact concentration, shown in Figure 7.4. This mean artifact length distribution supports the observation that chipped stone discard was patterned rather than arbitrary.

A broad range of activities are indicated by the artifact type composition. Core and biface reduction are the most obvious activities represented by the assemblage. Dorsal cortex percentages for core flakes were dominated by noncortical flakes for all material types, ranging between 38 and 100 percent. Core flakes with more than 50 percent dorsal cortex were 12 percent of the core flakes, indicating that a small amount of early stage reduction occurred, as might be expected with the heavy emphasis on local material use. Fourteen of the 226 core flakes were used or modified. Edge damage is visible after long use of a tool edge or brief use

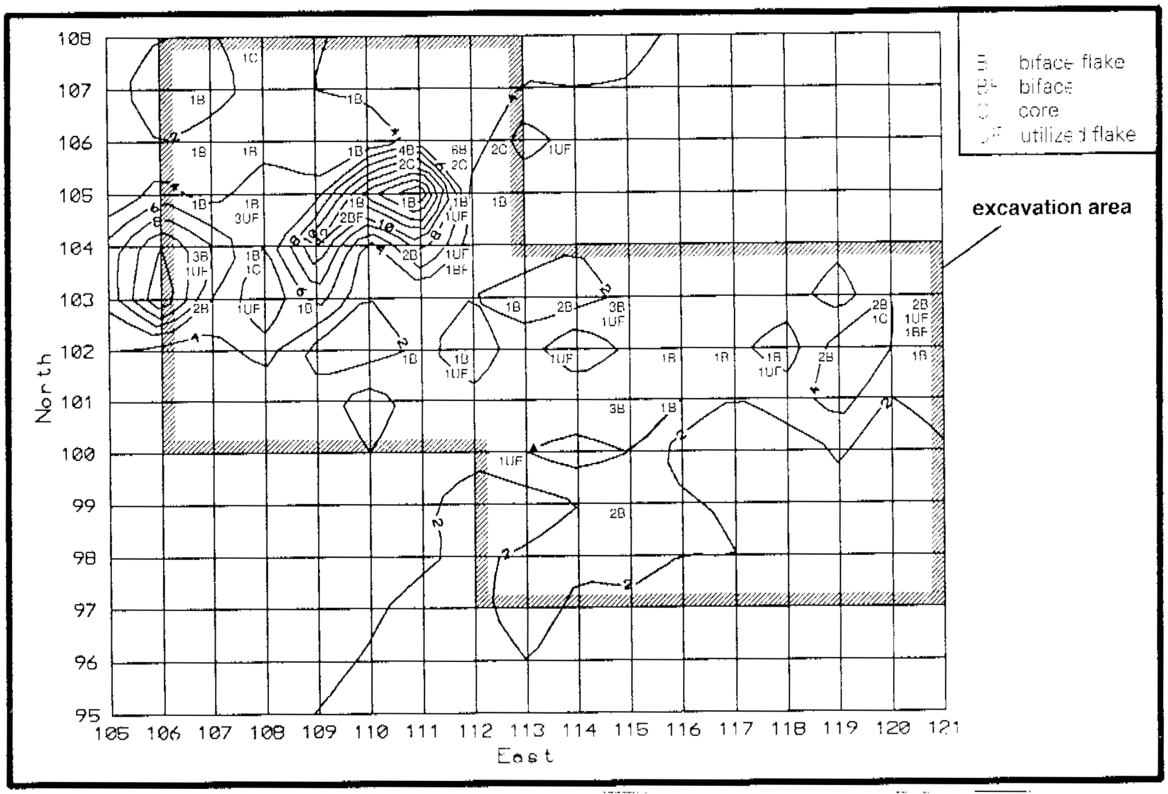

Figure 7.3. LA 86148, artifact density plot.

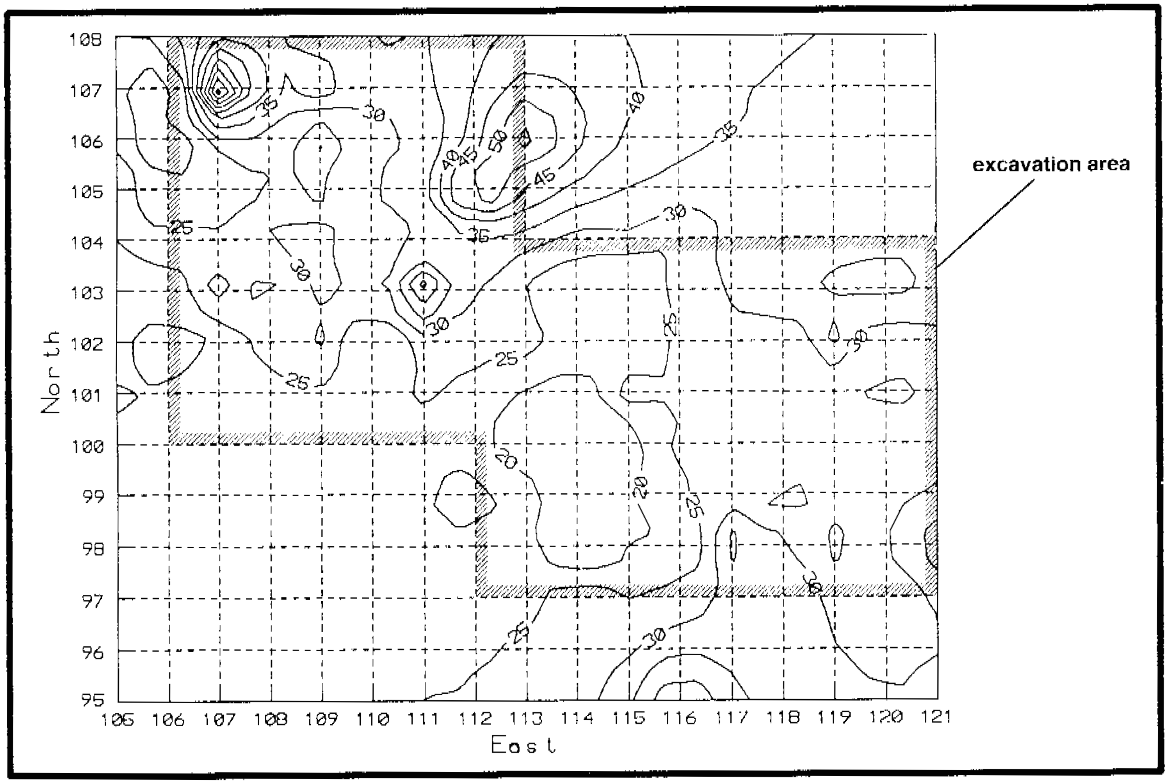

Figure 7.4. LA 86148, artifact length isopleth.

on a hard material. The low percentage of flakes with edge wear suggest that moderately hard to soft materials were processed, so that evidence of use may not have been detectable on many of the edges. Nine of the 14 utilized core flakes had multiple use edges. A high frequency of multiple use edges suggests that the tools were used intensively providing support for the observation that more core flakes may have been used, but the edge damage was not visible.

Biface reduction was not typical of projectile point manufacture. Biface flakes tended to be larger than would be expected for late stage biface manufacture, platforms tended toward single faceted and multifaceted forms in combination, rather than being dominated by retouched forms, and dorsal cortex was observed on three artifacts, indicating biface reduction at its earliest stage. The biface flake data suggest that early and middle stage reduction occurred with late stage reduction. Discarded bifaces made from raw material found in the assemblage were early and middle stage forms. The two projectile points were made from a raw material not present in the assemblage. This suggests that biface reduction was geared to produce early or middle stage bifaces or preforms for transport off-site in support of a logistical subsistence strategy. Three biface flakes were used, indicating that biface and core reduction debris were suitable as tools.

Core reduction and biface production provided flakes for immediate tool use, biface blanks for transport, and relied primarily on local material. These are activities that would be expected for a base camp. Additionally, the utilized flakes and angular debris exhibited a restricted range of edge angles clustering between 30 and 49 degrees. This edge-angle range would have been suited to a wide range of cutting and scraping tasks, but not for processing quantities of hard material, such as wood. A more generalized use of utilized debris would be expected for a base camp rather than a logistical or limited activity site.

A number of lines of evidence combine to indicate that LA 86148 was a limited or short-term base camp. These functional or technological indicators emphasize reduction of local raw material, and the virtual absence of nonlocal reduction debris, the mix of core and biface reduction, the intensive use of flakes as tools, the generalized tasks suggested by the utilized debitage edge angles, and the diverse tool assemblage, including utilized debitage, projectile points, and ground stone artifact. Distribution indicators of the occupation history and intensity are the clustered distribution of the chipped stone combined with the discard pattern evident in mean artifact length distribution. These distribution patterns suggest intentional maintenance of work space, such as would be expected if the occupation lasted more than a few days or a week. Evidence that does not support LA 86148 as a base camp is the lack of thermal features. Base camps are expected to have at least one hearth that was used for heating or cooking. The lack of a hearth is perplexing, but is not strong enough evidence to outweigh the technological, functional, and occupational patterns.

Las Campanas Archaic period sites are examined from the perspective of forager and collector mobility strategies. These strategies should be reflected in the artifact assemblage compositions and distributions. Naturally, the artifact and spatial patterns that might be formed by these strategies are subject to the effects of occupation duration, the number of occupations, group size, and seasonality. As a result of these influences and the difficulty in distinguishing their effects on patterns, different site types must be viewed as a continuum. For instance, residential camps may be termed short-term or long-term base camps based on the number and range of features, permanence of architecture, the frequency and range of discarded tools, and the amount and distribution of lithic reduction debris. Logistical camps or special activity sites may be termed ephemeral, those occupied for a few days; short-term, those occupied for a few weeks; or seasonal, those occupied for a few months (Gerow 1994:8). Seasonal camps may be difficult or impossible to distinguish from short-term residential camps as debris from domestic activities would accumulate as occupation duration increased.

LA 86150

Introduction

LA 86150 was identified by SAC as 290-26 during the Estates III inventory (Scheick and Viklund 1992:25). The site was reexamined by the OAS in May 1993. The extent of the cultural deposit and the surface evidence of thermal features led to the determination that LA 86150 had the potential to yield significant information

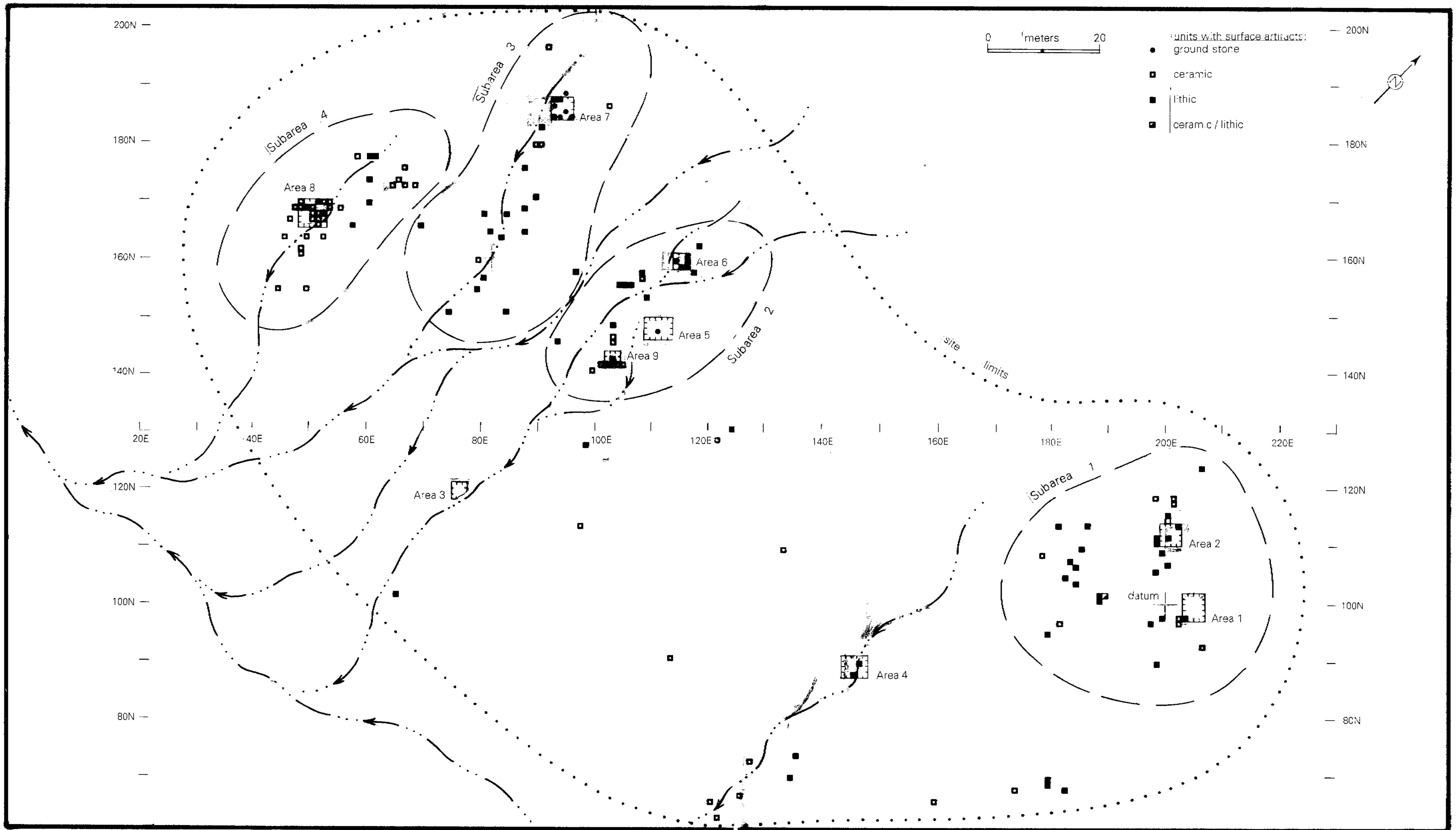

Figure 7.5. LA 86150, site map showing subareas.

on Coalition period foraging strategies. Excavation was conducted in September 1993 under an approved research design and data recovery plan for Estates IV excavations (Post 1993b).

Setting

LA 86150 is on a gentle, dissected, south-facing slope at an elevation of 2,006 m (6,580 ft). The gentle slope extends north from the edge of a deeply dissected arroyo bank to the edge of the grassy, piñon-juniper covered piedmont tableland. The arroyo is a deeply entrenched secondary arroyo that drains a large portion of the south-central portion of the Las Campanas area.

The site surface is deflated and eroded with surface gravel and cobbles mixed with the sandy loam. The soils are typical of the Pojoaque-Panky rolling association. The Pojoaque series exhibits a 20-cm-thick A1 horizon of sandy clay loam. It overlies C1ca horizon that is a gravelly, sandy clay loam (Folks 1975:43). The LA 86150 top soils are very gravelly and have low clay content suggesting a mixed A1 and C1ca horizon.

The vegetation is typical of piñon-juniper woodland. Vegetative cover is sparse to moderate, which may be a reflection of changing land-use patterns. It is most probable that the modern site surface is substantially different from the prehistoric surface. The grassy draw that borders the southwest portion of the site may best exemplify the vegetative ground cover during the prehistoric period. Fuelwood may have been more scattered with feature locations reflecting areas where dead wood was available.

Pre- and Post-Excavation Description

LA 86150 was originally identified as three discrete sherd and lithic artifact concentrations, a light scatter of lithic artifacts, and six soil stains that might be the remains of hearths or roasting pits. The site covers 6,000 sq m and is 120 m east-west by 50 m north-south.

LA 86150 was larger and had more feature/activity areas than were recorded during the original survey or subsequent reexamination. The site dimensions expanded to 180 m north-south by 130 m east-west covering an estimated 20,400 sq m (Fig. 7.5). A total of 208 sherd and chipped stone artifacts were collected. Nine features were identified and excavated. They represented nine occupation episodes because they were spatially discrete. The nine occupation episodes were mainly from the Coalition and early Classic periods based on the presence of Santa Fe Black-on-white, which was most abundant pottery type.

Excavation Methods

The site limits and activity areas were defined by pinflagging the surface artifacts and feature locations. A 1-by-1-m grid system was superimposed across the distribution. Surface artifacts were collected in 1-by-1-m units. The pinflags were left in place after the artifacts were collected to mark concentrations and activity areas for excavation.

Eleven areas were identified for excavation. Nine of the excavation areas had one feature associated with one or more artifacts. Two excavation areas yielded no features or subsurface artifacts. Each area was surface stripped in 1-by-1-m units by removing the loose modern top soil. Surface stripping exposed the feature outlines and fire-cracked rock configurations. Features were excavated following the procedures provided below. After each feature was excavated, an adjacent 1-by-1-m unit was excavated in 10 cm levels to ensure that a noncultural material-bearing level had been reached.

Excavation documentation consisted of field notes and grid forms compiled by the excavator. The forms contained locational, dimensional, stratigraphic, and contextual information. General notes outlining excavation strategy and rationale, field interpretations, and decisions were kept by the project director and site assistants.

Feature excavation began with exposing the top of the feature and the area immediately surrounding it. The stain or soil change was mapped and photographed (if appropriate). The feature was excavated in cross section in 10 cm levels, exposing the natural stratigraphy. The exposed cross section was profiled and described using a Munsell Color Chart and standard geomorphological terms. The second half of the feature was excavated in natural levels or 10 cm arbitrary levels. At least 1 liter of soil was collected from within the feature for water-screening in the lab. For the larger features, multiple samples were collected from different areas to increase the potential for retrieving charred plant remains.

After excavating the feature, feature maps and profiles were drawn and tied into the grid system. Drawings included a scale, north arrow, and key to abbreviations and symbols. Written descriptions were kept on standard forms that included provenience, dimensional, soil matrix, artifact, construction, temporal, excavation technique, and other data. Photographs included a metric scale, north arrow, and mug board with the LA and feature number, and date. All photographs were recorded on a photo data sheet.

The site was mapped with a transit and stadia rod. Mapping stations corresponded to staked grid corners. All elevations were tied into the main site datum at 100N/200E.

Excavation Areas

Nine excavation areas yielded the remains of features and dispersed remains of former artifact concentrations. Table 7.7 provides general information about each excavation area. The excavation areas were combined into Subareas 1 through 5 based on the distribution of artifacts and features. Figure 7.6 shows schematic drawings of the excavation areas.

Subarea 1 consists of Areas 1 and 2 and it is in the eastern portion of the site. Based on the artifact distribution, Subarea 1 was 35 m north-south by 30 m east-west covering a 1,050-sq-m area. A total of 54 sherds (Vessels 1, 4, and 5) and 28 chipped stone artifacts were recovered. Thirty-two grids contained sherds and lithic artifacts. The sherds occur within 10 m of the features. The lithic artifacts are more dispersed, primarily distributed in the western one-quarter of Subarea 1.

Subarea 2 is in the north-central portion of the site. It combines Excavation Areas 5, 6, and 9, all of which had ephemeral remains of thermal features. Subarea 2 was 25 m north-south by 21 m east-west covering a 525-sq-m area. This subarea was bisected by a shallow erosion channel. The surface was deflated and eroded and the features (5, 6, and 9) were in poor condition. Ten sherds (Vessel 4) and 21 lithic artifacts were recovered. They were mostly associated with Excavation Areas 6 and 9. Area 5 had two mano fragments associated with Feature 5.

Subarea 3 is west of Subarea 2. It consists of an elongated artifact distribution that follows the predominant drainage pattern. It was 53 m north-south by 32 m east-west covering 1,696 sq m. It includes Excavation Area 7, which was located at the deflated remains of a hearth. The hearth area was associated with small numbers of sherds, chipped stone, and one mano fragment, two indeterminate metate fragments, and two slab metate fragments. Ten sherds and five chipped stone artifacts were recovered. The elongated artifact distribution is dispersed to the south of the hearth area, making it difficult to prove temporal and functional association.

Subarea 4 is in the western portion of the site and adjacent to Subarea 3. The sherd and lithic artifact scatter was 25 m north-south by 25 m east-west covering 625 sq m. Subarea 4 includes Excavation Area 8 and a hearth, Feature 8. The associated artifact assemblage consisted of 40 sherds of Santa Fe Black-on-white pottery (Vessels 2, 3, 6, and 7) and 7 chipped stone artifacts. The sherds cluster around Feature 8, suggesting that they are temporally and functionally related. Although Subarea 4 is deflated and an erosion channel passes through Excavation Area 8, Feature 8 was is in good condition.

Excavation Area 4 was not assigned to a subarea. It is in the southeast portion of the site and had very few associated artifacts. However, Excavation Area 4 contained the largest rock-filled roasting pit excavated during the OAS excavations. Feature 4 was visible as a slight soil stain within a shallow erosion channel. Unfortunately, pottery was not associated with Feature 4 and it cannot be assigned to an occupation period.

The remaining site area not included in the four subareas consists of a highly dispersed artifact scatter with artifacts separated by 10 to 12 m. Excavation Area 3 is included in the general site area because it was not associated with artifacts and it was mostly removed by a recent deep erosion channel. A total of 9 sherds and 13 chipped stone artifacts were recovered from outside the four subareas and Excavation Area 4.

Feature Descriptions

Nine features that were identified as surface soil stains or concentrations of fire-cracked rock were

Table 7.7. Excavation Area Data, LA 86150

Location	Setting	Condition	Size (m)	Feature	Artifacts
1 (Subarea 1)	On a gentle south-facing slope	Surface is deflated with a loose cover of sandy top soil	5 n-s by 4 e-w	Basin-shaped pit with fire-cracked rock (Feature 1)	Sherds, lithics
2 (Subarea 1)	On a gentle south-facing slope	Surface is deflated with a loose cover of sandy top soil. Juniper tree is in the middle of the unit	4 n-s by 4 e-w	Basin-shaped pit with fire-cracked rock (Feature 2)	Sherds, lithics, ground stone
3 (general site area)	Near the bottom of a grassy draw in an area dissected by small drainages	The surface is deflated and eroded with the southeast quarter cut by an erosional channel.	3 n-s by 3 e-w	Oval-shaped pit (Feature 3)	None
4 (general site area)	On a gentle south-facing gravel slope	The surface is deflated and eroded with a shallow, modern erosion channel bisecting the area.	4 n-s by 5 e-w	Rock-filled roasting pit; two possible use episodes.	Lithics
5 (Subarea 2)	Upper portion of a gentle southwest-facing slope	The surface is deflated and eroded.	4 n-s by 5 e-w	Deflated fire-cracked rock concentration (Feature 5)	Ground stone
6 (Subarea 2)	On a gentle southwest-facing slope	The surface is deflated and eroded. The unit is bisected by a shallow modern erosion channel.	3 n-s by 3 e-w	Deflated fire-cracked rock concentration (Feature 6)	Lithics
7 (Subarea 3)	On a gentle southwest-facing slope	The surface is deflated and eroded with a loose cover of top soil. A shallow modern erosion channel bisects the unit.	4 n-s by 4 e-w	Deflated fire-cracked rock concentration (Feature 7)	Sherds, ground stone, lithics
8 (Subarea 4)	Near the bottom of a gentle southwest-facing slope above a grassy draw	The surface is deflated and eroded with a loose cover of top soil. A shallow modern erosion channel cuts through the southeast quarter of the unit.	5 n-s by 5 e-w	Basin-shaped pit with fire-cracked rock (Feature 8)	Sherds, lithics
9 (Subarea 2)	On a gentle southwest-facing slope	The surface is deflated with a loose cover of top soil. Bedrock is exposed in a nearby drainage	3 n-s by 3 e-w	Bifurcated, basin-shaped pit with fire-cracked rock	Sherds, lithics

Table 7.8. Feature Data, LA 86150

No.	Type	Location	Size (cm) and shape	Fill	Comments
1	Basin-shaped pit with fire-cracked rock	99-100N/ 204-206E, Area 1, Subarea 1	130 n-s by 120 e-w by 16 deep; circular	Dark brown soil, charcoal stained with burned and fire-cracked rock and slabs	Shallow pit excavated into native soil; did not appear to be slab lined, relatively small amount of burned and fired-cracked rock. One Santa Fe Black-on-white sherd from inside the pit.
2	Basin-shaped pit with fire-cracked rock	111-113N/ 203E, 112N/ 204E, Area 2, Subarea 1	157 n-s by 160 e-w by 20 deep; slightly oval	Dark brown, charcoal-stained alluvium mixed with fire-cracked rock and a few flecks of charcoal	Oblong pit excavated into native soil; small amounts of fire-cracked rock, no artifacts from within the feature.
3	Oval-shaped pit	120N/78-79E, Area 3, general site area	56 n-s by 38 e-w by 12 deep; probably oval-shaped	Dark brown, sandy charcoal-stained soil, no fire-cracked rock; mixed primary and secondary deposit	Part of an oblong shallow pit cut by an erosion channel. No artifacts from within or associated with the feature.
4	Fire-cracked rock-filled pits	89-91N/ 145-147E, Area 4	Pit A: 175 n-s by 150 e-w by 40 deep; roughly oval-shaped Pit B: 150 n-s by 162 e-w by 25 deep; roughly oval-shaped	Pit A: filled with fire-cracked cobbles mixed with dark brown to black sandy alluvium that is charcoal stained; Pit B: filled with mottled redeposited sandy loam mixed with scattered fire-cracked rock and pebbles.	Pits A and B represent reuse of the activity area. Pit B was used first and was probably filled with fire-cracked rock. Pit A was excavated through Pit B with the Pit B fire-cracked rock reused in Pit A. This observation is based on the scattered presence of fire-cracked rock in Pit B indicating that all of the fire-cracked rock was not removed. No artifacts were recovered from within the pits.
5	Deflated fire-cracked rock concentration	148-149N/ 112E, Area 5, Subarea 2	75 n-s by 65 e-w by undetermined depth; indeterminate shape	The fill was mottled redeposited brown sandy loam with a few flecks of charcoal and about 70 pieces of fire-cracked rock. No artifacts were recovered from within the feature.	The feature was deflated with the surface indications representing the bottom or lower portion of feature. Originally it may have been a shallow feature.
6	Deflated fire-cracked rock concentration	160N/115E, Area 6, Subarea 2	55 n-s by 62 e-w by undetermined depth; indeterminate shape	The fill was burned coarse sand mixed with decomposing sandstone bedrock. The soil was charcoal stained. A few fire-cracked rocks remained.	The feature was in an eroded and deflated area, bisected by a shallow drainage. There is a dispersed sherd and lithic scatter that may be associated. Two lithic artifacts were recovered from the immediate area.

No.	Type	Location	Size (cm) and shape	Fill	Comments
7	Deflated fire-cracked rock cluster	187N/94E, Area 7, Subarea 3	120 n-s by 90 e-w by undetermined depth; indeterminate shape	The fill was fine brown sandy loam mixed with gravel, a small amount of fire-cracked rock, and unburned cobbles. The was no charcoal or ash-staining present.	On the north edge of a dispersed sherd and lithic artifact scatter. Scattered fragments of a single vesicular basalt metate are associated with one mano. Feature was deflated and defined by a ring of burned quartzite cobbles.
8	Basin-shaped pit with fire-cracked rock	168-170N/ 51-52E, Area 8, Subarea 4	205 n-s by 125 e-w by 8 to 17 deep; oval-shaped	The fill was brown to black charcoal-stained sand mixed with unstained deposits of coarse-grained sand and pea gravel. 25 burned cobbles were recovered from the perimeter of the feature.	An oval-shaped roasting pit associated with a scatter of Santa Fe Black-on-white and dispersed lithic artifacts.
9	Possible hearth	143-144N/ 104-105E, Area 9, Subarea 2	110 n-s by 74 e-w by 20 deep; oval-shaped	The fill was lightly charcoal stained and mottled sandy loam mixed with small pieces of fire-cracked rock.	An oval-shaped pit was located on a gentle slope near a dispersed sherd and lithic scatter. No artifacts are directly associated. The fill is mottled and fairly clean suggesting a mostly secondary deposit.

excavated. Feature locations are shown on the site map (Fig. 7.5). Table 7.8 contains morphological and stratigraphic information for each feature. The shape and contents of the features allow them to be grouped into four classes: deflated fire-cracked rock concentrations; an oval-shaped pit; basin-shaped pits with fire-cracked rock; and a rock-filled roasting pit.

Three features, 5, 6, and 7, were identified as deflated fire-cracked rock concentrations (Figs. 7.7-7.11). All were located in the north-central portion of the site. These features had limits that were defined by fire-cracked rock or lightly stained soil. The stained soil appeared to be the bottom of the feature. Because feature walls and limits could not be confidently delineated, it was suggested that the features originally were shallow. These features did not yield ethnobotanical or chronometric information. Their general association with Santa Fe Black-on-white pottery allows tenuous temporal assignment to the Coalition or early Classic period. The lack of ethnobotanical data hinders any functional interpretation. Feature 7's association with metate fragments suggests use in conjunction with plant processing.

An oval-shaped pit, Feature 3, was isolated in the south-central portion of the site. It was not associated with any artifacts. It was located on the edge of and had been bisected by an erosion channel. Functional and temporal assignment for Feature 3 cannot be made. It did not yield ethnobotanical data. Its discrete location suggests that it may not be contemporaneous with the other features.

Four basin-shaped pits with fire-cracked rock were excavated. These included Features 1, 2, 8, and 9 (Figs. 7.12-7.19). Features 1, 2, and 8 were circular or slightly oval shaped, they contained dark charcoal stained fill, and they were associated with numerous sherds of Santa Fe Black-on-white pottery. In form and fill content these features are similar to the pottery-firing features excavated at LA 86159 and LA 84793, and the thermal features excavated at LA 98690.

Feature 1 in Subarea 1 yielded exfoliated sherds that resemble a pottery misfire (Figs. 7.12-7.13). Spalled and exfoliated sherds are one of the strongest criteria for identifying pottery-firing features. Another important characteristic

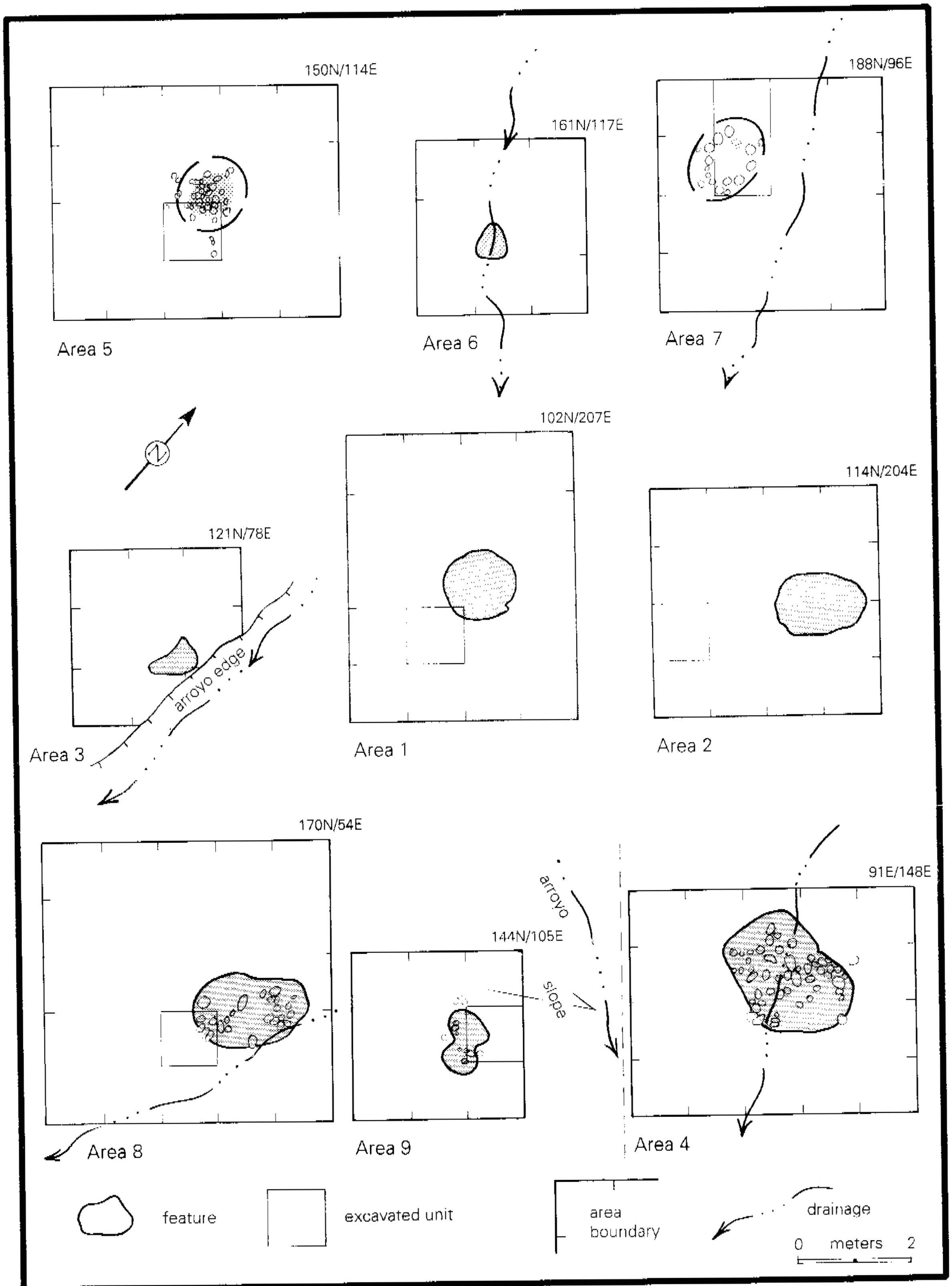

Figure 7.6. LA 86150, schematic drawings of excavation areas and feature locations.

Figure 7.7. LA 86150, Feature 5.

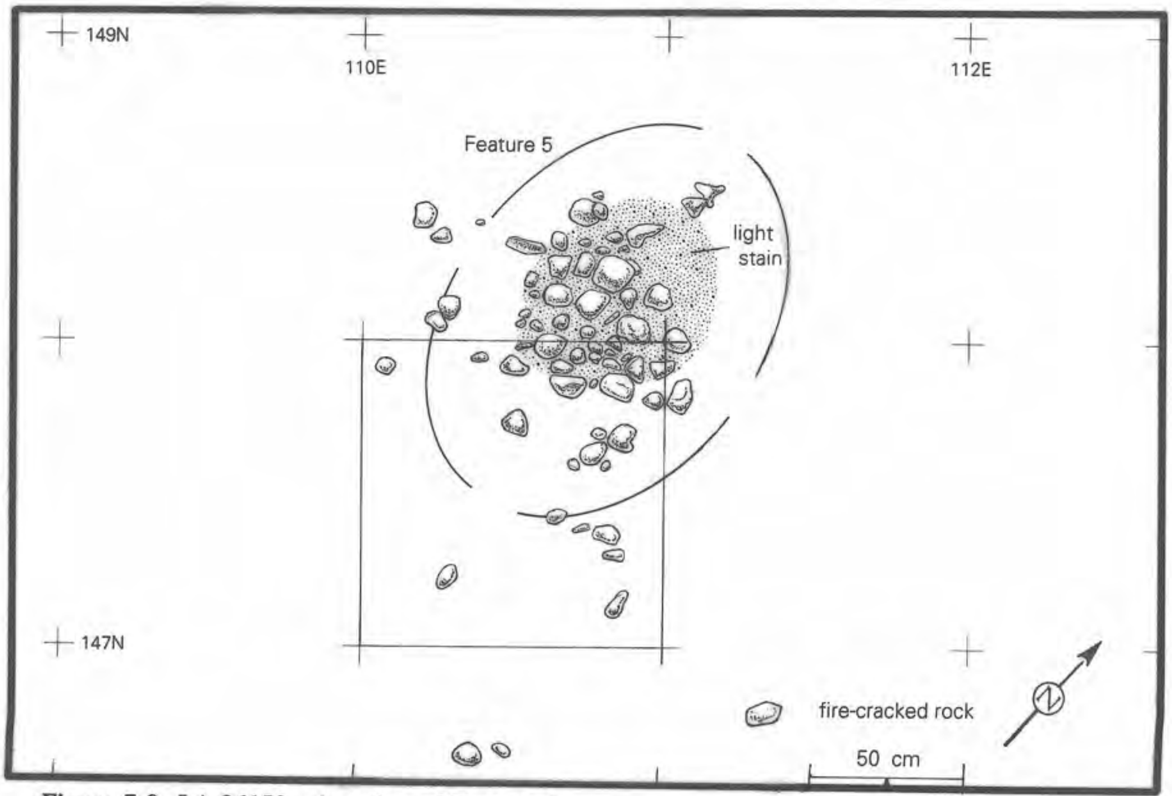

Figure 7.8. LA 86150, plan view of Feature 5.

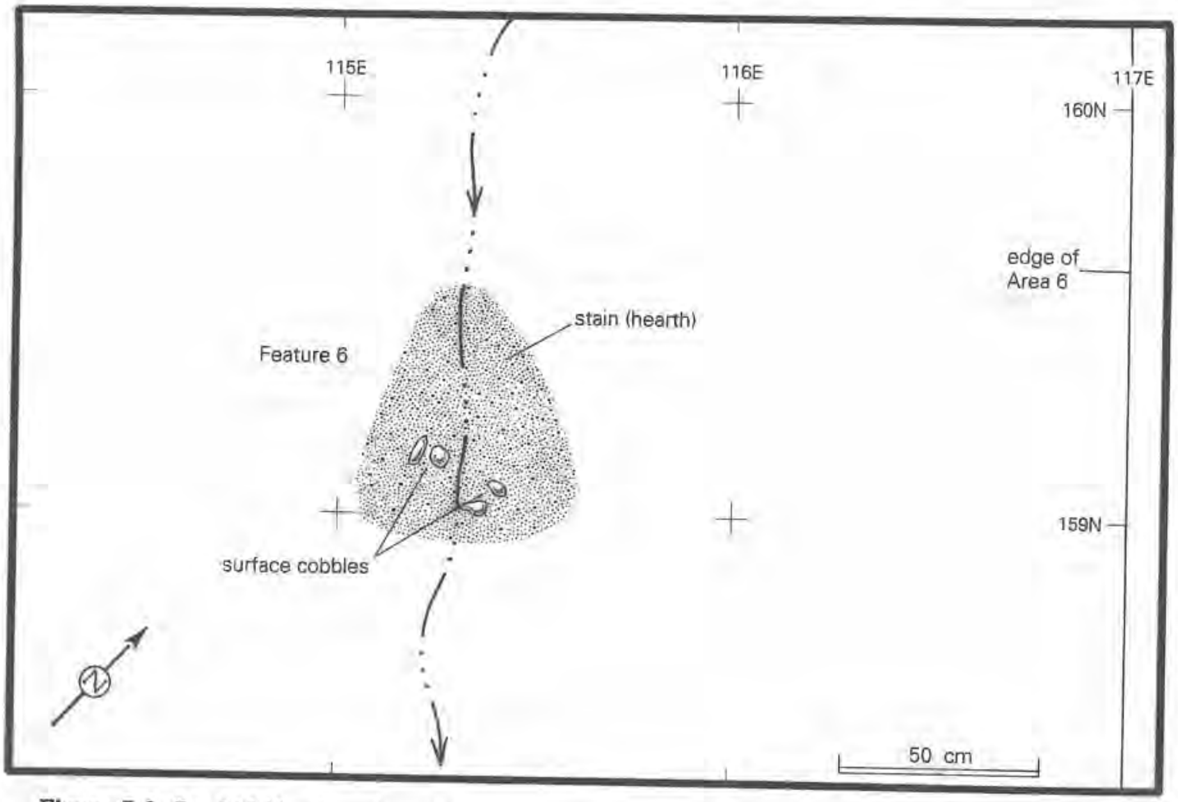

Figure 7.9. LA 86150, plan view of Feature 6.

is the darkly stained "greasy fill" that results from the secondary firing (Swink 1993). Fire-cracked rock was inadvertently removed with the fill, obscuring the actual stratigraphic relationship between the fire-cracked rocks and the pottery. Feature 1 may have been a pottery firing feature similar to Feature 1 from LA 84793 and Feature 1 from LA 86159. Feature 8 exhibits stratigraphic and morphological similarities with the pottery-firing features, but lacked spalls or spalled sherds (Figs. 7.14-7.15).

Features 2 and 9 are associated with pottery that exhibits breakage and surface treatments consistent with vessels used in association with food processing or consumption (Figs. 7.16-7.19). It is possible that these features are similar to Features 1 and 2 from LA 98690 in the Las Campanas project. Because no economic plant species were recovered from these features, a plant processing function is difficult to confirm.

Feature 4 was identified as two superimposed fire-cracked rock-filled pits (Figs. 7.20-7.21). Pit B appeared to be the earliest pit as evidenced by the less concentrated fire-cracked rock. Pit A was excavated through Pit B and was filled almost completely with heavily burned fire-cracked rock and dark charcoal-stained soil. The fire-cracked rock in Pit A was so dense that a stratigraphic profile was almost impossible to define. The ethnobotanical samples collected from Pits A and B did not yield economic plant species, except for small amounts of wood charcoal. The density of fire-cracked rock in Pit A suggests that a hot fire was built and the rocks were placed in the fire, heated, and processing or cooking occurred on top of the rocks, and not directly in the flames. This kind of roasting might have been used for piñon nuts (Ellis 1978). The relatively large size of the feature and the intensity of the fire suggests that a large quantity of gathered foods may have been processed in two separate episodes. No temporally diagnostic artifacts were associated with Feature 4. Artifact counts in this area were low and none of the artifacts could be confidently assigned to Feature 4 activity.

Artifact Assemblage

Pottery
by Steven A. Lakatos

A total of 118 sherds were recovered from the surface and four subareas. Seven vessels were

Figure 7.10. LA 86150, Feature 7, excavated.

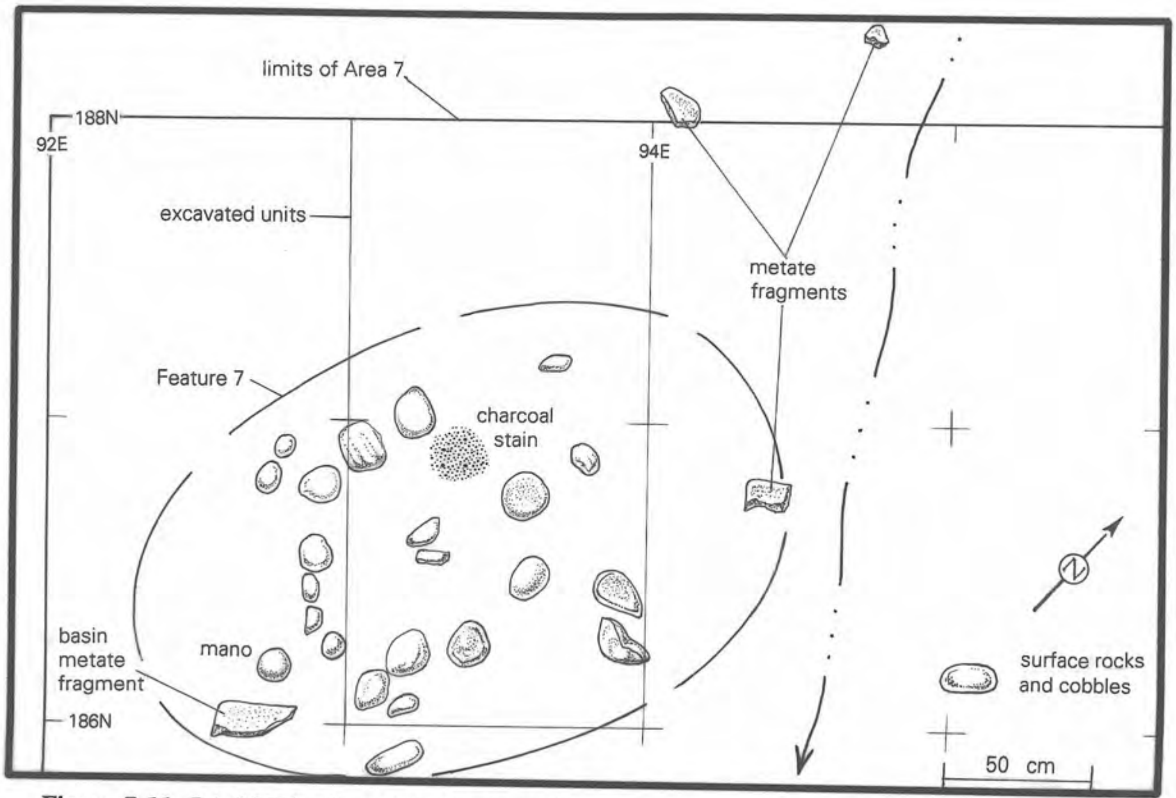

Figure 7.11. LA 86150, plan view of Feature 7.

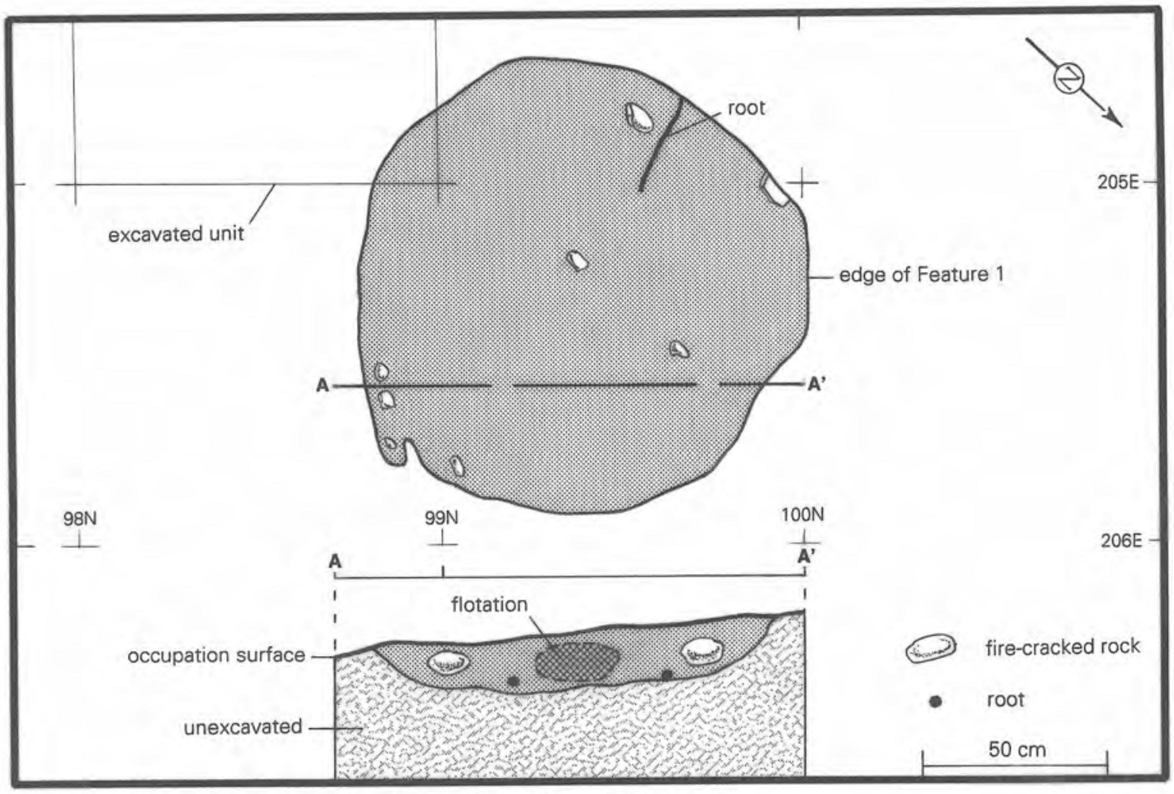

Figure 7.12. LA 86150, plan view and profile of Feature 1.

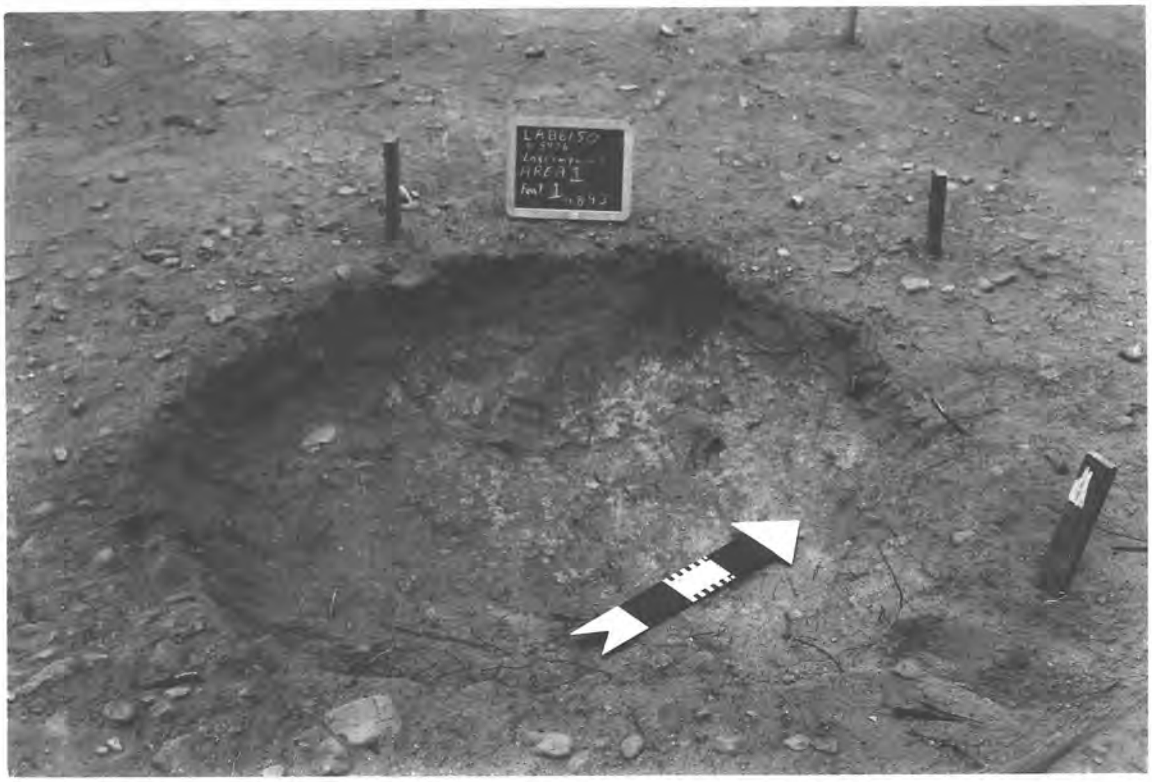
Figure 7.13. LA 86150, Feature 1, excavated.

Figure 7.14. LA 86150, Feature 8, excavated.

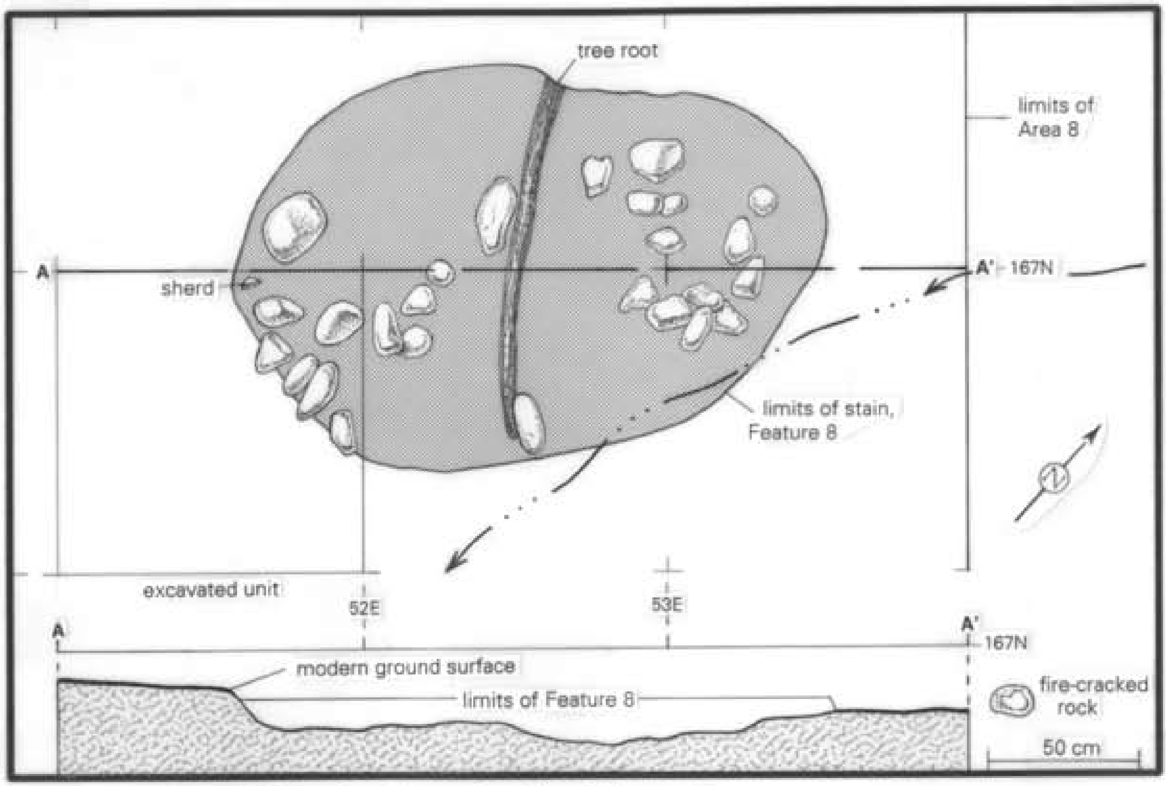

Figure 7.15. LA 86150, plan view and profile of Feature 8.

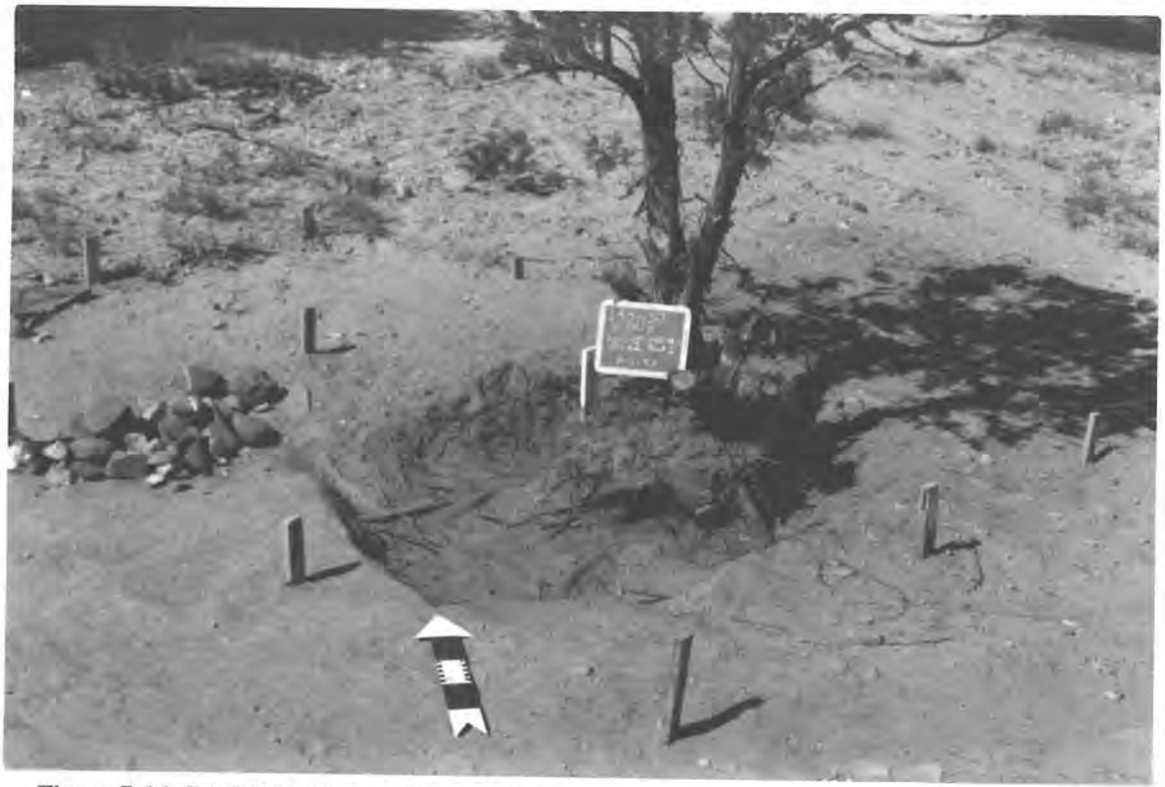

Figure 7.16. LA 86150, Feature 2, excavated.

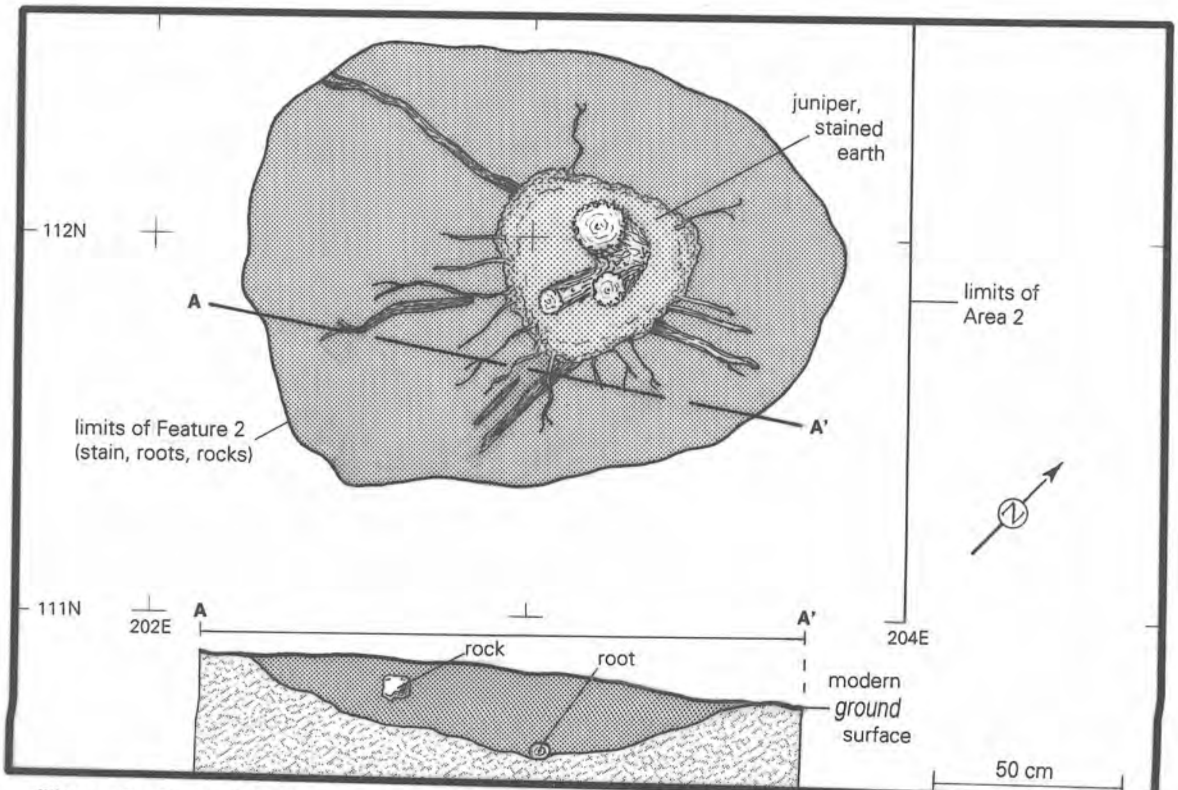

Figure 7.17. LA 86150, plan view and profile of Feature 2.

Figure 7.18. LA 86150, Feature 9, excavated.

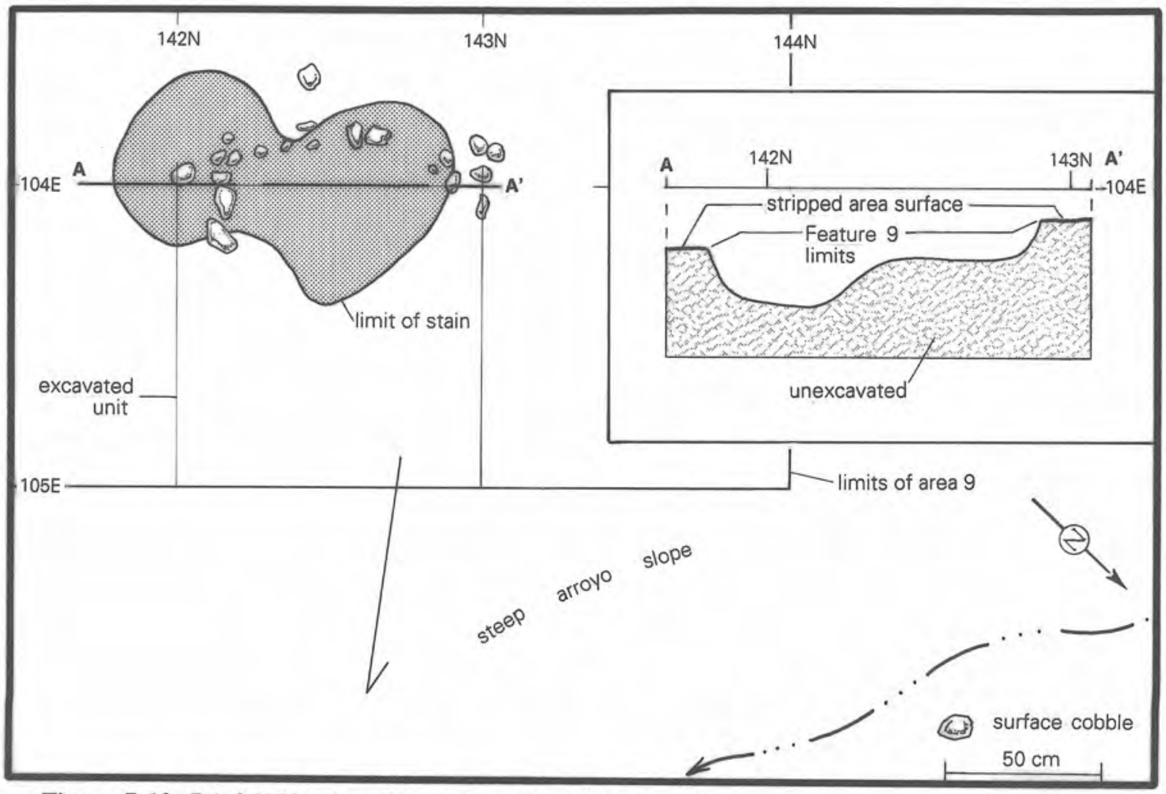

Figure 7.19. LA 86150, plan view and profile of Feature 9.

Figure 7.20. LA 86150, Feature 4, excavated.

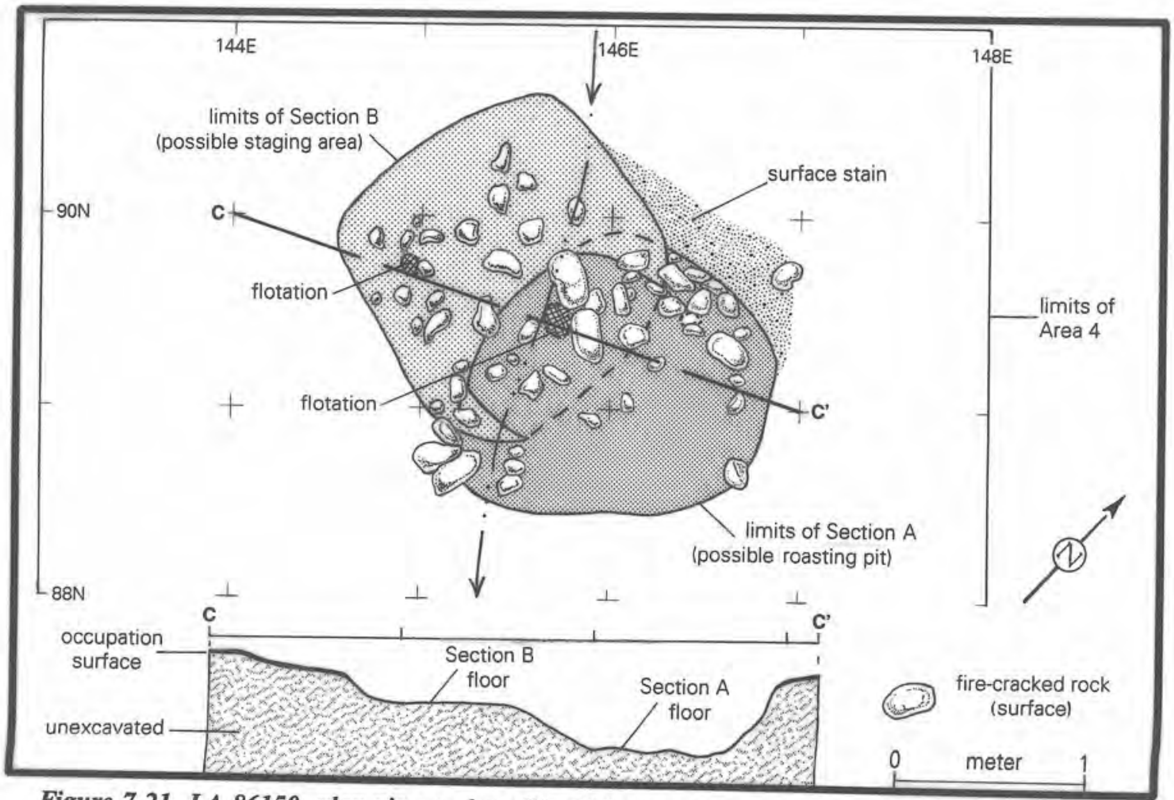

Figure 7.21. LA 86150, plan view and profile of Feature 4.

identified in the assemblage; 29 sherds were not assigned to a vessel. All vessels were identified as Santa Fe Black-on-white bowls. Four jar sherds were identified among those not assigned to a vessel, including one sherd of Kwahe'e Black-on-white. Table 7.9 shows the distribution of vessels recovered from each excavation area and the surface.

Bowls are the dominant vessel form from LA 86150. Rim sherds comprise 21 percent and body sherds comprise 77 percent of the assemblage. The relatively high percentage of rim sherds suggests that whole or large portions of vessels were brought to the site. Bowls are the bulk of decorated ceramics during the fourteenth century in the Northern Rio Grande (Habicht-Mauche 1993; Mera 1935; Stubbs and Stallings 1953). Table 7.10 shows the distribution of vessel form and portion by vessel.

Bowl rim forms range from flat (40 percent), tapered and flat (10 percent), to rounded or tapered and rounded (50 percent) (Table 7.11). Variability in rim form on a single vessel is a common trait for Santa Fe Black-on-white (Kidder and Amsden 1931). A wide variety of rim forms were identified in the Arroyo Hondo assemblage.

Bowl exteriors are usually scraped with horizontal striations common. A light to moderate exterior polish is displayed on 11 percent of the sherds. Polishing on the exterior of Santa Fe Black-on-white bowls was also reported in low percentages for the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) ceramic assemblages. Table 7.12 shows the location and degree of polish by vessel.

The majority of the sherds exhibit a variety of interior surface treatments other than smoothing. A gray floated slip combined with medium to high polish is present on 32 percent of the interior surfaces. A thin to moderately applied white slip combined with a medium to high polish is present on 27 percent of the assemblage. Table 7.13 shows slip thickness and location in the LA 86150 assemblage.

Paste color and texture are markedly similar throughout the assemblage, which is typical of Santa Fe Black-on-white. The paste is hard, light gray to gray (7.5YR 7/0-5/0), and fine grained in 97 percent of the examined sherds. Self-tempered clay was recorded for all sherds examined and is usually invisible without the aid of a microscope (30x-40x).

Decorated sherds comprised 54 percent of the assemblage. Pigment, usually located on the interior surfaces, consisted exclusively of black carbon paint. The color ranged from thick black (2.5YR 3/0-5/0), thin, streaky (2.5YR 3/0-6/0), to ghosted (2.5YR 7/0, 6/0, 6/2). Thick, black, well-bonded pigment is the dominant paint quality, constituting 78 percent of the decorated sherds. Thin streaky paint comprises 12 percent of the assemblage and resembles what Habicht-Mauche describes as "watery consistency" (1993:22).

Ghosted pigment comprises 10 percent of the assemblage. Ghosted paint is faintly visible on the surface and nearly invisible without applying water for contrast. Paint appearance on Santa Fe Black-on-white ceramics from Arroyo Hondo Pueblo ranged from very dark gray (2.5YR 3/0) to gray (2.5YR 5/0). Table 7.14 shows the quality and location of paint by vessel.

Design layouts and elements in the decorated assemblage are consistent with those described for the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) assemblages. Design layout for Vessels 1-7 are listed in Table 7.15.

Summary

The Santa Fe Black-on-white and Kwahe'e Black-on-white pottery from LA 86150 surface treatments, paste, and temper characteristics fall within the range of variability outlined by Kidder and Amsden (1931), Mera (1935), Stubbs and Stallings (1953) and Habicht-Mauche (1993) among others. Sherds assigned to Vessels 1-4 and 6-7 displayed an even breakage pattern with a flat cross section. This type of breakage pattern is typical of Santa Fe Black-on-white pottery broken by ordinary domestic use. Sherds assigned to Vessel 5 display a breakage pattern that is atypical of Santa Fe Black-on-white.

Vessel 5 was recovered from Feature 1, a thermal feature. The exterior surface of 18 body sherds, the interior surface of 1 body sherd, and 11 rim sherds are completely spalled. These sherds tend to be thinner with fewer intact surfaces than sherds spalled or exfoliated by natural processes. Both surfaces of all but one sherd are heavily burned and sooted. The spalled and sooted sherds are similar to sherds of Santa Fe Black-on-white pottery recovered from LA 86159 and LA 84793, suggesting Vessel 5 may represent a pottery-firing failure. Pottery-firing and associated assemblages are discussed in the

Table 7.9. LA 86150 Subareas by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Subarea 1	5 9.3 17.2	12 22.2 100.0			1 1.9 4.8	36 66.7 100.0			54 45.8
Subarea 2					10 100.0 47.6				10 8.5
Subarea 3	2 40.0 6.9				3 60.0 14.3				5 4.2
Subarea 4	13 32.5 44.8		5 12.5 100.0	6 15.0 100.0	7 17.5 33.3		5 12.5 100.0	4 10.0 100.0	40 33.9
Surface	9 100.0 31.0								9 7.6
Column Total	29 24.6	12 10.2	5 4.2	6 5.1	21 17.8	36 30.5	5 4.2	4 3.4	118 100.0

Table 7.10. LA 86150 Vessel Form and Portion by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Indeterminate	2 16.7 6.9					10 83.3 27.8			12 10.2
Bowl rim	4 16.0 13.8	3 12.0 25.0		4 16.0 66.7		11 44.0 30.6	3 12.0 60.0		25 21.2
Bowl body	19 24.7 65.5	9 11.7 75.0	5 6.5 100.0	2 2.6 33.3	21 27.3 100.0	15 19.5 41.7	2 2.6 40.0	4 5.2 100.0	77 65.3
Jar body	4 100.0 13.8								4 3.4
Column Total	29 24.6	12 10.2	5 4.2	6 5.1	21 17.8	36 30.5	5 4.2	4 3.4	118 100.0

Table 7.11. LA 86150 Rim Form by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Not applicable	24 26.4 85.7	9 9.9 75.0	5 5.5 100.0	3 3.3 50.0	21 23.1 100.0	22 24.2 73.3	3 3.3 60.0	4 4.4 100.0	91 82.0
Rounded	2 40.0 7.1	1 20.0 8.3		2 40.0 33.3					5 4.5
Tapered	1 100.0 3.6								1 .9
Flat						8 100.0 26.7			8 7.2
Tapered and rounded	1 25.0 3.6			1 25.0 16.7			2 50.0 40.0		4 3.6
Tapered and flat		2 100.0 16.7							2 1.8
Column Total	28 25.2	12 10.8	5 4.5	6 5.4	21 18.9	30 27.0	5 4.5	4 3.6	111

Table 7.12. LA 86150 Degree of Polish by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Absent	2 13.3 7.1					13 86.7 43.3			15 13.5
Light interior	2 40.0 7.1	2 40.0 16.7	1 20.0 20.0						5 4.5
Medium interior	8 47.1 28.6	4 23.5 33.3			3 17.6 14.3		2 11.8 40.0		17 15.3
Heavy interior	9 20.0 32.1	6 13.3 50.0	4 8.9 80.0	2 4.4 33.3	16 35.6 76.2	3 6.7 10.0	2 4.4 40.0	3 6.7 75.0	45 40.5
Heavy exterior	1 100.0 3.6								1 .9
Light interior/exterior				1 100.0 16.7					1 .9

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Medium interior, light exterior					1 100.0 4.8				1 .9
Heavy interior, light exterior	1 16.7 3.6			3 50.0 50.0	1 16.7 4.8			1 16.7 25.0	6 5.4
Heavy interior, medium exterior	1 100.0 3.6								1 .9
Light exterior	3 100.0 10.7								3 2.7
Indeterminate	1 6.3 3.6					14 87.5 46.7	1 6.3 20.0		16 14.4
Column Total	28 25.2	12 10.8	5 4.5	6 5.4	21 18.9	30 27.0	5 4.5	4 3.6	111 100.0

Table 7.13. LA 86150 Slip Thickness and Location by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Absent	9 39.1 32.1					13 56.5 43.3	1 4.3 20.0		23 20.7
Thin white interior	3 100.0 10.7								3 2.7
Medium white interior	4 14.8 14.3	2 7.4 16.7			21 77.8 100.0				27 24.3
Thick white interior	1 33.3 3.6					2 66.7 6.7			3 2.7
Medium white exterior	1 100.0 3.6								1 .9
Floated interior	8 22.2 28.6	10 27.8 83.3	5 13.9 100.0	6 16.7 100.0			3 8.3 60.0	4 11.1 100.0	36 32.4
Obscured	2 11.1 7.1					15 83.3 50.0	1 5.6 20.0		18 16.2
Column Total	28 25.2	12 10.8	5 4.5	6 5.4	21 18.9	30 27.0	5 4.5	4 3.6	111 100.0

Table 7.14. LA 86150 Paint Color and Appearance by Vessel

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	Row Total
Absent	9 24.3 32.1				12 32.4 57.1	13 35.1 43.3	1 2.7 20.0	2 5.4 50.0	37 33.3
Thin streaky black interior	2 33.3 7.1			1 16.7 16.7	3 50.0 14.3				6 5.4
Thin streaky black exterior	1 100.0 3.6								1 .9
Thick black interior	12 26.7 42.9	10 22.2 83.3	4 8.9 80.0	5 11.1 83.3	6 13.3 28.6	3 6.7 10.0	3 6.7 60.0	2 4.4 50.0	45 40.5
Thick black exterior	1 100.0 3.6								1 .9
Medium black interior	1 100.0 3.6								1 .9
Ghosted black interior	2 33.3 7.1	2 33.3 16.7	1 16.7 20.0				1 16.7 20.0		6 5.4
Obscured						14 100.0 46.7			14 12.6
Column Total	28 25.2	12 10.8	5 4.5	6 5.4	21 18.9	30 27.0	5 4.5	4 3.6	111 100.0

Table 7.15. LA 86150 Design Layout by Vessel

Vessel	Design Layout
1	An encircling band, 5 mm wide, pendant to the rim. Solid interlocking key figures similar to Stubbs and Stallings (1953, figs. 68d, Fig. 7.22a).
2	Three encircling bands, 4 to 7 mm wide.
3	Two 3 mm wide encircling bands located 12 mm and 19 mm below the rim. Interlocking hatched triangles, similar to Stubbs and Stallings (1953, figs. 55j, Fig. 7.22b).
4	Solid bands, solid, ticked, and hatched design elements (Fig. 7.22c).
5	Obscured or absent.
6	Five encircling bands starting 5 mm below the rim. The bands are 3 mm to 4 mm wide and 5 mm to 6 mm apart similar to Stubbs and Stallings (1953, fig. 41a).
7	Insufficient decoration to describe.

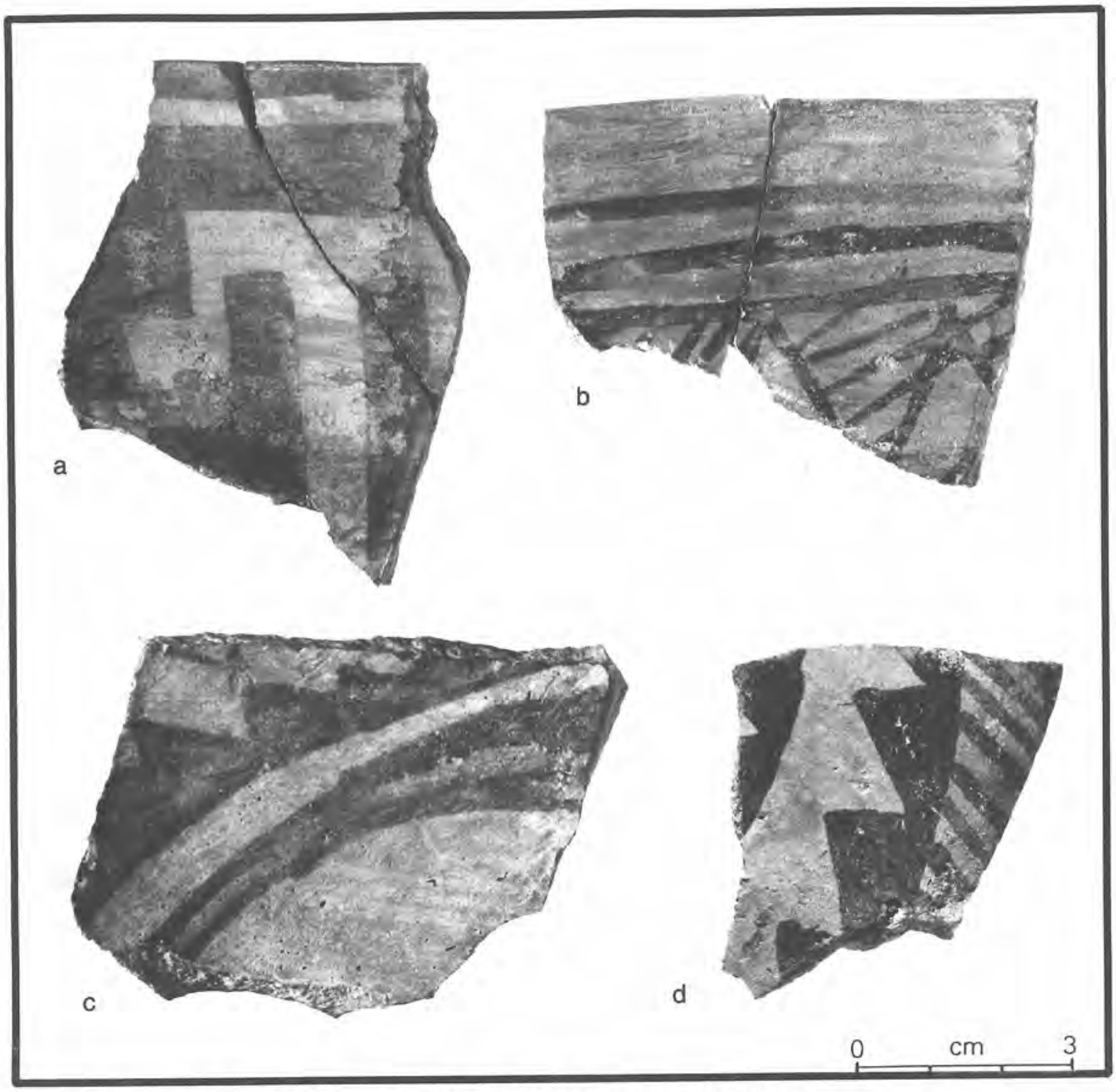

Figure 7.22. LA 86150, Santa Fe and Kwahe'e Black-on-white pottery.

Kiln and Thermal Features section of this report.

A Kwahe'e Black-on-white jar sherd was recovered from the southern portion of the site. It is decorated with thick black mineral paint with an organic binder and tempered with fine sand and crushed sherd (Fig. 7.22d). Kwahe'e Black-on-white, indigenous to the Northern Rio Grande, was common in this area during the eleventh and twelfth centuries (Habicht-Mauche 1993).

The presence of the Kwahe'e Black-on-white, multiple Santa Fe Black-on-white vessels, a possible pottery-firing feature, and a single vessel identified from several excavation areas suggests LA 86150 was occupied repeatedly between A.D. 1000 and 1375 for a variety of domestic activities.

Chipped Stone Artifacts
by Guadalupe A. Martinez

A total of 90 chipped stone artifacts were recovered from four subareas and the general LA 86150 site area. Artifact types are diverse, considering the low number of artifacts. Seven types were recorded. Table 7.16 shows the artifact type by material type and subarea distribution.

The chipped stone artifacts are debris from core reduction, biface manufacture or tool maintenance, and tool use. The raw materials reflect a use of local chert, quartzite, quartzitic sandstone, and obsidian from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west.

Lithic Raw Material Selection

The chipped, raw materials are mainly chert. Chert encompasses fine- to medium-grained material that occurs in a wide range of colors. Chert occurs throughout the Santa Fe formation gravels. Its abundance is subject to considerable spatial variability. The chert of the Santa Fe formation gravels was used extensively by the prehistoric inhabitants of the Santa Fe River Valley as a raw material source for chipped stone tools. Chert is by far the most common raw material identified on all Las Campanas area sites and as isolated chipped stone artifacts. Pedernal, a particular type of chert from the Chama Valley, was present in three of the subareas. Chalcedony, a fine form of chert, was recorded from Subarea 1. Quartzite and quartzitic sandstone were also present.

The obsidian is the clear to smokey gray variety that originates in the Jemez Mountains and along the drainages that originate in and around the Jemez Mountains. Obsidian is relatively scarce in Las Campanas assemblages (Post 1993a:25, 1992:61; Scheick and Viklund 1992:85-86).

Subarea 1

Core flakes comprised 18 of the 28 artifacts. There was only one formal tool in the assemblage. The material textures of the artifacts were 15 fine grained, 11 medium grained, and 2 coarse grained. Early, middle, and late stages of core reduction are represented by the distribution of dorsal cortex percentages (Fig. 7.23). Dorsal scars on all artifacts also reflect early and middle stage reduction--11 exhibited three or fewer scars and 12 exhibited five or fewer (Fig. 7.24). The core flakes were chert or quartzite. There were 11 whole core flakes collected from Subarea 1. The mean dimensions for whole core flakes were 32 mm in length, 29 mm in width, and 10 mm in thickness (Table 7.17). Platform types primarily reflect early and middle stage reduction. Four had single-faceted platforms and two had cortical platforms. Although the tendency in Subarea 1 is towards early to middle stage reduction, there were five artifacts with more than six scars, and there were two core flakes with abraded or multifaceted platforms suggesting some late stage reduction. Multifaceted platforms are typical of expedient core reduction aimed at producing flake tools or blanks.

Cores. Four cores were recovered from Subarea 1 (Table 7.18). Two were chert, one was Pedernal chert, and the other was quartzite. The texture of the cores was either fine or medium-grained, including a fine-grained quartzite. Two cores, one chert and one Pedernal chert, had 12 or more flake scars indicating they were greatly reduced. The other two cores had four or fewer scars. All of them had less than 50 percent cortex and three were multidirectional, suggesting middle to late stage reduction.

Tools. Two utilized core flakes were recovered from Subarea 1, FS 11 and FS 162. FS 11 had a concave edge outline. The flake had an edge angle of 33 degrees and a bidirectional wear pattern with rounding. It exhibited only nibbling damage, indicating limited use for cutting.

FS 162 had one convex edge and one concave edge. The convex edge angle was 40 degrees and the concave edge, 43 degrees. The convex edge exhibited bidirectional wear with step fractures, crescent scars, and nibbling damage. The concave edge had unidirectional wear with step fractures, crescent scars, and nibbling damage. This was a multipurpose tool for scraping and cutting.

Subarea 2

Only chert and obsidian artifacts were recovered. The artifacts were mostly medium grained (n = 16); three were fine grained and two glassy textured. Early, middle, and late stages of core reduction are represented by the distribution of dorsal cortex percentages (Fig. 7.23). Chert core flakes were the most common artifact type, and chert comprised all but one of the 21 artifacts recovered from Subarea 2 (Table 7.16). There were 9 whole core flakes collected from Subarea 2. The dimensional means for whole core flakes were 40 mm in length, 37 mm in width, and 11 mm in thickness (Table 7.17). Platform types

Table 7.16. LA 86150 Artifact Type by Material Type, Subareas 1-4, and Surface

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Core Undiff.	Core Multi-direct.	Biface Early Stage	Biface Late Stage	Row Total
Subarea 1								
Chert	5 22.7 100.0	14 63.6 77.8		1 4.5 100.0	1 4.5 100.0	1 4.5 100.0		22 78.6
Pedernal chert					1 100.0 33.3			1 3.6
Chalcedony		2 100.0 11.1						2 7.1
Quartzite		2 66.7 11.1			1 33.3 33.3			3 10.7
Column Total	5 17.9	18 64.3		1 3.6	3 10.7	1 3.6		28 100.0
Subarea 2								
Chert		16 80.0 100.0	1 5.0 100.0		3 15.0 100.0			20 95.2
Obsidian	1 100.0 100.0							1 4.8
Column Total	1 4.8	16 76.2	1 4.8		3 14.3			21 100.0
Subarea 3								
Chert	5 27.8 100.0	12 66.7 85.7			1 5.6 100.0			18 85.7
Pedernal chert		1 100.0 7.1						1 4.8
Obsidian		1 50.0 7.1	1 50.0 100.0					2 9.5
Column Total	5 23.8	14 66.7	1 4.8		1 4.8			21 100.0
Subarea 4								
Chert	1 20.0 33.3	4 80.0 100.0						5 71.4
Pedernal chert	1 100.0 33.3							1 14.3

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Core Undiff.	Core Multi-direct.	Biface Early Stage	Biface Late Stage	Row Total
Quartzite	1 100.0 33.3							1 14.3
Column Total	3 42.9	4 57.1						7 100.0
General Surface								
Chert	3 33.3 100.0	4 44.4 66.7			2 22.2 66.7			9 69.2
Obsidian							1 100.0 100.0	1 7.7
Quartzite		2 100.0 33.3						2 15.4
Quartzitic sandstone					1 100.0 33.3			1 7.7
Column Total	3 23.1	6 46.2			3 23.1		1 7.7	13 100.0

primarily reflect early and middle stage reduction; one was single-faceted and four had cortical platforms. Dorsal scars on all artifacts also reflect early and middle stage reduction; 13 exhibited three or fewer scars and 6 had five or fewer (Fig. 7.24).

Cores. Two multidirectional, medium-grained chert cores and one fine-grained multidirectional core were recovered from Subarea 2 (Table 7.18). The largest was 106 by 88 by 54 mm, the smallest 55 by 44 by 29 mm. The largest core had 70 percent cortex, indicating little reduction. Flake scars and cortex percentages on the other two cores suggest middle to late stage reduction.

Subarea 3

The material textures of the artifacts (n = 19) were mostly fine or medium grained; two had glassy textures. Middle and late stages of core reduction are represented by dorsal cortex percentages. Only two artifacts have more than 50 percent cortex, while 14 exhibit 10 percent or less (Fig. 7.23). Two-thirds of the debitage were core flakes, 14 out of 21 artifacts. The core flakes were made mostly from chert; one was Pedernal chert and one obsidian. There were nine whole core flakes collected from Subarea 3. The mean dimensions for whole core flakes were 41 mm in length, 33 mm in width, and 13 mm in thickness (Table 7.17). Six single-faceted platforms primarily reflect early and middle stage reduction. Dorsal scars on all artifacts also reflect early and middle stage reduction; 8 exhibited 0 to 2 scars and 10 had 3 to 5 scars (Fig. 7.24). One medial fragment of an obsidian biface flake was recovered. Subarea 3 chipped stone reflects a mixed reduction strategy--a high frequency of low cortex or noncortical debris suggests middle stage reduction, and medium to large core flake size and low dorsal scar counts indicates early stage reduction.

Core. A fine-grained chert, multidirectional core was recovered from Subarea 3 (Table 7.18). The small size, 12 dorsal scars, and 30 percent dorsal cortex indicate that it was intensively reduced.

Tools. There were two utilized core flakes recovered from Subarea 3, FS 57 and FS 97. FS

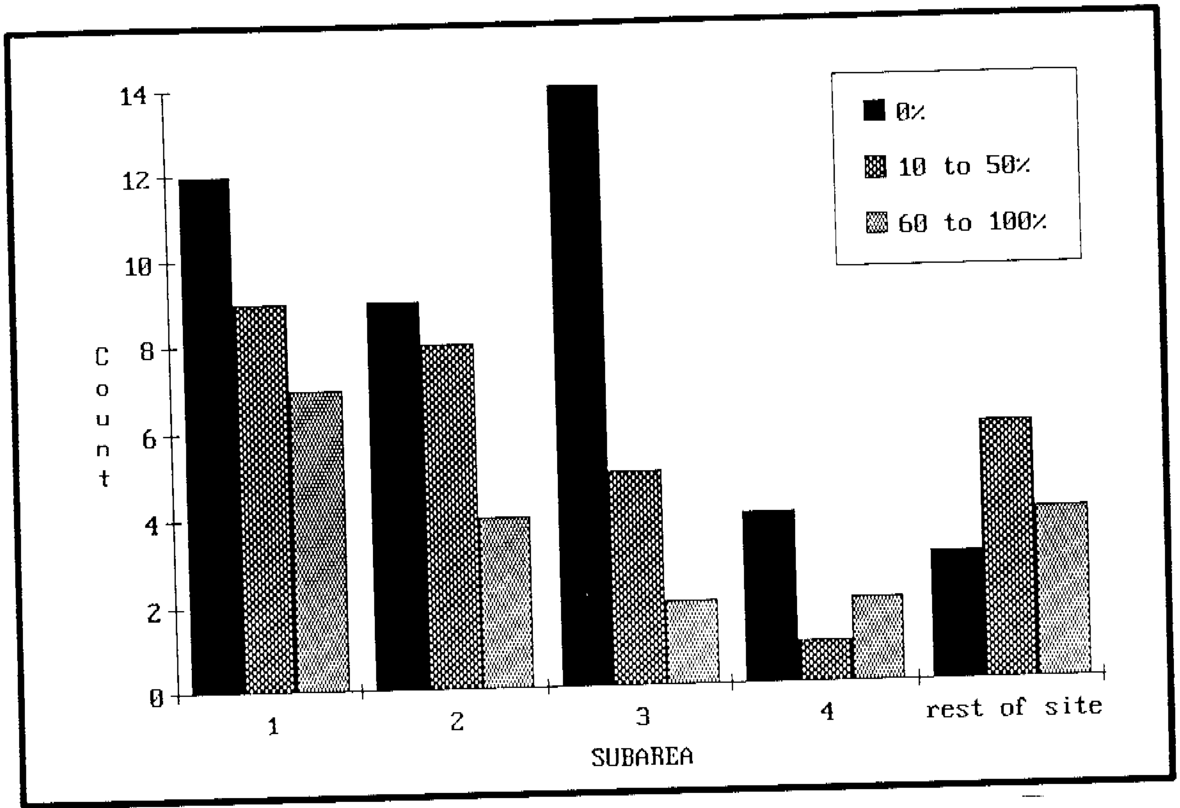

Figure 7.23. LA 86150, Subareas 1-4, dorsal cortex.

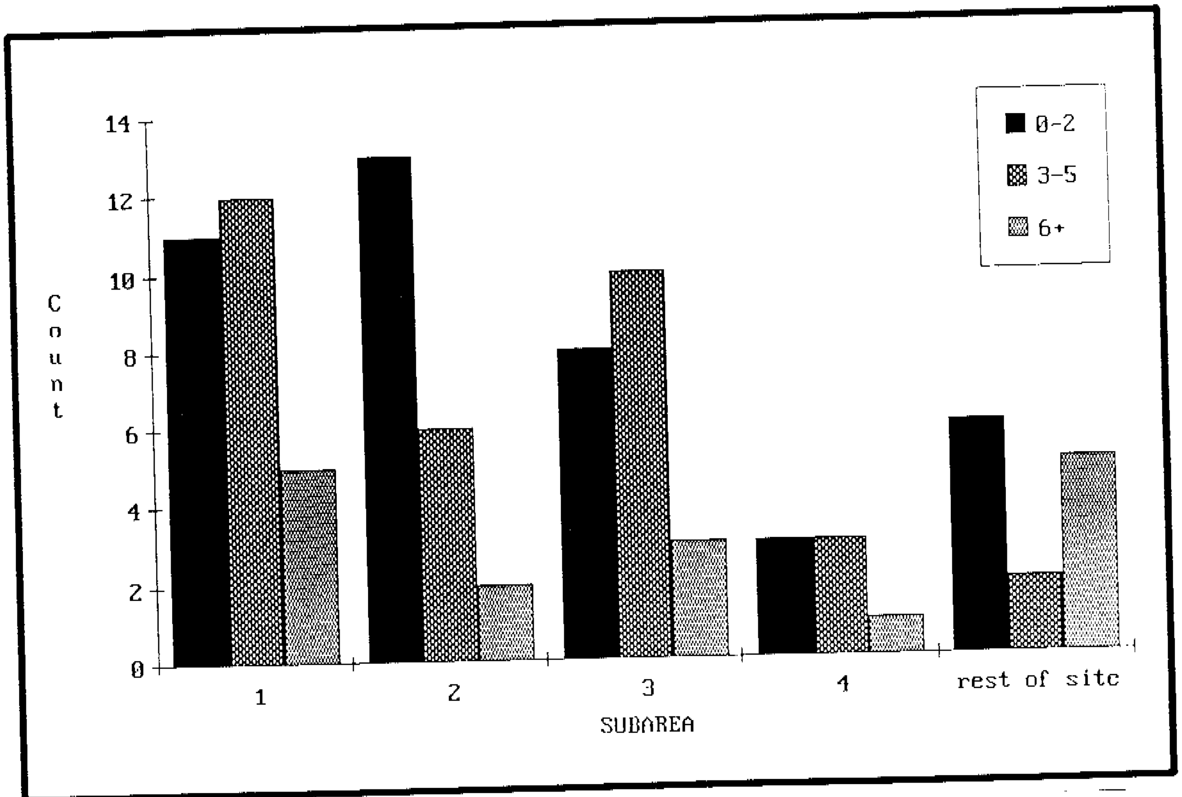

Figure 7.24. LA 86150, Subareas 1-4, dorsal scar counts.

57 had two used edges with a concave and a convex edge outline. Both edges had a 69 degree edge angle and rounding wear. The convex edge was unidirectional and the concave was bidirectional. Crescent scars, step fractures, and nibbling damage were present on both edges. The steep edge angles and presence of edge damage indicate the tools were used for scraping or sawing on a hard material, such as wood.

FS 97 had three used edges: two convex edges and one concave edge. The two convex edges had edge angles of 40 degrees and 52 degrees and the concave edge had a 57 degree edge angle. The convex edges exhibited unidirectional wear and rounding with crescent scars and nibbling damage. The concave edge had bidirectional wear with rounding and step fractures, crescent scars, and nibbling damage. FS 97 was a multipurpose tool used for cutting and scraping in conjunction with light butchering or plant processing.

Subarea 4

Only seven pieces of debitage were collected from Subarea 4, three pieces of angular debris and four core flakes (Table 7.16). The angular debris was miscellaneous chert, Pedernal chert, and quartzite. All four core flakes were chert. The core flakes and angular debris had dorsal cortex percentages reflecting all stages of reduction. Four artifacts lacked cortex, one artifact had 30 percent cortex, and two artifacts had 60 percent cortex. There were three whole core flakes recovered from Subarea 4. The three whole core flakes had a mean length of 45 mm, a mean width of 39 mm, and a mean thickness of 13 mm (Table 7.17). Core flake platform types reflect early stage reduction. All three had cortical platforms. Core flake dorsal flake scars reflect early and middle stage reduction. All three had three or fewer scars.

Tools. There was one utilized piece of angular debris recovered from Subarea 4, FS 148. It had one utilized concave-convex edge. The edge angle was 79 degrees. The edge exhibited unidirectional wear and rounding with crescent scars, step fractures, and nibbling damage. The steep edge angle suggests heavy scraping or processing of hard material.

General Surface

Debitage from general surface proveniences consisted of angular debris and core flakes (Table 7.16). Material texture was mostly fine or medium grained (n = 12) and one was glassy-textured. Early, middle, and late stages of core reduction are represented by the distribution of dorsal cortex percentages (Fig. 7.23). The most common artifact type is core flake (n = 6). Core flakes were made from chert and quartzite. The five whole core flakes tended to be large with a maximum dimension of greater than 40 mm (Table 7.17). Platform types primarily reflect early and middle stage reduction; three had single-faceted platforms and two had cortical platforms. Dorsal scars on all artifacts reflect early and late stage reduction. Six exhibited 0 to 2 scars and five had 6 or more scars (Fig. 7.24).

Cores. Three multidirectional cores were recovered. Two were chert: one fine grained, the other medium grained. The third core was made of fine-grained quartzitic sandstone. The largest core measured 175 by 123 by 114 mm. The smallest core was 65 by 38 by 37 mm. The two larger cores had 50 percent or more cortex and six or more scars. This is indicative of middle and late stage reduction. The small, fine-grained core had only 20 percent cortex and seven scars, which suggests that the core was originally a large piece of raw material that had been substantially reduced. Multidirectional cores are indicative of a reduction strategy that produces flake tools or blanks.

Projectile Point. A Jemez obsidian projectile point was collected from the surface. It measures 32 mm long by 14 mm wide by 5 mm thick. The tip is broken at the very end with most of the blade still intact. The blade is triangular with biconvex edges. The base is flat with one broken lateral edge. The corner notches are relatively shallow. The projectile point style was identified as San Pedro, which is a late Archaic period style dating from 800 B.C. to A.D. 1.

Tools. There was one utilized chert core flake recovered from the general surface. It had one utilized straight edge with an edge angle of 55 degrees. The edge exhibited bidirectional wear with crescent scars and nibbling damage.

Table 7.17. Whole Core Flake Dimensions

Subarea	Mean (mm)	St. Dev. (mm)	Minimum (mm)	Maximum (mm)
Subarea 1 (n = 11)				
Length	32	13	17	59
Width	29	7	13	41
Thickness	10	4	5	20
Subarea 2 (n = 9)				
Length	40	19	14	66
Width	37	22	13	80
Thickness	11	8	3	28
Subarea 3 (n = 10)				
Length	41	22	28	98
Width	33	17	13	74
Thickness	13	10	5	39
Subarea 4 (n = 3)				
Length	45	20	24	64
Width	39	17	22	56
Thickness	13	3	10	16
Subarea 99 (n = 5)				
Length	54	9	41	63
Width	45	24	17	82
Thickness	18	7	9	24
All subareas (N = 38)				
Length	40	18	14	98
Width	35	17	13	82
Thickness	12	8	3	39

Table 7.18. LA 86150, Core Attributes

Material	Texture	Type	Cortex (pct.)	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East	Subarea
Quartzitic Sandstone	Fine	Multidirection-al	50	7	175	123	114	91/114	99
Chert	Medium	Multidirection-al	20	16	41	30	21	102/190	1
Pedernal Chert	Fine	Multidirection-al	0	12	62	32	24	110/186	1
Chert	Medium	Undifferen-tiated	10	3	51	46	43	112/199	1
Chert	Medium	Multidirection-al	70	6	114	81	53	114/98	99
Quartzite	Fine	Multidirection-al	50	4	98	72	57	114/187	1
Chert	Fine	Multidirection-al	20	12	65	47	40	165/88	3
Chert	Medium	Multidirection-al	70	4	106	88	54	156/105	2
Chert	Medium	Multidirection-al	40	9	55	44	29	159/116	2
Chert	Fine	Multidirection-al	20	7	65	38	37	90/147	99
Chert	Fine	Multidirection-al	50	6	58	27	24	163/119	2

Ground Stone

Seven pieces of ground stone were recovered from three subareas (2, 3, 4). Subarea 2 had end fragments of two quartzitic sandstone manos. One weighed 1 kg and measured 117 by 74 by 74 mm. The other weighed 364 g and measured 121 by 36 by 78 mm.

Subarea 3 had one quartzite mano fragment and three metate fragments of vesicular basalt. Two of the metate fragments were internal fragments, and one was an end fragment. The fragments are from a single, basin-shaped metate. The mano was an end fragment weighing 550 g and measuring 106 by 72 by 53 mm.

Subarea 4 yielded one sandstone slab metate with two ground surfaces. The dimensions for the sandstones slab were 106 by 72 by 53 mm and it weighed 250 g.

The ground stone artifacts are not temporally diagnostic, but may have been most commonly used to process wild seeds or nuts. Metates could have been left in the field and reused by subsequent site users. They are indicators that LA 86150 was a focal point for resource gathering and pre-transport processing.

Research Questions

LA 86150 was a spatially extensive, low density, artifact scatter consisting of four spatially discrete artifact clusters associated with the remains of one to three thermal features. Pottery within the artifact clusters is primarily Santa Fe Black-on-white, which was manufactured between A.D. 1175 and 1400. Multiple features within the artifact clusters are evidence of repeated occupation. The subarea and the site assemblages and structure are used to address the research questions. The research design focused on questions of site function, subsistence strategy, and land tenure. Site function and subsistence strategy will be combined under the site function discussion. Additionally, site chronology will be addressed.

Chronology

Data recovery resulted in the excavation of nine thermal features and the collection of 118 sherds. It was expected that the thermal features would yield sufficient radiocarbon samples to provide a more refined date range than can be suggested from the manufacture dates for Santa Fe Black-on-white. The following outlines the results of the radiocarbon dating and ceramic dating of the features and subareas.

Radiocarbon Dating

Two charcoal samples were submitted for radiocarbon dating analyses. The samples were gleaned from the flotation samples. The samples were small; less than 1 g was submitted. Because of the small sample size, accelerator mass spectrometer (AMS) dating was used. Both samples were from wood charcoal and potentially suffer from the "old wood effect." However, they do provide interesting contrast to the field interpretation and the ceramic dates.

A juniper charcoal sample was analyzed from Feature 1, which was suggested to be a pottery-firing feature. AMS dating yielded a two-sigma date range of A.D. 895 to 1170 (Beta-81973, conventional age 1020 $\pm$ 60 B.P., C13/C12 ratio -24.1). This date places the charcoal and, by association, the feature in the late Developmental period of the Rio Grande sequence. The Santa Fe Black-on-white pottery recovered from within and around Feature 1 suggest a date 100 to 200 years later. The contradicting date ranges suggest that old juniper was used in Feature 1 or the inner wood was dated. The old wood problem, which has been well demonstrated for Basketmaker II sites on Black Mesa in Arizona, apparently has similar consequences for Pueblo period occupations in the Santa Fe area, and probably, the Northern Rio Grande region. Old wood was preferred for fuel and may have been the easiest to gather and chop for burning.

A 0.64 g piñon wood charcoal sample was submitted from the flotation sample from Feature 4 (Subarea 5). Feature 4 was centrally located within the site limits, but was not associated with an artifact cluster or temporally diagnostic artifacts. This absence of associated pottery led to the field conclusion that the feature was from the late Archaic period. AMS dating yielded a two-sigma date range of A.D. 1020-1220 (Beta-81971, conventional age 920 $\pm$ 40 B.P., C13/C12 Ratio -22.2). This date range suggests that Feature 4 is roughly contemporaneous with Feature 1 and dates to the late Developmental or Coalition periods of the Rio Grande sequence. This feature's contemporaneity with the other Coalition period features and subareas adds a different feature type to the Pueblo period use of LA 86150 and the Las Campanas area.

Ceramic Dating

The 118 sherds recovered from LA 86150 came primarily from four subareas. Eighty-nine sherds could be assigned to seven bowls of Santa Fe Black-on-white pottery. One jar sherd from the general site scatter was Kwahe'e Black-on-white pottery.

Based on the spatial association of Santa Fe Black-on-white pottery with Subareas 1 through 4, it is suggested that these artifact and feature clusters represent Coalition period limited activity components. Santa Fe Black-on-white pottery was recovered from within Features 1 (Subarea 1) and 8 (Subarea 4).

The Santa Fe Black-on-white pottery from LA 86150 had Group 1 temper (see Hill's report, this volume), except for Vessel 5 from Feature 1, which had Group 3 temper. The close similarity in paste and temper for all seven vessels recovered from LA 86150 suggest a common manufacture locale and contemporaneous activity areas. The fine-grained, self-tempered paste that characterizes the sherds is suggested to have been most abundant in village assemblages between A.D. 1250 and 1300 (Habicht-Mauche 1993).

Summary

The results of the radiocarbon dating and the ceramic dating strongly indicate that LA 86150 was repeatedly occupied during the Coalition period. The features and artifact clusters are definitely Coalition period components and probably date between A.D. 1250 and 1300.

This period coincides with the first building period at Pindi Pueblo, when a 40-room village was constructed. This suggests that relatively long-distance, daily forays into the piedmont were a common practice, before the highest population inhabited the Santa Fe River Valley between A.D. 1300 and 1350.

The presence of a single Kwahe'e Black-on-white sherd and a late Archaic period style projectile point suggest that LA 86150 was visited periodically over a long period, from 800 B.C. to A.D. 1300. However, these earlier occupations were short term and left no definable activity areas.

Site Function

Site function can be addressed by examining the artifact type and attribute patterns, the feature data, and the distribution of the artifacts and features. Spatial segregation of features and artifacts into five clusters indicates reoccupation. Differences in the artifact assemblage, features, and their spatial relationships may be used to examine changes in site function, and indirectly inform on changes in Coalition period subsistence strategies.

Function

The five artifact/feature clusters, Subareas 1-5, were defined by examining artifact and feature spacing and their distributions in relation to intrasite erosion and drainage patterns. Artifact distributions as shown on Figure 7.5 have distinctive spatial patterning that results from erosion and deflation of the sandy, gravel slope. Consistency in this distribution pattern suggests that each cluster was originally spatially discrete. These diagonal distributions have a thermal feature at or near their elevational upper limit and the artifacts, which were clustered around the features, were associated temporally and functionally. Some overlap of artifacts from adjacent clusters may result from downslope artifact movement. However, this overlap should minimally affect interpretation because, as Figure 7.5 shows, the closest artifacts from adjacent clusters are at least 7 m apart. At most, one or two artifacts would be associated with the wrong activity area, which would not substantially affect cluster artifact content or frequency.

Artifact distribution and frequency, and feature morphology suggest that Subareas 2 and 3 participated in similar activities, and that Subareas 1, 4, 5 and Subareas 2 and 3 are functionally different. Feature 3 was not assigned to a subarea because it lacked artifacts and was severely eroded. It is morphologically similar to Feature 9 in Subarea 2, and does indicate ephemeral use of LA 86150.

Subareas 2 and 3 are artifact/feature clusters consisting of three features (5, 6, and 9) and one thermal feature (Feature 7), respectively, and two to four times as many lithic artifacts as pottery. Features 5 and 6 in Subarea 2 and Feature 7 in Subarea 3 were deflated concentrations of fire-cracked rock. The lack of depth to these features suggests that they were surface fires used as camp or cooking fires. Subareas 2 and 3 had portions of Vessel 4, which was also associated with Subarea 4, suggesting recycling of artifacts between activity areas. All but one sherd in Subarea 2 was associated with Feature 9, which had more formal construction than Features 5, 6, or 7. Vessel 4 sherds are loosely associated and may not be contemporaneous with Feature 7 in Subarea 3. They may represent a cross-slope redeposition of sherds from Subarea 4, which has a relatively high sherd concentration consisting of portions from at least five Santa Fe Black-on-white bowls. Feature 5, Subarea 2, and Feature 7, Subarea 3, have ground stone implements including portions of a slab and a trough metate associated with Feature 7 and a mano fragment associated with Feature 5. The close spatial association of the ground stone with the features suggests they were functionally related, giving strong support to the interpretation that Subareas 2 and 3 were plant-processing loci.

Chipped stone assemblages from Subareas 2 and 3 were mainly core reduction debitage from locally available chert. Differences in chipped stone attributes exist for dorsal cortex percentages and dorsal scar count frequencies (see Figs. 7.23, 7.24). Subarea 2 has more cortical chipped stone artifacts than noncortical, while Subarea 3 exhibits the opposite relationship. Subarea 2 has proportionally more chipped stone with dorsal scar counts of less than three and Subarea 3 has proportionally more chipped stone with three or more dorsal scars. The dorsal cortex percentage and dorsal scar counts suggest that more complete reduction occurred for the Subarea 3 assemblage, while more early stage reduction debris was discarded at Subarea 2. These differences are minor and reflect variability within an expedient core to flake reduction trajectory. Primarily, medium to large flakes were produced from partly reduced raw materials for use as heavy-duty scrapers or cutting tools. The Archaic period projectile point from Area 3 raises the possibility that the artifacts remain from pre-Coalition period occupation. Collectively, the artifact and feature data suggest that Subareas 2 and 3 were used as overnight camps that may have support plant or plant product gathering and processing.

Subareas 1 and 4 are similar in artifact assemblage composition and feature morphology, but there may be differences in activity range. Subarea 1 had two thermal features, Feature 1 and Feature 2 and Subarea 4 had one thermal feature, Feature 8. There are similarities in the feature morphology that suggest similar function. All three features were rounded to oval shaped. Their maximum dimension was at least 1.30 m and maximum depth ranged from 16 to 20 cm. These thermal features were basin-shaped with irregular bottoms. Features 1 and 8 contained 30 and 25 burned cobbles or fire-cracked rocks, respectively. The rocks appeared to be suspended in the fill, which was stained dark gray. Feature 1 was interpreted as a pottery-firing feature because of the morphological traits and the 36 pieces of an exploded bowl that were recovered from the feature fill. Feature 8 was interpreted as a hearth or roasting pit because the pottery lacked evidence of spalling. The low chipped stone frequency combined with the high number of vessels that were identified suggest that Feature 8 also may have been a pottery-firing feature. However, without spalls and spalled sherds this conclusion is weakly supported. Feature 2, Subarea 1, is different from Features 1 and 8 because it lacked interior fire-cracked rock and did not have associated spalls or spalled sherds. Its function could not be determined from morphology or ethnobotanical remains. It is similar to other features excavated in the Las Campanas area and along the Santa Fe Relief Route (Wolfman et al. 1989).

Subareas 1 and 4 have artifact assemblages of two or more Santa Fe Black-on-white bowl fragments, a moderate percentage of sherds that could not be assigned to a vessel, and low frequency of lithic core reduction debris. Differences in the two subarea assemblages include a greater number vessels associated with Subarea 4 and more core reduction debris associated with Subarea 1. Subarea 4 had a minimum number of five vessels, and it is suggested that these may be cover sherds used during pottery-firing. The majority of sherds from Subarea 1 come from the exploded vessel portion (Vessel 5) recovered from within Feature 1. The exploded vessel strongly supports a pottery-firing function for Feature 1. Vessel 1 from Subarea 1 is scattered and cannot be confidently associated with Feature 1 or 2. The chipped stone debris is dominated by fine-grained, locally available core reduction debris from both areas. The higher frequency of debitage and four cores were recovered from Subarea 1. This suggests a greater emphasis on stone tool production and possibly tool use for Subarea 1. This would correspond with the interpretation of Feature 2 being a hearth or plant-processing feature rather than a pottery-firing feature. The higher core reduction debris count may also correspond to the concentration located 5 to 7 m east of the features. This small chipped stone concentration within Subarea 1 indicates a wide range of activities may have been conducted in conjunction with plant processing or pottery firing.

Subarea 5 is different from the other subareas because it has a large, formalized, fire-cracked rock-filled pit with only three associated pieces of chipped stone. This large, deep, heavily burned pit was initially interpreted as an Archaic period feature. The radiocarbon dates suggest it is roughly contemporaneous with the other Coalition period features. Feature 4 is different because of its size, unusually abundant rock content, and evidence of very high temperatures. The feature stratigraphy indicates that a hot fire was built and then covered with rocks. The rocks smothered the flame, but absorbed and supplied the heat used for processing. Similar roasting pits are associated with agave processing in the Chihuahuan Desert to the south. Agave is unknown this far north, but instead of agave, yucca or cactus fruits may have been processed. Ellis (1978:66) indicates that Pueblo Indians gently roasted yucca fruits at the place where they were gathered. Feature 4 may have been a roasting pit that was used to process a large quantity of gathered fruit. The fire could have been built and smothered, and partly cooled while fruits were gathered. Feature 4 does represent a departure from the other feature types excavated at LA 86150 and the Las Campanas area in general.

Feature and artifact analyses suggest that LA 86150 was used for many purposes during the Coalition period. Ephemeral camping or plant processing was indicated by deflated, fire-cracked rock concentrations associated with metate and mano fragments. Pottery-firing was suggested for Features 1 and possibly Feature 8. Feature 5 appears to be a specialized roasting pit built to handle a large volume of plants or plant products. A wider range of activities is indicated for Subarea 1 where a pottery-firing feature, a roasting pit, and discrete chipped stone concentration were located. These features and associated artifacts reflect the broad range of activities that were employed to exploit the resources of the Las Campanas piedmont.

Changing Subsistence Strategy

The presence of multiple features and activity areas at LA 86150 was a relatively unique occurrence in the Las Campanas area. From one to four thermal features had been identified on other Pueblo period sites, but the nine features undoubtedly reflect repeated occupation. Repeated occupation was not an unusual aspect of Las Campanas sites, since many sites are an accumulation of isolated occurrences rather than artifacts that accumulated from a single episode. Repeated occupation with facilities was unusual and reflects a change in Coalition period subsistence strategy. Changes in subsistence strategy were expected to be consequential of increased population and greater stress placed on resources of common lands, such as the piñon-juniper piedmont of Las Campanas. Contrary to pre-excavation expectations, LA 86150 does not show a change in function through time, nor do the data support the temporal hypothesis that LA 86150 was occupied during the mid-1300s, when population along the Santa Fe River and tributary drainages was at its zenith. Instead, the radiocarbon dates suggest a thirteenth-century occupation and the pottery is consistent with a mid to late thirteenth-century occupation.

Since LA 86150 does not date to the mid-A.D. 1300s and more likely dates to the mid to late A.D. 1200s, the interpretive focus is on use of the piedmont area before the population boom. Instead of internal or social pressures conditioning subsistence strategies, they may have been driven by variability in the abundance and distribution of the piedmont resources. The concentration of features may reflect extended forays into the piedmont focused on seasonally available plant products. Hunting and meat processing as a primary activity staged from LA 86150 is not considered a strong possibility because of the limited evidence for tool manufacture and maintenance. The possibility that Features 1 and 8 were pottery-firing features suggests that pottery production may have been embedded with other subsistence activities.

LA 86150 exhibits variable feature and artifact assemblage distributions that reflect different uses of the landscape. Surface fire-cracked rock concentrations with ground stone, basin-shaped thermal features with pottery and core reduction debris, and pottery-firing features attest to the wide range of activities that occurred. Longer duration occupation of LA 86150 is suggested by the formal nature of the features and the occurrence of site furniture in association with the facilities. LA 86150 is 6.4 km (4 mi) from the nearest contemporaneous village, which is Pindi Pueblo. This distance may have been within the diurnal range of Pueblo foragers. Other villages upriver from Pindi Pueblo and more distant from LA 86150 might have needed overnight or longer to effectively exploit the resources, and more formal facilities may have been built.

Feature 4 is a large, formal, and specialized feature that may have been used to roast piñon nuts or other gathered plants. It has a larger volume than other Las Campanas thermal features, which would have allowed longer roasting time or accomodated greater quantities of gathered food. Feature 4 may be evidence of exploitation of the Las Campanas area by larger populations as more people had to use the same land, more efficient strategies may have been used. A single, large roasting pit would have concentrated the foraging efforts in a restricted area. This strategy may have been necessary if common land resources became scarcer, more valuable, and ownership was more formalized.

Even though much of this discussion is conjecture, differences in LA 86150 site structure demonstrate that Pueblo use of the area was not monolithic or necessarily restricted to diurnal foraging. A small part of the site may result from pre-Coalition occupation. However, the clustering of artifacts and features mostly reflects more extended and formalized Coalition period subsistence strategies.

Land Tenure

Changing population centers and a concomitant change in the use and distribution of lands and resources was hypothesized for the Coalition and early Classic period (A.D. 1270 to 1350). The Las Campanas area was marginal to the Pueblo communities along the Santa Fe River and the Caja del Rio. The research design suggested that changes in land tenure might be evidenced in the paste and temper of the decorated ceramics from LA 86150. Petrographic analysis was conducted on a sample of sherds from each of the vessels to determine if there was paste and temper variability.

The petrographic analysis of eight sherds from LA 86150 showed remarkable homogeneity (Hill, this volume). Vessels 1, 2, 3, 4, 6, and 8 were made from Temper Group 1. Temper Group 1 was a self-tempered silty clay that may come from the Culebra Lake formation that outcrops along the Rio Grande. The sample was taken at the confluence of the Rio Grande and Cañada Ancha. The low frequency inclusions and the silty paste in the Culebra Lake clay are a strong visual match with the LA 86150 sherds. Only the sherd from Vessel 1 was a different paste group. However, even Group 3 could be considered within the possible range of variability for the Culebra Lake source.

This homogeneity in paste and temper suggests that the pottery used at LA 86150 came from the same source and perhaps indicates continuity in use by residents of the same village. Silty, self-tempered clays were common at Pindi Pueblo, Arroyo Hondo Pueblo, and make up a substantial portion of the late A.D. 1200 pottery from the North Bank site near Cochiti Dam (Lange 1968). Consistency within the ceramic characteristics indicate that land tenure remained stable during the LA 86150 occupations. Site occupants are suggested to have originated from the Santa Fe River Valley rather than the Pajarito Plateau.

CHAPTER 8
ESTATES V, UNITS 1, 2, AND 3 TEST EXCAVATIONS

The Estates V, Units 1, 2, and 3 test excavations were conducted between September and October 1993. The Estates V, Units 1, 2, and 3 testing project included sites within the subdivision and to the southwest of the subdivision in what is part of Estates VII. The investigation focused on 11 sites that were selected from a sample of 45 sites previously identified by SAC (Scheick and Viklund 1991, 1992). Eight sites, LA 84773, LA 84777, LA 86131, LA 86134, LA 86139, LA 86152, LA 86155, and LA 86156, were determined to have no further data potential and no further investigation was necessary. Three sites, LA 84787, LA 86159, and LA 84793, were determined to have significant cultural deposits, and they were recommended for data recovery. The testing results from these three sites were included with the data recovery plan that guided the excavation and analysis phases (Post 1994a). The results of the Estates V data recovery effort are presented later in this report. This section provides the testing results from the eight sites that were not recommended for data recovery.

LA 84773

Setting

LA 84773 was located on the slopes and hilltop of a southwest-oriented ridge that sloped down to the Arroyo Calabasas. The ridge separates the Arroyo Calabasas from a secondary arroyo. The hilltop is wide and flat with the upper and midslope gentle to moderately steep. The soils are of Pojoaque-Panky rolling association (Folks 1975:40), consisting of a sandy loam and clay with intermittent dense gravel and cobble depositions. The vegetation is piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall and short grasses, and snakeweed.

Pre- and Post-Excavation Description

LA 84773 is a dispersed artifact scatter. A total of 34 artifacts were observed on the site. Two loci were identified within the site limits. Locus 1, a 25-m-diameter area, contained 16 pieces of chert, which were mostly primary and secondary flakes. One uniface fragment was also observed. Locus 2, a 10-by-5-m area, contained a red chert chipping station with 15 lithic artifacts consisting of primary flakes, secondary flakes, and angular debris. Other chipped stone artifacts on the site were mostly chert, with the exception of a piece of Polvadera Peak obsidian. An indeterminate black-on-tan bowl sherd and three indeterminate gray ware jar sherds were part of the dispersed scatter.

Re-examination of the site increased the size to 120 m long by 55 m wide covering 6,600 sq m (Fig. 8.1). The two loci originally recorded were not relocated. The site was confirmed as a dispersed artifact scatter that included five small artifact concentrations. Three concentrations were near the south end of the site, and two were along the east slope. The artifact assemblage included 138 pieces of chipped stone and 4 sherds of Santa Fe Black-on-white pottery. No features were encountered. Four lithic artifacts were recovered from surface-stripping the 2-by-2-m test units, but no further subsurface cultural deposits were encountered.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Five 2-by-2-m units were placed in areas where the artifacts were more concentrated than the general site scatter. These units were identified from the northeast corner as Grids 179N/122E, 106N/84E, 83N/86E, 103N/106E, 133N/120E. Testing was to determine the depth of the cultural deposit and to expose any associated thermal features.

Test area 179N/122E was placed in an area of 17 lithic artifacts. Grid 179N/122E yielded two artifacts from the 10 cm surface strip, and

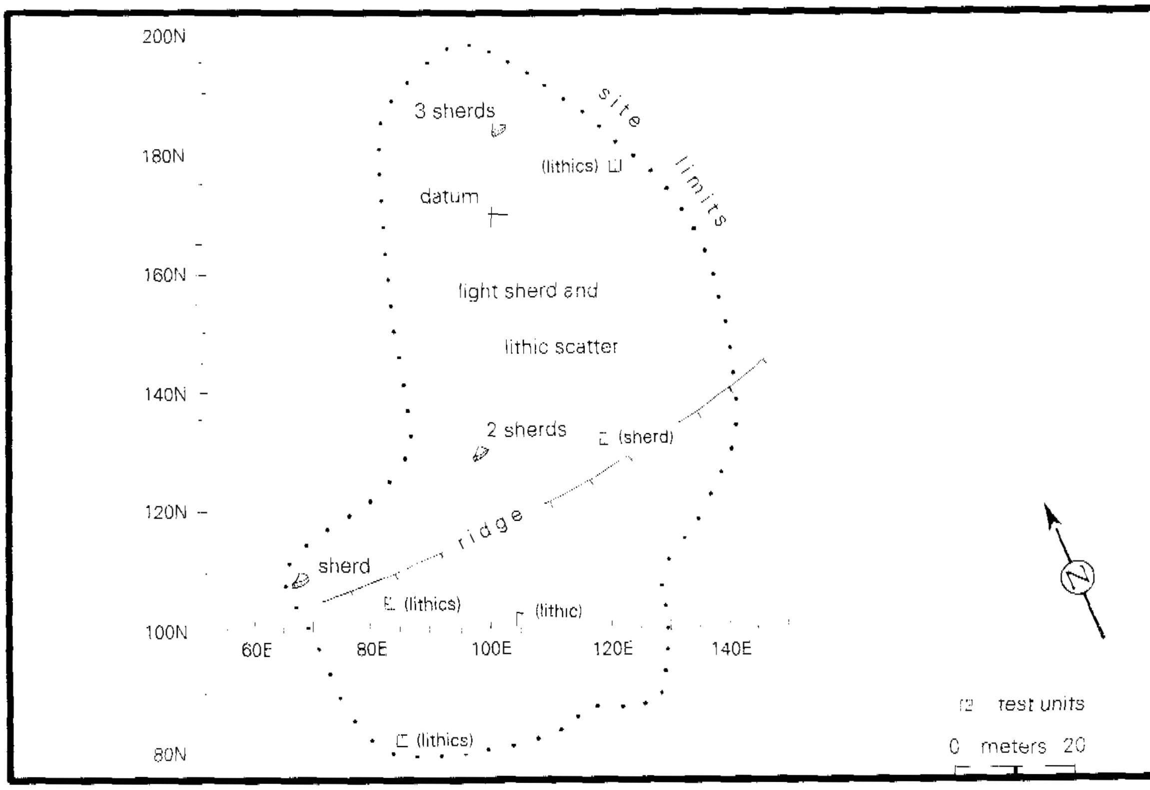

Figure 8.1. LA 84773, site map.

was selected for deeper excavation.

Test area 106N/84E was placed in a small lithic artifact concentration that was 8 m in diameter and contained 10 artifacts. One sherd was located 3 m directly south of the excavation unit. Two lithic artifacts were located on the surface, one in grid 106N/84E and one in grid 105N/84E. Two lithic artifacts were recovered during surface-stripping. Grid 105N/84E was selected for deeper excavation.

Test area 83N/86E was placed in a 8-by-8-m lithic artifact concentration that contained 12 artifacts. Five lithic artifacts were recovered during surface-stripping in Grid 83N/85E, and thus it was selected for deeper excavation.

Test area 103N/106E was placed in a 10-by-10-m lithic artifact concentration that contained eight artifacts. Surface-stripping yielded no cultural material. Grid 103N/106E was selected for deeper excavation.

Test area 133N/120E was placed at the south end of a small lithic artifact concentration that measured 8 m in diameter and contained five artifacts. One sherd was found on the surface of Grid 132N/120E. Surface-stripping yielded no cultural material. Grid 132N/120E was selected for deeper excavation.

The 2-by-2-m units were surface stripped in 1-by-1-m units. Surface stripping removed the upper 5-10 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. The 1-by-1-m unit was excavated until noncultural material-bearing soil was reached. The surface chipped stone was recorded as the site assemblage. The surface pottery was piece-plotted and collected for laboratory identification. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

One stratum was encountered. The stratum was a loose, reddish brown (5YR 6/4) sandy loam mixed with abundant gravel. The soil was mildly calcareous. This layer continued to the bottom of the excavated grids. The stratum corresponds well with the A1 horizon of the Pojoaque series (Folks 1975:43). Four lithic artifacts were recovered from this stratum.

Artifact Assemblage

Pottery

Five pieces of prehistoric pottery were recovered from the surface and surface-strip level at this site. Pottery types identified include Santa Fe Black-on-white and undifferentiated white ware.

Three Santa Fe Black-on-white sherds and one undifferentiated white ware sherd were recovered from the surface and one Santa Fe Black-on-white sherd was recovered from the 5 cm surface-strip (Grid 132N/120E). These sherds were widely distributed on the site and do not appear to be from the same vessel based on marked differences of surface and paste attributes. The exterior of the bowl body sherd, recovered from the surface strip is scraped smooth and a small portion of the interior surface is exfoliated. The intact interior surfaces exhibit a thin textured white slip, ghosted black organic paint, and a heavy polish. The exfoliation appears to be the result of natural effects such as freeze-thaw. The paste is hard, brown (10YR 6/2-5/2), and vitrified with a fine sand temper. The design layout consists of thin parallel hatching 2 to 3 mm apart.

The exterior of the undifferentiated white ware bowl body sherd is pitted and uneven with no polish or paint. The interior surface is exfoliated. The intact surfaces are uneven and exhibit a thin textured white slip and heavy polish on the raised areas. The exfoliation appears to be the result of natural effects such as freeze-thaw. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper.

The exterior of a Santa Fe Black-on-white bowl rim sherd, recovered from the surface, is scraped smooth exhibiting striations. The interior surface exhibits a medium textured white slip, thin streaky black organic paint, and a heavy polish. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper. The design layout consists of a thin encircling band located 3 mm below the rim intersected by parallel diagonal hatching 5 to 6 mm apart. The rim is tapered, rounded, and undecorated. Use of this vessel prior to deposition is indicated by abrasion on some areas of the rim.

The exterior of a Santa Fe Black-on-white bowl rim sherd, recovered from the surface, is scraped smooth exhibiting pronounced striations. The interior surface exhibits a thin textured light gray slip, thin streaky black organic paint, and a heavy polish. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper. The design layout consists of a thin encircling band extending 4 mm below the rim. A solid, ticked area and a hatched area are diagonal to this encircling band. The rim is tapered, rounded, and undecorated.

The exterior of the final Santa Fe Black-on-white bowl body sherd is scraped, exhibiting an uneven surface. The interior surface exhibits a medium textured white slip, thick black organic paint and a heavy polish. The paste is hard, gray (7.5yr 6/0-5/0), and vitrified, with a fine sand temper. Fine sand and self-tempered Santa Fe Black-on-white pottery are common on Coalition and Early Classic period sites in the Las Campanas area. The design layout consists of thin, concentric, triangular hatching 5 to 6 mm apart. At the wide end of the triangle is part of two pairs of parallel lines, perpendicular to one another, with a solid triangle at each corner (similar to Stubbs and Stallings 1953, fig. 61l).

Chipped Stone

A total of 138 chipped stone artifacts were recovered from LA 84773. The 138 chipped stone artifacts are assigned to eight artifact types. The assemblage is not diverse, consisting mainly of core flakes and angular debris.

The chipped stone artifacts are debris from core reduction and raw material procurement, although there is one formal tool. The raw materials reflect a use of local chert, obsidian, and quartzite from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio located to the west.

Lithic Raw Material Selection. The chipped raw materials are mainly chert (n = 129). Chert encompasses fine- to coarse-grained material that occurs in a wide range of colors. The majority of the lithics were fine-grained and medium-grained chert (n = 67 and 60, respectively). There were two pieces of coarse-grained chert. Chert occurs throughout the Santa Fe formation gravels. Its abundance is subject to considerable spatial variability. The cherts of the Santa Fe formation gravels were used extensively by the prehistoric inhabitants of the Santa Fe River Valley as a raw material source for chipped stone tools. Chert is by far the most common raw material identified on all Las Campanas area sites and as isolated chipped stone artifacts. Quartzite artifacts consisted of one fine-grained piece and seven coarse-grained pieces. There was one obsidian artifact.

Debitage. Debitage from core reduction accounts for 129 of the 138 chipped stone artifacts (Table 8.1). Core flakes and angular debris were the two most common artifact types with counts of 101 and 28, respectively. Early and middle stages of core reduction are represented by the distribution of dorsal cortex percentages. Fourteen pieces of angular debris had no cortex. Fifty-one core flakes had no dorsal cortex. Fifty of the core flakes were whole. Seven proximal, 8 medial, 31 distal, 2 lateral, and 2 indeterminate fragments were recorded. Platform types primarily reflect early and middle stage reduction; single-faceted (n = 41) and cortical (n = 17) platforms predominated. One multifaceted platform was recorded. The other 42 flakes had collapsed, crushed, or missing platforms. Dorsal flake scars also reflect early and middle stage reduction with 82 of the 101 core flakes exhibiting 3 or fewer dorsal scars. Eleven core flakes exhibited 4 dorsal scars, 2 exhibited 5, and 5 had 6 suggesting more intensive core reduction than would result from material procurement. Whole core flake dimensions had a mean length of 45 mm, a mean width of 35 mm, and a mean thickness of 14 mm. This suggests that medium to large-sized core flakes were the most common by-product of core reduction.

One undifferentiated uniface represents the only worked lithic on the site. The uniface material was recorded as a medium-grained chert. The dimensions of the uniface are 30 mm in length, 41 mm in width, and 11 mm in thickness.

Cores. Six cores were recorded from LA 84773 (Table 8.2). The largest was unidirectional with only two scars, indicating that it was tested as part of a material procurement strategy. The two bidirectional cores were used sparingly since they had six and four scars and 40-50 percent cortex remaining. Multidirectional cores with 30 percent or less cortex were more heavily reduced. Multidirectional cores are typical of expedient core reduction aimed at producing flake tools or blanks.

Summary of Results

LA 84773 was a chipped stone scatter that covered a large area on top of a finger ridge, which extended to the north edge of the Arroyo Calabasas floodplain. The ridge top was deflated with exposed gravel. The ridge slopes were more gravelly and may have been a source of raw material for chipped stone tool production.

Test excavation and detailed recording of LA 84773 yielded little direct information about the occupation period or function. Conclusions about site chronology and function must be drawn from indirect sources such as pottery manufacture dates and chipped stone technological information.

The four Santa Fe-Black-on-white sherds indicate that occupation occurred during the Coalition and early Classic period (A.D. 1175 to 1400). The sherds were widely distributed across the site and were part of four different vessels. Paste and surface treatment of these sherds were similar and displayed similarities in paste and surface treatment to the majority of the Santa Fe Black-on-white pottery recovered by the Las Campanas project. This similarity is a quality of Santa Fe Black-on-white that is found in assemblages from large and small sites in the Santa Fe and Cochiti areas. Silty, self-tempered clays were common in A.D. 1270 to 1325 assemblages from Pindi Pueblo, Arroyo Hondo Pueblo, and make up a substantial portion of the late A.D. 1200 pottery from the North Bank site near Cochiti Reservoir (Lange 1968). Site occupants are suggested to have originated in the Santa Fe River Valley rather than the Pajarito Plateau.

Site function is difficult to assess from the dispersed artifact distribution, the low frequency of formal tools, and the absence of features. The chipped stone data suggest that LA 84773 was used for many purposes, none of which resulted in intensive core reduction or tool manufacture. Some raw material was procured and partly reduced on site as indicated by the 14 core flakes that had more than 70 percent dorsal cortex and the four cores that retained 20 to 50 percent dorsal cortex. Two cores retained no dorsal cortex, but had 10 and 11 dorsal flake scars indicating intensive use of local raw materials. The predominance of noncortical core flakes or core flakes with less than 60 percent cortex suggests that most of the chipped stone was

Table 8.1. LA 84773, Artifact Type by Material Type

Count Row pct Column pct	Material Type			
Artifact Type	Chert	Obsidian	Quartzite	Row Total
Angular Debris	27 93.1 20.9	1 3.4 100.0	1 3.4 12.5	29 21.0
Core Flake	93 93.0 72.1		7 7.0 87.5	100 72.5
Biface Flake	1 100.0 .8			1 .7
Resharpening Flake	1 100.0 .8			1 .7
Unidirectional core	1 100.0 .8			1 .7
Bidirectional core	2 100.0 1.6			2 1.4
Multidirectional	3 100.0 2.3			3 2.2
Uniface, Undifferentiated	1 100.0 .8			1 .7
Column Total	129 93.5	1 .7	8 5.8	138 100.0

Table 8.2. LA 84773, Core Data

Material	Texture	Morphology	Cortex (pct)	Dorsal Scars	Length (mm)	Width (mm)	Thick. (mm)
chert	medium	bidirectional	50	6	67	54	22
chert	fine	bidirectional	40	4	52	47	33
chert	medium	unidirectional	20	2	102	70	51
chert	medium	multidirectional	0	10	46	39	20
chert	medium	multidirectional	0	11	53	31	16
chert	medium	multidirectional	30	12	79	62	34

brought to the site as flakes or partly reduced cores. This pattern would be expected if the chert within the gravel deposits on the ridge slope was not abundant. The dispersed distribution of core flakes and the very low artifact density (0.02 artifacts per sq m) also support the supposition that lithic raw material was present but not abundant.

The location of LA 84773 above the confluence of the Arroyo Calabasas and a primary tributary arroyo would have provided access to a richer floodplain environment, which may have supported a riparian plant community during the wetter years. Simple diurnal use of the area would not have required formal facilities nor would have resulted in concentrations of debris from tool manufacture, maintenance, or raw material processing. The very dispersed artifact distribution is a strong indication that the ridge was visited repeatedly. The chipped stone and four sherds probably represent a minor part of the entire range of activities that were conducted at the site.

LA 84777

Introduction

LA 84777 was identified by SAC as 278-22 during the Estates III survey (Scheick and Viklund 1991:21). Test excavation was conducted by OAS during the October 1993, Estates V, Unit 1 phase of the project. Test excavations were conducted to determine the extent and depth of the cultural deposit. No additional work was required at LA 84777 because the possible pit garden was determined to be the depression left from a tree removal.

Setting

LA 84777 is on the west-facing slope of a hill. The vegetative cover is typical of piñon-juniper woodland. The soil is sandy with dense deposits of gravel and river cobbles.

Pre- and Post-Excavation Description

The site area was 9 m long by 4 m wide and covers 36 sq m. The possible agricultural pit garden was 2 m in diameter and 60 cm deep with rocks placed upon the sides of the feature to give the pit definition. The feature appears similar in construction to pit gardens recorded along the Chama River and northeast of Santa Fe. There was a possibility that the pit depression was formed by the uprooting of a tree. Northeast of the pit garden and perpendicular to the associated drainage is a checkdam, which is two rocks wide. Three chert artifacts, a secondary flake, and two core flakes occur to the north and east of the pit garden. The cultural and temporal affiliation of the site cannot be determined due to the lack of diagnostic artifacts or features.

Examination of LA 84777 revealed the survey description to be accurate (Fig. 8.2). The possible pit garden was relocated and four lithic artifacts were found near the pit depression. Excavation exposed the pit depression profile and allowed examination of the pit stratigraphy for evidence of formal preparation.

Excavation Methods

A 1-by-2-m unit was placed east-west across the pit depression. The unit bisected the pit providing a stratigraphic profile of the depression. The pit interior was excavated in seven 10 cm levels. The soils were described and the soil and excavation profile were documented. Upon completion of the excavation the surface artifacts were piece-plotted and the topographic features were transit mapped. Work was halted when it was determined that the pit was a partly filled depression resulting from the removal of a tree.

Stratigraphy

The excavation revealed no evidence of formal preparation of the perimeter of the pit or along the pit sides. The pit was excavated into calcareous brown (7.5YR 5/4) sandy loam that contained caliche encrusted pea gravel. The upper 20 to 25 cm of the pit fill was a mix of unconsolidated sandy loam and abundant organic duff (Fig. 8.3). From 20 to 45 cm below the modern ground surface the pit was filled with water deposited brown sandy loam with laminae of caliche-encrusted pea gravel and an occasional small cobble (Stratum 2). From 45 to 68 cm below the modern ground surface the fill became

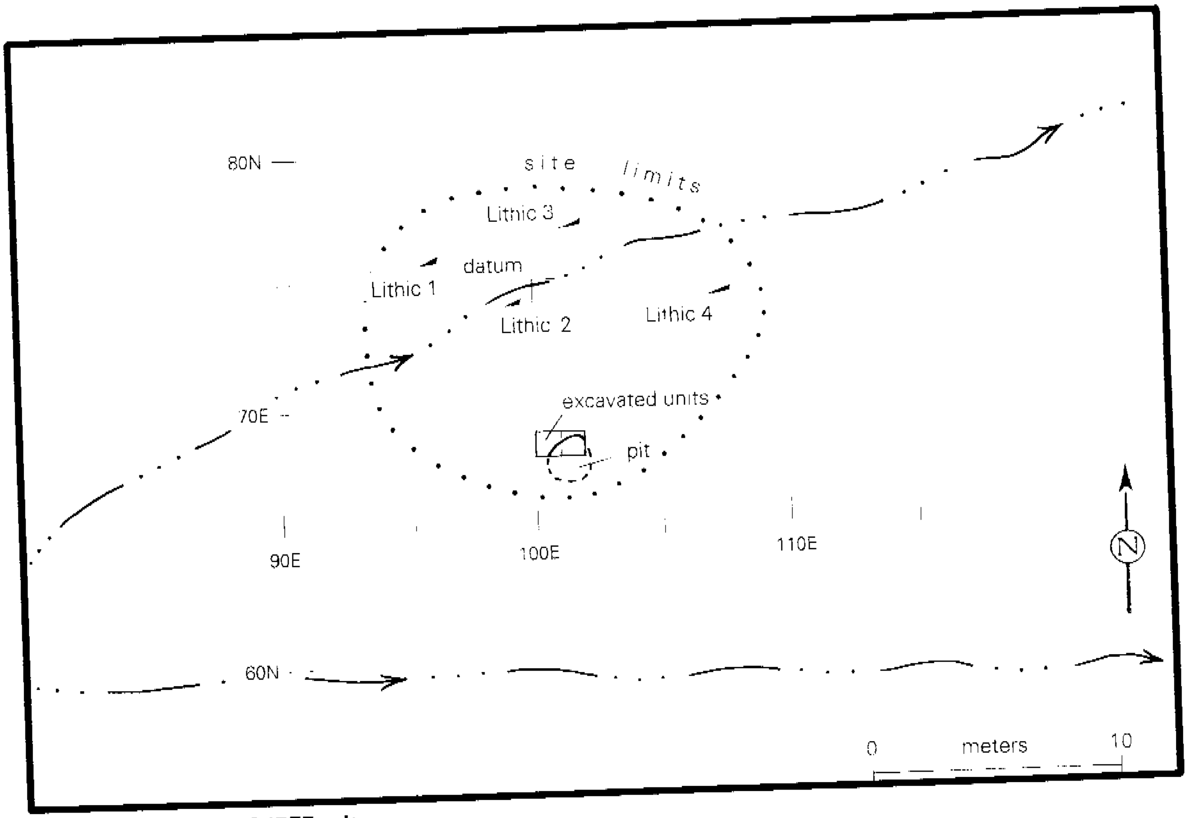

Figure 8.2. LA 84777, site map.

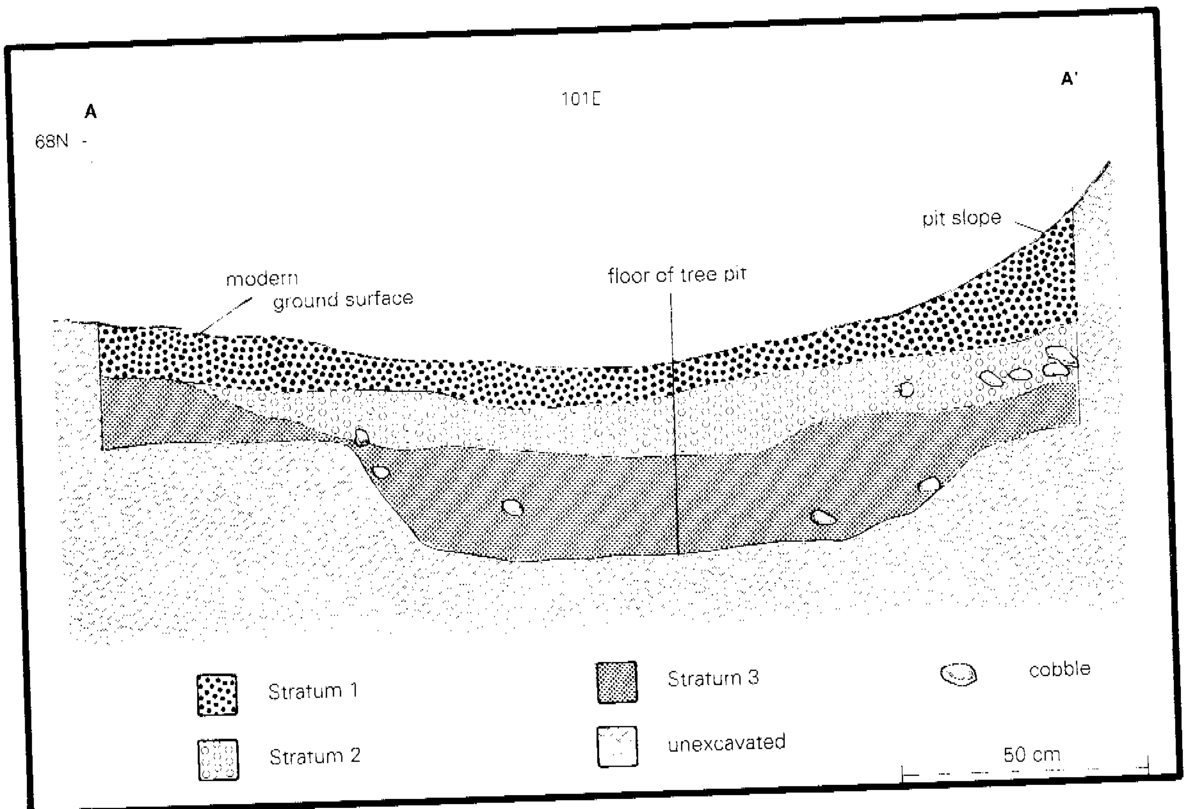

Figure 8.3. LA 84777, excavated profile of pit.

more impregnated with calcareous soil and gravel (Stratum 3). All soil appeared to be a mixed eolian and alluvial deposit. There was no evidence that the pit had been intentionally filled or layered to allow small-scale gardening.

Excavation Results

Excavation of a portion of the depression revealed the outline and profile and the internal stratigraphy already described. A brief description of the pit follows.

The pit depression outline was 2.4 m east-west by 2.0 m north-south. The excavated depth was 68 cm. The pit had moderately steep sides and the bottom showed no evidence of formal preparation. No artifacts or other cultural material were recovered from inside the pit. The exposed soil profile did not reveal layering that could not be attributed to alluvial deposition.

Artifact Assemblage

Chipped Stone

Four chipped stone artifacts were recovered or field recorded from LA 84777. The four chipped stone artifacts were assigned to three artifact types consisting of two core flakes, a tested cobble, and a multidirectional core.

Lithic Raw Material Selection

The chipped raw materials are chert. The chert encompasses fine- to medium-grained material that occurs in a wide range of colors. The majority of the lithics were fine-grained chert (n = 3) and one was medium grained.

Debitage

Debitage from core reduction accounts for all of the chipped stone artifacts including two core flakes, a tested cobble, and a multidirectional core. Early and middle stages of core reduction are represented by the distribution of dorsal cortex percentages. One core flake had no dorsal cortex, the other had 100 percent. Only one of the core flakes was whole, the other was proximal. Both core flakes had cortical platforms and exhibited less than three dorsal scars. The whole core flake was 75 mm long by 60 mm wide by 45 mm thick.

Tested Cobble. A fine-grained chert cobble had one flake removed leaving 80 percent cortex. The cobble measured 70 mm in length, 65 mm in width, and 20 mm in thickness.

Core. One multidirectional fine-grained chert core measured 80 mm in length, 60 mm in width, and 58 mm in thickness. Cortex covered 50 percent of the core. There were eight flake scars, which suggest that the core was used fairly extensively. The core was substantially reduced, though its size indicates it was not exhausted. Multidirectional cores are typical of expedient core reduction, aimed at producing flake tools or blanks.

Conclusions

LA 84777 was determined to be a man-made pit feature that resulted from the removal of a tree. The pit lacked any evidence of formal preparation or soil stratigraphy that resembled intentional layering of soil, cobbles, or gravel. The lithic artifacts probably pre-date the pit feature and were isolated occurrences remaining from raw material testing and procurement.

LA 86131

Setting

LA 86131 was on a southwest-facing finger ridge that sloped down to the floodplain of the Arroyo Calabasas. It was bounded on both sides by shallow arroyos that emptied into the prehistoric Arroyo Calabasas floodplain. The site covered about 5,500 sq m (Fig. 8.4). The surface of the ridge top was deflated and the slope was cut by numerous shallow erosion channels. The soil was of the rolling Pojoaque-Panky association (Folks 1975:43), consisting of a sandy loam and clay loam with gravel, pebbles, and an occasional cobble. The vegetation is piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall

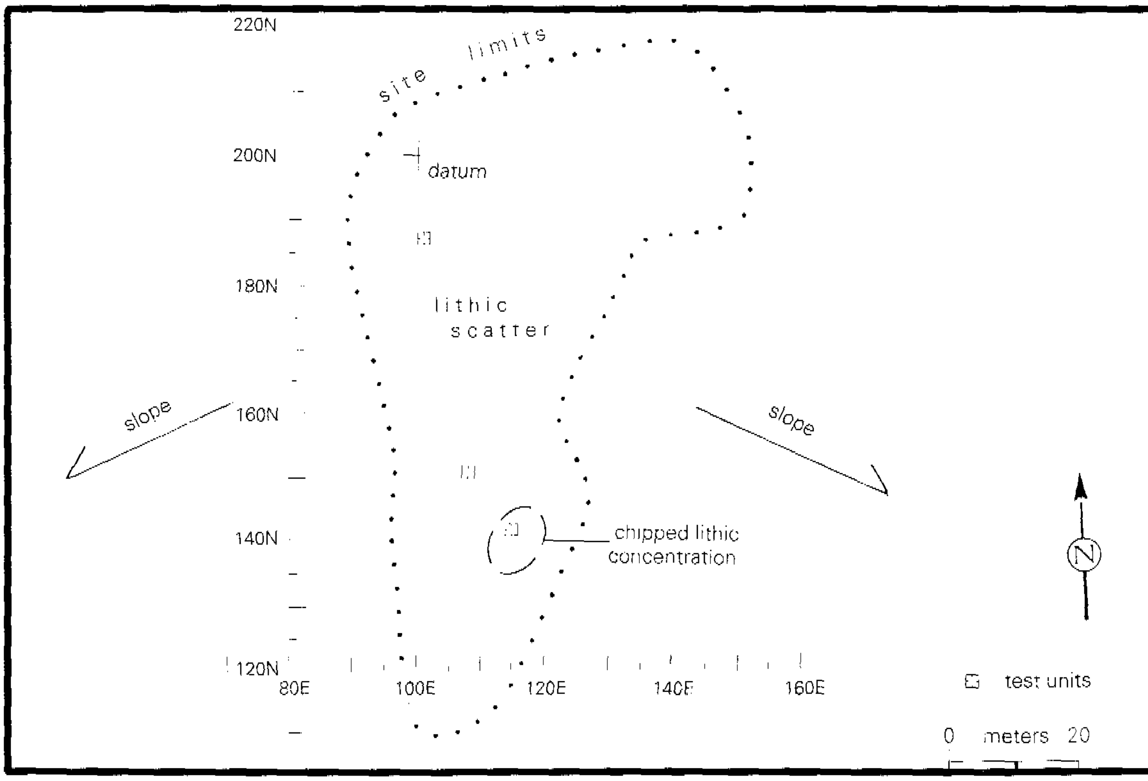

Figure 8.4. LA 86131, site map.

and short grasses, and snakeweed.

Pre- and Post-Excavation Description

LA 86131 is an artifact scatter that extends from below the crest of the ridge to just above the prehistoric floodplain. Within the artifact scatter is a chipping station, located at the southeastern edge of the site. It is 6 m long and 2 m wide. The chipping station artifacts consist of 32 pieces of chalcedonic chert, which are mostly secondary flakes and three cores. Other artifacts located within the site are 77 lithics, mostly chert secondary flakes, and two cores. Cultural and temporal affiliations could not be determined during the inventory due to the lack of diagnostic artifacts or features.

Excavation confirmed the survey identification. The site was a dispersed chipped stone scatter covering 5,500 sq m with a concentration of lithic core reduction debris (Fig. 8.4). Besides the chipped stone, two sherds of Santa Fe Black-on-white pottery were collected from the northeast portion of the site. No features or subsurface cultural deposits were encountered.

Excavation Methods

The site limits and artifact concentration were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Two 2-by-2-m units were placed in areas where the artifacts were less dispersed than the general site scatter (Grids 152N/109E and 188N/101E). A third 2-by-2-m unit (Grid 143N/116E) was placed in the chipped stone concentration. These units determined the depth of the cultural deposit. The 2-by-2-m units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 5 cm of loose soil. No subsurface artifacts were recovered, thus a 1-by-1-m unit was selected at the excavators's discretion. The 1-by-1-m unit was excavated until noncultural material-bearing soil was found. This depth was never more than 20 cm below the modern ground surface.

Test excavation revealed that the cultural deposits were limited to the surface. Deeper or more extensive excavation was not required. The surface chipped stone was recorded as a site assemblage. The surface pottery was collected for laboratory identification. The site was mapped with a transit and stadia rod. The site map recorded the site limits, topographic features, and excavation areas.

Stratigraphy

Two strata were encountered in the three excavation areas. Stratum 1 was a loose, light brown (7.5YR 6/4) sandy loam that was mixed with abundant cobbles and gravel. This layer was 7 to 10 cm thick. Twelve chipped stone artifacts were recovered from this level. Stratum 2 was a reddish brown (5YR 4/3) heavy clay loam with an angular to subangular blocky structure that was very sticky and plastic when wet. The soil is mildly calcareous with occasional gravel. Strata 1 and 2 correspond well with the A1, B1, and B2t horizons of the Panky series (Folks 1975:40). No artifacts were recovered from this stratum.

Artifact Assemblage

The artifact assemblage consists of 2 Santa Fe Black-on-white pottery sherds and 78 pieces of chipped stone. A concentration of chert core reduction debris represents a single occupation against a backdrop of numerous brief visits, which are represented by the diffuse artifact scatter.

Pottery

Two sherds of Santa Fe Black-on-white pottery were collected from the surface. The pottery was recovered from the northeast portion of the site away from the chipped stone concentration.

One rim sherd, which is tapered and rounded, and one body sherd appear to be from the same Santa Fe Black-on-white bowl. The sherds exhibit similar surface and paste attributes. The sherds have a light gray, floated interior with a smoothed exterior. The interiors are highly polished. The pigment is a thin back organic paint. The paste is hard, vitrified, and gray (7.5YR 6/0-5/0) with a fine sand temper. Fine sand and self-tempered Santa Fe Black-on-white pottery is common on Coalition to early Classic period sites of the Las Campanas area.

The design layout on the rim sherd consists of an encircling band. A 5-mm-wide line outlines the interior of the rim. A series of elongated alternating hatched and solid triangles are pendant 5 mm below the broad line. The filler between the pendant triangles is two opposed, vertically oriented, ticked triangles (similar to Stubbs and Stallings 1953, fig. 43n). The body sherd exhibits a band of opposed, solid triangles (Stubbs and Stallings 1953, fig. 43p, q). Encircling band layouts were the most common for Santa Fe Black-on-white pottery from Pindi Pueblo (Stubbs and Stallings 1953:62).

Chipped Stone

Seventy-eight chipped stone artifacts were recovered from the excavation areas or recorded in the field. The chipped stone assemblage includes core flakes, angular debris, biface flakes, and multidirectional, bidirectional, and unidirectional cores. The chipped stone discussion will be divided into the assemblages from the concentration (Area 1) and the rest of the site. These two assemblages will be compared. Table 8.3 shows the artifact type and material type distribution by Area 1 and the site scatter.

Lithic Raw Material

Lithic raw material selection is represented by four material types in the site scatter. Chert is the most common material; chalcedony and quartzite occur in smaller amounts, and there is a single obsidian artifact. Except for the obsidian, these are the most common raw materials occurring within the Las Campanas area. All of these materials could have been obtained from the Santa Fe Group gravel deposits. Chert was the only raw material represented in Area 1.

Debitage

Debitage is the main chipped stone category and represents the most abundant artifact type. The

Table 8.3. Artifact Type by Material Type

Count Row pct Column pct	Area 1	Material Type, General Surface				
Artifact type	Chert	Chert	Chalcedony	Obsidian	Quartzite	Row Total
Angular Debris	2 8.3	5 71.4 11.6		1 14.3 100.0	1 14.3 25.0	9 11.5
Core Flake	19 79.2	32 78.0 74.4	6 14.6 100.0		3 5.0 75.0	60 76.9
Biface Flake		2 100.0 4.7				2 2.6
Unidirectional core		2 100.0 4.7				2 2.6
Bidirectional core	1 4.2	1 100.0 1.5				1 1.3
Multidirectional core	2 8.3	2 100.0 4.7				4 5.1
Column Total	24	43 79.6	6 11.1	1 1.9	4 7.4	54 100.0

debitage assemblage for the whole site consists of core flakes, biface flakes, and angular debris. None of these artifacts exhibited use wear or modification indicating that they are waste products.

From the site scatter, core flakes reflect all stages of core reduction. Seventy-eight percent of the core flake assemblage is chert. Core flakes have a full range of noncortical and cortical items. Sixty-eight percent of the core flakes are noncortical with only 10 percent of the core flakes exhibiting more than 50 percent dorsal cortex. These percentages indicate a focus on core flake production rather than material testing and procurement. Whole flakes are 51.2 percent of the assemblage. Early and middle stage core reduction are indicated by the dominance of single and cortical platforms, which comprise 56 percent of the assemblage. Core flake dorsal scars are dominated by counts between one and three (78 percent). Low counts of core flakes with no dorsal scars or more than three dorsal scars suggest middle stage reduction. Raw material was not being procured and tested and tools were not manufactured as the main reductive activity. Whole core flake dimensions are medium to large in size with a mean length of 38 mm, a mean width of 31 mm, and a mean thickness of 12 mm.

The Area 1 assemblage results from the reduction of raw material that was available onsite. Core flakes are 79.2 percent of the Area 1 assemblage. Cortical core flakes are 58 percent of the assemblage, 31.7 percent exhibit more than 50 percent dorsal cortex. This contrasts with the site scatter, where only 10 percent of the core flakes exhibited more than 50 percent dorsal cortex. Whole core flakes are 47.4 percent with proximal (n = 2), medial (n = 3), and distal (n = 5) portions occurring. The dominance of broken flakes suggests that the raw material was flawed and may have been difficult to reduce. Only single-faceted and cortical platforms are present, which would be expected if early stages of reduction occurred. Almost 80 percent of the core flakes exhibit three or fewer flakes scars, which would correspond with decortication of raw material and early stage core reduction.

Whole core flake dimensions are medium to large with a mean length of 48 mm, a mean width of 35 mm, and a mean thickness of 18 mm.

Contrasting the site scatter with the Area 1 concentration shows clear differences in core flake attributes that relate to stages of reduction. Area 1 was a material procurement and early reduction location as indicated by the high percentages of large cortical core flakes with low dorsal scar counts. The site scatter shows a more mixed distribution of reduction stage attributes, which might be expected if the site was visited sporadically and briefly.

Cores

Seven cores were recorded: three from Area 1 and four from the site scatter. All cores were chert. Three cores had multidirectional platforms. Core attributes are presented in Table 8.4. Core dimensions suggest that medium to large-sized raw materials were available on-site or in nearby gravel deposits. The presence of cortex on five cores indicates that they were not completely reduced.

Summary of Results

Test excavation and field recording of LA 86131 revealed a large, dispersed artifact scatter with a chipped stone concentration (Area 1). The excavations revealed that the cultural deposits were restricted to the upper 5 cm of Stratum 1.

Two pieces of Santa Fe Black-on-white pottery provide an occupation date between A.D. 1200 and 1425. Similarities with Pindi Pueblo ceramics suggest a late A.D. 1200s or early 1300 occupation. The sherds were not associated with the chipped stone concentration or central portions of the site scatter. The pottery appears to be from a brief occupation.

The chipped stone artifacts were separated into Area 1 and site scatter assemblages, and then compared. The Area 1 assemblage is typical of raw material procurement and early stage core reduction. Salient attributes are a high percentage of cortical debris, a low dorsal flake scar count, and medium to large core flake size. The site scatter has a more generalized distribution of attributes suggesting it accumulated from a series of brief visits. The combination of a small artifact assemblage and large spatial distribution implies an accumulation from numerous, brief visits. These brief visits may have entailed diurnal raw material procurement or plant-gathering activities. An accumulation of artifacts from many different episodes would be expected to occur near a productive resource area within the daily range of a village or heavily populated area. The value of this assemblage is the contrast between the two assemblages, which can be used to understand assemblage variability at Las Campanas sites from all periods.

LA 86134

Setting

LA 86134 was located on a long, broad, east-west oriented finger ridge that borders the Arroyo Calabasas. The soils were of the rolling Pojoaque-Panky association (Folks 1975:40). This association consisted of a sandy loam that was deflated, and in most areas, was highly erodible with an abundant gravel and cobble deposit. The vegetation was piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall and short grasses, and snakeweed.

Pre- and Post-Excavation Description

LA 86134 was a concentrated artifact scatter with a possible rock alignment. A total of 22 lithic artifacts and an indeterminate quantity of sherds were observed on the site surface. The lithic artifacts were mostly chert secondary flakes, although one utilized flake and one core were reported. The possible rock alignment was a linear distribution of quartzite cobbles located on the southern end of the site. It was 3 m long by one course wide.

Re-examination increased the site size to 65 m long by 50 m wide covering 3,250 sq m (Fig. 8.5). The concentrated artifact scatter was relocated, but the possible rock alignment was not found. The main concentration is in a drainage located in the southwestern quarter of the site. The second concentration was on the top of the drainage, 17 m northwest of the main concentration. The third concentration was located in the

Table 8.4. Core Attributes, LA 86131

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	Area
chert	medium	multidirectional	50	6	68	49	42	1
chert	medium	multidirectional	60	4	141	110	110	1
chert	medium	bidirectional	50	6	72	66	43	1
chert	fine	multidirectional	30	8	169	87	78	0
chert	fine	unidirectional	0	3	60	42	29	0
chert	fine	unidirectional	80	3	73	45	23	0
chert	fine	multidirectional	60	2	124	100	98	0

southeastern corner of the site, 30 m east of the main concentration. Eighty-one pieces of chipped stone included one Basketmaker II projectile point, one obsidian biface, one chert biface, one uniface, one obsidian flake, and four sherds of Santa Fe Black-on-white pottery. No features were encountered. No artifacts were recovered from the subsurface.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Three 2-by-2-m units were located in areas with the greatest artifact density. These areas were Grids 92N/147E, 96N/115E, and 115N/100E (the designations refer to the northeast corner of each 2-by-2-m excavation unit). These units were used to determine the depth of the cultural deposit and to expose associated thermal features.

The 2-by-2-m units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 10 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. Grids 95N/115E, 114N/100E, and 92N/147E were excavated until noncultural material-bearing soil was reached. This depth was never more than 20 cm below the modern ground surface.

Test excavation revealed that the cultural deposits were limited to the surface. Deeper or more extensive excavation was not required. The surface chipped stone was recorded as the site assemblage. The surface pottery was piece-plotted and collected for laboratory identification. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

One stratum was encountered. The stratum was a loose, reddish brown (5YR 6/4) sandy loam that was mixed with abundant gravel and cobbles. This layer continued to the bottom of the excavated grids. The stratum corresponds well with the A1 horizon of the Panky series (Folks 1975:40). No artifacts were recovered from this stratum.

Artifact Assemblage

Pottery
by Steven A. Lakatos

Four Santa Fe Black-on-white sherds were recovered from the surface. A cluster of three sherds was located in the northwest portion of the site and one sherd was located downslope to the southeast.

Three Santa Fe Black-on-white bowl body sherds appear to be from the same vessel based on similar surface and paste attributes. Sherd

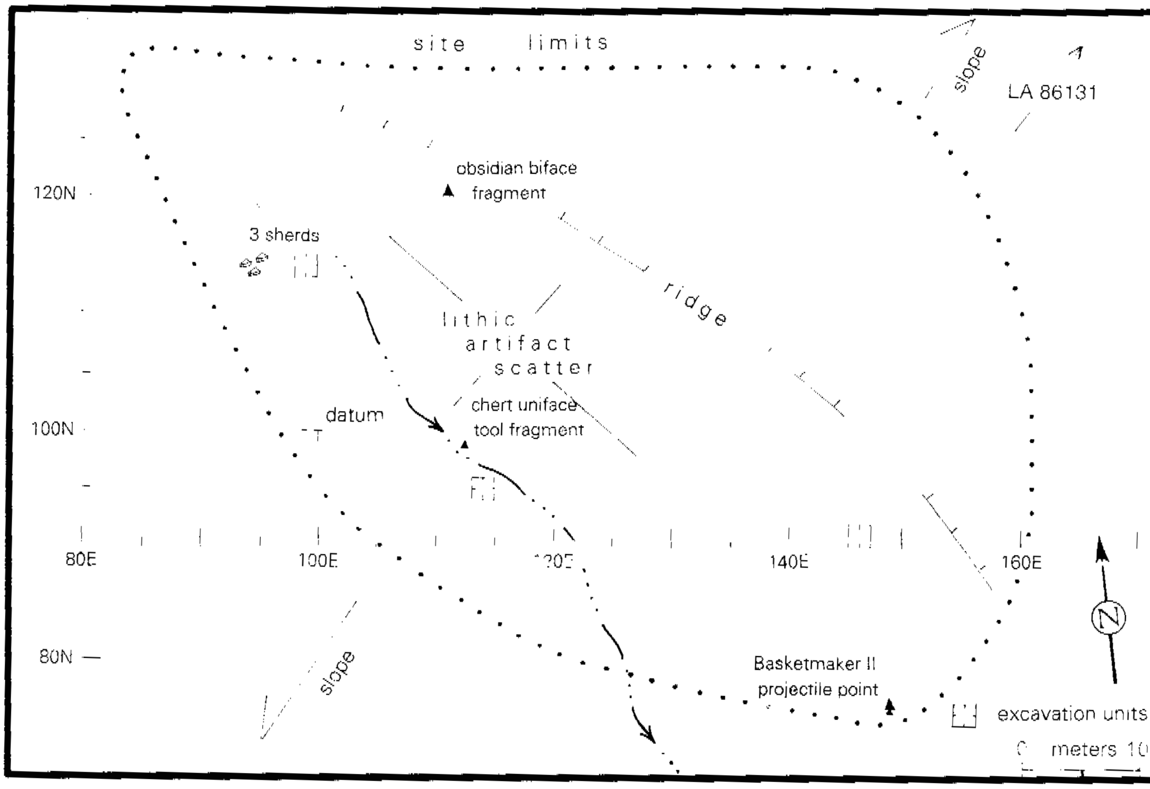

Figure 8.5. LA 86134, site map.

exteriors display a thin to medium textured white slip with a medium polish. Two sherd exteriors are exfoliated. One of these sherd exteriors exhibits a ghosted black organic paint. The interior of the sherds are exfoliated with the intact surfaces displaying a medium-textured white slip, ghosted black organic paint, and a medium polish. The exfoliation appears to be the result of natural effects such as freeze-thaw. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper. The design layout cannot be determined due to the lack of intact surfaces on these three sherds. The fourth sherd shares the same description as the previous three with two exceptions: the exterior is highly polished and lacks slip. This sherd may be from the same vessel, and was transported down slope by alluvial processes.

Chipped Stone
by Guadalupe A. Martinez

A total of 76 chipped stone artifacts were recovered or field recorded from LA 86134. The 76 chipped stone artifacts are assigned to seven artifact types consisting of core flakes, cores, angular debris, and formal tools (Table 8.5).

The chipped stone artifacts represent formal tools and debris from core reduction and raw material procurement. The majority of chipped stone artifacts (n = 70) were debris from core reduction and raw material procurement. The raw materials reflect a use of local material. The material types include chert, chalcedony, siltstone, quartzite, and obsidian from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west. The majority of the lithics were medium-grained chert (n = 41), 28 were fine grained, and 2 were coarse grained.

Debitage. Debitage from core reduction accounts for 69 of the 76 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types with counts of 60 and 9, respectively. The majority of the debitage was medium-grained chert (n = 35). A late stage of core reduction is represented by the distribution of dorsal cortex percentages. Ninety-four percent of the flakes exhibited 50 percent or less dorsal cortex. All nine pieces of angular debris had 50

Table 8.5. LA 86134 Artifact Type by Material Type

Count Row Pct Column Pct	Chert	Chalcedony	Obsidian	Siltstone	Quartzite	Row Total
Angular debris	8 88.9 11.8		1 11.1 50.0			9 11.8
Core flake	54 90.0 79.4	2 3.3 100.0		2 3.3 100.0	2 3.3 100.0	60 78.9
Biface flake			1 100.0 50.0			1 1.3
Multi-directional core	3 100.0 4.4					3 3.9
Uniface late stage	1 100.0 1.5					1 1.3
Biface early stage	1 100.0 1.5					1 1.3
Biface late stage	1 100.0 1.5					1 1.3
Column Total	68 89.5	2 2.6	2 2.6	2 2.6	2 2.6	76 100.0

percent or less cortex. Thirty-six or 60 percent of the core flakes had no dorsal cortex. The low percentage of cortex suggests that the lithic material was being reduced and prepared extensively for flake tool manufacture. Platform types primarily reflect all stages of reduction. Single-faceted (n = 31) and cortical (n = 8) platforms predominate and two single-faceted and abraded platforms, one multifaceted platform, and one multifaceted and abraded platform indicate late stage reduction. The other 17 flakes had collapsed, crushed, or missing platforms. Dorsal flake scars also reflect early and middle stage reduction; 40 of the 60 core flakes exhibiting three or fewer scars. Ten core flakes exhibit dorsal scars of four, five, or six, suggesting the cores that they were detached from were extensively used. The whole core flakes had a mean length of 45 mm, a mean width of 40 mm, and a mean thickness of 13 mm. Twenty-nine of the core flakes were whole. Seven proximal, 3 medial, 17 distal, and 4 lateral fragments were recorded. Dimensional data suggest that medium to large-sized core flakes were the most common by-product of core reduction.

Tools. There were five worked lithic tools in the assemblage. Two pieces of utilized obsidian were collected. One was a biface flake measuring 23 mm by 13 mm by 9 mm. It had a concave/-convex edge with a 65 degree edge angle. Bi-directional wear and abrasion along the working edge were noted. The flake had feather scars and an evenly rounded edge. The other piece of obsidian was angular debris measuring 34 mm by 20 mm by 11 mm. It had one convex utilized edge. It had an edge angle of 78 degrees. The edge was battered and had fracture scars.

A chert uniface end-side scraper measured 48 mm long by 23 mm wide by 7 mm thick. It had a convex edge with a 59 degree edge angle. The uniface had the most wear of all tools with rounding and unidirectional wear. It also had crescent scars and feather scars.

An early stage undifferentiated chert biface was collected. It was lenticular in profile with curving edges that met at a rounded point. It measured 46 mm long by 44 mm wide by 12 mm thick and appeared unused. Its two convex edges had 64 and 74 degree angles, but exhibited no detectable wear or damage. It was lenticular in cross section with curving edges that met at a rounded point.

A chert En Medio-style projectile point was identified. The tip was missing and the fracture was not diagnostic. The edges were convex with corner notches and a rounded base. The point measured 43 mm long by 25 mm wide by 6 mm thick. The edges displayed very little wear, only slight rounding. The complete point was probably never utilized or used only sparingly until it was fractured.

Cores. Three multidirectional medium-grained chert cores were recorded. None of the cores had cortex. One of the cores exhibited five scars and measured 52 mm long by 48 mm wide by 38 mm thick. The other two had 19 and 20 scars and measured 72 mm by 64 mm by 37 and 98 by 80 mm by 71 mm, respectively. The flake scars on the latter two cores suggest that they were originally large pieces of raw material. The cores were substantially reduced, though their size indicates that they were not exhausted. Multidirectional cores are typical of expedient core reduction aimed at producing flake tools or blanks.

Conclusions

LA 86134 was a sherd and lithic artifact scatter on a ridge top and slope that paralleled and extended towards the north floodplain of the Arroyo Calabasas. It is typical of many Las Campanas sites because it has a chipped stone concentration that is surrounded by a highly dispersed artifact scatter.

Test excavation and detailed recording of LA 86134 yielded little direct information about when the site was occupied and how it was used. Conclusions about site chronology and function must be drawn from indirect sources such as pottery manufacture dates and chipped stone technological information.

The earliest occupation is evidenced by the En Medio-style projectile point. This long-bladed, corner-notched form is typical of the 800 B.C. to A.D. 1. period in the Rio Puerco of the East (Irwin-Williams 1973) and the middle and Northern Rio Grande (Thoms 1977). This style has a wide, regional distribution. Other isolated late Archaic period projectile points suggest that the Las Campanas area was used by individual Archaic period hunters who left very limited evidence beyond discarded projectile points and temporally nondiagnostic tool fragments.

The four Santa Fe Black-on-white sherds indicate that part of the occupation occurred during the Coalition and early Classic period (A.D. 1175 to 1400). The sherds were widely distributed across the site and were part of four vessels. Paste and surface treatment of these sherds were similar and displayed similarities in paste and surface treatment with the majority of the Santa Fe Black-on-white pottery recovered by the Las Campanas project. This similarity is a quality of Santa Fe Black-on-white that is found in assemblages from large and small sites in the Santa Fe and Cochiti areas. Such consistency suggests that this pottery was made during the same span within its estimated 225 years of manufacture. The fine, self-tempered paste is a characteristic that suggests an earlier manufacture, such as between A.D. 1200 and 1300. The early half of this span includes the first settlement of Pindi Pueblo and the end of occupation at Arroyo Negro Pueblo.

Site function is difficult to address because of the dispersed artifact distribution, the low frequency of formal tools, and the absence of features. The chipped stone data suggest that LA 86134 was used for many purposes. At least one occupation resulted in a concentration of core reduction debris. The presence of five formal tools, but no evidence of tool manufacture, suggests that raw material was available but not abundant. Formal tools are more often associated with a curated strategy suggesting greater than a one-day travel distance from the residential site to the resource area. The presence of formal tools suggests that some of the artifacts may have been left by populations that did not live along the Santa Fe River.

Some raw material was procured and partly reduced on site as indicated by the five core flakes that had more than 60 percent dorsal cortex. Two cores had 19 and 20 dorsal flake scars indicating that intensive use of local raw materials did occur. The predominance of noncortical core flakes or core flakes with less than 60 percent cortex suggests that most of the chipped stone was brought to the site as flakes or partly reduced cores. This pattern would be expected if the gravel deposits on the ridge slope did not contain an abundant deposit of suitable lithic raw material. The dispersed distribution of core flakes and the very low artifact density (0.02 artifacts per sq m) also support the supposition that lithic raw material was present but not abundant.

The location of LA 86134 above the confluence of the Arroyo Calabasas and a primary tributary arroyo would have provided access to a richer, floodplain environment, which may have supported a riparian plant community during the wetter years. Simple diurnal use of the area would not have required formal facilities nor would have resulted in concentrations of debris from tool manufacture or maintenance or raw material processing. The very dispersed artifact distribution is a strong indication that the ridge was visited repeatedly, with the chipped stone and four sherds probably representing a minor part of all activities conducted at the site.

LA 86139

Setting

LA 86139 was located on a southeast-facing slope of a deep drainage system. It was eroded and dissected by three substantial channels and four minor channels. The soils were of the rolling Pojoaque-Panky association (Folks 1975:40), consisting of a sandy loam that was deflated and mixed with eroded gravel and cobble in terraced deposits. The vegetation was piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall and short grasses, and snakeweed.

Pre- and Post-Excavation Description

LA 86139 was a dispersed lithic artifact site with an intact checkdam reported at the northwestern edge of the site. Seventy-three artifacts were recorded. Of these most were obsidian secondary flakes with a sandstone metate fragment, three cores, and a biface.

Re-examination decreased site size to 40 m long by 35 m wide covering 1,400 sq m (Fig. 8.6). The artifact assemblage included core flakes, biface flakes, a basal fragment of an Armijo phase projectile point, a metate fragment, and cores. The lithic raw materials included black to gray, smokey, translucent obsidian and lesser amounts of chert and quartzite. The deflated remains of a hearth along the edge of an erosion channel were located and examined. The hearth fill yielded no artifacts and the soil was mostly redeposited. The site surface had been deflated to the top of or below the paleosol horizon. Due to the heavy erosion the surface distribution lacks spatial integrity. Excavation units did not yield any subsurface artifacts.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Four 2-by-2-m units were located in areas with the greatest artifact density. These areas were Grids 58N/100E, 68N/97E, 69N/100E, and 81N/104E (the designations refer to the northeast corner of each 2-by-2-m excavation unit). These units were used to determine the depth of the cultural deposit and to expose associated thermal features.

Test area 68N/97E was placed in an area with a possible feature. The probable feature was cross-sectioned. The exposed profile was recorded and a flotation sample was collected.

The 2-by-2-m units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 8-10 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. The 1-by-1-m unit was excavated until noncultural material-bearing soil was reached. This depth was never more than 25 cm below the modern ground surface. The surface chipped stone was recorded as the site assemblage. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

One stratum was encountered. The stratum was

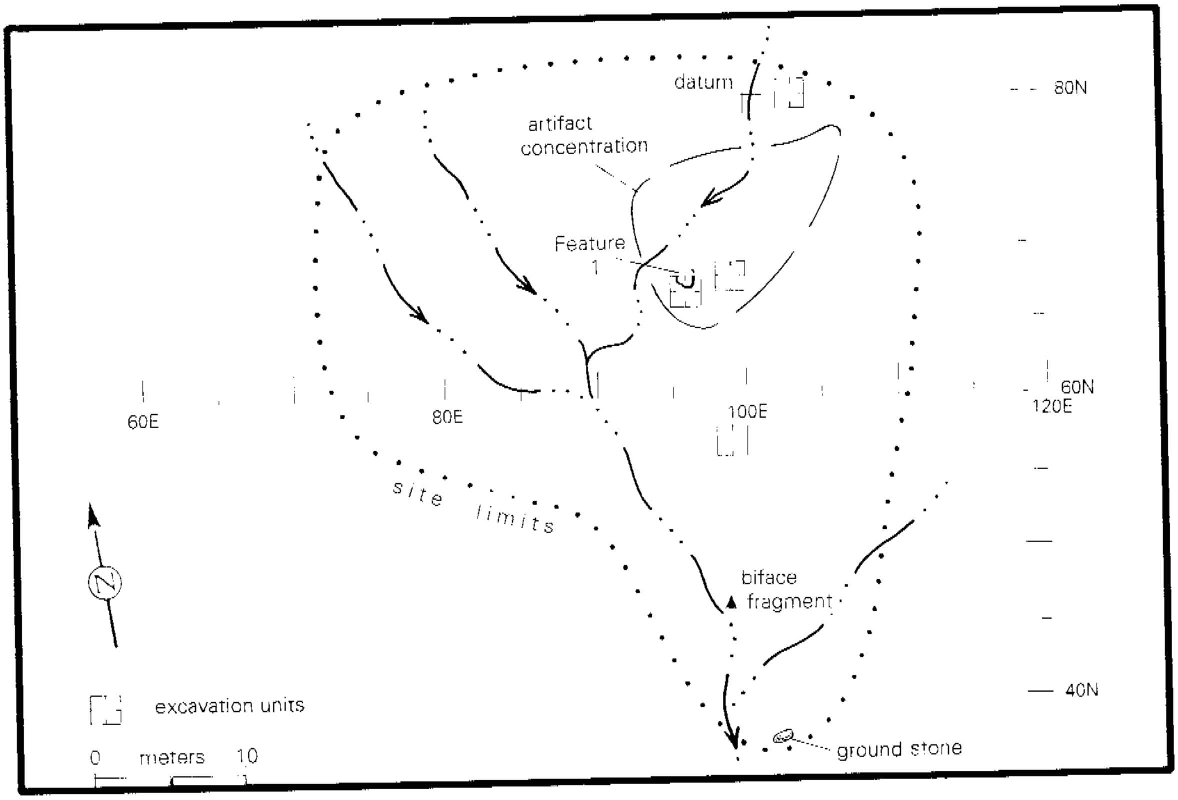

Figure 8.6. LA 86139, site map.

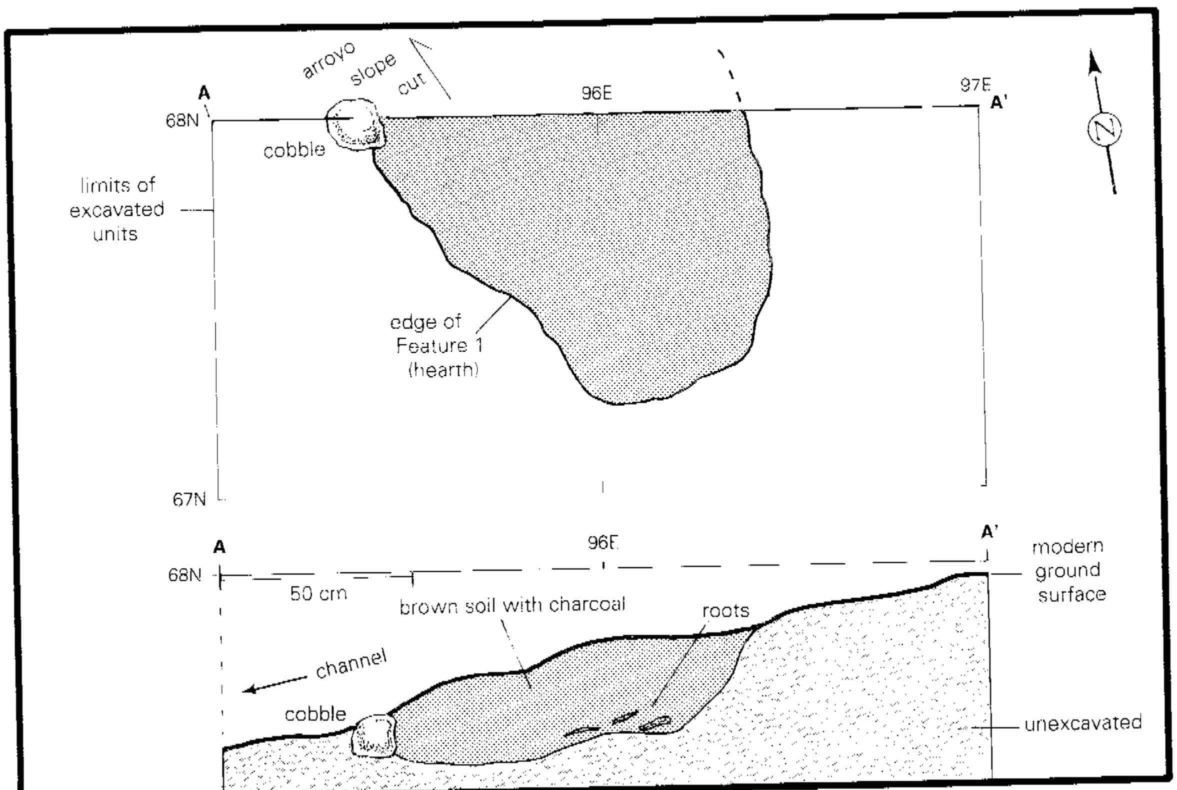

Figure 8.7. LA 86139, plan view and profile of Feature 1.

a loose, reddish brown (5YR 6/4) sandy loam that was mixed with abundant gravel. The soil was mildly calcareous. This layer continued to the bottom of the excavated grids. The stratum corresponds well with the A1 horizon of the Pojoaque series (Folks 1975:40). No artifacts were recovered from this stratum.

Feature 1 Description

Feature 1 was a thermal feature, possibly a hearth, located in Grids 68N/96-97E, on a west-facing slope above a southwest-flowing drainage. It measured 40 cm north-south by 50 cm east-west by 39 cm deep (Fig. 8.7). The feature was elongated, with a gentle curve at one end of the feature, creating a "fat L" shape.

It was dug into native soil with no fire-cracked rock or cobble lining present, was deflated, and cut by the bank of a deeply entrenched channel. The feature fill was mottled and was mixed primary and secondary deposit. No artifacts were recovered from the feature. The ethnobotanical sample yielded no nonwood economic species. The feature could not be independently dated from the artifact assemblage. It is assumed that the feature and the artifact concentration are contemporaneous.

Artifact Assemblage

Chipped Stone

A total of 98 chipped stone artifacts were recovered or field recorded from LA 86139. The 98 chipped stone artifacts consisted mostly of core flakes, angular debris, and biface flakes (Table 8.6).

The chipped stone artifacts are formal tools and debris from core reduction and raw material procurement. The majority of chipped stone artifacts (n = 81) were debris from core reduction and raw material procurement. The raw materials reflect a use of local material. The material types were chert, chalcedony, and obsidian from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west.

Debitage

Debitage from core reduction accounts for 81 of the 98 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types with counts of 65 and 16, respectively. The majority of the debitage was obsidian (n = 73). Core flakes exhibited a low frequency of dorsal cortex, with 52.3 percent lacking dorsal cortex, 34 percent having 10 to 50 percent dorsal cortex, and the remaining 15.7 percent having greater than 50 percent dorsal cortex. All but one of the 16 pieces of angular debris had 50 percent or less cortex. The low percentage of cortex suggests that the lithic material was being reduced and prepared extensively and is indicative of late stage core reduction or tool production.

Platform types in both core and biface flakes reflect an even distribution of early, middle, and late reduction stages with 20 cortical or single-faceted platforms and 22 multifaceted, multifaceted and abraded, or retouched platforms. The other 34 flakes had collapsed, crushed, or missing platforms, which occur during middle and late stage reduction.

Core flakes exhibited dorsal flake scar counts reflecting all stages of core reduction. Of the 65 core flakes, 7.7 percent lacked dorsal scars, 63 percent had from one to three dorsal scars, and 28.3 percent had four or more dorsal scars. All biface flakes exhibited two or more dorsal scars, with 6 of 11 biface flakes exhibiting four or more dorsal scars. The core and biface flake dorsal scar counts reflect all stages of core reduction and tool production, with more emphasis on the middle and late stages of the reduction sequence.

Thirty-nine core flakes and four biface flakes were whole. Twenty of the core flakes were distal portions, five were medial and one was proximal. The whole core flakes had a mean length of 34 mm, a mean width of 27 mm, and a mean thickness of 7 mm. Dimensional data suggest that small to medium-sized core flakes were the most common by-product of core reduction.

Tools. There were two obsidian bifacial tool fragments in the assemblage. The middle-stage biface measured 36 mm long by 20 mm wide by 10 mm thick and was the distal portion of a blade. The late stage biface was the basal and blade portion of an Armijo style projectile point (1800 to 800 B.C.). It measured 20 mm long by

Table 8.6. LA 86139 Artifact Type by Material

Count Row Pct Column Pct	Chert	Chalcedony	Obsidian	Jemez Obsidian	Row Total
Angular debris	3 18.8 13.0		7 43.8 25.9	6 37.5 13.0	16 16.3
Core flake	18 27.7 78.3	1 1.5 50.0	14 21.5 51.9	32 49.2 69.6	65 66.3
Biface flake	1 9.1 4.3		4 36.4 14.8	6 54.5 13.0	11 11.2
Tested cobble	1 100.0 4.3				1 1.0
Multidirectional core		1 100.0 50.0			1 1.0
Biface middle stage			1 50.0 3.7	1 50.0 2.2	2 2.0
Biface late stage			1 50.0 3.7	1 50.0 2.2	2 2.0
Column Total	23 23.5	2 2.0	27 27.6	46 46.9	98 100.0

15 mm wide by 3 mm thick.

Cores. Two cores were recorded at LA 86139. One undifferentiated fine-grained chert core was recorded. It had 80 percent cortex indicating it was not extensively reduced. It measured 90 mm long by 60 mm wide by 53 mm thick. The second core was a chalcedony multidirectional core that exhibited 10 percent cortex indicating that it was more extensively used. It measured 100 mm long by 70 mm wide by 33 mm thick.

Conclusions

LA 86139 is one of the earliest Archaic period sites in the Las Campanas area. It was a chipped and ground stone concentration that had been dispersed by post-occupation deflation and erosion. The presence of debris from core reduction, tool production, and chipped and ground stone fragments in association with a hearth suggest a greater diversity of activities and site structure than most other Las Campanas chipped stone sites. Chronology and site function are addressed with the artifact assemblage and feature data.

LA 86139 dates to the Armijo phase of the late Archaic period (1800 to 800 B.C.) based on the one temporally diagnostic projectile point. It is roughly contemporaneous with the pit structure and base camps located near the Santa Fe airport, 5 km to the southwest (Schmader 1994; Lent 1988).

Inferences about occupation history and site function can be drawn from the artifact assemblage, the presence of a hearth, and the topographic setting. The artifact assemblage indicates that a wide range of resource procurement and processing activities occurred at LA 86139. The relatively high artifact density (0.13 per sq m) combined with only one projectile point fragment and a single set of ground stone tools indicate that there was one main occupation. The relatively shallow and informal thermal feature and the low artifact count suggests that the group size was small and that the occupation was brief. The diverse assemblage of debris and tools indicates a wide range of activities.

A logistically organized subsistence strategy and lithic technology is indicated. Lithic raw materials were dominated by obsidian and fine-grained chert, both of which are superior for stone tool production. Medium-grained material are only 6 percent of the assemblage, which is a low percentage when compared with other Archaic period sites in the Las Campanas area. The importance placed on suitable raw material is further illustrated by the occurrence of obsidian at 74 percent of the assemblage. This obsidian could only be obtained near or along the Rio Grande or on the Pajarito Plateau. Furthermore, no cores of obsidian were recovered, suggesting obsidian was brought to the site as tool blanks or as partially reduced cores. Some local material was used as evidenced by the chert and chalcedony cores. However, all tools and the majority of the biface flakes were obsidian, suggesting that formal or important tool manufacture relied on better material, while more expedient manufacture made use of local material.

LA 86152

Setting

LA 86152 was located on a gentle, wide, dissected ridge slope facing south-southeast. The site was dissected by four northwest-southeast trending swales and one channel along the eastern edge. The site is along the south edge of the Buckman Road right-of-way and on the western edge of the Las Campanas Parkway road cut. The soils were of the Pojoaque-Panky rolling association (Folks 1975:40), consisting of a sandy loam alluvium mixed with abundant gravel and cobbles and nodules of chert present in the deposit. The vegetation was piñon-juniper, narrowleaf yucca, rabbitbrush, tall and short grasses, and prickly pear cactus.

Pre- and Post-Excavation Description

LA 86152 was described as a dispersed lithic scatter that included a chipping station and checkdam. Thirty-five lithic artifacts were recorded on site, and most were secondary chert flakes. One ground stone artifact, a possible mano, was also recorded. The possible chipping station was located in the northeastern part of the site and was approximately 1 m in diameter. The checkdam was considered to be a historic feature.

Reexamination increased the site size to 80 m long by 40 m wide covering 3,200 sq m (Fig. 8.8). Three lithic artifact concentrations were identified consisting of core flakes and angular debris. Each concentration was designated as an area and given an area number.

Area 1 measured 10-by-8 m and was located at Grid 88N/92E. Area 2 measured 8-by-8 m and was located at Grid 64N/92E. Area 3 measured 1 m in diameter and was located at the north end of the site.

In addition to the chipped stone debris, two utilized flakes, an indeterminate biface fragment, and a small, one-hand mano were recovered. No features were encountered. There were no significant subsurface deposits.

The remainder of this section briefly describes the natural stratigraphy and the artifact assemblage.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Two 2-by-2-m units were located in areas with the greatest artifact density. These areas were Grids 64N/92E and 88N/92E (the designations refer to the northeast corner of each excavation unit). These units were used to determine the depth of the cultural deposit and to expose associated thermal features.

The 2-by-2-m units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 5 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. Grid 88N/92E in Area 1 and Grid 63N/91E in Area 2 were selected for deeper excavation. The 1-by-1-m unit was excavated until noncultural material-bearing soil was

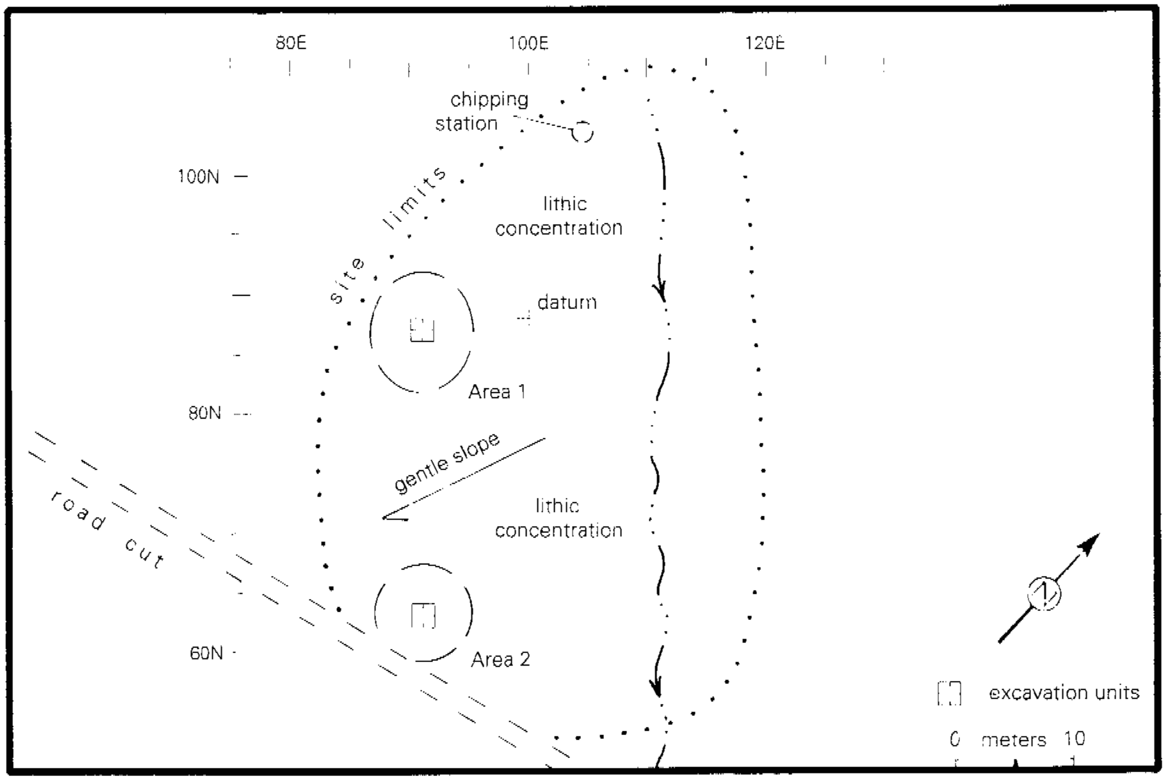

Figure 8.8. LA 86152, site map.

reached. This depth was never more than 15 cm below the modern ground surface.

Test excavation revealed that the cultural deposits were limited to the surface. Deeper or more extensive excavation was not required. The surface chipped stone was recorded as the site assemblage. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

Two strata were encountered. Stratum 1 was a loose, brown (7.5YR 6/4) sandy loam mixed with abundant gravel and cobbles. This layer contained all of the artifacts recovered at the site. This layer was 7 cm thick. Stratum 2 was a coarse, reddish brown (5YR 5/3) sandy loam with calcareous deposits at the bottom of the layer. No artifacts were recovered from this layer. This layer was at least 8 cm thick. These strata correspond with the A1 and B1 horizons of the Panky series (Folks 1975:40).

Chipped Stone

A total of 92 chipped stone artifacts were recovered or field recorded from LA 86152. The 92 chipped stone artifacts are assigned to 6 artifact types consisting mainly of core flakes and angular debris.

The chipped stone artifacts are debris from core reduction and raw material procurement. The raw materials reflect a use of local chert, quartzite, and quartzitic sandstone from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west. The chipped raw materials are mainly chert, which was fine to coarse grained and occurred in a wide range of colors.

Debitage

Debitage from core reduction accounts for 88 of the 93 chipped stone artifacts (Table 8.7). Core flakes and angular debris were the two most common artifact types with counts of 69 and 19, respectively. The majority of the debitage was of fine-grained chert (n = 56). Middle and late stages of core reduction are represented by the distribution of cortex percentages. Fourteen (74 percent) of the 19 pieces of angular debris had no cortex. Thirty-six (52 percent) of the core flakes exhibited no cortex. Only 13 percent of the core flakes had 50 percent or more cortex. Five of the core flakes had 100 percent cortex. Forty (58 percent) of the core flakes were whole, 4 were proximal fragments, 6 were medial, 15 were distal, 1 was lateral, and 3 were indeterminate. Platform types primarily reflect all reduction stages. Single-faceted (n = 26) and cortical (n = 5) platforms predominate. Eight multifaceted platforms, one single-faceted abraded, and two multifaceted abraded platforms were recorded. The other 27 flakes had collapsed, crushed, or missing platforms. Dorsal scars on core flakes also reflect all reduction stages. Fifty-four (78 percent) of the core flakes exhibited three or less scars. Eight core flakes exhibited four dorsal scars, five had five scars, one had six. One flake had twelve dorsal scars suggesting that the core it was detached from was extensively used. Whole core flake dimensions had a mean length of 37 mm, a mean width of 31 mm, and a mean thickness of 10 mm. Dimensional data suggest that medium-sized core flakes were the most common by-product of core reduction.

Undifferentiated Biface. One undifferentiated biface fragment represented the only worked lithic on the site. The biface was made of a fine-grained chert. The dimensions of the biface were 18mm in length, 42 mm in width, and 10 mm in thickness.

Cores. One unidirectional fine-grained chert core and two multidirectional fine-grained chert cores were recorded. The unidirectional core measured 72 mm long by 33 mm wide by 27 mm thick. Cortex covered 60 percent of the core, which suggests that the core was used minimally. The multidirectional cores measure 66 mm in length by 62 mm in width by 34 mm in thickness, and 92 mm in length by 67 mm in width by 53 mm in thickness. There was 50 and 60 percent cortex on the multidirectional cores. The cores were moderately reduced but not exhausted. Multidirectional cores are typical of expedient core reduction aimed at producing flake tools or blanks.

Conclusions

LA 86152 was a lithic artifact scatter on a southeast-facing ridge slope set back from the north floodplain of the Arroyo Calabasas. It is typical of many Las Campanas sites because it consisted of three concentrations of low artifact frequency separated by a very low density artifact scatter.

Test excavation and detailed recording of LA 86152 yielded little direct information about when the site was occupied or how it was used. Conclusions about site chronology cannot be drawn from the artifact or excavation data. Generalizations about site function can be made through the chipped stone analysis.

Site function is difficult to address because of the dispersed artifact distribution, the low frequency of formal tools, and the absence of features. The chipped stone data suggest that LA 86152 was used as a limited activity site. Activities that can be inferred from the chipped stone assemblage include raw material procurement and middle stage core reduction.

Raw material procurement is indicated by the presence of three unidirectional or multidirectional cores and five core flakes exhibiting 100 percent dorsal cortex. The cores retained 50 to 60 percent dorsal cortex, indicating that they were partly reduced, and then discarded. The desired product of raw mateial reduction apparently was core flakes and not cores.

In addition to raw material procurement, partly reduced cores may have been brought to the site and further reduced. This is indicated by the predominance of noncortical core flakes or core flakes with less than 60 percent cortex. This pattern would be expected if the gravel deposits on the ridge slope did not contain an abundant deposit of suitable lithic raw material. The presence of a broken biface suggests that core flakes may have been produced to replace worn out toolkit components. It is common for exhausted or broken tools to be discarded at a replacement material source.

The location of LA 86152 above the Arroyo Calabasas suggests that activities were related to exploiting the plant and animal resources of the low, broad piedmont ridges, as well as the riparian community. Simple diurnal use of the area would not have required formal facilities nor would have resulted in concentrations of debris from tool manufacture or maintenance, or raw material processing. The very dispersed

Table 8.7. LA 86152 Artifact Type by Material Type

Count Row pct Column pct	Material Type				
Artifact type	Chert	Chalcedony	Quartzite	Quartzitic Sandstone	Row Total
Angular Debris	19 100.0 22.1				19 20.7
Core Flake	62 91.2 72.1	2 2.9 100.0	1 1.5 100.0	3 4.4 100.0	68 73.9
Biface Flake	1 100.0 1.2				1 1.1
Tested Cobble	1 100.0 1.2				1 1.1
Pyramidal	2 100.0 2.3				2 2.2
Biface undifferentiated	1 100.0 1.2				1 1.1
Column Total	86 93.5	2 2.2	1 1.1	3 3.3	92 100.0

artifact distribution is a strong indication that the site was visited repeatedly. The three concentrations indicated that at least three visits entailed activities supplementary to raw material procurement.

LA 86155

Setting

LA 86155 was on a south-southwest facing slope with a drainage to the east. A swale bordered the site to the west-southwest. Four modern roads surrounded the site. The closest was approximately ½ km from the site. The soils were of the rolling Pojoaque-Panky association (Folks 1975:40), consisting of a sandy loam with cobbles and concentrations of gravel. The vegetation was piñon-juniper, banana leaf yucca, rabbit brush, tall and short grasses, salt sage, cholla and prickly pear cactus, and snakeweed.

Pre- and Post-Excavation Description

LA 86155 was an artifact scatter that included a chipping station, a sherd and lithic artifact scatter, and a possible hearth. The chipping station was 3-by-1 m, and was in a small drainage with 10 pieces of chipped stone, which were mostly secondary chert flakes. Other artifacts on the site were seven secondary chert flakes and nine black-on-white bowl sherds (seven Santa Fe Black-on-white and two of an indeterminate pottery type). The possible hearth measured 40 cm in diameter and was marked by three large cobbles and gray stained sand. The cultural and temporal affiliation, as determined from the Santa Fe Black-on-white pottery, was Puebloan from the Coalition period (A.D. 1175-1400).

Excavation confirmed the site identification as a chipped stone and sherd scatter covering 1,050 sq m although the rock feature was not relocated (Fig. 8.9). A small sherd concentration was located in a shallow southward drainage. In

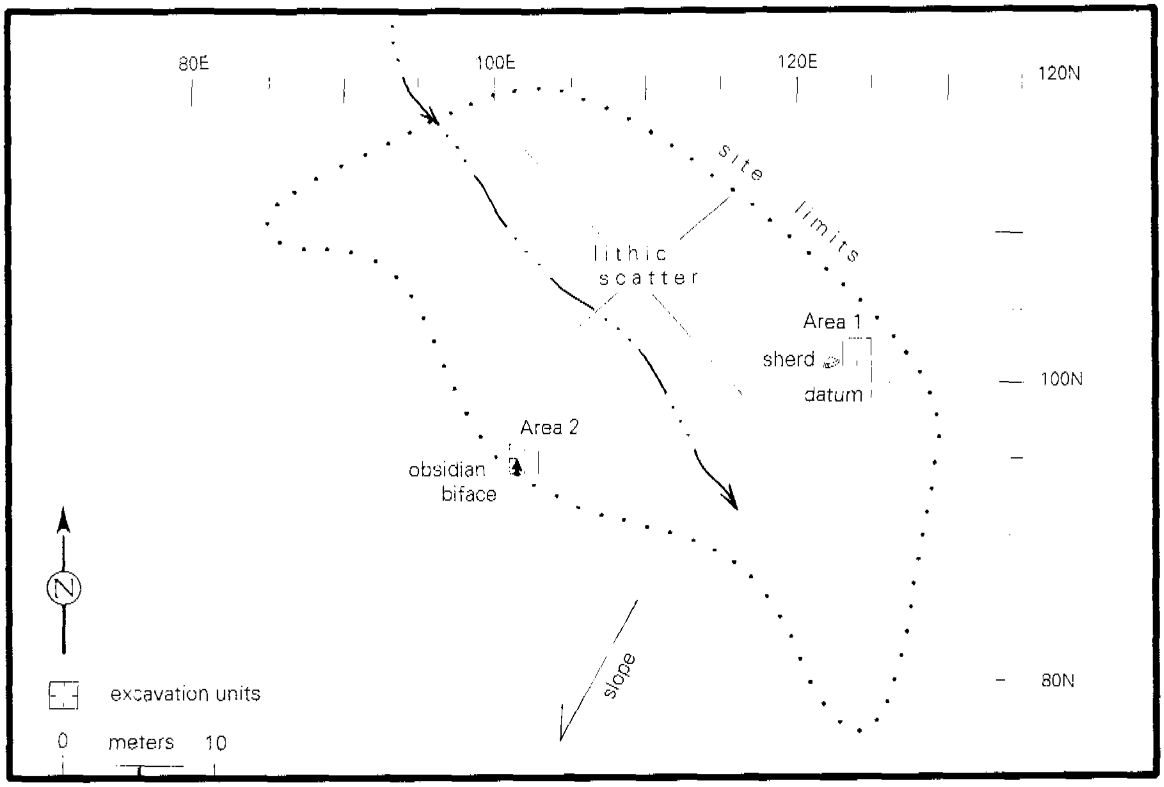

Figure 8.9. LA 86155, site map.

addition to the chipped stone and collected pottery sherds, an obsidian biface was found on the surface in Grid 95N/102E. No subsurface cultural deposits were encountered.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30 m intervals from which a grid system was superimposed across the site area.

Two 2-by-2-m units were placed in areas with the greatest artifact density. These areas were Grids 96N/103E and 102N/125E (the designations refer to the northeast corner of each 2-by-2-m excavation unit). These units were used to determine the depth of the cultural deposit and to expose associated thermal features.

The 2-by-2-m units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 5 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. The 1-by-1-m unit was excavated until noncultural material-bearing soil was reached. This depth was never more than 15 cm below the modern ground surface.

Test excavations revealed that the cultural deposits were limited to the upper 5 cm of loose soil. Deeper or more extensive excavation was not required. The surface chipped stone was recorded as the site assemblage. The surface pottery was piece-plotted and collected for laboratory identification. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

Two strata were encountered in the two excavated areas. Stratum 1 was a loose, pale yellow (2.5Y 8/4) eolian sand mixed with gravel and cobbles. This layer was 5 to 7 cm thick. Four pottery sherds were recovered from this level. Stratum 2 was a reddish brown (5YR 4/3) sandy clay loam mixed with gravel, some large cobbles, and was mildly calcareous. No artifacts were recovered from this stratum. Strata 1 and 2 correspond with the A1 and B1 horizons of the Panky series (Folks 1975:40).

Artifact Assemblage

Pottery

Ten prehistoric pottery sherds were recovered from the surface and the 5 cm surface-strip. All sherds were located at the western portion of the site in a 1-by-3-m area. Two Santa Fe Black-on-white vessels were identified based on surface and paste attributes.

Vessel 1 is represented by eight Santa Fe Black-on-white bowl body sherds, two of which refit. The exteriors of these sherds are scraped smooth, exhibiting striations and pitting. The interior of four sherds are exfoliated. The intact surfaces of two sherds exhibit a light gray floated slip, thick black organic paint, and a heavy polish. The surface condition appears to be the result of natural processes such as freeze-thaw. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper. Sand-tempered Santa Fe Black-on-white pottery is common on Coalition and Early Classic period sites of the Las Campanas area. The remaining three sherds share the same description as the previous four, but lack exfoliated surfaces. The design layout can only be determined on one of the sherds. It consists of thin parallel diagonal hatching 2 to 3 mm apart.

Vessel 2 is represented by a Santa Fe Black-on-white bowl rim sherd and a bowl body sherd. The exterior of the Santa Fe Black-on-white rim sherd is scraped smooth exhibiting striations and a light polish on raised surfaces. The interior surface exhibits a thin textured off-white slip, thin streaky black organic paint, and a heavy polish. The paste is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper. The design layout consists of a thick encircling band located 4 to 5 mm below the rim. Solid triangles opposed to hatching are positioned 4 mm below and perpendicular to the encircling band. The rim is tapered, rounded, and undecorated. Use of this vessel prior to deposition is indicated by abrasion on some areas of the rim.

The body sherd shares the same description as the rim sherd. The design layout on this sherd consists of a thin hatching 1 to 2 mm apart within a border.

Chipped Stone

A total of 40 chipped stone artifacts were recovered or field recorded from LA 86155. The 40 chipped stone artifacts are assigned to 5 artifact types, but consist mainly of core flakes.

The chipped stone artifacts are debris from core reduction and raw material procurement. The raw materials reflect a use of local chert, obsidian, and quartzite from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west (Table 8.8). Chert encompasses fine- to coarse-grained material that occurs in a wide range of colors. The next highest material type frequency was quartzite (n = 5), and the remaining two lithics were obsidian.

Debitage. Debitage from core reduction accounts for 37 of the 40 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types with counts of 31 and 6, respectively. Middle and late stages of core reduction are represented by the distribution of dorsal cortex percentages. Twenty-two core flakes had 50 percent or less dorsal cortex. All six pieces of angular debris had 50 percent cortex. Three core flakes had 70, 80, and 90 percent dorsal cortex and six had 100 percent. Thirteen core flakes were whole. One proximal, five medial, nine distal, and three lateral fragments were recorded. Platform types primarily reflect early and middle stage reduction with; ten had cortical platforms and five had single-facet platforms. The remaining core flakes fragments had no visible platforms. Dorsal flake scars reflect early and middle stage reduction; 84 percent of the 31 core flakes exhibited three or fewer scars. The highest number of scars was recorded for two flakes with six. There were two flakes with five scars and one with four. The scars on these five flakes suggest that the cores they were detached from were extensively used. Whole core flake dimensions had a mean length of 39 mm, a mean width of 29 mm, and a mean thickness of 10 mm. Dimensional data suggest that medium-sized core flakes were the most common by-product of core reduction.

One late stage biface and one undifferentiated biface represent the only worked lithics on the site. The late stage biface was an obsidian drill.

Table 8.8. LA 86155 Artifact Type by Material Type

Count Row pct Column pct	Material Type			
Artifact Type	Chert	Obsidian	Quartzite	Row Total
Angular debris	6 100.0 18.2			6 15.0
Core flake	25 80.6 75.8	1 3.2 50.0	5 16.1 100.0	31 77.5
Multidirectional core	1 100.0 3.0			1 2.5
Biface undifferentiated	1 100.0 3.0			1 2.5
Biface late stage		1 100.0 50.0		1 2.5
Column Total	33 82.5	2 5.0	5 12.5	40 100.0

It measured 29 mm long, 18 mm wide, and 6 mm thick.

Core. One unidirectional medium-grained chert core was recorded. It was 62 mm long by 33 mm wide by 27 mm thick. There was no dorsal cortex and it had ten flake scars.

Conclusions

LA 86155 was typical of many Las Campanas sites because it consisted of a sherd concentration representing fragments of two Santa Fe Black-on-white bowls and a dispersed scatter of chipped stone debris.

Test excavation and detailed artifact recording of LA 86155 yielded little direct information about when the site was occupied or how it was used. Conclusions about site chronology can only be drawn from the Santa Fe Black-on-white pottery. Generalizations about site function can be made from the chipped stone analysis.

The six Santa Fe Black-on-white sherds indicate that part of the occupation occurred during the Coalition and early Classic period (A.D. 1175 to 1400). The sherds were clustered in one area of the site and were from two vessels. Spatial proximity of the sherds suggests that they were discarded during a single occupation episode. They may have been used as temporary containers during small-scale and brief processing activities. Paste and surface treatment of these sherds was similar, and the sherds displayed similarities in paste and surface treatment to the majority of the Santa Fe Black-on-white pottery recovered by the Las Campanas project. This similarity is a quality of Santa Fe Black-on-white that is found in assemblages from large and small sites in the Santa Fe and Cochiti areas. Such consistency suggests that this pottery was made during the same span within its estimated 225 years of manufacture. The fine, self-tempered paste is a characteristic that suggests an earlier manufacture, such as between A.D. 1200 and 1300. The early half of this span includes the first settlement of Pindi Pueblo.

Site function is difficult to address because of the dispersed artifact distribution, the low frequency of formal tools, and the absence of features. The cluster of Santa Fe Black-on-white pottery may represent one occupation episode. The dispersed distribution of the chipped stone artifacts indicate that they could have been deposited as isolated artifacts from raw material testing and procurement and as debris from expedient tool manufacture. A single obsidian bifacial drill fragment may have been discarded when a suitable replacement was obtained through direct procurement or by using debris left from earlier occupation episodes. Chipped stone debris data indicate that all stages of core reduction occurred. Core flakes with greater than 50 percent dorsal cortex indicate early stage core reduction. Core flakes with more than three dorsal scars suggest limited middle to late stage core reduction focused on expedient tool production.

The location of LA 86155 ¼ km above the Arroyo Calabasas suggests that the artifacts were discarded during activities related to exploitation of plant and animal resources of the low, broad piedmont ridges, and perhaps the Arroyo Calabasas riparian community. The lack of formal facilities or concentrations of debris from tool manufacture or maintenance, or raw material processing suggest a diurnal foraging strategy rather than a logistically organized subsistence strategy. The dispersed artifact distribution and wide range of attributes recorded on the chipped stone debris are a strong indication that the site was visited repeatedly.

LA 86156

Setting

LA 86156 was on a gentle, southeast-facing slope above the prehistoric floodplain of the Arroyo Calabasas. The soils were of the Pojoaque-Panky rolling association (Folks 1975:40), consisting of a sandy loam and clay loam with abundant gravel and cobbles. The vegetation is piñon-juniper, narrowleaf yucca, cholla and prickly pear cactus, tall and short grasses, and snakeweed.

Pre- and Post-Excavation Description

LA 86156 is a dispersed lithic artifact scatter with one intact checkdam and one J-shaped alignment. Twenty-seven flakes, which were mostly secondary chert flakes, and one spoon were on the site. In the south-central portion of the site was the J-shaped rock alignment that may have been an agricultural plot. Cultural and temporal affiliations could not be determined during the inventory due to the lack of diagnostic artifacts or features.

Excavation confirmed the survey identification. The site was a dispersed artifact scatter covering 1,400 sq m and included four areas of lithic core reduction debris (Fig. 8.10). In addition to the chipped stone, five sherds of black-on-white pottery were collected from Area 1 in the southern part of the site. Areas 1, 3, and 4 yielded few subsurface artifacts. Area 5 yielded abundant core reduction debitage on the surface, in the surface strip, and from Level 1. Level 2, in Area 5, revealed that the cultural deposit was shallow. The excavated cross section of the J-shaped rock alignment in Area 2 yielded no further information regarding its function or age.

Excavation Methods

The site limits and artifact concentrations were defined by pinflagging the artifacts. A baseline was established at 30-m intervals from which a grid system was superimposed across the site area.

Four 2-by-2-m units were placed in areas with the greatest artifact density and labeled as Areas 1, 3, 4, and 5. These areas were located at Grids 56N/105E (Area 1), 66N/88E (Area 3), 91N/102E (Area 4), and 87N/112E (Area 5). A fifth area, Area 2, was located at Grid 72N/98E and included the J-shaped rock alignment. Excavation of Area 2 was undertaken by using a 1-by-2-m unit. These units were used to determine the depth of the cultural deposit and to expose associated thermal or architectural features.

Area 1 was placed in an artifact concentration in the southern portion of the site, 4 m from the southern site boundary. Five pottery sherds and one lithic artifact were recovered from this area. Grid 55N/105E yielded three pottery sherds from the surface-strip and was selected for deeper excavation.

Area 3 was placed in a chipped stone concentration in the western portion of the site, 20 m from Area 1 and 6 m from the western site boundary. Eight artifacts were recovered from this area. Grid 66N/88E yielded three chipped stone artifacts in the surface-strip and was select-

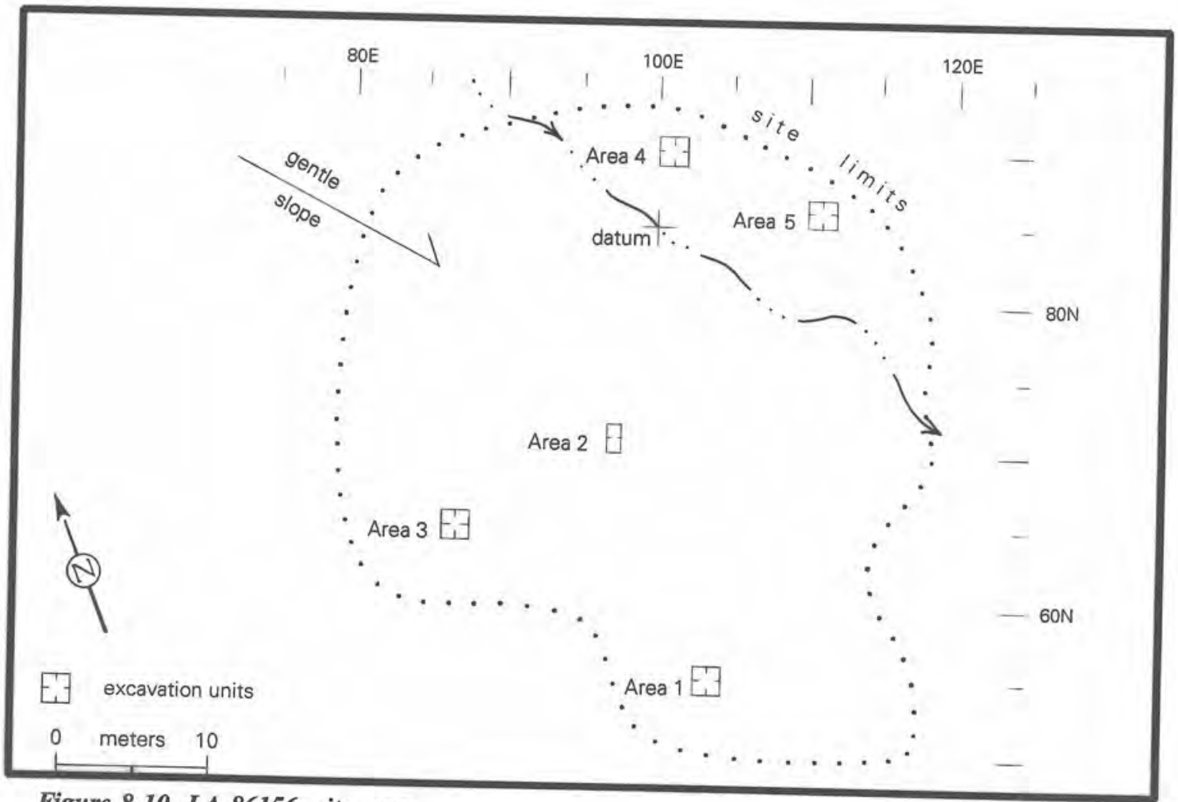

Figure 8.10. LA 86156, site map.

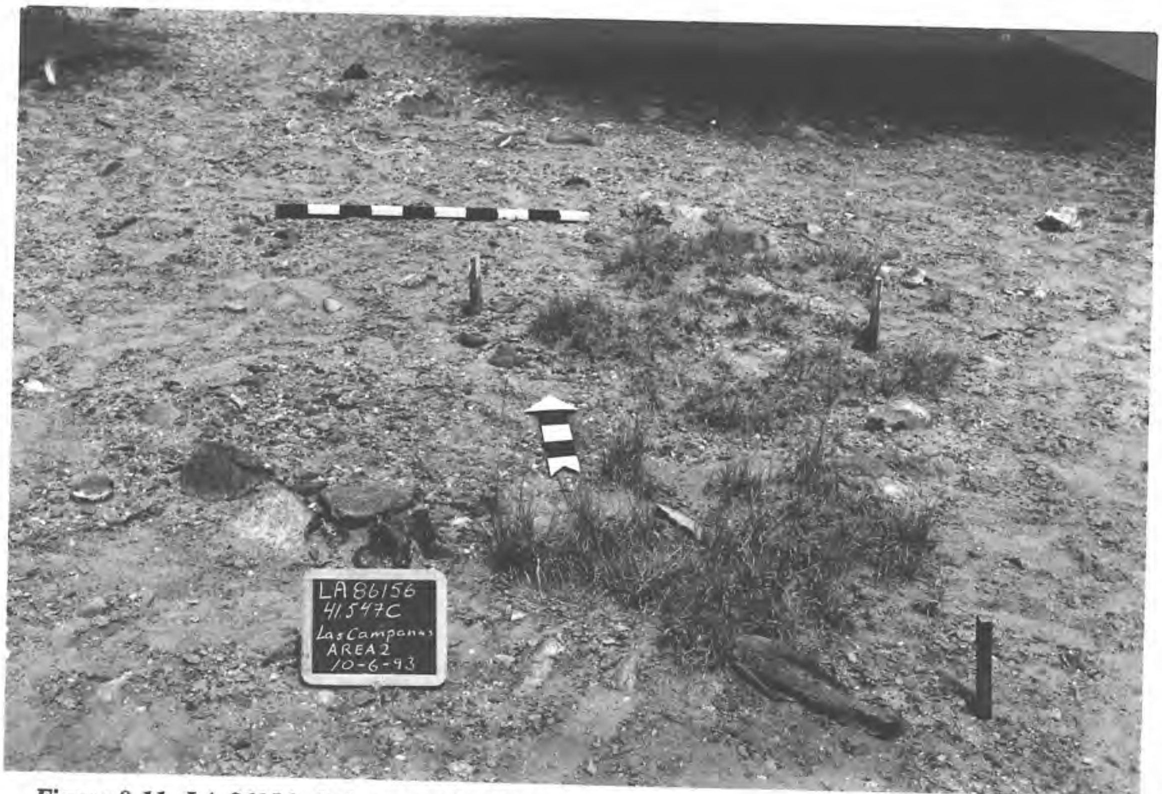

Figure 8.11. LA 86156, J-shaped rock alignment.

ed for deeper excavation.

Area 4 was placed in a chipped stone concentration in the northeastern portion of the site approximately 29 m from Area 1 and 1 m from the northeastern site boundary. Seven artifacts were recovered from this area. Grid 91N/102E yielded five artifacts in the surface-strip and was selected for deeper excavation.

Area 5 was placed in a chipping station at the northeast end of the site 8 m south of Area 4 and 2 m from the northeastern site boundary. Fourteen artifacts were recovered from the surface and 116 were recovered from surface-stripping. Grid 87N/111E was selected for deeper excavation.

Area 2 was placed in the area of the J-shaped rock alignment in the approximate center of the site, 19 m north of Area 1 (Fig. 8.11). The formation measured 6 m north-south by 2.3 m east-west. A profile was exposed in Grid 71N/98E revealing that the formation rested on caliche. No artifacts were recovered from within the formation or in association with it.

The excavation units were surface-stripped in 1-by-1-m units. Surface-stripping removed the upper 5-7 cm of loose soil. Selection of a 1-by-1-m unit for deeper excavation was based on artifact yield or at the excavator's discretion if no artifacts were recovered. The 1-by-1-m unit was excavated until noncultural material-bearing soil was reached. This depth was never more than 27 cm below the modern ground surface. The surface chipped stone was recorded as the site assemblage. The surface pottery sherds were piece-plotted and collected for laboratory identification. The site was mapped with a transit and stadia rod. The site map recorded site limits, datum locations, topographic features, and excavation areas.

Stratigraphy

Three strata were encountered in the five excavation areas. Stratum 1 was a loose, light brown (7.5YR 6/4) sandy loam mixed with abundant gravel and cobbles. This layer was 5 to 10 cm thick. All but 10 subsurface artifacts were recovered from this stratum. Stratum 2 was a reddish brown (5YR 4/3) compact sandy clay loam mixed with grass and tree roots and minimal gravel. This layer was 5 to 7 cm thick. Ten artifacts were recovered from this level, nine from Area 5, and one from Area 4. Stratum 3 was a mildly calcareous, compacted, pale yellow-brown (10YR 6/6) silty loam mixed with cobbles and gravel encrusted with caliche. No artifacts were recovered from this layer. Strata 1 and 2 correspond well with the A1, B1, and B2t horizons of the Panky series (Folks 1975:40). Stratum 3 corresponds with the A1 horizon of the Bluewing series (Folks 1975:15). The Bluewing series is a component of the Pojoaque-Panky association, rolling (Folks 1975:43).

Artifact Assemblage

Pottery

Five Santa Fe Black-on-white sherds were recovered from the 5-cm surface-strip. These sherds were located in the southern portion of the site in a 1-by-2-m area.

All five Santa Fe Black-on-white sherds appear to be from the same bowl based on similar surface and paste attributes. The vessel is represented by four body sherds and one rim sherd. All sherd exteriors are scraped smooth and display a medium polish. The interior of three bowl body sherds are exfoliated with no intact surfaces remaining. The fourth bowl body sherd is exfoliated with intact portions displaying a thick textured white slip, thin, streaky black organic paint, and a heavy polish. The exfoliation appears to be the result of natural effects such as freeze-thaw. The bowl rim sherd interior displays a thick textured white slip, thin streaky black organic paint, and a heavy polish. The rim is tapered, rounded, and decorated with thick black organic paint. The paste for all sherds is hard, gray (7.5YR 6/0-5/0), and vitrified with a fine sand temper.

The design layout on three of the bowl body sherds cannot be determined due to the lack of intact surfaces. The intact portion of the fourth sherd exhibits dots framed between two solid elements. The design layout on the rim sherd consists of an encircling band extending 9 mm below the rim. Under this band are two rows of alternating dots. These dots are framed in a 10-mm-wide area between the encircling band and another band framing a single row of dots perpendicular to the rim. This design layout is similar to a style described by Stubbs and Stallings (1953, fig. 47f) as bands with vertical sectioning. Use of this vessel prior to deposition is indicated by abrasion that has worn through the paint on some areas of the rim.

Chipped Stone

A total of 141 chipped stone artifacts were recovered or field recorded from LA 86156. The 141 chipped stone artifacts are assigned to five artifact types (Table 8.9). The assemblage is not diverse, consisting mainly of core flakes and angular debris.

The chipped stone artifacts are debris from core reduction and raw material procurement. The raw materials reflect a use of local chert from the Jemez Mountains, Rio Grande gravel deposits, or the Caja del Rio, located to the west. Chert encompasses fine- to medium-grained material that occurs in a wide range of colors. The majority of the lithics were medium-grained chert (n = 94), 47 were fine grained.

Debitage. Debitage from core reduction accounts for 134 of the 141 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types with counts of 80 and 54, respectively. The majority of the debitage was of medium-grained chert. Middle and late stages of core reduction are represented by the distribution of dorsal cortex percentages. Eighty-five percent of the core flakes exhibited less than 50 percent cortex. None of the 54 pieces of angular debris had any cortex. Seven core flakes had 100 percent dorsal cortex, 2 core flakes exhibited 50 percent, 2 exhibited 80 and 90 percent. Twenty-four of the core flakes were whole with 2 proximal, 15 medial, 36 distal, and 3 lateral fragments recorded. Platform types primarily reflect early and middle stage reduction with single-faceted (n = 18) and cortical (n = 9) platforms predominating. One multifaceted platform was recorded; the other 52 flakes had collapsed, crushed, or missing platforms. Dorsal flake scars also reflect early and middle stage reduction with 89 percent of the core flakes exhibiting three or fewer scars. Six core flakes exhibited four dorsal scars and three had five scars, suggesting that the cores they were detached from were more than minimally used. Whole core flake dimensions had a mean length of 23 mm, a mean width of 18 mm, and a mean thickness of 6 mm. Dimensional data suggest that small to medium-sized core flakes were the most common by-product of core reduction.

Cores. Two multidirectional chert cores were recorded. One was fine grained, the other was medium grained. The fine-grained core measured 44 mm long by 40 mm wide by 18 mm thick. The medium-grained core measured 69 mm long by 68 mm by 27 mm thick. Neither core had any cortex. One core had nine flake scars, indicating that the core was originally a large piece of raw material. The cores were substantially reduced and their size indicate that they were exhausted. Multidirectional cores are typical of expedient core reduction aimed at producing flake tools or blanks.

Conclusions

LA 86156 was a dispersed sherd and lithic artifact scatter with four artifact clusters and a rock alignment. It was on a gentle southeast-facing finger-ridge slope 0.1 km north of the Arroyo Calabasas floodplain.

Test excavation and detailed artifact recording of LA 86156 yielded little direct information about when the site was occupied and how it was used. Partial excavation of the rock alignment did not yield datable material or additional information on its construction and function. Conclusions about site chronology can only be drawn from the Santa Fe Black-on-white pottery. Generalizations about site function can be made from the results of the chipped stone analysis.

The five Santa Fe-Black-on-white sherds indicate occupation during the Coalition and early Classic period (A.D. 1175 to 1400). The sherds clustered in one area of the site and were from one vessel. They may remain from a partial vessel that was used as a temporary container during small-scale, processing activities. Paste and surface treatment of these sherds was similar to the majority of the Santa Fe Black-on-white pottery recovered by the Las Campanas project. This similarity is a quality of Santa Fe Black-on-white that is found in assemblages from large and small sites in the Santa Fe and Cochiti areas. Fine or self-tempered Santa Fe Black-on-white occur in the early deposits from Pindi and Arroyo Hondo Pueblos (Stubbs and Stallings 1953; Habicht-Mauche 1993), suggesting manufacture between A.D. 1200 and 1300.

Table 8.9. LA 86156, Artifact Type by Material Type

Count Row pct Column pct	Material Type		
Artifact type	Chert	Chalcedony	Row Total
Angular debris	54 100.0 38.6		54 38.3
Core flake	79 98.8 56.4	1 1.3 100.0	80 56.7
Biface flake	4 100.0 2.9		4 2.8
Hammerstone flake	1 100. .7		1 .7
Multidirectional core	2 100. 1.4		2 1.4
Column Total	140 99.3	1 .7	141 100.0

Site function is difficult to address, though general statements can be made from the artifact distribution and chipped stone analysis. At least five occupation episodes are represented by the artifacts and rock alignment. The cluster of Santa Fe Black-on-white pottery from Area 1 represents one occupation episode. The pottery is spatially separate from the chipped stone clusters. This suggests that the pottery was associated with activities that did not include chipped stone raw material procurement or core reduction. The chipped stone recovered from Areas 3 and 4 are medium-sized, and nearly half of the debitage exhibits dorsal cortex. These clusters represent single occupation episodes that partly focused on raw material testing and early stage core reduction.

Area 5 is different from the other clusters and is fairly unusual for the Las Campanas area. Area 5 yielded 125 chipped stone artifacts from a 2-by-2-m area, which is an unusually high artifact density of 31 artifacts per square meter. Nearly 60 percent of the debitage can be matched to a single fine-grained gray chert core. The core was not recovered during the excavation, but the low frequency of cortical debitage suggests that the core was partly reduced before transport to the site, and then heavily reduced on site. None of the debitage exhibited use wear and no tool fragments were recovered. Additional excavation might have yielded an exhausted core or tool blank, so it cannot be said that the core or tool blank was removed from the site. Three other distinct local raw materials were identified. The Area 5 assemblage reflects intensive core reduction that might have been part of gearing up for foraging or hunting activities. The concentration of material suggests that Area 5 was a midden area for a limited activity occupation. It is possible that this discard pattern and intensive use of raw material was associated with a logistical subsistence strategy.

Excavation of the J-shaped rock alignment yielded no information regarding its age or function. No artifacts were directly associated with the feature.

The location of LA 86156 0.1 km above the Arroyo Calabasas suggests that the artifacts were discarded during activities related to exploitation of plant and animal resources of the low, broad piedmont ridges, and perhaps the Arroyo Calabasas riparian community. The lack of formal facilities or concentrations of debris from tool manufacture or maintenance, or raw material processing suggest a diurnal foraging strategy for Areas 1, 3, and 4. Area 5 may represent the discard from a logistically organized subsistence strategy. The dispersed artifact distribution strongly indicates that the site was visited repeatedly. Identification of four discrete artifact clusters indicates that the site or immediate area had raw materials or resources that were collected or used to support foraging activities.

CHAPTER 9
THE ESTATES V, UNITS 2 AND 3 EXCAVATIONS, LA 84787, LA 84793, AND LA 86159

The Estates V, Units 2 and 3 excavations, were conducted between March and May 1994 at LA 84787, LA 86159, and LA 84793. Testing revealed significant cultural deposits that required data recovery. Testing results from these three sites were presented with the data recovery plan that guided the excavation and analysis phases (Post 1994a).

LA 84787

Introduction

LA 84787 was originally recorded by SAC (SAC 278-42) during the Estates III, West Golf Course and Adjacent Properties inventory (Scheick and Viklund 1991:26). It was recorded as a small chipped stone concentration. LA 84788 is located to the southwest and LA 84792 is located to the southeast. The area between the sites was reported to contain a dispersed chipped stone scatter. Reexamination of the area determined that there were six discrete artifact concentrations separated by a low density scatter of chipped stone. There were no breaks in the artifact distribution and five of the concentrations were probably contemporaneous, dating to the late Archaic period. Because of the continuous artifact distribution and the probable contemporaneity, LA 84788 and LA 84792 were combined with LA 84787 to form a single site. Test excavation of LA 84787 (Post 1994a:21-30) determined that Areas 1 through 4 had subsurface deposits dating to the late Archaic period. A data recovery plan was submitted and approved for the excavation of LA 84787 (Post 1994a).

Setting

LA 84787 is located near the end of a north-south oriented ridge top. The ridge is one of a series of finger ridges extending south from the tableland that forms the central portion of the Las Campanas project area. The finger ridges extend to the edge of the north floodplain of the Arroyo Calabasas, which is .6 km to the south. The table land and finger ridges are dissected by narrow drainages near their margins and are separated by broad grassy draws in the higher elevation areas. The site elevation is 2,055 m (6,740 ft).

The finger ridge slopes gently southward decreasing 1.5 m from north to south in the site area. The southern portion of the site, which includes Area 2, is within a very shallow swale that is 50 m long north-south and 30 to 50 m wide. Based on excavation, the swale may have been between 50 and 100 cm deeper during the late Archaic period. Cutting and filling of the swale occurred in between Area 2 occupation episodes and since Area 2 was abandoned. This cutting and filling, combined with extensive rodent burrowing, resulted in extremely mixed cultural deposits.

The soil within LA 84787 and especially within and around Area 2 was determined by backhoe excavation to be 1.2 to 1.4 m deep. The soil horizons are typical of the Panky and Pojoaque soils (Folks 1975). Soil profiles exposed in the backhoe trenches indicated that LA 84787 was located in a transition area between the deep ridge top deposits of the Panky series and the slope dominant Pojoaque series. This transition zone displayed a stratigraphic sequence that was not similar to either series, causing problems in projecting occupation levels beyond the excavation area and interpreting the age of different deposits within the site.

Pre- and Post-Excavation Description

LA 84787 is 180 m long north-south, and between 25 and 90 m wide. Site area is 10,080 sq m using an average site width of 55 m. It consisted of six artifact concentrations separated by a dispersed low frequency artifact scatter. Four concentrations (Areas 1-4) were designated for excavation. Artifact counts within the concentra-

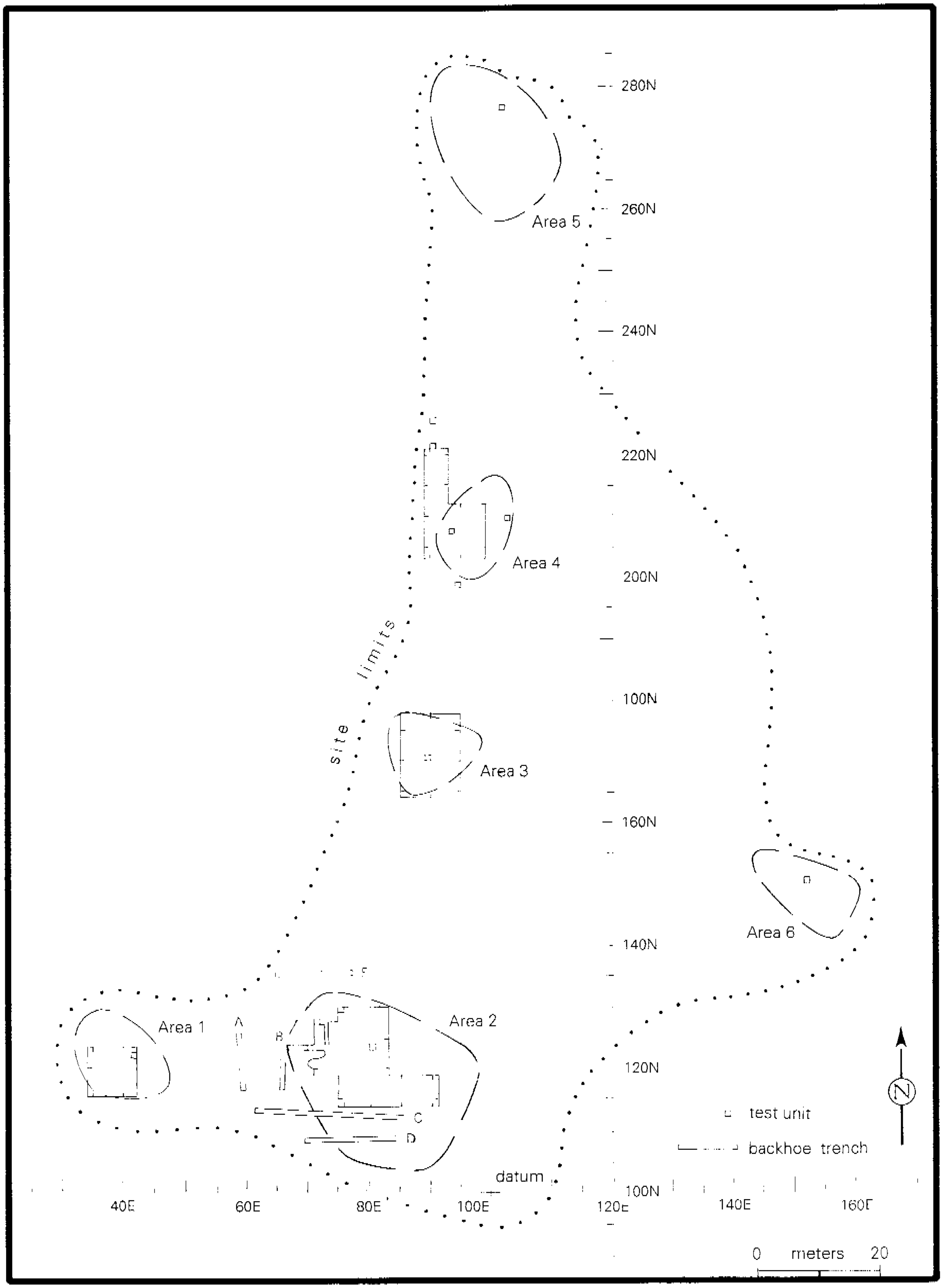

Figure 9.1. LA 84787, site map.

tions were expected to range between 100 and 3,000. A shallow cultural deposit was indicated by the testing results. Temporally diagnostic projectile points date to the late Archaic period (1800 B.C. to A.D. 1).

Excavation of LA 84787 confirmed the results of testing for Areas 1, 3, and 4 (Fig. 9.1). In these areas the cultural deposit was restricted to the upper 15 to 20 cm of soil. The extent of the artifact concentrations were as expected for Areas 1 and 3, but Area 4 was considerably larger than identified by testing. Areas 3 and 4 each yielded a small thermal feature. Excavation of Area 2 confirmed the predicted horizontal extent of the cultural deposit. High density artifact clusters were identified by surface-stripping and Level 1 excavation. However, the expected 20-cm-deep cultural deposit increased to 90 to 120 cm deep in the western portion of Area 2. Differential vertical artifact distribution indicated two temporally distinct components. Three thermal features were excavated in the upper cultural level. The lower level lacked features or a distinct occupation surface. Temporally diagnostic projectile points recovered from Area 2 dated to the Armijo and En Medio phases of the late Archaic period.

Excavation Methods

Areas 1, 3, and 4, and the upper levels of Area 2 were excavated in the same manner because of they had a similar cultural deposit. Excavation of the Area 2 lower levels followed a different strategy that will also be described.

For all areas the surface was reexamined and the artifacts were flagged. The original 1-by-1-m test unit was relocated and was used to orient the grid systems. Excavation area grid systems incorporated the majority of the surface artifact concentrations.

All surface artifacts within the gridded area were collected. Then, 1-by-1-m units were surface-stripped to 5 cm below the modern ground surface. The artifact yield and a brief description of the soil and unique artifacts were logged.

Grid artifact counts were used to target grids for deeper excavation. A 10 percent sample was selected from the grids having the highest surface-strip artifact counts. If no or low numbers of subsurface artifacts were encountered by the Level 1 excavation, no further units were excavated. If a high density of artifacts or a feature outline was encountered, then a sufficient number of units were excavated to define the distribution or expose the feature. Areas 2, 3, and 4 required additional excavation. Area 1 excavation terminated with the 10 percent sample.

Features were cross-sectioned, exposing the soil profile and any internal construction elements. The soil profile was mapped and described. Between 4 and 10 liters of soil were collected from each feature for ethnobotanical analysis. After the feature was excavated, the feature outline and profile were mapped, and the feature was described and photographed.

High artifact counts recovered from Area 2, Level 1, excavations required more work to determine the depth and extent of the cultural deposit. To determine the cultural deposit depth, Grid 124N/76E was excavated in 10-cm levels to 80 cm (Level 8) below the surface-strip (bss). Lithic artifacts were recovered from all levels. The presence of lithic artifacts at 80 cm bss was unexpected from limited testing results.

To define the spatial extent of the deep cultural deposit, Grids 124N/74-75, 124N/77E, and 122N/75E were excavated to a maximum of 120 cm bss. Artifact counts of up to 10 were common to a depth of 100 cm bss. Changes in the soil color, texture, and clay content were subtle and nearly impossible to discern when removing the fill in 10-cm levels. The excavated wall profiles showed subtle stratigraphic differentiation, severe mixing of the deposit, and large rodent burrow outlines. Cobbles and ground stone fragments in the fill were lying on edge, suggesting that the deposit had been jumbled.

Subtle changes in soil compaction and soil color were difficult to follow, and after the hand-excavation of nine grids to 90 cm bss, the limit of the deposit was not defined. The deep deposits were thought to indicate a buried structure that had filled with subsequent occupation debris. Then, the whole deposit had been churned and mixed by prairie dog or rabbit burrowing.

In Grids 125-126N/76-77E there were differences in compaction that suggested the upper limit of an architectural feature. Excavation of the softer fill yielded artifacts, as would be expected if the feature had filled with later occupation debris. However, the compact sandy loam also yielded artifacts. Artifacts would not be expected if the feature had been excavated into a natural stratum. As excavation progressed, these compaction differences were attributed to the difference between rodent tunnels and burrow walls. In other words, the rodents had tunneled through a single cultural deposit mixing the soils and creating compaction differences. It is possible that rodent burrowing mixed artifacts from the cultural deposit with the natural, noncultural deposit.

After excavating the nine units, examination of the wall profiles revealed differences in soil color and texture that still suggested a cultural intrusion into a natural stratum. This intrusion was provisionally treated as the remains of a pit structure. Soil profiles of the south wall of Grids 124N/74-77E exhibited a profile declining to the east, and the west wall of Grids 125-126N/76E exhibited a profile declining to the south. These sloping profiles resembled 25 to 40-cm-high remnants of pit structure walls. The pit structure floor was indicated by a very subtle soil color change, although the two soils registered as 7.5YR 6/4, light brown, on the Munsell Color Chart.

To assist excavation, a backhoe was used to further define the limits and to remove overburden from the top of the pit structure walls. A backhoe trench excavated through the projected north limit of the pit structure revealed a profile similar to, but more mixed than the profile of Grids 125-126N/76E. A backhoe trench extended the 124N line to Grid 124N/70E, revealing a gentle east-declining profile that abruptly ended at Grid 124N/72.50E. The declining profile was more gradual than Grids 124N/74-77E and Grids 125-126N/76E. The sudden interruption in the profile resembled the edge of a wall with the floor not yet exposed.

The backhoe was used to remove overburden within 20 to 40 cm of the projected floor level. A small patch of smoothed or polished clay was found in Level 11 at 110 cm bss in Grid 125N/76E. This depth was used as a vertical marker for overburden removal. The intent was to remove the upper mixed fill and attempt to define the floor and walls using the soil profiles as referents.

Grids 126N/74-76E, 125N/72-77E, 124N/72-77E, and 123N/72-75E were hand-excavated from 70 to 122 cm bss. Excavation of these 18 units yielded no clear evidence of formal walls, floor, or evidence of a sedentary occupation. Indicators of a floor would have been a thin layer of charcoal-impregnated eolian sand, the remnant of a hearth, postholes, and perhaps a slightly more compacted surface from use, if it was not formally prepared. None of these characteristics were encountered. Instead, there was mixed brown sandy loam with caliche inclusions, less than 5 percent pea gravel, rodent burrows, and low artifact frequencies. Rodent burrows occurred in every unit.

At and near the bottom of the excavated levels in most of the 18 units there was an undulating, loosely consolidated, coarse-grained sandstone bedrock. This layer underlies the Pojoaque-Panky soils at varying depths, which in the excavation area ranged from 95 to 130 cm bss. Rodent burrows intruded into recesses within the sandstone layer. Sandstone inclusions from this layer were occasionally found in the fill from 75 to 95 cm bss. These inclusions probably were transported upward in rodent burrows. The 25 to 55 cm upward movement of the sandstone fragments illustrated the effect burrowing had on the subsurface deposits.

The soil profile of the backhoe-excavated south wall of the excavation area (Grids 120N/72-75E) showed a sloping stratum that was similar to the stratum in the profile of Grid 124N/72-77E. Both profiles slope 25 to 40 cm downward to the east with a sudden break in the 73E grid row. These similar profiles suggested that the sloping stratum was not a pit structure wall or depression, but a natural depression or trough. This natural depression may have been used for shelter during the late Archaic occupation and was gradually filled with a sandy loamy colluvium.

Backhoe trenches were excavated outside the excavation area to explore additional cultural deposits and to expose the natural stratigraphy. The trench locations are shown in Figure 9.1. They ranged in length from 6.5 m to 22.25 m long and in depth from 0.50 to 1.25 m. All trench profiles were mapped and the soil texture, color, clay, and gravel content were recorded.

In the west wall of the north-south backhoe trench that exposed the profile of the northern edge of the natural depression, there was a 30 cm thick, gray-stained clay loam layer 40 to 70 cm bss. Three grids, 128N/72E-73E and 129N/72E, were excavated in 20 cm levels to investigate the stained stratum. This stratum potentially was an intact deposit from early in the occupation sequence. Grids 128N/72E yielded 39 artifacts from the upper 40 cm, which corresponds to the late occupation. From 40 to 70 cm bss, in all three grid units, only 3 lithic artifacts were encountered. There was no evidence of an occupation surface and this staining probably represented downward migration of the denser,

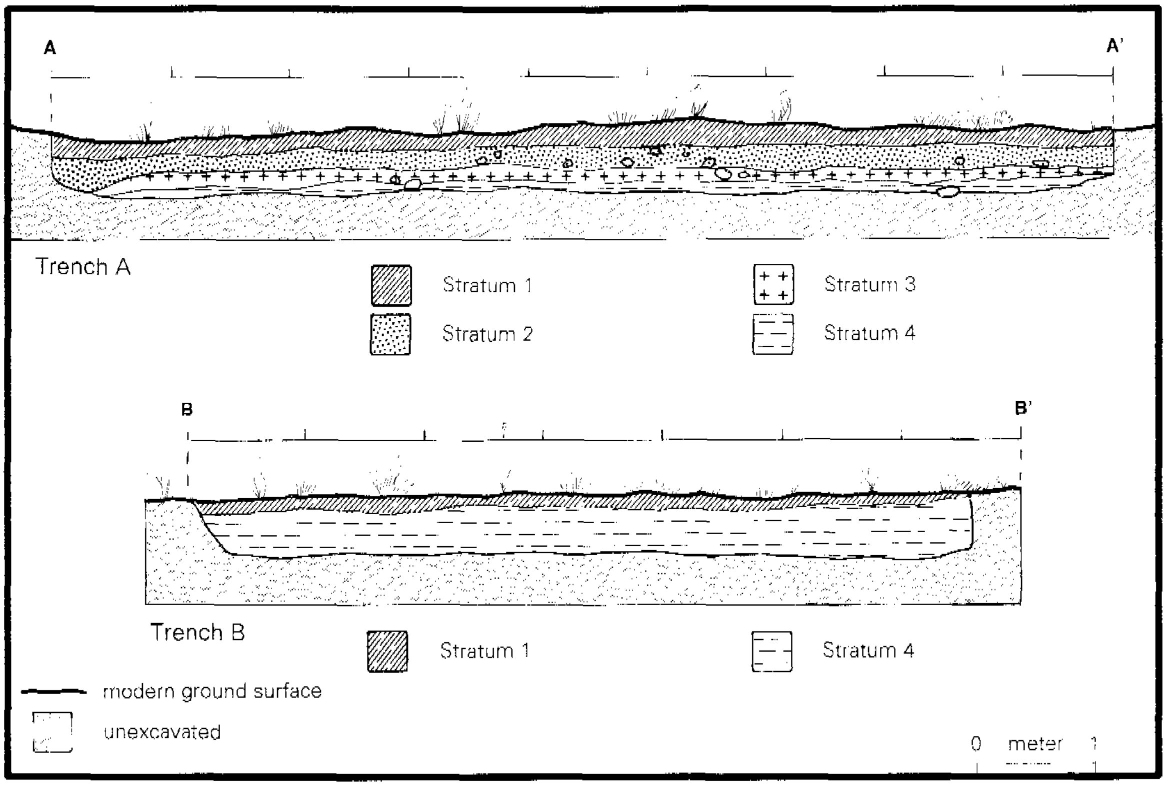

Figure 9.2. LA 84787, Backhoe Trenches A and B, profiled.

upper cultural layer.

Excavation was halted with work in Grid 129/72E. There were no definitive pit structure remains and the limits of the deep cultural deposits had been defined. Final recording entailed photographing and mapping the exposed excavation profiles and transit mapping all of the excavation areas.

Stratigraphy

Important to understanding and explaining the nature of the cultural deposit was the relationship between natural and cultural stratigraphy. Ideally, if a deep cultural deposit had been anticipated before the excavation, then backhoe-excavated stratigraphic trenches could have been placed on the periphery of the excavation area. Natural stratigraphy could have been compared to the cultural deposit and the differences may have been useful in guiding the work. Instead, the backhoe trenches were excavated after the deep deposit was encountered. There were differences in the natural stratigraphy within the backhoe trenches and between the backhoe trenches and hand-excavated area. These differences, combined with topographic features, provide insight into natural formation processes that have influenced the nature of the cultural deposit. Brief descriptions and implications of the different soil strata will be presented.

Four main natural strata were identified in the backhoe trenches (Figs. 9.2, 9.3). These natural strata coincide with the Panky-Pojoaque series soils as outlined by the Soil Conservation Service (Folks 1975). The Soil Conservation Service descriptions will be used for the natural stratigraphy.

Stratum 1 is ubiquitous throughout the site. This stratum is a dark brown (7.5YR 3/4) sandy clay loam grading from a fine to medium granular structure to a angular and blocky structure that is slightly to very sticky and plastic when wet. This layer is a combination of the A1 to B21t horizons of the Panky soils and the A1 horizon of the Pojoaque series. This 25 to 40-cm-thick layer contained the cultural deposits from Areas 1, 2, 3, and the upper or latest cultural deposit from Area 2. The features from all areas were excavated into this soil.

Stratum 2 was a thin layer of the B22t hori-

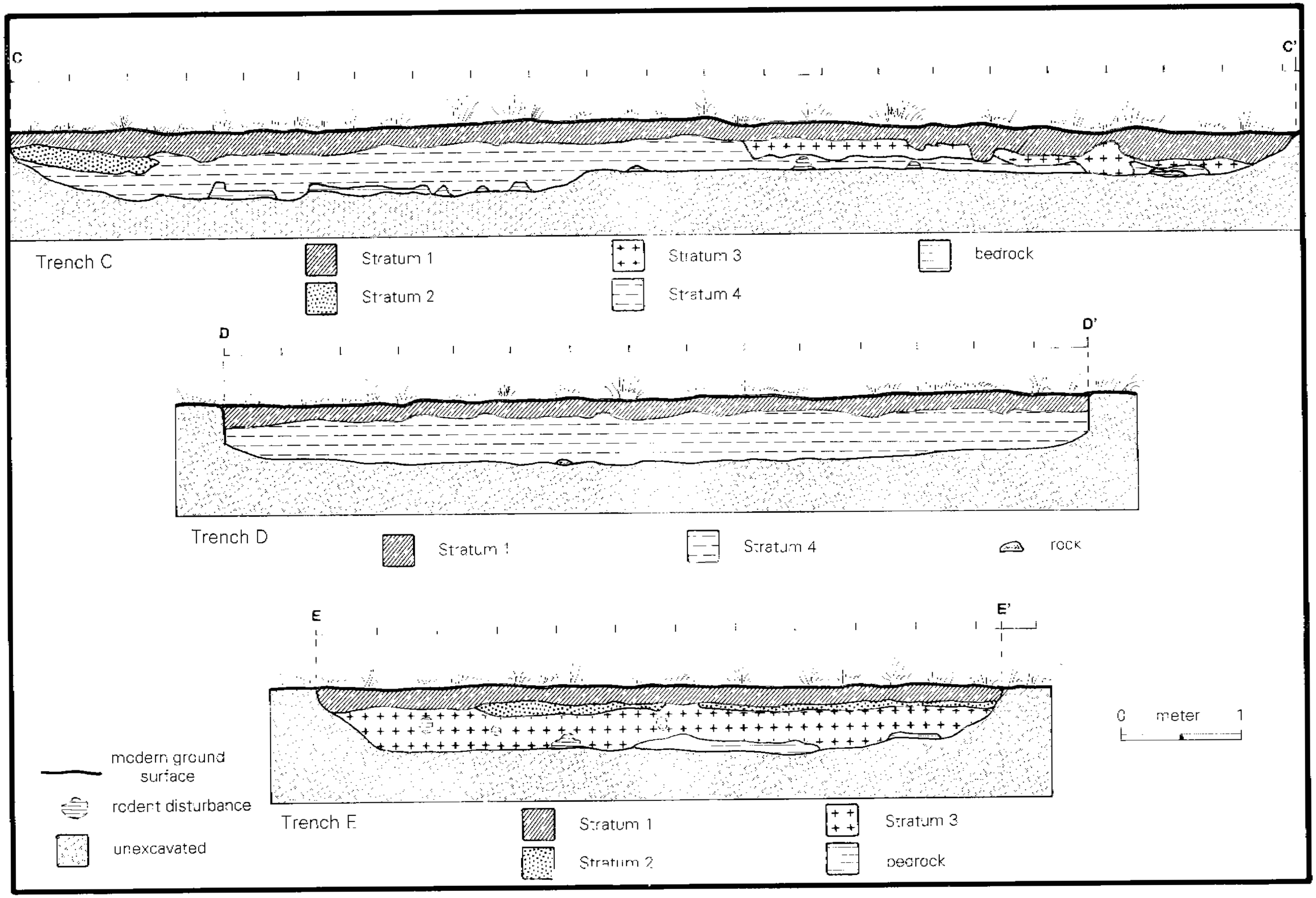

Figure 9.3. LA 84787, Backhoe Trenches C, D, and E, profiled.

zon of the Panky series that was observed in Backhoe Trenches A, B, the eastern 2.5 m of C, and E. This layer was not evident in Backhoe Trench D, which was south of the excavation area. The stratum was a dark brown (10YR 4/3) clay loam with a blocky structure, sticky and moderately plastic when wet, with little or no calcareous content. This layer was not apparent in the excavation area.

Stratum 3 was consistent with the Horizon Cca of the Panky series. It was a pinkish gray (7.5YR 7/2) sandy clay loam with a weak, medium, subangular blocky structure sticky and plastic when wet. The soil was strongly calcareous with 40 to 60 percent disseminated calcium carbonate. Stratum 3 occurred in Backhoe Trench E from 40 to 125 cm below the modern ground surface, in Backhoe Trench A at 50 to 60 cm below the modern ground surface, and in the west 3 m of Backhoe Trench C from 60 to 85 cm below the modern ground surface. It was a thin layer in Backhoe Trench C suggesting an edge to the soil horizon. Stratum 3 was not visible in the east 19 m of Backhoe Trench C, it was absent in Backhoe Trenches B and D, and it was not apparent in the excavation area.

Stratum 4 corresponds with the C2ca horizon of the Pojoaque series. It was a light reddish brown (5YR 6/4) sandy clay loam that was massive, and slightly sticky and plastic when wet with 0 to 15 percent gravel. It was slightly calcareous with clumps and inclusions of lime. Stratum 4 was observed in Backhoe Trenches A, B, C, and D. This horizon lies on top of a layer of siltstone, semi-indurated sandstone, or a layer of sand and gravel. The semi-indurated sandstone layer was encountered in the bottom of Backhoe Trenches C and E and the lower levels of the excavation area from 90 to 140 cm below the modern ground surface.

The soils in Area 2 were most similar to the Pojoaque series. The Panky series Cca horizon was absent, and in most of the area, so were the multilayered B horizon soils. It appears that the cultural strata were a mix of Panky-Pojoaque top soils in the upper levels (0-25 to 40 cm bss) and the Pojoaque series C1ca and C2ca horizons in the lower levels (25-40 to 140 cm bss).

The field observation and map data suggest that successive late Archaic period hunter-gatherers took advantage of the natural swale in the southern site area. The earliest occupation, between 1800 and 800 B.C., may have used the swale as a windbreak or even constructed a temporary shelter within it. The swale was partly filled between the early occupation and the later En Medio phase occupation, 800 B.C. to A.D. 400. The later occupants also may have used the slight swale for shelter. Today the swale appears almost level, gently sloping to the south.

Delineation of the cultural strata was difficult because post-occupation rodent burrowing had severely mixed the cultural strata. During the excavation we wondered if the rodents had chosen the soft pit structure fill for burrows. No pit structure was found and apparently the softer swale fill attracted the rodents. Burrowing transported charcoal and artifacts throughout the occupation strata. Although the cultural strata were mixed, three main strata within the excavation area could be identified.

As mentioned before, cultural Stratum 1 is the mixed Pojoaque-Panky top soil. This stratum had chipped stone, ground stone, occasional nonhuman bone, and was lightly charcoal-stained. This level contained Features 3, 4A, and 4B within Area 2, and all of the cultural deposit within Areas 1, 3, and 4. In Area 2, the stained fill was the deepest in Grids 127-129N/72-76E. The brown to dark brown fill in Grids 127N-128N/74-75E was removed with a backhoe as pit structure fill. In Grids 120-124N/77-79E, which included Features 3, 4A, and 4B, this level was about 25 cm thick. Grids 120-124N/77-79E contained 33 percent of the Area 2 ground stone and some of the highest chipped stone densities. Artifact diversity and abundance indicate residential activities, such as would remain from a limited base camp. Based on the presence of corner-notched projectile points, an En Medio period date, 800 B.C. to A.D. 1, is suggested for this stratum.

Stratum 2 was well represented in the north wall profile of Grids 126N/71-77E (Fig. 9.4). It occurred from 30-40 to 60-75 cm bss and it was 30 to 45 cm thick. Stratum 2 was a compact pinkish gray (7.5YR 5/2) to pale brown (10YR 6/4) sandy loam, with a granular and friable texture, moderately sticky and plastic when wet, some lime inclusions, but generally a very low calcareous content. Artifact counts from this level tended to be lower than upper or lower strata. The break between Stratum 2 and Stratum 1 and 3 was unclear. The lack of clear distinction was caused by the extensive rodent burrowing and similarity in soil color and composition. Stratum 2 was the intervening layer that filled the swale and buried the earliest occupation.

Stratum 3 contained the cultural material from the earliest or Armijo phase occupation within

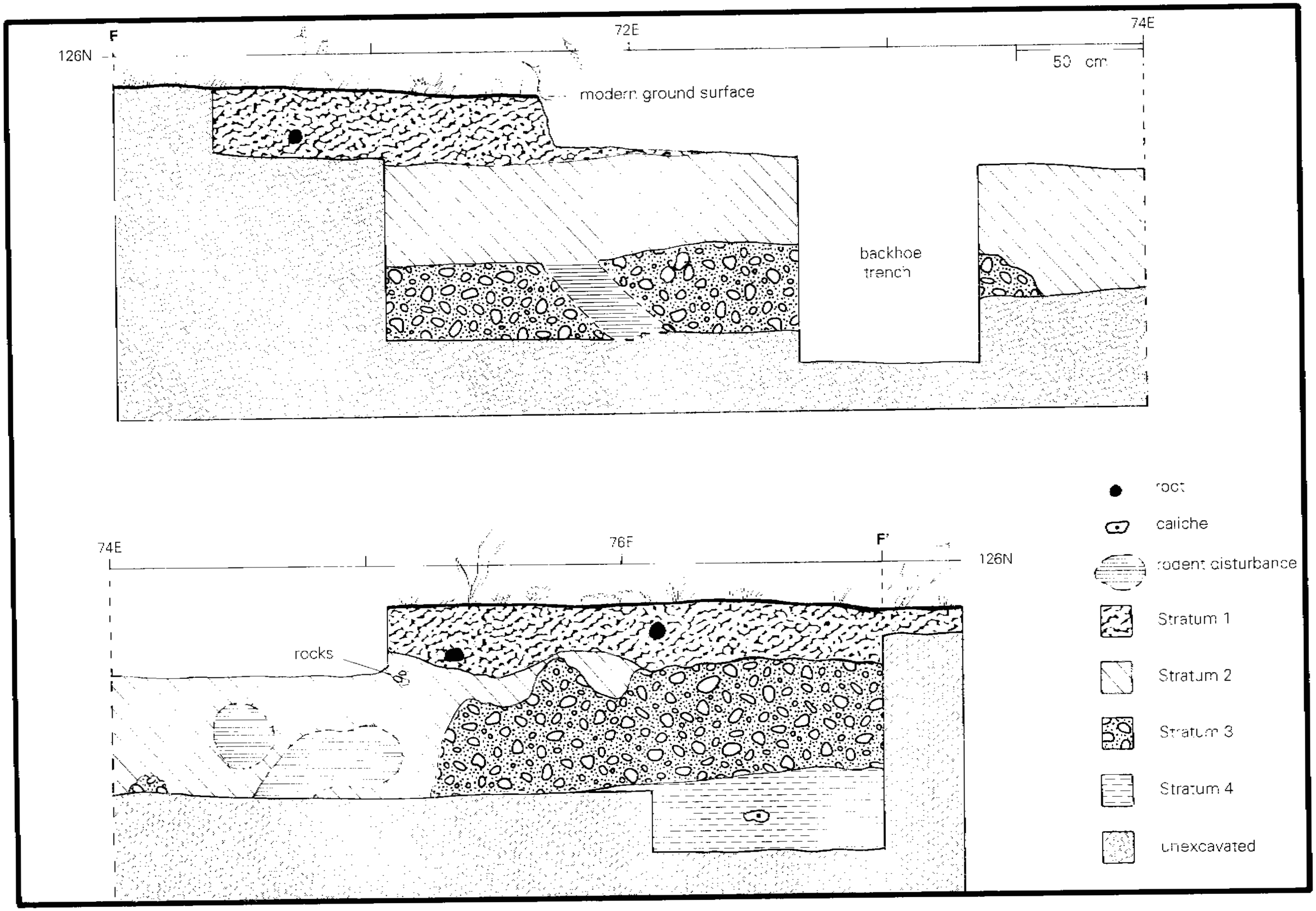

Figure 9.4. LA 84787, stratigraphic profile of 126N/71-77E, north wall.

Area 2. Stratum 3 was best preserved along the east wall of Grids 119-123N/76E and 124-126N/77E. This layer was similar to the Pojoaque series C2ca horizon. Stratum 3 was a light brownish gray (10YR 6/2) moderately consolidated sandy loam. It was slightly sticky and plastic when wet, with occasional lime inclusions and a low calcareous content. Artifact counts increased over Stratum 2 counts. Eight of the 36 ground stone artifacts and 11 of 20 nonhuman bones were recovered from this stratum. However, much of the nonhuman bone may be related to the rodent burrow use rather than human consumption. Stratum 3 graded into a noncultural material-bearing layer of sandy loam that lay on top of a layer of siltstone, semi-indurated sandstone, or a layer of sand and gravel. The lower layer of Stratum 3 was an alluvial deposit with 15 to 25 percent gravel, occasional large cobbles, and moderate to high calcareous content. Pockets of light gray-stained soil occurred within rodent burrows at the lowest portions of this level.

Excavation Areas

Area 1 is in the southwest corner of the site. It is an artifact concentration that covered a 13-by-11-m area or 132 sq m (Fig. 9.5). Surface collection and surface-stripping yielded 168 artifacts. Grid counts ranged from 0 to 9 artifacts with the majority of the units yielding fewer than 5 artifacts. A preliminary examination showed that 90 percent of the chipped stone assemblage was core reduction debitage of local chert. The remaining 10 percent included multidirectional cores, biface reduction flakes, bifacially retouched tools, and a few utilized core flakes. The assemblage reflected an expedient lithic technology using almost exclusively locally available materials. No temporally diagnostic artifacts or chronometric samples were recovered. Subsistence data were not collected, except indirectly as technological information from the lithic artifact assemblage. Aspects of the lithic reduction technology may reflect subsistence strategy and this information will be used in intra- and intersite comparisons.

Area 2 was located in the southeast portion of the site. It had the most extensive and highest frequency of surface artifacts. The surface distribution covered 875 sq m. A total of 168 1-by-1-m units were surface-stripped yielding 0 to 20 artifacts per unit and a total of 801 chipped stone artifacts (Fig. 9.6). In the western portion of the excavation area 56 sq m were excavated 10 cm bss, and a 3-by-4-m area to 20 cm bss yielding 2 to 19 artifacts per unit for a total of 480 chipped stone artifacts. Within the 3-by-4-m area three thermal features (Features 3, 4a, and 4b) were exposed and 14 flotation samples were collected.

Eighteen units were excavated to depths greater than 20 cm below the surface strip (Figs. 9.7, 9.8). These units yielded 492 chipped stone artifacts, a small amount of ground stone, and no features. Stratigraphic profiles in this area showed considerable mixing. The lower levels are thought to be an early occupation level, however.

Excavation of Area 2 revealed extensive, but disturbed cultural deposits. The occupation debris covered 875 sq m to a depth 120 cm below the modern ground surface in the main excavation area. Stratigraphy and artifact distribution suggest that there were at least two occupation episodes dating to the late Archaic period (1800 B.C. to A.D. 400).

Area 3 was an 18 m north-south by 16 m east-west concentration covering 288 sq m. The excavation area was 14-by-10 m and it covered the highest density portion of the area (Fig. 9.9). One hundred and thirty-seven 1-by-1-m units were surface-stripped 5 cm deep. A total of 39 grids or 28 percent of the area were excavated to 10 cm below the surface-strip. The majority of these units were surrounding Feature 1, which was a hearth located in the northeast portion of Area 3. Most of the Level 1 grids farthest from Feature 1 had fewer than four artifacts. Higher counts were yielded in the units south of Feature 1, suggesting a southern orientation to the discard pattern.

Surface collection and surface-stripping yielded 738 artifacts. The average artifact density per grid was 5, and ranged from 0 to 25 artifacts. The majority of the units yielded 5 to 10 artifacts. The densest distribution was in the northern half of the area adjacent to Feature 1. Excavation of Area 3 yielded no chronological information. No temporally diagnostic artifacts or chronometric samples were recovered.

Area 4 was an oval-shaped lithic artifact concentration measuring 27 m north-south by 16 m east-west, and totaled 432 sq m. A total of 139 units were surface-stripped in Area 4 (Fig.

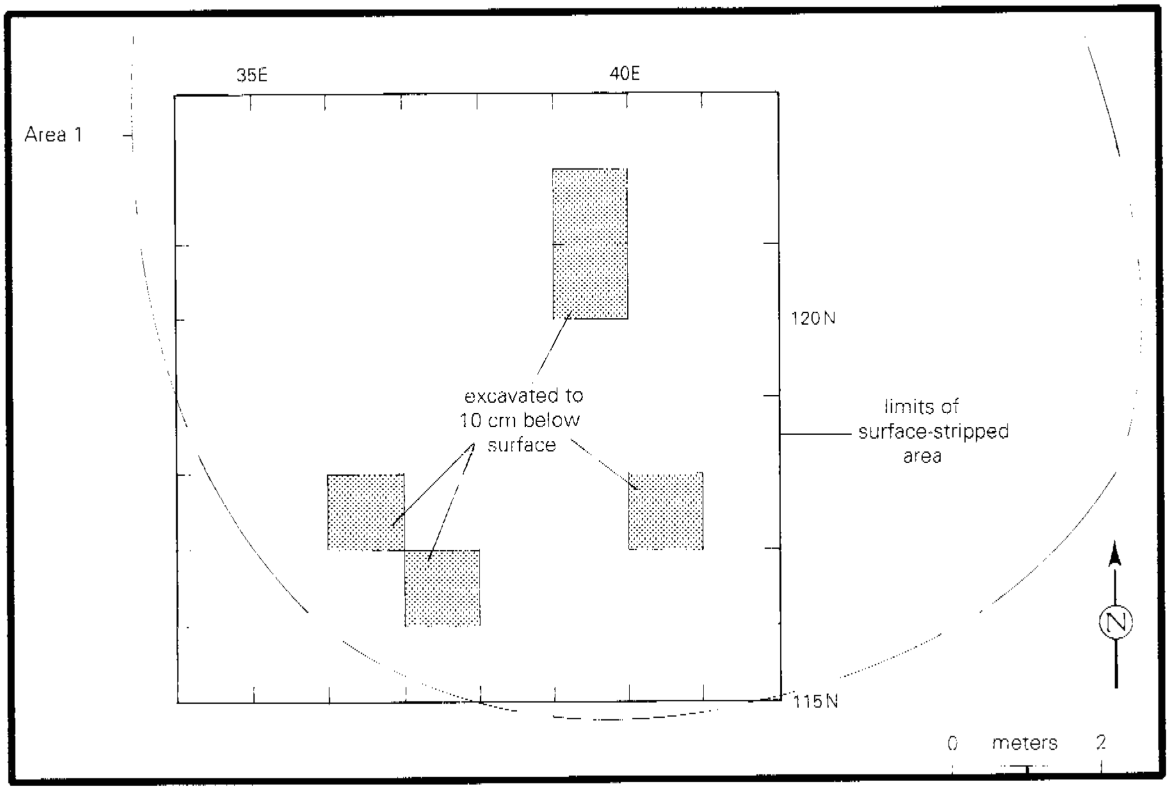

Figure 9.5. LA 84787, Area 1 map.

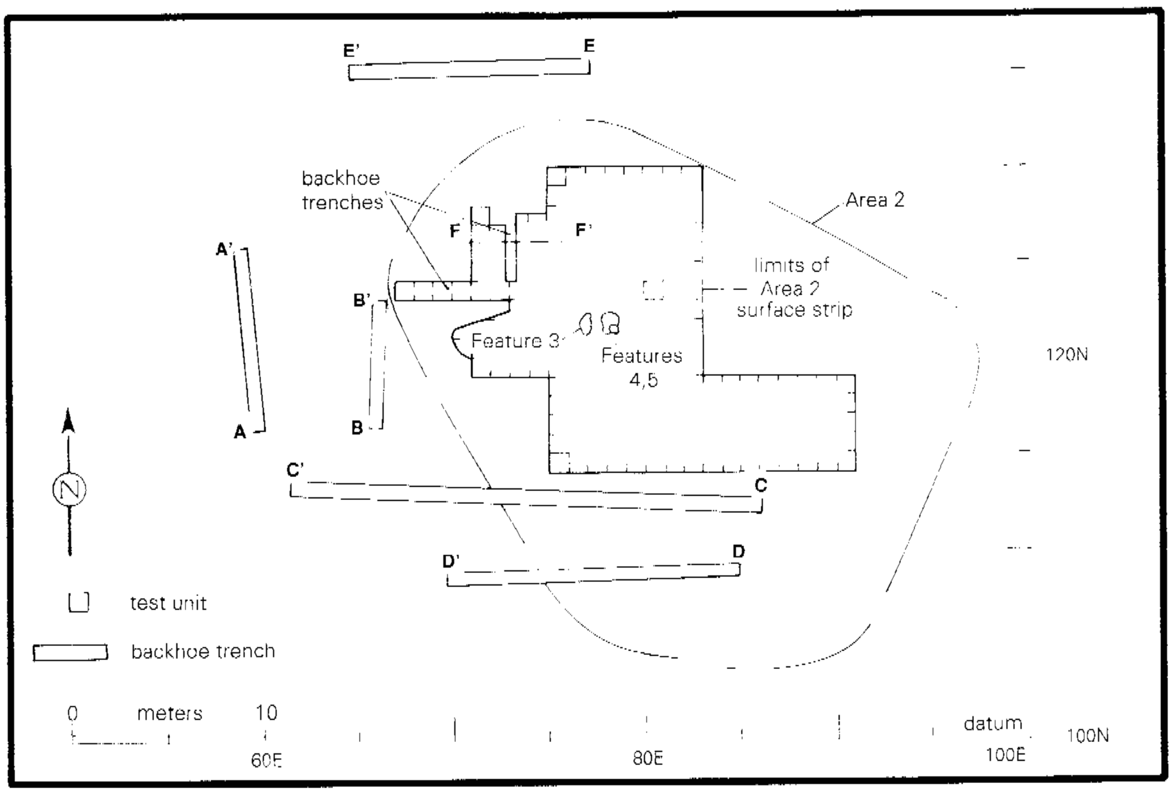

Figure 9.6. LA 84787, Area 2 map.

Figure 9.7. LA 84787, Area 2, looking south, showing backhoe and hand-excavated area.

Figure 9.8. LA 84787, Area 2, Feature 3 in middle ground, looking east.

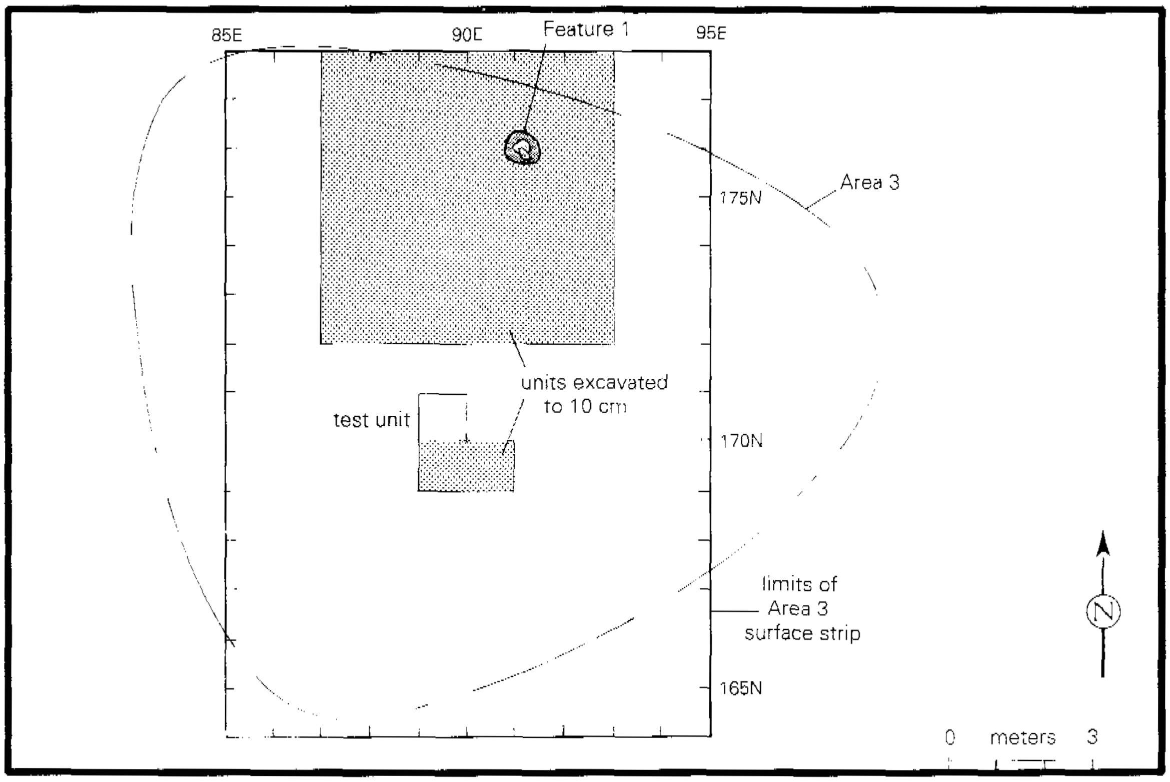

Figure 9.9. LA 84787, Area 3 map.

9.10). A 10-by-10-m area covered the highest density portion of the area. An additional 9-by-4-m area was extended from the northwest corner of the excavation area. Surface-stripping yielded 482 lithic artifacts. The mean grid count was 4 per unit with counts ranging between 0 and 17.

Testing had indicated that the artifacts were restricted to the upper 15 cm. Five grids within a 7 m north-south by 6 m east-west area, with Grid 213N/96E as the northeast corner, were excavated 10 cm below the surface-strip. This area had 10 units with 10 to 14 artifacts per grid. These units were within the initial 10-by-10-m excavation area. They yielded 5 artifacts. This decrease in artifact density with increased depth suggested that high density surface-strip units would not necessarily have subsurface artifacts. Excavation to the north revealed subsurface artifacts in an area that had few surface artifacts. This suggested that the surface distribution did not fully represent the actual distribution.

Expansion of the excavation area resulted in 60 units being excavated to Level 1. The artifact distribution for Level 1 units is shown in Figure 9.10. The mean artifact count was 3 per unit with a range between 0 and 8. A cluster of grids in the southeastern portion of the Level 1 grid block yielded 0 to 8 artifacts per unit. The artifact density in this area was slightly higher than the remainder of the block. Five units were excavated 30 cm below the surface-strip. Excavation of Area 4 yielded no chronological information or direct evidence of subsistence.

Feature Descriptions

Five features were exposed by surface stripping and subsurface excavation. The features are described in Table 9.1. Areas 3 and 4 each had one feature and Area 2 had three features. All five appear to be thermal features.

Feature 1, Area 3, Feature 2, Area 4, and Feature 5, Area 2, were circular thermal features that probably functioned as hearths (Figs. 9.11-9.14). Ethnobotanical samples yielded no functional information, but the size and depth of these features suggest a similar function. Small thermal features were most likely used for heat rather than heavy processing or long-term cooking.

Features 3 and 4, Area 2, were oblong pits

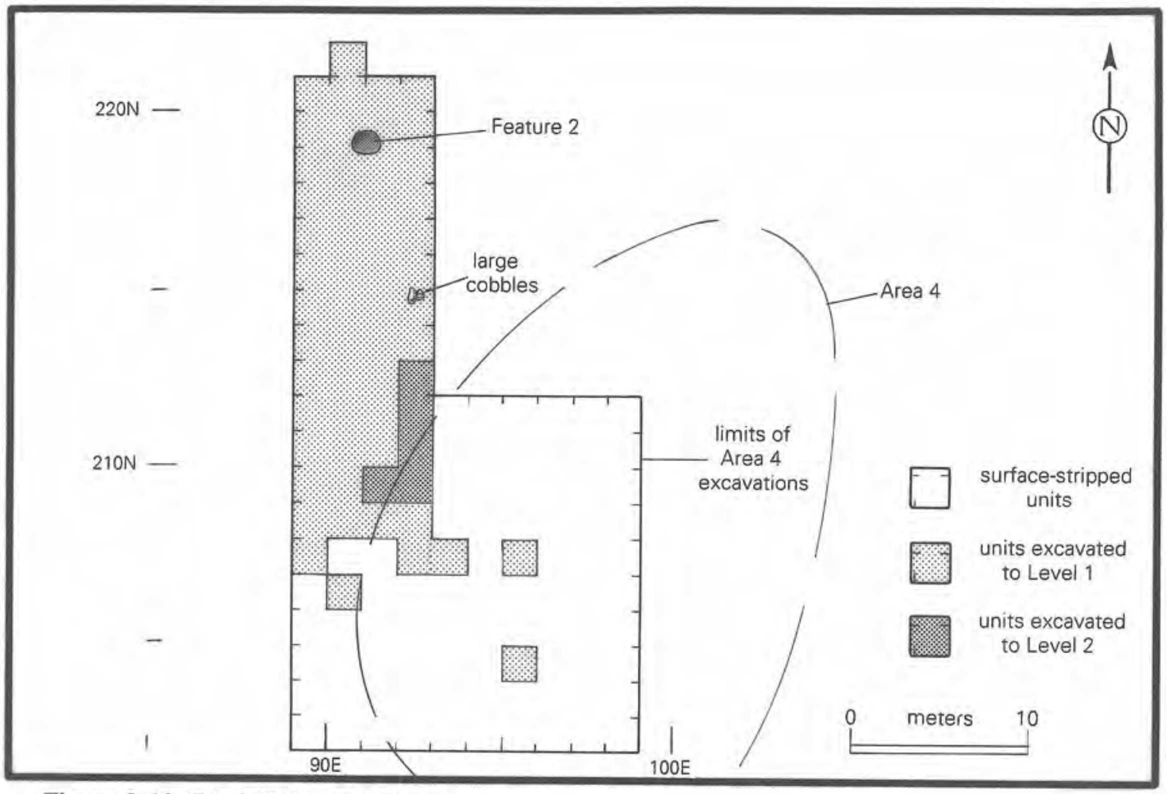

Figure 9.10. LA 84787, Area 4 map.

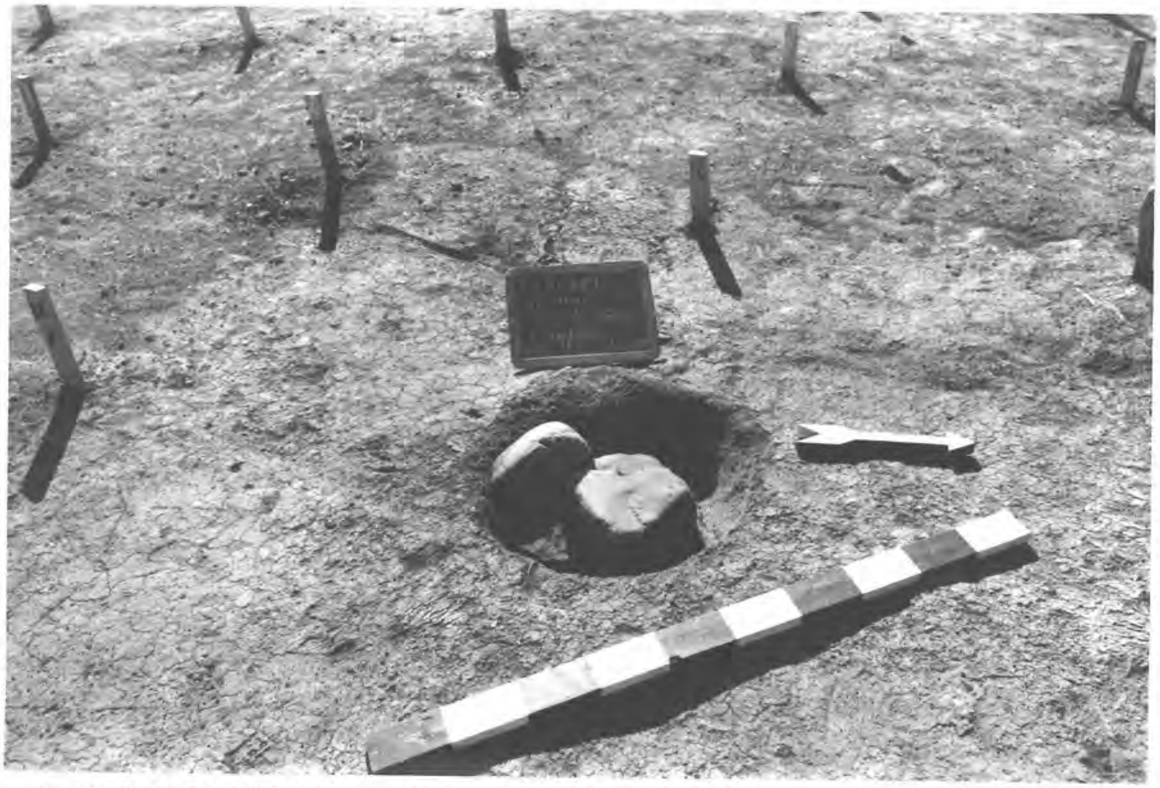

Figure 9.11. LA 84787, Feature 1, Area 3, excavated.

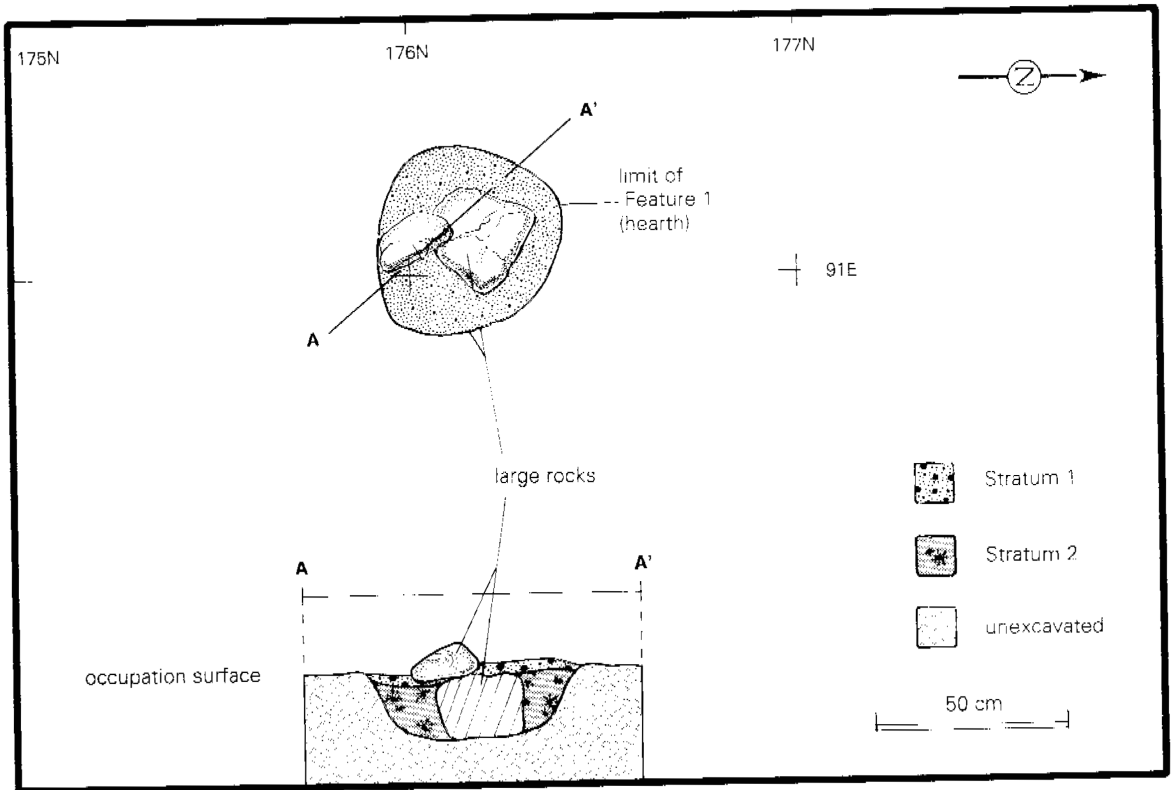

Figure 9.12. LA 84787, plan view and profile of Feature 1, Area 3.

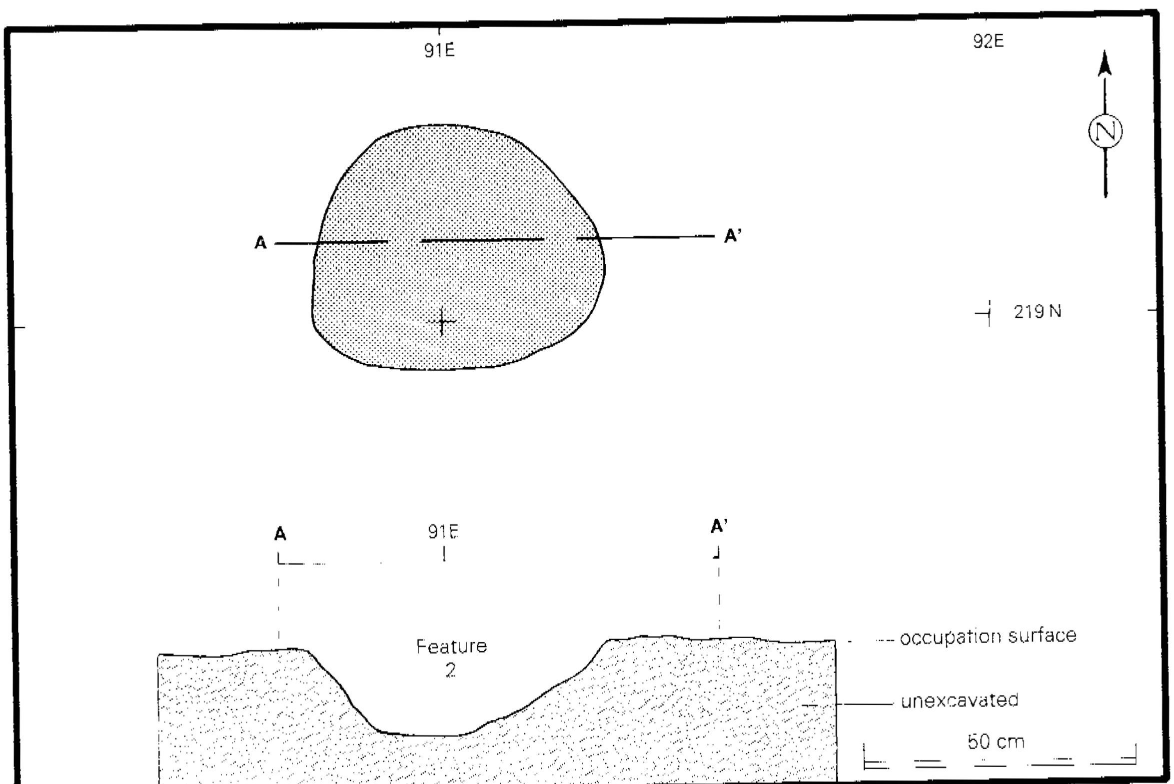

Figure 9.13. LA 84787, plan view and profile of Feature 2, Area 4.

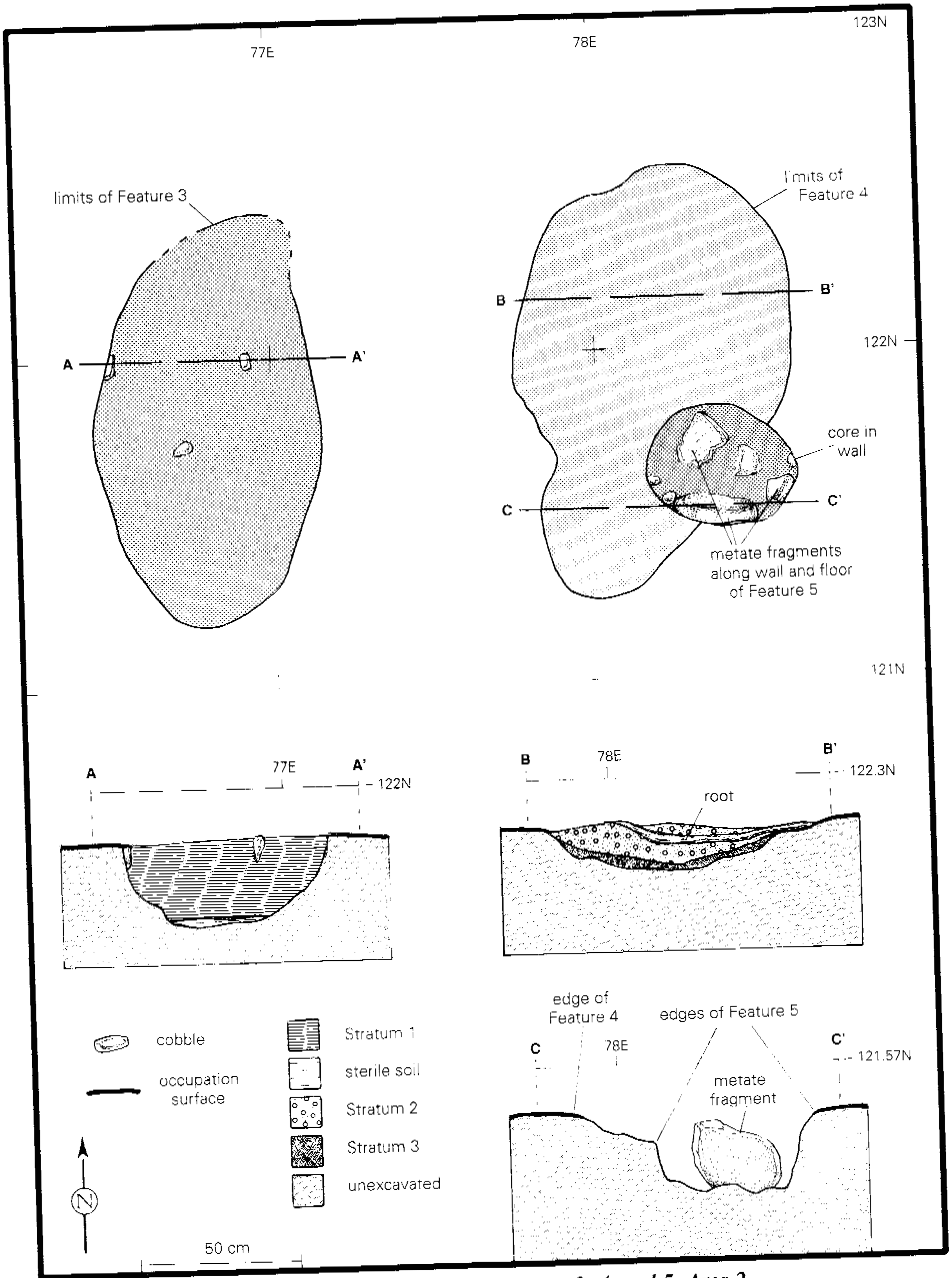

Figure 9.14. LA 84787, plan view and profile of Feature 3, 4, and 5, Area 2.

with lightly burned sides and moderate charcoal-stained fill (Fig. 9.14). They are almost identical in shape and size suggesting a similar function. Features 3 and 4 lacked internal fire-cracked rock and were not associated with concentrations of fire-cracked rock. In this way they are different from similar shaped pits excavated at LA 84758, another extensively occupied late Archaic period site in the Las Campanas area. The features are associated with increased densities of chipped stone debris and ground stone, suggesting that they were associated with a variety of processing and domestic activities. Their side-by-side positions indicate that they may be from two separate occupations. Feature 5 was built into Feature 4, suggesting that Feature 5 may have been used to produce coals for use in Feature 3.

Artifact Assemblage

A total of 3,575 chipped stone and 35 ground stone artifacts were recovered by excavation. Nonhuman bone was the only other material recovered that was not stone artifacts or charred floral remains. The lithic artifact assemblages for each area are described. They will be compared in the Research Questions section.

Chipped and Ground Stone Artifacts

Area 1 yielded 159 pieces of chipped stone, Area 2 yielded 1,820, Area 3 yielded 855, and Area 4 yielded 732 chipped stone artifacts. The range of artifact material types across these assemblages was remarkably similar, suggesting the use of similar raw material sources throughout the site's history.

Area 1, Chipped Stone

The 159 chipped stone artifacts were assigned to nine artifact types including core flakes, biface flakes, cores, angular debris, and formal tools. The raw materials were local raw material (chert, quartzite, and chalcedony) with a small amount of nonlocal obsidian and basalt.

Lithic Raw Material Selection. The raw materials are mainly miscellaneous chert (Table 9.2). The majority of the materials were medium or coarse grained (n = 93) and 66 were fine grained. The single obsidian artifact was a biface fragment indicating it was probably brought to the site as a finished tool. Basalt, which is nonlocal, is a common raw material from the Cochiti area and outcrops abundantly along the Rio Grande. The majority of the raw materials could have obtained from the gravel of the Ancha formation. The remainder of the assemblage description is presented as a comparison of fine and medium-coarse-grained materials.

Debitage. Debitage from core reduction accounts for 143 of the 159 chipped stone artifacts. Core flakes and angular debris were the two most common artifact types. Generally, there is the same ratio of core flakes to angular debris for fine and medium to coarse grained materials. Biface flakes are more commonly made of fine-grained materials (Table 9.3). The remaining discussion focuses on core flakes as indicators of reduction sequence and stage.

Core flake dorsal cortex percentages can be used to suggest reduction stage. Almost 60 percent of the core flakes for fine and medium to coarse grained material lacked cortex. High percentages of noncortical flakes result from middle stage reduction. A limited emphasis on early stage reduction is suggested by the 11 core flakes having more than 50 percent dorsal cortex (Table 9.4). This apparent focus on middle stage reduction is further indicated by 53 percent of the core flakes that had three to five dorsal scars. Late stage reduction is indicated by the 13 core flakes that had more than five dorsal flake scars (Table 9.5).

Early or middle stage core reduction is indicated by the high percentage of cortical and single-faceted platforms (52 percent; Table 9.6). The limited amount of late stage reduction evidenced in the dorsal flake scar counts is supported by the presence of low counts of multifaceted and retouched platforms. Another indicator of early or middle stage core reduction is high percentages of whole flakes (Table 9.7). Fify-seven percent of the whole core flakes are made from medium to coarse-grained materials, 47 percent are fine-grained. These percentages are lower than might be expected and they suggest that factors other than stage of reduction may have influenced core flake condition.

Table 9.1. Feature Data, LA 84787

No.	Type	Location	Size (cm)	Fill	Artifacts	Comments
1	Circular burned pit, possible hearth	176-177N/ 91-92E Area 3	46 N-S x 45 E-W x 15 deep	The top 1-2 cm consisted of dark gray ash/ loam. The remaining fill was a compact, reddish brown clay/loam that was mottled and charcoal-stained.	None	Circular pit dug into native soil; two large rocks inside feature, one a fire-cracked cobble, the second a square rock located in the middle of the feature.
2	Oval, basin-shaped hearth	218-219N/ 91-92E Area 4	45 N-S x 54 E-W x 17 deep	The fill consisted of two strata: the upper fill was a charcoal-stained, dark brown sandy loam with roots and worm holes and 5 artifacts. The lower fill was a mottled clay/loam with caliche and no charcoal.	5 lithics, 6 flotations (3 each from north and south portions)	Oval pit dug into native soil; no cobble lining or fire-cracked rock. The feature was associated with an extensive lithic artifact scatter that contained some ground stone.
3	Basin-shaped pit, possible hearth	122-123N/ 77-78E Area 2	125 N-S x 70 E-W x 25 deep	The fill consisted of charcoal-stained, compact sandy loam ranging in color from reddish brown to dark gray; several medium-sized cobbles.	17 lithics, 4 floats (2 each from north and south portions)	Basin-shaped pit dug into native soil; two rodent burrows were in the NE and NW corners; a 6-by-8-cm sandstone cobble was embedded in the NW wall.
4	Basin-shaped pit, possible hearth	121-123N/ 77-79E Area 2	130 N-S x 74 E-W x 38 deep	The fill consisted of charcoal-stained, compact sandy loam mixed with charcoal flecks and fire-cracked rock; the color ranged from dark brown to dark gray and black.	4 lithics, 4 floats (2 each from north and south portions)	Basin-shaped pit dug into native soil; the fire-cracked rock content was small and was concentrated in the north end of the feature.
5	Circular pit, possible hearth	122N/79E Area 2	40 N-S x 50 E-W x 30 deep	The fill consisted of dark gray to black sandy loam mixed with charcoal; small amount of fire-cracked rock mixed in the fill. In the exterior of the feature, the fill was a charcoal-stained reddish brown compact sandy loam with inclusions of caliche.	2 lithics (cores), 4 metate fragments, 2 pollen samples, 1 float	Circular pit dug into Feature 4; Feature 5 contained metate fragments and lithic artifacts mixed in the fill and metate fragments lining the interior walls; several pieces of fire-cracked rock lay at the bottom of the feature with metate fragments; no charcoal recovered due to the small size of the flecks. Feature walls were baked, but not oxidized.

Table 9.2. Material Type by Artifact Type, LA 84787, Area 1

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Unidirect. Core	Multidirect. Core	Cobble Tool	Uniface Undiff.	Biface Undiff.	Row Total
Chert	22 17.1 84.6	93 72.1 79.5	5 3.9 100.0	1 .8 100.0	4 3.1 80.0	1 .8 100.0	1 .8 100.0	2 1.6 66.7	129 81.1
Chalcedony	1 20.0 3.8	4 80.0 3.4							5 3.1
Silicified Wood		1 100.0 .9							1 .6
Obsidian								1 100.0 33.3	1 .6
Nonvesicular Basalt		1 100.0 .9							1 .6
Quartzite	3 13.6 11.5	18 81.8 15.4			1 4.5 20.0				22 13.8
Column Total	26 16.4	117 73.6	5 3.1	1 .6	5 3.1	1 .6	1 .6	3 1.9	159 100.0

Table 9.3. Material Texture by Artifact Type, LA 84787, Area 1

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Unidirect. Core	Multidirect. Core	Bidirect Cobble Tool	Uniface Undiff.	Biface Undiff.	Row Total
Fine	4 21.2 53.8	45 68.2 38.5	4 6.1 80.0		1 1.5 20.0			2 3.0 66.7	66 41.5
Medium/ Coarse	12 12.9 46.2	72 77.4 61.5	1 1.1 20.0	1 1.1 100.0	4 4.3 80.0	1 1.1 100.0	1 1.1 100.0	1 1.1 33.3	93 58.5
Column Total	26 16.4	117 73.6	5 3.1	1 .6	5 3.1	1 .6	1 .6	3 1.9	159 100.0

Table 9.4. Core Flakes by Material Texture and Dorsal Cortex Percentage, LA 84787, Area 1

Count Row Pct Column Pct	0%	10-50%	60-100%	Row Total
Fine	29 64.4 41.4	9 20.0 25.0	7 15.6 63.6	45 38.5
Medium/Coarse	41 56.9 58.6	27 37.5 75.0	4 5.6 36.4	72 61.5
Column Total	70 59.8	36 30.8	11 9.4	117 100.0

Table 9.5. Core Flakes by Material Type and Dorsal Scar Count, LA 84787, Area 1

Count Row Pct Column Pct	0-2	3-5	6 or more	Row Total
Fine	16 35.6 38.1	25 55.6 40.3	4 8.9 30.8	45 38.5
Medium/ Coarse	26 36.1 61.9	37 51.4 59.7	9 12.5 69.2	72 61.5
Column Total	42 35.9	62 53.0	13 11.1	117 100.0

Table 9.6. Core Flakes by Material Texture and Platform Type, LA 84787, Area 1

Count Row Pct Column Pct	Not Appli-cable	Cortical	Single Facet	Single Facet Abraded	Multifacet	Retouched	Collapsed	Crushed	Absent	Row Total
Fine	1 2.2 100.0	2 4.4 11.8	18 40.0 40.9	3 6.7 50.0	2 4.4 33.3		3 6.7 75.0	2 4.4 40.0	14 31.1 42.4	45 38.5
Medium/ Coarse		15 20.8 88.2	26 36.1 59.1	3 4.2 50.0	4 5.6 66.7	1 1.4 100.0	1 1.4 25.0	3 4.2 60.0	19 26.4 57.6	72 61.5
Column Total	1 .9	17 14.5	44 37.6	6 5.1	6 5.1	1 .9	4 3.4	5 4.3	33 28.2	117 100.0

Table 9.7. Core Flakes by Material Texture and Flake Portion, LA 84787, Area 1

Count Row Pct Column Pct	Indeterminate	Whole	Proximal	Medial	Distal	Lateral	Row Total
Fine	3 6.7 60.0	21 46.7 33.9	4 8.9 40.0	2 4.4 40.0	10 22.2 41.7	5 11.1 45.5	45 38.5
Medium/ Coarse	2 2.8 40.0	41 56.9 66.1	6 8.3 60.0	3 4.2 60.0	14 19.4 58.3	6 8.3 54.5	72 61.5
Column Total	5 4.3	62 53.0	10 8.5	5 4.3	24 20.5	11 9.4	117 100.0

Table 9.8. Whole Core Flake Dimensions by Material Texture (in mm)

	Mean	Standard Deviation	Range
Length			
Fine (n = 21)	24	10	15-58
Medium-coarse (n = 40)	33	13	13-65
Width			
Fine	21	10	12-34
Medium-coarse	29	12	12-74
Thickness			
Fine	9	5	5-13
Medium-coarse	12	6	3-32

Table 9.9. Core Attributes, LA 84787, Area 1

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East
Chert	Medium	Multi-directional	20	9	87	63	45	120/35
Chert	Medium	Multi-directional	30	10	40	31	23	121/35
Chert	Coarse	Multi-directional	0	12	65	46	39	123/36
Quartzite	Fine	Multi-directional	10	5	87	84	41	122/42
Chert	Medium	Multi-directional	0	5	41	34	16	122/42
Chert	Medium	Unidirectional	50	3	69	56	3	122/42

Whole core flake dimensions indicate a use of predominantly small to medium-size debris. Table 9.8 shows the dimensions by material texture. The minimum and maximum dimensions indicate that small and large core flakes were discarded, though the majority were within the 20-39 mm long by 20-39 mm wide ranges. Medium-grained core flakes tended to be larger that fine-grained, perhaps suggesting that a wider range of core sizes or tool sizes were being produced.

Cores. Six cores were recovered, of which, five were chert and one was quartzite (Table 9.9). The majority were made of medium-grained material. All have less than 60 percent dorsal cortex and 3 to 12 dorsal scars.

Tools. Six tool types were identified including utilized debitage, a chopper, two core-hammerstones, a uniface, two bifaces, and a temporally nondiagnostic projectile point fragment. The tools are described below.

Utilized Debitage. Ten pieces of utilized debitage were identified. Four of the utilized debitage had two used edges and the remainder had one used edge. Edge outlines were evenly distributed among concave, convex, and straight. Edge angles range from 48 to 70 degrees, suggesting multipurpose functions. Unidirectional wear from scraping was observed on 10 of the 14 edges. Crescent scars combined with nibbling and feather fractures were visible on 13 of the 14 edges. Visible edge wear, including nibbling and crescent scars, indicates early stages of edge attrition or that most of the utilized debitage was used briefly.

Bifaces. Two bifaces were identified. FS 102-1 was a medium-grained chert undifferentiated biface fragment. It was 48 mm long by 44 mm wide by 14 mm thick. It may have been an early stage biface that was intended to be a tool blank, but was not completely reduced. FS 106-1 was a fine-grained chert undifferentiated biface fragment. It measured 43 mm long by 32 mm wide by 14 mm thick. Similar to FS-102, FS 106-1 may have been an unfinished tool blank.

FS 113-1 was a nondiagnostic portion of an obsidian projectile point. It measured 12 mm long by 9 mm wide by 5 mm thick. There is no debris from obsidian tool manufacture, so it is probable that the artifact was brought to the site as a fragment and discarded when a suitable replacement was obtained.

Uniface. A unifacially retouched artifact that was probably a scraper was identified. It was made from medium-grained chert. It measured 39 mm long by 23 mm wide by 13 mm thick. It had an edge angle of 73 degrees, suggesting it was intended for heavy-duty scraping. It exhibited rounding, which indicates that it was used extensively on hard or durable material.

Area 1, Ground Stone Artifacts

Two metate fragments, two mano fragments, and one whole mano were recovered. FS 154 was a whole quartzite mano measuring 110 mm long by 82 mm wide by 50 mm thick. It was ground and battered on both sides. The two mano fragments were quartzite and quartzitic sandstone. Both were portions of one-hand manos. They exhibited grinding and battering on both surfaces. The metate fragments were indeterminate portions. One fragment was quartzite and the other was granite.

Area 2, Chipped Stone Artifacts

A total of 1,820 chipped stone artifacts were recovered from Area 2 excavations. Artifact types were dominated by debitage with considerably fewer cores, cobble tools, and unifacial and bifacial tools. Miscellaneous chert accounted for 78 percent of raw material types. Lower amounts of chalcedony, quartzite, silicified wood, basalt, and obsidian were identified. The chipped stone analysis is divided into two broad stratigraphic classes: Surface to Level 4, and Level 5 to Level 12. Surface to Level 4 includes all surface-collected and surface-strip artifacts and the sample that was recovered from the upper four 10-cm levels. Levels 5 through 12 include the mixed levels that may contain a remnant of the earliest site occupation. The arbitrary nature of these divisions cannot be avoided, but they do allow comparison of the less disturbed upper levels with the assemblages recovered from the other excavation areas. Surface to Level 4 will be referred to as the late level and Level 5 to Level 12 as the early level (Tables 9.10, 9.11).

Lithic Raw Material Selection. The raw material was predominantly miscellaneous chert from

Table 9.10. Artifact Type by Material Type, Late Level, Area 2, LA 84787

Count Row Pct Column Pct	Chert	Chalcedony	Silicified Wood	Obsidian	Igneous Undiff.	Nonvesic. Basalt	Granite	Quartzite-Undiff.	Quartz Crystal	Massive Quartz	Row Total
Angular Debris	206 80.5 18.1	39 15.2 20.3	6 2.3 60.0			1 .4 1.7		3 1.2 15.8	1 .4 5.6		256 17.7
Core Flake	808 79.1 70.9	124 12.1 64.6	4 .4 40.0	2 .2 25.0		46 4.5 79.3	3 .3 100.0	16 1.6 84.2	16 1.6 88.9	2 .2 100.0	1021 70.4
Biface Flake	84 68.3 7.4	27 22.0 14.1		2 1.6 25.0		9 7.3 15.5			1 .8 5.6		123 8.5
Notching Flake	1 50.0 .1	1 50.0 .5									2 .1
Blade					1 100.0 100.0						1 .1
Hammer-stone Flake	2 100.0 .2										2 .1
Tested Cobble	1 100.0 .1										1 .1
Core Undiff.	3 100.0 .3										3 .2
Unidirectional Core	3 100.0 .3										3 .2
Bidirectional Core	2 100.0 .2										2 .1
Multidirectional Core	20 95.2 1.8	1 4.8 .5									21 1.4
Cobble Tool Undiff.	6 85.7 .5					1 14.3 1.7					7 .5
Cobble Tool Unidirect.	1 100.0 .1										1 .1
Uniface Undiff.	1 100.0 .1										1 .1
Biface Early Stage	1 100.0 .1										1 .1
Biface Late Stage				4 80.0 50.0		1 20.0 1.7					5 .3
Column Total	1139 78.6	192 13.2	10 .7	8 .6	1 .1	58 4.0	3 .2	19 1.3	18 1.2	2 .1	1450 100.0

Table 9.11. Artifact Type by Material Type, Early Level, Area 2, LA 84787

Count Row Pct Column Pct	Chert	Chalcedony	Obsidian	Igneous Undiff.	Nonvesic. Basalt	Quartzite Undiff.	Quartz Crystal	Row Total
Angular Debris	52 85.2 18.1	5 8.2 13.9	1 1.6 20.0				3 4.9 23.1	61 16.5
Core Flake	207 77.0 72.1	27 10.0 75.0	1 .4 20.0	1 .4 100.0	24 8.9 88.9		9 3.3 69.2	269 72.7
Biface Flake	19 67.9 6.6	4 14.3 11.1	1 3.6 20.0		3 10.7 11.1		1 3.6 7.7	28 7.6
Notching Flake	2 100.0 .7							2 .5
Core Undiff.	1 100.0 .3							1 .3
Bidirectional Core	3 100.0 1.0							3 .8
Multidirectional Core	1 50.0 .3					1 50.0 100.0		2 .5
Cobble Tool Undiff.	2 100.0 .7							2 .5
Biface Middle Stage			1 100.0 20.0					1 .3
Biface Late Stage			1 100.0 20.0					1 .3
Column Total	287 77.6	36 9.7	5 1.4	1 .3	27 7.3	1 .3	13 3.5	370 100.0

the early and late levels (Tables 9.10, 9.11). Chalcedony is the second most common material, a pattern also observed in Area 4. Quartzite, which is the second most common raw material from Areas 1 and 3, occurs as 1 percent or less in the early and late levels of Area 2. Different from the other excavations areas is the 4-7 percent occurrence of basalt. Basalt, which is most common from sources located along the Rio Grande, had to be imported. The majority of the basalt artifacts were core flakes, suggesting that basalt was brought to the area as cores rather than preforms or finished products. Ten of the 13 obsidian artifacts were formal tools or debris from tool manufacture. This suggests that obsidian was part of a curated strategy.

Fine and medium to coarse-grained materials were equally present in the late level and occurred as in the early levels at 57 and 43 percent. Typically, medium to coarse-grained raw materials are slightly more abundant in Las Campanas assemblages. This suggests that raw material sources were variable and that suitable raw materials may have a wide variety of original provenances. This is a condition that would be expected if the raw material sources were composed of gravel and cobbles that had formed differently, but were combined by similar geological processes. These raw materials may originate from the cobble pediments identified by Lang and Scheick (1991) along the Arroyo de los Frijoles or from the Totavi Lentil deposits along the Rio Grande.

Debitage. Debitage from core reduction accounts for 89 percent of the early level and 88 percent of the late level chipped stone assemblages, if angular debris is counted as a core reduction by-product. Core flakes and angular debris were the two most common artifact types from both levels. Debitage ratios and attribute frequencies can be compared between levels by fine and medium to coarse-grained material texture classes. There are similar ratios of core flakes to angular debris for fine and medium to coarse-grained materials for early and late levels. Medium to coarse-grained materials have a 5:1 ratio and fine-grained materials have a 3:1 ratio for both levels. This suggests that all materials were reduced in a similar fashion regardless of texture. Biface flakes are evenly distributed between fine and medium to coarse-grained materials for both levels. This suggests that fine and medium to coarse-grained materials were used interchangeably by the prehistoric flint-knapper.

Core flake dorsal cortex percentages can be used to suggest reduction stage. Table 9.12 shows the dorsal cortex percentage distributions for fine and medium to coarse-grained materials in both levels. High percentages (67 to 83 percent) of noncortical core flakes dominate both material classes and levels. High percentages of noncortical flakes result from more complete reduction of raw materials. A limited range of early stage reduction is suggested by the 8 to 10 percent of core flakes with 60 to 100 percent dorsal cortex. In addition to a more complete reduction sequence, low counts of cortical flakes indicate that raw material was brought to the site in a partly reduced form.

The apparent focus on middle stage and late stage reduction is not strongly supported by the dorsal scar counts. From 68 to 88 percent of the core flakes from both material classes and levels exhibited two or fewer scars (Table 9.13). This percentage can be contrasted with the Area 1 assemblage, which had 53 percent core flakes with three to five dorsal scars. The Area 2 assemblage pattern is more similar to the Area 3 and 4 pattern, suggesting that the relationship between dorsal cortex percentages and dorsal scar counts is not a simple correlation. Late stage core reduction is minimally indicated by a total of 31 core flakes from both levels and material classes with more than five dorsal flake scars.

Early or middle stage core reduction is indicated by the cortical and single-faceted platforms (37 to 49 percent; Table 9.14). Low cortical platform counts support the observation that raw materials were commonly brought to the site in a partly reduced state. The limited late stage reduction evidenced by the dorsal flake scar counts is reinforced by the low multifaceted and abraded platform counts. Similar to other area assemblages, 31 to 40 percent of core flakes lack platforms. High percentages of missing platforms are usually associated with late stage and biface reduction.

Another indicator of early or middle stage core reduction is high percentages of whole flakes (Table 9.15). Thirty-eight to 49 percent of the core flakes were whole. This low frequency of whole core flakes might be an indicator of late stage reduction or the use of excessive force to remove flakes from cores that were not optimal in size or platform angle. Whole core flake percentage was essentially the same for both material classes from both levels. This supports the interpretation that fine and medium to coarse-grained materials were used in essentially the same manner.

Whole core flake dimensions by material class and level are presented in Table 9.16. Whole core flakes of fine and medium to coarse-grained material from the early level had similar dimensions. This is reflected in the close mean and range of all dimensions. A few large core flakes were recovered, but the majority were small to medium sized. Whole core flakes from the late level show a marked difference in dimensions between fine and medium to coarse-grained material. The latter materials tend to be large, though a broad size range is indicated for both classes. The larger size of the medium to coarse-grained core flakes may reflect size of parent material or differentiation in flake production to support specific tasks.

Biface flake attributes can be compared with core flakes. Biface flakes were almost equally divided between fine and medium to coarse-grained materials for both levels. This is similar to the core flakes and the overall assemblage. As expected, noncortical biface flakes account for all but 7 percent from both levels. Biface flakes with 0 to 2 dorsal scars accounted for 65 percent of the assemblage from the late level and 86 percent from the early level. This suggests that biface production may have focused on early and middle stage bifaces and preforms. Sixty-eight percent of the early level biface flakes were complete, while only 50 percent of the late level biface flakes were complete. The distal fragments from the late level (26 percent) fit well

Table 9.12. Material Texture by Dorsal Cortex for Core Flakes, Area 2, LA 84787

Early Level				
Count Row Pct Column Pct	0	10-50	60-100	Row Total
Fine	117 77.0 54.7	20 13.2 66.7	15 9.9 60.0	152 56.5
Medium-Coarse	97 82.9 45.3	10 8.5 40.0	10 8.5 40.0	117 43.5
Column Total	214 79.6	30 11.2	25 9.3	269 100.0
Late Level				
Count Row Pct Column Pct	0	10-50	60-100	Row Total
Fine	343 66.6 48.7	118 22.9 53.9	54 10.5 55.1	515 50.4
Medium-Coarse	361 71.3 51.3	101 20.0 46.1	44 8.7 44.9	506 49.6
Column Total	704 69.0	219 21.4	98 9.6	1021 100.0

Table 9.13. Material Texture by Dorsal Scar Count for Core Flakes, Area 2, LA 84787

Early Level				
Count Row Pct Column Pct	0-2	3-5	6+	Row Total
Fine	115 75.7 52.8	31 20.4 68.9	6 3.9 100.0	152 56.5
Medium-Coarse	103 88.0 47.2	14 12.0 31.1		117 43.5
Column Total	218 81.0	45 16.7	6 2.2	269 100.0
Late Level				
Fine	352 68.3 49.7	151 29.3 52.4	12 2.3 48.0	515 50.4

Medium-Coarse	356 70.4 50.3	137 27.1 47.6	13 2.6 52.0	506 49.6
Column Total	708 69.3	288 28.2	25 2.4	1021 100.0

Table 9.14. Material Texture by Platform for Core Flakes, Area 2, LA 84787

Early Level									
Count Row Pct Column Pct	Cortical	Single Facet	Single Facet, Abraded	Multi-facet	Multi-facet, Abraded	Collapsed	Crushed	Absent	Row Total
Fine	9 5.9 64.3	66 43.4 59.5	5 3.3 45.5	11 7.2 57.9	1 .7 50.0	12 7.9 80.0	6 3.9 50.0	42 27.6 49.4	152 56.5
Medium-Coarse	5 4.3 35.7	45 38.5 40.5	6 5.1 54.5	8 6.8 42.1	1 .9 50.0	3 2.6 20.0	6 5.1 50.0	43 36.8 50.6	117 43.5
Column Total	14 5.2	111 41.3	11 4.1	19 7.1	2 .7	15 5.6	12 4.5	85 31.6	269 100.0
Late Level									
Fine	34 6.6 46.6	1 .2 14.3	193 37.5 56.3	20 3.9 40.0	19 3.7 70.4	6 1.2 50.0	1 .2 100.0	1 .2 100.0	515 50.4
Medium-Coarse	39 7.7 53.4	6 1.2 85.7	150 29.6 43.7	30 5.9 60.0	8 1.6 29.6	6 1.2 50.0			506 49.6
Column Total	73 7.1	7 .7	343 33.6	50 4.9	27 2.6	12 1.2	1 .1	1 .1	1021 100.0

Table 9.15. Material Texture by Portion for Core Flakes, Area 2, LA 84787

Early Level						
Count Row Pct Column Pct	Whole	Proximal	Medial	Distal	Lateral	Row Total
Fine	75 49.3 56.8	21 13.8 72.4	11 7.2 50.0	31 20.4 49.2	14 9.2 60.9	152 56.5
Medium-Coarse	57 48.7 43.2	8 6.8 27.6	11 9.4 50.0	32 27.4 50.8	9 7.7 39.1	117 43.5
Column Total	132 49.1	29 10.8	22 8.2	63 23.4	23 8.6	269 100.0

Late Level						
Fine	10 1.9 40	212 41.2 52.6	69 13.4 52.3	43 8.3 45.3	129 25.0 48.9	515 50.4
Medium-Coarse	15 3.0 60.0	191 37.7 47.4	63 12.5 47.7	52 10.3 54.7	135 26.7 51.1	506 49.6
Column Total	25 2.4	403 39.5	132 12.9	95 9.3	264 25.9	1021 100.0

Table 9.16. Whole Core Flake Dimensions by Material Texture and Level

	Mean (mm)	Standard Deviation (mm)	Range (mm)
Early Level			
Length			
Fine (n = 75)	22	12	8-64
Medium-coarse (n = 57)	25	10	12-59
Width			
Fine	21	10	7-46
Medium-coarse	21	11	7-56
Thickness			
Fine	8	5	2-27
Medium-coarse	8	5	2-22
Late Level			
Length			
Fine (n = 212)	24	10	7-58
Medium-coarse (n=191)	31	12	7-74
Width			
Fine	21	10	7-88
Medium-coarse	27	12	4-57
Thickness			
Fine	7	4	2-33
Medium-coarse	10	5	1-29

with biface production, where increasingly thinner and weaker platforms are crushed or broken in reduction. Overall biface flakes were smaller than core flakes. Biface flakes from both levels had a 16 mm mean length with a 7 mm standard deviation, and a 5 to 44 mm range. The mean width was 14 mm with a standard deviation of 5 mm and a 5 to 33 mm range. Mean thickness was 3 mm with a 3 mm standard deviation and a 1 to 19 mm range. Restricted size distributions are indicated by Student's t-values for fine and medium-grained materials that were significant at the .36 to .50 level. This is expected for biface manufacture, which was a planned and controlled activity where formal tools were produced for specific tasks.

Cores. Thirty-six cores were recovered, 30 of which came from the late level and 6 came from the early level (Table 9.17). A roughly equal number of cores were fine and medium to coarse-grained from the late level. The early level cores were equally fine and medium to coarse-grained. Material texture distribution for cores is comparable to the debitage distribution. The majority of the cores from both levels were multidirectional with fewer numbers of unidirectional and bidirectional cores; only one tested cobble was recovered. Only two cores from the late level had more than 50 percent cortex and none from the early level had more than 50 percent dorsal cortex. This suggests that cores were intensively worked and that raw material testing and early stage discard of cores was rare. The dorsal scar counts range from 1 to 15. Only one core from the late level has two or fewer dorsal scars. This distribution supports observations about reduction stage suggested by the dorsal cortex data. Core lengths range from 34 to 87 mm, widths range from 26 to 75 m, and thickness ranges from 14 to 55 mm. Ninety-five percent of the cores from both levels fall within a 48 to 58 mm long, 39 to 48 mm wide, and 26 to 34 mm thick range. This range indicates that the majority of cores were small to medium in size with a number of small cores reflecting complete reduction of the raw material. All core attributes strongly point to intensive reduction of raw material resulting in cores with low dorsal cortex, high dorsal scar counts, and small to medium size.

Tools. Ten tool types were identified including utilized debitage, a chopper, three hammerstones, two end scrapers, one knife, one undifferentiated biface, and three projectile points. Each tool class is described and summarized.

Utilized Debitage. One hundred and twenty-three pieces of utilized debitage were recovered from both levels. Since only five utilized flakes were recovered from the lower levels, they were combined with the late level assemblage. Nine pieces of the utilized debitage had two used edges, one had three utilized edges, and the remainder had one used edge. Edge outlines were relatively evenly distributed among concave (n = 40), convex (n = 41), and straight (n = 41). Edge angles range from 15 to 88 degrees, suggesting that expedient tools were produced for a wide variety of tasks, including cutting or slicing and heavy-duty scraping (Fig. 9.15). The majority of the utilized edge angles were within the 40 to 60 degree range. A higher frequency of wider edge angles suggests that expedient tools were also needed for light cutting or slicing and heavy scraping or processing of coarse or hard materials. Table 9.18 shows the distribution of major edge-wear classes by edge outline. Not included in the table are six edges that exhibit rounding (n = 1), battering (n = 3), and abrasion (n = 2). Unidirectional wear is the most common and was observed on 68 edges. Unidirectional and bidirectional wear occurred in roughly the same proportion on all edge outlines. This suggests that edge outlines were not selected for specific tasks and that all outlines were used interchangeably. One minor observation is that rounding is most common on straight edges, suggesting that straight edges were used more often to cut or incise harder materials than concave or convex edges. Edge damage was dominated by feather fractures and edge nibbling. Feather fractures were observed on 92 edges. Feather fractures result from early stages of cutting and scraping. Their abundance indicates that most of the tools were used for a short time and discarded. The low occurrence of step fractures and retouched or modified edges suggests that available raw material was sufficient for all expedient tool needs.

Hammerstones. Five hammerstones were recovered from both levels. All hammerstones were chert. Three were fine grained and two were medium grained. They range in size from 56 to 67 mm long by 39 to 59 mm wide by 15 to 39 mm thick. All exhibit battering or crushing on one or more edges. Four hammerstones were used first as cores, then as hammerstones, which

Table 9.17. Core Data, Area 2, LA 84787

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East	Level
Chert	Medium	Multidirectional	40	4	34	39	23	117/79	0
Chert	Medium	Multidirectional	20	7	38	37	20	117/80	0
Chert	Medium	Multidirectional	30	5	38	35	20	116/80	0
Chert	Medium	Multidirectional	0	15	52	43	28	115/81	0
Chert	Medium	Multidirectional	20	6	50	43	34	116/81	0
Chalcedony	Fine	Multidirectional	20	8	49	37	19	118/82	0
Chert	Fine	Multidirectional	20	7	46	30	30	118/81	0
Chert	Medium	Multidirectional	10	8	69	48	48	116/83	0
Chert	Coarse	Multidirectional	0	14	50	46	28	121/83	0
Chert	Fine	Multidirectional	40	8	64	38	27	115/82	0
Chert	Fine	Multidirectional	30	7	60	39	25	118/83	0
Chert	Fine	Multidirectional	20	5	41	37	22	123/79	0
Chert	Medium	Multidirectional	0	9	52	46	25	124/79	0
Chert	Fine	Multidirectional	20	6	36	35	14	127/76	0
Chert	Medium	Multidirectional	30	11	43	26	18	125/81	0
Chert	Fine	Unidirectional	30	4	37	27	26	126/81	0
Chert	Medium	Multidirectional	20	6	56	45	29	128/77	0
Chert	Medium	Multidirectional	30	5	53	49	37	122/78	1
Chert	Fine	Tested Cobble	90	1	51	34	16	121/81	1
Chert	Fine	Multidirectional	10	7	45	41	29	126/76	1
Chert	Fine	Bidirectional	0	5	69	46	31	126/83	1
Chert	Fine	Unidirectional	60	5	70	55	34	126/82	1
Chert	Medium	Bidirectional	30	5	53	46	38	124/75	8
Chert	Fine	Bidirectional	40	9	56	55	40	126/76	2
Chert	Fine	Bidirectional	30	7	51	41	32	122/75	5
Chert	Medium	Undiff.	0	6	50	46	34	121/76	2
Chert	Fine	Bidirectional	0	4	40	32	22	125/77	6
Chert	Medium	Unidirectional	60	8	79	68	44	121/78	2
Chert	Fine	Undifferentiated	30	7	65	42	34	123/79	99
Chert	Medium	Multidirectional	20	6	57	50	35	123/76	9
Chert	Medium	Undifferentiated	0	4	87	68	47	128/72	1
Chert	Fine	Undifferentiated	30	4	63	45	39	128/72	1
Chert	Fine	Multidirectional	40	12	75	75	55	121/79	1

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East	Level
Quartzite	Medium	Multidirectional	0	7	96	73	43	124/75	6
Chert	Coarse	Multidirectional	0	5	34	28	20	124/81	0
Chert	Medium	Multidirectional	30	5	63	55	33	124/81	2

Table 9.18. LA 84787, Area 2, Utilized Debitage, Edge Outline by Wear Pattern

Outline	Unidirectional	Bidirectional	Rounding and Unidirectional	Rounding and Bidirectional	Total
Concave	22 32.4 55.0	9 33.3 22.5	4 25.0 10.0	3 18.8 7.5	38 29.9
Convex	23 33.8 56.1	8 29.6 19.5	4 25.0 9.8	4 25.0 9.8	39 30.4
Concave-Convex	7 10.3 63.6	4 14.8 6.4			11 8.6
Straight	16 23.5 39.0	6 22.2 14.6	8 50.0 19.5	9 56.3 22.0	39 30.7
Total	68 53.5	27 21.2	16 12.6	16 12.6	127

is additional evidence of intensive use of raw materials. Three hammerstones were from the main part of the late level excavation area. The other hammerstones were from Levels 5 and 10 within the early level.

Pecking stone. FS 854-1 is a nodule of brown chert that exhibits heavy battering along both margins and at the distal end. The marginal battering is lighter, suggesting that the edge was dulled. The distal end formed a point that was heavily battered. The point allowed more precision in aiming the tool. It is this more specialized form that separates it from the other hammerstones. The artifact measures 47 mm long by 40 mm wide by 20 mm thick.

Core/chopper. FS 908 is a bidirectional core that exhibits step fracturing along one margin. It appears that core flakes were removed from the core until it was exhausted. The edge was used as a chopping or heavy-duty cutting tool, indicated by the extent of the wear. It measures 53 mm long by 45 mm wide by 23 mm thick.

End scrapers. Two artifacts were classified as end scrapers. FS 887-1 is a piece of chert angular debris with large retouch flakes removed from one margin. The edge exhibits unidirectional scarring indicating that is was used for scraping. The scarring is extensive and visible with the unaided eye. This scarring might have been caused by heavy use on hard materials. It measures 45 mm long by 37 mm wide by 22 mm thick.

FS 823-1 is a chert end scraper fragment. It exhibits unimarginal retouch and unidirectional wear along one edge. It measures 16 mm long by 14 mm wide by 8 mm thick.

Spokeshaves. Three core flakes and two pieces of angular debris were identified as spokeshaves. Four of the artifacts have a single notch that exhibited unidirectional wear (FS 857-1, FS 904-1, FS 916-1, FS 861-1). A fifth spokeshave (FS 916) had two notches on two different edges. All

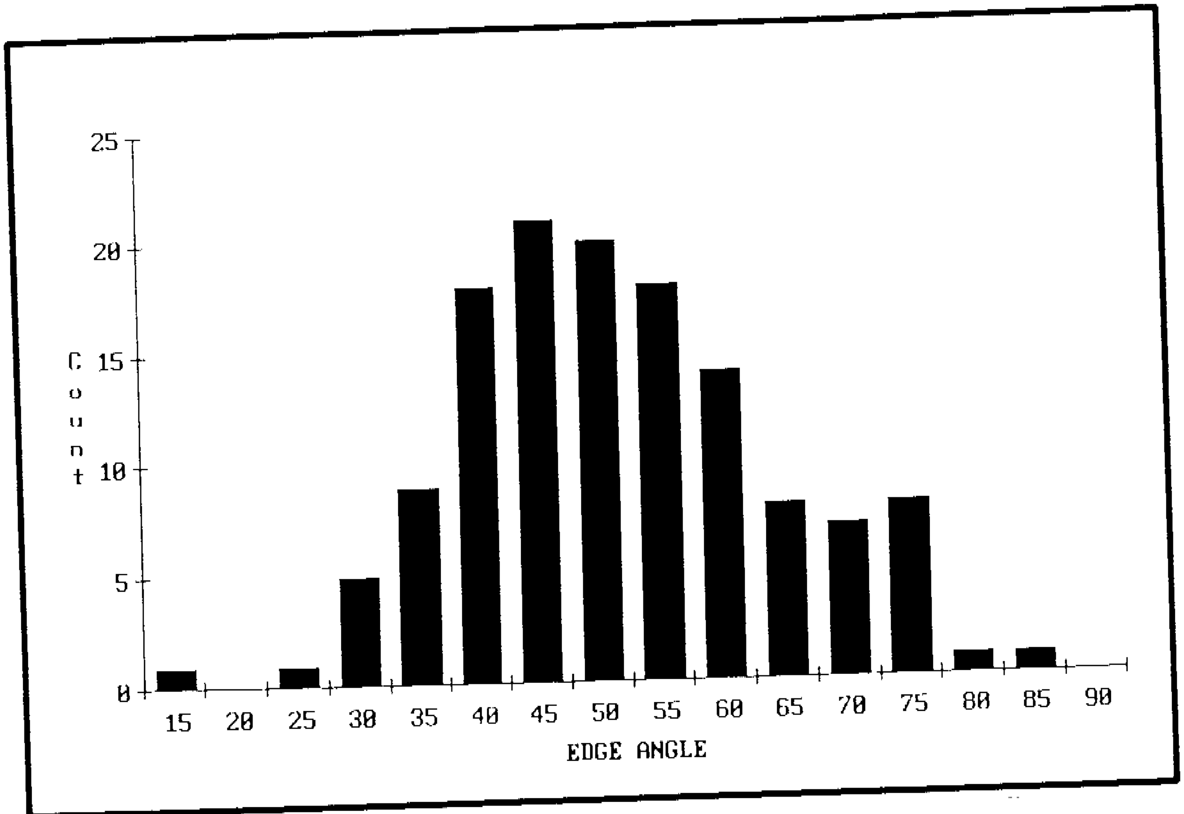

Figure 9.15. LA 84787, utilized debitage edge angles. Area 2.

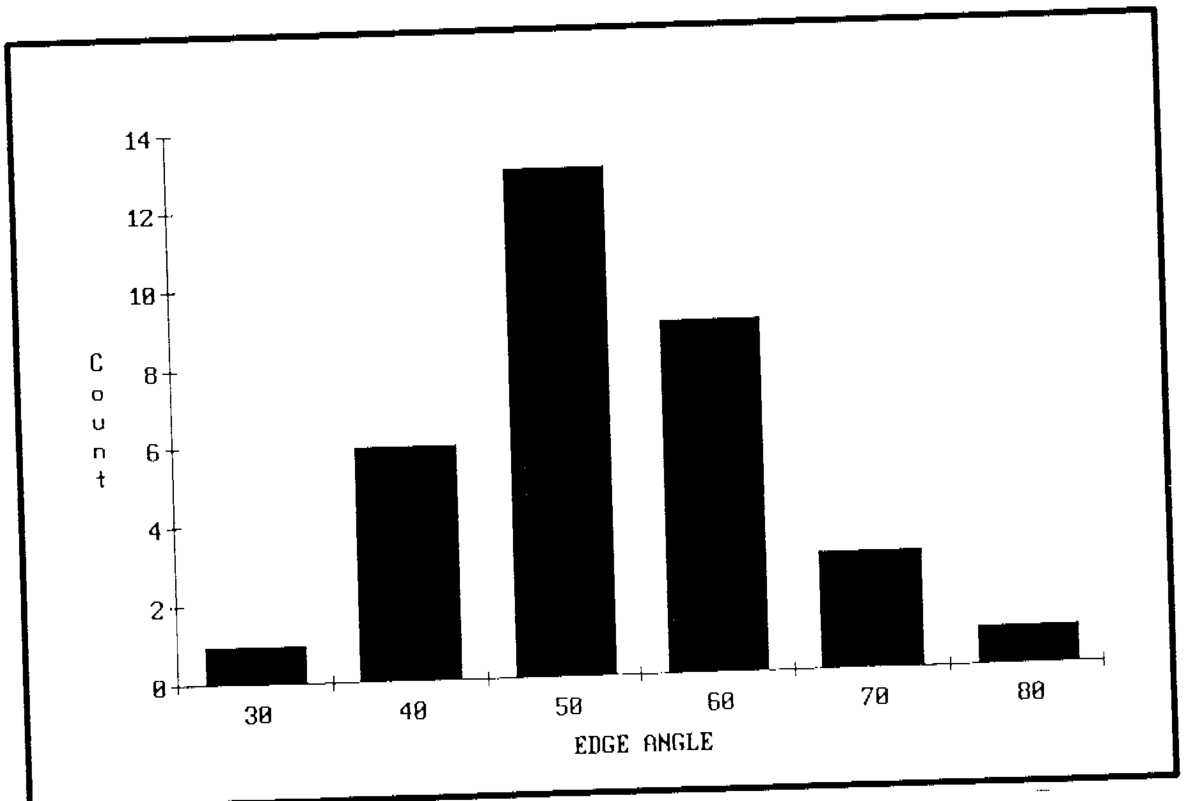

Figure 9.16. LA 84787, utilized debitage edge angles, Area 3.

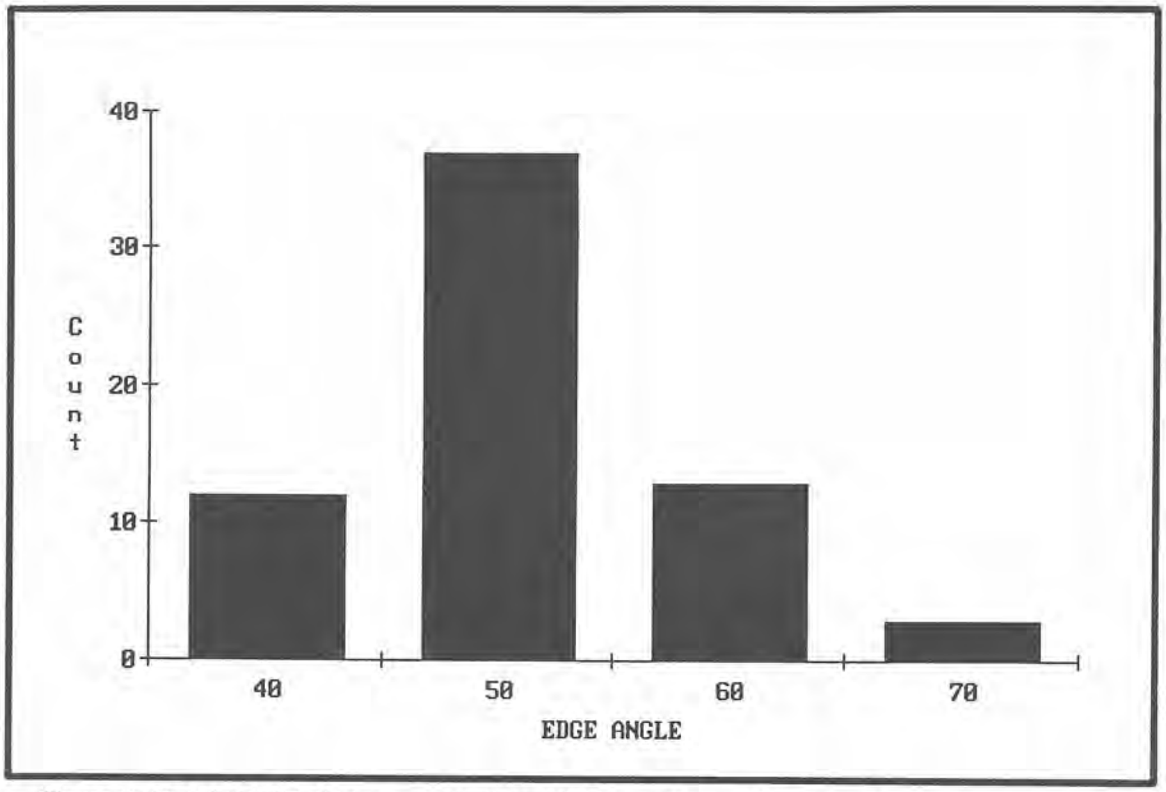

Figure 9.17. LA 84787, histogram of utilized debitage edge angles, Area 4.

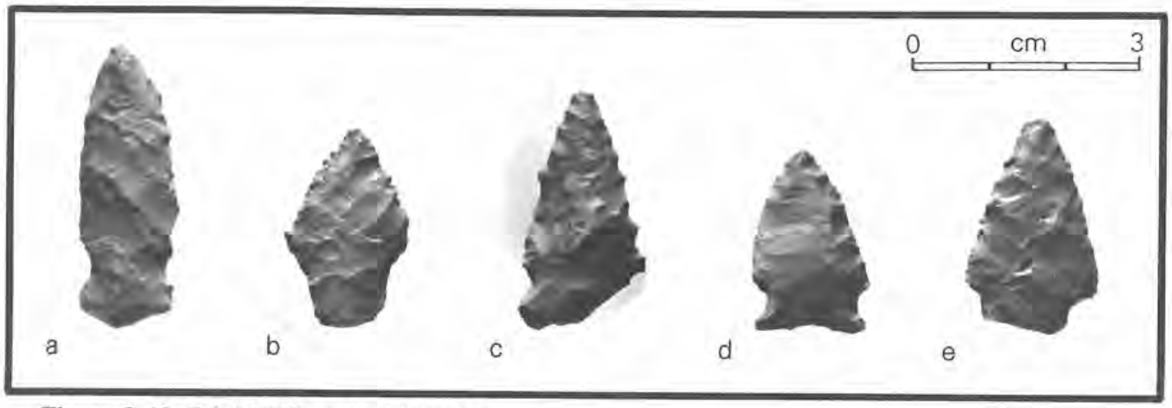

Figure 9.18. LA 84787, projectile points.

spokeshaves were made from fine-grained chert (n = 2) or chalcedony (n = 3). The edge angles within the notch range from 72 to 85 degrees. Spokeshaves are usually associated with wood processing.

Knife. A chalcedony core flake exhibits continuous bidirectional wear along one convex edge (FS 950). Regular bidirectional wear indicates this tool was used for light-duty sawing or cutting. The artifact measures 22 mm long by 14 mm wide by 6 mm thick.

Undifferentiated Biface Fragment. An obsidian artifact exhibits bifacial flake scars (FS 857-7). The small tool fragment appears to be a medial late stage biface fragment. The edges exhibit bidirectional wear and rounding, suggesting that the tool was used for cutting. The artifact measures 13 mm long by 12 mm wide by 5 mm thick.

Projectile Points. Three projectile points were recovered from the subsurface excavations. These are in addition to the two projectile points collected during the testing phase (Fig. 9.18a, b).

FS 1053 is an almost complete Jemez obsidian Armijo-style projectile point (Fig. 9.18c). It has an elongated triangular blade with straight edges. The edges are slightly serrated, which is a common attribute of Armijo-style projectile points. It has corner notches that are relatively broad and shallow. The base is mostly missing, but it may have been slightly expanding. It measures 32 mm long by 17 mm wide by 5 mm thick.

FS 1062 is a complete Jemez obsidian En Medio or late Armijo-style projectile point (Fig. 9.18d). It has a short, convex edged, leaf-shaped blade. It has broad, shallow, side notches that are immediately above a concave base. This projectile point was made from a small to medium-sized obsidian biface flake by bidirectionally retouching the margins. It measures 24 mm long by 15 mm wide by 3 mm thick.

FS 900 is a blade fragment of an obsidian En Medio-style projectile point recovered from the surface strip in Grid 124N/81E (Fig. 9.18e). The triangular blade has convex edges with marginal and facial retouch scars. The blade ends in shallow, but moderately broad corner notches. It measures 29 mm long by 19 mm wide by 5 mm thick. The neck width is 11 mm.

Ground Stone Artifacts, Area 2

A total of 29 ground stone artifacts were recovered from Area 2. They included 14 metate fragments, 8 complete one-hand manos, 6 mano fragments, and an undifferentiated fragment. The ground stone was primarily recovered from the late level in association with Features 3, 4, and 5.

Four fragments are from basin-shaped metates and 10 fragments could not be assigned to a metate form. Two of the basin metate fragments were quartzite (FS 979 and FS 2049), one fragment was quartzitic sandstone (FS 970), and one was indurated sandstone (FS 2036). The undifferentiated metate fragments also were quartzite (n = 8), quartzitic sandstone (n = 1), and mica schist (n = 1). The material type distribution suggests that at least three metates were discarded. Basin-shaped metates are commonly found on late Archaic period sites and are associated with seed or nut processing.

Fourteen complete or fragmentary manos were recovered. All the manos are quartzite. Table 9.19 shows the condition and dimensions of all specimens. All manos exhibit evidence of grinding or pecking on both surfaces. The ground surfaces are all convex. One-hand manos are typically associated with basin-shaped metates on late Archaic period sites.

Area 3, Chipped Stone Artifacts

A total of 855 chipped stone artifacts were recovered from Area 3. Eight artifact types were identified, including core and biface flakes, angular debris, cores, and bifaces. Seven material types included chert, chalcedony, silicified wood, obsidian, basalt, quartzite, and massive quartz. The majority of the artifacts were recovered from an arc-shaped discard area associated with Feature 1 in the north portion of the excavation area.

Lithic Raw Material Selection. The raw material was predominantly miscellaneous chert (Table 9.20). Chalcedony and quartzite are well represented and may occur in percentages that reflect their distribution within the main raw material source. Obsidian and basalt are obvious nonlocal raw materials. Both may have been brought from the Rio Grande gravel deposits. Basalt is abundant and was the primary raw material found on Cochiti area prehistoric sites (Warren 1979b; Kemrer and Kemrer 1979). Basalt and obsidian occur as biface flakes and bifaces in higher percentages than the more locally available chert, quartzite, and chalcedony. Raw material texture occurs as fine and medium to coarse grained. Medium to coarse-grained materials comprised 57 percent of the assemblage. Higher percentages of medium to coarse-grained material over fine-grained raw material seems to be a common pattern for Las Campanas assemblages, which are dominated by locally available raw material (Table 9.21).

Debitage. Debitage from core reduction accounts for 87 percent of the chipped stone assemblage. Core flakes and angular debris were the two most common artifact types. There is approximately the same ratio of core flakes to angular debris for fine and medium to coarse-grained materials. Biface flakes are evenly distributed between fine and medium to coarse-grained materials. This suggests that fine and medium to coarse-grained materials were virtually interchangeable for the prehistoric flintknapper.

Table 9.19. LA 84787, Area 2, Mano Characteristics

FS	Condition	Length (mm)	Width (mm)	Thickness (mm)
950	whole	104	83	50
990	whole	104	83	50
1019	whole	107	82	48
1077	whole	85	55	31
1085	whole	94	66	40
2047	whole	118	90	48
2058	whole	111	87	48
2068	whole	107	80	45
887	edge fragment	74	54	29
1056	edge fragment	57	51	34
1062	internal fragment	53	42	27
1085	end fragment	74	51	42
2005	end fragment	108	57	42
2029	edge fragment	45	42	25

Table 9.20. Material Type by Artifact Type, LA 84787, Area 3

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Core Undiff.	Multidirect. Core	Cobble Tool Undiff.	Biface Undiff.	Biface Late Stage	Row Total
Chert	165 21.9 89.2	501 66.4 89.1	77 10.2 84.6	1 .1 100.0	11 1.5 91.7				755 88.3
Chalcedony	12 29.3 6.5	22 53.7 3.9	7 17.1 7.7						41 4.8
Silicified Wood	1 100.0 .5								1 .1
Obsidian		1 33.3 .2	1 33.3 1.1					1 33.3 100.0	3 .4
Nonvesicular Basalt		10 55.6 1.8	6 33.3 6.6				2 11.1 100.0		18 2.1
Quartzite	7 19.4 3.8	27 75.0 4.8			1 2.8 8.3	1 2.8 100.0			36 4.2

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Core Undiff.	Multidirect. Core	Cobble Tool Undiff.	Biface Undiff.	Biface Late Stage	Row Total
Massive Quartz		1 100.0 .2							1 .1
Column Total	185 21.6	562 65.7	91 10.6	1 .1	12 1.4	1 .1	2 .2	1 .1	855 100.0

Table 9.21. Material Texture by Artifact Type, LA 84787, Area 3

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Core Undiff.	Multidirect. Core	Cobble Tool Undiff.	Biface Undiff.	Biface Late Stage	Row Total
Fine	87 23.6 47.0	231 62.8 41.1	45 12.2 49.5		2 .5 16.7		2 .5 100.0	1 .3 100.0	368 43.0
Medium/ Coarse	98 20.1 53.0	331 68.0 58.9	46 9.4 50.5	1 .2 100.0	10 2.1 83.3	1 .2 100.0			487 57.0
Column Total	185 21.6	562 65.7	91 10.6	1 .1	12 1.4	1 .1	2 .2	1 .1	855 100.0

Table 9.22. Core Flakes by Material Texture and Dorsal Cortex Percentage, LA 84787, Area 3

Count Row Pct Column Pct	0%	10-50%	60-100%	Row Total
Fine	174 75.3 41.2	44 19.0 38.9	13 5.6 48.1	231 41.1
Medium/ Coarse	248 74.9 58.8	69 20.8 61.1	14 4.2 51.9	331 58.9
Column Total	422 75.1	113 20.1	27 4.8	562 100.0

Core flake dorsal cortex percentages can be used to suggest reduction stage. Seventy-five percent of the core flakes for all material textures lacked cortex. High percentages of noncortical flakes result from middle stage and late stage reduction. A limited range of early stage reduction is suggested by the 27 core flakes that had more than 50 percent dorsal cortex (Table 9.22). Low counts of cortical flakes indicate that raw material was brought to the site in a partly reduced form and cores were extensively reduced on-site.

The apparent focus on middle stage and late stage reduction is not strongly supported by the dorsal scar counts (Table 9.23). Sixty-five percent of the core flakes exhibited two or fewer scars. This percentage can be contrasted with the Area 1 assemblage, which had 53 percent core flakes with three to five dorsal scars. The Area 3 assemblage pattern suggests that the relationship between dorsal cortex percentages and dorsal

Table 9.23. Core Flakes by Material Texture and Dorsal Scar Counts, LA 84787, Area 3

Count Row Pct Column Pct	0-2	3-5	6+	Row Total
Fine	148 64.1 40.5	81 35.1 42.9	2 .9 25.0	231 41.1
Medium/ Coarse	217 65.6 59.5	108 32.6 57.1	6 1.8 75.0	331 58.9
Column Total	365 64.9	189 33.6	8 1.4	562 100.0

scars counts is not a simple correlation. Late stage core reduction is minimally indicated by the eight core flakes that had more than five dorsal flake scars.

Early or middle stage core reduction is indicated by the 45 percent of cortical and single-faceted platforms (Table 9.24). The limited amount of late stage reduction evidenced in the dorsal flake scar counts is supported by the presence of low counts of multifaceted and abraded platforms. Unexpected are the 40 percent of the core flakes with missing platforms. High percentages of missing platforms are usually associated with late stage and biface reduction. Another indicator of early or middle stage core reduction is the high percentage of whole flakes (Table 9.25). Almost equal percentages of whole core flakes occur for both material classes. This supports the interpretation that fine and medium to coarse-grained materials were used in essentially the same manner.

Whole core flake dimensions indicate a predominance of small to medium-size debris. Core flake dimensions are presented in Table 9.26. The minimum and maximum dimensions indicate that small and large core flakes were discarded, while the majority were within the 20 to 39 mm long by 20 to 39 mm wide ranges.

Biface flake attributes can be compared with the core flakes. Biface flakes were almost equally divided between fine and medium to coarse-grained materials. This is similar to the core flakes and the overall assemblage. As expected, noncortical biface flakes account for all but three artifacts. Three to five dorsal scars were present on 50.5 percent of the biface flakes, which is higher than the core flakes. However, the percentage of biface flakes with fewer than three dorsal scars is higher than expected (45 percent). This suggests that biface production may have focused on early and middle stage bifaces and preforms. Thirty-eight biface flakes were complete, while 20 were proximal fragments, 3 were medial fragments, 13 were distal fragments, and 7 were lateral fragments. High percentages of flake fragments are expected for biface production. Biface flakes were smaller than core flakes. Biface flakes had a 18 mm mean length with a 7 mm standard deviation, and a 1 to 35 mm range. The mean width was 15 mm with a standard deviation of 5 mm and a 7 to 30 mm range. Mean thickness was 5 mm with a 2 mm standard deviation and a 2 to 9 mm range.

Cores. Thirteen cores were recovered, of which 12 were chert and 1 was quartzite (Table 9.27). The majority were of medium-grained material. All have less than 60 percent dorsal cortex and 2 to 13 dorsal scars. Core lengths range from 44 to 111 mm, widths range from 38 to 78 m, and thicknesses range from 17 to 55 mm. This broad size range suggests that the raw material source contained a wide size range of cobbles and nodules. The range also suggests that cores were differentially reduced and that all raw materials were not exhausted. All but one core are multidirectional. Multidirectional cores are a common by-product of core reduction that focuses on flake or expedient tool production.

Tools. Six tool types were identified, including utilized debitage, choppers, pecking stones, biface, and a San Pedro-style projectile point. The tools are described below.

Utilized Debitage. Twenty pieces of utilized

Table 9.24. Core Flakes by Material Type and Platform Type, LA 84787, Area 3

Count Row Pct Column Pct	Cortical	Cortical Abraded	Single Facet	Single Facet, Abraded	Multi-facet	Multi-facet, Abraded	Collapsed	Crushed	Absent	Row Total
Fine	20 8.7 39.2	2 .9 50.0	75 32.5 37.5	1 .4 20.0	11 4.8 73.3	4 1.7 80.0	21 9.1 55.3	6 2.6 31.6	91 39.4 40.4	231 41.1
Medium/ Coarse	31 9.4 60.8	2 .6 50.0	125 37.8 62.5	4 1.2 80.0	4 1.2 26.7	1 .3 20.0	17 5.1 44.7	13 3.9 68.4	134 40.5 59.6	331 58.9
Column Total	51 9.1	4 .7	200 35.6	5 .9	15 2.7	5 .9	38 6.8	19 3.4	225 40.0	562 100.0

Table 9.25. Core Flakes by Material Type and Flake Portion, LA 84787, Area 3

Count Row Pct Column Pct	Indeter- minate	Whole	Proximal	Medial	Distal	Lateral	Row Total
Fine	11 4.8 37.9	85 36.8 37.9	40 17.3 55.6	28 12.1 43.1	50 21.6 39.7	17 7.4 37.0	231 41.1
Medium/ Coarse	18 5.4 62.1	139 42.0 62.1	32 9.7 44.4	37 11.2 56.9	76 23.0 60.3	29 8.8 63.0	331 58.9
Column Total	29 5.2	224 39.9	72 12.8	65 11.6	126 22.4	46 8.2	562 100.0

Table 9.26. Whole Core Flake Dimensions by Material Texture

	Mean (mm)	Standard Deviation (mm)	Range (mm)
Length			
Fine (n=85)	24	10	8-64
Medium to coarse (n=139)	29	14	10-53
Width			
Fine	22	11	7-67
Medium to coarse	29	12	12-74
Thickness			
Fine	9	5	5-13
Medium to coarse	12	6	3-32

Table 9.27. Core Attributes, LA 84787, Area 3

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East
Chert	Medium	Multidirectional	60	13	38	44	22	174/93
Chert	Medium	Multidirectional	30	6	54	52	17	175/90
Chert	Medium	Undifferentiated	0	2	60	49	34	176/88
Chert	Medium	Multidirectional	0	10	54	40	19	172/90
Chert	Medium	Multidirectional	0	9	43	42	25	178/87
Chert	Fine	Multidirectional	10	7	56	52	27	178/88
Chert	Medium	Multidirectional	40	6	62	42	34	170/90
Chert	Medium	Multidirectional	0	5	51	26	26	172/94
Chert	Medium	Multidirectional	10	8	87	74	52	170/89
Chert	Coarse	Multidirectional	0	5	80	38	27	176/86
Chert	Medium	Multidirectional	0	4	54	51	27	176/86
Quartzite	Fine	Multidirectional	50	11	111	78	55	177/89
Chert	Medium	Multidirectional	10	7	44	30	29	173/88

debitage were identified. Five of the utilized debitage had two used edges and the remainder had one used edge. Edge outlines were relatively evenly distributed among concave (n = 6), convex (n = 8), and straight (n = 10). Edge angles range from 34 to 74 degrees, suggesting that the core flake tools were produced for a wide variety of tasks including cutting, slicing, and heavy-duty scraping (Fig. 9.17). Unidirectional wear from scraping was observed on 16 of the 25 edges. Bidirectional wear was observed on 8 edges. Crescent scars combined with nibbling and feather fractures were visible on 16 of the 25 edges. Visible edge wear, including nibbling and crescent scars, indicate early stages of edge attrition. The low percentage of utilized debitage with two or more edges suggests that raw materials for tool production were abundant and the intensive use of raw material was not necessary.

Biface. FS 444 is a small obsidian ovate-shaped biface with a missing tip and a missing tang. It is unnotched and lacks temporally diagnostic characteristics. It measures 20 mm long by 13 mm wide by 4 mm thick. This appears to be a finished product that was brought to the site and discarded when a suitable replacement could be obtained.

Projectile Point. FS 362 is a corner-notched San Pedro-style projectile point. It has shallow, broad notches, and a convex base with a direct stem. The outline is convex-convex. The tip is missing and appears to have sustained an impact fracture. The projectile point was made from basalt, indicating that it may have been brought from the Rio Grande channel. The tip was broken and it was disgarded on site rather than refurbished. San Pedro-style projectile points were made from 800 B.C. to A.D. 400. They suggest a late Archaic or Basketmaker II period occupation.

Chopper. FS 442 is a red chert core flake with a single edge that has bimarginal retouch. The edge exhibits step fractures that were formed by use on hard material. The chopper measures 70 mm long by 50 mm wide by 24 mm thick.

Ground Stone Artifacts, Area 3

Two ground stone artifacts were recovered. FS 322 was a complete quartzite one-hand mano, ground and pecked on both sides. It measured 123 mm long by 88 mm wide by 48 mm thick. FS 323 was a quartzitic sandstone ground slab fragment, lightly ground on one surface. Both fragments were recovered in close proximity to Feature 1 within the main discard area southwest of the feature.

Area 4, Chipped Stone Artifacts

A total of 732 chipped stone artifacts were recovered from Area 4. Nine artifact types were identified including core and biface flakes, angular debris, cores, a uniface, a cobble tool, a reworked tool, and bifaces. Seven material types were found, including chert, chalcedony, silicified wood, obsidian, basalt, quartzite, and rhyolite. The majority of the artifacts were recovered from an oval-shaped discard area located in the north-central and western portions of the excavation area.

Lithic Raw Material Selection. The raw material was predominantly miscellaneous chert (Table 9.28). Chalcedony is present in the highest percentages found in any of the excavation area assemblages. The Area 4 inhabitants may have exploited a gravel source that was higher in chalcedony than the majority of the source areas. The chalcedony and chert appear to have been used in the same manner based on the similar percentages of core and biface flakes and angular debris. Obsidian, basalt, and rhyolite are obvious nonlocal raw materials. They may have been brought from the Rio Grande gravel deposits. Basalt is abundant and was the primary raw material found on Cochiti area prehistoric sites (Warren 1979b; Kemrer and Kemrer 1979). Basalt and obsidian biface flakes and bifaces occur in higher percentages than the more locally available chert, quartzite, and chalcedony. The rhyolite artifact was an undifferentiated biface. The nonlocal materials and artifact types suggest that a curated strategy was practiced on a small scale by the area occupants. Raw material texture occurs as fine and medium to coarse grained (Table 9.29). Medium to coarse-grained materials comprised 56 percent of the assemblage. Medium to coarse-grained material percentages were higher than fine-grained raw material. This seems to be a common pattern for Las Campanas assemblages, which are dominated by locally available raw material.

Debitage. Debitage from core reduction accounts for 86 percent of the chipped stone assemblage. Core flakes and angular debris were the two most common artifact types. There is approximately the same ratio of core flakes to angular debris for fine and medium to coarse-grained materials. Biface flakes are evenly distributed between fine and medium to coarse-grained materials. This suggests that fine and medium to coarse-grained materials were virtually interchangeable for the prehistoric flintknapper.

Core flake dorsal cortex percentages can be used to suggest reduction stage. Seventy-three percent of the core flakes for all material textures lacked cortex. High percentages of noncortical flakes result from middle stage and late stage reduction. A limited range of early stage reduction is suggested by the 38 core flakes that had more than 50 percent dorsal cortex (Table 9.30). Low counts of cortical flakes indicate that raw material was brought to the site in a partly reduced form and that cores were extensively reduced on-site.

The apparent focus on middle and late stage reduction is not strongly supported by the dorsal scar counts (Table 9.31). Sixty-eight percent of the core flakes exhibited two or fewer scars. This percentage can be contrasted with the Area 1 assemblage, which had 53 percent core flakes with three to five dorsal scars. The Area 4 assemblage pattern, which is similar to the Area 3 pattern, suggests that the relationship between dorsal cortex percentages and dorsal scars counts is not a simple correlation. Late stage core reduction is minimally indicated by the six core flakes with more than five dorsal flake scars.

Early or middle stage core reduction is indicated by the number of cortical and single-faceted platforms (43 percent; Table 9.32). The limited amount of late stage reduction evidenced in the dorsal flake scar counts is supported by the presence of low counts of multifaceted and abraded platforms. Unexpected are the number (44 percent) of core flakes with missing platforms. High percentages of missing platforms are usually associated with late stage and biface reduction. Another indicator of early or middle stage core reduction is high percentages of whole flakes (Table 9.33). Almost equal percentages of whole core flakes occur for both material classes. This supports the interpretation that fine and medium to coarse-grained materials were used in essentially the same manner.

Whole core flake dimensions indicate a predominance of small to medium-sized debris.

Table 9.28. Material Type by Artifact Type, LA 84787, Area 4

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Hammerstone Flake	Tested cobble	Bidirect. Core	Multidirect. Core	Cobble Tool	Uniface Middle Stage	Biface Undiff.	Biface Middle Stage	Biface Late Stage	Reworked Tool	Row Total
Chert	118 22.0 70.7	350 65.3 75.4	48 9.0 65.8	3 .6 75.0	1 .2 100.0	1 .2 100.0	9 1.7 75.0	3 .6 100.0	1 .2 50.0		1 .2 50.0		1 .2 100.0	536 73.2
Chalcedony	42 27.3 25.1	90 58.4 19.4	17 11.0 23.3	1 .6 25.0			3 1.9 25.0		1 .6 50.0					154 21.0
Silicified Wood	3 75.0 1.8	1 25.0 .2												4 .5
Obsidian	2 33.3 1.2	2 33.3 .4	1 16.7 1.4									1 16.7 100.0		6 .8
Non-Vesicular Basalt	1 5.3 .6	11 57.9 2.4	6 31.6 8.2								1 5.3 50.0			19 2.6
Rhyolite										1 100.0 100.0				1 .1
Quartzite	1 8.3 .6	10 83.3 2.2	1 8.3 1.4											12 1.6
Column Total	167 22.8	464 63.4	73 10.0	4 .5	1 .1	1 .1	12 1.6	3 .4	2 .3	1 .1	2 .3	1 .1	1 .1	732 100.0

Table 9.29. Material Texture by Artifact Type, LA 84787, Area 4

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Hammer-stone Flake	Tested Cobble	Bidirect. Core	Multidirect. Core	Cobble Tool Undiff.	Uniface Middle Stage	Biface Undiff.	Biface Middle Stage	Biface Late Stage	Reworked Tool	Row Total
Fine	87 27.2 52.1	189 59.1 40.7	31 9.7 42.5	1 .3 25.0	1 .3 100.0		5 1.6 41.7	1 .3 33.3	2 .6 100.0	1 .3 100.0		1 .3 100.0	1 .3 100.0	320 43.7
Medium/ Coarse	80 19.4 47.9	275 66.7 59.3	42 10.2 57.5	3 .7 75.0		1 .2 100.0	7 1.7 58.3	2 .5 66.7			2 .5 100.0			412 56.3
Column Total	167 22.8	464 63.4	73 10.0	4 .5	1 .1	1 .1	12 1.6	3 .4	2 .3	1 .1	2 .3	1 .1	1 .1	732 100.0

Table 9.30. Core Flakes, Material Texture by Dorsal Cortex Percentage, LA 84787, Area 4

Count Row Pct Column Pct	0%	10-50%	60-100%	Row Total
Fine	139 73.5 40.9	34 18.0 39.5	16 8.5 42.1	189 40.7
Medium/ Coarse	201 73.1 59.1	52 18.9 60.5	22 8.0 57.9	275 59.3
Column Total	340 73.3	86 18.5	38 8.2	464 100.0

Table 9.31. Core Flakes, Material Texture by Dorsal Scar Counts, LA 84787, Area 4

Count Row Pct Column Pct	0-2	3-5	6+	Row Total
Fine	132 69.8 41.9	55 29.1 38.5	2 1.1 33.3	189 40.7
Medium/ Coarse	183 66.5 58.1	88 32.0 61.5	4 1.5 66.7	275 59.3
Column Total	315 67.9	143 30.8	6 1.3	464 100.0

Table 9.32. Core Flakes, Material Texture by Platform Type, LA 84787, Area 4

Count Row Pct Column Pct	Not Appli- cable	Cortical	Cortical Abraded	Single Facet	Single Facet, Abraded	Multi- Facet	Multi- Facet, Abraded	Collapsed	Crushed	Absent	Row Total
Fine	1 .5 100.0	15 7.9 50.0		50 26.5 34.7	3 1.6 15.8	2 1.1 33.3	3 1.6 50.0	19 10.1 51.4	5 2.6 45.5	91 48.1 44.2	189 40.7
Medium/ Coarse		15 5.5 50.0	4 1.5 100.0	94 34.2 65.3	16 5.8 84.2	4 1.5 66.	3 1.1 50.0	18 6.5 48.6	6 2.2 54.5	115 41.8 55.8	275 59.3
Column Total	1 .2	30 6.5	4 .9	144 31.0	19 4.1	6 1.3	6 1.3	37 8.0	11 2.4	206 44.4	464 100.0

Table 9.33. Core Flakes, Material Texture by Flake Portion, LA 84787, Area 4

Count Row Pct Column Pct	Indeterminate	Whole	Proximal	Medial	Distal	Lateral	Row Total
Fine	3 1.6 30.0	59 31.2 36.6	26 13.8 43.3	30 15.9 47.6	55 29.1 42.6	16 8.5 39.0	189 40.7
Medium/ Coarse	7 2.5 70.0	102 37.1 63.4	34 12.4 56.7	33 12.0 52.4	74 26.9 57.4	25 9.1 61.0	275 59.3
Column Total	10 2.2	161 34.7	60 12.9	63 13.6	129 27.8	41 8.8	464 100.0

Table 9.34. Whole Core Flake Dimensions by Material Texture

	Mean (mm)	Standard Deviation (mm)	Range (mm)
Length			
Fine (n = 59)	25	10	10-53
Medium to coarse (n = 102)	33	13	12-73
Width			
Fine	24	8	13-50
Medium to coarse	29	10	11-64
Thickness			
Fine	9	4	2-23
Medium to coarse	10	5	4-28

Core flake dimensions are presented in Table 9.34. The minimum and maximum dimensions indicate that small and large core flakes were discarded, while the majority were within the 20 to 39 mm long by 20 to 39 mm wide ranges. A Student's t-test between fine and medium-grained length, width, and thickness showed a significant difference at the .01 level for length and width, but no significant difference for thickness. Differences in length and width may reflect raw material size or intensity of reduction of different material textures.

Biface flake attributes can be compared with the core flakes. Biface flakes were almost equally divided between fine and medium to coarse-grained materials. This is similar to the core flakes and the overall assemblage. As expected, noncortical biface flakes account for all but four artifacts. Biface flakes with three to five dorsal scars accounted for 34 percent of the assemblage, which is slightly higher than the core flakes. Biface flakes with fewer than three dorsal scars is higher than expected (66 percent). This indicates that biface production may have focused on early and middle stage bifaces and preforms. Twenty-four biface flakes were complete, while 21 were proximal fragments, 11 were medial fragments, 13 were distal fragments, and 4 were lateral fragments. High percentages of flake fragments are expected for biface production. Biface flakes were smaller than core flakes. Biface flakes had a 21 mm mean length with a 6 mm standard deviation, and a 13 to 33 mm range. The mean width was 16 mm with a

Table 9.35. Core attributes, LA 84787, Area 4

Material	Texture	Type	Cortex	Dorsal Scars	Length (mm)	Width (mm)	Thickness (mm)	North/ East
Chalcedony	Fine	Multidirectional	0	9	51	37	29	208/91
Chert	Medium	Multidirectional	40	6	103	73	4	209/94
Chert	Fine	Multidirectional	30	6	80	65	41	212/99
Chert	Medium	Multidirectional	40	3	60	40	18	209/93
Chert	Medium	Bidirectional	20	5	49	47	44	210/90
Chert	Fine	Tested cobble	90	3	51	43	23	209/92
Chalcedony	Fine	Multidirectional	10	10	62	42	32	212/93
Chert	Coarse	Multidirectional	0	11	114	67	50	210/92
Chert	Medium	Multidirectional	0	7	56	51	32	214/93
Chalcedony	Fine	Multidirectional	40	4	46	45	24	215/93
Chert	Fine	Multidirectional	30	6	75	59	28	215/93
Chert	Medium	Multidirectional	20	9	50	36	25	220/91
Chert	Coarse	Multidirectional	0	5	70	61	45	217/92
Chert	Medium	Multidirectional	60	6	76	43	28	

standard deviation of 5 mm and an 8 to 26 mm range. Mean thickness was 4 mm with a 1 mm standard deviation and a 2 to 6 mm range. Restricted size distributions are indicated by variances that are less than 37.

Cores. Fourteen cores were recovered, of which 11 were chert and 3 were chalcedony (Table 9.35). Eight cores were medium to coarse-grained material and six were fine grained. The tested cobble has 90 percent dorsal cortex and the remaining cores exhibit 60 percent or less dorsal cortex. The dorsal scar counts range from 3 to 11. Core length ranged from 46 to 114 mm, width ranged from 36 to 73 mm, and thickness ranged from 23 to 50 mm. This broad size range suggests that the raw material source contained a wide range of sizes of cobbles and nodules. The range also suggests that cores were differentially reduced and that all raw materials were not exhausted. All but two cores are multidirectional. Multidirectional cores are a common by-product of core reduction that focuses on flake or expedient tool production.

Tools. Five tool types were identified including utilized debitage, a chopper, two pecking stones, and a biface. The tools are described below.

Utilized Debitage. Fifty-two pieces of utilized debitage were identified. Five pieces of utilized debitage had two used edges, one had three utilized edges, and the remainder had one used edge. Edge outlines were relatively evenly distributed among concave (n = 19), convex (n = 20), and straight (n = 22). Edge angles range from 38 to 73 degrees, suggesting that the core flake tools were produced for a wide variety of tasks including cutting, slicing, and heavy-duty scraping (Fig. 9.17). The majority of the utilized edge angles were within the 45 to 55 degree range. Table 9.36 shows the distribution of edge wear by edge outline. Unidirectional wear is the most common and was observed on 38 edges. Unidirectional and bidirectional wear occurred in roughly the same proportion for all edge outlines. This suggests that edge outlines were not selected for specific tasks and that outlines were used interchangeably. Edge damage was dominated by feather fractures and edge nibbling. Feather fractures were observed on all but six edges. Feather fractures result from early stages of cutting and scraping. Their abundance indicates that most of the tools were used for a short time and discarded. The low occurrence of step fractures and retouched or modified edges suggests that available raw material was sufficient

Table 9.36. Utilized Debitage Edge Outline by Wear Pattern, LA 84787, Area 4

Outline	Unidirectional	Bidirectional	Rounding, Unidirectional	Rounding, Bidirectional	Total
Concave	10 52.6 29.4	5 26.3 27.8	1 5.3 5.6	3 15.8 33.3	19 29.2
Convex	9 45.0 26.5	5 25.6 27.8	2 10.0 50.0	4 20.0 44.4	20 30.8
Sinuous	2 50.0 5.9	1 25.0 5.6	1 25.0 25.0		4 6.2
Straight	13 59.1 38.2	7 31.8 38.9		2 9.1 22.2	22 33.8
Total	34 52.3	18 27.7	4 6.2	9 13.8	65

for all expedient tool needs.

Hammerstone Flakes. Four hammerstone flakes were identified. These flakes were scattered throughout the excavation area. They exhibit battering along one or more margins indicating that they were formerly attached to a hammerstone. Three were chert and one was chalcedony. These flakes exhibit low percentages of dorsal cortex suggesting that the hammerstones were initially reduced as cores.

Spokeshave. FS 694 has two utilized edges, one of which is a retouched notch that may have been used as a spokeshave. The other edge exhibits unidirectional retouch indicating that it was used as a scraper. The retouched notch has an edge angle of 65 degrees and exhibits multiple step fractures within the notch. The step fractures indicate that the notch was used for scraping durable or hard material. The other retouched edge has an angle of 80 degrees. The edge is rounded and exhibits step fractures, suggesting that is was used on a hard material.

Drill. A late stage biface was retouched along one end forming a sharp point that exhibits rotary wear. The rotary wear resulted from use of the tool as a drill. The drill measures 26 mm in length, 15 mm in width, and 5 mm in thickness.

Knife. A tabular piece of fine-grained rhyolite was retouched on both sides of one edge. The retouch is irregular and mostly terminated in step fractures. The retouched edge was rough or jagged. This edge may have been suitable for sawing and cutting. The artifact measures 98 mm long by 40 mm wide by 8 mm thick.

Undifferentiated Biface Fragment. A medium-grained basalt artifact exhibits bifacial flake scars. The artifact appears to be a middle stage biface fragment, but cannot be positively identifed from the fragment. It is possible that the biface was used as a core and tool as part of a curated strategy. The basalt is a nonlocal material that is common along the Rio Grande. The artifact measures 32 mm long by 59 mm wide by 11 mm thick.

Ground Stone Artifacts, Area 4

A total of 13 ground stone artifacts were recovered from Area 4. They included six metate fragments, four complete one-hand manos, two mano fragments, and a shaped slab fragment. The ground stone was primarily concentrated in three loci within the excavation area.

The six metate fragments are all from basin-shaped metates. The fragments were made from three material types indicating that at least three metates were used. The material types are quartzitic sandstone, undifferentiated igneous, and granite. The fragments tend to be small ranging from 100 to 176 mm long. Basin-shaped metates

Table 9.37. LA 84787, Area 4, Mano Characteristics

FS	Condition	Material	Length (mm)	Width (mm)	Thickness (mm)
678	medial	quartzite	89	87	56
695	complete	quartzite	120	83	47
746	complete	quartzite	100	75	48
758	complete	quartzite	99	72	45
773	complete	quartzite	118	94	65
791	medial	quartzitic sandstone	65	41	38

are commonly associated with seed or nut processing.

Six complete or fragmentary manos were recovered. Table 9.37 shows the dimensions and material types for all specimens. All manos exhibit evidence of grinding or pecking on both surfaces. The ground surfaces are all convex. One-hand manos are typically associated with basin-shaped metates on late Archaic period sites.

Research Questions

Research questions for LA 84787 focused on chronology, occupation history, and subsistence. Testing indicated the presence of four spatially discrete late Archaic period components, Areas 1 to 4. Similarity in artifact distributions and the dates derived from the three surface projectile points suggested the occupations occurred between 1800 B.C. and A.D. 400. Testing could not determine the occupation sequence, but projectile point dates suggested that the earliest occupation occurred at Area 2. The artifact assemblages from Areas 1-4 resembled limited base camp or multiple occupation limited activity sites. The research questions will be addressed and, when appropriate, Areas 1-4 will be compared.

Chronology

LA 84787 occupations were assigned to the late Archaic period, 1800 B.C. to A.D. 1 based on temporally diagnostic projectile points recovered from the surface during test excavations. Four occupation areas were identified, which were expected to allow an assessment of occupation periodicity and its relationship to environmental conditions between 400 B.C. and A.D. 400. Expectations were that excavation would yield contexts with charcoal samples that could be radiocarbon dated or that obsidian hydration dating would be possible. Excavations yielded no charcoal samples that could be used for radiocarbon dating. Burned features contained mixed fill that was charcoal stained but charcoal poor. Suitable obsidian was only obtained from deep, disturbed contexts within the early level of Area 2. Therefore, the occupation sequence and periodicity could not be addressed by the excavation. Two more projectile points were recovered from Area 2 excavation providing a general chronological measure, but the general lack of projectile points from other contexts limits their utility for assigning date ranges or a sequence to the occupation of Areas 1-4.

As described in the Area 2, Chipped Stone section, two projectile points were recovered from stratigraphically different contexts. The projectile points were of the Armijo and early En Medio styles. FS 1053 is an almost complete Jemez obsidian Armijo style projectile point. Armijo style projectile points were associated with Armijo phase sites and cultural materials of the Oshara Tradition (Irwin-Williams 1973:9-11). The Armijo phase is dated between 1800 B.C. and 800 B.C. Currently, there are no subdivisions between early and late Armijo sites, though the co-occurrence of Armijo and En Medio-style projectile points might indicate a transitional period between the two phases. LA 54751 is a late Archaic period site with pit structures and associated features and Armijo and En Medio style projectile point fragments (Schmader 1994: 77). Associated radiocarbon dates range from

1870 to 800 B.C. This site may be an example of a transition from Armijo to En Medio phases. Unfortunately, the date range is to broad to aid in refining the Area 2 occupation.

Two projectile points that date to the end of the Armijo phase or early En Medio phase were recovered from the surface. One projectile point is similar to the San Pedro projectile point style often associated with the Cochise Culture (Sayles 1983; Dick 1965). The style could be assigned to the Armijo phase of the Oshara tradition. A similar example is shown in Irwin-Williams (1973, fig. 5d). The second projectile point is similar to the Augustin style of the San Pedro stage of the Cochise Culture. This style is not well dated, but is associated with sites with cultural deposits that date from 1100 to 600 B.C. (Dick 1965). A similar example is shown in Irwin-Williams (1973, fig. 6e). This style is associated with En Medio phase sites which temporally would place it at the late end of the span suggested for Augustin style points from the Albuquerque and Socorro districts. Variety in projectile point styles may reflect manufacture during a period of changing styles. The co-occurrence of the San Pedro and Augustin-style points with an En Medio-style projectile point from the late level of Area 2 suggests that the late level may date to the 1100 to 600 B.C. period suggested for Augustin style projectile points.

One temporally diagnostic projectile point was recovered from Area 3. FS 362 was a corner-notched San Pedro style projectile point. San Pedro-style points were made from 800 B.C. to A.D. 400, and are contemporaneous with the En Medio phase of the Oshara Tradition. This projectile point is stylistically similar to the San Pedro projectile point recovered from Area 2. This similarity indicates that Area 3 and the late level of Area 2 are roughly contemporaneous within the 1,200 year span. Unfortunately, further refinement of the date range is not possible.

In summary, the LA 84787 occupations occurred during the late Archaic period. Occurrence of temporally and stylistically different projectile points may indicate occupation during the transition from Armijo to En Medio phases, 1100 to 600 B.C. The wider variety of projectile point styles may reflect movement from the south to the north by Cochise populations or exchange of functional and stylistic information between populations in an area that was becoming more densely populated after 1200 B.C.

Occupation History

Discrete spatial distribution of the four artifact concentrations, Areas 1-4, evidences at least four occupation episodes at LA 84787. How many probable episodes are represented by the four artifact concentrations? This question can be addressed by examining the artifact distributions within each concentration. Artifact distributions include the overall artifact density pattern and the spatial distribution of temporally or functionally diagnostic artifacts. Functionally diagnostic artifacts that served as site furniture may be strong indicators of occupation episodes. Site furniture is left behind because it is not portable and is less likely to be affected by erosion, deflation, or post-abandonment disturbance (Binford 1979:271-272). Site furniture may have been recycled or salvaged, resulting in transport off-site or no new site furniture being added to an assemblage by subsequent occupations.

Artifact density isopleth maps were generated for each area. These maps are shown as Figures 9.19-9.22). The Area 1 map shows a fairly even, low frequency distribution of chipped stone, which is reflected in the low density per unit area of 2.47. An arc-pattern distribution is weakly suggested by the elongated distribution extending diagonally from Grids 121N/39E to 117N/37E. The arc pattern was typical of the late Archaic period single occupation components from Cochiti Reservoir (Camilli 1979; Chapman 1979). The single concentration and the evenly distributed scatter suggest that Area 1 resulted from a single occupation episode.

Area 2 represented the most complex occupation and is the most difficult to interpret. The intensity, length, and complexity of the occupation is indicated by a relatively high artifact density of 8.6 for the late level. The density map shows a high density area surrounding and including Features 3, 4, and 5 (which is within Feature 4). Within this area are two somewhat linear distributions of metate fragments, whole and fragmentary manos, and cores. The distribution of the cores and the metate fragments to the north and south of the features suggest at least two occupations. The high density area overlaps so that specific distribution patterns cannot be separated into occupation components. This high density artifact concentration combined with facilities that are tightly spaced suggests that Area 2 was reused by the same group over a short period, such as a generation. The extensive distribution of the general scatter suggests that

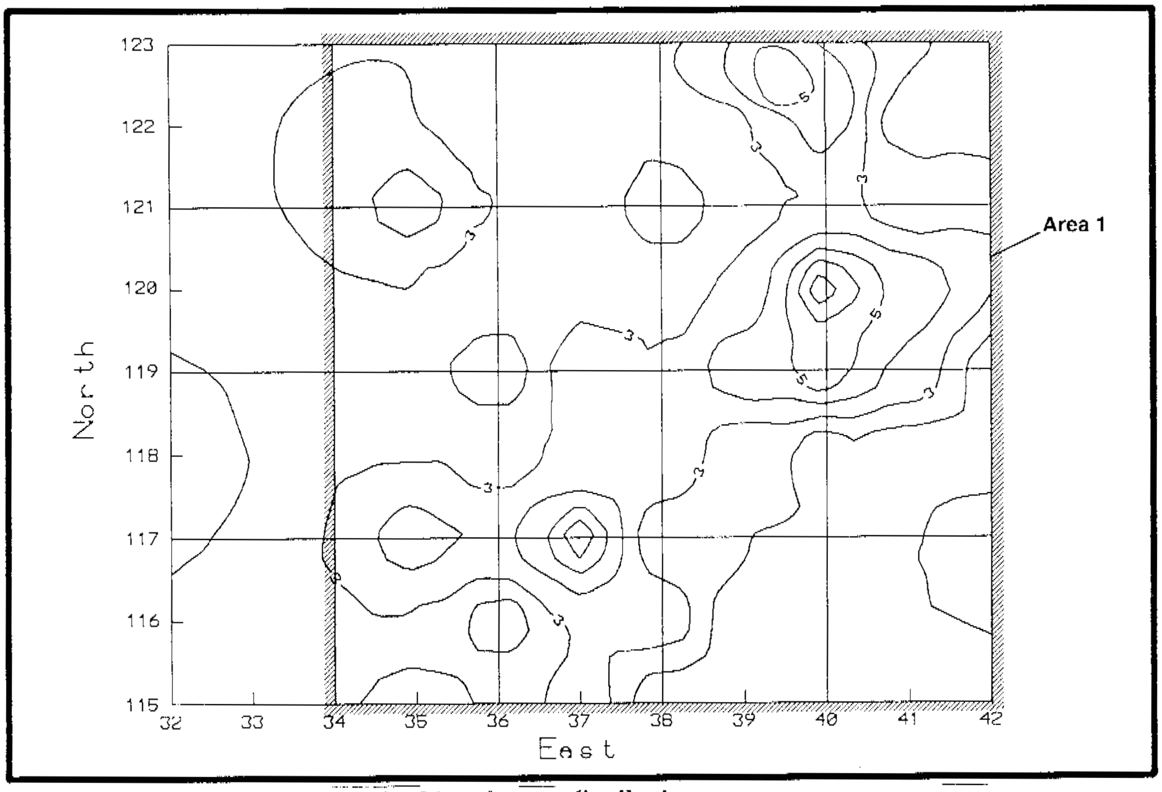

Figure 9.19. LA 84787, Area 1, chipped stone distribution.

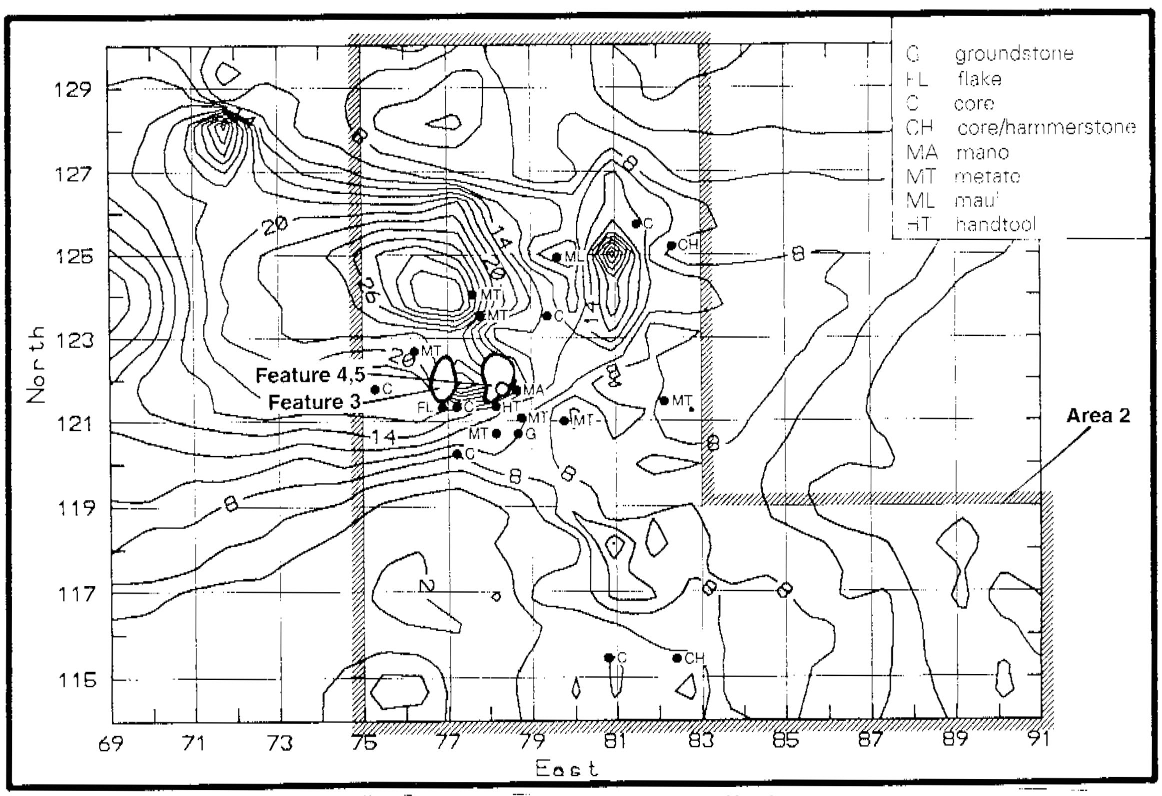

Figure 9.20. LA 84787, Area 2, late level chipped stone distribution.

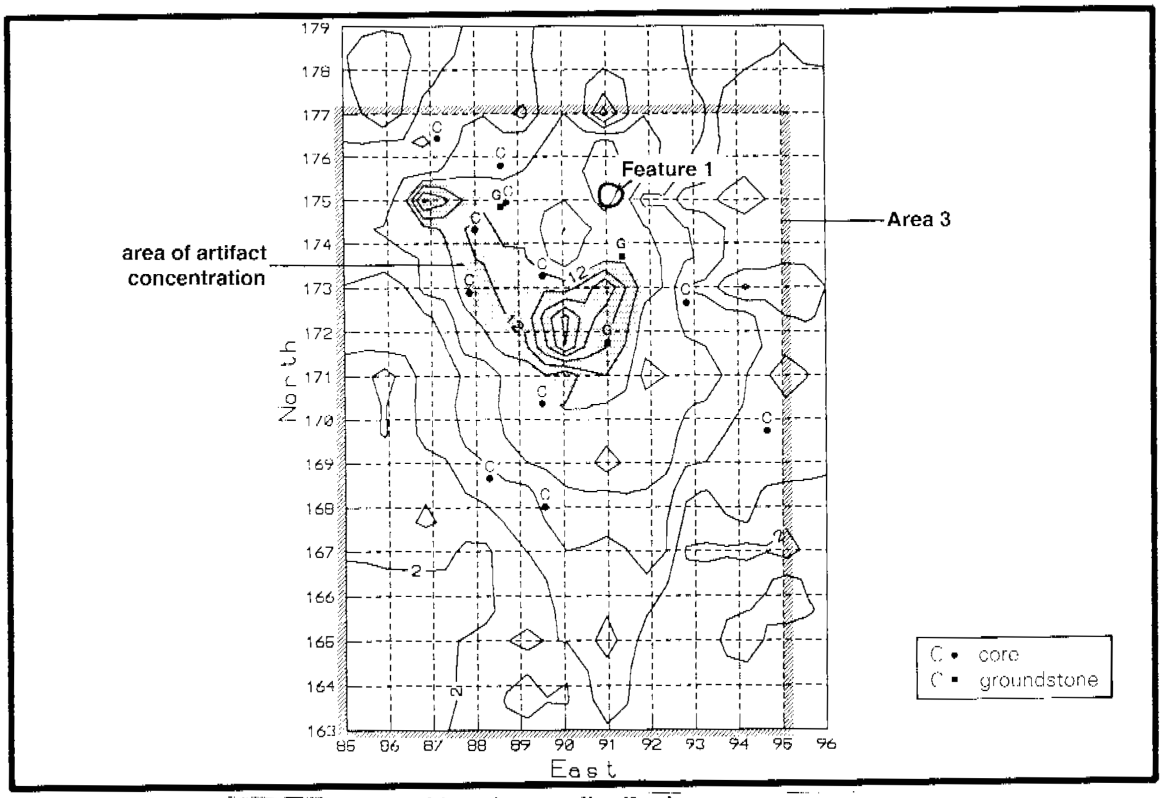

Figure 9.21. LA 84787, Area 3, chipped stone distribution.

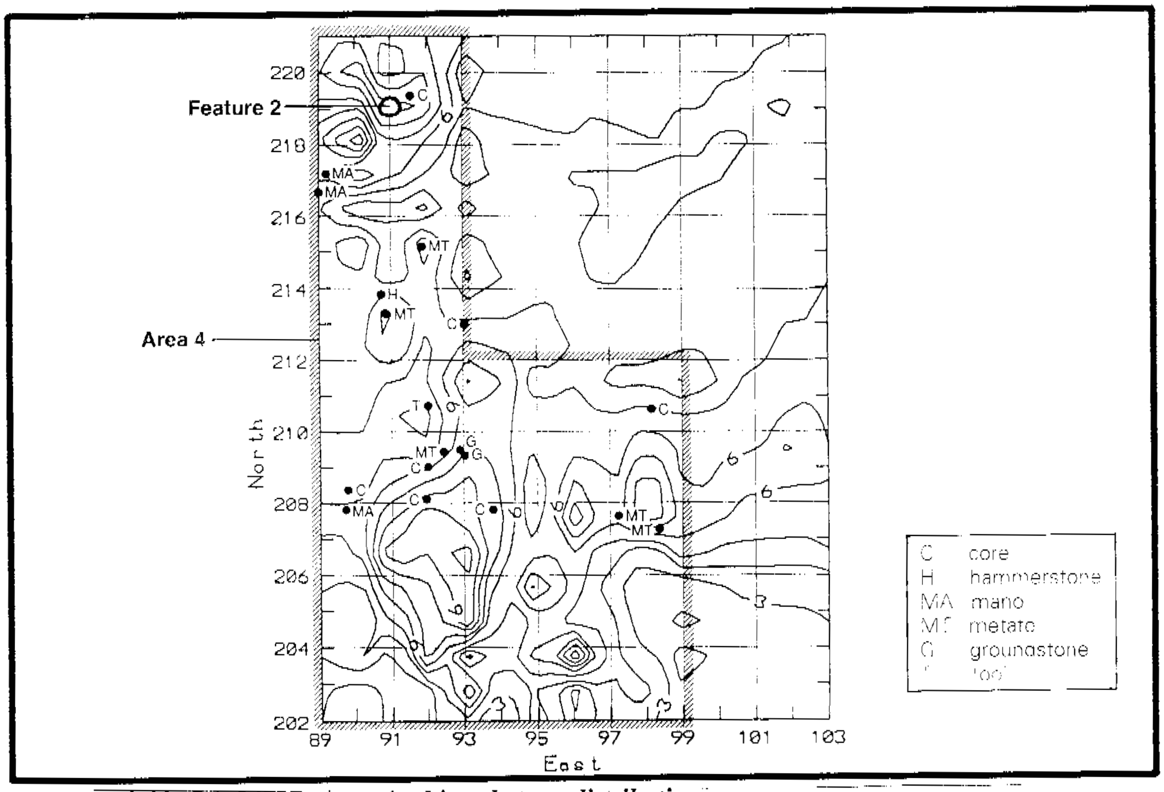

Figure 9.22. LA 84787, Area 4, chipped stone distribution.

more than two occupations occurred, but that they are masked by the heavier artifact concentration.

Area 3 is similar to Area 1 and the general scatter from Area 2 because it is mainly a spatially extensive low frequency scatter. Area 3 has an artifact density of 6.24, which is between Area 1 and 2. The north half of Area 3 does exhibit a patterned distribution focused around Feature 1. The density plot shows a diagonal or arc-pattern distribution to the southwest of Feature 1. South of this concentration the artifact counts drop dramatically, though a low density site scatter was encountered throughout the area. No ground stone was piece-plotted, but the whole mano and the metate fragment were recovered near Feature 1. Most of the cores shown in Figure 9.21 cluster within the main concentration associated with Feature 1. This clustered distribution of chipped stone debitage, cores, and ground stone indicate a single occupation. The low density scatter outside the concentration represent a distribution halo that results from post-abandonment processes.

Area 4 is a spatially extensive artifact scatter with two main concentrations. The occupation intensity is similar to Areas 2 and 3 as indicated by an artifact density of 5.27. The concentration in the southern portion of Area 4 is similar in distribution to Area 2 with a high density concentration covering a 64-sq-m area with two or three clusters and metates, manos, and cores associated. No feature was exposed in this area, but the frequency of ground stone and range of debitage suggest a similar type of occupation. The concentration in the north portion of Area 2 exhibits tight clustering between 2 manos, Feature 2, and an artifact cluster. Unfortunately, more area around this cluster was not exposed so that its full shape is unknown. However, the clustering of ground stone and the feature morphology suggest an occupation similar to Area 3. The artifact spatial distribution for Area 4 indicates at least two occupation episodes occurred.

In summary, the spatial distribution data for Areas 1-4 indicate that at least six occupation episodes account for the artifact clustering. Areas 1-4 were separated by a dispersed artifact scatter and two areas, 5 and 6 were not included in the data recovery effort. Therefore, more than six episodes contributed to the site formation and artifact distribution. The importance of identifying episodes is that the intensity and duration of the occupations can be investigated. Late Archaic occupation components can be compared with other site types from within the Santa Fe area contributing to a more meaningful interpretation of late Archaic period behavior.

Site Function

Site function can be examined using artifact assemblage and attribute frequencies, artifact and feature spatial relationships, and feature morphology. Areas 1-4 exhibit a remarkable consistency in artifact attribute distributions, but have subtle differences in artifact diversity, density, and distribution that suggest functional or behavioral differences.

The most abundant indicator of site function are the lithic artifacts and the technological organization that they represent. Areas 1-4 can be compared from the perspective of technological organization as indicators of the range of activities that occurred.

Strong similarities exist in Areas 1-4 raw material selection and use. A chi-square test for homogeneity was conducted by combining the local raw material types, chert, chalcedony, silicified wood, quartzite, and nonlocal material types, obsidian, basalt, rhyolite, and comparing their distribution by area. For 4 degrees of freedom at the .01 significance level the critical value is 13.2767. The chi-value obtained in the test was 14.44044, indicating that there was a significant difference in material type distribution by area. The adjusted residuals show no cell contributing significantly at the .01 level, but it should be noted that Area 2, early level, and Area 3 contribute more than one-half the total critical value. Area 2, early level, has more than expected nonlocal material and Area 3 has less than expected nonlocal material. The patterns are subtle, but they do indicate slight differences in raw material procurement or reduction.

The strongest similarity is the predominance of local raw material. Chert is the most common in all areas comprising 71 to 88 percent of the raw material. These percentages reflect the abundance of chert in the raw material source. However, later Pueblo period sites do occasionally exhibit higher percentages of quartzite indicating that quartzite was also available in abundance. The difference in Archaic and Pueblo raw material selection may reflect technological requirements, although there is a strong tendency toward core reduction in Las Campanas assemblages regardless of time. Among Areas 1-4 there are minor differences in the secondary raw material types. Area 1 is unique because quartzite is the second most abundant raw material. Area 2, early level, had almost equal percentages of chalcedony and quartzite. Area 3 had almost equal percentages of chalcedony and basalt. Area 2, late level, and Area 4 have chalcedony as the second most abundant raw material. The differences among the areas may reflect different foraging routines resulting in use of sources with variable frequencies of secondary raw materials. Typically, the secondary raw materials other than quartzite tend to have slightly higher percentages of biface flakes than chert indicating there may be limited raw material selection for specific tool production.

Technological organization can be examined with core flake dorsal scar percentage and dorsal scar counts as indicators of the form in which raw material was brought to the site, reduction stage, and general intensity of reduction. Patterns exhibited in dorsal scar percentage and dorsal scar counts can be checked against other less powerful indicators such as flake platform type and flake portion.

Dorsal cortex percentages were combined into three ranges: no cortex, 10 to 50 percent cortex, and 60 percent or greater cortex. Review of the Areas 1-4 material texture by dorsal cortex tables shows similar percentages of the dorsal cortex classes by material texture. The material texture groups, fine and medium to coarse, can be combined, and Areas 1-4 can be examined for significant differences in dorsal cortex distributions. A chi-square test was conducted with the null hypothesis of no significant difference in dorsal cortex frequency by area. The critical value at the .01 significance level for 8 degrees of freedom is 20.092. The obtained chi-square value was 36.64892 resulting in rejection of the null hypothesis indicating significant difference in dorsal cortex percentage distribution. The adjusted residuals show that only Area 4 had close to expected values for all dorsal cortex classes (Table 9.38). Area 1 and Area 2, late level, had less than expected and Area 2, early level, had greater than expected 0 cortex frequencies. Area 1 had greater than expected 10 to 50 percent dorsal cortex and Area 2, early level, had less than expected 10 to 50 percent dorsal cortex. Only Area 3 had lower than expected 60 to 100 percent frequencies. The strongest patterns are in Area 1 and Area 2, early level, with Area 1 exhibiting more early or middle stage reduction and Area 2, early level, showing a strong focus on middle or late stage reduction. The lower frequency in Area 4, 60 to 100 percent dorsal cortex, is also an indicator of more late stage reduction. In general the patterns are not strong and the low chi-square value, although statistically significant, suggests that differences that relate to technological behavior may be minimal.

Dorsal scar counts were compared among Areas 1-4 by testing for a statistically significant difference in dorsal scar count distributions. The null hypothesis was that dorsal scar counts for all areas were similar. A 5-by-3 chi-square contingency table was constructed and had 8 degrees of freedom and a critical value of 20.0902 at the .01 significance level. The computed chi-square value was 107.7147, which rejects the null hypothesis. There are statistically significant differences in dorsal scar count distributions (Table 9.39). Examination of the adjusted residuals shows that Area 2, late level, Area 3, and Area 4 were very similar with no adjusted residuals above 2.58 (significant at the .01 level). Area 1 and Area 2, early level, contribute in a highly disproportionate manner. Area 1 had much higher than expected 3-5 and greater than 6 dorsal scars, and lower than expected 0-2 dorsal scars, while Area 2, early level, had more than expected 0-2 dorsal scars and lower than expected 3-5 dorsal scars. This patterning suggests a similar intensity of core reduction for Area 2, late level, Area 3, and Area 4. Area 1 had more core flakes with high flake scar counts suggesting that more late stage reduction occurred, perhaps indicating a focus on hunting or formal tool production. Area 2, early level, had more core flakes exhibiting early stage reduction, which does not coincide with its higher than expected dorsal cortex percentages. This demonstrates that sometimes ambiguous results are derived from dorsal scar counts.

Core flake platform types from all areas are dominated by cortical and single-faceted platforms that display low incidences of preparation. Missing platforms are the other abundant categories. High percentages of broken platforms result from hard-hammer reduction of progressively thinner flakes (Crabtree 1972; Moore 1994). This occurs as the reduction sequence progresses from decortication to core exhaustion. This assumption can be tested by comparing platform types with core flake thickness. This pattern is apparent in the LA 84787 assemblage for all areas. Thin (1-5 mm thick) core flakes dominate all areas, comprising 44 percent of the total assemblage. Thin broken core flakes account for percentages equal to or more than whole thin

Table 9.38. LA 84787, Chi-Square Contingency Table for Core Flake Dorsal Cortex by Area

Count Expected Adjusted Residual	0%	10-50%	60-100%	Totals
Area 1	70 84 -2.98	36 23 3.02	11 10 .49	117
Area 2, Early Level	214 193 2.95	30 54 -3.81	25 22 .71	269
Area 2, Late Level	704 734 -2.78	219 203 1.64	98 83 2.17	1021
Area 3	422 404 1.90	113 112 .14	27 46 -3.33	562
Area 4	340 334 .72	86 92 -.81	38 38 0.00	464
Total	1750	484	199	2433

Table 9.39. LA 84787, Core Flake Dorsal Scar Counts by Area

Count Expected Adjusted Residual	0-2	3-5	6+	Totals
Area 1	42 79 -7.55	62 35 5.60	13 37 6.34	117
Area 2, Early Level	218 182 4.95	45 80 -5.00	6 6 -.17	269
Area 2, Late Level	708 692 1.44	288 305 -1.53	25 24 .18	1021
Area 3	365 381 -1.61	189 168 2.21	8 13 -1.70	562
Area 4	315 314 .00 7	143 139 .49	6 11 -1.71	464
Total	1750	484	199	2433

core flakes. Conversely, the thick core flakes from all areas (thicker than 10 mm) have higher proportions of whole to broken specimens. This suggests that for all areas hard hammer percussion was used in early to late stage reduction. This would be expected from a technology geared to reducing relatively abundant local raw material for the purpose of producing durable core flakes that are used as tools.

The core flake data show a technological organization geared to middle to late stage core reduction. Characteristics of early stage reduction are present, but in the minority in all cases. Middle and late stage core reduction are indicated by high percentages of thin to medium thickness core flakes, high percentages of noncortical core flakes, and a positive relationship between core flake thickness and platform type. These patterns are strong for all areas, suggesting that lithic technology was organized to support a similar range of activities. Production of core flakes to be used as tools or manuports is indicative of generalized subsistence strategies that would be expected for base camp and limited base camp occupations.

The core flake data exhibit strong similarities among all areas. These similarities suggest that similar types of activities occurred, but for different durations or for repeated occupations. The proportions of debitage to tools and other nondebitage artifacts may provide additional information on site function and activities.

The artifact assemblages can be collapsed into general functional categories of core reduction debris, cores, tools and tool production debris, and ground stone artifacts. The frequencies of these different classes can be compared across areas for differences that may relate to site function. Table 9.40 shows the frequencies by artifact class by area and the chi-square expected values and the adjusted residuals. The chi-square test with 9 degrees of freedom and a critical value of 21.666 at the .01 significance level rejected the null hypothesis of no significant difference in artifact class by area with a chi-square value of 30.84934. Areas 3 and 4, which represent one or two occupation episodes contribute the most to the significant value. Area 3 had higher than expected debitage and lower than expected ground stone. Area 4 had higher than expected debitage and lower than expected tools. These differences cannot be unambiguously explained, but it does appear that on-site processing may have been a more important activity at Area 4. Core reduction and lower tool production and use occurred at Area 3. Areas 1 and 2 seem to show an even mix of tool use and production, plant processing, and core reduction. None of the areas show a inverse relationship with evidence of more plant processing and less evidence of tool use and production. The moderate differences between the areas suggest that the areas had similar functions within the late Archaic period subsistence organization.

Site function may also be derived from feature morphology and ethnobotanical and faunal remains. Ethnobotanical and faunal remains are sparse to nonexistent from all areas. The faunal remains reflect a reliance on mammals of all sizes, though the low frequencies make it impossible to determine if one species was selected over another. The shattered and burned condition of the bone is typical of late Archaic population processing strategy. The absence of abundant faunal remains indicates that hunting did not contribute greatly to subsistence.

Ethnobotanical remains were sparse to nonexistent. No economic plant species remains were found within the hearths. Ground stone artifacts recovered from all areas show that plant processing did occur, only the seeds or plant parts did not preserve in the hearths.

The thermal features from Areas 2, 3, and 4 suggest different uses for fire. The Area 3 and 4 hearths were small and relatively deep in proportion to diameter. These features are interpreted as heating fires rather than large-scale roasting or processing pits. They may have been used to make coals or embers for processing, but no large-scale processing or meat cooking occurred within them. The two oblong features from Area 2 are larger and may have accommodated larger scale plant processing or cooking. The concentration of ground stone implements around these features supports this observation. The larger size of the Area 2 features indicate an occupation when plant parts and seeds were available for processing. Perhaps plant processing and consumption contributed more to the subsistence regimen of the Area 2 residents.

What was the site function? The preceding analyses demonstrate the remarkable consistency in the artifact frequency and distribution patterns across the sites and the difficulty in using chipped and ground stone as the main indicator of subsistence strategy. Differences in distribution and frequency exist as do differences in hearth morphology. However, these differences are not so dramatic as to indicate a change in subsistence focus or different occupation seasons.

Table 9.40. LA 84787, Artifact Classes by Area, Frequency Data and Chi-Square Test

Count Expected Adjusted Residual	Area 1	Area 2	Area 3	Area 4	Total
Debitage	133 132 .11	1484 1488 -.32	727 693 3.37	579 609 -3.20	2923
Cores	6 3 1.68	36 35 .21	13 16 -.96	14 14 -.12	69
Tools and Debris	20 26 -1.35	293 294 -.11	116 137 -2.24	149 121 -3.25	578
Ground Stone	5 2 1.92	29 25 1.16	2 12 -3.25	13 10 .98	49
Total	164	1842	858	755	3619

In fact, the consistency seen in the LA 84787 assemblages speaks to the remarkable persistence and conservatism in the late Archaic subsistence practice and organization.

LA 84793

Setting

The site was at the base of a southeast-facing ridge slope above a wide, grassy draw that drains to the south into the north floodplain of the Arroyo Calabasas. The gentle slope is cut by a shallow drainage that has scattered the potsherds downslope from Feature 1. The site elevation is 2,050 m (6,725 ft). Feature 1 was located on the slope below the broad ridge top, which may have sheltered it from direct wind.

The soil was of the Panky-Pojoaque association, rolling. The gentle slope was deflated and had a thin mantle of the A1 horizon. Feature 1 was excavated through the lower limit of the A1 horizon into the B1 horizon of a Panky fine sandy loam component of the association. Gravel was abundant on the surface and cobble concentrations were visible in the shallow drainages.

The vegetative cover on the broad ridge top was a moderate to dense cover of grama grass and rabbitbrush. The gentle slope had a sparse to moderate ground cover including grasses, yucca, prickly pear cactus, and chamisa in the bottom of the draw. Piñon and juniper were abundant on the slope and ridge top.

Pre- and Post-Excavation Description

LA 84793 was originally recorded by SAC as a multicomponent, dispersed sherd and lithic artifact scatter with two checkdams and one concentration of artifacts (Scheick and Viklund 1991:28-29). Archaeological testing by OAS in 1993 revealed three artifact concentrations. Areas 2 and 3 were a sherd and lithic concentration and lithic concentration, respectively. Based on the testing results, no further archaeological excavation was recommended or required in those areas.

Area 1 consisted of an activity area with a sherd concentration represented by one partial bowl associated with a partly excavated thermal feature. Partial excavation of Feature 1 revealed a shallow, steep-sided pit with a small amount of interior, fire-cracked cobbles and associated fire-cracked rock. The sherds were Santa Fe Black-on-white pottery, which was the common pottery type at Pindi Pueblo (LA 1) between A.D. 1270 and 1350 (Stubbs and Stallings 1953:23). The sherd breakage pattern may have resulted from pottery-firing or the exfoliation of a vessel with internal flaws that caused breakage during use. The breakage pattern resembled those found on sherds associated with kilns in the Mesa Verde

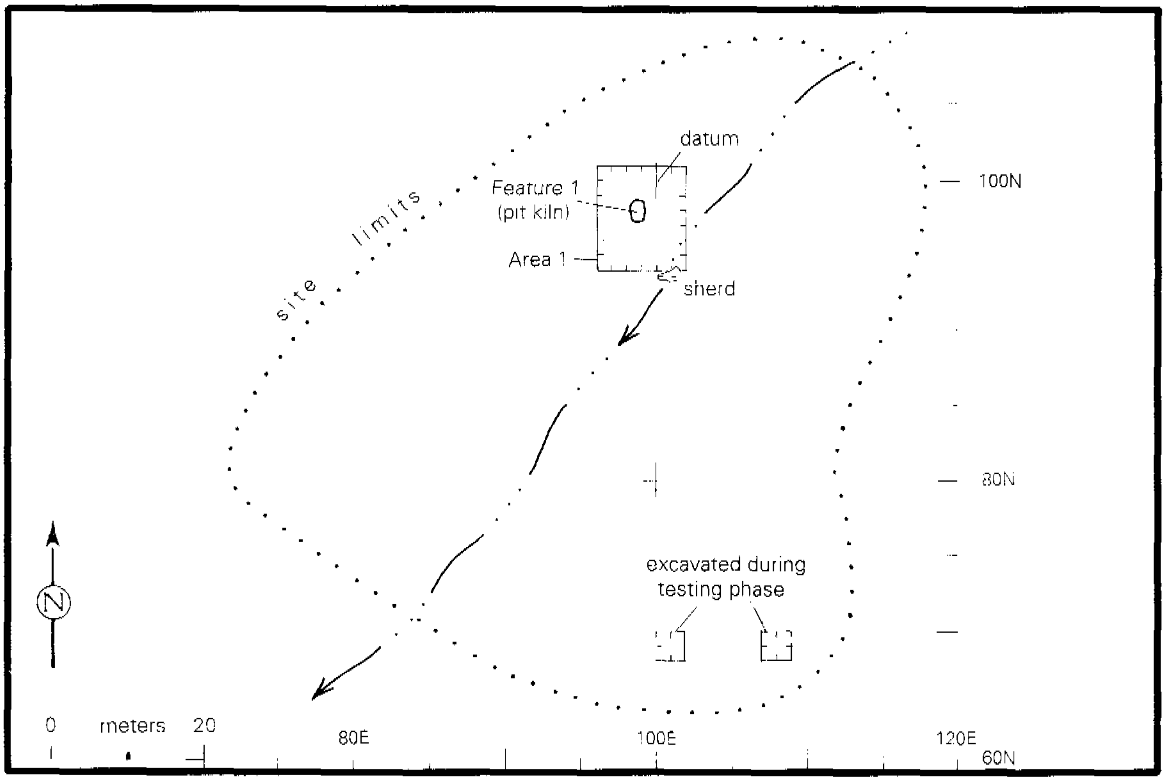

Figure 9.23. LA 84793, site map.

region (Purcell 1993). Determining the function of the thermal feature, identifying the cause of the unique fracture pattern, and defining the relationship among the sherds and the thermal feature were the primary research objectives that guided the excavation.

Excavation of Area 1, Feature 1, confirmed and expanded on the testing results (Fig. 9.23). Feature 1 was an oval, basin-shaped thermal feature with interior fire-cracked rock. Pottery was recovered from within and around the feature area. A total of 255 sherds from a single vessel and 36 lithic artifacts were recovered.

Excavation Methods

The initial test excavation was expanded to a total of 36 sq m covering a 6-by-6-m area. The north and west edge of the excavation area was restricted by a dense thicket of piñon and juniper trees. The excavation area was surface stripped, removing the loose, modern, eolian deposit of sandy loam. The surface strip depth ranged from 5 to 10 cm below the modern ground surface. Surface stripping exposed the extent of the stain associated with the thermal feature and recovered the bulk of the associated potsherds. A 2-by-2-m area within Area 1 and including Feature 1 was excavated by hand, using a trowel. Pieces of fire-cracked rock and sherds with a maximum dimension of greater than 5 cm were piece-plotted. Artifacts recovered from the shovel-stripped units were piece-plotted when possible.

Feature 1 excavation proceeded by hand troweling the feature area until the limits of the stain were defined. The test-excavated portion of the feature was used as a guide. The feature fill in the south half was removed in two 8-cm levels. Sherds were piece-plotted and were restricted to the upper fill level. The exposed profile was drawn, described, and photographed. The north half of the feature fill was excavated and flotation samples were collected from the upper and lower fill levels. All cobbles were left in place so that their stratigraphic position could be recorded.

The excavated feature was mapped and profiled from two orientations. The cobbles were recorded by size, material type, condition, vertical and horizontal orientation, and elevation within the feature. The feature was photographed. The excavation and general site area were transit mapped.

Feature 1 Description

Feature 1 is located at the northern end of the site in Grids 98N/99E, 99N/99E, 98N/100E, and 99N/100E. Feature 1 is diagonal to the southeast-facing slope.

Feature 1 is a shallow, oval basin, which was excavated into native, sandy clay loam with a high calcareous content. Its long axis is oriented north-south and it has been subjected to erosion and root intrusion. The feature measures 1.55 m long by 1.06 m wide and ranges from 9 to 18 cm deep (Figs. 9.24-9.26).

The east and south sides of the feature range in slope from 15 to 45 degrees and the west and north sides of the feature range in slope from 60 to 80 degrees. The west and north feature limits were the most intact, exhibiting steep sloping sides and an 18 cm depth. The south and east walls are partially deflated as evidenced by fire-cracked cobbles protruding above the feature lip and the presence of redeposited fill. The northeast wall of the feature eroded and was replaced by a redeposited semiconsolidated sandy loam.

The floor or bottom of the feature is generally flat with some irregular and uneven areas. There are cobbles and gravel located in a 50-cm area southeast of the feature. It is unclear if they occur naturally or if they represent spoils from initial kiln-building.

The fill was a dark, charcoal-stained (Munsell 5YR 4/2 to 5YR 3/1), homogeneous, sandy loam with inclusions of small charcoal flecks, spalls of fire-cracked rock, fire-cracked cobbles, unburned pebbles, and Santa Fe Black-on-white bowl sherds (Fig. 9.27). No ash was present in the feature. The upper fill was comprised of a mixed primary and secondary deposit of sandy loam, while the lower fill consisted of dark, charcoal-stained sandy loam. The east side of the feature had been disturbed by an alluvial channel. Small, unburned pebbles were mixed with the primary feature fill.

A thick, 3-to-5-cm oxidized soil layer around the sides and bottom of the feature suggest exposure to intense prolonged radiant heat. This "rind" of oxidation was clearly visible on the west side where it extends from the feature onto the old ground surface.

The stratigraphic sequence revealed a thick "rind" of oxidation above which was 3 to 12 cm of blackened primary fill. The majority of the fire-cracked cobbles were contained in this fill. Above the cobbles rested a mixed primary-secondary deposit containing numerous Santa Fe Black-on-white bowl sherds. In one case, the interior surfaces of two sherds were in direct contact with the top of one of the cobbles. The majority of these sherds were centrally located, lying with their interior surfaces facing down. Sooting or smudging was present on the interior surfaces of some sherds.

A total of 22 cobbles were recorded within the feature. Recorded attributes include material type, condition, orientation, dimensions, and vertical placement. The majority of the cobbles were quartzite ($n = 21$). Fine-grained sandstone ($n = 1$) and granite ($n = 1$) were also present. All the cobbles displayed evidence of being exposed to heat, such as blackening. Twelve remained intact, nine were fire-cracked, and one was exploded. The average cobble length was 12.3 cm, ranging from 6.0 to 22.0 cm; the average cobble width was 8.5 cm, ranging from 4.0 to 14.0 cm; and the average cobble thickness was 6.1 cm, ranging from 3.0 to 7.8 cm.

Of the 22 cobbles, 20 were resting in fill. Six were in a reverse diagonal position (tilting away from the center), six were in a forward diagonal position (tilting toward the center), and eight were flat. Charcoal was best preserved under cobbles that provided protection against the erosion and deflation. Based on the high percentage of cobbles resting in fill and some on charcoal, it appears that they were placed in the feature, possibly on a bed of coals. Of the remaining two cobbles, one is embedded in the southwest side of the feature. Based on its size and location, it may have been redeposited. The other is partially resting in fill and partially resting on the bottom. None of the cobbles appear to line or define the feature. The cobbles are irregularly placed and show no distinguishable pattern. These cobbles may have functioned as cooking platforms or to support vessels to be fired.

The 255 Santa Fe Black-on-white bowl sherds from one vessel were recovered from the top 5 to 10 cm of fill, above the fire-cracked cobbles, and from the area surrounding the feature. The sherds were centrally located in the feature. Twenty-two of the bowl interiors face down and 11 of the bowl interiors face upwards. Two sherds had their interior surface in contact with

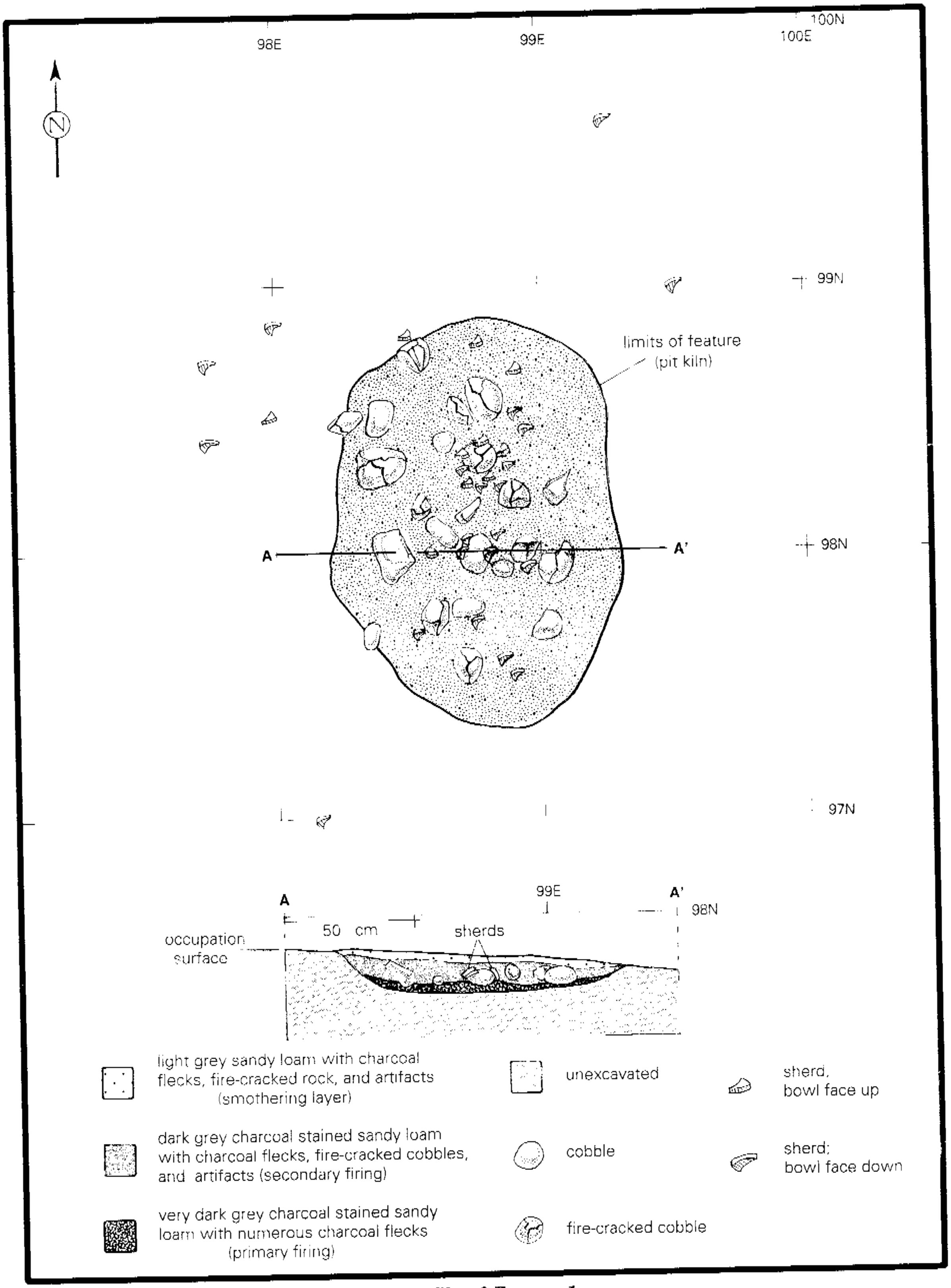

Figure 9.24. LA 84793, plan view and profile of Feature 1.

Figure 9.25. LA 84793, Feature 1, pit kiln, partly excavated.

Figure 9.26. LA 84793, Feature 1, pit kiln, excavated.

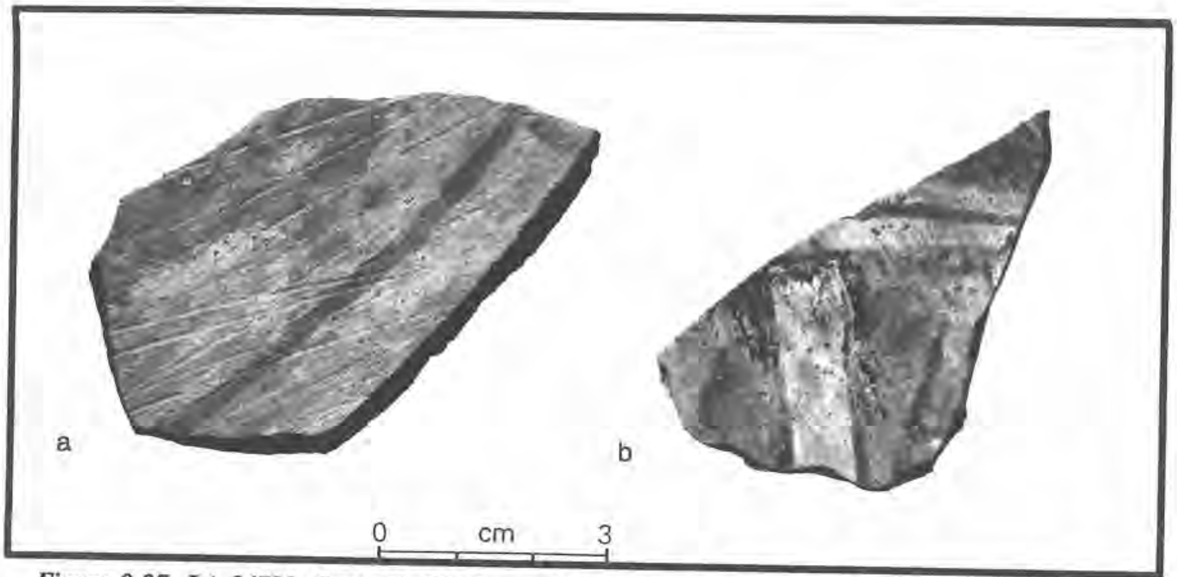

Figure 9.27. LA 84793, Santa Fe Black-on-white pottery from Feature 1.

a cobble. Some of the sherds were heavily smudged or sooted on the interior surface.

Artifact Assemblage

Pottery
by Steven A. Lakatos

Part of a single vessel consisting of 26 rim and 229 body sherds were recovered from Feature 1. The majority of the rims are beveled and display a white slip. A variety of surface characteristics are exhibited on the vessel. On 71 percent of the sherds the exteriors are scraped, lightly to moderately polished with striations visible. An exterior white slip occurs on 4 percent of the sherds. When present, the slip is thinly applied and does not cover the entire surface. The interior surfaces have a thinly applied white to light gray slip and are highly polished.

Black organic paint is present on 138 sherds or 75 percent of the assemblage. Paint retention on 80 percent of these sherds ranged from ghosted to thin and streaky (Fig. 9.27a). The remaining decorated sherds displayed a thick black paint, which was the desired appearance. Clay type and firing atmosphere are important determining factors in the retention of carbon paint (Shepard 1936; Swink 1993). Replication studies have demonstrated that it is possible to produce thick, black paint with this clay type. Therefore, it is assumed that firing atmosphere and not clay quality contributed significantly to the high percentage of ghosted to thin, streaky pigment.

The assemblage included a total of 182 sherds that are spalls or are spalled. A spall is a sherd that has only one intact surface, whereas a spalled sherd has intact portions of both the interior and exterior surfaces. These sherds were recovered from in and around Feature 1. Spalling is most common on the interior only followed by spalling on both surfaces. Sherds that are spalls or are spalled are more common outside the feature than within (Table 9.41). A chi-square test with a null hypothesis of no significant difference in breakage pattern distribution was conducted using the data from Table 9.41. The resulting chi-square value of 42.85 for 1 degree of freedom was significant at greater than the .01 level, rejecting the null hypothesis. Proportionally more spalled sherds were recovered from outside the feature, reflecting feature clean-out of part of the failed vessel.

The paste is fine, hard, gray (7.5YR 6/0-5/0), and self-tempered. Self-tempered Santa Fe Black-on-white pottery is common on Coalition and Early Classic period sites in the Las Campanas area.

The design layout consists of a thin encircling band located 6 mm below the rim. Indeterminate hatched, solid design elements, and interlocking solid triangles are positioned diagonal to and intersect with the encircling band (Fig. 9.27b;

Table 9.41. LA 84793, Feature 1, Distribution of Spalled and Intact Sherds

Count Row pct Total pct	Spalled	Intact	Total
Extramural sherds	141 85.0 55.0	25 15.0 10.0	166 65.0
Intramural sherds	41 46.0 16.0	48 54.0 19.0	89 35.0
Total	182 60.0	73 40.0	255

note poor pigment retention) similar to Stubbs and Stallings (1953, fig. 43f, p, q). These design elements are common on Santa Fe Black-on-white pottery from the Las Campanas area and in the Pindi Pueblo and Arroyo Hondo Pueblo ceramic assemblages (Habicht-Mauche 1993; Stubbs and Stallings 1953).

Vessel 1 appears to represent a pottery-firing failure. The firing failure may have resulted from excessive heat or moisture in the vessel. Poor pigment retention and the high percentage of spalled sherds are strong indicators of a firing failure (Blinman 1992; Post and Lakatos 1994, 1995; Toll et al. 1991).

Summary

There are two important differences between the Santa Fe Black-on-white pottery in the LA 84793, Vessel 1, assemblage and the descriptions provided by Kidder and Amsden (1931), Mera (1935), Stubbs and Stallings (1953), and Habicht-Mauche (1993), among others. These differences are in pigment appearance and breakage patterns. Poor pigment retention and a high percentage of spalled pottery are strong indicators of a firing failure (Purcell 1993; Swink 1993; Brisbin 1993; Post and Lakatos 1994).

Ghosted to thin, streaky pigment is the dominant paint appearance and occurs on 80 percent of the painted sherds in Vessel 1. This is a marked difference from the Santa Fe Black-on-white ceramics from Arroyo Hondo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953). In those assemblages, paint usually ranged from very dark gray to gray. Two important factors contribute to the appearance of the carbon paint, clay type, and firing atmosphere (Shepard 1936; Swink 1993). The presence of thick black paint on remaining decorated sherds indicates that firing atmosphere, not clay quality, may have contributed to the poor paint quality on the majority of the ceramics.

Atypical breakage patterns were common in the ceramic assemblage. Sherd spalls and spalled sherds comprise 60 percent of Vessel 1. The high percentage of spalled pottery recovered may be the result of feature cleaning, surface treatment, or post-abandonment breakage and dispersal agents. More likely the spalls are the result of one or more pottery-firing failures. Rapid heat rise or vaporization of moisture in the vessel wall may result in spalled or exploded pottery. Pottery-firing replications using local raw materials produced results that are strikingly similar to the archaeological pattern (Lakatos n.d.). Pottery-firing features and associated ceramics are discussed in detail in the Thermal Feature section of this report.

Chipped Stone Artifacts
by Guadalupe A. Martinez

A total of 36 chipped stone artifacts were recovered from LA 84793. There were four artifact types, including angular debris, core flakes, biface flakes (all of chert), and multidirectional core (Table 9.42).

Debitage. The chipped stone artifacts are debris from core reduction and tool maintenance. The most common artifact type was the core flake (n = 24). Twenty-one core flakes had 10 percent or less cortex and the other three had 90 percent or more. Middle and late stages of core reduction

Table 9.42. LA 84793 Artifact Type by Material Type

Count Row Pct Column Pct	Chert	Quartzitic Sandstone	Row Total
Angular debris	10 100.0 28.6		10 27.8
Core flake	24 100.0 68.6		24 66.7
Biface Flake	1 100.0 2.9		1 2.8
Multidirectional core		1 100.0 100.0	1 2.8
Column Total	35 97.2	1 2.8	36 100.0

are represented by the distribution of dorsal cortex percentages. Platform types primarily reflect early and middle stage reduction and single-faceted and cortical platforms predominate (n = 13). Dorsal flake scars also reflect early and middle stage reduction. Twenty-three core flakes had four or fewer dorsal scars.

Core. One quartzitic sandstone multidirectional core was recovered from LA 84793. It had eight dorsal scars and 20 percent cortex, indicating that it was reduced substantially, and probably reflects middle or late stage reduction. It is medium sized, measuring 105 mm long by 86 mm wide by 45 mm thick, suggesting it was not exhausted when discarded. The core is a different raw material than the majority of the debitage. The core was discarded after it was reduced at another location or flakes removed from the core were transported off-site.

Research Questions

Research problems as outlined in the data recovery plan (Post 1994a) focused on chronology, function, and subsistence production. Test excavation results provided strong indications that Feature 1, Area 1, was a pottery-firing feature. Excavation confirmed the preliminary interpretation. The pottery-firing feature and a 6-by-6-m area surrounding it yielded information on discard patterns and post-abandonment deposition. A small sample of chipped stone was recovered, while the overwhelming artifact assemblage component was sherds, spalls, and spalled sherds from a single Santa Fe Black-on-white bowl. Chronology will be addressed by comparing the pottery with other assemblages. Function will be addressed in detail in another section of this report. Subsistence production will only be addressed briefly because the main thrust of this investigation was the pottery-firing feature.

Chronology

The excavation of Feature 1, Area 1, was expected to yield sufficient charcoal for radiocarbon dating. Dry- and water-screening soil collected from Feature 1 yielded an insufficient amount of wood charcoal for radiocarbon dating. Ceramic dating was the only other avenue for assigning an occupation period.

All sherds recovered from LA 84793 were Santa Fe Black-on-white bowl sherds. The two partial vessels had similar fine-grained silty paste and they were self-tempered. The fine-grained, self-tempered paste that characterizes the sherds is suggested to have been most abundant in Pindi and Arroyo Hondo village assemblages between A.D. 1250 and 1325. The paste and temper are almost identical to pottery recovered from LA

86159, the other site with a good example of a pottery-firing feature. The A.D. 1250 to 1325 date for LA 84793 is based on the paste and temper characteristic and the absence of later pottery types, such as Pindi, Galisteo, or Wiyo Black-on-white.

Subsistence Production

Site function for LA 84793 is overshadowed by the presence of a pottery-firing feature. Most analysis focused on describing the feature and analyzing the ceramic attributes and breakage patterns. Identification of pottery-firing features is a significant contribution to the understanding of local pottery production, but pottery-firing was not the only activity conducted at the site.

Test excavation and recording identified a spatially extensive, but dispersed artifact scatter and two other artifact concentrations, one of pottery and the other of chipped stone. These two areas and the chipped stone scatter indicate that LA 84793 was visited numerous times for purposes other than pottery production. Raw material was obtained from gravel on nearby slopes fro production of flakes and cores that were then transported off-site for use. The recovery of debitage around the pottery-firing feature suggests that other subsistence activities were conducted while the pots fired. The 6-km distance from the village to the pottery-firing feature may have necessitated bundling activities to reduce the cost of firing pottery at greater distances.

LA 86159

Setting

LA 86159 was on a low north-south saddle between two low knolls. The southern 15 m of the site was on the gentle south slope of the saddle. The majority of the site extended to the north on the west side of a shallow drainage that originated at the top of the saddle and flowed to the north. The knolls and saddle were at the southern edge of a heavily dissected area that drains into Arroyo Alamo to the north. The site elevation is 2,073 m (6,800 ft).

The soil was of the Panky-Pojoaque association, rolling (Folks 1975:39-40). The A1 horizon was deepest in the southern portion of the site. To the north, the A1 horizon was eroded and deflated and contained dense gravel and cobbles. At the northern end of the site on the western slope of the shallow drainage, the A1 horizon was absent. The soils there were of the B1 horizon.

The vegetative cover consisted of a sparse to moderate grama and galleta grass with yucca, cholla, and prickly pear occurring in the more deflated and disturbed areas. Mature piñon and juniper trees were abundant throughout the site and knoll area. The broken land to the north has a dense cover of piñon-juniper woodland.

Pre- and Post-Excavation Description

An examination of the site surface during the testing phase in the fall of 1993 showed that LA 86159 was spatially more extensive and archaeologically more diverse than originally recorded during the survey. The site measured 83 m north-south by 25 m east-west. The original artifact concentration (Area 1) reported by the inventory was relocated during testing, but an additional sherd and lithic artifact concentration (Area 5) and a lithic artifact concentration (Area 2) also were defined. The three thermal features observed during test excavation were relocated. The thermal features in Areas 1 and 5 primarily were associated with Santa Fe Black-on-white potsherds. The thermal feature in Area 2 was associated with lithic artifacts.

Excavation of LA 86159 focused on Areas 1, 2, and 5, which had thermal features (Fig. 9.28). Excavation of Area 1 revealed a heavily burned feature containing fire-cracked rock and a charcoal and pottery discard area. Sherds from seven vessels were recovered. Area 2 revealed a chipped stone concentration associated with a deflated rock-filled hearth. The chipped stone included discarded tool fragments. Area 5 was a dispersed sherd and lithic artifact scatter and a diffuse soil stain. The soil stain was an eroded hearth with poorly defined limits. The associated sherds could be matched to vessels associated with Feature 1, Area 1. The chipped stone was scattered and included a possible strike-a-light flint.

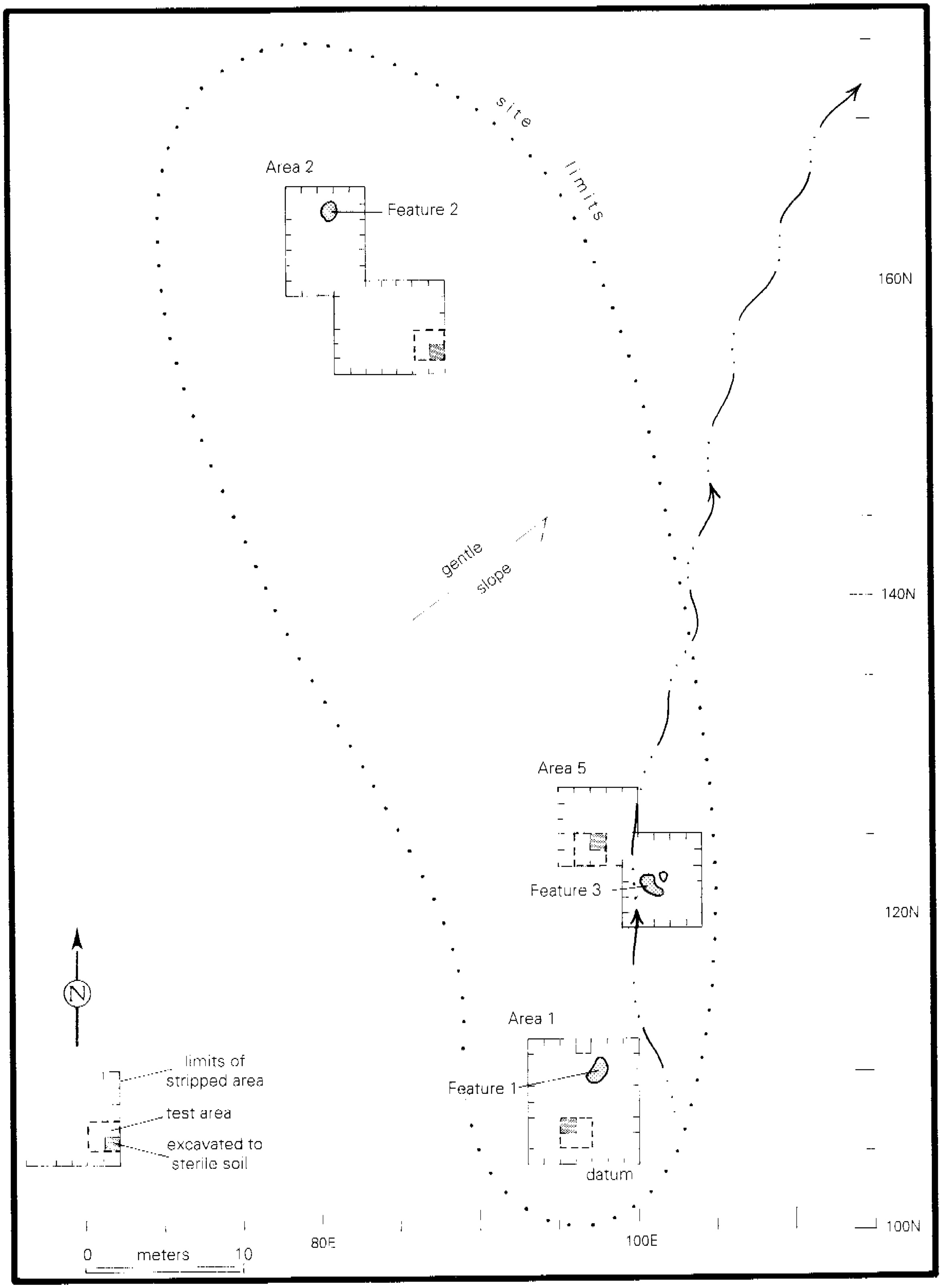

Figure 9.28. LA 86159, site map.

Excavation Methods

The site area was reexamined and all surface artifacts were flagged. The artifact distribution defined the excavation area limits. Excavation areas centered on the artifact concentrations and features.

A total of 56 sq m covering an 8-by-7-m area was excavated in Area 1. A 5-by-5-m area within Area 1 was excavated by hand using a trowel. Pieces of fire-cracked rock and sherds with a maximum dimension of greater than 5 cm were piece-plotted. The remaining area was shovel-stripped and piece-plotting was employed whenever possible. The surface strip depth ranged from 5 to 10 cm below the modern ground surface. Surface-stripping exposed the extent of the stain associated with the thermal feature and recovered the bulk of the associated potsherds.

Six units with the highest artifact count were excavated below the surface-stripped level. A low frequency of sherds was recovered from the upper 3 to 5 cm of the deeper excavation. The soil was a compact, moderately calcareous sandy clay. The lower 5 cm of the level did not yield artifacts or evidence of charcoal staining. Excavation was halted at this level.

Feature 1 was defined by the extent of the soil stain and fire-cracked rock. The eastern half of Feature 1 was excavated in two 5-to-8-cm levels, exposing the profile and determining the feature depth. Sherds were piece-plotted and were restricted to the upper fill level. The exposed profile was drawn, described, and photographed. The western half of the feature fill was excavated and flotation samples were collected from the upper and lower fill levels. All cobbles were left in place so that their stratigraphic position could be recorded.

The excavated feature was mapped and profiled from two orientations. The cobbles were recorded by size, material type, condition, vertical and horizontal orientation, and elevation within the feature. The feature was photographed.

A 74-sq-m area was surface-stripped around Feature 2, which encompassed the densest portions of the lithic artifact concentration. The surface strip depth ranged from 5 to 8 cm below the modern ground surface.

The five 1-by-1-m units that yielded the highest artifact counts were excavated 10 cm below the surface strip level. The soil was a moderately calcareous clay loam with calcareous gravel. This level did not yield artifacts or charcoal staining. Excavation did not proceed below this level. Feature 2 excavation followed the procedure described for Feature 1. Detailed recording of the interior cobbles was not conducted.

A 53-sq-m area was excavated within the densest portion of the Area 5 artifact concentration. This area included a 2-m radius around Feature 3 which was trowel excavated to expose the feature limits. Feature 3 was excavated using the procedures described for Feature 1. No units were excavated below the surface-stripped level.

Stratigraphy

Two strata were encountered in the excavation units. Stratum 1 consisted of brown sandy loam containing 3 to 5 percent gravel and a moderate to high density of cobbles. The highest gravel and cobble concentrations were encountered in Areas 2 and 5. This layer was 5 to 12 cm thick. Stratum 2 was a reddish brown (5YR 4/4) clay loam with less than 2 percent calcareous gravel content and no cobbles. This stratum was encountered below the surface strip in Areas 1 and 2. Excavation only proceeded 10 cm into this level because it lacked cultural material.

Excavation Areas

Excavation Area 1 was identified as a Santa Fe Black-on-white pottery concentration associated with a charcoal soil stain (Fig. 9.29). A total of 55 1-by-1-m units within an 8 m north-south by 7 m east-west area were surface-stripped. The six 1-by-1-m units (109/95N-96E, 108N/95-97E, and 107N/95E) yielded low artifact frequencies from more than 5 cm below the surface strip. A total of 569 sherds and 10 lithic artifacts were recovered from Area 1 excavations. The majority of the artifacts were recovered from a 4-by-4-m charcoal-stained area immediately southwest of Feature 1. The soil stain and sherd concentration resembled a discard area, suggesting that Feature 1 had been reused.

Excavation Area 2 was identified as a chipped stone concentration associated with the deflated remains of a fire-cracked rock feature (Feature

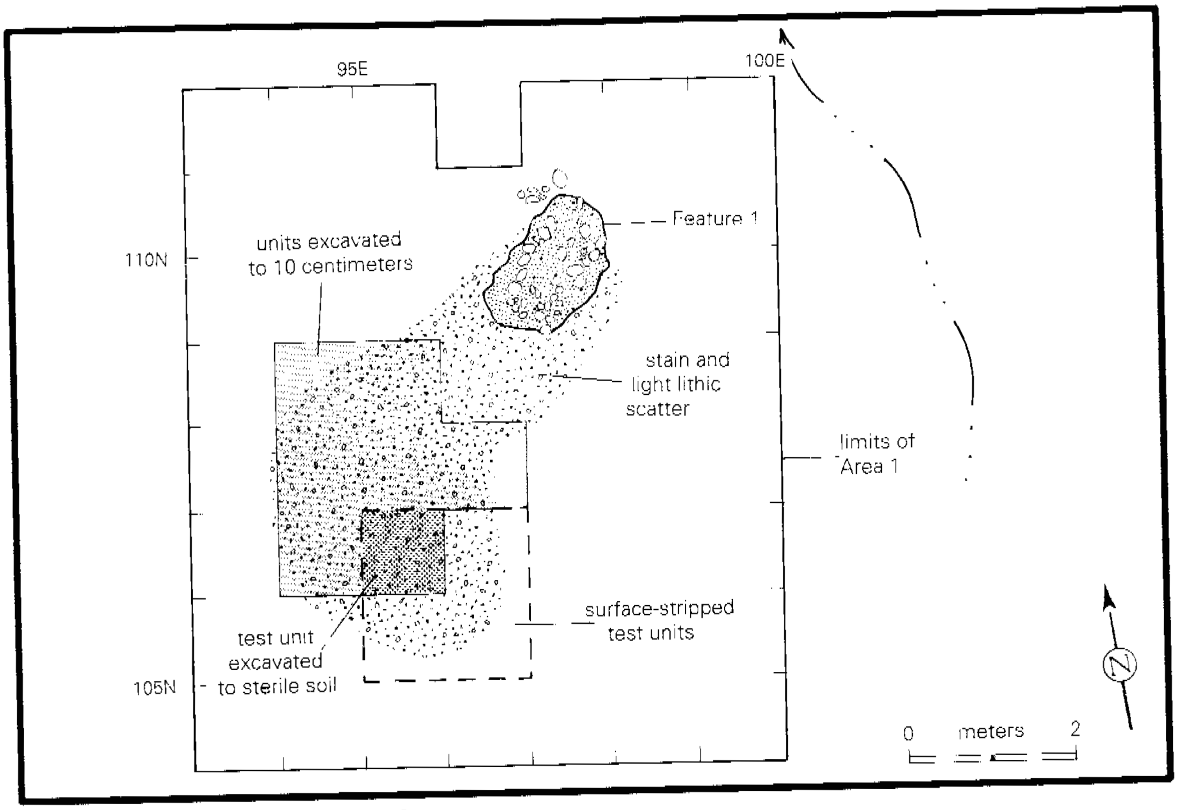

Figure 9.29. LA 86159, Area 1 map.

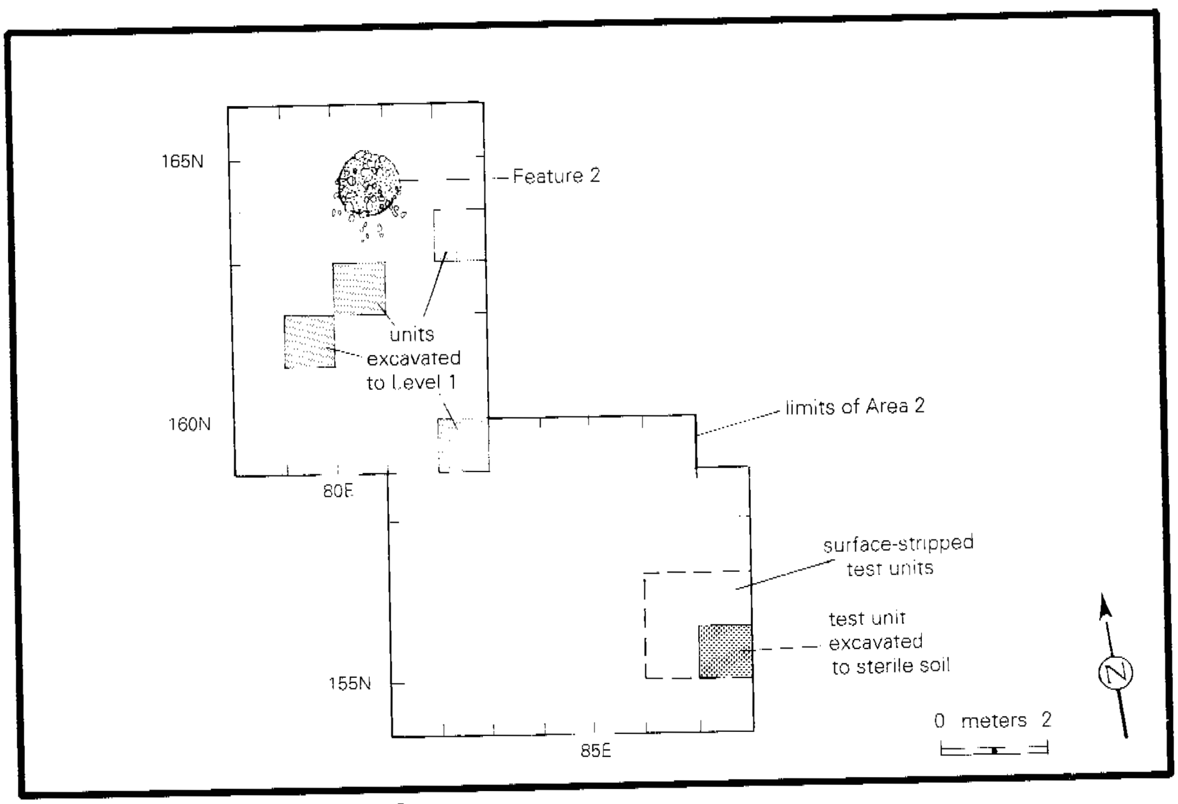

Figure 9.30. LA 86159, Area 2 map.

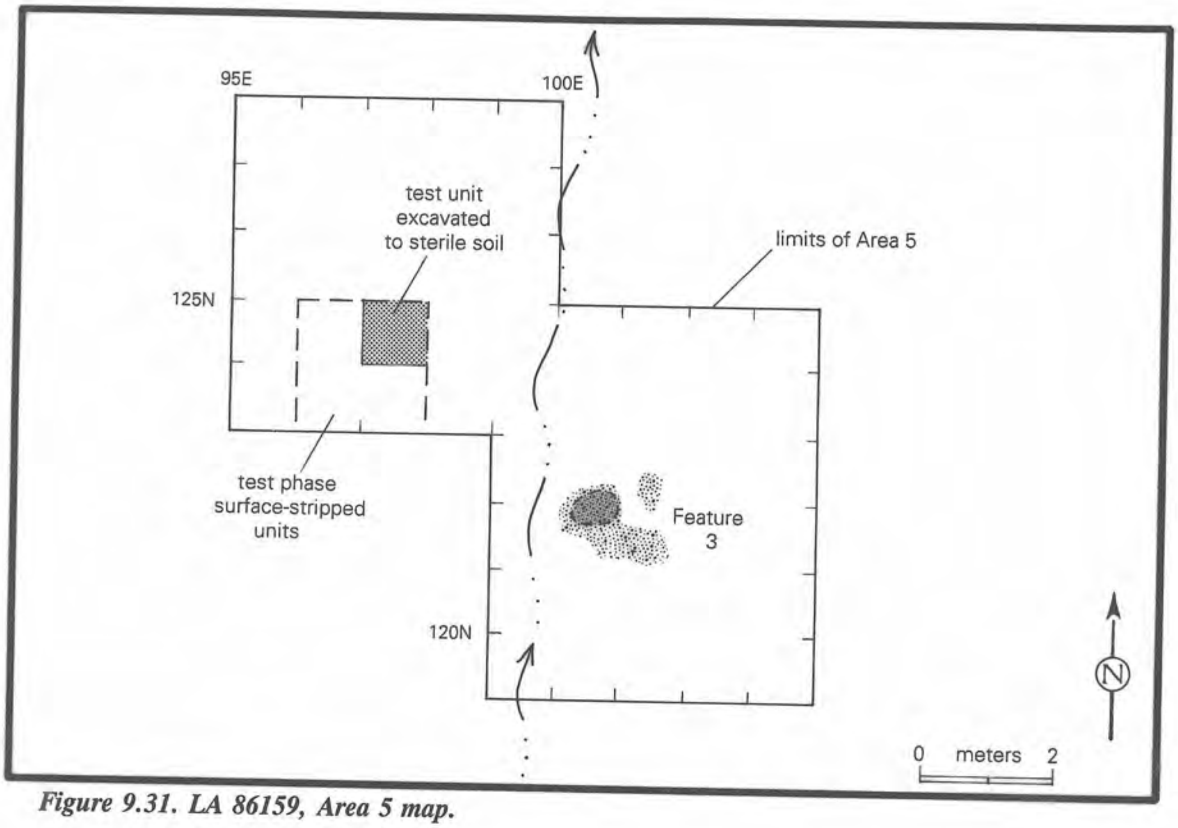

Figure 9.31. LA 86159, Area 5 map.

Figure 9.32. LA 86159, Feature 1, pit kiln, excavated profile.

2) (Fig. 9.30). Area 2 was located on a gentle north-facing slope at the north end of the saddle. A total of 74 1-by-1-m units were surface-stripped and 7 units were excavated 10 cm below the surface strip. All artifacts were confined to the surface-stripped level. A total of 124 lithic artifacts were recovered. Feature 2 was defined as the deflated remains of an oval-shaped hearth.

Excavation Area 5 was located in a dispersed artifact scatter with an associated soil stain (Fig. 9.31). The artifacts were distributed within the saddle. Forty-nine 1-by-1-m units were excavated yielding 28 sherds of Santa Fe Black-on-white pottery and 39 pieces of chipped stone. The sherds were matched with vessels associated with Feature 1, Area 1. The chipped stone was not clustered near the feature and cannot be conclusively associated with the feature. Feature 2 was defined as the deflated remains of probable hearth.

Feature Descriptions

Feature 1

Feature 1 is a shallow to moderately deep oval basin, which was excavated into native, sandy clay loam with a high calcareous content. Its long axis is oriented north-south. The feature measures 1.71 m long by 1.10 m wide and ranges from 12 to 26 cm deep (Figs. 9.32, 9.33).

The feature walls have slopes ranging from 30 to 80 degrees. The best preserved portion of the feature was along the north edge, suggesting that it may have been up to 26 cm deep. The south and east walls are partially deflated, evidenced by fire-cracked cobbles protruding above the edge of the feature and redeposited fill. The southwest wall of the feature was deflated, allowing stained soil to wash away to the south.

The floor or bottom of the feature is irregular, which may partly reflect construction and root intrusions. The feature floor is heavily burned with caliche inclusions hardened and oxidized from the fire. The floor was unprepared and the cobbles were generally on fill above the floor.

The fill was dark, charcoal-stained (2.5YR 3/0 to 7.5YR 3/2), homogeneous, sandy loam with inclusions of small charcoal flecks, spalls of fire-cracked rock, fire-cracked cobbles, unburned pebbles, and Santa Fe Black-on-white bowl sherds (Figs. 9.34, 9.35). No ash was present in the feature. The upper fill was comprised of a mixed primary and secondary deposit of sandy loam, while the lower fill consisted of dark, charcoal-stained sandy loam.

A thick, 3 to 10 cm oxidized soil layer around the sides and bottom of the feature suggest exposure to intense prolonged radiant heat. This "rind" of oxidation is clearly visible on the west side where it extends out of the feature and onto the prehistoric surface.

The stratigraphic sequence revealed a thick "rind" of oxidation above which was 3 to 12 cm of blackened primary fill. The majority of the fire-cracked cobbles were contained in this fill. Above the cobbles rested a mixed primary-secondary deposit containing numerous Santa Fe Black-on-white bowl sherds. Numerous sherds were in direct contact with the top of one of the cobbles. The majority of these sherds were centrally located, lying with the interior surfaces facing up and sooting or smudging present on the interior surfaces of some sherds.

A total of 49 cobbles were recorded within the feature as to their material type, condition, orientation, dimensions, and vertical placement. Considerable material type variability was encountered; medium-grained quartzite (n = 23), granite (n = 10), metamorphic schist (n = 9), quartz (n = 2), indurated sandstone (n = 4), and igneous (n = 1) were present. All cobbles displayed evidence of being exposed to heat, such as blackening; 30 remained intact, 7 were lightly cracked, and 9 were cracked through. The average cobble length was 12.2 cm, ranging from 5.0 to 26.0 cm; the average cobble width was 8.2 cm, ranging from 4.0 to 15.3 cm; and the average cobble thickness was 5.8 cm, ranging from 3.0 to 12.1 cm.

Of the 49 cobbles, 28 were resting in fill, 15 were on the floor, and 6 were outside the feature limit. Their orientations were primarily flat (n = 19) or tilted toward the interior of the feature (n = 12). Charcoal was best preserved under some of the cobbles, where the cobble provided protection against post-depositional processes. Based on the high percentage of cobbles resting in fill and some on charcoal, it appears that they were placed in the feature, possibly on a bed of coals. The cobbles are irregularly placed within the feature with no distinguishing pattern. These cobbles were the platforms used to support vessels for firing.

A total of 597 Santa Fe Black-on-white bowl

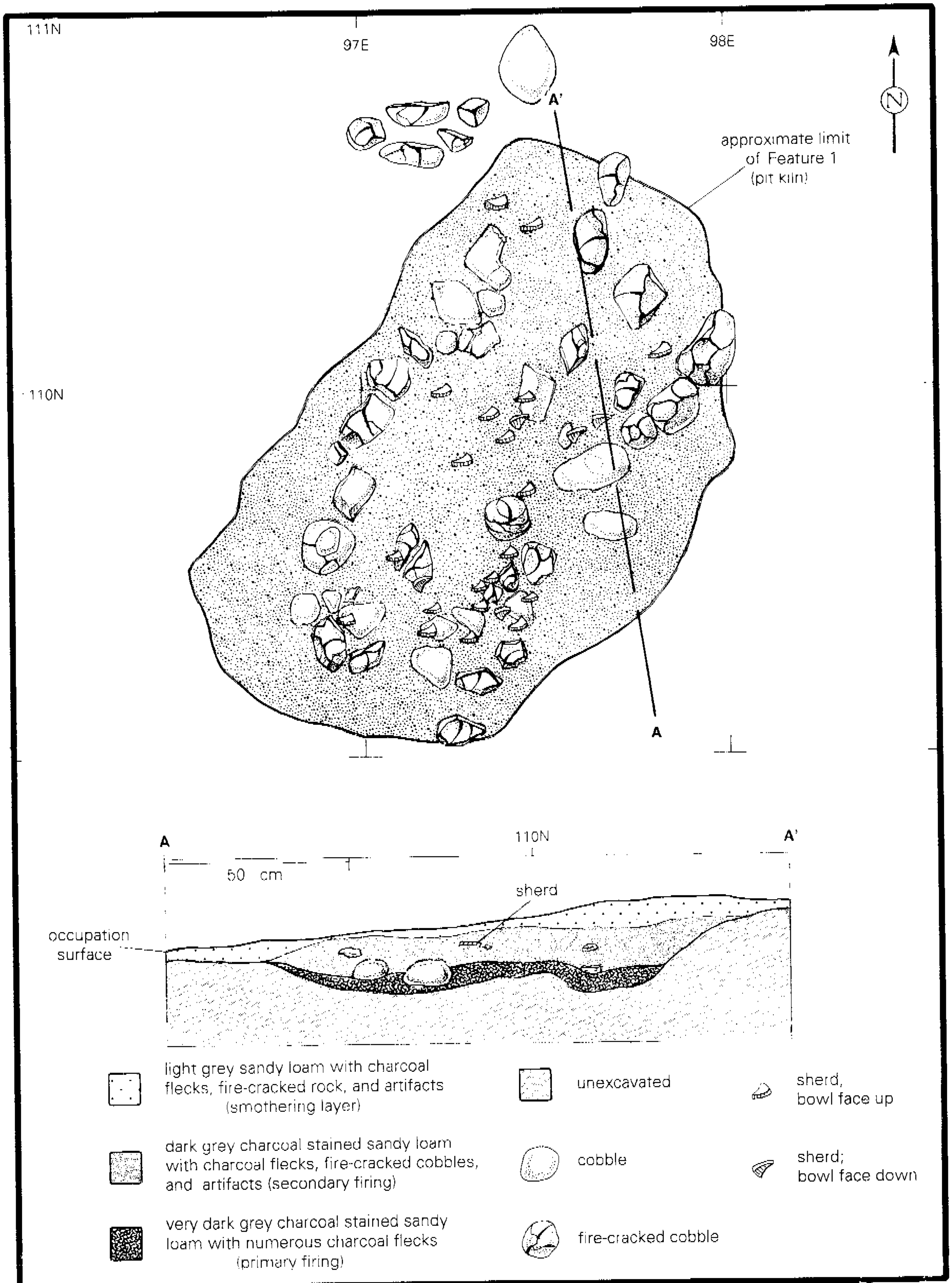

Figure 9.33. LA 86159, plan view and profile of Feature 1.

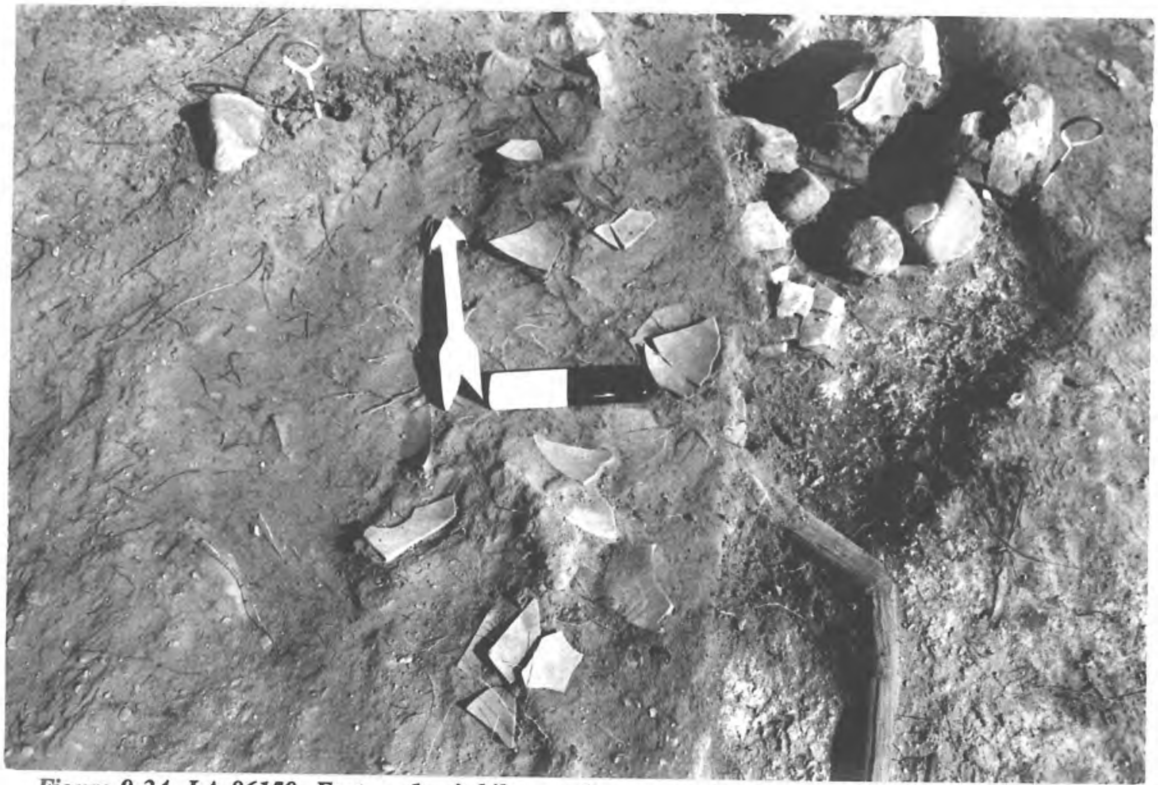

Figure 9.34. LA 86159, Feature 1, pit kiln, partly excavated with sherds.

Figure 9.35. LA 86159, Feature 1, pit kiln, excavated.

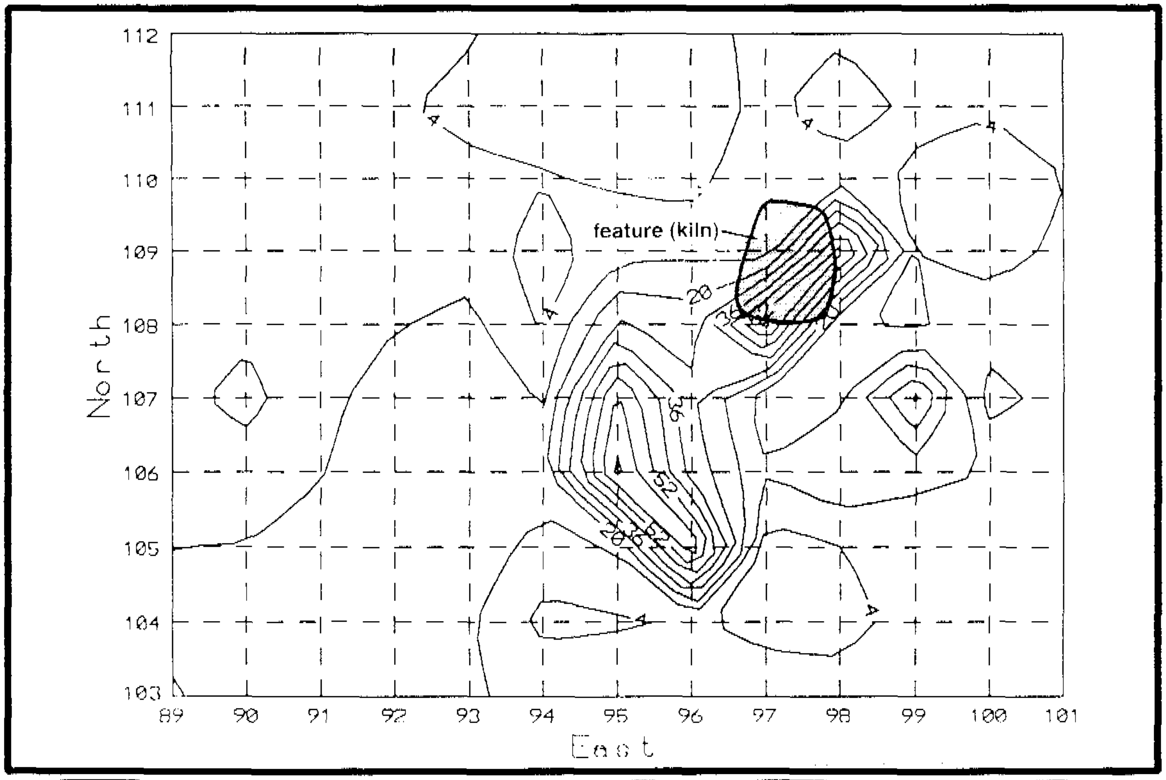

Figure 9.36. LA 86159, sherd distribution map.

sherds from seven vessels were recovered from the Feature 1 and the surrounding area (Fig. 9.35). All of the sherds within the feature were recovered from the top 5 to 10 cm of fill, above the fire-cracked cobbles. The sherds were centrally located in the feature; five had their bowl interior facing down and 33 had their bowl interior facing up. Some of the sherds were heavily smudged or sooted on the interior surface. A sherd discard pile was located to the southeast of the kiln (Fig. 9.36).

Feature 2

Feature 2 was located in Grids 164-165N/81-82E, in the northern half of Area 2, approximately 5 m from the north site boundary. It had an oval outline with deflated and poorly defined edges. It measured 147 cm long north-south by 122 cm wide east-west by 22 cm deep in the northern portion of the feature (Fig. 9.37).

Feature 2 was excavated into native soil. Thirty to forty cobbles were placed on the floor of the feature, but they did not line the feature interior (Fig. 9.38). The cobbles had an average diameter of 12 cm with a range between 2.5 and 20 cm.

The feature deposit was mostly eroded and replaced with alluvial sandy loam. The center of the feature was more stabilized by the cobbles. It contained pockets of dark, gray-black (10YR 4/1) sandy loam mixed with charcoal flecks and fire-cracked rock. No artifacts were recovered from within the feature.

Soil samples collected from Feature 2 yielded meager ethnobotanical specimens and chronometric samples. Based on the spatial association, Feature 2 is assumed to be functionally and temporally related to the chipped stone concentration. A radiocarbon sample of juniper charcoal yielded a two sigma date range of A.D. 1025 to 1275 (Beta-81972, conventional radiocarbon age 870 ± 60 B.P., C13/C12 = -21.9).

Feature 3

Feature 3 was located in Grids 122-123N/101E, within Area 5, and approximately 10 m north of Feature 1. The feature was 55 cm long east-west by 35 cm north-south by 30 cm deep (Fig. 9.39). It was defined as a semicircle that was dug into the native soil. The feature walls were steep and

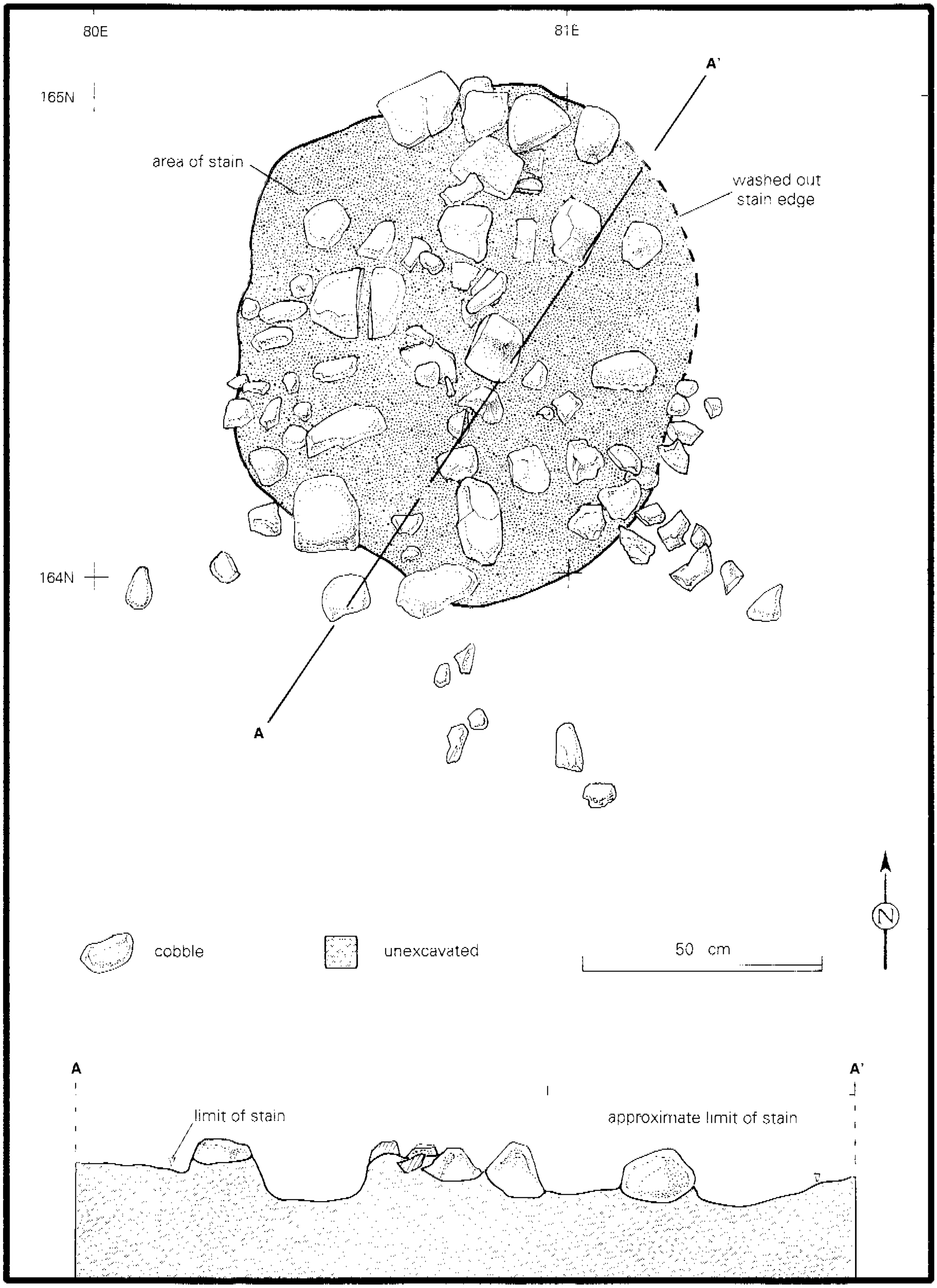

Figure 9.37. LA 86159, plan view and profile of Feature 2, Area 2.

Figure 9.38. LA 86159, Feature 2, Area 2, excavated.

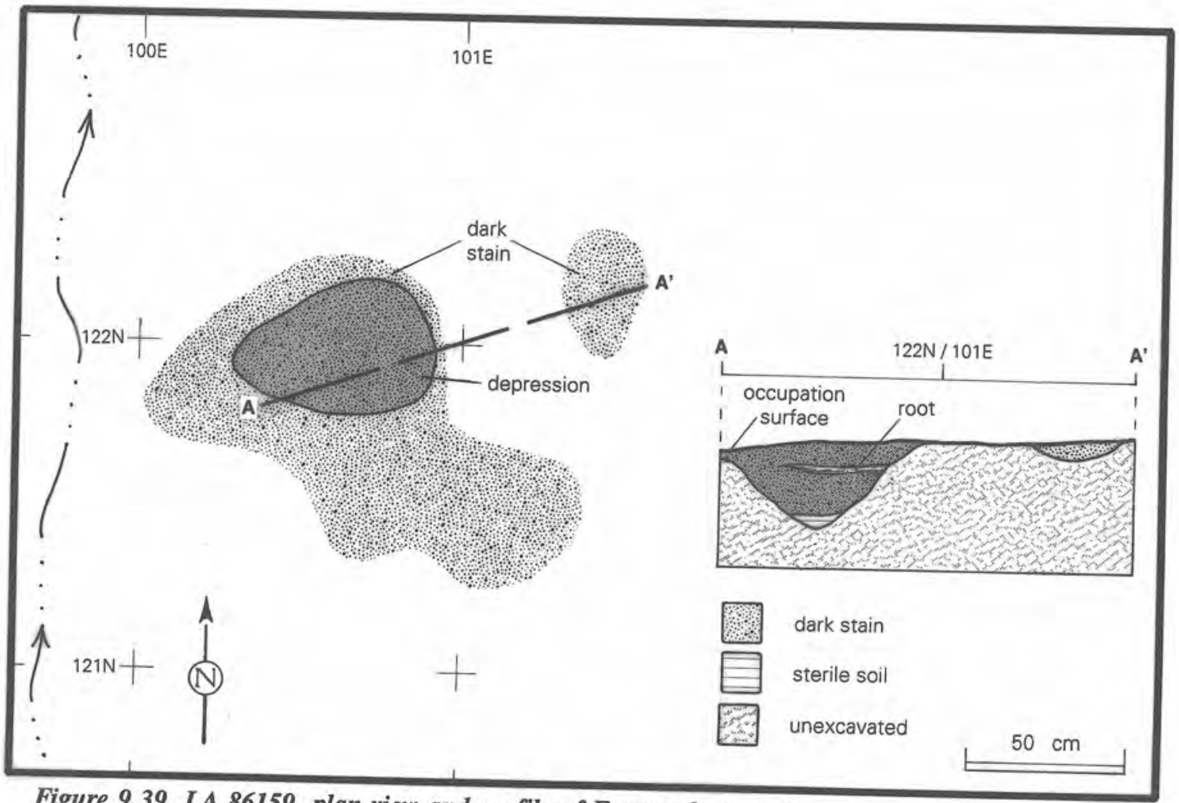

Figure 9.39. LA 86159, plan view and profile of Feature 3, Area 5.

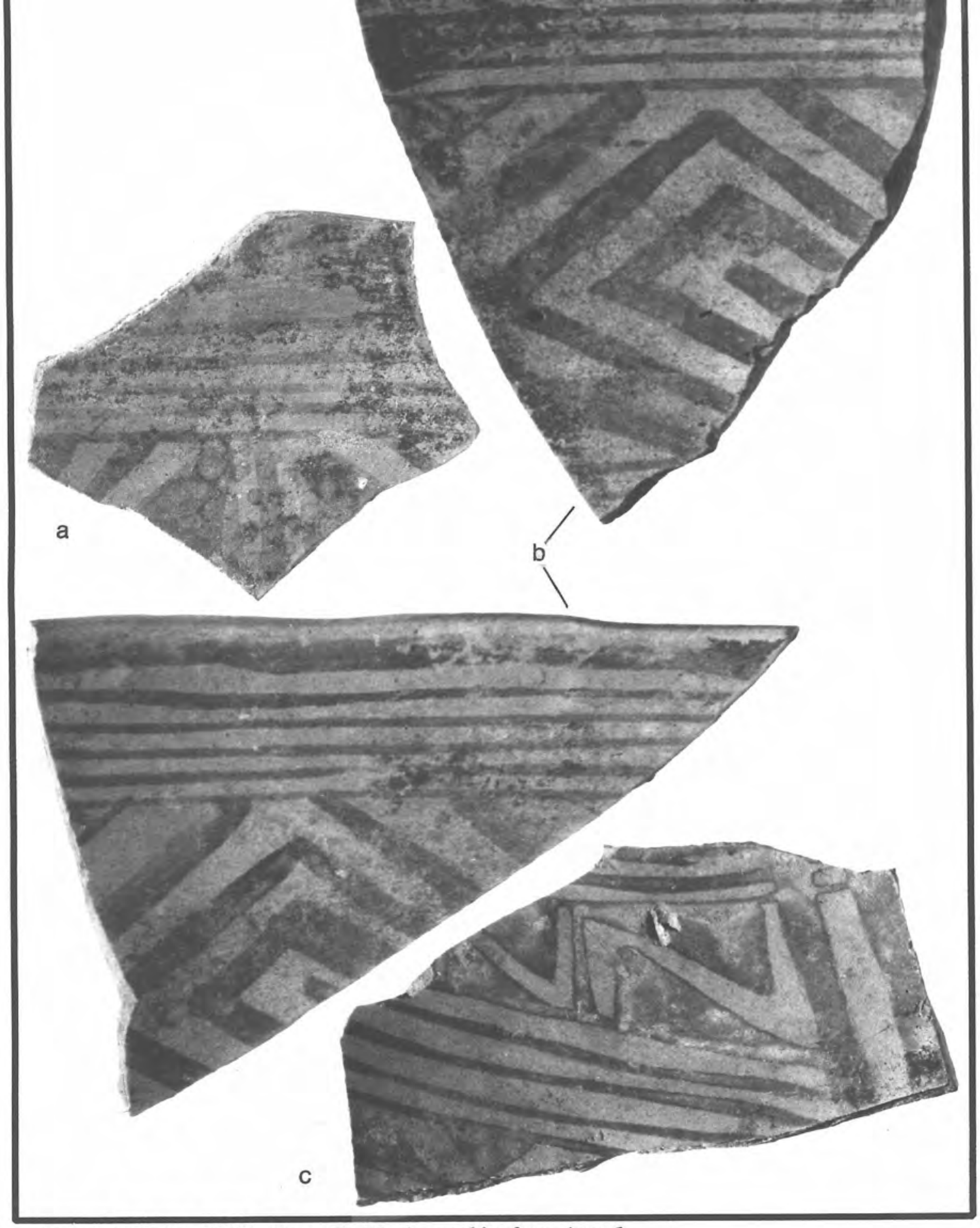

Figure 9.40. LA 86159, Santa Fe Black-on-white from Area 1.

contracted at the base.

The feature fill consisted of black sandy loam surrounded by brown loam that was mottled with pink sandstone inclusions. The fill contained small to medium-sized cobbles. One large juniper root cut through the center of the feature contributing to the mixed condition of the fill. An amorphous soil stain 5 cm deep occurred to the east of the feature. It appeared to be an eroded and mixed component of the feature fill. Ethnobotanical samples yielded no economic plant species other than wood charcoal. No artifacts were recovered from the feature.

Artifact Assemblage

Pottery
by Steven A. Lakatos

A total of 597 sherds of Santa Fe Black-on-white pottery were recovered from the excavation of Area 1 and Feature 1. A minimum of seven vessels was identified in the assemblage with 119 sherds not assigned to a vessel. Vessels 1-7 were identified among 528 sherds recovered from outside Feature 1. Vessels 1, 2, 6, and 7 were identified among 69 sherds recovered from within Feature 1.

Bowls are the dominant vessel form from LA 86159 as is true of the bulk of decorated ceramics during the fourteenth century in the Northern Rio Grande (Habicht-Mauche 1993; Mera 1935; Stubbs and Stallings 1953). Table 9.43 shows the distribution of vessel form and portion by vessel numbers.

Bowl rims range from flat or square (57 percent) to rounded or tapered and rounded (36 percent). Other forms include beveled and indeterminate form. Flat, ticked rims are typically associated with Galisteo Black-on-white (A.D. 1300-1350) in the Arroyo Hondo assemblage and may reflect the close stylistic association of this type to Mesa Verde White Wares (Habicht-Mauche 1993). By extension, the high percentage of flat, ticked rims on the Santa Fe Black-on-white pottery in this assemblage may also reflect the same close stylistic and temporal relationship. Variability of rim form on a single vessel is common in Santa Fe Black-on-white (Kidder and Amsden 1931). Different rim forms are illustrated in Habicht-Mauche (Habicht-Mauche 1993:43, fig. 22). Table 9.44 shows rim form distribution.

Rim ticking is present on 58 percent of the flat or square rims and on 37 percent of the rounded or tapered and rounded rims. Flat, ticked rims are typically associated with Galisteo Black-on-white in the Arroyo Hondo assemblage (Habicht-Mauche 1993).

Bowl exteriors are usually scraped with horizontal striations common. The majority display a light to moderate polish (Table 9.45). Polishing on the exterior of Santa Fe Black-on-white bowls was rare in the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) assemblages. Polishing on the exterior surfaces of Santa Fe Black-on-white is a Wiyo-like attribute (Lang and Scheick 1989:64-65) and may reflect a spatial (Lang 1975:178-179) and stylistic association between the LA 86159 ceramic assemblage and the Pajarito white wares.

A gray floated slip combined with high polish is present on 98 percent of the interior surfaces. A thin to moderately thick white slip is present on the interior or exterior of 7 percent of the assemblage. Table 9.46 shows the location and application of slip in the LA 86159 assemblage.

Paste color and texture are remarkably similar throughout the assemblage, which is typical of Santa Fe Black-on-white. The paste is hard, light gray to gray (7.5YR 7/0-5/0), and vitrified in 98 percent of the examined sherds. A fine sand temper was recorded in all of the examined sherds. Temper is usually invisible without the aid of a microscope (30x-40x). Consistency in paste and temper may suggest a restricted raw material source.

Decorated sherds comprised 60 percent of the examined assemblage. Pigment, usually located on the interior surfaces, consisted exclusively of black carbon paint. The color ranged from thick black (2.5YR 3/0-5/0), thin, streaky (2.5YR 3/0-6/0) to ghosted (2.5YR 7/0, 6/0, 6/2) (Table 9.47). Thick, black, well-bonded pigment comprised 21 percent of the painted assemblage and thin streaky paint comprised 18 percent. Thin streaky pigment resembles what Habicht-Mauche describes as "watery consistency" (Habicht-Mauche 1993:22-23; illustrated fig. 9, top right).

Ghosted pigment is the dominant paint, making up 61 percent of the assemblage (Fig. 9.40a). This is a marked difference from the Santa Fe Black-on-white ceramics from Arroyo Hondo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953). There, paint usually ranged from very dark gray (2.5YR 3/0) to gray (2.5YR 5/0). Two important factors contribute to

Table 9.43. LA 86159 Vessel Form and Portion by Vessel

Count Row pct Col pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Indeterminate	14 54.8 11.8	12 46.2 3.3							26 4.4
Bowl rim	11 10.9 9.2	57 56.4 15.9	6 5.9 20.7	3 3.0 27.3	6 5.9 75.0	4 4.0 25.0	11 10.9 21.2	3 3.0 00.0	101 16.9
Bowl body	92 19.7 77.3	290 62.0 80.8	23 4.9 79.3	8 1.7 72.7	2 .4 25.0	12 2.6 75.0	41 8.8 78.8		468 78.4
Jar body	2 100.0 1.7								2 .3
Column total	119 19.9	359 60.1	29 4.9	11 1.8	8 1.3	16 2.7	52 8.7	3 .5	597 100.0

Table 9.44. LA 86159 Rim Forms by Vessel

Count Row Pct Column Pct	Vessel Number								Row Total
	Indeter- minate	1	2	3	4	5	6	7	
Indeterminate	2 40.0 18.2	2 40.0 4.9					1 20.0 9.1		5 6.0
Rounded	3 10.7 27.3	15 53.6 36.6	5 17.9 83.3	1 3.6 33.3	1 3.6 16.7		3 10.7 27.3		28 33.3
Flat or square	5 10.4 45.5	23 47.9 56.1	1 2.1 16.7	2 4.2 66.7	4 8.3 66.7	3 6.3 100.0	7 14.6 63.6	3 6.3 100.0	48 57.1
Tapered and rounded		1 50.0 2.4			1 50.0 16.7				2 2.4
Beveled	1 100.0 9.1								1 1.2
Column Total	11 13.1	41 48.8	6 7.1	3 3.6	6 7.1	3 3.6	11 13.1	3 3.6	84 100.0

Table 9.45. LA 86159 Location and Degree of Polish by Vessel

Count Row Pct Column Pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Absent		3 100.0 1.3							3 .8
Light interior		1 100.0 .4							1 .3
Medium interior		1 100.0 .4							1 .3
Heavy interior		5 83.3 2.2					1 16.7 2.1		6 1.6
Light exterior		1 100.0 .4							1 .3
Medium exterior	1 16.7 2.1	1 16.7 .4		4 66.7 40.0					6 1.6
Light interior/ exterior		5 100.0 2.2							5 1.3
Medium interior/ exterior		7 87.5 3.1					1 12.5 2.1		8 2.1
High interior/ exterior	1 12.5 2.1	4 50.0 1.8				1 12.5 9.1	2 25.0 4.2		8 2.1
Light interior, medium exterior		2 66.7 .9		1 33.3 10.0					3 .8
Medium interior, light exterior		3 75.0 1.3					1 25.0 2.1		4 1.1
Heavy interior, light exterior	6 9.4 12.8	37 57.8 16.5	9 14.1 33.3	1 1.6 10.0	3 4.7 42.9	1 1.6 9.1	5 7.8 10.4	2 3.1 66.7	64 17.0
Heavy interior, medium exterior	28 12.2 59.6	134 58.3 59.8	17 7.4 63.0	1 .4 10.0	3 1.3 42.9	9 3.9 81.8	37 16.1 77.1	1 .4 33.3	230 61.0
Heavy exterior	1 100.0 2.1								1 .3
Obscured interior, light exterior	1 16.7 2.1	5 83.3 2.2							6 1.6

Count Row Pct Column Pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Obscured interior, medium exterior	2 40.0 4.3		1 20.0 3.7	2 40.0 20.0					5 1.3
Light interior, obscured exterior		1 100.0 .4							1 .3
Heavy interior, obscured exterior	6 31.6 12.8	11 57.9 4.9			1 5.3 14.3		1 5.3 2.1		19 5.0
Indeterminate	1 20.0 2.1	3 60.0 1.3		1 20.0 10.0					5 1.3
Column Total	47 12.5	224 59.4	27 7.2	10 2.7	7 1.9	11 2.9	48 12.7	3 .8	377 100.0

Table 9.46. LA 86159 Slip Location and Thickness by Vessel

Count Row Pct Column Pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Absent		3 100.0 1.3							3 .8
Thin white interior		4 50.0 1.8				3 37.5 27.3		1 12.5 33.3	8 2.1
Thin white exterior		1 20.0 .4		4 80.0 40.0					5 1.3
Medium white exterior	1 25.0 2.1			3 75.0 30.0					4 1.1
Thin white interior/ exterior	1 10.0 2.1	4 40.0 1.8		1 10.0 10.0	3 30.0 42.9		1 10.0 2.1		10 2.7
Medium white interior/ exterior		2 100.0 .9							2 .5
Thin white interior, medium exterior	1 33.3 2.1	1 33.3 .4					1 33.3 2.1		3 .8
Floated interior	38 11.8 80.9	202 62.5 90.2	26 8.0 96.3	1 .3 10.0	3 .9 42.9	8 2.5 72.7	43 13.3 89.6	2 .6 66.7	323 85.7
Floated interior, thick white exterior					1 25.0 14.3		3 75.0 6.3		4 1.1

Count Row Pct Column Pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Obscured interior, thick white exterior	1 100.0 2.1								1 .3
Obscured	5 35.7 10.6	7 50.0 3.1	1 7.1 3.7	1 7.1 10.0					14 3.7
Column Total	47 12.5	224 59.4	27 7.2	10 2.7	7 1.9	11 2.9	48 12.7	3 .8	377 100.0

Table 9.47. LA 86159 Paint Appearance and Location by Vessel

Count Row Pct Column Pct	Indeter- minate	1	2	3	4	5	6	7	Row Total
Absent	11 16.2 20.4	53 77.9 22.6		4 5.9 40.0					68 16.9
Thin/streaky black interior	4 6.9 7.4	30 51.7 12.8	13 22.4 44.8		3 5.2 37.5		8 13.8 16.3		58 14.4
Thin/streaky black exterior		1 100.0 .4							1 .2
Thin/streaky black interior/exterior		1 100.0 .4							1 .2
Thick black interior	11 16.2 20.4	26 38.2 11.1	11 16.2 37.9		1 1.5 12.5		19 27.9 38.8		68 16.9
Thick black interior/exterior	1 50.0 1.9						1 50.0 2.0		2 .5
Ghosted black interior	27 14.3 50.0	119 63.0 50.6	4 2.1 13.8	6 3.2 60.0	4 2.1 50.0	7 3.7 46.7	20 10.6 40.8	2 1.1 66.7	189 46.9
Ghosted black exterior		1 100.0 .4							1 .2
Thick black interior, thin/streaky exterior							1 100.0 2.0		1 .2
Ghosted black interior/exterior		4 30.8 1.7				8 61.5 53.3		1 7.7 33.3	13 3.2

Obscured			1 100.0 3.4						1 .2
Column Total	54 13.4	235 58.3	29 7.2	10 2.5	8 2.0	15 3.7	49 12.2	3 .7	403 100.0

Table 9.48. LA 86159 Design Layout by Vessel

Vessel	Design layout
1	A 7-mm-wide encircling band located 6 mm below the rim and two sets of four thin framing lines. Alternating pairs of concentric triangles and solid ticked triangles are located between and pendent to the thin framing lines. Alternating tick marks are present on the lower set of framing lines (Fig. 9.40b).
2	A 4-mm-wide encircling band, located 3 mm below the rim, and set of four thin framing lines. Interlocking key figures (Stubbs and Stallings 1953, fig. 45a) are located between the two sets of framing lines. Hatching is used as a filler between the interlocking design elements.
3	Undecorated.
4	A 4-mm-wide encircling band located 3 mm below the rim. An indeterminate paneled design is located 3 mm below the encircling band.
5	An indeterminate paneled design with interlocking key figures.
6	Panel design with opposed solid triangles between two sets of thin framing lines similar to Stubbs and Stallings (1953, fig. 51k) (Fig. 9.41c).
7	A 7-mm-wide encircling band pendant to the rim and an indeterminate paneled design.

the quality of the appearance of the carbon paint: clay type and firing atmosphere (Shepard 1936; Swink 1993). The low percentage of thick black paint indicates that firing atmosphere, not clay quality, may have contributed to the poor paint quality on the majority of the ceramics.

Design layouts and elements in the decorated assemblage are consistent with those described in the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) assemblages. Design layout for Vessels 1-7 are shown in Table 9.48.

Atypical breakage patterns for Santa Fe Black-on-white were common in the ceramic assemblage. Sherd spalls and spalled sherds are 17 to 81 percent of the total sherds assigned to each vessel (Table 9.49). The high percentage of spalled pottery in the indeterminate category is partly due to small sherd size, which made it difficult to assign them to a vessel. The abundant spalled pottery from in and around Feature 1 may reflect feature cleaning, post-abandonment breakage and dispersal agents, or surface treatment. The main cause of spalling in this assemblage is pottery-firing failures. Rapid heat rise or the vaporization of moisture in the vessel wall may result in spalled or exploded pottery.

Vessels 1 and 6 were recovered from both outside and inside Feature 1 and have the highest number of sherds assigned to them. Using these vessels as a sample, the distribution of spalled to intact sherds from interior and exterior contexts were compared. The distribution shows spalling is more common on sherds recovered from outside the feature. Table 9.50 shows the extra and intramural distribution of spalled and intact sherds from Vessels 1 and 6.

The higher number of sherds recovered from outside the feature is due in part to sherd size or feature cleaning. Smaller sherds size may be attributed to post-abandonment breakage, dispersal agents, and surface treatment.

A total of 23 sherds recovered from Feature 1 were heavily sooted. Sooted or blackened pottery can result from a reducing firing atmosphere. A number of sherds exhibit a polk-a-dot pattern on interior surfaces. This pattern was created by rain drops that landed on the exposed hot surface of the sherd. The water dissolved the soot resulting in the speckled pattern. Exposing

Table 9.49. LA 86159 Spall Location by Vessel

Count Row Pct Column Pct	Ind-eter-minate	1	2	3	4	5	6	7	Row Total
Intact	23 9.4 19.3	146 59.8 40.7	20 8.2 69.0	10 4.1 8.3	5 2.0 62.5	10 4.1 62.5	28 11.5 53.8	2 1.0 66.7	244 40.8
Spalling interior	10 8.4 13.9	51 70.8 14.2	4 5.6 13.8		1 1.4 12.5	1 1.4 6.3	5 6.9 9.6		72 12.0
Spalling exterior	15 12.6 19.5	52 67.5 14.5	1 1.3 3.4	1 1.3 8.3			7 9.1 13.5	1 1.0 33.3	77 12.9
Spalling both surfaces	14 16.9 11.8	49 59.0 13.6	2 2.4 6.9	1 1.2 8.3	2 2.4 25.0	4 4.8 25.0	11 13.3 21.1		83 13.9
Spalls	57 46.7 47.9	61 50.0 17.0	2 1.6 6.9			1 1.0 6.3	1 1.0 2.1		122 20.4
Total number spalled	96 80.7 27.1	213 60.2 59.3	9 2.5 31.0	2 1.0 16.7	3 1.0 37.5	6 1.2 37.5	24 6.8 46.2	1 0.0 33.3	354 59.2
Column total	119 19.9	359 60.0	29 4.8	12 2.0	8 1.3	16 2.7	52 8.7	3 1.0	598

Table 9.50. LA 86159, Distribution of Spalled and Intact Sherds from Vessels 1 and 6

	Vessel 1		Vessel 6		Total	
Count Row pct Total pct	Spalled	Intact	Spalled	Intact	Vessel 1	Vessel 6
Extramural sherds	199 65.0 55.0	107 35.0 35.00	22 46.0 42.0	26 54.0 50.0	306 85.0	48 92.0
Intramural sherds	15 28.0 4.0	38 72.0 11.0	2 50.0 46.0	2 50.0 4.0	53 15.0	4 8.0
Total	214 60.0	145 40.0	24 46.0	28 54.0	359	52

hot vessels to cool rain may have caused a thermal shock that contributed to the high percentage of spalled pottery.

The indeterminate category is represented by 11 Santa Fe Black-on-white bowl rim sherds, 92 bowl body sherds, two jar sherds, and 12 sherds of an indeterminate vessel portion. Rim forms, surface treatments, paste, temper, paint appearance, and design layout all fall within the range of descriptions given for Vessels 1-6.

Summary

Santa Fe Black-on-white has been described in detail by Kidder and Amsden (1931), Mera (1935), Stubbs and Stallings (1953), and Habicht-Mauche (1993), among others. It is generally recognized by a fine, gray to light gray homogeneous, hard to medium-hard paste; temper, often invisible without the aid of a microscope, ranges from fine sand, volcanic ash, to self-tempered; cleavage is generally even with a flat cross section; bowls are the dominant vessel form; rim forms are generally rounded, square, tapered or combinations of the three; decoration usually consists of carbon paint with paneled band designs, framing lines, triangular figures, and hatching being dominant design elements. The Santa Fe Black-on-white pottery in the LA 86159 assemblage is generally analogous to the type description except that differences in surface treatment and breakage pattern suggest some temporal, stylistic, and functional variation.

LA 86159, Feature 1, is interpreted as a pottery-firing location and feature based on the high percentage of spalled pottery and poor paint appearance. Poor pigment retention and a high percentage of spalled pottery are strong indicators of a firing failure (Purcell 1993; Swink 1993; Post and Lakatos 1994; Blinman 1993, 1994; Brisbin 1993). Pottery-firing replications using local raw materials have produced breakage patterns and pigment retention that are strikingly similar to the archaeological pattern. Feature 1 is associated with a charcoal-stained discard area that contained many sherd spalls and spalled sherds. The discard area may represent the repeated use of this location and feature for pottery firing.

Chipped Stone
by Guadalupe A. Martinez

Area 1

Area 1 contained a thermal feature, Santa Fe Black-on-white sherds, and ten chipped stone artifacts. The chipped stone artifacts are debris from core reduction and biface manufacture. Area 1 chipped stone artifact types consisted of three chert and four chalcedony pieces of angular debris, two obsidian core flakes, and one obsidian biface flake.

Area 2

One hundred twenty-four pieces of chipped stone were recovered from the excavation area and surface collection. Area 2 contained a collapsed rock-filled thermal feature. The chipped stone assemblage includes core flakes, angular debris, multidirectional and unidirectional cores. Table 9.51 shows the entire artifact assemblage by material type distribution.

Lithic Raw Material. Six material types are represented in the assemblage (Table 9.51). The raw materials reflect a use of chert and chalcedony from Rio Grande gravel deposits or the Caja del Rio located to the west. The chert encompasses fine-grained, medium-grained, and coarse-grained material that occurs in a wide range of colors. Obsidian artifacts were also present at Area 1. The obsidian is the clear to smokey gray variety that originates in the Jemez Mountains and along the drainages that originate in and around the Jemez Mountains. To monitor the effect material texture might have on core reduction or tool production, material types were collapsed into fine and medium to coarse-grained categories (Table 9.52).

Debitage. Debitage represents the most abundant artifact type. The debitage assemblage consists mainly of core flakes and angular debris. None of these artifacts exhibited use wear or modification, indicating that they are waste products.

There were 93 core flakes in the assemblage. Core flakes result from all stages of core reduction. Chert is 74 percent of the core flake assemblage. Seventy-seven percent of the core flakes had no cortex, and over 95 percent of the core flakes exhibited 50 percent or less dorsal cortex (Table 9.53). These percentages are strong indicators of early and middle stage reduction of locally available raw material. Dorsal scars also reflect a pattern of middle and late stage reduction with 82 percent of the core flakes having between two and five scars (Table 9.54).

Whole flakes comprise 42 percent of the core flake assemblage (Table 9.55). There are more whole medium to coarse-grain flakes than fine

Table 9.51. Material by Artifact Type, Area 2, LA 86159

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Resharpening Flake	Hammerstone Flake	Bidirectional Core	Multidirectional Core	Biface, undiff.	Row Total
Chert	12 12.9 85.7	69 74.2 74.2	4 4.3 66.7			1 1.1 100.0	1 1.1 100.0	6 6.5 100.0	93 75.0
Chalcedony	2 28.6 14.3	3 42.9 3.2	1 14.3 16.7		1 14.3 100.0				7 5.6
Silicified Wood		3 75.0 3.2		1 25.0 100.0					4 3.2
Obsidian		2 100.0 2.2							2 1.6
Quartzite		8 88.9 8.6				1 11.1 50.0			9 7.3
Quartzitic Sandstone		8 88.9 8.6	1 11.1 16.7						9 7.3
Column Total	14 11.3	93 75.0	6 4.8	1 .8	1 .8	2 1.6	1 .8	6 4.8	124 100.0

Table 9.52. Material Texture by Artifact Type, Area 2, LA 86159

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Resharpening Flake	Hammerstone Flake	Bidirectional Core	Multidirectional Core	Biface Undiff.	Row Total
Fine	3 6.3 21.4	38 79.2 40.9	2 4.2 33.3	1 2.1 100.0	1 2.1 100.0			3 6.3 50.0	48 38.7
Medium to Coarse	11 14.5 78.6	55 72.4 59.1	4 5.3 66.7			2 2.6 100.0	1 1.3 100.0	3 3.9 50.0	76 61.3
Column Total	14 11.3	93. 75.0	6 4.8	1 .8	1 .8	2 1.6	1 .8	6 4.8	124 100.0

Table 9.53. Core Flakes by Material Texture by Dorsal Cortex, Area 2, LA 86159

Count Row Pct Column Pct	0	10	20	30	40	50	80	90	100	Row Total
Fine	32 84.2 44.4	1 2.6 14.3		1 2.6 50.0	1 2.6 33.3	1 2.6 50.0	1 2.6 100.0		1 2.6 50.0	38 40.9
Medium to coarse	40 72.7 55.6	6 10.9 85.7	3 5.5 100.0	1 1.8 50.0	2 3.6 66.7	1 1.8 50.0		1 1.8 100.0	1 1.8 50.0	55 59.1
Column Total	72 77.4	7 7.5	3 3.2	2 2.2	3 3.2	2 2.2	1 1.1	1 1.1	2 2.2	93 100.0

Table 9.54. All Core Flakes by Texture by Dorsal Scars, Area 2, LA 86159

Count Row Pct Column Pct	0	1	2	3	4	5	6	7	10	Row Total
Fine	1 2.6 25.0	2 5.3 20.0	11 28.9 37.9	9 23.7 60.0	8 21.1 40.0	6 15.8 50.0	1 2.6 100.0			38 40.9
Medium to coarse	3 5.5 75.0	8 14.5 80.0	18 32.7 62.1	6 10.9 40.0	12 21.8 60.0	6 10.9 50.0		1 1.8 100.0	1 1.8 100.0	55 59.1
Column Total	4 4.3	10 10.8	29 31.2	15 16.1	20 21.5	12 12.9	1 1.1	1 1.1	1 1.1	93 100.0

Table 9.55. Core Flakes by Material Texture by Portion, Area 2, LA 86159

Count Row Pct Column Pct	Indeterminate	Whole	Proximal	Medial	Distal	Lateral	Row Total
Fine	1 2.6 33.3	11 28.9 28.2	2 5.3 25.0	13 34.2 54.2	10 26.3 62.5	1 2.6 33.3	38 40.9
Medium to coarse	2 3.6 66.7	28 50.9 71.8	6 10.9 75.0	11 20.0 45.8	6 10.9 37.5	2 3.6 66.7	55 59.1
Column Total	3 3.2	39 41.9	8 8.6	24 25.8	16 17.2	3 3.2	93 100.0

Table 9.56. Core Flakes by Material Texture by Platform, Area 2, LA 86159

Count Row Pct Column Pct	Not Applicable	Cortical	Single Facet	Single Abraded	Multifacet	Multi Abraded	Collapsed	Crushed	Absent	Row Total
Fine		1 2.6 10.0	5 13.2 19.2	1 2.6 50.0	1 2.6 100.0	2 5.3 100.0	3 7.9 50.0	1 2.6 20.0	24 63.2 60.0	38 40.9
Medium/ Coarse	1 1.8 100.0	9 16.4 90.0	21 38.2 80.8	1 1.8 50.0			3 5.5 50.0	4 7.3 80.0	16 29.1 40.0	55 59.1
Column Total	1 1.1	10 10.8	26 28.0	2 2.2	1 1.1	2 2.2	6 6.5	5 5.4	40 43.0	93 100.0

grain flakes, but fine-grained flakes have greater percentages of medial and distal fragments. Different flake portion distributions may reflect reduction stage. Whole flakes are more prevalent in early and middle stage core reduction and broken flakes occur more in late stage reduction. Core flake platforms support more early and middle stage core reduction for medium to coarse-grained flakes with only single-faceted or cortical platforms present. Late stage reduction is emphasized more for fine-grained flakes that have multifaceted, modified, and collapsed or crushed platforms (Table 9.56). Whole core flake dimensions clearly fall in the small to medium size range with a mean length of 28 mm, a mean width of 25 mm, and a mean thickness of 9 mm.

Six biface flakes were recovered from Area 2. Four were chert, one was chalcedony, and one was quartzite. Five flakes had three or fewer dorsal scars and one had six or fewer. The flakes are slightly smaller than core flakes with a mean length of 21 mm, mean width of 16 mm, and mean thickness of 3 mm.

Cores. Three cores were recovered from Area 2. Two were chert, one bidirectional and one multidirectional. The third was a bidirectional quartzite core.

A medium-grained bidirectional chert core recovered from Grid 163N/82E is 95 mm long by 63 mm wide by 49 mm thick. It has 90 percent cortex and six dorsal scars.

A coarse-grained multidirectional chert core recovered from Grid 162N/79E is 48 mm long by 43 mm wide by 25 mm thick. It had seven dorsal scars and no cortex. No cortex suggests it was reduced more completely than other recovered cores.

A medium-grained bidirectional quartzite core recovered from Grid 163N/81E is 126 mm long by 77 mm wide by 54 mm thick. It has 80 percent cortex and three dorsal scars. This core may have been a tested cobble.

Tools. Six bifaces were recovered from Area 2. They were all made of fine or medium-grained chert. Three artifact types were represented.

FS 242 was an undifferentiated biface of fine-grained chert. It had one modified convex edge exhibiting a rounding wear pattern with evenly rounded damage. Its dimensions were 16 mm long by 16 mm wide by 4 mm thick.

One early stage medium-grained chert biface was recovered, FS 233. It had two modified convex edges; neither exhibited any use wear. It measured 37 mm long by 32 mm wide by 12 mm thick.

FS 216 contained two biface artifacts. One was a fine-grained middle stage biface that had been heat-treated. It had one utilized edge with unidirectional wear, rounding, and feather fractures. Its dimensions were 21 mm long by 27 mm wide by 10 mm thick. The other artifact was a medium-grained middle stage biface. It had two modified convex edges. Neither of the edges had been utilized. It measured 27 mm long by 27 mm wide by 10 mm thick.

FS 231 also contained two biface artifacts. One was an early stage medium-grained chert biface. It had two convex modified edges; however, only one edge was utilized. The utilized edge exhibited rounding wear with crescent and feather scarring. It measured 48 mm long by 40 mm wide by 10 mm thick. The other was a fine-grained chert, middle stage biface. It had two

Table 9.57. Material by Artifact Type, Area 5, LA 86159

Count Row Pct Column Pct	Angular Debris	Core Flake	Multi-directional Core	Row Total
Chert	1 8.3 25.0	10 83.3 29.4	1 8.3 100.0	12 30.8
Sedimentary Undiff.		1 100.0 2.9		1 2.6
Quartzite	3 12.5 75.0	21 87.5 61.8		24 61.5
Quartzitic Sandstone		1 100.0 2.9		1 2.6
Quartz Crystal		1 100.0 2.9		1 2.6
Column Total	4 10.2	34 87.2		39 100.0

modified convex edges. Both edges exhibited unidirectional rounding wear and feather scarring.

Area 5

Thirty-nine pieces of chipped stone were recovered from excavation and surface collection of Area 5. Area 5 had a hearth, Santa Fe Black-on-white sherds, and stone artifacts. The sherds washed in from Area 1 and do not appear to be associated with the chipped stone assemblage. The chipped stone assemblage includes core flakes, angular debris, and a core (Table 9.57).

Lithic Raw Material. Five material types were represented in the assemblage (Table 9.57). Quartzite is the most common material. These are the most common raw materials occurring within the Las Campanas area. All of these materials could have been obtained from the Santa Fe Group gravel deposits.

Debitage. Debitage is the main chipped stone category and represents the most abundant artifact type. The debitage assemblage consists of core flakes and angular debris. Core flakes made up 87 percent of the assemblage, 34 of 39 artifacts. None of these artifacts exhibited use wear or modification, indicating that they are waste products.

Core flakes result from all stages of core reduction. Quartzite were 62 percent of the core flake assemblage and chert made up 29 percent. Seventy-four percent of the core flakes had 50 percent or less dorsal cortex, indicating intensive reduction. Fifty-six percent of the core flakes had either cortical or single-facet platforms, which are indicative of core reduction rather than biface production.

Cores. One multidirectional chert core was recovered from Grid 124N/104E. It had no cortex. The core measured 52 mm long by 47 mm wide by 43 mm thick.

Strike-a-light. One medium-grained quartzite strike-a-light was recovered from Area 5. Metal adhesions were observed along the worked edge. This is the only historic artifact from LA 86159.

Research Questions

Research problems as outlined in the data recovery plan (Post 1994a) focused on chronology, function, and subsistence production. Chronology will be addressed by comparing the pottery with other assemblages. One radiocarbon date was obtained from Area 2, Feature 2. Site function will be addressed with artifact and feature attribute and distribution data. A comparative study of pottery-firing features and other thermal features is presented later in this report. Subsistence production is addressed for Areas 2 and 5.

Chronology

The identification of three spatial and functional components at LA 86159 suggested that it had been occupied at least three times. Close proximity and the presence of Santa Fe Black-on-white pottery in Areas 1 and 5 suggested that they could be contemporaneous. Area 2 was separated from Areas 1 and 5 by 21 m and lacked pottery, which suggested that it was not contemporaneous. The absence of pottery and the thermal feature characteristics suggested a late Archaic period occupation, although radiocarbon dating proved differently.

All sherds recovered from Area 1, Feature 1, were Santa Fe Black-on-white bowl sherds. The seven partial vessels from Area 1, Feature 1, had similar fine-grained silty paste and they were self-tempered. The fine-grained, self-tempered paste that characterizes the sherds is suggested to have been most abundant in Pindi and Arroyo Hondo village assemblages between A.D. 1250 and 1325. The paste and temper are almost identical to pottery recovered from LA 84793, the other site with a good example of a pottery-firing feature. The A.D. 1250 to 1300 date for LA 86159 is based on the paste and temper characteristic and the absence of later pottery types, such as Pindi, Galisteo, or Wiyo Black-on-white.

Area 5 could be dated only by the associated Santa Fe Black-on-white pottery. Analysis revealed that the sherds recovered from Area 5 matched the vessels associated with Area 1, Feature 1. The dispersed distribution of the sherds within Area 5 suggest that they were naturally deposited and were not functionally associated with Feature 3. Therefore, Feature 3 cannot confidently be assigned a Coalition to early Classic period date. The scattered distribution of the artifacts suggests that Area 5 may result from many brief, small-scale occupations spread over a long period.

Other dating evidence for Area 2 is the strike-a-light flint. Strike-a-light flints have rarely been recovered from surface contexts of briefly occupied sites. There were no other artifacts present to suggest a historic period occupation for Area 2. Area 2 chipped stone displays an unusually high percentage of quartzite debitage. Other assemblages from Las Campanas with high quartzite percentages have been associated with Classic period occupations, such as LA 98688. Early historic period chipped stone assemblages are not well known for the Santa Fe area. Part of the dispersed artifact scatter may date to the early historic period.

Area 2 did not yield temporally diagnostic artifacts. Excavation of Feature 2 did yield sufficient charcoal for Accelerator Mass Spectrometer (AMS) dating. The juniper charcoal recovered during ethnobotanical analysis yielded a calibrated two-sigma, 95 percent probability date range of A.D. 1025 to 1275. This places occupation of Area 2 during the late Developmental or Coalition period, contradicting the initial assessment that Area 2, Feature 2, was a late Archaic logistical site.

Site Function

LA 86159 had three activity areas defined by artifact scatter limits and the remains of thermal features. Area 1, Feature 1, has been identified as a pottery-firing feature. It is compared with other pottery-firing features and thermal features in a later section of this report. It will not be further discussed except in the context of the overall site function profile. Areas 2 and 5 provide interesting contrasts in feature morphology and artifact type and attribute composition. These differences may relate to different activities that were conducted at the site.

Features 2 and 5 are dissimilar morphologically, which may reflect functional differences. Feature 2 was deflated so that its former shape can only be estimated. The cobble configuration and mottled charcoal-stained soil suggested that it was oval shaped and probably of shallow depth. The rocks within the feature are relatively equally spaced and do not make a platform, nor do they appear to have lined the feature. The use of rock and the size of the feature indicate that it was used for more than warmth. A large, open hearth could have been used to cook meat or other foods. Food may have been placed on top of rocks so that it could have been easily retrieved. Feature 5 lacked interior burned rock and the charcoal stain was amorphous and shallow, suggesting that it had been a surface fire. The lack of formal construction, its small size, and an absence of associated artifacts suggest that Feature 5 may have been used for warmth or as a single-night campfire.

Artifact assemblages from Areas 2 and 5 are very different in terms of artifact types and artifact type attributes. Chipped stone assemblages from both areas were dominated by core flakes. However, Area 5 had only core reduction debris, except for the strike-a-light flint. Area 2 had core reduction, biface reduction, and maintenance debris, and curated and discarded bifacial tool fragments. The low frequency of biface reduction debris relative to the number of biface fragments suggests that the biface fragments were brought to and not manufactured at the site. Area 2 assemblage has debris from maintenance and processing activities, as well as evidence of artifact curation. Tool manufacture and curation are characteristic of a logistically organized subsistence strategy with a wider array of artifact types resulting from more activities and perhaps longer length of occupation. Area 5 has an assemblage that reflects expedient core reduction and use of quartzite in the production of flakes. Quartzite was recovered from Las Campanas sites, but it was not common. The Area 5 assemblage is characteristic of a foraging strategy, such as might result from daily foraging and repeated visits to the site to procure raw materials.

LA 86159 is located at the transition between the broad ridge top and tablelands of the middle Arroyo Calabasas and Arroyo de los Frijoles drainages and the highly dissected uplands of the Alamo Creek drainage. From LA 86159, foraging or hunting parties could have exploited the resources of either drainage. Diurnal foraging is a strategy that was originally suggested for residents of Santa Fe River pueblos. Logistically organized forays are suggested for the more distant Classic period villages or for pre-Coalition period occupations. However, the radiocarbon date suggests that Coalition period populations used a logistical strategy to exploit the distant reaches of Alamo Creek and Arroyo Calabasas. The presence of a pottery-firing feature at LA 86159 suggests that diurnal foraging may have been bundled with other foraging activities. The process of pottery firing requires a day, leaving down time for gathering other resources before returning to the village.

CHAPTER 10
ESTATES VII EXCAVATIONS

The Estates VII excavations included three sites, LA 98680, LA 98688, and LA 98690. These sites were identified by OAS during the inventory of the southern and western portions of the Las Campanas project area. These were the last sites excavated on the property. LA 98688 and LA 98690 represented two of the most spatially extensive sites in the project area. LA 98680 was excavated in May 1993 (Post 1993a), LA 98690 was excavated in June 1994 (Post 1994a), and LA 98688 (Post 1994b) was excavated in September and October 1994.

LA 98680

Setting

LA 98680 was located at the western end of an east-west ridge that was bordered by the Arroyo Calabasas to the north and an unnamed, deeply entrenched arroyo to the south. The ridge top and slope was covered by dense to intermittent stands of piñon-juniper, sparsely distributed grasses, prickly pear cactus, narrow-leaf yucca, and mountain mahogany. The soil was unconsolidated sandy loam containing gravel and cobbles. The cobble concentration was in an area with low density gravel and cobbles. The site is not eroded and a general lack of ground cover resulted in a deflated surface.

Pre- and Post-Excavation Description

LA 98680 was an artifact scatter with a cobble concentration and a single cobble checkdam. The site covered 450 sq m. Most of the artifact concentration was confined to a 10-m-diameter area that included a roughly linear quartzite cobble concentration. The cobbles covered an area 4-by-2.75 m with a northwest-southeast orientation. The linear arrangement was irregular, and most of the cobbles were dispersed, suggesting that the concentration was dismantled and scattered. Twenty-five lithic artifacts were recorded or recovered from the surface and test pits within the 10-m-diameter lithic artifact concentration. Two Santa Fe Black-on-white bowl sherds from the same vessel were collected from east of the lithic artifact concentration.

Data recovery at LA 98680 more completely defined the limits and outline of the cobble concentration and recovered 127 chipped stone artifacts, one vesicular basalt mano, and two more pieces of a modified Santa Fe Black-on-white bowl sherd. The cobble concentration and artifacts are distributed across a 30 m north-south by 10 m east-west area (Fig. 10.1). The cobble concentration covered a 3.25 m north-south by 5 m east-west area. The cobbles roughly formed an oval outline that may be the dismantled foundation of a temporary structure.

Excavation Methods

Excavation concentrated on the artifact and cobble concentration. A 6-by-6-m area of 1-by-1-m units was placed across the artifact and cobble concentration. Each 1-by-1-m unit was excavated 10 cm. All the fill was screened through ¼-inch mesh. The fill was inspected for the remains of building material or refuse from processing activities. As the grids were excavated, a tally was kept of the artifact count from each unit.

The cobbles were left in place and mapped when all of the 1-by-1-m units were excavated. The 10-cm excavation level removed the soil to the base of or below most of the cobbles. No intramural evidence of construction was found. After the units were excavated, three 1-by-1-m units with low, medium, and high artifact counts were excavated 10 cm deeper. Grid 102N/97E contained the most cobbles and a high artifact density. It was excavated to determine if artifacts occurred below the cobbles. No cultural material was recovered from Level 2 within the three units, so excavation was stopped.

Recording and mapping methods followed those that were described in the data recovery plan (Post 1993:46-48).

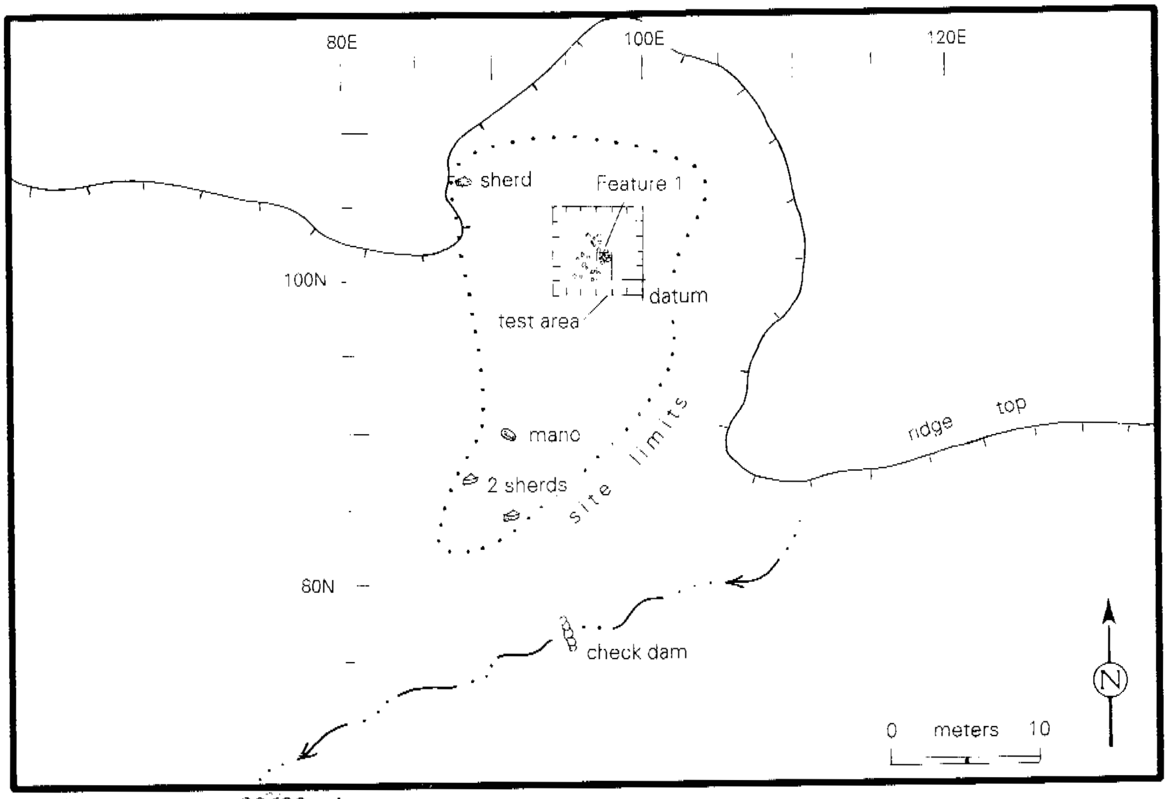

Figure 10.1. LA 98680, site map.

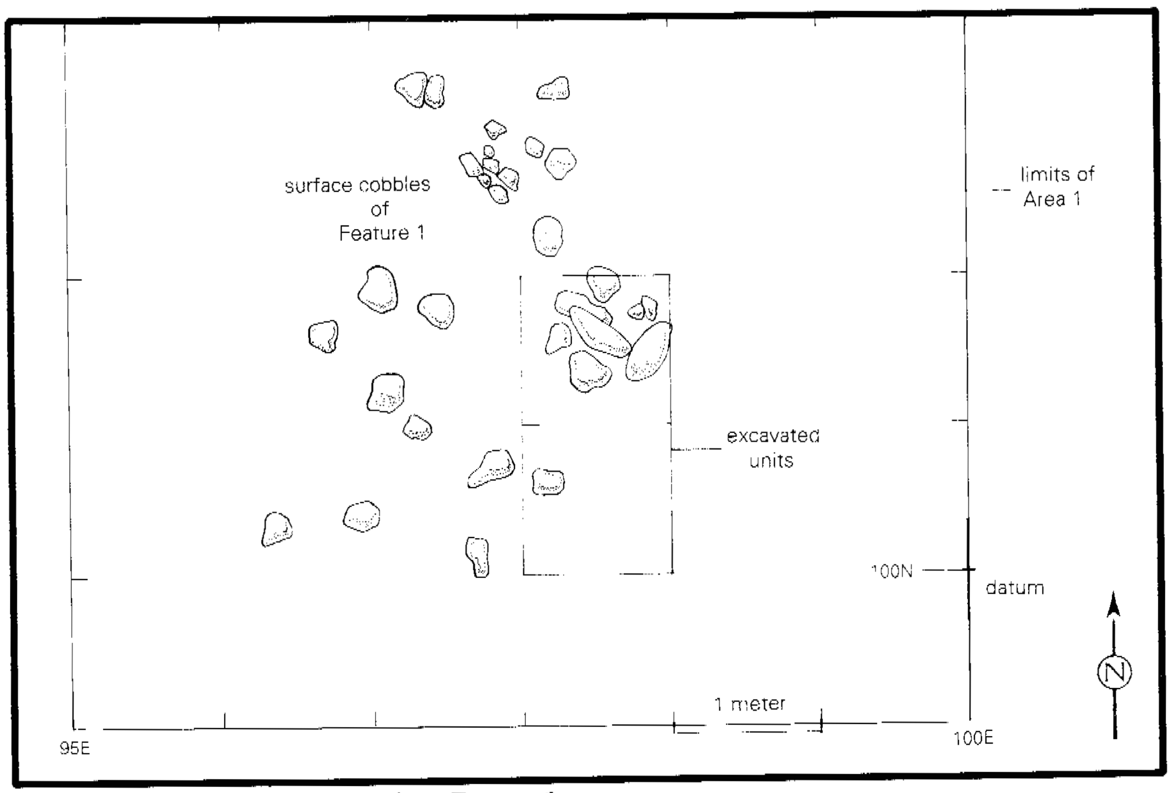

Figure 10.2. LA 98680, plan view, Feature 1.

Stratigraphy

The excavation area was located in a clearing surrounded by piñon-juniper trees with sparse bunch grass, yucca, and prickly pear cactus. The soil in this area is of the Pojoaque-Panky association, rolling. This association is typical of the Las Campanas ridge tops and slopes. The top soil is a Panky fine sandy loam (Folks 1975, map 39). The soil is mixed with abundant pea- to fist-size gravel and occasional quartzite and metamorphic cobbles. The soils were deflated and cut by numerous shallow erosion channels outside the excavation area.

Stratum 1 was a continuation of the Panky fine sandy loam top soil. The soil was dark brown (10YR 4/4, wet). The gravel was subrounded quartzite and metamorphic pebbles and angular indurated sandstone. Stratum 1 continued to 15 cm below the modern ground surface. The soil became more calcareous with depth. Cultural material was recovered from only the upper 5 cm of Stratum 1.

Feature Description

Feature 1 was the cobble concentration that covered approximately 15 sq m. The feature was suggested to be the foundation of a temporary structure or storage facility. The surface alignment was oriented northwest-southeast. Excavation revealed a more oval-shaped outline with a northeast-southwest orientation. The feature consisted of 39 quartzite or metamorphic cobbles that ranged in length from 8 to 40 cm and width from 5 to 30 cm. None of the cobbles were burned and no charcoal was found between or below the cobbles. The feature dimensions were 3.25 m north-south by 5 m east-west (Fig. 10.2). The feature fill was the same as Stratum 1. Artifact density tended to be higher in association with the cobbles.

Excavation did not yield additional construction evidence. There were no postholes or melted adobe from a jacal structure. A similar rock concentration was excavated at LA 12447 from the Cochiti Reservoir (Chapman et al. 1977:226-227). The feature from LA 12447 did not yield construction evidence and the cobbles were limited to a single level within 5 cm of the modern ground surface. Chapman and others (1977:226) suggest that the rubble was a stockpile for construction of a one-room structure similar to many others that occurred in the Cochiti Reservoir project area. No one-room Pueblo structures have been identified in the Las Campanas area. In fact no prehispanic Puebloan architectural features have been identified. There is no evidence to support the assumption that the feature was a storage facility. Therefore, a staged model of storage and transportation of gathered resources is not appropriate for interpreting the site function. Instead, it is possible that Feature 1 at LA 98680 was a temporary hunting shade or overnight structure used for diurnal or longer hunting and gathering forays. Discussion of Feature 1 and artifact associations will be presented in the Research Questions section.

The Artifact Assemblage

A total of 127 chipped stone artifacts, 1 ground stone artifact, and 3 Santa Fe Black-on-white sherds were recovered during the excavations. The chipped stone was concentrated around Feature 1. The Santa Fe Black-on-white pottery was located southwest of the concentration.

Pottery
by Steven A. Lakatos

Three Santa Fe Black-on-white sherds were recovered from the surface. Two body sherds appear to be from the same vessel based on similar surface and paste attributes, the third is a Santa Fe Black-on-white bowl rim.

All sherd exteriors are scraped smooth, exhibit striations, and have a medium polish. The bowl body sherds exhibit a gray, highly polished, floated interior. Pigment consists of a thick black organic paint. The bowl rim sherd also has a gray, highly polished, floated interior, but the pigment is thin and streaky. The rim is tapered, rounded, and undecorated. The paste of the bowl body sherds is hard, gray (7.5YR 6/0-5/0), and vitrified, with a fine sand and tuff temper. The paste of the rim sherd was not examined. Sand- and tuff-tempered Santa Fe Black-on-white pottery is rare on Coalition and early Classic period sites of the Las Campanas area.

The design layout on one of the bowl body sherds consists of a band of solid triangles perpendicular to hatched lines (similar to Stubbs and Stallings 1953, fig. 44I). The other bowl body sherd consists of two solid bands 10 mm and 15 mm wide and 15 mm apart. The design layout on the bowl rim consists of a encircling band that extends 7 mm below the rim. A solid band, diagonal to the rim, intersects with a hatched area.

All sherds display post-firing modifications. The bowl body sherds have two of their three edges ground flat and slightly rounded. The rim sherd also has two of three edges ground flat and slightly rounded with the addition of a drill hole 3 mm below the rim and slightly off-center. The perforation may have functioned as a repair hole prior to the sherd edges being ground or this sherd may have functioned as a pendant. Post-firing modifications are not common on Coalition period (A.D. 1175-1325) ceramics in the Las Campanas assemblage.

Chipped Stone
by Guadalupe A. Martinez

A total of 127 chipped stone artifacts were recovered from LA 98680. There were six artifact types represented in the assemblage. Table 10.1 shows the artifact type by material type distribution.

The chipped stone artifacts are debris from core reduction, biface manufacture, or tool maintenance. The raw materials reflect a use of local chert and quartzite.

Lithic Raw Material Selection. The chipped raw materials are chert and quartzite. Chert encompasses fine- to coarse-grained material that occurs in a wide range of colors. Fine- and medium-grained chert made up 79 percent of the assemblage. Fine-grained material dominated the assemblage (n = 58). Gray-red chert had 21 coarse-grained artifacts. They were the only artifacts of this texture. Color and texture were monitored to determine if cores and flakes could be matched by material type. The three cores in the assemblage were made of two of the material types, orange-red chert and black quartzite. Chert and quartzite occur throughout the Santa Fe formation gravel.

Debitage. Debitage from core reduction accounts for all of the chipped stone artifacts. The most common artifact type is the core flake (n = 100). Core flakes were made from all material types; miscellaneous chert totaled one-third and all other chert (from a minimum of seven cores) made up 49 percent of the core flake assemblage. Middle and late stages of core reduction are represented by the distribution of dorsal cortex percentages (Table 10.2). Sixty-eight core flakes (68 percent) lacked dorsal cortex, indicating that these flakes were removed from a core that had been extensively reduced. Twenty-two percent of the core flakes had between 10 and 50 percent dorsal cortex, again indicating that they were from cores that were being extensively reduced. The remaining 10 core flakes ranged from 70 to 100 percent dorsal cortex, suggesting that unmodified or minimally reduced raw material was transported to the site.

Fifty percent of the core flakes were whole; however, the full range of fragments was represented in the assemblage (Table 10.3). Equal or greater numbers of partial to whole core flakes is an indicator of middle or late stage core reduction. Platform types primarily reflect early and middle stage reduction; single-faceted and cortical platforms predominating (Table 10.4). Dorsal flake scars also reflect early and middle stage reduction; 80 percent of the core flakes exhibited three or fewer scars. The remaining 20 percent had between four and seven scars, suggesting that the cores they were detached from were extensively used. Whole core flake dimensions displayed differences between chert and quartzite (Table 10.5). The chert core flakes were small to medium in size with an average length of 25 mm, an average width of 24 mm, and an average thickness of 8 mm. The quartzite core flakes were massive in comparison, the average length was 52 mm, average width was 38 mm, and average thickness 15 mm. The marked difference in size reflects the size of the collected raw material or that chert and quartzite were reduced for different intended products. The difference may reflect production of chert flakes to be used as small hand tools, such as scrapers or blades. Quartzite may have been used to produce larger hand tools, such as choppers or heavy-duty scrapers.

There were five biface flakes, indicating limited formal tool production or maintenance. The biface flakes were of miscellaneous chert, strengthening the pattern of differential raw material use displayed by the core flakes. As would be expected, quartzite was not used in

Table 10.1. LA 98680, Artifact Type by Material Type

Count Row Pct Column Pct	Misc. Chert	Cream Chert	Orange- Red Chert	Gray- Red Chert	Gray Trans- lucent	Light Brown Quartzite	Gray- Brown Chert	Gray-Tan Quartzite	Black Quartzite	Row Total
Angular debris	5 26.3 11.6	1 5.3 12.5	1 5.3 6.3	7 36.8 29.2	1 5.3 50.0	1 5.3 16.7			3 15.8 18.8	19 15.0
Core flake	33 33.0 76.7	7 7.0 87.5	14 14.0 87.5	17 17.0 70.8	1 1.0 50.0	5 5.0 83.3	7 7.0 100.0	5 5.0 100.0	11 11.0 68.8	100 78.7
Biface flake	5 100.0 11.6									5 3.9
Undiff. core			1 100.0 6.3							1 .8
Unidirectional core									1 100.0 6.3	1 .8
Bidirectional core									1 100.0 6.3	1 .8
Column Total	43 33.9	8 6.3	16 12.6	24 18.9	2 1.6	6 4.7	7 5.5	5 3.9	16 12.6	127 100.0

Table 10.2. LA 98680 Core Flakes, Material Type by Dorsal Cortex

Count Row Pct Column Pct	Misc. Chert	Cream Chert	Orange- Red Chert	Gray- Red Chert	Gray Trans- lucent	Light Brown Quartzite	Gray- Brown Chert	Gray-Tan Quartzite	Black Quartzite	Row Total
0	28 41.2 84.8	5 7.4 71.4	4 5.9 28.6	11 16.2 64.7	1 1.5 100.0	3 4.4 60.0	4 5.9 57.1	4 5.9 80.0	8 11.8 72.7	68 68.0
10	2 22.2 6.1		5 55.6 35.7	1 11.1 5.9			1 11.1 14.3			9 9.0
20	1 33.3 3.0		1 33.3 7.1				1 33.3 14.3			3 3.0
30	1 33.3 3.0		1 33.3 7.1					1 33.3 20.0		3 3.0
40		1 25.0 14.3					1 25.0 14.3		2 50.0 18.2	4 4.0
50				2 66.7 11.8					1 33.3 9.1	3 3.0

Count Row Pct Column Pct	Misc. Chert	Cream Chert	Orange- Red Chert	Gray- Red Chert	Gray Trans- lucent	Light Brown Quartzite	Gray- Brown Chert	Gray-Tan Quartzite	Black Quartzite	Row Total
70				2 100.0 11.8						2 2.0
80		1 100.0 14.3								1 1.0
90			2 100.0 14.3							2 2.0
100	1 20.0 3.0		1 20.0 7.1	1 20.0 5.9		2 40.0 40.0				5 5.0
Column Total	33 33.0	7 7.0	14 14.0	17 17.0	1 1.0	5 5.0	7 7.0	5 5.0	11 11.0	100 100.0

Table 10.3. LA 98680 Core Flakes, Portion by Material Type

Count Row Pct Column Pct	Misc. Chert	Cream Chert	Orange- Red Chert	Gray- Red Chert	Gray Trans- lucent	Light Brown Quartzite	Gray- Brown Chert	Gray-Tan Quartzite	Black Quartzite	Row
Indeterminate Fragment	1 100.0 3.0									1 1.0
Whole	16 32.0 48.5	6 12.0 85.7	7 14.0 50.0	7 14.0 41.2		3 6.0 60.0	4 8.0 57.1	2 4.0 40.0	5 10.0 45.5	50 50.0
Proximal	3 21.4 9.1	1 7.1 14.3	2 14.3 14.3	2 14.3 11.8			2 14.3 28.6	2 14.3 40.0	2 14.3 18.2	14 14.0
Medial	3 27.3 9.1		2 18.2 14.3	4 36.4 23.5	1 9.1 100.0	1 9.1 20.0				11 11.0
Distal	9 47.4 27.3		2 10.5 14.3	3 15.8 17.6		1 5.3 20.0		1 5.3 20.0	3 15.8 27.3	19 19.0
Lateral	1 20.0 3.0		1 20.0 7.1	1 20.0 5.9			1 20.0 14.3		1 20.0 9.1	5 5.0
Column Total	33 33.0	7 7.0	14 14.0	17 17.0	1 1.0	5 5.0	7 7.0	5 5.0	11 11.0	100 100.0

Table 10.4. LA 98680 Core Flakes, Platform by Material Type

Count Row Pct Column Pct	Misc. Chert	Cream Chert	Orange- Red Chert	Gray- Red Chert	Gray Trans- lucent	Light Brown Quartzite	Gray Brown Chert	Gray-Tan Quartzite	Black Quartzite	Row
Cortical	10 47.6 30.3	1 4.8 14.3	1 4.8 7.1	2 9.5 11.8			5 23.8 71.4		2 9.5 18.2	21 21.0
Single Facet	8 20.5 24.2	5 12.8 71.4	7 17.9 50.0	4 10.3 23.5		3 7.7 60.0	2 5.1 28.6	4 10.3 80.0	6 15.4 54.5	39 39.0
Single Facet Abraded				1 100.0 5.9						1 1.0
Multifacet Abraded	1 100.0 3.0									1 1.0
Collapsed	1 16.7 3.0	1 16.7 14.3		4 66.7 23.5						6 6.0
Crushed	5 55.6 15.2		2 22.2 14.3	2 22.2 11.8						9 9.0
Absent	8 34.8 24.2		4 17.4 28.6	4 17.4 23.5	1 4.3 100.0	2 8.7 40.0		1 4.3 20.0	3 13.0 27.3	23 23.0
Column Total	33 33.0	7 7.0	14 14.0	17 17.0	1 1.0	5 5.0	7 7.0	5 5.0	11 11.0	100 100.0

Table 10.5. LA 98680 Whole Core Flake Dimensions

	Mean	Standard Deviation	Minimum	Maximum
All Core Flakes (N = 50)				
Length	30.68	16.73	10	88
Width	25.94	11.16	6	54
Thickness	9.24	4.85	3	24
Miscellaneous Chert (N = 16)				
Length	23.13	10.13	10	42
Width	20.94	9.14	9	42
Thickness	7.37	3.56	3	16
Cream Chert (N = 6)				
Length	21.33	6.77	11	29
Width	21.00	4.34	15	26

	Mean	Standard Deviation	Minimum	Maximum
Thickness	6.33	3.44	3	11
Orange-Red Chert (N = 7)				
Length	22.14	6.64	16	33
Width	15.29	6.68	6	28
Thickness	6.57	2.88	3	12
Gray-Red Chert (N = 7)				
Length	33.43	10.33	24	50
Width	30.57	4.93	20	35
Thickness	11.14	4.45	5	19
Light-Brown Quartzite (N = 3)				
Length	56.33	27.47	39	88
Width	37.67	4.93	32	41
Thickness	18.00	6.56	11	24
Gray-Brown Chert (N = 4)				
Length	25.50	5.00	19	31
Width	32.25	13.35	13	43
Thickness	8.25	3.69	4	13
Gray-Tan Quartzitic Sandstone (N = 2)				
Length	42.00	14.14	32	52
Width	35.50	2.12	34	37
Thickness	11.50	4.95	8	15
Black Quartzite (N = 5)				
Length	58.40	16.35	30	71
Width	40.40	10.74	25	54
Thickness	14.40	2.51	10	16

formal tool manufacture, since fine-grained chert was available and more suitable.

Cores. Three cores were recovered from LA 98680. FS 11 was a unidirectional core of black quartzite with 30 percent cortex and four dorsal scars. It measured 80 mm by 62 mm by 31 mm. FS 12 was a bidirectional core also made from black quartzite. It had 40 percent cortex, eight dorsal scars, and measured 87 mm by 68 mm by 67 mm. FS 20 was an undifferentiated core made of orange-red chert. This core had three dorsal scars and 30 percent cortex. It measured 33 mm by 31 mm by 20 mm. All three cores had less that 50 percent cortex indicating that they were substantially reduced. The chert core was small, suggesting it was exhausted. The larger size of the quartzite cores compares favorably with the core flake dimensions, indicating that quartzite was reduced for larger flakes and that it may have been available as larger-sized raw material.

Ground Stone Artifact

FS 32 was recovered from the surface to the south of Feature 1 and the lithic artifact concentration. It was a one-hand mano with an unusual form. It was made from scoriaceous basalt. It had an oval plan view and a bifurcated cross section. It measured 138 mm long by 96 mm wide by 57 mm thick. It exhibited minimal grinding wear, suggesting that it was a specialized tool used for purposes other than nut or seed grinding.

Research Questions

LA 98680 is an unusual site for the Las Campanas project because it has a chipped stone cluster spatially associated with the remains of a deflated and disarticulated cobble feature. Excavation of the cobble feature yielded no clues as to its construction or function. The 127 chipped stone artifacts indicate that core reduction resulted in the production of small to medium-sized chert core flakes and medium to large quartzite core flakes. This size differentiation suggests that tools were produced for different activities. The Santa Fe Black-on-white sherds were tuff-tempered, suggesting that the site was occupied during the early to middle A.D. 1300s.

The research questions focus on problems of chronology and site function. These problems are important for understanding the role played in prehistoric subsistence strategies by small sites that are distant from the Santa Fe River Valley villages. In order to interpret the site within the appropriate context, we must be reasonably certain that LA 98680 dates to the Coalition period. The presence of the cobble concentration and a differentiated chipped stone assemblage suggests that LA 98680 may have played a specialized role in Santa Fe River Valley subsistence strategies.

Chronology

Does the LA 98680 date to the Coalition period? Excavation of LA 98680 did not yield additional chronological information beyond the Santa Fe Black-on-white pottery. The Santa Fe Black-on-white pottery allows a broad date range of A.D. 1175 to 1400 to be assigned. The petrographic analysis of the pottery from LA 98680 identified fine sand temper. Tuff temper is increasingly more common in Santa Fe Black-on-white pottery produced during the early and middle A.D. 1300s (Lang and Scheick 1989; Habicht-Mauche 1993). This weak evidence suggests that LA 98680 may have been occupied during the height of the Pindi Pueblo occupation.

Site Function and Structure

What role did LA 98680 play in the economic organization of the Coalition-early Classic period Santa Fe River villages? Does the site structure reflect staging activities? These questions imply that different sites within the Las Campanas area played different roles in economic organization and subsistence strategies of the Santa Fe River villages. Topographic location, the presence of a cobble feature associated with a chipped stone concentration, the composition of the chipped stone assemblage, and distance from the Santa Fe River villages were characteristics suggesting a potentially unique function for LA 98680.

LA 98680 is near the end of an east-west ridge top that overlooks the Arroyo Calabasas. From this promontory there is an unobstructed view of the lower reaches of the Arroyo Calabasas drainage, the Cañada Ancha, and the Caja del Rio to the western edge of La Bajada. The location provides easy access to these areas and their natural resources. These topographic qualities would have made LA 98680 a good location for a limited base camp or staging area to support hunting and gathering.

Excavation of Feature 1 yielded limited evidence of construction or function. The chipped stone assemblage lacked functionally diagnostic tools, but displayed technological patterns that indirectly indicate the nature of the finished products. The spatial relationship between the cobble concentration (Feature 1) and the chipped stone artifacts suggests that they were contemporaneous and functionally related.

Based on size and subjective interpretation of morphology, Feature 1 may be the remains of a foundation for a temporary structure, such as a hunting blind. The structure shape may have been D-shaped with a northwest orientation. Based on the cobble alignments, interior space could have been 2 m northwest-southeast by 2.25 m northeast-southwest for 4.5 sq m of floor space. This small area would have provided shelter to one or two individuals. The absence of any hearths in or around Feature 1 suggests it was a shelter and not a habitation. Presence of an interior hearth is usually interpreted as indicating cool or cold weather occupation. The lack of a hearth or other domestic artifacts suggests the occupation was brief and mostly supported by durable or perishable gear (Binford 1979).

Expedient or situational tool production is indicated by a chipped stone assemblage that lacked formal tools (Kelly 1988; Binford 1979; Andrefsky 1994). Differential use of local lithic raw material for tool production is suggested by size differences in chert and quartzite. The absence of discarded tools could result from no tool use on site, low impact tool use that resulted in no recognizable edge damage, tools being transported off-site, or tools being removed from the site by subsequent site occupants.

Artifact distributions exhibit patterning that relate to number of occupations. Overall, the chipped stone assemblage is low in number, but the material type matching indicates that at least eight cores were partly reduced, and 34 percent miscellaneous chert indicate that even more cores were reduced. Miscellaneous local chert was recovered from 22 of the 36 excavation units and is scattered around Feature 1. Use of local chert may coincide with very brief, low-intensity use. By comparison, raw materials assigned to specific cores exhibit more patterned distribution. Cream-colored and gray-brown chert and light brown, black, and gray-tan quartzite are mostly restricted to the southern half of the excavation area. Orange-red chert is concentrated in the northern half of the excavation area. This distribution pattern could have resulted from two distinct occupations. Spatial structure as represented by the two distinct artifact distributions indicates planned activities, such as might be expected for a logistically organized subsistence strategy. Raw materials were brought to the site, systematically reduced to produce core flakes and perhaps core tools, and this location was repeatedly used.

Debitage attribute variability between material types may reflect technological organization. Raw materials used to produce the same tools should have resulted in similar by-products. In this assemblage there are differences in the debitage size and core flake dorsal scar counts.

Chert dimension ranges are much smaller than quartzite and consequently the standard deviations are also lower. Quartzite core flakes were much larger, have a wide size range, and standard deviation is consistently higher. These data suggest that chert and quartzite were used differently. These differences may relate to the production of different sized hand tools, though a lack of discarded tools makes it difficult to support this inference.

Dorsal scar count frequencies also seem to indicate differential raw material use. Figure 10.3 shows the dorsal scar count distribution by combined chert and quartzite classes. Chert shows a much higher proportion of artifacts with three or more dorsal scars than those with two or fewer dorsal scars. Quartzite shows the opposite pattern with a higher proportion of core flakes with two or fewer dorsal scars present. Dorsal scars are one indicator of reduction stage with more dorsal scars created as reduction progresses. Therefore, chert and quartzite were subject to different reduction strategies.

Core flake size and dorsal scar counts do show different reduction patterns for chert and quartzite. These differences may reflect production of different tools. The data can be used to suggest that differences may relate to production of different hand tools such as might have been needed to process wood or a range of plant materials.

The first three variables combine to suggest that LA 98680 was more than casually used to support hunting and gathering activities. The artifact clustering and attribute distribution suggest that planned activities occurred as part of a repeated occupation pattern. Planned or logistically organized activities would be expected if the distance to the resource was greater than the diurnal range or if the resource could not be transported long distances without interim processing. LA 98680 is 5.4 km (3.4 mi) from Pindi or Agua Fria Schoolhouse pueblos. Many sites are 5 km or farther from the pueblos, but they do not display the same material culture or spatial patterning. A 5-to-7-km diurnal radius has been suggested to be possible for the Santa Fe River villagers. This radius would operate under optimal conditions where distance to resource and portability of the resource were within energy thresholds. The location of LA 98680 at 5.4 km suggests that the resources were within or near the diurnal limit, but may not have been portable without an interim processing stage. A bulky resource such as wood might have required processing prior to transport. The absence of heavy-duty tools or possible wood-working tools makes this hypothesis tenuous. It is possible

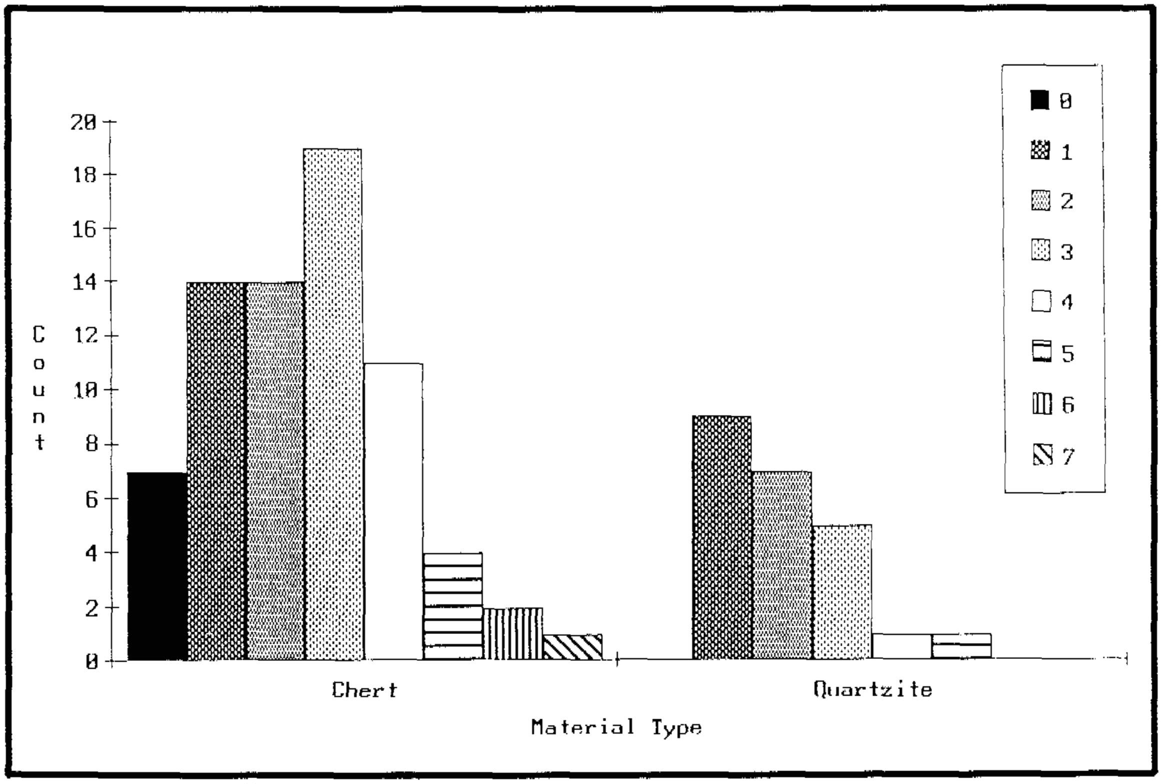

Figure 10.3. LA 98680, core flake dorsal scar counts.

that this was a strategy that was instituted late in the occupation of Pindi or Agua Fria Schoolhouse pueblos resulting in few comparable sites and a discontinuation of the strategy when the villages were abandoned.

Conclusions

Excavation of LA 98680 has shown that the site was occupied during the early to middle A.D. 1300s, when the Santa Fe River population was at its height. The date range is based on the presence of tuff temper in the Santa Fe Black-on-white pottery. Artifact, topographic, and geographic variables suggest that LA 98680 was repeatedly used for planned or staged activities, such as would result from a logistically organized strategy. Suitable raw materials for producing different sized tools were available and used. Distance from LA 98680 to the villages is within a diurnal range, but the artifact assemblage suggests that the site was used to pre-process the gathered material prior to transport. The lack of discarded expended or broken hand tools and the low frequency of chipped stone debris suggest this strategy was used sparingly.

LA 98688

Setting

LA 98688 was at an elevation of 2,015 m (6,610 ft) on flat to gently sloping tableland that covered the southern portion of the project. The tableland forms the divide between the Arroyo Calabasas and Cañada Ancha drainage basins. The ridge is the highest point between the southern boundary of the piedmont and the Santa Fe River Valley and La Cienega to the south and southwest, La Bajada and the Cochiti area to the west, the base of the Caja del Rio to the northwest, and the Cañada Ancha to the north. Two drainage swales or draws originate along the eastern boundary and to the west-southwest of the site. These draws eventually empty into the Arroyo Calabasas floodplain.

The soil was typical of the Pojoaque-Panky association, rolling, which was common on the

Las Campanas ridge tops and slopes. The topsoil was a Panky fine sandy loam (Folks 1975, map 39). The soil was mixed with abundant pea- to fist-size gravel and occasional quartzite and metamorphic cobbles. The soils were deflated and cut by numerous shallow erosion channels outside the excavation area.

This tableland is covered by an even distribution of piñon and juniper. The ground cover is sparse to moderate grama with cholla, prickly pear, barrel cactus, and yucca occurring in the more disturbed and deflated areas.

Pre- and Post-Excavation Description

LA 98688 is a large multicomponent sherd and lithic artifact scatter. The site covers 12,200 sq m or 1.2 ha (3 acres). The artifact scatter has a linear distribution. The surface sherds total between 300 and 500. Most of the sherds are in three concentrations. The lithic artifacts are more diffusely scattered and total between 50 and 100. Most of the sherds are from pottery types that date from A.D. 1325 to 1415 with a few pottery types that date from A.D. 1050 to 1150 and 1400 to 1500.

Two possible features, an ash stain and a cobble alignment, were observed at the site. An ash stain was located about 40 m to the north of the main artifact concentration. No artifacts were directly associated with either feature. Cultural affiliation and temporal determination could not be made from the surface evidence. A cobble alignment was located 15 m east of the main artifact concentration. The alignment was roughly L-shaped and may be a checkdam. Each perpendicular alignment was 1.5 to 2 m long.

Excavation of LA 98688 confirmed and refined the survey identification and preliminary interpretation. Reexamination of the site showed that the majority of the artifacts were concentrated within a 30-by-30-m area in the south one-quarter of the site. The remaining artifacts displayed a linear distribution with small, low artifact frequency concentrations located at 20 to 30 m intervals. The artifacts were distributed over a 180 m north-south by 75 m east-west area covering 12,650 sq m (Fig. 10.4). Excavation within the artifact concentration yielded 4,248 sherd and lithic artifacts. The pottery manufacture dates suggest many occupations occurred between A.D. 1100 and 1700. In addition to the pottery and chipped stone debris, a late Archaic projectile point and a fragment of a glass adornment were recovered, further emphasizing the palimpsest nature and potential temporal and functional complexity of the deposit. Two shallow, deflated soil stains were observed and may be the remains of surface hearths.

Excavation Methods

The excavation strategy followed the methods outlined in the data recovery plan (Post 1994b). The extent of the site area and location of artifact concentrations were determined by pinflagging all surface artifacts. A baseline for a 1-by-1-m grid system was established on a roughly north-south axis at 30 m intervals spanning the length of the site.

A 16-by-16-m area within the main artifact concentration (northeast corner Grid 162N/100E) was surface collected in 1-by-1-m units and the artifact counts plotted on a distribution map. The six units with the highest artifact counts were excavated to determine the depth of the cultural deposit in the concentration. Four 1-by-1-m units were placed in the corners of the 16-by-16-m area to define subsurface limits of the cultural deposit. The majority of artifacts recovered from these units were from the surface strip or Level 1 (0-10 cm below surface strip [bss]). Subsequent excavation focused on the upper level based on these results.

Surface-stripping began with the southwest 8-by-8-m quarter (northeast corner Grid 156N/92E) of the 16-by-16-m area. Surface-stripping removed the top 5 cm of soil, which was screened through ¼-inch steel mesh. This initial 8-by-8-m area was expanded to the north, east, and west by following the artifact counts. Eventually, a 14 m north-south by 18 m east-west area was completely surface-stripped. The artifact density distribution for the 14-by-18-m area was plotted and used to determine the placement of additional below surface excavation units.

Thirty-six units were excavated 10 cm below the surface strip across areas with the highest artifact densities. Ten of these units were excavated in two 5 cm levels to determine if artifacts were associated with the upper sandy loam or the lower consolidated clay loam. Few artifacts were recovered from the lower 5 cm, so it was assumed that artifacts were restricted to the upper

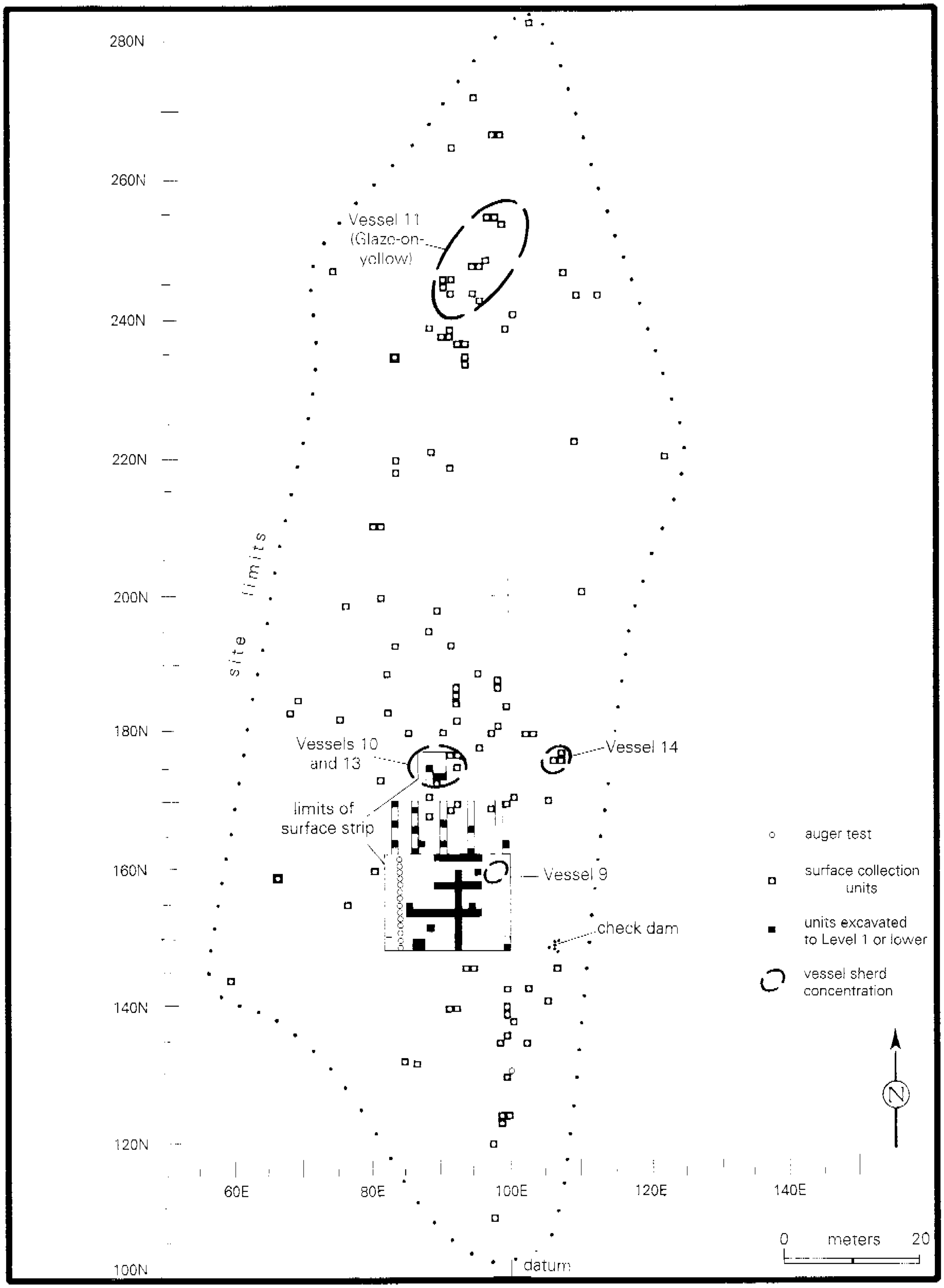

Figure 10.4. LA 98688, site map.

level. Generally, the Level 1 artifact type proportions reflected the surface-strip counts, but in lower numbers. Surface-strip units with the highest artifact counts usually yielded the most artifacts from Level 1.

Surface-strip and Level 1 excavation within the 14-by-18-m area revealed two small (15 cm diameter) soil stains that were less than 5 cm deep. These appeared to be the deflated remains of small, shallow hearths. No other soil staining or evidence of features was exposed. The excavation strategy assumed that the artifact concentration represented an eroded or deflated midden and that the associated structure or feature would be located in an area of low artifact density.

To further search for a structural or activity area, five 1-by-8-m units were excavated north from the Grid 162N line across an area that had low surface artifact counts. These 40 units were surface-stripped and 10 units were excavated 10 cm below the surface strip. No staining, charcoal, or other feature evidence was encountered. Auger tests were placed in the bottom of each Level 1 unit to explore for deep cultural deposits or unusual soils. These auger tests were bored to depths ranging from 20 to 50 cm below the modern ground surface. The auger tests did not yield evidence of a cultural deposit.

Additional auger tests were placed in the center of each grid along the Grid 85E line to the west of the densest portion of the artifact concentration. These tests were bored from 40 to 70 cm below the modern ground surface. Natural soil horizons were encountered, but there was no evidence of a buried cultural deposit.

Charcoal flecks were observed in Level 1 of Grid 149N/88E. Three contiguous units forming a 2-by-2-m area, including Grid 149N/188E, were excavated to search for additional charcoal or a charcoal-stained soil level. These units did not contain charcoal and yielded few or no artifacts.

A small sherd and chipped stone concentration was located 12 m north of the main concentration. A 4-by-4-m excavation area was demarcated with Grid 177N/91E as the northeast corner. All units were surface-stripped, yielding 75 sherds and 4 pieces of chipped stone. The three units with the highest artifact count from surface strip were excavated 10 cm bss. These subsurface units did not yield evidence of features or a buried cultural deposit, so no further work was conducted in this area.

Stratigraphy

Six soil layers were identified by excavation and auger testing. Stratigraphic descriptions are based on grid excavations to 30 cm below the modern ground surface and auger tests for deeper observations. The upper 15 to 40 cm of soil consisted of brown to light brown sandy loam with 2 to 5 percent gravel and a low calcareous content (Stratum 1). Only 5 five to 10 flecks of charcoal were noted in this upper layer throughout the excavation area. From 15 to 30 cm below the modern ground surface (bmgs) in the northeast three-quarters of the excavation area, there was a compacted, block clay loam with less than 2 percent gravel and low calcareous content (Stratum 2). This layer rarely contained artifacts, but one of the 15 cm diameter soil stains was embedded within it. This suggests that the clay-loam was below the prehistoric occupation surface. In the southwest one-quarter of the excavation area the clay-loam layer was replaced by the light brown sandy loam that is 15 to 30 cm thick (Stratum 3). Stratum 2 and Stratum 3 were on top of a 20 to 30 cm thick layer of sandy clay loam that was slightly blocky, moderately calcareous, and contained 2 to 5 percent gravel (Stratum 4). This layer lacked any evidence of a cultural deposit. From 50 to 70 cm bmgs was a light yellow brown fine sandy loam that had less than 2 percent gravel and was moderately calcareous (Stratum 5). This layer was of unknown thickness, but it was clearly below the prehistoric occupation. Stratum 6 was encountered in the auger test near the checkdam. Between 70 and 100 cm below the modern ground surface there was a light pale brown fine sand. This layer did not contain cultural material and was well below the prehistoric occupation.

Artifact Assemblage

Pottery
by Steven A. Lakatos

A total of 3,115 pottery sherds were recovered from the site surface and excavation of Area 1. The ceramic assemblage is comprised of pottery types that were manufactured, used, and exchanged throughout the Northern Rio Grande between A.D. 1050 and 1700 (Fig. 10.5). Table

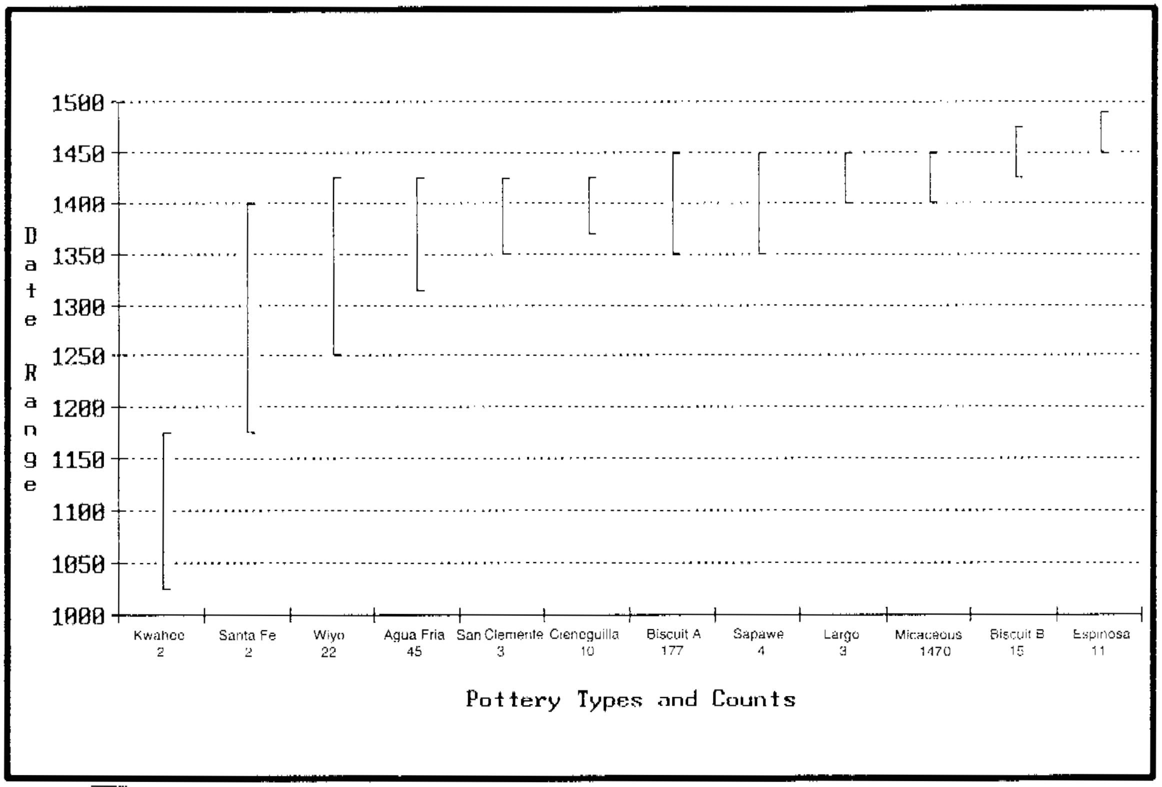

Figure 10.5. LA 98688, pottery type manufacture dates.

Table 10.6. LA 98688 Ceramic Types, Manufacture Dates, and References

Type	Date	Reference
Sapawe Micaceous	A.D. 1350-1450	Fallon and Wening (1987), Shepard (1936), Mera (1935), Stubbs and Stallings (1953), Warren (1979a)
Smeared, Indented, Corrugated, Micaceous	A.D. 1400-1500	McKenna and Miles (1990), Mera (1935)
Kapo	A.D. 1650-present	Shepard (1936), McKenna and Miles (1990), Mera (1935), Sundt (1987)
Kwahe'e Black-on-white	A.D. 1025-1175	Habicht-Mauche (1993), McKenna and Miles (1990), Mera (1935), Sundt (1987), Warren (1979a)
Santa Fe Black-on-white	A.D. 1175-1325	Kidder and Amsden (1931), Breternitz (1966), Habicht-Mauche (1993), McKenna and Miles (1990), Mera (1935), Stubbs and Stallings (1953), Sundt (1987), Warren (1979a)
Pindi Black-on-white	A.D. 1300-1400	Breternitz (1966), Habicht-Mauche (1993), Stubbs and Stallings (1953), Sundt (1987)
Wiyo Black-on-white	A.D. 1250-1425	Kidder and Amsden (1931), Breternitz (1966), Habicht-Mauche (1993), McKenna and Miles (1990), Mera (1935), Stubbs and Stallings (1953), Sundt (1987), Warren (1979a)
Abiquiu Black-on-gray (Biscuit A)	A.D. 1350-1450	Kidder and Amsden (1931), Breternitz (1966), Fallon and Wening (1987), Habicht-Mauche (1993), McKenna and Miles (1990), Sundt (1987), Warren (1979a)
Bandelier Black-on-gray (Biscuit B)	A.D. 1425-1475	Kidder and Amsden (1931), Breternitz (1966), Fallon and Wening (1987), McKenna and Miles (1990), Sundt (1987), Warren (1979a)

Type	Date	Reference
Glaze A Red Agua Fria Glaze-on-red	A.D. 1315-1425	Habicht-Mauche (1993), Shepard (1936), McKenna and Miles (1990), Mera (1933), Sundt (1987), Warren (1976, 1979a)
Glaze A Yellow Cieneguilla Glaze-on-yellow	A.D 1370-1425	Habicht-Mauche (1993), Shepard (1936), McKenna and Miles (1990), Mera (1933), Sundt (1987), Warren (1976, 1979a)
San Clemente Glaze poly-chrome	A.D. 1350-1425	Habicht-Mauche (1993), Shepard (1936), McKenna and Miles (1990), Mera (1933), Sundt (1987), Warren (1976, 1979a)
Glaze B Yellow Largo Glaze-on-yellow	A.D. 1400-1450	Habicht-Mauche (1993), Shepard (1936), McKenna and Miles (1990), Mera (1933), Sundt (1987), Warren (1976, 1979a)
Glaze C polychrome Espi-nosa Glaze polychrome	A.D. 1450-1490	Habicht-Mauche (1993), Shepard (1936), McKenna and Miles (1990), Mera (1933), Sundt (1987), Warren (1976, 1979a)

10.6 lists the formal type names, the accepted manufacture dates, and the major references used to identify and characterize the types. This ceramic analysis will focus on typological, technological, and functional variability through time and across traditions. The analysis is divided into a general and detailed studies. The general analysis was conducted for the whole assemblage while the detailed analysis focused on a sample of sherds selected for their potential to provide information on the site and regionally specific research questions.

General Analysis

All 3,115 sherds recovered from LA 98688 were initially sorted by pottery type and vessel form and portion. The sherds within each sorted category were counted and weighed. Based on the initial sort, the assemblage could be separated into utility wares, white wares, and glaze wares. A fourth category includes historic pottery and sherds that could not be assigned to a formal ware. Within these wares, formal types and sorting categories were assigned. Frequencies of formal types tend to be low because of the predominance of small sherds, as evidenced by an average weight of 0.6 g per sherd. Small sherd size also contributes to the relatively high percentage of pottery assigned to the indeterminate vessel form category. Table 10.7 shows the distribution of wares by vessel form and portion.

A total of 1,525 utility ware jar sherds were recovered. Of these, 1,489 were micaceous and 36 were nonmicaceous. Micaceous pottery types include Smeared Indented corrugated (1,485 sherds) and Sapawe Micaceous (4 sherds). Nonmicaceous pottery includes small quantities of corrugated, clapboard, incised corrugated, and smeared indented corrugated varieties. The high frequency of micaceous utility ware pottery is to be expected based on the decorated pottery types recovered.

A total of 420 white ware bowl and jar sherds were recovered. Pottery types include Kwahe'e Black-on-white, Santa Fe Black-on-white, Pindi Black-on-white, Wiyo Black-on-white, Biscuit A, Biscuit B, and a transitional Wiyo/Biscuit A. The transitional Wiyo/Biscuit A sherds displays characteristics of both types and were assigned to the undifferentiated organic white category. Table 10.8 shows the distribution of white wares by vessel form and portion.

A total of 1,050 glaze ware bowl and jar sherds were recovered. Glaze A types include Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, and San Clemente Glaze-on-polychrome. Glaze B and C types include Largo Glaze-on-yellow and Espinosa Glaze-on-polychrome. Portions of bowls and jars that could not be assigned to a formal type were placed in sorting categories based on slip color. Table 10.9 shows the distribution of glaze wares by vessel form and portion.

A total of 120 bowl and jar sherds were placed in the miscellaneous ware group. A Kapo gray bowl (six sherds) is the only formal type defined in this group. The remaining 114 sherds are placed in two sorting categories, plain polished brown and plain polished gray. The plain polished brown category includes 5 bowl bodies, 1 jar rim, 26 jar bodies and 10 indeterminate sherds. The plain polished gray category includes 1 bowl rim, 23 bowl bodies, 3 jar rims, 38 jar bodies, and 7 indeterminate sherds. These sherds are undecorated and display a moderate to high polish on the interior or exterior surfaces.

Table 10.7. LA 98688 Ceramic Ware Groups by Vessel Form and Portion

Count Row Pct Column Pct	Utility Ware		White Ware		Glaze Ware		Other		Row Total	Wt Total
	Cnt	Wt	Cnt	Wt	Cnt	Wt	Cnt	Wt		
Indeterminate	5 2.4 .3	5 2.2 .3	44 21.4 10.5	57 25.1 4.0	145 70.4 13.8	151 66.3 6.1	12 5.8 10.0	15 6.4 5.7	206 6.6	228 4.1
Bowl rim			21 42.9 5.0	82 42.1 5.8	24 49.0 2.3	107 54.5 4.3	4 8.2 3.3	7 3.4 2.6	49 1.6	196 3.5
Bowl body			341 47.0 81.2	1245 58.3 88.0	354 48.8 33.7	795 37.2 32.1	30 4.1 25.0	95 4.5 37.1	725 23.3	2136 38.0
Jar rim	27 61.4 1.8	47 35.0 3.2			13 29.5 1.2	78 58.4 3.1	4 9.1 3.3	9 6.6 3.4	44 1.4	133 2.4
Jar body	1493 72.3 97.9	1424 49.7 96.5	9 .4 2.1	21 .7 1.5	499 24.2 47.5	1296 45.3 52.3	64 3.1 53.3	121 4.2 47.0	2065 66.3	2862 50.9
Undiff. rim			5 19.2 1.2	9 12.3 .6	15 57.7 1.4	52 72.4 2.1	6 23.1 5.0	11 15.3 4.3	26 .8	72 1.3
Column Total	1525 49.0	1476 26.2	420 13.5	1415 25.1	1050 33.7	2479 44.1	120 3.9	257 4.6	3115	5626

Table 10.8. LA 98688 White Wares by Vessel Form and Portion

Count Row Pct Column Pct	Undecorated White Ware	Organic/ White Undiff.	Mineral/ White Undiff.	Biscuit Ware Undiff.	Kwahe'e B/w	Santa Fe B/w	Pindi B/w	Wiyo B/w	Biscuit A	Biscuit B	Row Total
Indeter-minate	40 90.9 40.4			4 9.1 18.2							44 10.5
Bowl rim		8 38.1 10.3				1 4.8 50.0		5 23.8 22.7	7 33.3 4.0		21 5.0
Bowl body	52 15.2 52.5	68 19.9 87.2		17 5.0 77.3			1 .3 100.0	17 5.0 77.3	170 49.9 96.0	16 4.7 100.0	341 81.2
Jar body	3 33.3 3.0	2 22.2 2.6	1 11.1 100.0		2 22.2 100.0	1 11.1 50.0					9 2.1
Undiff. rim	4 80.0 4.0			1 20.0 4.5							5 1.2
Column Total	99 23.6	78 18.6	1 .2	22 5.2	2 .5	2 .5	1 .2	22 5.2	177 42.1	16 3.8	420 100.0

Table 10.9. LA 98688 Glaze Ware Types by Vessel Form and Portion

Count Row Pct Column Pct	Glaze Un-diff.	Glaze Red Undiff.	Glaze Yellow Undiff.	Glaze Poly. Undiff.	Agua Fria G/red	Ciene-guilla G/ yellow	San Cle-mente G/poly.	Largo G/ yellow	Esp-inosa G/poly.	Row Total
Indeter-minate	71 49.0 73.2	33 22.8 13.8	32 22.1 5.4	1 .7 1.9	8 5.5 17.4					145 13.8
Bowl rim			4 16.7 .7	1 4.2 1.9	1 4.2 2.2	8 33.3 80.0	1 4.2 33.3	3 12.5 100.0	6 25.0 54.5	24 2.3
Bowl body	10 2.8 10.3	16 4.5 6.7	286 80.8 48.6	35 9.9 67.3	6 1.7 13.0	1 .3 10.0				354 33.7
Jar rim	1 7.7 1.0	10 76.9 4.2	1 7.7 .2			1 7.7 10.0				13 1.2
Jar body	13 2.6 13.4	178 35.7 74.2	260 52.1 44.2	15 3.0 28.8	31 6.2 67.4		2 .4 66.7			499 47.5
Undiff. rim	2 13.3 2.1	3 20.0 1.3	5 33.3 .9						5 33.3 45.5	15 1.4
Column Total	97 9.2	240 22.9	588 56.0	52 5.0	46 4.4	10 1.0	3 .3	3 .3	11 1.0	1050 100.0

The LA 98688 ceramic assemblage is comprised of utility ware jars, white ware bowls and jars, and glaze ware bowls and jars. The ratio of count to weight shows that the utility wares are friable and the most susceptible to post-abandonment processes while the white wares are the most durable of the ware groups. Decorated bowls are 86 percent of the white wares while glaze wares occurred in roughly equal percentages of bowls (36 percent) and jars (49 percent).

Bowl forms dominated the white ware assemblages during the late Coalition periods. Decorated jars, which were rare before the early Classic period, were revived with glaze-paint pottery production. This revival may reflect expanding socio-economic needs.

Detailed Analysis

A total of 617 sherds representing a minimum of 21 vessels were selected for the detailed analysis. This sample represents 20 percent of the total assemblage by count and 50 percent of the total assemblage by weight. The detailed analysis focused on pottery type, vessel form and portion, paste characteristics, rim form, post-firing modification, use wear, and interior and exterior surface condition.

Rim sherds, sherds 2 cm or greater, and sherds that displayed post-firing modification were selected for the detailed analysis. Pottery which fit these criteria was expected to have the most potential for answering research questions. Sherds were sorted, weighed and placed in ware groups as defined in the general analysis.

The detailed analysis identified additional formal pottery types that were not identified during the general analysis. These types were recorded within the white and glaze ware categories. Table 10.10 shows the distribution of ware by vessel form and portion.

Utility wares. A total of 59 jar sherds or 4 percent of all utility wares were selected. Portions of two vessels were identified, including a Sapawe Micaceous vessel (Vessel 19) and a corrugated micaceous vessel (Vessel 20). Utility ware sherds not assigned to a vessel include two nonmicaceous clapboard corrugated sherds and three smeared indented corrugated sherds.

Vessel 19, Sapawe Micaceous, represented by 21 rim and 20 body sherds, closely corresponds to the descriptions provided in Habicht-Mauche

Table 10.10. LA 98688 Detailed Analysis, Vessel Form and Portion by Ware

Count Row Pct Column Pct	Utility Ware	White Ware	Glaze Ware	Other	Row Total
Indeterminate		6 26.1 3.0	13 56.5 4.0	4 17.4 12.1	23 3.7
Bowl rim		23 43.4 11.4	26 49.1 8.0	4 7.5 12.1	53 8.6
Bowl body		153 58.6 79.3	103 39.5 31.0	5 1.9 15.2	261 42.3
Jar rim	25 55.6 42.4	1 2.2 .5	13 28.9 4.0	6 13.3 18.2	45 7.3
Jar body	34 15.7 57.6	7 3.2 3.5	164 75.6 50.8	12 5.5 36.4	217 35.2
Indeterminate rim		3 16.7 1.5	13 72.2 4.0	2 11.1 6.1	18 2.9
Column Total	59 9.6	193 31.3	332 53.8	33 5.3	617 100.0
Count Percent*	59 4.0	193 46.0	332 32.0	33 28.0	617 20.0

* in detailed analysis

(1993) and Mera (1935). It has a black, friable paste and is tempered with crushed igneous rock and mica. The surface is smoothed with horizontal coil junctures visible.

Vessel 20, corrugated micaceous, represented by 4 rim and 9 body sherds, also has a black, friable paste, but is tempered with quartz and mica. The surface is smeared with corrugated impressions visible.

Traditionally, utility wares have been associated with domestic activities such as cooking and food preparation. The presence of utility wares at this site suggests it was occupied for a long enough period of time or frequently enough that food preparation was necessary.

White Wares

A total of 193 white ware sherds or 46 percent of all white wares were selected. Portions of six vessels were identified, including a Wiyo Black-on-white vessel (Vessel 3), a transitional Wiyo/Biscuit A (Vessel 5), an undifferentiated organic white ware vessel (Vessel 6), and two Biscuit A vessels (Vessels 7 and 8). Table 10.11 shows the distribution of vessel forms and portions by vessel.

Vessel 3, a Wiyo Black-on-white bowl, is represented by 12 sherds. The paste is soft, light gray to gray in color (7.5YR 7/0-5-0), fine grained, and is tempered with glassy pumice. The exterior of the vessel is smoothed with pitting visible, while the interior is polished displaying a greenish colored, floated slip. Rim wear was recorded on one sherd suggesting use prior to deposition.

Vessel 5, a transitional Wiyo/Biscuit A, is represented by 23 sherds. The paste is soft, light gray (7.5YR 7/0), fine to medium grained, and is tempered with glassy pumice. The exterior is lightly slipped and polished near the rim and

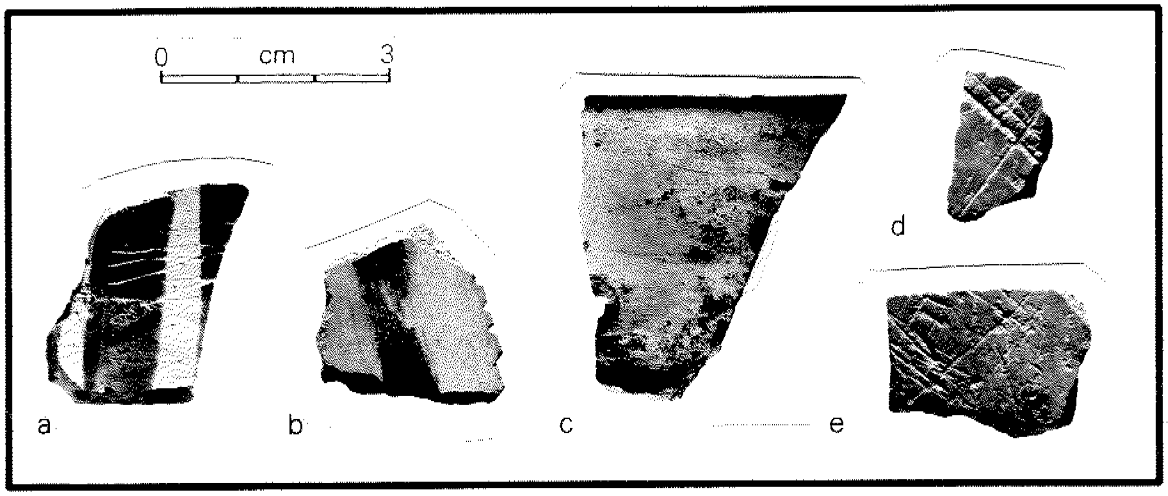

Figure 10.6. LA 98688 pottery.

Table 10.11. LA 98688 Detailed Analysis, White Ware Vessel Form and Portion by Vessel

Count	Wiyo B/W (Vessel 3)	Transitional Wiyo-Biscuit A (Vessel 5)	Organic White Undiff. (Vessel 6)	Biscuit A-1 (Vessel 7)	Biscuit A-2 (Vessel 8)	Row Total
Indeterminate		1				1 1.0
Bowl rim	6	6			2	14 13.9
Bowl body	6	16	6	7	51	95 85.1
Column Total	12 11.9	23 22.8	6 5.9	7 6.9	53 52.5	101 100.0

Table 10.12. LA 98688 Detailed Analysis, Nonvessel White Ware Types by Vessel Form and Portion

Count	Undecorated WW	Organic WW Undiff.	Mineral WW Undiff.	Biscuit Ware Undiff.	Kwahe'e B/W	Santa Fe B/W	Wiyo B/W	Biscuit A	Biscuit B	Row Total
Indeterminate	5									5 5.4
Bowl Rim	1					1	2	5		9 9.8
Bowl Body	7	11		8			1	33	7	67 72.8
Jar Rim								1		1 1.1
Jar Body	1	2	1		2	1				7 7.6
Indeterminate Rim	2			1						3 3.3
Column Total	16 17.4	13 14.0	1 1.1	9 9.8	2 2.2	2 2.2	3 3.3	39 42.4	7 7.6	92 100.0

smoothed on lower portions. The interior surface displays a thin white to greenish gray polished slip.

A variety of post-firing modifications are exhibited by this vessel. The edges of two sherds are ground and beveled, the interior surface of one sherd has numerous parallel striations that penetrate the slip (Fig. 10.6a), and one rim sherd is serrated (Fig. 10.6b). Extensive post-firing modification is evidence that vessels brought to the site were already heavily used or partial vessels were used secondarily as scrapers or dippers.

Vessel 6, an undifferentiated white ware bowl, is represented by six sherds. The past is soft, light gray in color (7.5YR 7/0), fine grained, and is self-tempered with tuff and pumice. The exterior of the vessel is smoothed. The interior surface displays a polished pearly white to off-white slip. The edges of two sherds are ground and rounded, suggesting portions of this vessel were utilized for activities unrelated to its original function.

Vessels 7 and 8, Biscuit A bowls, are represented by 7 and 53 sherds, respectively. Vessel 7 has a soft, light brown (10YR 5/2), fine-grained paste, and is self-tempered with tuff and pumice. The exterior of the vessel is smoothed with pitting visible, while the interior is polished displaying a thick white slip.

Vessel 8 has a soft, dark gray (7.5YR 4/0) exterior and a light brown (10YR 5/2) interior, fine to medium paste, and is self-tempered, similar to Vessel 7. The exterior of the vessel is smoothed with pitting visible, while the interior is polished, displaying a thick white slip. The rim form and decoration of this vessel is similar to Glaze B and Glaze C pottery being produced during the early Classic period. This similarity may reflect the strong influence of glaze ware pottery styles during this period.

Ninety-two sherds were not assigned to a vessel. Bowl sherds are 83 percent and jar sherds 9 percent of the white wares not attributable to a specific vessel. Formal pottery types identified include two Kwahe'e Black-on-white sherds, two Santa Fe Black-on-white sherds, and seven Biscuit B sherds. Sorting types identified include 16 undecorated white ware sherds, 12 undifferentiated organic white ware sherds, one undifferentiated mineral white ware sherd, and nine undifferentiated Biscuit ware sherds. Table 10.12 shows the distribution of vessel forms and portion by formal types and sorting categories.

Glaze wares. A total of 332 glaze ware sherds or 32 percent of all glaze wares were selected. Portions of 11 vessels were identified, including an Agua Fria Glaze-on-red vessel (Vessel 1), a Cieneguilla Glaze-on-polychrome vessel (Vessel 2), a San Clemente Glaze-on-polychrome vessel (Vessel 9), an undifferentiated glaze-on-polychrome vessel (Vessel 10), an Espinosa Glaze-on-polychrome vessel (Vessel 13), three Cieneguilla Glaze-on-yellow vessels (Vessels 15, 17, and 18), a Largo Glaze-on-polychrome vessel (Vessel 16), and two undifferentiated glaze-on-yellow vessels (Vessels 11 and 21). Table 10.13 shows the distribution of vessel form and portion by vessel.

Vessel 1, an Agua Fria Glaze-on-red jar, is represented by 57 sherds. This vessel exhibits a Glaze A rim style, which is direct, parallel, and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, light gray (7.5YR 7/0) to light red (2.5YR 6/6-6/8) in color, medium grained, and is tempered with augite latite. The exterior of the vessel is slipped red and polished. The interior of the neck is also slipped red and polished while lower portions are only smoothed.

Vessel 2, a Cieneguilla Glaze-on-polychrome jar, is represented by 22 sherds. This vessel exhibits a Glaze A rim style, which is direct, parallel and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, light gray (7.5YR 7/0) to light red (2.5YR 6/6-6/8) in color, medium grained, and is tempered with San Felipe basalt. The exterior of the vessel is slipped red and polished from the rim to the shoulder where it is then slipped white, polished, and decorated with black glaze paint. The interior of the neck is also slipped red and polished while lower portions are only smoothed. The exterior of the vessel is abraded, suggesting that it may have been used for purposes other than storage.

Vessel 9, a San Clemente Glaze-on-polychrome bowl, is represented by 9 sherds. This vessel exhibits a Glaze A rim style which is direct, parallel, and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard and friable, light tan (5YR 8/2-7/2) in color, fine to medium grained, and tempered with hornblende latite. The interior and exterior surface finish of all sherds display varying degrees of exfoliation. Both surfaces exhibit a well polished, creamy pink colored slip, pendant to the rim, and a thick red slip on lower portions of the vessel. Black glaze paint separates the slip

Table 10.13. LA 98688 Detailed Analysis, Glaze Ware Vessels by Form and Portion

Count	Agua Fria Glaze/Red (Vessel 1)	Cieneguilla Glaze/poly (Vessel 2)	San Clemente Glaze/poly (Vessel 9)	Glaze/ Poly (Vessel 10)	Glaze-yellow (Vessel 11)	Espinosa Glaze/Poly (Vessel 13)	Cieneguilla Glaze/ yellow (Vessel 15)	Largo Glaze/Poly (Vessel 16)	Cieneguilla Glaze/ yellow (Vessel 17)	Cieneguilla Glaze/ yellow (Vessel 18)	Glaze/ yellow (Vessel 21)	Row Total
Indeter-minate			2			1		1		1		5 2.0
Bowl Rim			4			8	5	3	3			23 9.4
Bowl Body			1	11	9	14	19	3	2			59 24.1
Jar Rim	8	2								2		12 4.9
Jar Body	48	17								60	9	134 54.78
Indeter-minate Rim	1	3	2			2				4		12 4.9
Column Total	57 23.3	22 9.0	9 3.7	11 4.5	9 3.7	25 10.2	24 9.8	7 2.9	5 2.0	67 27.3	9 3.7	245 100.0

colors.

Vessel 10, an undifferentiated glaze polychrome bowl, is represented by 11 sherds. This vessel has a Glaze A rim style, which is direct, parallel and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, light gray (7.5YR 6/0-5/0) and light red near the exterior (2.5YR 6/6-6/8), medium grained, and tempered with basalt. The exterior surface is undecorated and displays a well-polished red slip. The interior surface is also undecorated and displays a well-polished, creamy white slip. This vessel probably represents a Cieneguilla Glaze-on-polychrome bowl however, it is undifferentiated based on the lack of decoration.

Vessel 11, an undecorated, glaze yellow bowl, is represented by nine body sherds. The paste is hard, fine, light gray (7.5YR 7/0), and is tempered with hornblende latite. The exterior and interior of the vessel are slipped and well polished.

Vessel 13, an Espinosa Glaze-on-polychrome bowl, is represented by 25 sherds. This vessel exhibits a Glaze C rim style, which is beveled, slightly concave, with a high carina, and decorated with brownish black glaze paint (McKenna and Miles 1990; Mera 1933). The paste is hard, gray (7.5YR 6/0-5/0) in color, medium grained, and is tempered with augite latite. The interior and exterior of the vessel exhibits a well-polished white slip that displays various shades of gray. A brownish black glaze paint is evident on both surfaces.

Vessels 15 and 17, Cieneguilla Glaze-on-yellow bowls, are represented by 24 and 5 sherds respectively. Vessel 15 exhibits a Glaze A rim style, which is direct, parallel, and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, light red (2.5YR 6/6-6/8), medium grained, and is tempered with augite latite. The exterior and interior of the vessel are slipped creamy yellow and polished. The surface treatment on 46 percent of sherds from this vessel are exfoliated. The interior surface of three sherds exhibit abrasion, suggesting use prior to deposition.

Vessel 17 exhibits a Glaze A rim style, which is direct, parallel, and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, gray to dark gray (7.5YR 6/0-4/0), medium grained, and is tempered with augite latite. The exterior and interior surface treatments are intact and exhibit a creamy yellow, well-polished slip. Rim wear was recorded on one sherd.

Vessel 16, a Largo Glaze-on-polychrome bowl, is represented by seven sherds. This vessel exhibits a Glaze B rim style, which is thick and flat (McKenna and Miles 1990; Mera 1933). The paste is hard, gray (7.5YR 6/0-5/0) and light red near the exterior (2.5YR 6/6-6/8), medium grained, and is tempered with augite latite. The interior and exterior of the vessel are slipped white, displaying varying shades of gray, and well polished. Both surfaces exhibit a brownish black glaze paint.

Vessel 18, a Cieneguilla Glaze-on-yellow jar, is represented by 67 sherds. This vessel exhibits a Glaze A rim style, which is direct, parallel, and slightly convex (McKenna and Miles 1990; Mera 1933). The paste is hard, light gray to gray (7.5YR 6/0-4/0) in color, medium grained, and tempered with augite latite. The exterior of the vessel is slipped creamy yellow and polished. The interior of the neck is also slipped creamy yellow and polished while lower portions are only smoothed. A drill hole of unknown function perforates one rim sherd (Fig. 10.6c) and use wear was recorded on another rim sherd indicating that Vessel 18 had a use-life before discard.

Vessel 21, an undifferentiated glaze-on-yellow jar, is represented by nine body sherds. The paste is hard, light gray (7.5YR 6/0-5/0) and light red near the exterior (2.5YR 6/6-6/8), medium grained, and is tempered with augite latite. The exterior is slipped creamy yellow, polished, and decorated with thick black glaze paint.

A total of 87 sherds were not assigned to a specific vessel. Bowl sherds were 54 percent and jar sherds 36 percent of the glaze wares not attributed to a specific vessel. Formal pottery types identified include Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, San Clemente Glaze-on-polychrome, and Espinoso Glaze-on-polychrome. Sorting types identified include undifferentiated glaze-on-red, undifferentiated glaze-on-yellow, undifferentiated glaze-on-polychrome, undecorated glaze-on-red, undecorated glaze-on-yellow, undecorated glaze red and white-gray, and undifferentiated glaze ware (see Table 10.14). Post-firing modification was recorded on a total of six sherds or seven percent of all glaze ware sherds not assigned to a vessel. Modifications include a sherd with a rounded edge, a sherd with a ground edge, and 4 sherds with striated exteriors. The striations are parallel and penetrate the slip exposing the paste. Figure 10.6d and e are representative of the striated surfaces. All post-firing modifications were recorded on glaze-on-red sherds.

Miscellaneous. A total of 33 miscellaneous sherds or 28 percent of all miscellaneous wares were selected. Portions of three vessels were identified, including one Kapo Gray bowl (Vessel 12), a plain polished brown jar (Vessel 14), and a plain polished gray jar (Vessel 4). Miscellaneous sherds not assigned to a vessel include one plain polished brown bowl rim, one plain polished brown bowl body, one plain polished brown jar body, two plain polished gray bowl body, and one plain polished gray jar body.

Vessel 12, a Kapo Gray bowl, is represented by three rims and two body sherds. The paste is gray to dark gray (7.5YR 6/0-4/0), fine grained, and is tempered with vitric tuff. The exterior and interior surfaces are unslipped and display a high polish.

Vessel 14, a plain polished brown jar, is represented by six rim, two body, and two indeterminate rim sherds. It also has a gray to dark gray (7.5YR 6/0-4/0), fine grained paste, but is tempered with basalt. The exterior surface is unslipped and displays a high polish, while the interior is only smoothed.

Vessel 4, a plain polished gray jar, is represented by eight body sherds and one sherd from an indeterminate vessel portion. It has a dark gray (7.5yr 4/0), fine to medium grained micaceous paste and is tempered with tuff (volcanic ash). The exterior surface is unslipped and displays a high polish while the interior is only smoothed.

Summary. The detailed analysis of LA 98688 identified four ware groups, utility wares, white wares, glaze wares, and a miscellaneous wear group. Utility wares are 10 percent, white wares are 33 percent, glaze wares are 52 percent, and miscellaneous wares are 5 percent of the detailed assemblage by count.

Vessel form among the decorated pottery reveals a pattern typical of late Coalition and early Classic period sites in the Northern Rio Grande. The white wares are dominated by bowls that are 92 percent of the ware group, while jars are 4 percent. The glaze wares show relatively equal amounts of bowls (37 percent) and jars (55 percent). Decorated jars, which are rare in the Coalition period, were revived in the early Classic period. The variety of wares and vessel forms recorded indicates LA 98688 was a location where small-scale domestic activities were conducted.

Temper types identified in the analysis suggest different production areas for white wares and the glaze wares recovered from LA 98688. Volcanic ash and fine sand temper types were identified in the organic white ware pottery from LA 98688. These temper types suggest production on or near the Pajarito Plateau (Warren 1979a:194-195) or the Northern Tewa basin. Glaze ware tempering materials are dominated by augite/latite followed by basalt. These temper types suggest that the glaze painted pottery was produced in or near the Galisteo basin or Cochiti area (Warren 1979a).

Pottery manufacture dates suggest repeated occupations between A.D. 1025-1760. The majority of formal pottery types recovered, Biscuit A, Glaze A, and Glaze B, were made during the early Classic period, A.D. 1375-1425.

Chipped Stone Artifacts
by Guadalupe A. Martinez

A total of 1,133 chipped stone artifacts were recovered from LA 98688. The chipped stone artifacts were assigned to 11 artifact types; the majority are angular debris and core flakes (Table 10.15). Eight material types were recorded, four of which were chert varieties. Chert variation was monitored as a possible indicator of different raw material sources. For analytical purposes the material categories were combined into "all chert," chalcedony, quartzite, and "other."

Lithic Raw Material Selection. The chipped stone raw materials are mainly chert and quartzite (Table 10.15). The high percentage of quartzite is unusual for Las Campanas assemblages, which are usually dominated by chert. Because of this unusual pattern, cortex type was monitored for variability that may relate to different raw material sources (Table 10.16). Cortex types observed included weatherworn, nonweatherworn, shiny, and patinated. Chert, chalcedony, and quartzite show some differences in the distribution of cortex type.

A chi-square test was conducted for significant differences between cortex type and material type with a null hypothesis that there was no significant difference in cortex type distribution. A critical value of 41.38 was obtained, which is significant at greater than the .01 level. This result indicates that there are significant differences in the distribution. The adjusted residuals

Table 10.14. LA 98688 Detailed Analysis, Glaze Ware Types not Attributed to a Vessel by Vessel Form and Portion

Count	Glaze Undiff.	Glaze-red Undiff.	Glaze-yellow Undiff.	Glaze-poly Undiff.	Agua Fria G-red	Cieneguilla Glaze-yellow	San Clemente G-poly	Espinosa G-poly	Glaze-red Unpainted	Glaze-yellow Unpainted	Glaze-red/ white	Row Total
Indeterminate	2		1						4	1		8 9.2
Bowl Rim					1			1			1	3 3.4
Bowl Body	1	4	21	1		1			2	13	1	44 50.6
Jar Rim										1		1 1.1
Jar Body	2	1	9	2			2		3	11		30 34.5
Indeterminate Rim										1		1 1.1
Column Total	5 5.7	5 5.7	31 35.6	3 3.4	1 1.1	1 1.1	2 2.3	1 1.1	9 10.3	27 31.0	2 2.3	87 100.0

Table 10.15. LA 98688 Artifact Type by Material

Count Row Pct Column Pct	Chert	Madera chert	Gray mottled chert	Chalcedony	Silicified wood	Obsidian	Basalt	Quartzite	Row Total
Indeterminate								1 100.0 .2	1 .1
Angular debris	164 59.6 32.0	3 1.1 21.4		48 17.5 30.6	8 2.9 88.9	4 1.5 20.0		48 17.5 11.6	275 24.3
Core flake	328 39.8 64.1	11 1.3 78.6	4 .5 100.0	106 12.8 67.5	1 .1 11.1	10 1.2 50.0	4 .5 100.0	361 43.8 87.4	825 72.8
Biface flake	3 50.0 .6					2 33.3 10.0		1 16.7 .2	6 .5
Hammerstone flake	1 50.0 .2							1 50.0 .2	2 .2
Unidirectional core	5 71.4 1.0			1 14.3 .6				1 14.3 .2	7 .6
Bidirectional core	10 90.9 2.0			1 9.1 .6					11 1.0
Multidirectional core	1 100.0 .2								1 .1
Biface, early stage						1 100.0 5.0			1 .1
Biface, late stage				1 25.0 .6		3 75.0 15.0			4 .4
Column Total	512 45.2	14 1.2	4 .4	157 13.9	9 .8	20 1.8	4 .4	413 36.5	1133 100.0

Table 10.16. LA 98688 Material by Cortex Type

Count Row Pct Column Pct	Not applicable	Waterworn	Nonwaterworn	Shiny, not waterworn	Patinated	Row Total
Chert	311 60.7 41.0	87 17.0 53.7	73 14.3 50.7	17 3.3 68.0	24 4.7 54.5	512 45.2

Count Row Pct Column Pct	Not applicable	Waterworn	Nonwaterworn	Shiny, not waterworn	Patinated	Row Total
Madera chert	8 57.1 1.1				6 42.9 13.6	14 1.2
Gray mottled chert	1 25.0 .1		3 75.0 2.1			4 .4
Chalcedony	114 72.6 15.0	12 7.6 7.4	13 8.3 9.0	5 3.2 20.0	13 8.3 29.5	157 13.9
Silicified wood		2 22.2 1.2	5 55.6 3.5	1 11.1 4.0	1 11.1 2.3	9 .8
Obsidian	18 90.0 2.4		2 10.0 1.4			20 1.8
Basalt	3 75.0 .4		1 25.0 .7			4 .4
Quartzite	303 73.4 40.0	61 14.8 37.7	47 11.4 32.6	2 .5 8.0		413 36.5
Column Total	758 66.9	162 14.3	144 12.7	25 2.2	44 3.9	1133 100.0

show that at the .05 significance level (1.96 or greater) that there are differences within chalcedony and quartzite that may reflect procurement patterns.

Quartzite has significantly more than expected waterworn cortex suggesting that it may have been obtained from deposits with riverine origins. This does not mean that the quartzite was obtained from near a river, only that the quartzite was part of a riverine deposit in the geologic past. Santa Fe formation gravel contains riverine deposits and the quartzite may come from an isolated deposit that had less chert and was located conveniently to the site. Chalcedony had greater than expected patinated cortex and less than expected waterworn cortex. Patination may form during extended periods of surface exposure. It is possible that chalcedony was salvaged from local Archaic period sites and reused at LA 98688. It is also possible that chalcedony surfaces show patination better than other materials, resulting in an observation bias.

The raw materials reflect a use of quartzite, chalcedony, local chert, silicified wood, basalt, and obsidian. Quartzite occurs as medium- and coarse-grained textures (Table 10.17). Chert occurs is a wide range of colors and textures. The high frequency of quartzite is unusual for Las Campanas sites. In the OAS site assemblage, quartzite is abundant only in Area 5 of LA 86159. Increased use of quartzite may reflect diminished availability of quartzite or use of gravel deposits that contained more quartzite and less chert.

The obsidian is the clear to smokey gray variety that originates in the Jemez Mountains and along the drainages that originate in and around the Jemez Mountains. Obsidian is relatively scarce in Las Campanas assemblages (Post 1993a:25, 1992:61; Scheick and Viklund 1992:85-86).

Debitage. The assemblage was dominated by angular debris and core flakes. The frequency of angular debris was much higher here than other sites in Las Campanas. For this reason the

Table 10.17. LA 98688 Material by Texture

Count Row Pct Column Pct	Glassy	Fine Grained	Fine Grained, Flawed	Medium Grained	Medium Grained, Flawed	Coarse Grained	Row Total
All Chert		389 73.4 68.4	37 7.0 90.2	90 17.0 19.3	8 1.5 66.7	6 1.1 28.6	530 46.8
Chalcedony	3 1.9 12.5	94 59.9 16.5	4 2.5 9.8	52 33.1 11.2	4 2.5 33.3		157 13.9
Quartzite		74 17.9 13.0		324 78.5 69.5		15 3.6 71.4	413 36.5
Other	21 63.6 87.5	12 36.4 2.1					33 2.9
Column Total	24 2.1	569 50.2	41 3.6	466 41.1	12 1.1	21 1.9	1133 100.0

Table 10.18. LA 98688 Angular Debris, Material by Percentage of Cortex

Count Row Pct Column Pct	0%	50%	100%	Row Total
All chert	100 59.9 58.8	60 35.9 63.8	7 4.2 63.6	167 60.7
Chalcedony	32 66.7 18.8	15 31.3 16.0	1 2.1 9.1	48 17.5
Quartzite	34 70.8 20.0	13 27.1 13.8	1 2.1 9.1	48 17.5
Other	4 33.3 2.4	6 50.0 6.4	2 16.7 18.2	12 4.4
Column Total	170 61.8	94 34.2	11 4.0	275 100.0

Table 10.19. LA 98688 Angular Debris, Material by Dorsal Scars

Count Row Pct Column Pct	0-2	3-5	6+	Row Total
All Chert	40 24.0 47.6	79 47.3 60.8	48 28.7 78.7	167 60.7
Chalcedony	14 29.2 16.7	27 56.3 20.8	7 14.6 11.5	48 17.5
Quartzite	28 58.3 33.3	18 37.5 13.8	2 4.2 3.3	48 17.5
Other	2 16.7 2.4	6 50.0 4.6	4 33.3 6.6	12 4.4
Column Total	84 30.5	130 47.3	61 22.2	275 100.0

angular debris attributes of dimensions, cortex percentage, texture, and dorsal scarring were monitored.

There were 275 pieces of angular debris in the chipped stone assemblage. Some differences in angular debris attributes exist between material types and these differences can be discussed. Angular debris data are presented in Tables 10.18, 10.19, and 10.20.

Angular debris was distributed primarily among chert, quartzite, and chalcedony. Material texture distributions resemble the overall assemblage pattern; chert occurred in fine to coarse-grained textures, quartzite was predominantly medium grained, and chalcedony occurred mainly as fine-grained material.

Angular debris dorsal cortex distribution for all material types is predominated by noncortical artifacts. Quartzite has the highest percentage of noncortical debris followed by chalcedony and chert. Intuitively, noncortical debris could be expected to occur at higher frequencies for fine-grained material if it was being selected for more intensive reduction. Obviously, the high percentage of noncortical quartzite angular debris suggests an absence of selection bias towards fine-grained material. Early stage reduction of all materials is shown by the 30 percent occurrence of angular debris having 60 percent or greater dorsal cortex.

Dorsal flake scar counts are consistent across material types. All material types exhibit high frequencies of angular debris having five or fewer dorsal scars. Chalcedony varies slightly from the pattern by having a higher percentage of artifacts with six or more dorsal scars. This suggests that occasionally chalcedony was selected for more intensive reduction.

Summary data for angular debris dimensions are displayed in Table 10.20. The data indicate that quartzite for all dimensions tends to be larger than chert or chalcedony. Because other angular debris attributes indicate that all materials were basically used in the same manner, the larger quartzite angular debris may result from its coarser grain size. Generally, all angular debris tends to be small to medium in size. A higher number of large quartzite angular debris also may contribute to its greater mean dimensions.

Core flakes were the most numerous artifact type in the assemblage. Core flakes were 73 percent of the entire assemblage, 825 out of the 1,133 artifacts (Table 10.15). The same attributes as angular debris were monitored on core flakes plus portion and platform type. Early, middle, and late stages of core reduction are represented by the distribution of cortex percentages among all the core flakes (Table 10.21). A large portion of the core flakes, regardless of material type, had no cortex, indicating intensive reduction. However, over 30 percent of the core flakes had cortex percentages reflecting early and middle stage reduction strategies.

Table 10.20. LA 98688 Angular Debris, Dimensions by Material Type

Material	Mean	Standard Deviation	Range	
			Minimum	Maximum
Length				
All chert n = 167	18.76	7.477	8	53
Chalcedony n = 48	16.668	5.961	8	38
Quartzite n = 48	22.938	11.241	10	63
Other n = 12	19.833	6.926	13	31
Width				
All chert n = 167	12.766	5.98	6	36
Chalcedony n = 48	11.208	4.317	5	24
Quartzite n = 48	15.229	7.826	6	39
Other n = 12	11.417	4.981	6	22
Thickness				
All chert n = 167	6.617	3.877	1	20
Chalcedony n = 48	5.708	3.421	2	16
Quartzite n = 48	6.937	4.029	2	18
Other n = 12	5.5	2.747	2	12

Table 10.21. LA 98688, Core Flakes by Cortex Percentage Ranges by Material

Count Row Pct Column Pct	0%	10-50%	60-100%	Row Total
All Chert	204 59.5 36.7	62 18.1 54.4	77 22.4 49.7	343 41.6
Chalcedony	81 76.4 14.6	6 5.7 5.3	19 17.9 12.3	106 12.8
Quartzite	261 72.3 46.9	43 11.9 37.7	57 15.8 36.8	361 43.8
Other	10 66.7 1.8	3 20.0 2.6	2 13.3 1.3	15 1.8
Column Total	556 67.4	114 13.8	155 18.8	825 100.0

Table 10.22. LA 98688 Core Flakes by Dorsal Scars by Material with Chi-Square Expected Frequency and Adjusted Residuals

Count Row Pct Column Pct Expected Adjusted Residuals	0-2	3-5	6+	Row Total
All chert	171 49.9 35.3 201 -4.34	116 33.8 43.0 112 0.56	56 16.3 78.9 30 6.67	343 41.6
Chalcedony	50 47.2 10.3 62 -2.57	48 45.3 17.8 35 2.95	8 7.5 11.3 9 -0.42	106 12.8
Quartzite	259 71.7 53.5 212 6.73	97 26.9 35.9 118 -3.16	5 1.4 7.0 31 -6.52	361 43.8
Other	4 26.7 .8 9 -2.54	9 60.0 3.3 5 2.27	2 13.3 2.8 1 0.66	15 1.8
Column Total	484 58.7	270 32.7	71 8.6	825 100.0

Dorsal scars on core flakes also reflect this pattern of early and middle stage reduction; 484 exhibit two or fewer scars and 270 have three to five scars (Table 10.22). A chi-square test was conducted to determine if the dorsal scar counts were significantly different across material types. The null hypothesis was that there was not a significant difference in dorsal scar counts by material type. The chi-square value of 78.6303 was significant at the .01 level for 6 degrees of freedom. The adjusted residuals shown in Table 10.22 are interpreted at the .01 significance level. They show that all chert has a significantly low frequency of core flakes with two or fewer dorsal scars and a high frequency of core flakes with six or more dorsal scars. By comparison the quartzite core flakes have a significantly high frequency of two or fewer dorsal scars and low frequencies of three to five and six or more dorsal scars. This suggests that all chert and quartzite cores were differentially reduced; more late stage reduction occurred for chert and more early stage reduction in the quartzite.

Platform types for core flakes primarily reflect early and middle stage reduction. There were 276 single-faceted and 66 cortical platforms (Table 10.23). Though platform types emphasize early to middle stage reduction, there were 70 core flakes with abraded or multifaceted platforms, suggesting that some late stage reduction occurred. Multifaceted platforms are typical of core reduction, which aimed at producing flake tools or blanks. To test for significant differences in platform types by material type, a chi-square test was conducted on combined platform classes. Cortical and single-faceted, multifaceted, and collapsed and crushed platform classes were combined into three groups by all chert, chalcedony, and quartzite. With 4 degrees of freedom at the .01 significance level the critical value is 13.2767. The chi-square value for the combined platform classes by material type was 45.86428. There is a significant difference in platform types by material type. Adjusted residuals interpreted at the .01 significance level indicate that chert has lower than expected cortical and single-

Table 10.23. LA 98688 Core Flakes by Platform Type by Material Type

Count Row Pct Column Pct	Cortical	Cortical and abraded	Single-facet	Single-facet and abraded	Multi-facet	Multi-facet and abraded	Collapsed	Crushed	Absent	Row Total
All chert	42 12.2 47.7	1 .3 100.0	142 41.4 34.8	7 5.0 56.7	29 8.5 60.4	10 2.9 90.9	32 9.3 51.6	38 11.1 43.2	32 9.3 36.0	343 41.6
Chalcedony	3 2.8 3.4		38 35.8 9.3	5 4.7 16.7	10 9.4 20.8	1 .9 9.1	10 9.4 16.1	19 17.9 21.6	20 18.9 22.5	106 12.8
Quartzite	42 11.6 47.7		218 60.4 53.4	7 1.9 23.3	9 2.5 18.8		20 5.5 32.3	30 8.3 34.1	35 9.7 39.3	361 43.8
Other	1 6.7 1.1		10 66.7 2.5	1 6.7 3.3				1 6.7 1.1	2 13.3 2.2	15 1.8
Column Total	88 10.7	1 .1	408 49.5	30 3.6	48 5.8	11 1.3	62 7.5	88 10.7	89 10.8	825 100.0

faceted platforms and higher than expected multifaceted platforms. Chalcedony has lower than expected cortical and single-faceted platforms and higher than expected collapsed or crushed platforms. Quartzite has significantly higher than expected cortical and single-faceted platforms and lower than expected multifaceted and collapsed or crushed platforms. These data support the observation based on the dorsal scar counts that quartzite debitage reflects a higher proportion of early or middle stage reduction, and chert and chalcedony are associated with more middle and late stage reduction.

There was an unusually large number of whole core flakes in the assemblage (n = 63 percent; Table 10.24). All materials were represented relatively equally. This higher percentage of whole flakes provided a strong data base for comparing dimensions by material type. Summary dimensional data by material type are presented in Table 10.25. Quartzite core flakes tended to be larger than chert and chalcedony core flakes. A one-way ANOVA test for homogeneity demonstrated that chert core flakes were consistently smaller than quartzite core flakes at the .01 significance level. This test result lends support to the hypothesis that chert may have been more completely or intensively reduced than quartzite.

Cores. Nineteen cores were recovered from LA 98688 (Table 10.26). Core platform types included undifferentiated, unidirectional, bidirectional, and multidirectional. One unidirectional quartzite core was recorded. The other 18 cores were chert and included 10 multidirectional, 4 unidirectional, 3 bidirectional, and one undifferentiated. Five multidirectional cores, 3 unidirectional cores, 3 bidirectional cores, and 1 undifferentiated core had 10 or fewer dorsal scars. Two unidirectional and five multidirectional cores had between 11 and 19 scars. All cores had 60 percent or less cortex. The small mean dimensions for cores indicate that they were probably exhausted (Table 10.27).

Tools. There were 12 utilized core flakes, 2 pieces of utilized angular debris, 5 bifaces, and 1 hammerstone flake recovered from LA 98688 (Table 10.28). The flakes and angular debris edge angles ranged from 44 to 73 degrees. Only one flake showed marginal retouch. The edge damage for tools other than bifaces is typical of sawing and scraping, nibbling indicates that the edges were not used for prolonged periods.

Bifaces had an edge angle range of 39 to 65 degrees. One biface was made of chalcedony the others were of obsidian. One biface, FS 28, was an obsidian drill. It exhibited rotary wear and marginal retouch. Three bifaces were projectile points, FS 246, FS 229, and FS 399. The last two were marginally retouched.

Projectile Points. Three projectile points were

Table 10.24. LA 98688, Core Flakes by Portion by Material

Row Pct Column Pct	Indeterminate Fragment	Whole	Proximal	Medial	Distal	Lateral	Row Total
All Chert		236 68.8 45.6	27 7.9 36.5	4 1.2 44.4	27 7.9 34.6	49 14.3 34.0	343 41.6
Chalcedony	1 .9 .50	51 48.1 9.8	12 11.3 16.2		20 18.9 25.6	22 20.8 15.3	106 12.8
Quartzite	1 .3 .50	220 60.9 42.5	33 9.1 44.6	5 1.4 55.6	29 8.0 37.2	73 20.2 50.7	361 43.8
Other		11 73.3 2.1	2 13.3 2.7		2 13.3 2.6		15 1.8
Column Total	2 .2	518 62.8	74 9.0	9 1.1	78 9.5	144 17.5	825 100.0

Table 10.25. LA 98688 Whole Core Flake Dimensions

Material	Mean	Standard Deviation	Range	
			Minimum	Maximum
Length				
All chert n = 236	18.5508	8.7627	2	69
Chalcedony n = 51	18.2745	7.8615	8	48
Quartzite n = 220	22.3227	10.4681	6	73
Other n = 11	12.6364	5.8356	5	27
Width				
All chert n = 236	16.4492	8.9367	5	101
Chalcedony n = 51	17.3529	7.9494	8	42
Quartzite n = 220	20.6818	9.5079	5	66
Other n = 11	13.3636	6.5003	7	27
Thickness				
All chert n = 236	5.5508	3.3162	1	28
Chalcedony n = 51	6.1765	3.6205	2	15
Quartzite n =220	7.4000	4.2280	1	29
Other n = 11	4.2727	2.1019	1	8

Table 10.26. LA 98688 Core Attributes

FS	Artifact Type	Material	Texture	Cortex	Dorsal Scars	Length	Width	Thickness	North	East
13	Bidirectional	Chert	Fine-grained	60	4	38	34	19	151	91
165	Multidirectional	Chert	Fine-grained	0	15	27	21	16	157	93
210	Multidirectional	Chalcedony	Fine-grained	60	15	37	35	23	153	87
213	Unidirectional	Chert	Fine-grained	30	4	31	22	15	153	91
225	Multidirectional	Chert	Fine-grained	20	10	30	21	19	151	92
227	Unidirectional	Chert	Fine-grained	50	12	52	28	23	150	91
229	Multidirectional	Chert	Fine-grained	10	16	39	25	23	156	93
248	Unidirectional	Chert	Fine-grained	10	11	25	20	11	158	92
266	Multidirectional	Chert	Fine-grained and flawed	0	16	31	25	13	159	89
271	Multidirectional	Chert	Fine-grained	20	19	29	22	12	159	90
288	Multidirectional	Chert	Medium-grained	0	10	33	31	29	155	96
321	Multidirectional	Chert	Fine-grained	50	9	49	42	28	162	95
332	Unidirectional	Quartzite undiff.	Fine-grained	60	4	61	51	20	161	90
360	Multidirectional	Chert	Fine-grained and flawed	50	5	20	17	15	157	98
427	Unidirectional	Chert	Fine-grained	60	3	35	34	18	201	111
429	Multidirectional	Chert	Fine-grained	50	5	45	35	18	221	123
488	Bidirectional	Chert	Fine-grained	40	5	55	32	23	220	84
555	Bidirectional	Chert	Fine-grained	60	3	27	23	12	164	91
560	Undifferentiated	Chert	Fine-grained	60	3	39	27	19	167	91

Table 10.27. LA 98688, Dimensions by Core Type

Core Type	Mean	Standard Deviation	Range	
			Minimum	Maximum
Length				
Unidirectional n = 7	39.143	13.813	25	61
Bidirectional n = 11	35.455	9.863	20	55
Multidirectional n = 1	39.00	.	39.00	39.00
Width				
Unidirectional n = 7	30.429	10.784	20	51
Bidirectional n = 11	27.909	7.556	17	42
Multidirectional n = 1	25.00	.	25.00	25.00
Thickness				
Unidirectional n = 7	16.286	4.645	11	23
Bidirectional n = 11	19.909	5.300	13	29
Multidirectional n = 1	23.00	.	23.00	23.00

Table 10.28. LA 98688, Utilized Debitage and Formal Tools

FS	Artifact No.	Artifact Type	Material	Modified	Retouch	Outline	Angle	Wear	Damage
514	1	core flake	chert	1	0	convex	55	Unidirect.	Crescent, nibbling, steps
512	1	core flake	chert	2	0	concave	63	Unidirect.	Crescent
512	1	core flake	chalcedony	2	0	straight	59	Unidirect.	Crescent
368	1	core flake, edge 1	chert	2	0	concave-convex	44	Rounding, unidirect.	Crescent, nibbling
368	1	core flake, edge 2		2	0	concave	52	Rounding, unidirect.	Crescent, nibbling
365	1	biface, flake	Madera chert	1	0	convex	60	Bidirect., abrasion on working edge	Crescent, nibbling, steps
365	2	core flake	Madera chert	1	0	concave	54	Unidirect.	Feathers, crescent
365	3	core flake	Madera chert	1	0	convex	49	Unidirect.	Feathers, nibbling
348	1	biface, undiff., edge 1	obsidian	2	0	straight	41	Rounding, bidirect.	Evenly rounded edge

FS	Artifact No.	Artifact Type	Material	Modified	Retouch	Outline	Angle	Wear	Damage
348	1	biface, undiff., edge 2		2	0	straight	50	Unidirect.	Feathers, steps
332	1	angular debris	chert	1	0	concave	62	Rounding, unidirect.	Feathers, nibbling
106	1	core flake	chert	1	Marginal Unidirect .	concave-convex	51	Serrated-denticulate	Feathers, steps
48	1	hammer-stone flake	quartzite	1	0	convex	0	Battering	Fractures
28	1	rew. late stage biface drill, edge 1	obsidian	3	0	straight	46	Abrasion	0
28	1	rew. late stage biface drill, edge 2		3	Marginal Bidirect.	convex	63	Rotary	Evenly rounded edge
47	1	core flake	chert	1	0	concave	64	Rounding, unidirect.	Feathers, nibbling
307	1	core flake	quartzite	1	0	convex	68	Rounding, unidirect.	Feathers
293	1	core flake, edge 1	quartzite	2	0	concave	62	Unidirect.	Feathers, nibbling
293	1	core flake, edge 2		2	0	concave	65	Unidirect.	Feathers, nibbling
331	1	core flake	chert	1	0	concave	73	Rounding, unidirect.	Feathers, nibbling
247	1	core flake	chert	1	0	concave	50	Bidirect.	Feathers, crescent, nibbling
301	1	core flake	chert	1	0	concave	53	Unidirect.	Feathers, nibbling

recovered from LA 98688, two were obsidian and the other was made of chalcedony. All three were unidentifiable points, although FS 399 may be a reworked Armijo-style projectile point (Fig. 10.7).

FS 399 was a whole obsidian point with side notching and reworked edges from the notches to the tip (Fig. 10.7a). The edges were convex and the base was indented. The blade shape was ovoid and the cross-section was lenticular. Flake removal scars were regular. It measures 24 mm long by 15 mm wide by 5 mm thick.

FS 246 was a chalcedony point with a missing base. The edge shape was straight and the cross section was lenticular (Fig. 10.7b). The blade shape was triangular with regular flake removal. It measured 16 mm long, 9 mm wide, and 3 mm thick.

FS 229 was an obsidian point with both the base and tip missing but most of the blade was still intact (Fig. 10.7c). The shape of the blade was straight with a lenticular cross section. Flake removal scars were regular. The measurements for FS 229 were 23 mm long, 13 mm wide, and 3 mm thick.

Miscellaneous Artifacts

FS 225 is a quartzite ball that measures 24.5 mm in diameter (Fig. 10.7d). The exterior is smooth,

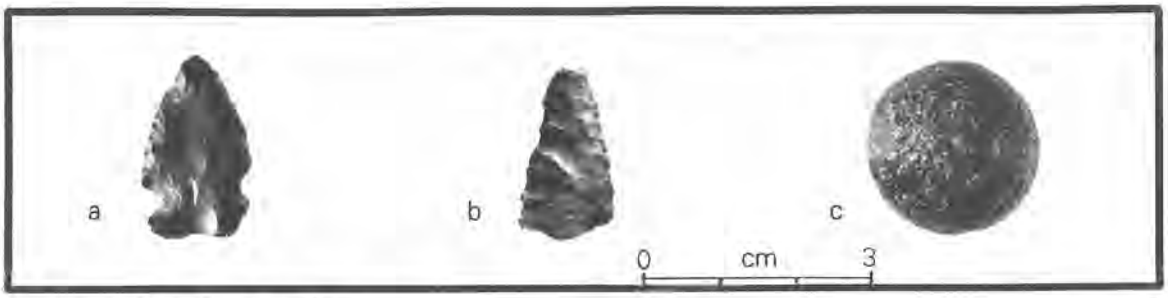

Figure 10.7. Stone artifacts.

though remnant pecking scars are visible, suggesting that it was partly shaped. No function or date can be assigned to the artifact.

FS 193 is a hand-blown glass adornment or decorative fragment. It has been suggested that it was part of a pendant or an appliqué adornment to a glass bottle (Dr. Donna Pearce, pers. comm 1996) (Fig. 10.7). A suggested period of manufacture spans the seventeenth and eighteenth centuries. It was not closely associated with other historic period artifacts, although historic period pottery was recovered from LA 98688. Its presence suggests that LA 98688 may have been used as a campsite into the Spanish Colonial period.

Research Design

LA 98688 excavation identified a high-density artifact concentration in the southern quarter of the site. This concentration yielded 3,315 sherds and 1,133 chipped stone artifacts. The artifact assemblage was larger than expected and is the largest ceramic assemblage recovered from the Las Campanas sites.

Survey data suggested that LA 98688 had a long history of occupation. The bulk of the occupation occurred during the early Classic period between A.D. 1325 and 1450. This determination was based on the presence of glaze-paint and biscuit ware pottery. Less intensive occupations were indicated for the periods between A.D. 1050 and 1150 and 1500 to 1700, based on a few sherds of temporally diagnostic pottery. The typologically diverse pottery assemblage was characterized by wider vessel form diversity than had been observed in other Las Campanas pottery assemblages. Utility and decorated jars accompanied glaze and carbon paint bowls. While the diversity of pottery types and forms were expected from the surface indications, the abundance of chipped stone debris was not evidenced in the surface deposits. Excavation yielded far greater numbers of chipped stone debris that had different patterns of material type selection and reduction than other Las Campanas assemblages.

The frequency and diversity of artifacts were initially interpreted as resembling a domestic or residential midden. Though no structural remains were visible on the surface, it was expected that structure and feature remains would be encountered. Excavation did not yield structural remains and the two feature remains were very shallow and deflated. They appeared to be surface camp fires.

Artifact assemblage size and diversity and expectations of structural remains strongly influenced the research design orientation. From the apparently large and diverse pottery assemblage it was expected that chronology could be refined by comparing the assemblage attributes with assemblages from local sites that were independently dated by dendrochronology or ceramic seriation. Furthermore, similarities in paste attributes and type frequencies were expected to provide some indication of origin of the site inhabitants. The expectation of structural remains in association with thermal features and the middenlike artifact assemblage afforded the opportunity to test a dichotomous model of site function based on agricultural versus foraging subsistence activities.

Site Chronology

Site chronology can only be addressed using pottery type manufacturing dates. No chronometric samples were recovered from the excavations. Table 10.6 and Figure 10.5 show the

Table 10.29. LA 98688, Pottery Types by Unit

Type	Unit 1	Unit 2	Unit 3	Total
Nonmicaceous utility ware	2 7.7	34 1.2	2 0.6	38 1.2
Smeared indented micaceous		1465 52.9	18 5.7	1483 47.6
Sapawe micaceous		4 0.1		4 0.1
Undecorated white ware	1 3.8	77 2.8	21 6.6	99 3.2
Organic-white undifferentiated	2 7.7	59 2.1	17 5.3	78 2.5
Mineral-white undifferentiated		1 -		1 -
Biscuit ware undifferentiated		18 0.6	4 1.3	22 0.7
Kwahe'e B/w		2 0.1		2 -
Santa Fe B/w		1 -	1 0.3	2 -
Pindi B/w		1 -		1 -
Wiyo B/w	1 3.8	21 0.8		22 0.7
Biscuit A	6 23.1	162 5.8	9 2.8	177 5.7
Biscuit B		16 0.6		16 0.3
Glaze undifferentiated		88 3.2	9 2.8	97 3.1
Glaze-red undifferentiated	3 11.5	200 7.2	37 11.6	240 7.7
Glaze-yellow undifferentiated	7 26.9	449 16.2	131 41.5	587 18.8
Glaze-polychrome undifferentiated		29 1.0	23 7.2	52 1.7
Agua Fria Glaze-red		44 1.6	2 0.6	46 1.5
Cieneguilla Glaze-yellow		10 0.4		10 0.3
San Clemente Glaze-polychrome		2 0.1	1 0.3	3 -
Largo Glaze-polychrome			3 0.9	3 -

Type	Unit 1	Unit 2	Unit 3	Total
Espinosa Glaze-polychrome	1 3.8	2 0.1	8 2.5	11 0.4
Plain polished brown		38 1.4	4 1.3	42 1.3
Plain polished gray	3 11.5	44 1.6	25 7.9	72 2.3
Kapo gray		4 0.1	2 0.6	6 0.2
Total	26 0.8	2771 90.0	318 10.2	3115

Table 10.30. LA 98688, Vessel by Unit

Type (Vessel Number)	Unit 1	Unit 2	Unit 3	Total
Vessel 0	10 66.7	127 26.7	47 39.2	184 30.2
Agua Fria Glaze-red (1)		49 10.3	8 6.7	57 9.3
Cieneguilla Glaze-poly-chrome (2)		21 4.4	1 0.8	22 3.6
Wiyo B/w (3)		12 2.5		12 2.0
Plain polished gray (4)		1 0.2	8 6.7	9 1.5
Transitional Wiyo-Bis-cuit A (5)	1 6.7	18 3.8	4 3.3	23 3.8
Undifferentiated organic white ware (6)		6 1.3		6 1.0
Biscuit A (7)		6 1.3	1 0.8	6 1.1
Biscuit A (8))		53 11.2		53 8.7
San Clemente Glaze-polychrome (9)		9 1.9		9 1.5
Undifferentiated Glaze-polychrome (10)			11 9.2	11 1.8
Undifferentiated Glaze-yellow (11)			9 7.5	9 1.5
Kapo Gray (12)		3 0.6	2 1.7	5 0.8
Espinoso Glaze-poly-chrome (13)	2 13.3	3 0.6	20 16.7	25 4.1
Plain polished brown (14)		13 2.7		13 2.1

Type (Vessel Number)	Unit 1	Unit 2	Unit 3	Total
Cieneguilla Glaze-yellow (15)		23 4.8		23 3.8
Largo Glaze-polychrome (16)		4 0.8	3 2.5	7 1.1
Cieneguilla Glaze-yellow (17)		5 1.1		5 0.8
Cieneguilla Glaze-yellow (18)	1 6.7	59 12.4	5 4.2	65 10.7
Sapawe micaceous (19)		40 8.4	1 0.8	41 6.7
Micaceous utility (20)	1 6.7	14 2.9		15 2.5
Undiff. Glaze-yellow (21)		9 1.9		9 1.5
Total	15 2.5	475 77.9	120 19.7	610

manufacture date ranges for LA 98688 pottery.

The site can be divided into spatial units to examine the distribution of individual vessels and types and the temporal relationships. The spatial units are somewhat arbitrary, but are based on artifact density. The three spatial units are: all grids south of the 144N grid line (Unit 1), the grids between 145 and 164N (Unit 2), and all grids north of the 165N grid line (Unit 3). Tables 10.29 and 10.30 provide type and vessel distributions by Units 1, 2, and 3.

The formal pottery types identified in the LA 98688 ceramic assemblage suggest that this site was occupied repeatedly between A.D. 1025 and 1760. The early portion of this span, A.D. 1025 to 1250, is represented by only four sherds of Kwahe'e and Santa Fe Black-on-white pottery. Two sherds of Kwahe'e Black-on-white were recovered from Unit 2. One sherd of Santa Fe Black-on-white was recovered from Unit 2 and 3. The presence of these types may signify the first uses of LA 98688 as a foraging or travel camp. Given the few sherds, it is assumed that occupations from this period contributed minimally to site formation.

The next span is A.D. 1250 to 1350, which includes the period of major growth and abandonment of Pindi Pueblo. At Pindi Pueblo, the latter half of this span, A.D. 1300 to 1350, is characterized by increasing frequencies of Galisteo Black-on-white and the brief production of Pindi Black-on-white (Stubbs and Stallings 1953; Ahlstrom 1989; Lang and Scheick 1989). At Arroyo Hondo this period is characterized by varying frequencies of Santa Fe, Wiyo, and Galisteo Black-on-white (Habicht-Mauche 1993; Lang 1993). The Agua Fria Schoolhouse site evidenced a middle fourteenth-century component that was similar to Arroyo Hondo Pueblo (Lang and Scheick 1989). All three sites had low frequencies of Biscuit A and early Rio Grande glaze wares, though Stubbs and Stallings suggest that the Pindi Pueblo biscuit ware was intrusive from a later component of the Agua Fria Schoolhouse site occupation (1953:56). Lang suggests that Biscuit A, found at Arroyo Hondo, was made on a small-scale as early as the A.D. 1340s (1993:179). Wiyo Black-on-white only occurred in Units 1 and 2, and 12 of the sherds could be assigned to Vessel 3. This suggests that part of the occupation of LA 98688 within Units 1 and 2 occurred between the late A. D. 1200s and middle 1300s. This is tempered by the absence of Galisteo and the low frequency of Santa Fe Black-on-white, suggesting that occupation during this time was brief and probably contributed little to the overall assemblage. The high frequency of Agua Fria Glaze-on-red or undifferentiated red body sherds in the LA 98688 assemblage suggests deposition at a time when glaze-paint pottery was common--a time that post-dates A.D. 1350 in the Santa Fe area.

The strongest evidence for occupation dates comes from the co-occurrence of Biscuit A, Biscuit B, Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, San Clemente Glaze-on-polychrome, and Largo Glaze-on-polychrome pottery, and Sapawe and micaceous utility wares. This array of types is not reported for the Pindi Pueblo assemblage. Arroyo Hondo only has a small amount of biscuit ware and glaze-yellow pottery in the Component II contexts that postdate A.D. 1400. These types are minimally present in the Agua Fria Schoolhouse assemblage, though surface distributions suggested a large part of the village that may date to the late A.D. 1300s and early 1400s have been removed by recent construction (Lang and Scheick 1989). Assemblages from Arroyo Hondo Pueblo and the Agua Fria Schoolhouse site lack Largo Glaze-on-polychrome and Biscuit B pottery. Both Biscuit B and Largo Glaze-on-polychrome were made between A.D. 1425 and 1450. The full array of types, minus Largo Polychrome, was recovered from Component I of the Alfred Herrera site, LA 6455, at Cochiti Reservoir. Honea (1968:126) suggests that Component I dates between A.D. 1400 and 1425. At LA 98688, the predominance of pottery that dates to this period and its corresponding spatial association with the chipped stone concentration suggests that the bulk of the occupation occurred between A.D. 1400 and 1450. Pottery types from this period were recovered from and dominated the assemblages from all three units. Fifteen of the 21 identified vessels date to this period.

Later occupations are indicated by low frequencies of Espinosa polychrome and Kapo Gray. Espinoso polychrome was produced between A.D. 1450 and 1490. It was recovered from Units 2 and 3, but primarily occurred in Unit 2. Kapo Gray was made between A.D. 1650 and 1900. Kapo Gray was recovered from Units 2 and 3, though probably originated in Unit 2. No other pottery types from these periods was identified. Occupations from these periods were minor contributors to the artifact assemblages. The Espinosa polychrome is evidence of at least 75 years of use during the late Classic period. The Kapo Gray pottery is contemporaneous with the hand-blown glass adornment, which also dated to the seventeenth or eighteenth centuries.

To summarize, the occupation of LA 98688 occurred discontinuously over a possible 700-year span. Low frequencies of pottery types from A.D. 1025 to 1350 suggest limited use of the site, probably resulting in low accumulations of cultural material. These early occupations are evidenced within Unit 2. The bulk of the pottery types have manufacture dates that cluster around A.D. 1350 and 1450. This array is sufficiently different from assemblages from later contexts at Arroyo Hondo Pueblo and the Agua Fria Schoolhouse site to suggest deposition near the end of their occupation or after their abandonment between A.D 1425 and 1450. The vessel distribution suggests that the main occupation occurred in the Unit 2 area, but that other brief visits are represented by the distribution of spatially discrete distributions of Vessels 10 and 11 within Unit 3. The presence of Largo polychrome indicates low-level reoccupation of Unit 2 during the later fourteenth century. Kapo Gray and the glass adornment are indicators of use of Unit 2 into the seventeenth and eighteenth centuries.

Site Function

Differences in assemblage composition and distribution for LA 98688 indicated that LA 98688 may have been functionally unique within the Las Campanas site assemblage. The artifact assemblage had an abundance of sherds from decorated bowls and jars and utility ware jars. The pottery and chipped stone were clustered rather than occurring in separate concentration. The latter pattern is suggestive of many low accumulation, short-term occupations, resulting in enough artifacts deposited to be classified as a site. The former pattern of clustered distribution suggested longer-term occupation with an artifact accumulation resembling a domestic midden or sheet trash deposit. The pottery diversity and the artifact clustering raised the possibility that LA 98688 was the remains of an agricultural fieldhouse.

The examination of site function focused on distribution and artifact characteristics that would reflect fieldhouse occupations or a repeatedly occupied foraging or campsite related to long-distance resource procurement or travel. To assess the probability of either proposition, a functional dichotomy was outlined defining occupation patterns that would be expected to result from fieldhouse or foraging/resource procurement/travel occupations. Evident time depth strongly suggests that LA 98688 results from numerous and different activities conducte over a long span. The intention of this study is to look for strong patterning that would indicate an emphasis on agricultural-related activities versus foraging/procurement activities, while recognizing that both may have occurred. The assessment was based on presence, type, and structure of architecture, type of land and resources proximate to the site, and the use pattern including number and form of thermal or other features, artifact assemblage composition, and refuse discard patterns. The function(s) of LA 98688 can be assessed in terms of these three variables.

Excavation of 308 1-by-1-m units within and adjacent to the artifact concentrations did not reveal architectural remains. No cobbles were identified as foundation elements. The cobble alignment located southeast of the excavation area was determined to be a check dam placed at the head of a shallow erosion channel. Two severely deflated hearths were exposed in the eastern quarter of Unit 2, but they lacked depth or feature fill. The condition of the features suggests that LA 98688 had been subject to long-term water and wind erosion. It is possible that erosion removed ephemeral foundation remnants. Absence of architectural remains is a strong factor in favor of LA 98688 functioning as a gathering/resource procurement/travel site, but the other lines of evidence should be examined.

The site is on broad tableland that borders the Arroyo Calabasas to the north. According to the 1975 soil survey (Folks 1975), the soils of the ridge tops and slopes would not have been suitable for farming. The site is located 250 m from the floodplain of the Arroyo Calabasas, which might have been suitable for farming. The floodplain is not visible from the site, though the 0.2 km distance is not a long or unreasonable trip. For foraging/resource procurement/travel, LA 98688 affords convenient access to the Arroyo Calabasas and the more wooded tablelands. Most of the earlier gathering sites that evidence long-term use or repeated occupation tend to be located along the margins of or near the head of secondary arroyos, with easy access to primary arroyos, such as the Arroyo Calabasas or Arroyo de los Frijoles. In terms of a travel or long-distance procurement camp, LA 98688 is located on the edge of a natural travel route between Cieneguilla Pueblo and the San Ildefonso/Pajarito area. It is 3.2 km east of the headwaters of Cañada Ancha, which leads to the Rio Grande. From LA 98688, Cieneguilla Pueblo is 12 km to the southwest by way of Arroyo Calabasas. LA 98688 is roughly midway between the two areas, and it may have been a logical stopping place. Repeated use of the site may have resulted in the caching of vessels and lithic raw materials that could be used to support traveling and resource procurement. Site location is not strongly favored for a fieldhouse, but is reasonably located for a foraging/resource procurement/traveling site.

The use pattern is difficult to assess because of the general pattern of a long period of discontinuous occupation and the likelihood that the deposit results from many brief occupations. Ephemeral use patterns, such as would result from occasional travel or diurnal foraging are masked by the high density concentration of the main excavation area. The more dispersed, linear distribution of chipped stone and pottery that extended to the north (see Fig. 10.4) may be evidence of these brief visits, though it is more likely that they represent redeposition of artifacts from the main concentration through livestock and human traffic.

Daily use with limited overnight stays for planting and harvesting would result in tools and containers for food procurement, processing, and consumption. However, evidence of extensive processing or procurement should not be present unless the site is reoccupied. Evidence for biseasonal use with continual occupancy during the growing season should include structural remains, an artifact assemblage that supported a full range of domestic activities, and extramural hearths or roasting pits.

Gathering site use patterns would be strongly conditioned by the season and length of occupation and the foodstuffs that were processed. Intensively used gathering and processing sites would be expected to exhibit remains of roasting pits, cobble or fire-cracked rock discard areas, ground stone, and hand tools for maintaining ground stone and for processing. Core reduction with a relatively high percentage of unmodified flake tools should be present. Other activities, such as hunting, may have been conducted from gathering sites, depending on the occupation duration. Low frequencies of tool production and maintenance debris might be present. Pottery vessels for limited domestic activities may be present. Pottery may be brought to the site as partial vessels that could be used as scoops or temporary containers.

LA 98688 lacked structural remains or formal, well-used thermal features that could be assigned to a specific occupation. The lack of formal features or facilities and an incomplete domestic toolkit indicates LA 98688 never functioned as a biseasonal residence.

The LA 98688 ceramic assemblage has vessels that could have been used for food processing and consumption. Cooking and water storage jars and wide rimmed bowls are present, though only a minimum number of 21 vessels were identified. The majority of the vessels and pottery dated between A.D. 1425 and 1450, suggesting the most intensive occupation. The range of vessel forms are comparable to a domestic assemblage from a village site. Presence of a domestic assemblage is a strong indicator that longer than overnight occupation occurred. A fieldhouse or repeated seasonal logistical gathering forays are the most likely interpretation. The lithic data, however, are partly contradictory.

The majority of the chipped stone artifacts were from core reduction of local chert and quartzite. Lesser amounts of chalcedony, obsidian, and basalt are present. A few biface reduction flakes were observed, but their limited presence testifies to the low importance of formal tool production and maintenance. Obsidian bifaces were brought to the site as finished products and discarded after breaking or being reused. The chert, quartzite, and chalcedony cores were mostly small to medium sized with 11 to 17 dorsal scars common, suggesting that all raw material was intensively reduced. This condition would result from repeated visits. Lacking from the assemblage are hammerstones, ground stone, or other heavy hand tools for resource processing. These tools would be expected at biseasonal fieldhouses or repeatedly used gathering sites, where processing prior to transport would have occurred. Also lacking from the assemblage are the unmodified flake tools that would accompany large volume processing or a lengthy domestic occupation. The surprisingly high frequency of core reduction debitage, the low tool frequency, and absence of ground stone suggests a daily-use fieldhouse with limited overnight visits or repeated diurnal gathering forays, where resource processing was not necessary.

The artifact distribution pattern is another line of evidence that can be used to address function and occupation history. The sherd and lithic artifact grid counts were plotted by different classes within artifact type for Unit 2. Lithic artifacts were plotted by material type (Figs. 10.8, 10.9). Sherds were plotted by utility, white, and glaze wares (Figs. 10.10, 10.11, 10.12). The ceramic density plots show a high concentration of all wares in the east-central portion of Unit 2. The utility wares are mainly restricted to this area as are the majority of the white and glaze wares. The white wares exhibit two other density pockets, one north of the main utility ware concentration and the other southwest of the concentration. This may suggest two components that were not associated with the intensive use of utility ware pottery. The glaze ware distribution shows a small density pocket to the west of the main concentration. This pocket may represent a separate occupation. The chipped stone show no distributional variability by material type. "Quartzite and other" and "chert and other" occur in densities that correspond to the ceramics. There are no outlying high density pockets. This suggests that the chipped stone is associated with the main occupation episode.

The majority of vessels were recovered from Unit 2. All sherds assigned to vessels from Unit 1 also occur in Unit 2. This pattern suggests that most of Unit 1 sherds were redeposited from Unit 2. Unit 3 has Vessels 10 and 11 that occur exclusively outside Unit 2. Vessel 4 and Vessel 13 occur predominantly in Unit 3, although a few of their sherds were redeposited subsequently in Unit 2. These vessel and type distributions from the general ceramic sort have important ramifications for the occupation sequence and may reflect functional differences between temporal components.

Units 1 and 2 appear to primarily represent the same mixed deposits from many occupation episodes. This mixed deposit contains all of the Kwahe'e Black-on-white and Wiyo Black-on-white pottery and most of the Santa Fe Black-on-white pottery. These sherds represent site use between A.D. 1025 and 1400, but most likely between A.D. 1100 and 1350. Because the brief occupations that these sherds represent are mixed with a dominant early fifteenth-century assemblage, the early occupation contribution of the chipped stone is masked. Relatively low pottery counts for the early occupation suggests brief visits that may have contributed only small amounts of core reduction debris. The low pottery frequency is consistent with the Coalition and early Classic period use of the Las Campanas area for diurnal foraging.

All the units are dominated by vessels and sherds from the A.D. 1400 to 1450 period. These ceramics include the glaze-red, glaze-yellow, and glaze-polychrome types and micaceous paste utility wares. The exception to this pattern is the low frequency of micaceous utility

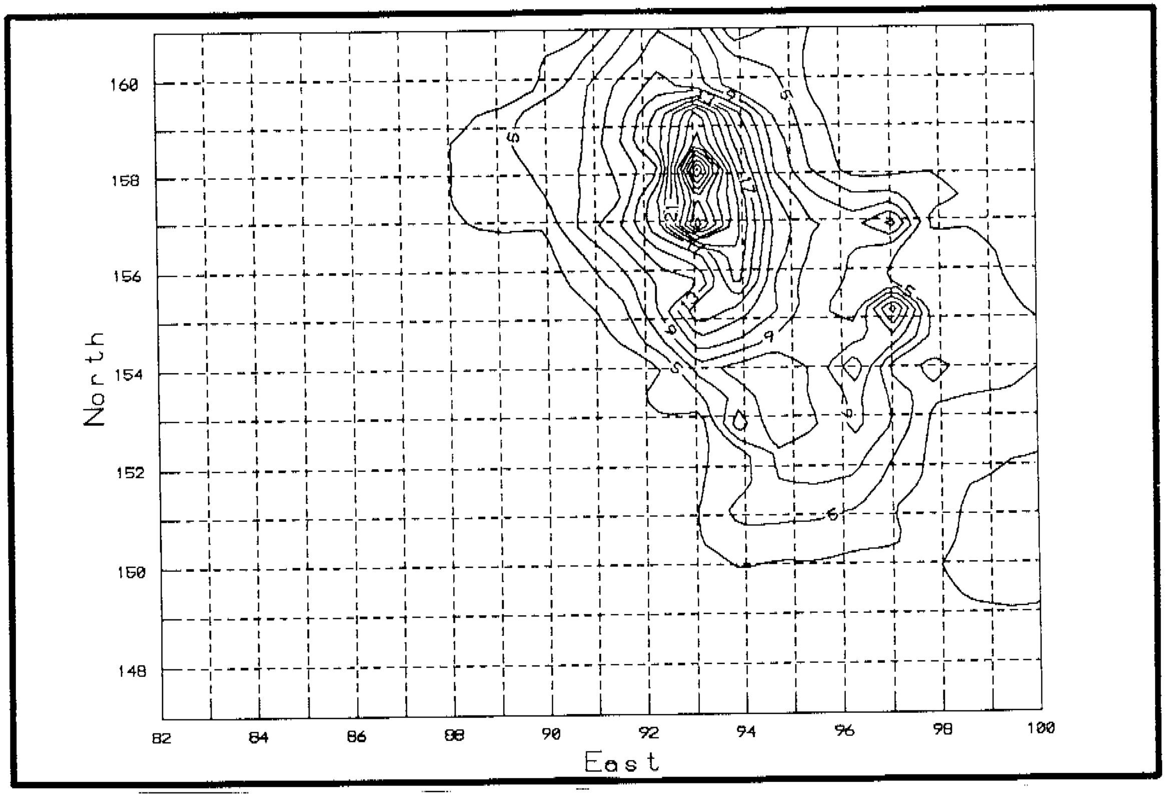

Figure 10.8. LA 98688, distribution of chert, chalcedony and other stone.

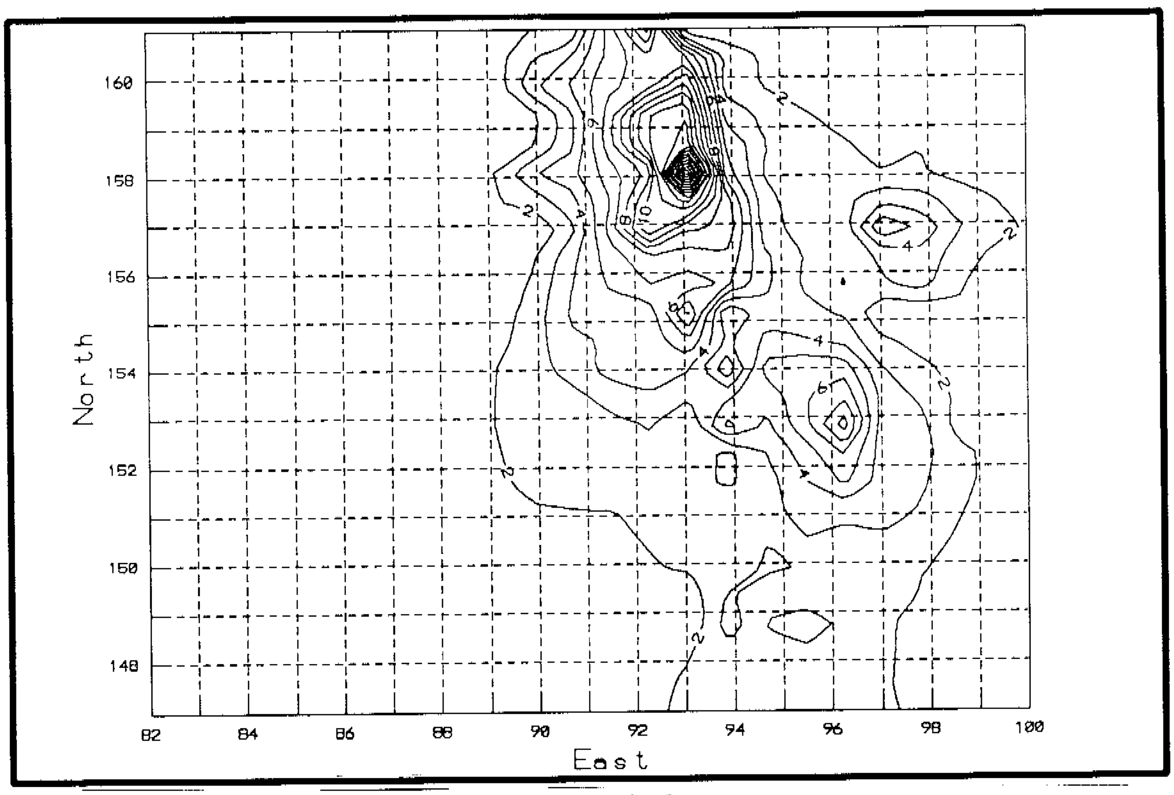

Figure 10.9. LA 98688, distribution of quartzite and other.

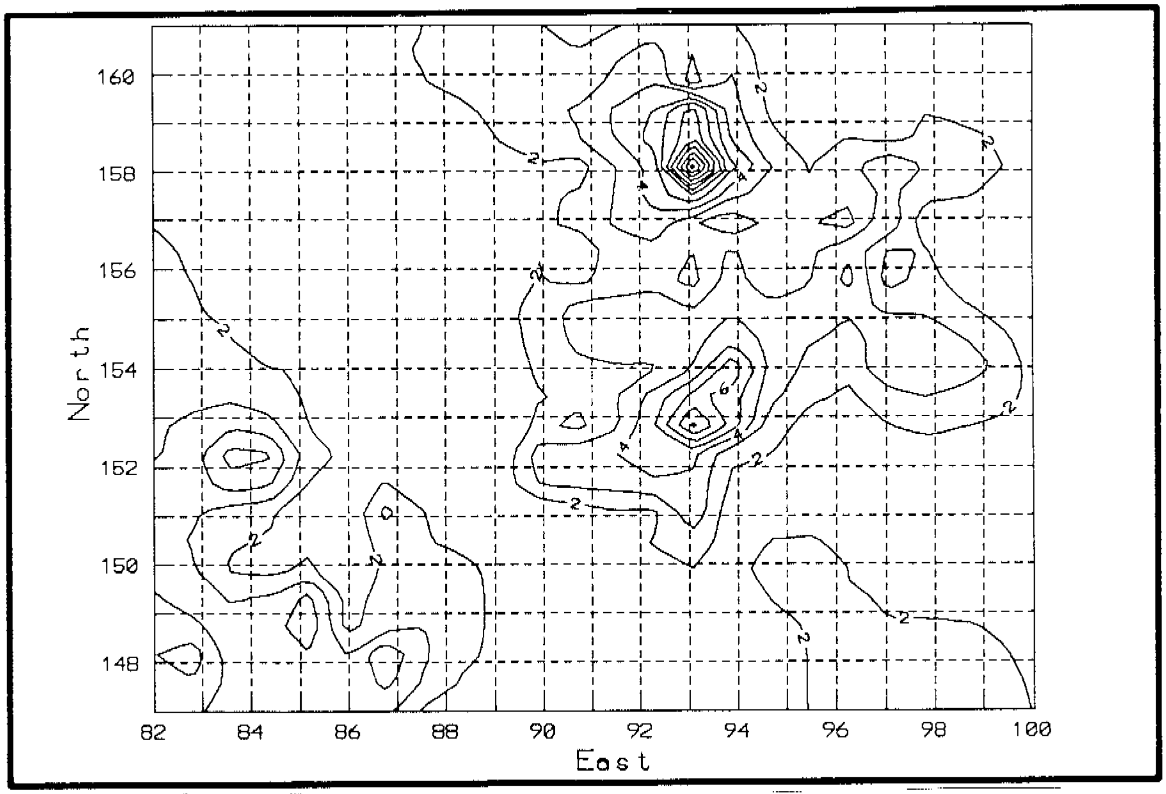

Figure 10.10. LA 98688, distribution of white ware.

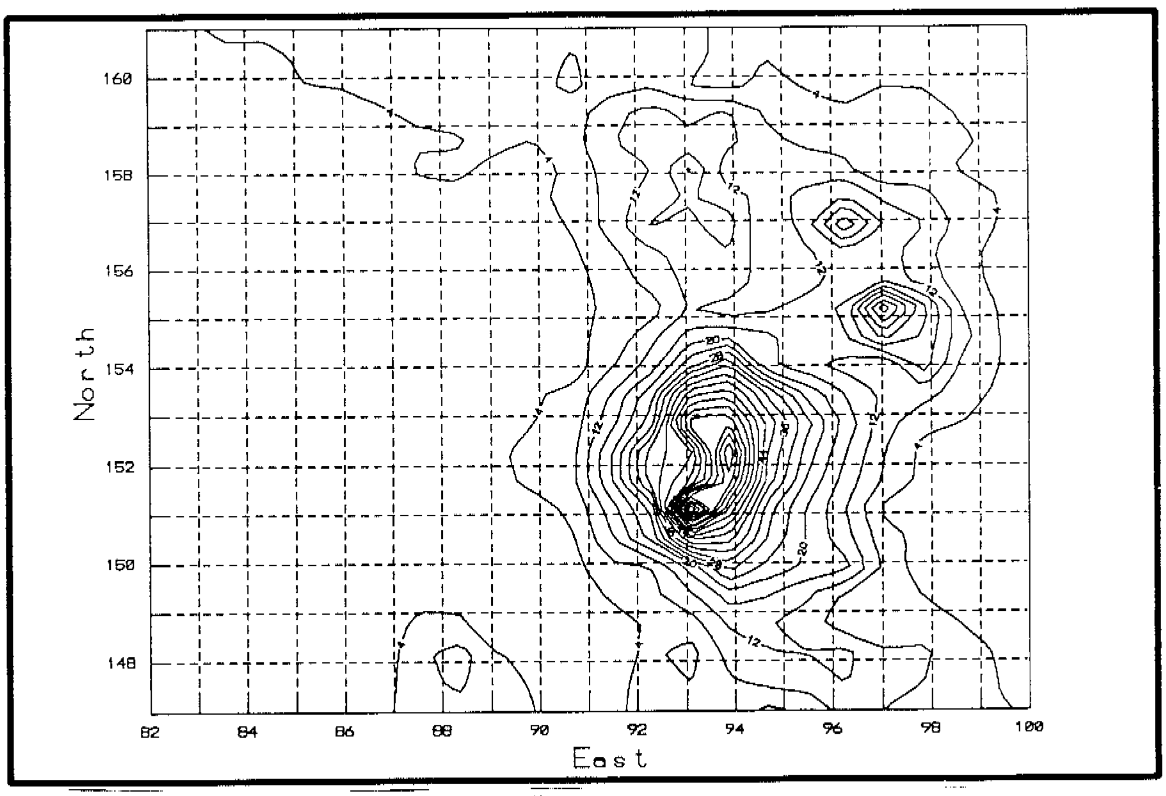

Figure 10.11. LA 98688, distribution of utility ware.

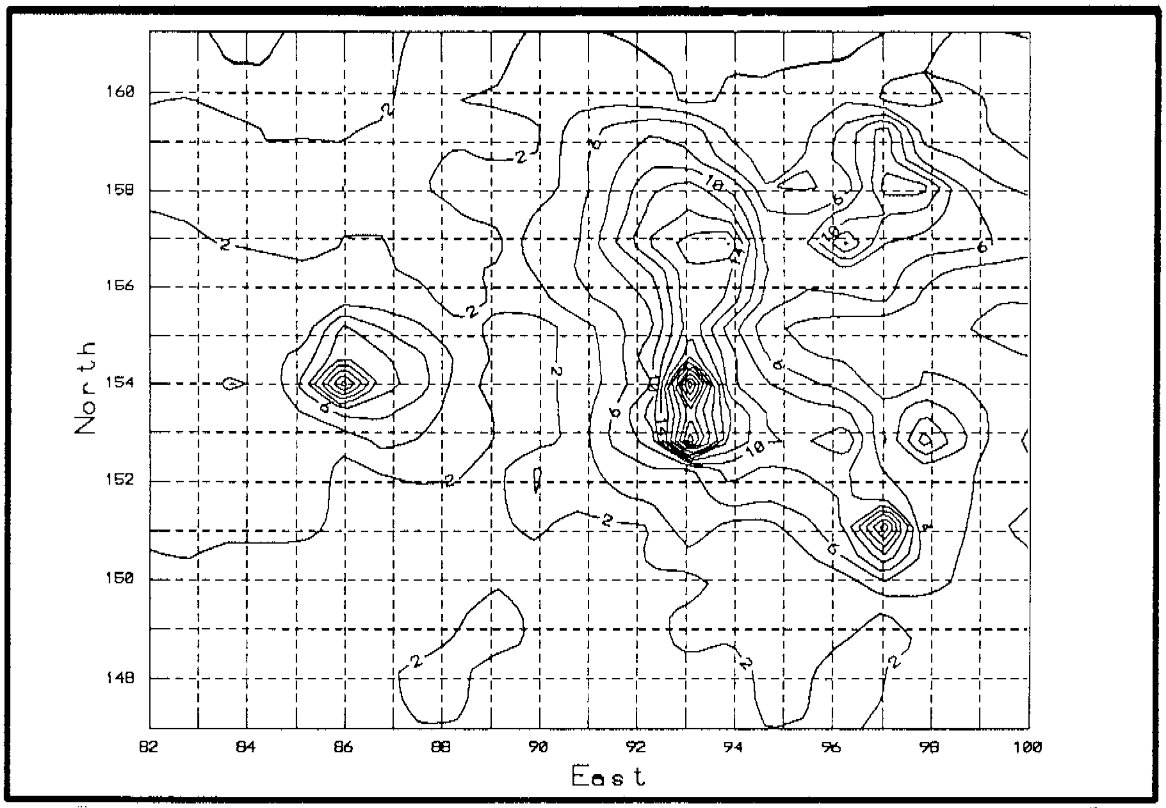

Figure 10.12. LA 98688, distribution of glaze ware.

wares in Units 1 and 3. Fourteen of the identified vessels date to this period. The cluster of vessels and sherds from Unit 2 strongly resembles a domestic assemblage suggesting that the A.D. 1400 to 1450 period included a fieldhouse occupation. This is based on the vessel form diversity and the dominance of utility ware pottery over decorated pottery.

A chi-square test was conducted for Units 1, 2, and 3 vessel form distribution (Table 10.31). The matrix was indeterminate vessels, utility jars, decorated bowls, and decorated jars by unit. The null hypothesis was that there was no difference in vessel form distribution between units. The critical value for a 3-by-4 contingency table with 6 degrees of freedom at the .01 significance level is 16.8119. The chi-square value was 390.7575. The null hypothesis is rejected, indicating that there is a statistically significant difference in the vessel form distribution by unit. The adjusted residuals show that Units 1 and 3 have significantly more than expected decorated bowls and fewer than expected utility jars. Unit 2 exhibits the opposite pattern with a strong emphasis on jars. The chi-square test results suggest that the Unit 2 occupation was functionally different than Units 1 or 3. Decorated jars occur in close to expected frequencies with slightly more decorated jars present in Unit 2 and slightly less than expected in Units 1 and 3. The vessel distribution suggests that much of the Unit 1 distribution is redeposited from Unit 2. Unit 3 has a vessel form and type distribution that represents occupation episodes that are functionally and temporally discrete from Units 1 and 2.

The Unit 3 vessel distributions exhibit two concentrations that represent at least two brief occupations. Vessels 10 and 13 were recovered from the Grid 174-176N/89-91E area. These were a bowl of Espinosa polychrome and a bowl of undifferentiated Glaze-on-polychrome with a Glaze A rim form. These vessels may represent two separate reoccupations resulting in a low accumulation of debris, or it is possible that the Glaze A bowl was taken from Unit 2 refuse and reused with the Glaze C Espinosa Polychrome. Either way this occupation pattern is a return to brief occupations perhaps for foraging or as travel camps between the Cieneguilla Pueblo area and the San Ildefonso area.

A third vessel was scattered across six grids in the northern portion of Unit 2. This glaze-on-yellow bowl represents a brief occupation of the site during the A.D. 1350 to 1450 period. It

Table 10.31. LA 98688, Chi-Square Matrix Vessel for Form by Units 1, 2, and 3

Count Expected Adjusted Residual	Indeterminate	Utility Jar	Decorated Bowl	Decorated Jar	Total
Unit 1	5 2 2.30	2 13 -4.21	15 6 3.89	4 5 -.46	26
Unit 2	184 206 -4.87	1498 1352 16.68	558 688 -17.27	531 524 1.03	2771
Unit 3	43 24 4.35	20 155 -16.00	201 79 16.71	54 60 -.93	318
Total	232	1520	774	589	3115

cannot be determined if the occupation pre- or post-dated the main Unit 2 occupation. Functionally, the occupation is similar to the brief visits of the early and later occupation periods. A single vessel associated with a dispersed chipped stone scatter suggests a limited activity site for foraging or travel.

The late occupation represented by the Kapo Gray and glass adornment fragment is masked by the main Unit 2 occupation. The low number of sherds, probably all from the same vessel, indicate a short occupation. The glass adornment fragment may be an item that broke from a highly curated seventeenth- or eighteenth-century glass bottle. These artifacts illustrate that the pattern of brief occupation and limited activity continued into the recent past. The only break in this pattern is the more substantial A.D. 1400 to 1450 occupation of Unit 2.

The role of LA 98688 in the local and regional economy changed through time. The overarching pattern of short occupations with limited activities occurred during the early and late occupation period. The change to a longer duration, domestic-focused occupation occurred during the A.D. 1400 to 1450 period, but the pattern lacked longevity. Petrographic analysis of sherd temper and paste and the temper identification from the detailed ceramic analysis can be used to indicate where the site occupants came from and if there was a change in geographic origin of the site occupants.

The temper data overwhelmingly indicate that most of the Unit 2 A.D. 1400 to 1450 ceramics came from the Galisteo Basin and secondarily from the Cochiti and Pajarito Plateau areas. The augite latite, hornblende latite, and San Marcos latite are the main indicators of Galisteo Basin pottery production. These tempers were used in Agua Fria Glaze-on-red and the Glaze A and B yellow and polychrome pottery. Lower frequencies of basalt temper were also used in the glaze wares. The combination of basalt and latite-tempered vessels is consistent with Glaze A and B pottery recovered from Cieneguilla Pueblo (Warren 1979a:194). Augite pottery would have been produced at San Marcos Pueblo and traded to Cieneguilla Pueblo. Crystal pumice-tempered biscuit ware pottery would have been produced on the Pajarito Plateau and traded with Cochiti area pueblos and perhaps, with Cieneguilla Pueblo. The percentages of biscuit ware pottery at the Herrera site and from small Cochiti Reservoir sites indicate that it was a common, though secondary component of the ceramic assemblage.

Differences exist in the Unit 3 assemblage where the latite and crystal pumice tempers are common, but Vessels 4 and 10 are unique. Vessel 4 was a polished brown ware, tempered with mica and tuff. This ceramic type has not been described in the literature, but appears to be an aberrant type that may come out of the glaze-red tradition. Its occurrence outside Unit 2 suggests that this was a partial vessel brought to the site during travel or foraging. Its unique attributes and discrete distribution support the hypothesis that brief visits to LA 98688 were an important part of the occupation pattern before and after the A.D. 1400 to 1450 occupation. It also suggests travel to the site from the ancestral Tewa production areas to the north. The hornblende-tempered glaze-on-yellow vessel is clustered within Unit 3, suggesting that it, too, was discarded during a brief foraging or traveling occupation.

Summary

Chronological and site function analysis reveals a complex occupation sequence consisting of changing use patterns through time. Early occupations between A.D. 1050 and 1350 or 1400 were brief foraging trips from the Santa Fe River to the Las Campanas area. The spatial and functional patterns left from the early occupations are masked by the more intensive A.D. 1400 to 1450 occupation. The A.D. 1400 to 1450 occupation displayed evidence of a longer and more intensive occupation. No architectural remains were found, but the vessel form assemblage and distribution combined with a heavy emphasis on core reduction is similar to fieldhouse assemblages recovered from Cochiti area Classic period sites (Kemrer and Kemrer 1979). A predominance of utility jars with fewer numbers of decorated bowls and jars reflects a focus on domestic activities. The typological array closely resembles Cochiti area proportions of utility, carbon-paint and glaze-paint pottery for this time. Temper and paste types show a strong affinity with Galisteo Basin sources with proportions of temper types similar to those reported for Cieneguilla Pueblo. Distance between Cieneguilla Pueblo and LA 98688 would have required logistical organization, such as establishment of a fieldhouse. Other occupations during this period reflect brief, low intensity foraging or traveling between Cieneguilla Pueblo and the northern Pajarito Plateau and the Tewa Basin. Low intensity occupations occurred periodically between A.D. 1490 and the mid-nineteenth century. LA 98688 is along a topographically sensible travel route between the Cieneguilla and San Ildefonso areas.

LA 98690

Setting

LA 98690 was on the northwest margin of a long, broad, southwest- sloping ridge that separates the Arroyo Calabasas drainage catchment from the upper reaches of the Cañada Ancha drainage system. This low elevation (1,994 m [6,540 ft]) area is characterized by broad, gently sloped ridges with eroded and deflated margins. The site is 1.6 and 3 km from the Arroyo Calabasas and Cañada Ancha floodplains, respectively.

The site was at the transition between Panky-Pojoaque association, rolling, and the Panky fine sandy loam of the lower Arroyo Calabasas. From this site there would have been access to the floodplain of the Cañada Ancha to the northwest. The Cañada Ancha consists of intermittent Panky-Pojoaque association, rolling, Blue-wing gravelly sandy loam, and Guaje gravelly sandy loam. This area, with more diverse soil associations, may have supported more abundant or diverse biotic communities that could have been exploited from LA 98690.

No water was available on-site, but the Cañada Ancha has springs that would have been accessible to human inhabitants and been favored by game mammals or herds. Surface water is rare in the general area, so that springs would have been important water sources. Camps may have been intentionally located up to a kilometer from the spring to protect it from pollution or degradation.

Pre- and Post-Excavation Description

LA 98690 is a series of small artifact concentrations scattered across an area of 16,000 sq m or 1.5 ha (4 acres). There are nine sherd concentrations, a fire-cracked rock concentration, a Pueblo side-notched obsidian projectile point fragment, and a mano. The artifact count for the site ranges between 200 and 300. The sherds tend to be scattered along erosional channels indicating some artifact movement from erosion. The sherds are all Santa Fe Black-on-white, dating the site to the Coalition or early Classic period (A.D. 1175 to 1425).

Excavation of LA 98690 confirmed the inventory evaluation. Instead of nine artifact concentrations, seven artifact concentrations (Areas 1 through 7) were investigated. The site dimensions were determined to be 180 m east-west by 140 m north-south, covering 26,250 sq m (Fig. 10.13). The dimensions are slightly larger than reported by the inventory. Areas 1 and 5 had thermal features and the other excavation areas

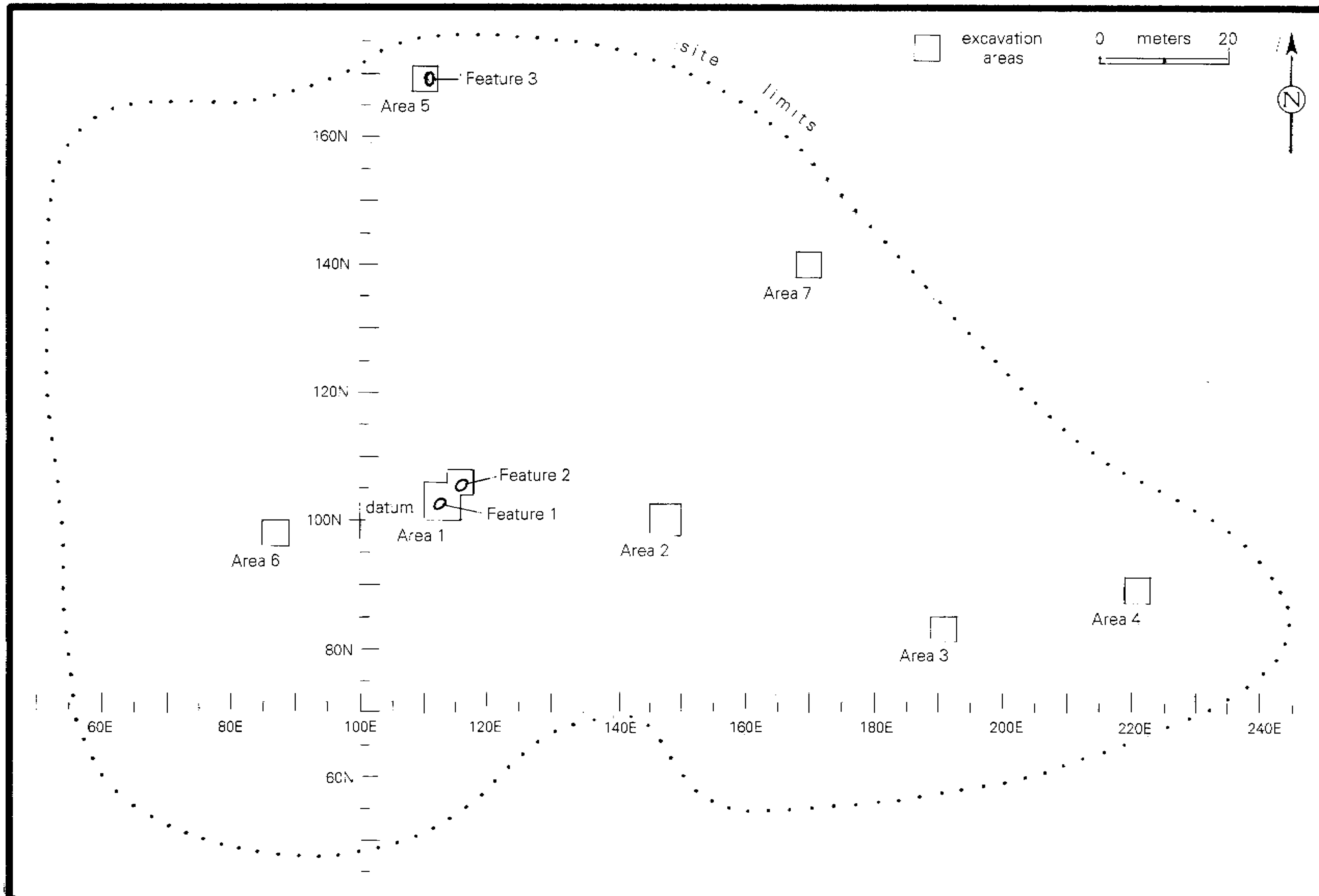

Figure 10.13. LA 98690, site map.

had shallow cultural deposits containing sherds and chipped stone. A total of 186 sherds, 45 pieces of chipped stone, and 6 ground stone artifacts were collected.

Excavation Methods

The site was reexamined and the surface artifacts were flagged, defining the site limits and potential excavation areas. A baseline for a 1-by-1-m grid system was established at intervals that were convenient for working in a heavily treed area. The baseline was extended into excavation areas that centered on high artifact density areas and features.

The excavation areas were surface-stripped in a 5 to 10 cm level. Surface stripping exposed the extent of staining associated with the thermal features and exposed features that were not evident on the surface. A 2-by-2-m area around each feature was trowel-excavated. Pieces of fire-cracked rock and sherds with a maximum dimension of greater than 5 cm were piece-plotted as they were encountered. Artifacts recovered from the shovel-stripped units were piece-plotted whenever it was possible.

In areas where features were not encountered one or two 1-by-1-m units were excavated in two 10-cm levels to insure that deeper deposits were not present. In Areas 2 and 4 deeper excavation was not necessary because the friable bedrock was encountered in the surface-strip level.

Feature excavation proceeded by hand troweling the feature area until the limits of the stain were defined. One half of the feature was excavated exposing the soil profile. The exposed profile was drawn, described, and photographed. The remainder of the feature fill was excavated and flotation samples were collected. All cobbles were left in place so that their stratigraphic position could be recorded.

The excavated feature was mapped and profiled from two orientations. The cobbles were recorded by size, material type, condition, vertical and horizontal orientation, and elevation within the feature. The feature was photographed. The excavation and general site area were transit-mapped.

Stratigraphy

The stratigraphy consisted of a single layer of loose, colluvial sandy loam that was mixed with pebbles and an occasional cobble. This upper layer ranged from 5 to 20 cm deep throughout the site. This layer was not stratified and contained all the cultural material. This layer lies on top of a crumbly sandstone bedrock that is common in the western quarter of the Las Campanas project area.

Excavation Areas

Seven areas were excavated because of the artifact density or the presence of features. These areas will be briefly described. Their locations are shown in Figure 10.13.

Area 1 was a sherd and lithic artifact scatter with an associated charcoal-stained soil concentration in the south-central portion of the site between Areas 2 and 6. Area 1 was on a southwest-facing gentle slope that was cut by a series of shallow erosion channels that originate to the east and northeast. The soil was brown, coarse, loose sandy loam that was mixed with 5 to 10 percent gravel. The soil was a mixed eolian and alluvial deposit. The vegetative cover was less than 10 percent.

Area 1 was initially located to expose the relationship between a concentration of surface sherds and charcoal-stained soil. A 6-by-6-m area was centered on the charcoal-stained soil (Feature 1). This area, except for a 3-by-3-m area with Grid 104N/114E as its northeast corner, was excavated to 10 cm below the modern ground surface (Fig. 10.14). The 3-by-3-m area of charcoal-stained soil was excavated to 5 cm below the modern ground surface. In the northeast corner of the 6-by-6-m area, another charcoal stain with fire-cracked cobbles was partly exposed in the 10 cm surface strip. An additional 12 sq m were excavated around the second stain (Feature 2) to define its limits. Excavation revealed two thermal features and recovered 49 sherds and 14 lithic artifacts, including one metate fragment in the southeast portion of the area.

Area 2 was a small sherd concentration that was in the north-central portion of the site. It covered approximately a 48-sq-m area. The sherds were sitting on a coarse sand matrix that was mixed with platy spalls of sandstone bedrock. This area was not cut by drainage channels, but was deflated.

The Area 2 excavation unit covered a 5-by-5-

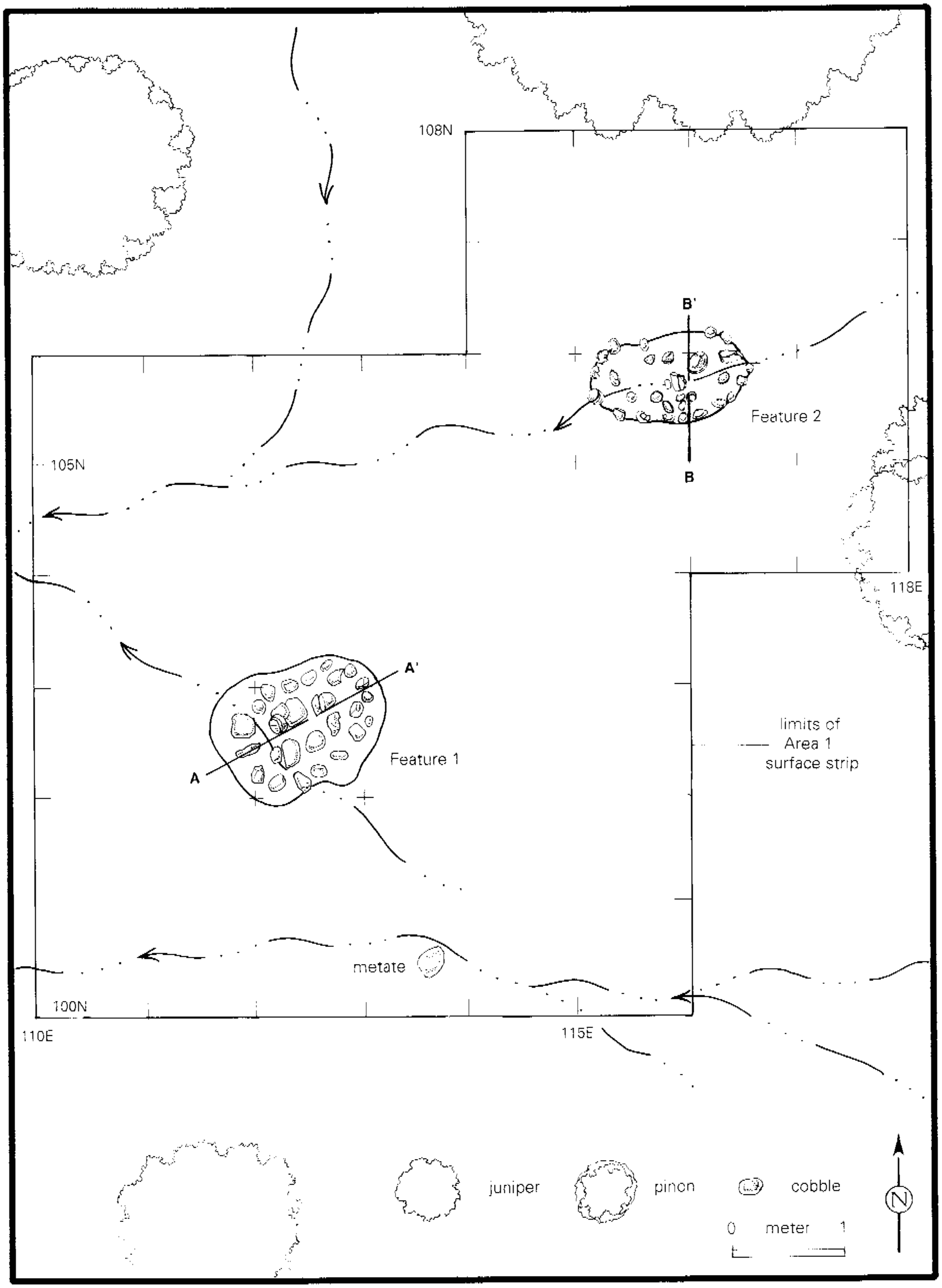

Figure 10.14. LA 98688, Area 1, showing Features 1 and 2.

m area. The loose sandy top soil was surface-stripped from these units to a 10 cm depth. Between 8 and 10 cm below the modern ground surface was a layer of exfoliated, coarse grained, loosely cemented sandstone. Excavation was halted at the bedrock layer. There were no soil stains or stratigraphic changes that might indicate a cultural deposit.

Surface-stripping yielded 92 sherds, 1 piece of chipped stone, and 1 ground stone fragment. The artifact density ranged from 0 to 10 per meter with the majority of the units yielding less than 6 sherds. The sherds represent a minimum number of three vessels of Santa Fe Black-on-white pottery. Rim and body portions were identified. Forty-three sherds came from a 2-by-3-m (Grids 101N/86E and 101-102N/147-148E) area. This suggests that the sherds are from a potdrop or that partial bowls were used as temporary containers or tools.

Area 3 was in the southeast portion of the site, near Area 4. It was a sherd concentration that covers a 30-sq-m area. The sherds were sitting on a coarse sand matrix that was mixed with platy spalls of sandstone bedrock. This area was cut by a north-south drainage channel.

The Area 3 excavation unit covered a 5-by-5-m area. The loose sandy top soil was surface-stripped from these units to a 10 cm depth. Between 8 and 10 cm below the modern ground surface was a layer of exfoliated, coarse grained, moderately cemented sandstone. Excavation was halted at the bedrock layer in the south half of the excavation area. Grid 84N/196E was excavated to 20 cm below the modern ground surface. The soil was loose, light brown sand mixed with 5 to 10 percent gravel and spalls of the sandstone bedrock. There were no soil stains or stratigraphic changes that might indicate a cultural deposit. The excavation was halted because of the absence of cultural material and bedrock was reached.

Surface-stripping yielded 10 sherds, 3 pieces of chipped stone, a ground stone fragment, and a nonhuman bone fragment. The artifact density ranged from 0 to 4 per sq m with the majority of the units lacking artifacts. The sherds represent portions of two vessels of Santa Fe Black-on-white pottery.

Area 4 was in the eastern portion of the site on a gentle southwest-facing slope. The sherd concentration covered 16 sq m. The soil was loose sandy loam mixed with gravel and spalls of sandstone bedrock. The area was deflated and had been cut by two shallow erosion channels.

The excavation area covered 16 sq m and included the full extent of the artifact concentration. The area was excavated to 10 cm below the modern ground surface where bedrock was encountered. No artifacts were recovered from the excavated units. The area lacked subsurface artifacts or evidence of a cultural deposit, so excavation was halted. Surface collection yielded five bowl sherds of Santa Fe Black-on-white pottery and a single piece of chipped stone.

Area 5 was near the north-central site limit. It was a dispersed lithic artifact scatter associated with a fire-cracked rock concentration. The fire-cracked rock concentration (Feature 3) and diffuse charcoal staining were visible on the surface. The dispersed artifact scatter covers 300 to 400 sq m. There are no artifacts directly associated with the feature. The topography was flat to gently sloping to the southwest. There was a narrow and shallow rivulet through the northwest portion of the area. The soil was loose sandy loam mixed with 5 to 10 percent gravel.

The Area 5 excavation area covered 16 sq m and was centered on Feature 3. The area around Feature 3 was shovel-stripped to 10 cm below the modern ground surface. Surface-stripping yielded 9 chipped stone and 1 ground stone artifact. There was no evidence of a migrating charcoal stain and there were fewer than 20 spalls of fire-cracked rock suggesting that the feature limit had not spread much beyond the surface configuration. Grids 169-170N/111E were excavated with a trowel. The limits of the fire-cracked rock configuration and pockets of dark brown charcoal-stained soil were defined. Only one piece of chipped stone was recovered from the feature.

Area 6 was located west of Area 1 near the western site limit. It was within a part of the site that was cut by numerous erosion channels. Erosion has scattered 50 to 100 artifacts across the western quarter of the site. Area 6 was selected to investigate the nature of the dispersed artifact scatter. The artifact scatter was on a gentle southwest-facing slope. The artifacts sat on a loose, sandy loam that was mixed with 5 to 10 percent gravel. The sandstone bedrock that occurred in the western portion of the site was not evident in and around Area 6.

The Area 6 excavation area was 4-by-4 m. All units were surface stripped to 10 cm below the modern ground surface. A single obsidian flake was recovered from the 16 units. Two units (Grids 98N/89E and 100N/88E) were excavated to 20 cm below the modern ground surface.

They did not yield artifacts or evidence of a cultural deposit. The Area 6 artifact assemblage consists of five pieces of chipped stone and eight sherds. An additional twelve sherds were collected from a 10-m radius around the perimeter of the excavation area. The artifact assemblage was different from the other areas because all of the chipped stone artifacts were obsidian debitage. The sherds were Santa Fe Black-on-white bowl sherds.

Area 7 was a sherd concentration located near the northeastern site limit on a gentle southwest-facing slope. The sherd concentration covered 10 sq m. The soil was loose sandy loam mixed with gravel and spalls of sandstone bedrock. The surface was deflated and had a very sparse ground cover.

The excavation area covered 16 sq m and included the full extent of the artifact concentration. The excavation area was excavated to 10 cm below the modern ground surface. The subsurface soil was the same as the surface soils. No artifacts were recovered from the excavated units. Grid 141N/71E was excavated to 20 cm below the modern ground surface. The soil was a brown, clay sand loam with less than 5 percent gravel. Surface collection yielded ten bowl sherds of Santa Fe Black-on-white pottery and a single piece of chipped stone.

Feature Descriptions

Feature 1 was located in Area 1. It was an elliptical ring of fire-cracked cobbles with an interior ring of cobbles (Figs.10.15-10.17). The feature was 1.60 m east-west by 1.10 m north-south with an estimated depth of 20 to 25 cm based on cobble height.

Feature 1 was probably a shallow pit lined with small- to medium-size quartzite cobbles (Figs. 10.15, 10.16). A fire was started within the exterior cobble ring. A second ring of medium to large cobbles was placed in the fire, forming a platform or elliptical space for cooking or processing. Dark brown, charcoal-stained soil was recovered from within both cobble rings.

A total of 27 cobbles ranged in size from 10 cm long by 10 cm wide by 7 cm thick to 22 cm long by 17 cm wide by 10 cm thick. The cobbles were locally available, and all but two cobbles were quartzite. The interior cobbles were lying flat on the feature floor, while the majority of the outer cobbles were vertical or tilted forward. The majority of the cobbles were cracked, but none were exploded as was found with the pottery-firing features at LA 86159 and LA 84793.

No artifacts were recovered from within Feature 1. Eight to ten sherds were recovered from above the stained soil in the redeposited sandy loam. Given the extent of erosion around and in Area 1, it is unlikely that these sherds were originally deposited within Feature 1. A metate fragment was located to the south, 2 m from Feature 1, suggesting that the feature was used for plant processing. The absence of pottery in the upper feature fill is one criterion suggesting that Feature 1 was not a pottery-firing feature and instead was used to field-process gathered resources.

Feature 2 was located in Area 1. It was an oval-shaped, cobble-lined hearth (Figs. 10.15, 10.17) that measured 1.60 m east-west by 1.05 m north-south with an estimated depth of 25 cm. The fill was a mix of redeposited sandy loam with charcoal-stained sand. Occasional charcoal flecks, pea gravel, fire-cracked rock spalls, and one sherd were mixed with the soil. An erosion channel runs through the feature and has removed some of the primary deposit.

The feature was lined with 24 cobbles, and 7 cobbles exhibited thermal fractures. The cobbles are quartzite and were available from a nearby source. Most of the cobbles were small to medium size with dimensions ranging from 9 cm long by 7 cm wide by 6 cm thick to 19 cm long by 13 cm wide by 9 cm thick. Seven cobbles were lying flat and the remainder are oriented diagonally or vertically. Seven cobbles were suspended in the fill and the remainder were in contact with the feature floor or wall. All of the cobbles were slightly cracked or whole. None of the cobbles appear to have been heated to a high temperature, such as was found with the pottery-firing features at LA 86159 and LA 84793.

The size, configuration, and cobble content of Feature 2 is similar to Feature 1. These similarities suggest that the two features were functionally similar. Based on preliminary observations, Features 1 and 2 appear more similar to each other than to the pottery-firing features of LA 86159 and LA 84793. Differences are evident in the intensity of burning, the size and orientation of the cobbles, and the composition and location of the ceramic assemblages. These differences will be more fully explored in a later section of this report.

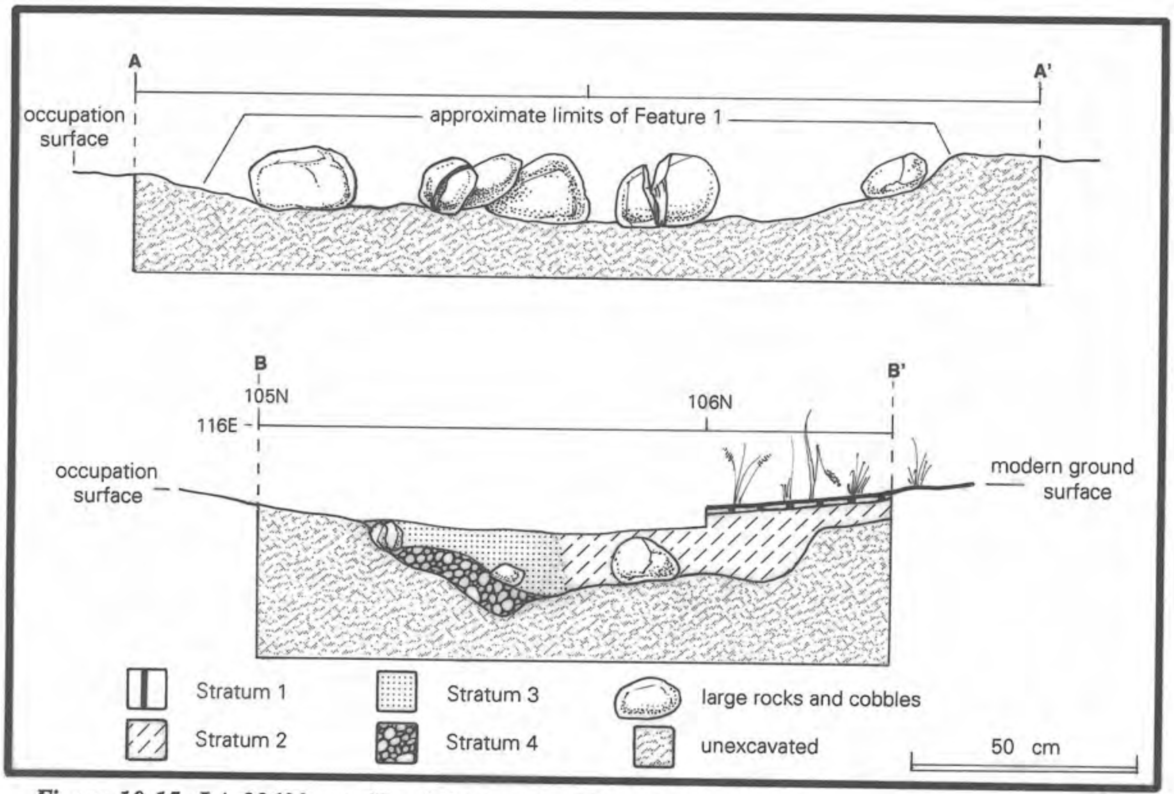

Figure 10.15. LA 98690, profile of Feature 1 and Feature 2, Area 1.

Figure 10.16. LA 98690, Feature 1, excavated.

Figure 10.17. LA 98690, Feature 2, excavated.

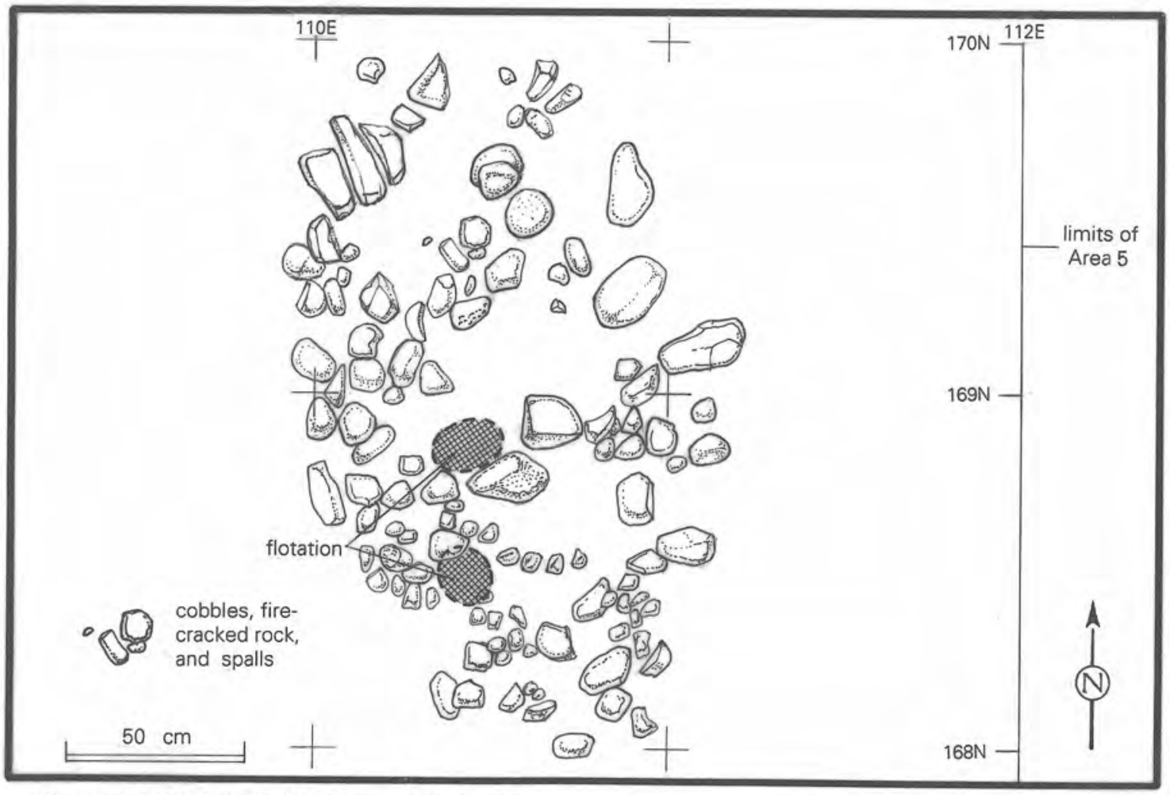

Figure 10.18. LA 98690, Feature 3, Area 5.

Figure 10.19. LA 98690, Feature 3 excavated.

Feature 3 was located in Area 5. It was an oval-shaped cobble- filled hearth (Figs. 10.18, 10.19). No evidence of a former pit outline could be discerned, but it is likely that the edges have been deflated and could no longer be distinguished. The remaining fire-cracked cobble configuration was 1.95 m long northwest-southeast by 1.45 m northeast-southwest. It is likely that the feature was a shallow, basin-shaped pitthat was filled with a layer of cobbles. The feature floor was not stained or mottled from heavy burning, suggesting that the fire was not intense or of long duration.

Approximately 60 cobbles were exposed. The cobbles ranged from 9 cm long by 6 cm wide by 4 cm thick to 25 cm long by 23 cm wide by 8 cm thick. They were mostly quartzite, but four cobbles were metamorphic schist or igneous. Many of the cobbles were cracked and spalled; small spalls were recovered from the feature fill. The cobbles were not excessively cracked or spalled as was apparent in the pottery-firing features found at LA 86159 and LA 84793.

Artifact Assemblage

Pottery
by Steven A. Lakatos

A total of 186 sherds were recovered from the surface and six excavation areas. A minimum of 11 vessels were identified in the assemblage; 49 sherds were not assigned to a vessel. All vessels were identified as Santa Fe Black-on-white bowls, except for one jar sherd. Table 10.32 shows the distribution of vessels recovered from each excavation area.

Bowls are the dominant vessel form from LA 98690. Rim sherds are 18 percent and body sherds are 79 percent of the assemblage. The relatively high percent of rim sherds suggests that whole or large portions of vessels were brought to the site (Fig. 10.20a). Bowls are the bulk of decorated ceramics during the fourteenth century in the Northern Rio Grande (Habicht-Mauche 1993; Mera 1935; Stubbs and Stallings 1953). Table 10.33 shows the distribution of vessel form and portion.

Table 10.32. LA 98690 Excavation Area by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Area 1	23 46.9 39.7	5 10.2 100.0	5 10.2 100.0	9 18.4 100.0	7 14.3 100.0								49 26.3
Area 2	8 8.7 13.8					45 48.9 100.0	20 21.7 100.0	19 20.7 100.0					92 49.5
Area 3	5 50.0 8.6								5 50.0 100.0				10 5.4
Area 4	5 100.0 8.6												5 2.7
Area 6	11 55.0 19.0									5 25.0 100.0	4 20.0 100.0		20 10.8
Area 7	6 60.0 10.3											4 40.0 100.0	10 5.4
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186

Table 10.33. LA 98690 Vessel Form and Portion by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Indeterminate	2 50.0 3.4							2 50.0 10.5					4 2.2
Bowl rim	10 29.4 17.2	1 2.9 20.0	3 8.8 60.0		1 2.9 14.3	7 20.6 15.6	9 26.5 45.0				2 5.9 50.0	1 2.9 25.0	34 18.3
Bowl body	45 30.6 77.6	4 2.7 80.0	2 1.4 40.0	9 6.1 100.0	6 4.1 85.7	38 25.9 84.4	11 7.5 55.0	17 11.6 89.5	5 3.4 100.0	5 3.4 100.0	2 1.4 50.0	3 2.0 75.0	147 79.0
Jar body	1 100.0 1.7												1 .5
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186 10.0

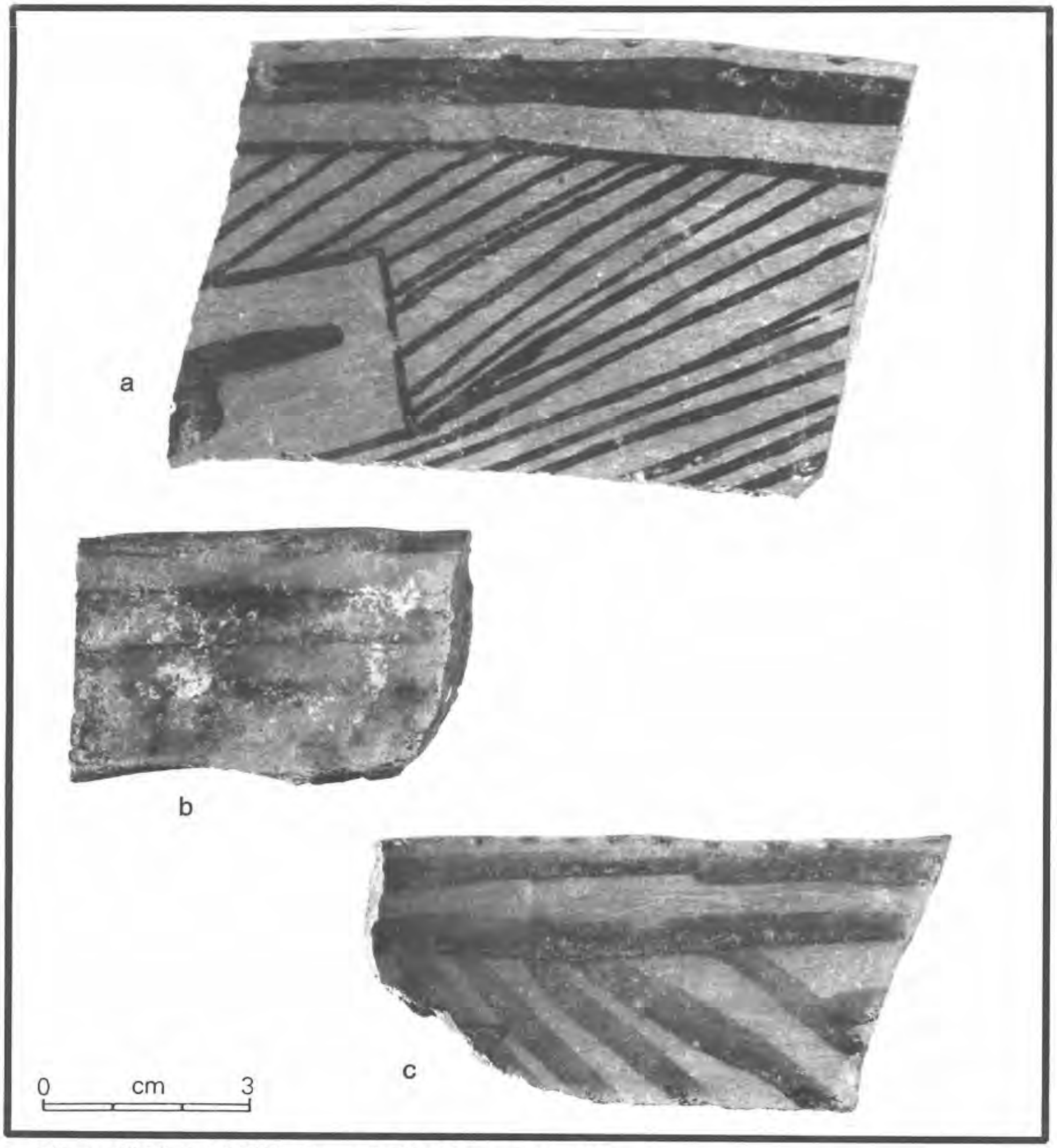

Figure 10.20. LA 98690, Santa Fe Black-on-white pottery.

Bowl rim forms range from flat (10 percent), tapered and flat (43 percent), to rounded or tapered and rounded (43 percent). Variable rim forms in a single vessel is a common trait for Santa Fe Black-on-white (Kidder and Amsden 1931). A wide range of rim forms were identified in the Arroyo Hondo assemblage (Habicht-Mauche 1993). Table 10.34 shows the rim form distribution.

Bowl exteriors are usually scraped with horizontal striations common. A light to moderate exterior polish is displayed on 16 percent of the sherds. Polishing on the exterior of Santa Fe Black-on-white bowls was also reported in low percentages for the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) ceramic assemblages. Table 10.35 shows the location and degree of polish by vessel.

The majority of the sherds exhibit a variety of interior surface treatments other than smoothing. A gray floated slip combined with high polish is present on 62 percent of the interior surfaces. A thin to moderately applied white slip combined

Table 10.34. LA 98690 Rim Form by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Not applicable	50 32.1 86.2	4 2.6 80.0	2 1.3 40.0	9 5.8 100.0	6 3.8 85.7	37 23.7 82.2	13 8.3 65.0	19 12.2 100.0	5 3.2 100.0	5 3.2 100.0	2 1.3 50.0	4 2.6 100.0	156 83.9
Straight and flat	1 50.0 1.7				1 50.0 14.3								2 1.1
Rounded							7 100.0 35.0						7 3.8
Flat	1 100.0 1.7												1 .5
Tapered and rounded	4 66.7 6.9		2 33.3 40.0										6 3.2
Tapered and flat	2 15.4 3.4	1 7.7 20.0				8 61.5 17.8					2 15.4 50.0		13 7.0
Beveled			1 100.0 20.0										1 .5
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186 100.0

Table 10.35. LA 98690 Degree and Location of Polish by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Absent	4 30.8 6.9							9 69.2 47.4					13 7.0
Light interior	2 100.0 3.4												2 1.1
Medium interior	5 26.3 8.6	2 10.5 40.0				2 10.5 4.4	5 26.3 25.0			4 21.1 80.0		1 5.3 25.0	19 10.2
Heavy interior	43 30.5 74.1	3 2.1 60.0	5 3.5 100.0	9 6.4 100.0	7 5.0 100.0	43 30.5 95.6	13 9.2 65.0	5 3.5 26.3	5 3.5 100.0	1 .7 20.0	4 2.8 100.0	3 2.1 75.0	141 75.8
Heavy interior, medium exterior	2 100.0 3.4												2 1.1
Heavy exterior, light interior							1 100.0 5.0						1 .5
Light exterior								4 100.0 21.1					4 2.2
Medium exterior								1 100.0 5.3					1 .5
Indeterminate	2 66.7 3.4						1 33.3 5.0						3 1.6
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186 100.0

with a medium to high polish is present on 19 percent of the assemblage. Table 10.36 shows the slip thickness and location for the assemblage.

Paste color and texture are markedly similar throughout the assemblage, which is typical of Santa Fe Black-on-white. The paste is hard, light gray to gray (7.5YR 7/0-5/0), and fine grained in 96 percent of the assemblage. A fine, self-tempered paste was recorded in all sherds examined. Temper is usually invisible without the aid of a microscope (30x-40x).

Decorated pottery were 82 percent of the assemblage. Pigment, usually located on the interior surfaces, consisted exclusively of black carbon paint. The color ranged from thick black (2.5YR 3/0-5/0), thin, streaky (2.5YR 3/0-6/0) to ghosted (2.5Y 7/0, 6/0, 6/2). Thick, black, well-bonded pigment is the dominant paint quality comprising 54 percent of the decorated sherds. Thin streaky paint is 26 percent and resembles what Habicht-Mauche describes as "watery consistency" (1993:22). Ghosted pigment is 21 percent of the assemblage. Ghosted paint is faintly visible on the surface. Table 10.37 shows the quality and location of paint by vessel.

Design layouts and elements for the decorated assemblage are consistent with those described in the Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Pindi Pueblo (Stubbs and Stallings 1953) assemblages. Design layout for Vessels 1-11 are listed in Table 10.38.

Summary

The Santa Fe Black-on-white pottery from the LA 98690 falls within the range of variability outlined by Kidder and Amsden (1931), Mera (1935), Stubbs and Stallings (1953), and Habicht-Mauche (1993), among others. Clay source research has identified one source near the Las Campanas area, Culebra Lake Gray (Kelley 1948), which is suitable for the manufacture of Santa Fe Black-on-white pottery. The homogeneous paste in this ceramic assemblage suggests a limited or restricted raw material resource. Multiple vessels within excavation areas, and vessels associated with thermal features, suggest LA 98690 was occupied repeatedly between A.D. 1175 and 1425 for a variety of domestic activities.

Chipped Stone Artifacts
by Guadalupe A. Martinez

A total of 51 stone artifacts from seven separate areas were recovered from LA 98690. Forty-five were chipped stone and six were ground stone fragments. Four artifact types and five material types were represented in the assemblage (Tables 10.39, 10.40). All artifacts were debris from core and biface reduction.

LA 98690, Area 1

A total of 13 chipped stone artifacts were recovered from Area 1. The chipped stone artifacts are debris from core reduction and biface manufacture. Three material types and three artifact types were represented. Obsidian dominates the assemblage at Area 1.

Two pieces of obsidian angular debris were recovered. Eight core flakes, two of chert, two of quartzite, and four of obsidian were recovered. All debitage had less than 30 percent cortex, eleven lacked cortex. The angular debris had no dorsal scars. Core flake dorsal scars ranged from two to eight with the majority displaying three to five. The cortex percentages and the dorsal scars indicate that middle and late stages of core reduction are represented at Area 1.

There were three biface flakes, two obsidian and one quartzite. Two biface flakes had two dorsal scars. One biface flake had five scars. It appears that limited obsidian and quartzite biface use or maintenance took place at Area 1.

LA 98690, Area 2

One piece of chipped stone was recovered from Area 2. The artifact was the distal portion of a chert core flake. It had no cortex and no discernable dorsal scars.

LA 98690, Area 3

One piece of chipped stone was recovered from Area 3. The artifact was a unidirectional chert core with 20 percent cortex. The core had four

Table 10.36. LA 98690 Slip Thickness and Location by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Absent	4 22.2 6.9							14 77.8 73.7					18 9.7
Thin white interior	6 66.7 10.3						3 33.3 15.0						9 4.8
Medium white interior	8 27.6 13.8						13 44.8 65.0	4 13.8 21.1	4 13.8 80.0				29 15.6
Thick white interior	4 57.1 6.9						3 42.9 15.0						7 3.8
Thin white exterior	1 100.0 1.7												1 .5
Medium white interior,thin white exterior	1 100.0 1.7												1 .5
Floated interior	30 26.1 51.7	5 4.3 100.0	5 4.3 100.0	9 7.8 100.0	7 6.1 100.0	44 38.3 97.8	1 .9 5.0	1 .9 5.3		5 4.3 100.0	4 3.5 100.0	4 3.5 100.0	115 61.8
Obscured	4 66.7 6.9					1 16.7 2.2			1 16.7 20.0				6 3.2
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186 100.0

Table 10.37. LA 98690 Paint Color and Appearance by Vessel

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Absent	12 36.4 20.7			1 3.0 11.1		3 9.1 6.7	1 3.0 5.0	16 48.5 84.2					33 17.7
Thin streaky black interior	11 28.2 19.0			3 7.7 33.3	2 5.1 28.6	11 28.2 24.4	10 25.6 50.0	1 2.6 5.3				1 2.6 25.0	39 21.0
Thick black interior	23 28.0 39.7	4 4.9 80.0	5 6.1 100.0	4 4.9 44.4	5 6.1 71.4	26 31.7 57.8	3 3.7 15.0	2 2.4 10.5	5 6.1 100.0	1 1.2 20.0	4 4.9 100.0		82 44.1
Ghosted black interior	9 31.0 15.5	1 3.4 20.0		1 3.4 11.1		5 17.2 11.1	6 20.7 30.0			4 13.8 80.0		3 10.3 75.0	29 15.6

Count Row Pct Column Pct	Vessel Number												Row Total
	0	1	2	3	4	5	6	7	8	9	10	11	
Ghosted black exterior	2 100.0 3.4												2 1.1
Obscured	1 100.0 1.7												1 .5
Column Total	58 31.2	5 2.7	5 2.7	9 4.8	7 3.8	45 24.2	20 10.8	19 10.2	5 2.7	5 2.7	4 2.2	4 2.2	186 100.0

Table 10.38. LA 98690 Design Layout by Vessel

Vessel	Design layout
1	A 4-mm-wide encircling band is pendant to the rim and a 7-mm-wide encircling band is located 4 mm below the first. Checkerboard design elements similar to Stubbs and Stallings (1953, fig. 41r) are located 5 mm below the second encircling band (Fig. 10.20b).
2	A 3-mm-wide encircling band is pendent to and drifting away from the rim. Below are two 3 mm wide bands with solid pendant triangles.
3	Diagonal hatching framed between the thin 2-mm-wide encircling bands and a thick 6 mm wide encircling band.
4	A 4-mm-wide encircling band is located 3 mm below the rim. Thick diagonal hatching 6 mm below the encircling band are pendant to a framing line (Fig. 10.20c).
5	A 2-mm-wide encircling band is located 4 mm below the rim. An 18-mm-wide encircling band is located 6 mm below the first. Solid triangles are pendant to the lower encircling band and other, solid design elements are framed by thin diagonal hatching.
6	Four encircling bands are located 11 mm below the rim. The bands are 2 to 3 mm wide and 2 to 3 mm apart. Similar vertical hatching is exhibited on the body sherds.
7	Insufficient design elements remain.
8	Hatching, 2-3 mm wide with solid pendant triangle.
9	A 5-mm-wide encircling band with pendant checkerboard elements similar to Stubbs and Stallings (1953, fig. 41r).
10	Two encircling bands, one is 6 mm wide, located 3 mm below the rim, and the second is 6 mm wide and located 6 mm below the first. Vertical lines are pendant to the second encircling band.
11	A 3-mm-wide encircling band is located 4 mm below the rim and a 5-mm-wide band is located 9 mm below the first. Checkerboard design elements, similar to Stubbs and Stallings (1953, fig. 41r), are pendant to the lower encircling band.

Table 10.39. LA 98690 Area by Material

Count Row Pct Column Pct	Chert	Chalcedony	Obsidian	Basalt	Quartzite	Row Total
Area 1	2 15.4 10.5		8 61.5 57.1		3 23.1 75.0	13 28.9
Area 2	1 100.0 5.3					1 2.2
Area 3	1 100.0 5.3					1 2.2
Area 4				1 100.0 33.3		1 2.2
Area 5	9 69.2 47.4	1 7.7 20.0	1 7.7 7.1	2 15.4 66.7		13 28.9
Area 6	6 40.0 31.6	4 26.7 80.0	5 33.3 35.7			15 33.3
Area 7					1 100.0 25.0	1 2.2
Column Total	19 42.2	5 11.1	14 31.1	3 6.7	4 8.9	45 100.0

Table 10.40. LA 98690 Area by Artifact Type

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Unidirectional Core	Row Total
Area 1	2 15.4 28.6	8 61.5 27.6	3 23.1 37.5		13 28.9
Area 2	1 100.0 14.3				1 2.2
Area 3				1 100.0 100.0	1 2.2
Area 4		1 100.0 3.4			1 2.2
Area 5	3 23.1 42.9	9 69.2 31.0	1 7.7 12.5		13 28.9

Count Row Pct Column Pct	Angular Debris	Core Flake	Biface Flake	Unidirectional Core	Row Total
Area 6	1 6.7 14.3	10 66.7 34.5	4 26.7 50.0		15 33.3
Area 7		1 100.0 3.4			1 2.2
Column Total	7 15.6	29 64.4	8 17.8	1 2.2	45 100.0

dorsal scars and measured 65 mm by 49 mm by 44 mm.

LA 98690, Area 4

One piece of chipped stone was recovered from Area 4. The artifact was a basalt core flake with 20 percent cortex. The flake was whole with a cortical platform.

LA 98690, Area 5

Thirteen pieces of chipped stone were recovered from Area 5. Nine artifacts were core flakes, six were chert and there was one each of chalcedony, obsidian, and basalt. There were three pieces of chert angular debris. One basalt biface flake was recorded. Neither the angular debris nor the biface flake had any cortex. Six of the core flakes had no cortex. One core flake had 30 percent cortex, one had 60 percent, and one had 80 percent.

LA 98690, Area 6

Fifteen artifacts were recovered from Area 6. They were fairly evenly distributed for three material types with six of chert, four of chalcedony, and five of obsidian. Three artifact types were represented, one piece of angular debris, ten core flakes, and four biface flakes. All the artifacts except one biface flake lacked cortex. Biface flakes had between four and nine dorsal scars.

LA 98690, Area 7

One quartzite core flake was recovered from Area 7. It was a distal fragment with 100 percent cortex.

Ground Stone Artifacts

Six pieces of ground stone were recovered from Areas 1, 2, 3, and 5. Area 1 had an end fragment of a quartzite basin metate. Area 2 had an internal fragment of an unspecified quartzite mano. Area 3 had three pieces of ground stone. Two pieces of siltstone were recorded as internal axe fragments. The third piece was an end fragment of a quartzite mano. Area 5 had a shaped slab made of sandstone.

Research Design

Excavation of LA 98690 focused on the seven artifact concentrations (Areas 1 through 7) that were discretely located within a 180 m east-west by 140 m north-south area that covered 26,250 sq m. Areas 1 and 5 had thermal features and the other excavation areas had shallow cultural deposits containing sherds and chipped stone. A total of 186 sherds, 45 pieces of chipped stone, and 6 ground stone artifacts were recovered. The discrete artifact concentrations associated with thermal features and a disperse artifact concentration reflected repeated use of LA 98690 during the prehistoric period. The research design focused on determining the site function and role that LA 98690 may have had in Coalition or early Classic period subsistence organization. These research domains were addressed by retrieving temporal, spatial, and technological data.

Chronology and Occupation History

Chronological data were potentially available from different pottery types or as chronometric samples collected from the thermal features. Excavation yielded no data that could be used to objectively refine the site occupation dates or sequence. Pottery analysis provided some subjective indications of possible occupation dates within the Coalition to early Classic period framework (A.D. 1175 to 1400).

Petrographic analysis of sherds from the 11 vessel fragments from Areas 1-4, 6, and 7 showed remarkable homogeneity. All sherds were classed as Group 1 or 2, self-tempered (Hill, this volume). The pastes showed close similarity to clay from the Culebra Lake deposit along the Rio Grande near its confluence with Cañada Ancha. The distinguishing characteristic of this clay is the very fine to fine silt particles mixed with less than 5 percent accessory minerals. Silty self-tempered Santa Fe Black-on-white pottery is common in the early occupations from Arroyo Hondo (Habicht-Mauche 1993) and Pindi (Stubbs and Stallings 1953) pueblos. The Arroyo Hondo data suggest a pre A.D. 1350 date.

The Santa Fe Black-on-white pottery was recovered from six discrete clusters that represent an equivalent number of occupations. The similarity in the paste of pottery strongly supports the observation that the clusters are contemporaneous within the same relatively short temporal span. The absence of other decorated pottery types that were commonly associated with Santa Fe Black-on-white pottery in assemblages from Pindi and Arroyo Hondo Pueblos suggests that LA 98690 was occupied before these types were made or were common. This would imply that the occupations occurred before A.D. 1300.

The lack of ceramic type variability and radiocarbon dates makes defining an occupation sequence for LA 98690 impossible. The activity areas are spatially discrete and there was no inter-area distribution of vessel portions. Proximity of Features 1 and 2 within Area 1 suggests that they were used concurrently or sequentially. Feature 2 is disarticulated, which suggests that cobbles may have been removed for use in the construction of Feature 1. Shallow cultural deposits and low frequency artifact counts for each area suggest that all occupations were brief. Features 1, 2, and 3 may have been used for food processing or cooking during overnight stays.

Site Function

Site function will be addressed by examining artifact attribute and distribution patterns and feature and artifact associations. Low artifact frequency and negative results of ethnobotanical analysis of feature fill render site function determination weak and somewhat subjective. However, general statements can be made from the artifact and feature evidence.

The presence of seven discrete artifact or feature clusters indicates that LA 98690 was occupied at least six times with the occupations occurring primarily during the Coalition period. During the A.D. 1200 to 1300 period increasing population and variable precipitation and temperature may have made the more distant grassy parkland of the piedmont edge more attractive to extended foraging or hunting forays. Site occupants are assumed to have used the Las Campanas area from the Santa Fe River. LA 98690 is 7.2 km from Coalition period villages along the Santa Fe River. This distance would have been a 14.4 km round trip for daily foraging, which is beyond the most commonly suggested daily travel distance for foraging by sedentary populations (Flannery 1976). Therefore, to effectively exploit the resources of the Cañada Ancha environment, overnight camps may have been necessary. Camps that were centrally located with respect to most productive resource areas would have been reoccupied. Reoccupation would have resulted in discrete artifact or feature concentrations with an associated dispersed artifact scatter.

LA 98690 appears to be a overnight camp that was repeatedly used. The artifact attribute and type composition can be examined for patterns and variability that relate to subsistence activities and site function.

The pottery types and forms are the same for all areas, except Area 5, which lacked associated pottery and a single jar body sherd that was recovered from the general site scatter. A minimum of 11 partial bowls were identified. Area 1, which had Features 1 and 2, had four vessels. Area 2, which did not have a thermal feature, had three vessels, and Area 6 had two vessels. All but vessels 3, 7, 8, and 9 had rim and body sherds indicating that only upper portions of bowls were left behind. As whole vessels, bowls served as temporary containers for cooking and consumption. In domestic settings they may have been used to hold frequently used household items that needed to be accessible. In field contexts, bowl functions are not well understood. Bowls are rigid containers that would have been inefficient for transporting bulk quantities of processed resources or raw materials. However, rigidity and durability may have been favorable qualities to transport daily rations or for use as tools or scoops during processing. From this perspective, bowl fragments would have been multipurpose tools. The presence of multiple bowl fragments within an area could indicate processing of greater quantities of resources or raw materials or reoccupation.

The chipped stone assemblage is atypical for most Las Campanas assemblages. Differences in the LA 98690 assemblage include higher than usual percentages of biface flakes and nonlocal materials (obsidian and basalt). Use of nonlocal material and more emphasis on biface production or maintenance would be expected for a hunting camp or more logistically organized foraging forays (Kelly 1988). Low core counts indicate that lithic raw material may not have been available in the immediate vicinity.

Core flake attributes can also inform on the availability of lithic raw material and reduction strategy. Areas 1, 5, and 6 had the most core flakes. These core flakes had a high percentage of noncortical core flakes with three or more dorsal scars. This pattern strongly suggests late stage core reduction, where chipped stone was brought to the site in a substantially reduced form. Partial reduction would have facilitated longer distance transport from a source or residence. This reduction strategy fits well with a logistically organized subsistence strategy or a long-distance daily foraging strategy that was geared to traveling light.

The low number of ground stone artifacts reflect a limited emphasis on plant processing. Area 1 had an associated basin metate fragment. Basin metates were most functionally suited to seed or nut processing (Lancaster 1983). Two axe fragments were recovered from Area 3, which may have been used to procure and process wood. The small amount of ground stone tools could have been used for processing resources for transport or to support limited domestic activities at an overnight camp.

Three thermal features were excavated. Features 1 and 2 were in Area 1. Feature 3 was in Area 5 away from the areas that had pottery. Hearths with cobbles are common features on Coalition period sites. Features 1 and 2 were deflated and contained mixed deposits that did not yield subsistence information. They were similar in size and configuration suggesting that they performed similar functions and were used by groups of similar size. These features were different from the pit kilns found at LA 86159 and LA 84793 in that sherd spalls and spalled sherds were absent, the cobble orientation was horizontal, the cobbles had little evidence of burning, and an oxidized rind was absent. Assigning function to Features 1 and 2 based on morphology is not possible. The size and relatively formal internal cobble configuration of Feature 1 suggest that it was use to provide more than warmth. The internal cobble ring may have been used as a platform for roasting edible plant parts or game.

Artifact and feature data indicate that LA 98690 was a repeatedly occupied foraging or hunting camp. The chipped stone debris suggest logistical organization with an emphasis on biface production or maintenance and use of heavily reduced local and nonlocal lithic materials. The pottery is typical of the Las Campanas Coalition period sites because it was primarily the upper portion of bowls. Bowls could have been used in many ways to support overnight forays. The features have relatively formal structure and appear to be more than simple hearths built for warmth. LA 98690 data suggest that as foraging activities increased beyond the 6 to 7 km radius, a logistical strategy had to be employed. Another example of a logistical site might be LA 86150, which had multiple hearths, biface reduction, Santa Fe Black-on-white bowl sherds, and a few pieces of ground stone.

CHAPTER 11
POTTERY OF THE LAS CAMPANAS PROJECT

Steven A. Lakatos

Introduction

Ceramic manufacture, use, and exchange in the Northern Rio Grande have been a focus of archaeologists for over a century (Bandelier 1881, 1890, 1892; Nelson 1913, 1914, 1916, 1917; Mera 1933, 1934, 1935; Hewett and Bandelier 1937; Stubbs and Stallings 1953; Shepard 1968; Lang 1977; Warren 1976, 1979a; Habicht-Mauche 1993). These studies have developed a regional ceramic typology, a chronological sequence of manufacture dates, and potential production locales. The definition of ceramic types in the Northern Rio Grande is based primarily on combinations of paste, pigment, and surface characteristics (Habicht-Mauche 1993). Regions of manufacture are defined by the different frequencies of these attributes. Existing type and variety descriptions were used to identify pottery types in the Las Campanas ceramic assemblage. Type names, references and estimated dates of manufacture were previously presented.

The Las Campanas ceramic assemblage was derived from the surface collection and excavation of 13 small archaeological sites. Table 11.1 shows the distribution of pottery types, vessel form, and portion by site. The assemblage consists of 4,318 sherds, including 1,593 white wares, 1,059 glaze wares, and 1,656 utility wares. Pottery types identified within these ware groups suggest that the Las Campanas area was occupied from the late Developmental-early Coalition (A.D. 1050-1200) through the early Historic period (A.D. 1650). Frequencies of types suggest two main periods of occupation, the early Coalition (A.D. 1175-1250) and the early Classic period (A.D. 1315-1450).

Typology and Chronology

White Wares

Pottery types from the late Developmental to the early Historic period were identified in the Las Campanas ceramic assemblage. The earliest white ware pottery type identified was Kwahe'e Black-on-white. Kwahe'e Black-on-white, indigenous to the Northern Rio Grande (Habicht-Mauche 1993:15), was manufactured during the late Developmental-early Coalition period (A.D. 1025-1250) (Stuart and Gauthier 1981:51). Kwahe'e Black-on-white is often found in association with other mineral-painted white wares such as Red Mesa Black-on-white, Escavada Black-on-white, and Gallup Black-on-white. Kwahe'e Black-on-white displays similar stylistic characteristics to the mineral-painted Cibola White Wares of the southern San Juan Basin (McNutt 1969:11; Mera 1935:5). This inter-regional relationship between the San Juan Basin and the Northern Rio Grande, cultivated during the late Developmental period, may have carried over into the Coalition period (A.D. 1175-1325). Kwahe'e Black-on-white was rare on the OAS sites: three sherds occurred on two sites. The low frequency reflects limited use of the piedmont, which was more than 5 km distant from the Santa Fe River during the late Developmental period.

Santa Fe Black-on-white is the primary decorated pottery type on Coalition period (A.D. 1175-1325) and Las Campanas sites. Based on stylistic similarities, early investigators suggested that Santa Fe Black-on-white developed locally from Kwahe'e Black-on-white (Stubbs and Stallings 1953:48). Most Coalition period village sites have extensive ceramic assemblages that include Santa Fe Black-on-white (McNutt 1969: 79). Unmixed Santa Fe Black-on-white assemblages are rare. However, relatively unmixed Santa Fe Black-on-white assemblages are associated with the early Coalition (A.D. 1175-1250) occupations of Pindi Pueblo (LA 1), Pueblo del Encierro (LA 70), and the Tesuque By-Pass Site (LA 3294).

The Tesuque By-Pass Site (LA 3294) is the oldest excavated village among Pindi Pueblo (LA 1), Pueblo del Encierro (LA 70), and Arroyo Hondo (LA 12). Of the 85 Santa Fe Black-on-white sherds recovered from LA 3294, 73 percent were self-tempered, followed by equal percentages of fine sherd and fine sand. Santa Fe Black-on-white recovered from Pindi Pueblo can be divided into two groups, with the earlier

Table 11.1. Distribution of Ceramic Types, Vessel Form, and Portion by Site

	LA 84759			LA 98688			White ware sites number of sites = 10 range of sherds = 2-597			
Type	Bowls	Jars	Other	Bowls	Jars	Other	Other	Bowls	Jars	Total
Mineral white					1					1
Kwahe'e B/w					2				1	3
White, unpainted	4			52	3	4	12	35	3	113
Organic white				76	2		30	144	2	254
Santa Fe B/w	2			1	1		4	967	1	976
Wiyo B/w				22						22
Biscuit undiff				17		4				21
Biscuit A	5			177						182
Biscuit B	14			16						30
Pindi B/w				1						1
Plain undiff		3	1		2					6
Plain polished brown				5	27	10				42
Plain polished gray				24	41	7				72
Plain micaceous		1	*2		1					4
Corrugated micaceous					1478	5				1483
Corrugated nonmicaceous		1			34					35
Potsuwi'i		1								1
Sapawe		3			4					7
Kapo Gray				5		1				6
Glaze undiff.				10	14	73				97
Glaze red undiff.	1	6		16	188	36				247
Glaze yellow undiff.			**1	290	261	37				589
Glaze poly. undiff.				36	15	1				52
Agua Fria G/r				7	31	8				47
San Clemente G/p*				1	2					3
Cieneguilla G/y				9	1					10
Largo G/p					3					3
Espinosa G/p					6	5				11
Total	26	15	4	774	2109	191	46	1146	7	4318

* lug handle; ** spout (small canteen rim?)

"lots" being consistently harder (Stubbs and Stallings 1953:50). The authors relate the use of tuff temper to paste hardness. They observed an increased use of tuff temper in later "lots," which may be an important temporal indicator for other sites in the Santa Fe area (Stubbs and Stallings 1953:50).

Following sherd temper, at Pueblo del Encierro nearly equal amounts of fine siltstone and fine pumice were recorded (Warren 1976:B4). Warren suggests minor temporal differences may be reflected in the quantity of sherd temper and that most or all of the Santa Fe Black-on-white was intrusive to this site. At Arroyo Hondo, the youngest of these sites, fine, naturally silty clays were preferred among the potters. Fine volcanic ash was added to these naturally silty clays in approximately 50 percent of the Santa Fe Black-on-white pottery recovered (Habicht-Mauche 1993:62). The addition of tuff temper may reflect the temporal trend observed by Stubbs and Stallings (1953).

Santa Fe Black-on-white pottery was recovered from all OAS sites with pottery. The majority of this pottery displayed a hard, self-tempered paste. These assemblages were relatively unmixed with other contemporaneous white wares. Only LA 86150 yielded Kwahe'e Black-on-white in loose spatial association with Santa Fe Black-on-white. The high frequency of sites with unmixed Santa Fe Black-on-white pottery suggests these sites pre-date A.D. 1300. This is further supported by the low frequency of tuff-tempered Santa Fe Black-on-white pottery in the assemblage.

The naturally silty or self-tempered clays produce a very hard paste pottery, which may have been preferred at the inception of Santa Fe Black-on-white. Through time, the addition of finely crushed sherd or tuff temper suggests that exploitation of a broader resource base was necessary. As population increased, access to former traditional resources may have been restricted. These changes in clay and temper resulted in the identification of varieties of Santa Fe Black-on-white including Poge, Pindi, and Galisteo Black-on-white. These types are common on Coalition period sites after A.D. 1300. The OAS inventory lacked these later types, giving strong support to the observation that many of the sites were occupied during the middle to late A.D. 1200s.

The early and middle Classic periods of the Northern Rio Grande are characterized by changes in temper, paste, and pigments used to manufacture pottery. The increased use of tuff temper in Santa Fe Black-on-white developed into Wiyo Black-on-white (Mera 1935; Stubbs and Stallings 1953; Habicht-Mauche 1993). Wiyo Black-on-white is manufactured in the Northern Rio Grande by about A.D. 1250-1275 and continues to be produced until A.D. 1425 (Stubbs and Stallings 1953:16-17; Sundt 1987). Abiquiu Black-on-gray (Biscuit A) and Bandelier Black-on-gray (Biscuit B) also seem to have developed from the Santa Fe-Wiyo carbon-paint tradition. Biscuit wares appear in the Northern Rio Grande around the A.D. 1350 and are produced into the A.D. 1470s. Wiyo Black-on-white and Biscuit wares are indigenous to the Northern Rio Grande, specifically the Pajarito Plateau and the Chama Valley (Kidder and Amsden 1931: Mera 1935; Habicht-Mauche 1993). These pottery types only occurred on LA 98688 and LA 84759 in the OAS sample. They occur in concentrations and in greater vessel form diversity, suggesting a change in use of the Las Campanas area during the A.D. 1350 to 1450 period.

Glaze Wares

Glaze ware pottery appears in the Albuquerque or the Santo Domingo areas from the Zuni region as early as A.D. 1300 (Habicht-Mauche 1993:33). However, it does not become popular outside these areas until A.D. 1340-1350 (Mera 1940:3; Stubbs and Stallings 1953:56). Glaze ware pottery made between A.D. 1325 and 1450 is virtually indistinguishable as small vessel body sherds. Slip color and decoration show remarkable similarity across a large area and through the 125-year span. Based on large village samples (Warren 1976, 1979a; Shepard 1936; Honea 1971) and Mera's areal sample (1933), a temporally sensitive rim form sequence for glaze ware pottery was developed in the Northern Rio Grande. These temporally sensitive rim forms are used in the absence of other chronometric data to provide site occupation dates in the Northern Rio Grande. Based on the rim form sequence, glaze ware pottery types from Las Campanas sites (LA 98688 and LA 84759) included Glaze A red through Glaze C polychrome from the early to middle Classic period, A.D. 1315-1490.

The majority of the glaze ware pottery was recovered from two sites, LA 84759 and LA 98688. These sites also included matte-paint pottery types Wiyo Black-on-white, Biscuit A, and Biscuit B. Biscuit and glaze ware pottery commonly co-occur on early Classic period sites in the Northern Rio Grande. Glaze and matte-paint types have similar vessel forms, design layout, and element use, reflecting their similar roots. These pigments are the defining criterion for the pottery traditions that now reflect linguistic divisions of the Rio Grande Pueblo Indians.

Utility Wares

Relatively low numbers of utility wares were recovered from Las Campanas. Formal types included Potsuwi'i and Sapawe Micaceous and Kapo Gray. Undifferentiated plain and corrugated micaceous utility wares are present along with low frequencies of nonmicaceous utility wares. Other varieties of utility ware pottery include plain polished brown and plain polished gray. All utility wares were recovered from two sites, LA 84759 and LA 98688, which date to the Classic or early Historic periods.

Function

The function of ceramic forms is related to or dependent on the activities for which they were used. The Las Campanas ceramic assemblage had primarily bowls and jars. This low diversity reflects the short duration of the occupations and limited range of activities that occurred at these sites. From the OAS sites, two distinct functional assemblages are apparent (see Table 11.1). One assemblage type is characterized by decorated bowls, which date to the early Coalition period and include 11 sites. The other assemblage category is characterized by the co-occurrence of decorated bowls and jars and utility ware jars, which date to the Classic or early Historic periods. These two assemblage categories reflected different site functions or subsistence patterns.

Coalition Period

The 11 Coalition period sites have almost exclusive assemblages of Santa Fe Black-on-white bowls. The number of sherds at these sites ranges from 1 to 597. These assemblages reflect two different site functions. One function is specifically related to the production of Santa Fe Black-on-white bowls. The second function is more generally attributed to subsistence activities related to daily foraging, for which Santa Fe Black-on-white pottery was used in numerous ways that may have extended their originally intended function.

Three sites, LA 84793, LA 86159, and 86150, had 75 percent of the white ware pottery recovered from Coalition period sites at Las Campanas. LA 84793, LA 86159, and LA 86150 (Feature 1) are interpreted as pottery-firing locations (Lakatos 1994; Post 1994a; Post and Lakatos 1994, 1995) used to manufacture Santa Fe Black-on-white bowls during the Coalition period. Much of the pottery from these locations have attributes consistent with unsuccessful firing as determined from archaeological contexts and replication studies. These attributes include ghosted pigment, spalling, and sooting on the vessel interiors. As discussed previously in the report, the abundant and unique spalls that result from thermal shock were especially effective for identifying pottery-firing locations. Not all the pottery associated with and discarded outside the kilns displayed evidence of thermal shock or unsuitable firing atmosphere. These sherds, particularly from LA 86159, may have been used as cover sherds during firing.

The remaining 25 percent of white ware pottery from the OAS Las Campanas Coalition period sites reflect different ceramic and site functions. The multipurpose use of Santa Fe Black-on-white pottery can be attributed to its hard, durable paste and lack of exterior surface treatment beyond scraping and light polishing. The hard, durable paste of Santa Fe Black-on-white may have made this type attractive for a variety of functions. Minimal investment of raw materials and time used to "finish" the exterior surfaces of Santa Fe Black-on-white bowls may be a reflection of a multifunctional design. Coalition period utility wares were made of local clays with more friable and less durable pastes, which was suitable for domestic purposes, but apparently not well suited for the requirements of foraging 5 km or more from the village.

When Santa Fe Black-on-white pottery was produced, agriculture was practiced and intensive foraging occurred in marginal and tertiary environmental zones (Dickson 1979:73). Ethnographic evidence suggests that diurnal foraging could extend up to 10 km beyond the village with daily meals consisting of preprepared foods (Sebastian 1983: 404-405). The durable, hard paste of Santa Fe Black-on-white pottery at Las

Campanas may have made portions of bowls attractive as containers to transport these prepared foods. These temporary containers were discarded periodically, resulting in vessel fragments being distributed on the landscape. Bowl fragments may have been periodically reused during subsequent visits and were redeposited on the landscape. This observation is supported by portions of a single vessel being recovered from four separate spatial components at LA 86150.

Water transportation was an important consideration for field house agriculture and foraging. Typically, water storage and transport is associated with decorated ollas and canteens, which are rare on Las Campanas Coalition period sites and in the Northern Rio Grande in general (Stubbs and Stallings 1953:48-50; Habicht-Mauche 1993:41). During the Coalition period water storage may have been accommodated by utility ware jars, which had porous pastes more suited to keeping water cool. Utility wares make excellent sedentary storage vessels as evidenced by their high frequency at habitation sites. However, their friability makes them undesirable as transportable containers. Since water would have been necessary in the field and there is no firm evidence of vessel caching during the Coalition period, water may have been transported in nonarchaeologically visible containers such as skin bags, bladders, or gourds.

Limited decorated jar manufacture in white wares continued throughout the early and middle Classic periods as indicated by low frequencies reported for Galisteo or Wiyo Black-on-white or Abiquiu or Bandelier Black-on-gray pottery. Increased jar production and use corresponds with the introduction of glaze-paint pottery in the Northern Rio Grande.

Classic Period

It is unclear why decorated ollas returned to the Northern Rio Grande with the production of glaze ware pottery. This vessel form, produced through the 1200s in the White Mountain region, may have followed glaze paint technology into the Northern Rio Grande. The production of glaze paint bowls and jars occurred over a wide area, suggesting that technological innovations permitted their production to spread rapidly. This dichotomy between glaze-paint and carbon-paint forms is apparent in small and large site assemblages (Honea 1968; Biella 1979; Warren 1976).

From the OAS sites, LA 84759 and LA 98688 ceramic assemblages had decorated bowls and jars associated with utility wares. This array of forms and wares is a common trend on small archaeological sites in the Southwest (Green and DeBloois 1978:79-77; Ward 1978:139-140; Mills 1987:117; Sebastian 1983:408-409). These small site assemblages suggest a variety of domestic activities and are typically associated with fieldhouse agriculture (Sebastian 1983:406). Although no architectural remains were identified at LA 84759 and LA 98688, the ceramic assemblages reflect a limited habitation site, such as a fieldhouse. The duration of occupation and the diversity of activities at these sites may be reflected in the frequency of post-firing modifications recorded on sherds from these sites.

Post-firing modification or worked sherds were more common in the Classic period assemblages than in the Coalition period assemblages from the OAS Las Campanas sites. Recorded modifications included serrated sherd edges, deeply striated sherd surfaces, and edge grinding. The common, though not necessarily abundant occurrence of post-firing modifications in the early Classic period assemblages may be related to longer occupation of these sites or the reuse of discarded sherds and vessel fragments as distance to contemporaneous habitation sites increased.

Technology

Technology, as used here, refers to the raw materials and methods used to produce pottery. Clay, temper, and firing strategies are critical aspects of pottery technology. Ceramic pastes can be analyzed to identify minerals in the clay and temper that reflect the geologic source of the raw materials used to produce the pottery. Petrographic and sourcing studies, developed by Anna Shepard (1936), have been used to identify regions of ceramic manufacture in the Northern Rio Grande (Shepard 1936; Warren 1976, 1979a; Habicht-Mauche 1993).

Petrographic analysis was conducted on a total of 60 pieces of pottery from 10 sites at Las Campanas (Hill, this volume). Petrographic analysis supplemented and refined the microscopic examinations that were part of the detailed ceramic analysis. The petrographic analysis identified four general temper groups: untempered or self-tempered, volcanic ash, and latite or basalt. These temper groups are generally associated with Santa Fe Black-on-white, biscuit wares, and glaze wares, respectively. The following discussion of temper and paste focuses on white wares, glaze wares, and utility wares.

White Wares

Self-tempered Santa Fe Black-on-white pottery was recovered from all 13 sites, including the pottery-firing locations of LA 84793, LA 86150, LA 86159. Most of the Santa Fe Black-on-white pottery appears to be made from very similar raw materials based on the type and quantity of accessory minerals. These pastes also displayed similar color before and after refiring. This homogeneity of paste color and composition is unusual when compared to the Santa Fe Black-on-white pottery recovered from the excavated village sites of Pindi Pueblo, Agua Fria Schoolhouse site, and Arroyo Hondo. At those sites, variability of tempering materials and paste color within Coalition and early Classic period white wares was common.

The similarity between Las Campanas Santa Fe Black-on-white pottery from all sites suggests use of a geologically restricted clay source, a clay that was suitable for hard-bodied Santa Fe Black-on-white without additives, and production during a time when access to the source was unrestricted.

The homogeneous matrix of the Santa Fe Black-on-white pottery from Las Campanas may also reflect restricted availability of raw materials. Clay-source research in the Las Campanas area has identified three sources available to prehistoric potters. Of these, only one, Culebra Lake (Kelley 1948), is suitable for the production of Santa Fe Black-on-white pottery. Ceramic replication studies with this clay in an limited oxidation firing (Swink 1993) has produced carbon-painted black-on-white pottery (Lakatos n.d.). This preliminary result supports the inference that the homogeneity of Santa Fe Black-on-white pottery at Las Campanas is the result of a geologically restricted source.

Volcanic ash-tempered pottery types identified include Wiyo Black-on-white, Biscuit A, and Biscuit B. Differences between Wiyo Black-on-white and Biscuit A appear to be in the type of clay used (Habicht-Mauche 1993). Wiyo Black-on-white appears to be produced from a gray firing clay similar to Santa Fe Black-on-white, but tempered with large quantities of volcanic ash. Biscuit ware pottery appears to be made from light firing clays located on the north side of the Jemez Caldera (Shepard 1936:492-493). These clays are characterized by high shrinkage and poor workability which may explain the thickness of these wares (Habicht-Mauche 1993:26). Biscuit A and Biscuit B differ in surface treatment. Biscuit A was slipped and painted on the interior and Biscuit B was slipped and painted on both the interior and exterior surfaces. These types are recognized as being indigenous to the Pajarito Plateau and the Chama Valley (Kidder and Amsden 1931; Mera 1934; Habicht-Mauche 1993).

Glaze Wares

Extensive petrographic work conducted by A. Helene Warren (1976, 1979a) has identifed regions of manufacture associated with latite and basalt tempered pottery types. Latite- and basalt-tempered pottery recovered from Las Campanas include Glaze A through Glaze C and plain polished brown wares.

The most common temper identifed in the glaze ware ceramics recovered from Las Campanas was augite latite. Augite latite was most common in Cieneguilla Glaze-on-yellow, but was also identified in Agua Fria Glaze-on-red, and Largo Glaze-on-polychrome. The suggested manufacture area for these types is the Galisteo Basin, centering around San Marcos Pueblo (LA 98) (Warren 1979a:210-211).

Following augite latite, hornblende latite was the next most common temper type identified in the Las Campanas assemblage. This temper type was recognized in San Clemente Glaze-on-polychrome, undifferentiated glaze-on-polychrome, and Espinosa Glaze-on-polychrome. The suggested manufacture area for these types is the Cochiti area, centering around Tonque Pueblo (LA 240), Espinosa Ridge (LA 278), and La Vega Pueblo (LA 412) (Warren 1979a:213).

Finally, basalt temper was identified in Cieneguilla Glaze-on-polychrome and in plain polished brown wares. The suggested manufacture area for basalt-temper pottery is not as clearly defined as for the augite latite and hornblende latite temper types. Basalt-tempered Glaze A Red pottery is suggested to have been manufactured near La Bajada Pueblo (LA 7). However, Glaze A Yellow pottery tempered with basalt seems to have been manufactured over a broader area centering around White Rock Canyon (Warren 1976, 1979a).

CHAPTER 12
LITHIC ARTIFACT SYNTHESIS

The Las Campanas lithic analysis was divided into the study of two functional artifact classes, chipped stone and ground stone. Analyses of these artifact classes addressed technology and its relationship to subsistence production and site function and structure. The lithic artifact synthesis is an opportunity to examine the data from different temporal and functional perspectives. This is possible because of the time depth of the Las Campanas sites and their apparent functional variability. This synthesis focuses on chipped stone assemblages.

The OAS Las Campanas excavations recovered 7,769 chipped stone artifacts from 20 sites representing at least 36 components. The sites and components are classed according to broad periods, Archaic, Coalition, Classic, Unknown, and Mixed (LA 98688). Broad temporal divisions were based on diagnostic artifacts. Unknown components lacked temporally diagnostic artifacts. The mixed class consists solely of chipped stone from LA 98688, which was a temporally mixed deposit that potentially spanned from A.D. 1000 to 1600. Some site-specific studies recognized occupation components based on artifact and feature distributions. These components are used in this synthesis to further partition the assemblages into higher resolution analytical units, by which aspects of technology and function are compared within and between the broad periods. (These components are designated in subsequent tables by a decimal extension after the LA number.)

Functional variability is apparent for the different temporal components in the form of differential distribution of feature and artifact frequencies and classes. This functional variability can be understood in terms of subsistence and settlement strategies. These strategies are assumed to have changed as prehistoric groups went from a highly mobile lifestyle to a more sedentary agricultural existence.

The Archaic period components may reflect different components of a mobile pattern that was conditioned by seasonal and annual periodicity in the abundance and distribution of biotic resources. A typological continuum of base camps, limited activity sites, and extraction loci have been proposed to interpret artifact and feature frequency, structure, and distributional variability (Binford 1980; Vierra 1985; Ebert and Kohler 1988). The Archaic period variability reflects changing use patterns within the Las Campanas area and the Santa Fe River basin.

The Coalition and Classic period components result from sedentary village dwellers of the Santa Fe River using the piedmont landscape to obtain resources that supplemented floodplain agriculture. The components are viewed as remnants of a strategy that was primarily diurnal with brief occupations resulting in accumulations of materials in favored locales such as arroyo margins and primary ridges that separated drainage systems. By defining expectations for a technology needed to support a diurnal foraging strategy, the chipped stone can be examined for variability that may suggest divergence from the expected patterns. These divergences may be related, but not limited to changing population size and distribution, depletion of local resources, or changing subsistence strategies.

The unknown and mixed components can be used as comparative data. Unknown and mixed components should reflect one of the main patterns that will be discussed. It is also possible that by comparison, the unknown components may be tentatively assigned to one of the temporal components based on assemblage similarities.

The Analytical Framework

To interpret chipped stone patterns, many lithic specialists rely on two defined chipped stone reduction strategies that are based on expectations of forager and collector subsistence models proposed by Lewis Binford in the late 1970s and early 1980s (Binford 1977, 1979, 1980). Curated strategies are characterized by the manufacture of bifaces that served as the source of flakes or blanks for informal and formal tools and as formal tools. Expedient strategies focused on the production of flakes for use as tools with limited or no modification. Curated strategies were suggested to be associated with residential mobility, while expedient strategies were associated with long-term residential stability. Each strategy may result in debitage and tool morphology and frequency patterns that are relatively distinct (Kelly 1988; Camilli 1989; Bamforth 1991; Ebert 1992; Andrefsky 1994).

Curated strategies emphasize production of the maximum length of usable edge per core (Moore 1994:287). Flintknappers maximized the number of usable flakes per core with the added potential of using the core as a tool (Kelly 1988:719-720). By more efficient tool production, waste was reduced and raw materials were more effectively used, reducing the amount of raw material that needed to be transported to or obtained from a base camp. Expedient strategies were not conditioned by transport costs, therefore raw material did not have be used as efficiently (Kelly 1988:719; Andrefsky 1994). Flakes were removed from cores as needed. Therefore, it is expected that long-term forager or collector base camps would have chipped stone assemblages dominated by the debris from expedient reduction and a greater frequency of informal tools versus formal tools. Collector base camps, which were moved more frequently, may exhibit increased evidence of a curated or more efficient reduction strategy with more debris from biface reduction. Logistical camps or limited activity sites, where raw material was not available or suitable, should exhibit greater evidence of a curated reduction strategy. Daily foraging sites may exhibit no evidence of lithic reduction, or flakes and tools would be produced from local material.

Curated and expedient strategies are defined as mutually exclusive. However, it is more likely that these different reduction strategies operated on a continuum. Reliance on one or the other strategy would have been relative and conditioned by availability of suitable raw material, occupation duration, range of tasks, potential for reuse of existing materials, and distance from the residence in the case of logistical or daily foraging sites. Chipped stone assemblages undoubtedly represent a mix of these reduction strategies with subtleties masked by more abundant artifact classes.

The dichotomy of curated and expedient strategies is useful for examining differences in how Archaic and Pueblo period populations organized their technology to extract resources from the piñon-juniper piedmont north of the Santa Fe River. Archaic populations are typically characterized as mobile, small, commensal units that would have settled near critical resources and organized their strategies around extracting the maximum yield from nearby biotic resources (Chapman 1979). Pueblo populations during the Coalition, early Classic, and Developmental periods were more sedentary and relied heavily on agriculture. Diurnal foraging would have supplemented stored foods. Longer duration forays would have been supported by village stores and food-sharing. These contrasting subsistence and settlement patterns should result in different reduction strategies. These differences will be illuminated by examination of material selection, reduction sequence and stages, and tool manufacture and use.

Material Selection

Lithic raw material suitable for core reduction and tool manufacture was locally available in and around the Las Campanas area. The Santa Fe and Ancha formations contained middle to late Tertiary deposits that contained a wide range of igneous and metamorphic rock. Mixed with these deposits are the alluvial deposits from the Sangre de Cristo Mountains that contain redeposited nodules of chert and chalcedony from the bedded Pennsylvanian age Madera limestone formation (Lang 1993). These combined deposits provided a wide range of chert, chalcedony, silicified wood, quartzite, igneous, and metamorphic materials. These deposits are differentially distributed throughout the piedmont with particularly thick deposits noted along the Arroyo de los Frijoles (Lang 1996). These local raw materials are 95 percent of the chipped stone recovered by the OAS excavations.

Table 12.1 provides the material type distributions by period. These totals represent the combined counts for all sites or components from a particular period. In general, the materials occur as water-transported nodules or cobbles with cryptocrystalline, isotropic, and elastic structure, which are highly suited to flintknapping. Variability in these materials occurs as structural flaws from geologic formation or fracture planes created by alluvial transport. These flaws are unpredictable and contribute to blocky or uneven fracture patterns that hampered core reduction.

It is obvious on Table 12.1 that the Archaic period accounted for the majority of the chipped stone artifacts. Archaic period components were typically dominated by chert ranging from 23.5

Table 12.1. Material Type by Period for All Components and Sites

Count Row Pct Column Pct	Chert	Chalcedony	Silicified wood	Obsidian	Basalt	Sedimentary	Quartzite	Other	Row total
Archaic period	4154 79.6 71.7	483 9.3 72.2	28 .5 68.3	177 3.4 76.0	136 2.6 96.5	5 .1 62.5	201 3.8 26.6	37 .7 97.4	5221 68.0
Coalition period	844 82.8 14.6	27 2.6 4.0	4 .4 9.8	30 2.9 12.9	1 .1 .7	3 .3 37.5	109 10.7 14.4	1 .1 2.6	1019 13.3
Classic period	66 66.0 1.1	1 1.0 .1		5 5.0 2.1			28 28.0 3.7		100 1.3
Unknown period	199 96.6 3.4	2 1.0 .3		1 .5 .4			4 1.9 .5		206 2.7
Mixed period	531 46.9 9.2	156 13.8 23.3	9 .8 22.0	20 1.8 8.6	4 .4 2.8		413 36.5 54.7		1133 14.8
Column Total	5794 75.5	669 8.7	41 .5	233 3.0	141 1.8	8 .1	755 9.8	38 .5	7679 100.0

(LA 86139) to 98.5 (LA 86148) percent, and most commonly ranging between 70 and 90 percent. Usually, the second most common materials were chalcedony or quartzite. Divergence from this pattern is represented by the 75 percent occurrence of obsidian from LA 86139. Obsidian and basalt, as the most readily recognized nonlocal materials, were usually, with the exception of LA 86139 and LA 84775, Area 1, present in combined percentages ranging from 1.3 to 6.4.

Coalition period assemblages were dominated by chert and secondarily by quartzite. Chert typically occurred as 75 to 90 percent of an assemblage. Quartzite accounted for as much as 25 percent of an assemblage, although more commonly it was present as 7 to 12 percent of the assemblage. These percentages probably reflect relative abundance of chert and quartzite in the local gravel deposits. They may also partly result from intentional selection of chert as a superior flake-producing material.

The Classic period is represented by only LA 84759, Area 2. It had 66 percent chert, 28 percent quartzite, and 5 percent obsidian. This assemblage reflects a heavy dependence on local material. Obsidian is present in higher percentages than was typical for Coalition period sites, which may reflect the longer occupation of LA 84759, Area 2.

The Unknown period assemblages are almost exclusively dominated by chert. All components have 90 percent or greater amounts chert. This pattern is similar to the Coalition period components.

The only Mixed period assemblage, LA 98688, exhibits a different pattern from the other temporal components. It had only 47 percent chert and an usually high (37 percent) occurrence of quartzite. The predominant pottery types were from the Classic period, suggesting that the majority of the debris was discarded then. The high percentage of quartzite suggests that a different source or gravel pediment was used. The high percentage of quartzite may also result from intensive reduction of materials as a result of multiple occupations. Intensive reduction may be partly indicated by the absence of quartzite cores. The absence of quartzite cores suggests that materials were thoroughly reduced and cores were removed from the site for continued reduction elsewhere.

Obviously, local raw material was emphasized for core reduction. The high percentages of chert for all periods suggests that it was dominant in the local sources as well. The presence of lower percentages of quartzite, chalcedony, silicified wood, and other materials reflects their low frequency in the source as much as prehistoric selection biases. Nonlocal obsidian and basalt were present in most components although usually in low counts. The relationship between local and nonlocal materials and curated and expedient strategies can be examined with the chipped stone data.

Local and Nonlocal Material Selection and Use

Examination of lithic raw material sources is important to understand and segregate curated and expedient reduction technologies. In a curated strategy, tools are produced in anticipation of projected needs or the means are made available to make suitable tools through transporting suitable material. In an expedient strategy, tools are made as they are needed from whatever material is available. These strategies are at opposite ends of a technological and behavioral continuum (Bamforth 1991). Conditions that affect which strategy is used include level of residential mobility, logistical subsistence organization (Kelly 1988; Binford 1980), and availability of suitable raw materials (Bamforth 1986; Andrefsky 1994; Moore 1994).

Recent study of Archaic period assemblages near San Ildefonso, New Mexico (Moore n.d.), suggests that in some cases a mixed strategy was employed. Archaic period assemblages exhibited expedient reduction of local raw materials. Exotic materials, such as obsidian, were used to produce formal tools or bifaces. Exotic materials were efficiently reduced in anticipation of future tasks. Local materials were efficiently reduced when groups were low on obsidian and were moving away from the local raw material sources. In other words, a group that recently returned from the Jemez Mountains had obsidian to produce bifaces, while the same group moving from the Tewa Basin into the Jemez Mountains may have lacked obsidian and instead used the local chert until more obsidian could be obtained.

In the Las Campanas assemblage the site assemblages and periods can be examined from the perspective of local versus nonlocal material. As indicated previously, all periods exhibit a strong emphasis on the use of local raw material. Combined percentages range between 94 and 98 percent local material (Table 12.2). Variability is seen at the site and artifact type levels for the different periods.

The Archaic period assemblages exhibit a preponderance of local material. However, the nonlocal and local materials were not used in the same way, indicating a mixed reduction strategy was employed in some cases. If artifact classes of core reduction debris, biface manufacture debris, cores, hand tools, and projectile points, bifaces, and other formal tools are compared there are interesting differences (Table 12.3). Core reduction debris is the main class for both material classes, however biface manufacture debris is 23.3 percent of the nonlocal material and only 8.7 percent of the local material. All cores and 93 percent of the hand tools were made from local materials. Of projectile points, bifaces, and other tools, 67 percent are nonlocal material. The pattern is that bifacial tools, which are more portable, and likely to be part of a curated strategy, are more often made from nonlocal materials during the Archaic period. Furthermore, the two Archaic period components, LA 84775, Area 1, and LA 86139 with the most nonlocal material, appear to be limited activity or short-term basecamps. This suggests that reliance on local material may be partly conditioned by occupation duration. For all Archaic period components, expedient and heavy-duty tools are made from local materials.

The Archaic period assemblage pattern does not hold true for the Coalition period assemblages. The focus is almost completely on local material use. Core reduction debris, cores, hand tools, and projectile points, bifaces, and other formal tools are primarily made from local materials. Biface manufacture debris from nonlocal material did occur, but in low frequencies. This pattern suggests that the more residentially stable Coalition period populations relied heavily on local material for all facets of core reduction and tool production.

Mixed and Unknown period assemblages exhibit a high frequency of local materials. Nonlocal materials occur as 0.5 and 2.1 percent. Eighty percent of the Mixed period projectile points, bifaces, and other formal tools are made from nonlocal materials, suggesting curation of specialized tools, but with a low rate of discard.

Lithic raw material provenance patterns do reflect differing settlement and mobility patterns. Archaic period sites reflect a higher proportion of nonlocal materials used for formal tool manufacture and use, indicating that exotic materials were selected for their special properties.

Table 12.2. Local and Nonlocal Material Types by Period, All Sites

Count Column Pct	Archaic	Coalition	Classic	Unknown	LA 98688	Row total
Local	4908 94.0	988 97.0	95 95.0	205 99.5	1109 97.9	7305 95.1
Nonlocal	313 6.0	31 3.0	5 5.0	1 .5	24 2.1	374 4.9
Column Total	5221 68.0	1019 13.3	100 1.3	206 2.7	1133 14.8	7679 100.0

Table 12.3. Artifact Class by Material Source by Period

Count Row Pct Column Pct	Core Reduction Debris	Biface Manufacture Debris	Cores	Hand Tools	Projectile Points, etc.	Row Total
Archaic period						
Local	4327 88.2 95.4	428 8.7 85.4	111 2.3 100.0	27 .6 93.1	15 .3 33.3	4908 94.0
Nonlocal	208 66.5 4.6	73 23.3 14.6		2 .6 6.9	30 9.6 66.7	313 6.0
Column Total	4535 86.9	501 9.6	111 2.1	29 .6	45 .9	5221 100.0
Coalition period						
Local	901 91.2 97.9	24 2.4 75.0	45 4.6 100.0	2 .2 100.0	16 1.6 80.0	988 97.0
Nonlocal	19 61.3 2.1	8 25.8 25.0			4 12.9 20.0	31 3.0
Column Total	920 90.3	32 3.1	45 4.4	2 .2	20 2.0	1019 100.0
Classic period						
Local	83 87.4 95.4	5 5.3 100.0	6 6.3 85.7		1 1.1 100.0	95 95.0
Nonlocal	4 80.0 4.6		1 20.0 14.3			5 5.0
Column Total	87 87.0	5 5.0	7 7.0		1 1.0	100 100.0

Count Row Pct Column Pct	Core Reduction Debris	Biface Manufacture Debris	Cores	Hand Tools	Projectile Points, etc.	Row Total
Unknown period						
Local	191 93.2 100.0	3 1.5 100.0	7 3.4 100.0	3 1.5 100.0	1 .5 50.0	205 99.5
Nonlocal					1 100.0 50.0	1 .5
Column Total	191 92.7	3 1.5	7 3.4	3 1.5	2 1.0	206 100.0
LA 98688						
Local	1083 97.7 98.3	4 .4 66.7	19 1.7 100.0	2 .2 100.0	1 .1 20.0	1109 97.9
Nonlocal	18 75.0 1.3	2 8.3 33.3			4 16.7 80.0	24 2.1
Column Total	1101 97.2	6 .5	19 1.7	2 .2	5 .4	1133 100.0

Coalition period sites reflect a dominant use of local raw materials in all aspects of core reduction and tool manufacture and use. This reflects a detailed knowledge of local resources and their suitability for production and use.

Material Texture

Lithic raw material can be classed by suitability for different tasks (Chapman 1977). Obsidian is a good example because it is superior for producing fine-edged cutting tools. It flakes easily and yields sharp edges, but edges may be too brittle for use in heavy-duty processing. Heavy-duty tasks may be better suited to basalt and quartzite, which have duller edges, but are more resilient for use with hard or rough materials. In general, fine-grained materials yield sharper edges than medium or coarse-grained materials. Fine-grained materials are more easily and predictably flaked, which is desirable for tool manufacture. Medium or coarse-grained materials may be used for expedient core reduction in situations where a wide range of tasks must be completed and durability and flexibility is desirable over precision.

Table 12.4 illustrates the material texture distribution by artifact class for each period. For Archaic, Coalition, and Mixed periods, fine and medium-grained materials occur in roughly equal percentages; glassy and coarse-grained materials occur less frequently. The Coalition period had slightly more medium-grained material and the Mixed period yielded slightly more fine-grained material.

Material texture distributions by artifact class show unexpected patterns with respect to fine- and medium-grained materials. Archaic and Coalition period sites exhibit roughly equal percentages of fine- and medium-grained core reduction and biface manufacture debris. This suggests that these grain sizes were interchangeable, affording a more flexible use of local material sources. This also is reflected in the cores and hand tools, which have roughly equal percentages of fine- and medium-grained materials. As expected, glassy materials were best suited for projectile points, bifaces, and other formal tools. However, this pattern holds only for the Archaic period, since low frequencies of glassy material were used during the Coalition period. These data suggest that during the Archaic period, material was selected more for suitability, while during the Coalition period, fine- and medium-grained materials were deemed

Table 12.4. Artifact Class by Material Texture by Period

Count Row Pct Column Pct	Glassy	Fine	Medium	Coarse	Row Total
Archaic period					
Core reduction debris	107 2.4 59.1	2106 46.4 87.1	2118 46.7 88.3	204 4.5 91.5	4535 86.9
Biface manufacture debris	48 9.6 26.5	247 49.3 10.2	197 39.3 8.2	9 1.8 4.0	501 9.6
Cores		41 36.9 1.7	60 54.1 2.5	10 9.0 4.5	111 2.1
Hand tools	1 3.4 .6	13 44.8 .5	15 51.7 .6		29 .6
Projectile points, scrapers, etc.	25 55.6 13.8	12 26.7 .5	8 17.8 .3		45 .9
Column Total	181 3.5	2419 46.3	2398 45.9	223 4.3	5221 100.0
Coalition period					
Core reduction debris	20 2.2 62.5	383 41.6 90.5	475 51.6 91.3	42 4.6 95.5	920 90.3
Biface manufacture debris	8 25.0 25.0	14 43.8 3.3	10 31.3 1.9		32 3.1
Cores		16 35.6 3.8	27 60.0 5.2	2 4.4 4.5	45 4.4
Hand tools		1 50.0 .2	1 50.0 .2		2 .2
Projectile points, scrapers, etc.	4 20.0 12.5	9 45.0 2.1	7 35.0 1.3		20 2.0
Column Total	32 3.1	423 41.5	520 51.0	44 4.3	1019 100.0
Classic period					
Core reduction debris	4 4.6 80.0	19 21.8 82.6	56 64.4 90.3	8 9.2 80.0	87 87.0
Biface manufacture debris		2 40.0 8.7	2 40.0 3.2	1 20.0 10.0	5 5.0

Count Row Pct Column Pct	Glassy	Fine	Medium	Coarse	Row Total
Cores	1 14.3 20.0	2 28.6 8.7	3 42.9 4.8	1 14.3 10.0	7 7.0
Projectile points, scrapers, etc.			1 100.0 1.6		1 1.0
Column Total	5 5.0	23 23.0	62 62.0	10 10.0	100 100.0
Unknown period					
Core reduction debris		110 57.6 91.7	74 38.7 96.1	7 3.7 87.5	191 92.7
Biface manufacture debris		2 66.7 1.7	1 33.3 1.3		3 1.5
Cores		5 71.4 4.2	2 28.6 2.6		7 3.4
Hand tools		2 66.7 1.7		1 33.3 12.5	3 1.5
Projectile points, scrapers, etc.	1 50.0 100.0	1 50.0 .8			2 1.0
Column Total	1 .5	120 58.3	77 37.4	8 3.9	206 100.0
Mixed periods					
Core reduction debris	18 1.6 75.0	587 53.3 96.2	475 43.1 99.4	21 1.9 100.0	1101 97.2
Biface manufacture debris	2 33.3 8.3	3 50.0 .5	1 16.7 .2		6 .5
Cores		18 94.7 3.0	1 5.3 .2		19 1.7
Hand tools		1 50.0 .2	1 50.0 .2		2 .2
Projectile points, scrapers, etc.	4 80.0 16.7	1 20.0 .2			5 .4
Column Total	24 2.1	610 53.8	478 42.2	21 1.9	1133 100.0

suitable for all tasks. Archaic hunter-gatherers also had more frequent access to better materials as their mobile subsistence strategies positioned them closer to obsidian sources in the Jemez Mountains and basalt sources along the Rio Grande.

Reduction Strategies and Stages

Several attributes relate to reduction stage. At the attribute level, platform shape and modification, flake breakage, dorsal cortex percentage, and flake dimensions are informative. At the assemblage level, debitage ratios are useful for examining reduction strategies. These attributes can be examined individually, but it is the overall attribute patterning that provides the best indication of reduction strategy. Different attributes are examined at the site level and across temporal periods to illustrate within and between period variability.

Dorsal Cortex

Dorsal cortex refers to the outer rind of nodules or cobbles that has been chemically altered by exposure to the elements and rarely is suitable for reduction or use (OAS Staff 1994). Additionally, outer layers of alluvially transported nodules and cobbles often have microcracks or fissures that form a zone with unreliable flaking characteristics. As unsuitable dorsal cortex is removed and discarded, it provides a measure of reduction. As a cobble or nodule is reduced, the dorsal cortex is removed. Early stage reduction has flakes with high percentages of dorsal cortex, while late stage reduction may lack cortical flakes.

Reduction can be divided into two basic stages: core reduction and tool manufacture. During core reduction, flakes are removed to prepare a core for tool production, or flakes are removed for use as tools. Primary core reduction is defined by the initial core platform preparation and removal of the cortical surface (Moore 1994:301). Secondary core reduction refers to the removal of cores from the core interior. Distinction between primary and secondary core reduction is not clear-cut. Both stages usually occur simultaneously, and often secondary reduction begins before or during cortex removal and platform preparation. However, as general markers of reduction, core flakes can be classified as primary or secondary based on dorsal cortex percentage. Primary core flakes have more than 50 percent dorsal cortex. Secondary core flakes have 50 percent or less dorsal cortex. Definition of a third class, tertiary core flakes, was attempted by combining core flake thickness and absence of dorsal cortex. Generally, thinner flakes (5 mm or less) tended to have less cortex and could represent a late core reduction stage. However, the pattern was not consistent enough to warrant further use of the third core flake class in this analysis.

Inferences about core reduction strategies can be drawn from dorsal cortex and primary and secondary core flake distributions. Moore (1994:301) and Chapman (1977) suggest that a lack of primary flakes indicates initial reduction occurred elsewhere, while the presence of few secondary flakes may indicate that cores were transported to another locale for further reduction. A mix of primary, secondary, and biface flakes indicates intensive reduction of raw materials. A mixed technology would support curated or expedient strategies, while an emphasis on biface production would indicate a curated strategy.

Table 12.5 shows core flake dorsal cortex ranges for all sites by period. The dorsal cortex ranges, 0, 10-50 percent, and 60-100 percent, reflect secondary and primary reduction with the 10-50 percent class representing the vague distinction between primary and secondary. Only whole core flakes were used for this table.

Archaic period sites show consistent patterning. Most assemblages have a majority of flakes that lack cortex. Lower frequencies of 10-50 percent and 60-100 percent also occur. Generally, sites that were occupied longer tend to have higher percentages of noncortical core flakes. Shorter duration components, such as LA 86139, LA 84787, Area 1, and LA 84775.1 have higher percentages of primary flakes. This suggests that longer occupation resulted in more intensive reduction of raw materials. It is also possible that as occupation was prolonged, partly reduced materials obtained from on-site may have been used in conjunction with materials brought from off-site sources. In all cases, the presence of some primary core flakes indicates that raw material was brought to the sites in unreduced forms. The high percentage of secondary flakes suggests that the main purpose of core reduction was to produce flakes for on-site tool use and

Table 12.5. Whole Core Flake Dorsal Cortex by Site by Period

Count Row Pct	0	10-50%	60-100%	Row Total
Archaic period				
84758.0	263 62.8	115 27.4	41 9.8	419 27.1
84775.1	4 57.1	2 28.6	1 14.3	7 .5
84787.0	1 100.0			1 .1
84787.1	32 52.5	25 41.0	4 6.6	61 3.9
84787.2	351 65.6	137 25.6	47 8.8	535 34.6
84787.3	148 66.1	64 28.6	12 5.4	224 14.5
84787.4	103 64.0	42 26.1	16 9.9	161 10.4
86139.0	19 48.7	14 35.9	6 15.4	39 2.5
86148.0	59 61.5	17 17.7	20 20.8	96 6.2
98690.5	1 33.3	1 33.3	1 33.3	3 .2
Column Total	981 63.5	417 27.0	148 9.6	1546 100.0
Coalition period				
84759.1	8 30.8	6 23.1	12 46.2	26 7.6
84773.0	23 44.2	16 30.8	13 25.0	52 15.1
84793.0	5 38.5	6 46.2	2 15.4	13 3.8
86131.0	16 53.3	9 30.0	5 16.7	30 8.7
86134.0	17 58.6	10 34.5	2 6.9	29 8.4
86150.0	1 20.0	1 20.0	3 60.0	5 1.5
86150.1	6 54.5	2 18.2	3 27.3	11 3.2
86150.2	3 33.3	4 44.4	2 22.2	9 2.6

Count Row Pct	0	10-50%	60-100%	Row Total
86150.3	6 60.0	3 30.0	1 10.0	10 2.9
86150.4		1 33.3	2 66.7	3 .9
86155.0	4 30.8	5 38.5	4 30.8	13 3.8
86156.0	14 58.3	6 25.0	4 16.7	24 7.0
86159.2	27 69.2	11 28.2	1 2.6	39 11.3
86159.5	3 15.8	10 52.6	6 31.6	19 5.5
98680.0	32 64.0	15 30.0	3 6.0	50 14.5
98690.0		1 100.0		1 .3
98690.1	2 50.0	2 50.0		4 1.2
98690.6	2 100.0			2 .6
98861.0	2 50.0	1 25.0	1 25.0	4 1.2
Column Total	171 49.7	109 31.7	64 18.6	344 100.0
Classic period				
84759.2	24 50.0	16 33.3	8 16.7	48 100.0
Unknown period				
84775.2	17 60.7	8 28.6	3 10.7	28 38.9
84777.0			1 100.0	1 1.4
84787.0	2 66.7	1 33.3		3 4.2
86152.0	21 52.5	10 25.0	9 22.5	40 55.6
Column Total	40 55.6	19 26.4	13 18.1	72 100.0
Mixed periods				
98688.0	326 62.9	82 15.8	110 21.2	518 100.0

production.

Coalition period components exhibit much greater variability in primary and secondary reduction. Some variability may be accounted for by sample size. Components with fewer than 25 core akes tended to have higher percentages of primary core flakes, a few associated cores, and few or no tools or tool manufacture debris. This pattern relates to occupation duration with short visits requiring limited core reduction or tool production. Available material was cursorily used and discarded. As duration and range of tasks increased, more core reduction was required, resulting in higher percentages of secondary core flakes and the presence of tools. The presence of primary and secondary core flakes and cores suggests that unmodified nodules and partly reduced cores were brought to the sites. Dispersed distribution of core flakes and limited core to core flake "fits" suggest that cores may have been regularly transported from site to site with necessary flakes removed until a core was exhausted or flakes were no longer needed. Eight of the nineteen components have more cortical than noncortical flakes, which suggests primary and early secondary stage reduction. This would be expected with casual or expedient flake production. The Coalition period assemblages effectively represent a continuum of reduction stages within an expedient strategy.

The Classic and Unknown period reduction strategies are similar to the Coalition period with relatively high percentages of cortical flakes. LA 84759, Area 2, may have been a seasonally occupied fieldhouse. The low noncortical or later stage secondary flake counts may reflect incomplete excavation of the component rather than an emphasis on earlier stages of reduction. However, the assemblage reflects expedient reduction of locally available material as seven cores were recovered.

The Mixed period assemblage is more similar to the Archaic period assemblages. The 63 percent noncortical secondary flakes suggest an intensive reduction strategy. LA 98688 was reoccupied over a 600-year period with surface chipped stone debris reused by successive occupants. A low frequency of quartzite cores suggests that they were brought to the site in flake form and then small core flakes were removed from the flake cores. Unfortunately, no recognizable flake cores were recovered. Chert cores were more common, indicating a core to flake trajectory.

Flake Platforms

Flake platforms remain from the edge of a tool or core from which flakes were removed. Different platform types can be discerned, providing information about reduction strategy. Cortical platforms usually indicate early-stage core reduction, especially in conjunction with dorsal cortex. Single-facet platforms refer to a core striking platform formed by the removal of a single flake. Multifacet platforms result from flake removal from a striking platform created by multiple previous flake removals. Multifacet platforms result from late-stage reduction (OAS Staff 1994).

Platforms were modified to promote flake removal. Two kinds of modification are commonly identified: retouch and abrasion. Abrasion may occur during all stages of core reduction and is associated with cortical, single-faceted, and multifaceted platforms. Abrasion results from moving a striker parallel to the platform. Retouch results from perpendicular movement of a striker across a platform and is usually associated with later reduction. Both modifications result in a stronger platform and increase successful flake removal.

Platforms may be obscured by flake breakage during or subsequent to reduction (Moore 1994:304). Manufacture breakage may increase as flakes and platforms become thinner during later stages of reduction. Therefore breakage patterns may be an indication of reduction stage. Platforms may also be obscured by crushing or collapsing. These occur when a platform is weak or poorly prepared. Collapsing or crushing may occur at any stage, although as a flake thins, damage to the platform may be more likely.

A one-way ANOVA test for flake thickness by platform type for whole core flakes indicates that in the Las Campanas assemblage core flakes with retouched, crushed, or collapsed platforms have a significantly thinner mean thickness (.05 significance level) than core flakes with other platform types. This suggests that in the Las Campanas assemblage, core flakes with crushed or collapsed platforms occur during later stage core reduction.

Table 12.6 displays the core flake platform frequencies by material class and period. For all periods and material classes, single-faceted core flakes and core flakes lacking platforms are the most common. Quartzite core flakes tend to have fewer missing platforms and obsidian tends to have more for all periods. Single, multifaceted,

Table 12.6. Core Platform Type by Material Class and Period

Count Row Pct Column Pct	Chert, etc.	Quartzite, etc.	Obsidian, etc.	Row Total
Archaic period				
Cortical	279 88.0 8.6	32 10.1 16.2	6 1.9 3.2	317 8.7
Single facet	1224 89.9 37.8	80 5.9 40.6	58 4.3 31.2	1362 37.6
Multifacet and modified	180 85.7 5.6	10 4.8 5.1	20 9.5 10.8	210 5.8
Crushed/ collapsed	356 89.4 11.0	16 4.0 8.1	26 6.5 14.0	398 11.0
Absent	1201 89.9 37.1	59 4.4 29.9	76 5.7 40.9	1336 36.9
Column Total	3240 89.4	197 5.4	186 5.1	3623 100.0
Coalition period				
Cortical	102 79.7 16.9	24 18.8 26.1	2 1.6 15.4	128 18.1
Single facet	208 84.9 34.5	36 14.7 39.1	1 .4 7.7	245 34.6
Multifacet	16 94.1 2.7		1 5.9 7.7	17 2.4
Crushed/ collapsed	80 88.9 13.3	8 8.9 8.7	2 2.2 15.4	90 12.7
Absent	197 86.4 32.7	24 10.5 26.1	7 3.1 53.8	228 32.2
Column total	603 85.2	92 13.0	13 1.8	708 100.0

Count Row Pct Column Pct	Chert, etc.	Quartzite, etc.	Obsidian, etc.	Row Total
Classic period				
Cortical	13 76.5 27.7	3 17.6 12.0	1 5.9 33.3	17 22.7
Single facet	17 47.2 36.2	17 47.2 68.0	2 5.6 66.7	36 48.0
Multifacet	2 50.0 4.3	2 50.0 8.0		4 5.3
Crushed/ collapsed	3 75.0 6.4	1 25.0 4.0		4 5.3
Absent	12 85.7 25.5	2 14.3 8.0		14 18.7
Column Total	47 62.7	25 33.3	3 4.0	75 100.0
Unknown period				
Cortical	10 100.0 7.6			10 7.4
Single facet	60 100.0 45.8			60 44.4
Multifacet	13 100.0 9.9			13 9.6
Crushed/ collapsed	12 100.0 9.2			12 8.9
Absent	36 90.0 27.5	4 10.0 100.0		40 29.6
Column Total	131 97.0	4 3.0		135 100.0

Count Row Pct Column Pct	Chert, etc.	Quartzite, etc.	Obsidian, etc.	Row Total
Mixed periods				
Cortical	47 52.8 10.4	42 47.2 11.6		89 10.8
Single facet	202 46.1 44.9	225 51.4 62.3	11 2.5 78.6	438 53.1
Multifacet	50 84.7 11.1	9 15.3 2.5		59 7.2
Crushed/ collapsed	99 66.0 22.0	50 33.3 13.9	1 .7 7.1	150 18.2
Absent	52 58.4 11.6	35 39.3 9.7	2 2.2 14.3	89 10.8
Column Total	450 54.5	361 43.8	14 1.7	825 100.0

and modified platforms combine for more than 50 percent for all periods. Cortical platforms are more common during the Coalition and Classic periods.

Table 12.7 shows the platforms by site and period. Archaic period components range between 11 and 40 percent cortical platforms, 3 and 25 percent multifaceted and modified platforms, 6 to 13 percent crushed or collapsed platforms, and 28 to 67 percent missing platforms. These ranges suggest an intensive reduction strategy that did not result in a large number of multifaceted or retouched platforms. LA 86139 has the highest percentage of late stage platforms, which corresponds to a greater use of nonlocal materials and a curated reduction strategy. By contrast, LA 84758, which was a residential base camp, exhibited more single-faceted platforms, indicating a more expedient reduction strategy. Overall, intensive reduction of the Archaic period platform distribution suggests a heavy reliance on core flakes and less emphasis on tool manufacture.

Coalition period components have a range of 0 to 50 percent cortical platforms, 0 to 50 percent single-faceted platforms, 0 to 14 percent multifaceted and modified platforms, 0 to 38 percent collapsed or crushed platforms, and 8 to 50 percent missing platforms. The broad percentage ranges reflect the small assemblage sizes and the expedient reduction strategy that characterizes most of the components. Generally, the Coalition period sites have greater percentages of cortical platforms than Archaic period components and fewer multifaceted and modified or collapsed or crushed platforms. This is also strong evidence of a primary and early secondary reduction strategy that focused on local materials.

The Classic period and Unknown components are similar to the Coalition period pattern with an emphasis on cortical and single-faceted platforms. LA 98688 is similar to the Archaic pattern with fewer cortical platforms and more single-faceted platforms. LA 98688 reflects a strategy of intensive reduction that resulted in few modified or retouched platforms.

Core Flake Dimensions

Core flake dimensions are an indicator of reduction strategy and stage, although dimensions can be affected by factors independent of reduction such as raw material size. However, in a general sense, it is expected that as core reduction progresses, the by-products should be progressively smaller in length and thickness. Though neither relationship is strong, linear regression plots of

Table 12.7. Core Platform Types by Site and Period

Count Row Pct	Cortical	Single facet	Multifacet	Crushed	Absent, etc.	Row Total
Archaic period						
84758.0	93 10.6	348 39.6	75 8.5	117 13.3	246 28.0	879 24.3
84775.1	3 21.4	4 28.6	1 7.1		6 42.9	14 .4
84787.0		1 100.0				1 .0
84787.1	17 14.8	49 42.6	7 6.1	9 7.8	33 28.7	115 3.2
84787.2	94 7.3	515 39.9	62 4.8	135 10.5	484 37.5	1290 35.6
84787.3	55 9.8	205 36.5	20 3.6	57 10.1	225 40.0	562 15.5
84787.4	34 7.3	163 35.2	12 2.6	48 10.4	206 44.5	463 12.8
86139.0	7 10.8	13 20.0	16 24.6	4 6.2	25 38.5	65 1.8
86148.0	13 5.8	63 28.0	17 7.6	27 12.0	105 46.7	225 6.2
98690.5	1 11.1	1 11.1		1 11.1	6 66.7	9 .2
Column Total	317 8.7	1362 37.6	210 5.8	398 11.0	1336 36.9	3623 100.0
Coalition period						
84759.1	9 24.3	16 43.2	5 13.5	4 10.8	3 8.1	37 5.2
84773.0	17 17.2	41 41.4	1 1.0	9 9.1	31 31.3	99
84793.0	5 20.8	8 33.3		4 16.7	7 29.2	24 3.4
86131.0	10 16.9	24 40.7		4 6.8	21 35.6	59 8.3
86134.0	8 13.3	33 55.0	2 3.3	7 11.7	10 16.7	60 8.5
86150.0	2 33.3	3 50.0			1 16.7	6 .8
86150.1	4 22.2	4 22.2	1 5.6	3 16.7	6 33.3	18 2.5
86150.2	5 31.3	3 18.8	1 6.3	4 25.0	3 18.8	16 2.3
86150.3		7 50.0		4 28.6	3 21.4	14 2.0

Count Row Pct	Cortical	Single facet	Multifacet	Crushed	Absent, etc.	Row Total
86150.4	2 50.0			1 25.0	1 25.0	4 .6
86155.0	10 32.3	5 16.1			16 51.6	31 4.4
86156.0	9 11.4	18 22.8	1 1.3	12 15.2	39 49.4	79 11.2
86159.1					2 100.0	2 .3
86159.2	10 10.9	28 30.4	3 3.3	11 12.0	40 43.5	92 13.0
86159.5	11 32.4	8 23.5		3 8.8	12 35.3	34 4.8
98680.0	21 21.0	40 40.0	1 1.0	15 15.0	23 23.0	100 14.1
98690.0	1 50.0				1 50.0	2 .3
98690.1	2 25.0		1 12.5	3 37.5	2 25.0	8 1.1
98690.6		4 40.0		1 10.0	5 50.0	10 1.4
98861.0	2 15.4	3 23.1	1 7.7	5 38.5	2 15.4	13 1.8
Column Total	128 18.1	245 34.6	17 2.4	90 12.7	228 32.2	708 100.0
Classic period						
84759.2	17 22.7	36 48.0	4 5.3	4 5.3	14 18.7	75 100.0
Unknown period						
84775.2	2 3.1	31 47.7	3 4.6	10 15.4	19 29.2	65 48.1
84777.0	2 100.0					2 1.5
84787.0	1 33.3	2 66.7				3 2.2
86152.0	5 7.7	27 41.5	10 15.4	2 3.1	21 32.3	65 48.1
Column Total	10 7.4	60 44.4	13 9.6	12 8.9	40 29.6	135 100.0
Mixed periods						
98688.0	89 10.8	438 53.1	59 7.2	150 18.2	89 10.8	825 100.0

length and thickness show a higher correlation than length and width in core flakes. To look for possible changes in reduction strategies through time, whole core flake length and thickness data were subjected to a one-way ANOVA test. At the .05 significance level, the Mixed period core flake sample was significantly thinner and shorter than the other periods, and the Archaic period sample was significantly thinner and shorter than the Coalition, Classic, and Unknown periods. This corresponds well with other attributes that indicate that Archaic period components and LA 98688 reflect more intensive core reduction.

Cores

Cores as an artifact class can be used to monitor reduction strategy and intensity. As flakes are removed from nodules or cores, the core cortical cover is reduced. As cores are reduced, their size decreases with a full range of sizes and cortex percentages representing a complete reduction sequence. Early stage reduction would have a high percentage of larger cores with high dorsal cortex percentages. If reduction of raw materials is intensive, and replacement material is scarce or unsuitable, a high percentage of small cores with no cortex may remain.

Figures 12.1 to 12.3 show the distribution of core length ranges, cortex, and dorsal scar counts by period. These three attributes reflect different reduction strategies that relate to patterns observed for core flakes.

Core lengths were classed into ranges of 10-49 mm, 50-99 mm, and 100 mm or longer. These ranges are referred to as small, medium, and large cores. Core length is a rough index of reduction intensity, if original cobble or nodule size is held constant. While recognizing that variable raw material size occurred in the Las Campanas area, core lengths can still be examined for general patterns. Figure 12.3 shows a similar distribution for Archaic and Coalition period core lengths with medium-sized cores predominating. This suggests that cores were not exhausted in terms of size, therefore other factors may have contributed to their discard. A slightly higher percentage of medium cores from the Coalition period and virtually exclusive presence of medium cores from the Classic and Unknown periods suggests similar reduction strategies for all three periods. The dominance of small cores from LA 98688 fits well with the hypothesis that repeated occupation resulted in reuse of surface materials. LA 98688 cores were reduced to a size where flake removal was not possible.

Cortex was divided into three ranges, 0 to 20 percent, 30 to 50 percent, and 60 to 90 percent. These three ranges represent a range of reduction from intensive to casual. With cortex the similarity between the Archaic and Coalition period samples ends. Archaic period cores are dominated by artifacts with 0 to 20 percent dorsal cortex. This indicates intensive reduction, with the lower frequencies of the other categories further demonstrating reduction as a continuum. The other periods have roughly equal frequencies of 0 to 20 percent and 30 to 50 percent, or 60 to 100 percent. This tendency of more cortex remaining on discarded cores suggests a more casual reduction with flakes removed as needed. LA 98688 exhibits a pattern that contradicts the size distribution with almost equal frequencies of all cortex ranges. This suggests that some small core sizes reflect raw material size.

Dorsal scar counts, which were difficult to interpret for core and biface flakes, are more informative for cores. Figure 12.2 shows dorsal scar range distributions for one to four, five to eight, and nine or more dorsal scars. Fewer dorsal scars imply earlier reduction stage and more scars suggest later or more intensive reduction. The Archaic period distribution shows a predominance of cores with five to eight dorsal scars. The nine or more class is more common than the one to four class, which supports an interpretation of more intensive reduction. Coalition, Classic, and Unknown samples show a definite tendency toward cores with fewer than nine dorsal scars, which is suggestive of less intensive or more casual reduction. LA 98688 exhibits a majority of cores with nine or more scars, which supports the observation that the assemblage was intensively reduced through reoccupation.

Cores provide strong indication of reduction patterns when viewed as a continuum from casual to intensive. Archaic period sites yielded cores that show a tendency towards more intensive reduction, while Coalition, Classic, and Unknown period cores tend more toward the less intensive or casual end. These differences undoubtedly reflect occupation duration and intensity. Archaic period sites were usually some form of base camp, while most of the Coalition, Classic, and Unknown period sites reflect brief occupations for the purpose of foraging. LA 98688 with 600 years of discontinuous, repeated

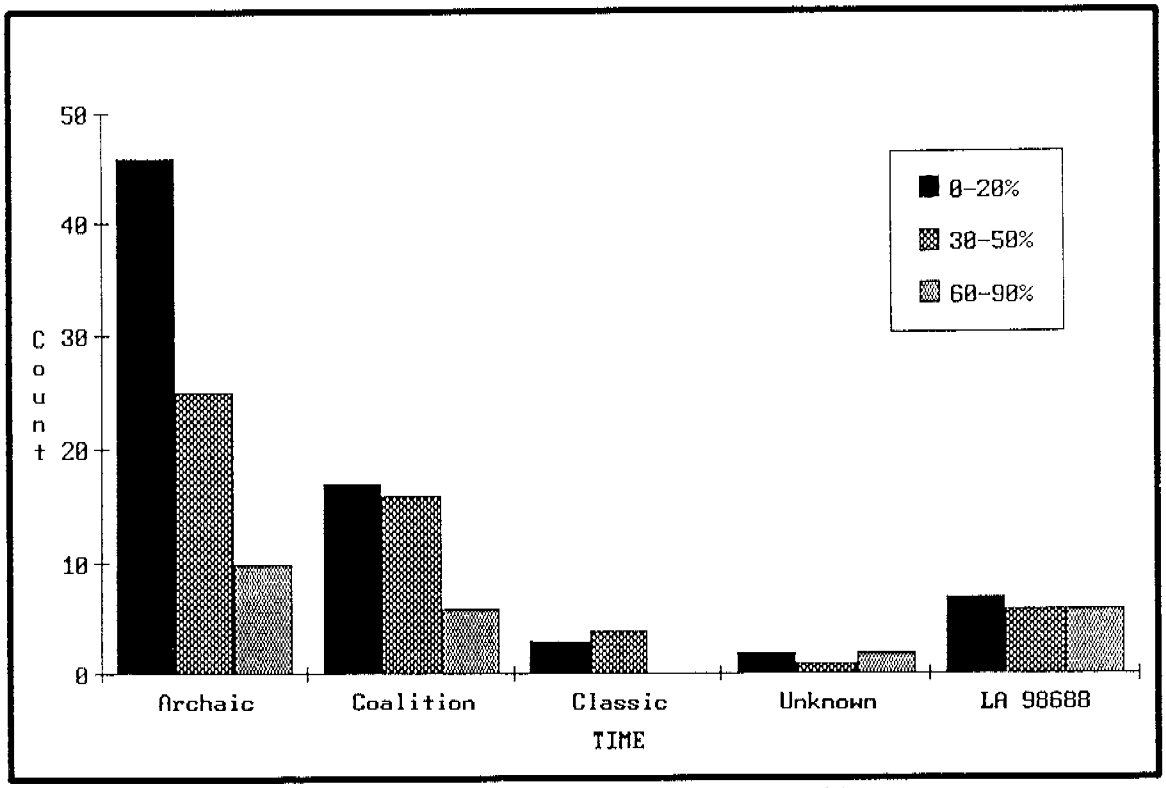

Figure 12.1. Core cortex ranges by period, all OAS sites.

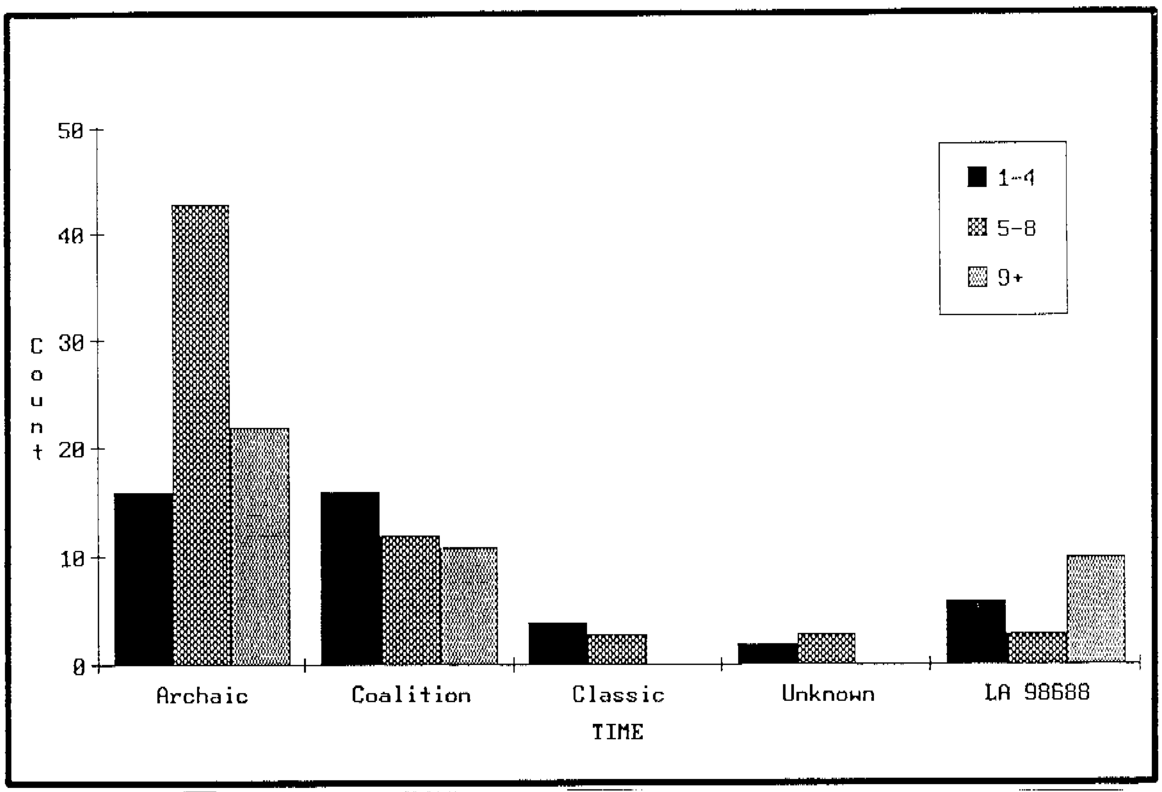

Figure 12.2. Core dorsal scar count ranges by period, all OAS sites.

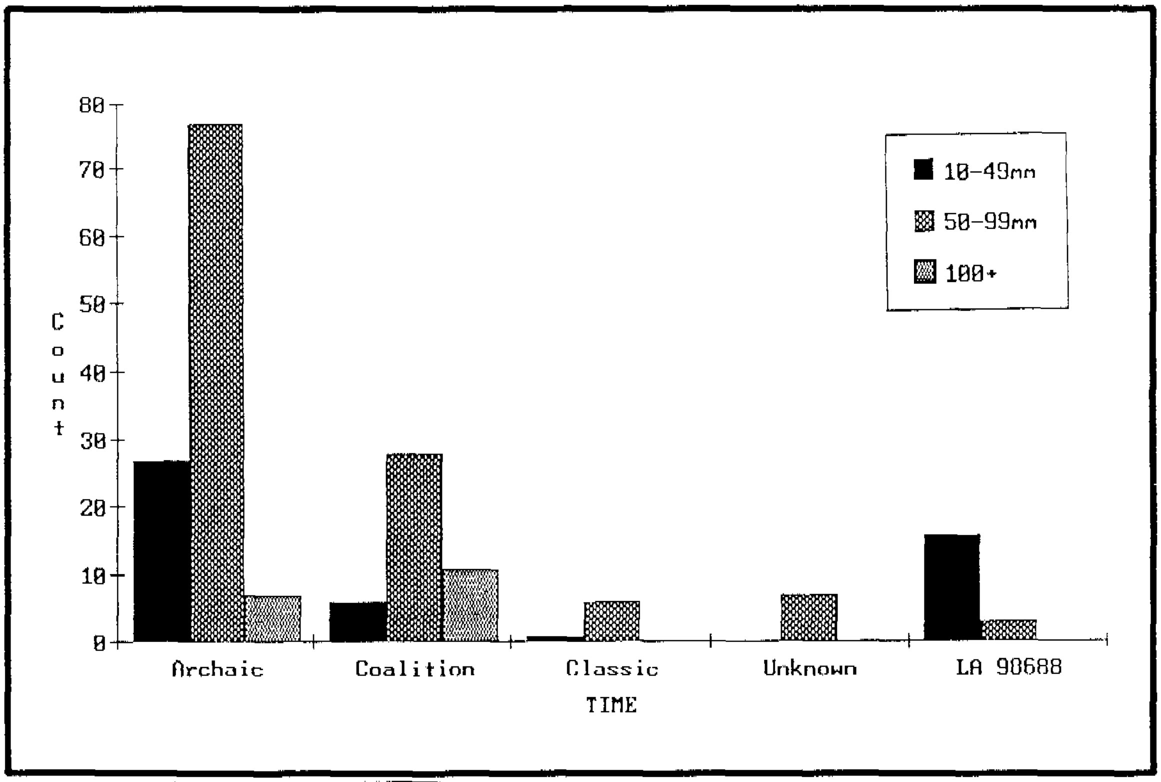

Figure 12.3. Core length ranges by period, all OAS sites.

use shows patterns that indicate intensive use of raw materials left over from previous occupations.

Tool Production and Use

Evidence of tool production and use can be used to examine site function. Tool production relates to reduction strategy. Tool use relates to other activities that occurred or were prepared for on-site. Tool production is monitored through identification and analysis of biface manufacture flakes and the presence of utilized debitage. Biface manufacture is associated with more formal or planned strategies, while utilized debitage is associated with expedient strategies. Depending on the occupation duration and range of activities conducted at or prepared for on-site, biface manufacture and utilized debitage will be represented in variable frequencies.

Many of the tables previously presented included data on biface manufacture. Those tables will be used in this discussion as well as additional data that illustrate patterns in utilized debitage, tool ratios, and debitage to tool ratios.

Biface Manufacture

A total of 547 biface flakes were recovered from all sites. Ninety-two percent of the biface flakes were from Archaic period sites, providing the best data base to examine biface manufacture. It is expected that different Archaic period site types will yield evidence of different biface reduction strategies. These different strategies can be examined by comparing flake thickness and length, platform types, and material type use across sites and components.

The progression from early to late stage biface manufacture results in the gradual reduction in size of the core or blank. Therefore, as biface reduction proceeds, the flakes should shorten and become thinner. Logically, there should be a tendency for early stage flakes to be longer and slightly thicker than late stage flakes. Figure 12.4 shows the distribution of biface flake length as ranges by Archaic period component. The majority of the assemblages are dominated by the 11-20 mm flake length range, with 1-10 mm and 21 mm or longer the second most common. This distribution suggests all stages of biface reduction occurred. LA 86148 exhibits a different pattern. Its assemblage is dominated by 21 mm or longer biface flakes. This suggests more focus on early or middle stages of biface manufacture, such as would result from the reduction of large bifacial cores.

Figure 12.5 shows the biface flake thickness range distribution from thin to thick. Most of the assemblages show a predominance of medium thick flakes followed by fewer numbers of thin flakes. LA 84758 and LA 86139 exhibit higher frequencies of thin flakes. This may partly reflect reduction strategy, but it also results from a more common use of obsidian for biface reduction. Obsidian can be flaked more finely than chert or chalcedony, resulting in thinner flakes. It is also possible that the abundance of thin flakes reflects the production of projectile points or other small, formal tools.

The greater use of obsidian for biface manufacture is illustrated in Figure 12.5. LA 84758 has the most obsidian biface flakes and 10 of the 11 biface flakes from LA 86139 were obsidian. The abundance of local material used in biface manufacture at the other sites suggests that local materials were suitable and that forays near obsidian sources were rare or obsidian was not procured and transported to Las Campanas sites.

Figure 12.6 shows the platform type distributions for all Archaic period components. Typically, crushed or collapsed platforms predominate, which is expected with late stage biface reduction. Most components have lower frequencies of single and multifaceted platforms, which reflects a full range of biface reduction. LA 86148 is different because it had modified platforms as the second most common type of platform. Modified platforms indicate a systematic or planned strategy associated with formal tool production.

Biface manufacture as represented by biface flakes shows three patterns. The main pattern is general biface reduction with all stages represented by a predominance of medium length and thickness flakes, local material, and collapsed, crushed, or faceted platforms. The second pattern is similar to the first, except that thinner biface flakes are present as a result of more obsidian use. The third pattern is exemplified by LA 86148 and LA 86139 with a tendency towards longer biface flakes and crushed or collapsed or modified platforms suggesting a biface reduction strategy that employed bifacial cores for blanks and tool flakes.

Informal Tools

Informal tools are pieces of debitage that were used or modified along one or more edges. Only Archaic period sites and LA 98688 and LA 86150 (Coalition period) yielded sufficient frequencies of utilized debitage for analysis and comparison. Two attributes, edge damage and edge angle, provide the best indications of tool use and by inference, site activities.

Informal tools were identified by edge modification or the presence of visible edge damage. Debitage edges were examined with binocular microscope for consistent damage. Three basic wear patterns were commonly identified alone or in combination: unidirectional, bidirectional, and rounding. Unidirectional wear is attributed to repeated scraping of rough or hard materials (Vaughan 1985:52) or extended use (Schutt 1980). Bidirectional wear is attributed to sawing or cutting of hard materials such as wood or bone. Rounding results from extended use of tools so that scars become obliterated and the use edge is dulled.

Figure 12.7 shows the distribution of edge damage by component. Most components have a predominance of unidirectional edge wear with lesser amounts of the other categories. The LA 84787 components exhibit similar edge wear distribution suggestive of a wide range of activities, such as would be expected for a base camp. Intensive cutting and scraping resulted in visible edge damage. Intensive tool use would occur with longer occupations where tools would be reused for similar tasks or tasks that required similar tools. LA 86148 exhibits the highest percentage of rounding and unidirectional wear with rounding. This suggests a more specialized activity set; an observation that coincides well with the biface manufacture evidence. The two Pueblo period components, LA 86150 and LA 98688, reflect an accumulation of utilized debitage from many occupations. LA 86150 shows a pattern similar to LA 86148, while LA 98688 is more similar to the base camp pattern. Greater evidence of scraping only means it is an activity that resulted in the most commonly visible wear. The presence of even a few cutting or sawing-damaged edges is a strong indicator that a wide range of activities occurred. In the case of LA 86148, the predominance of rounding suggests that cutting or sawing activities did predominate with scraping.

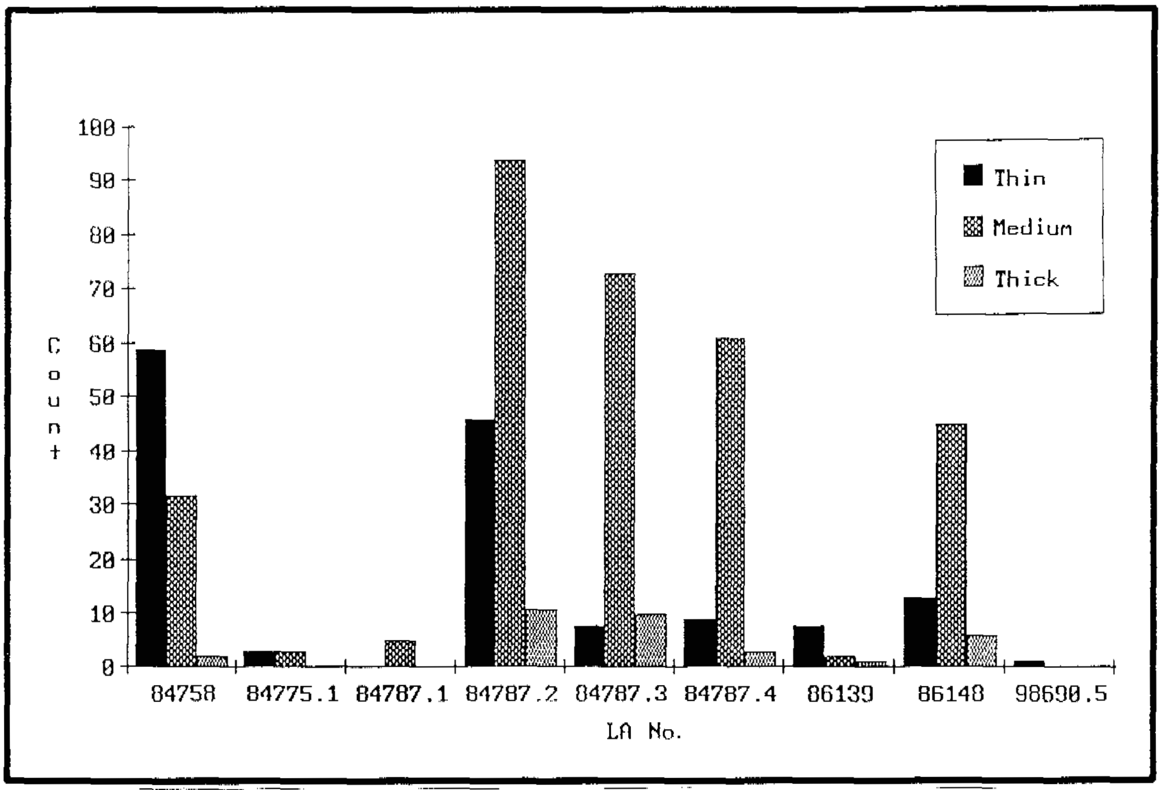

Figure 12.4. Archaic period biface flake thickness distribution.

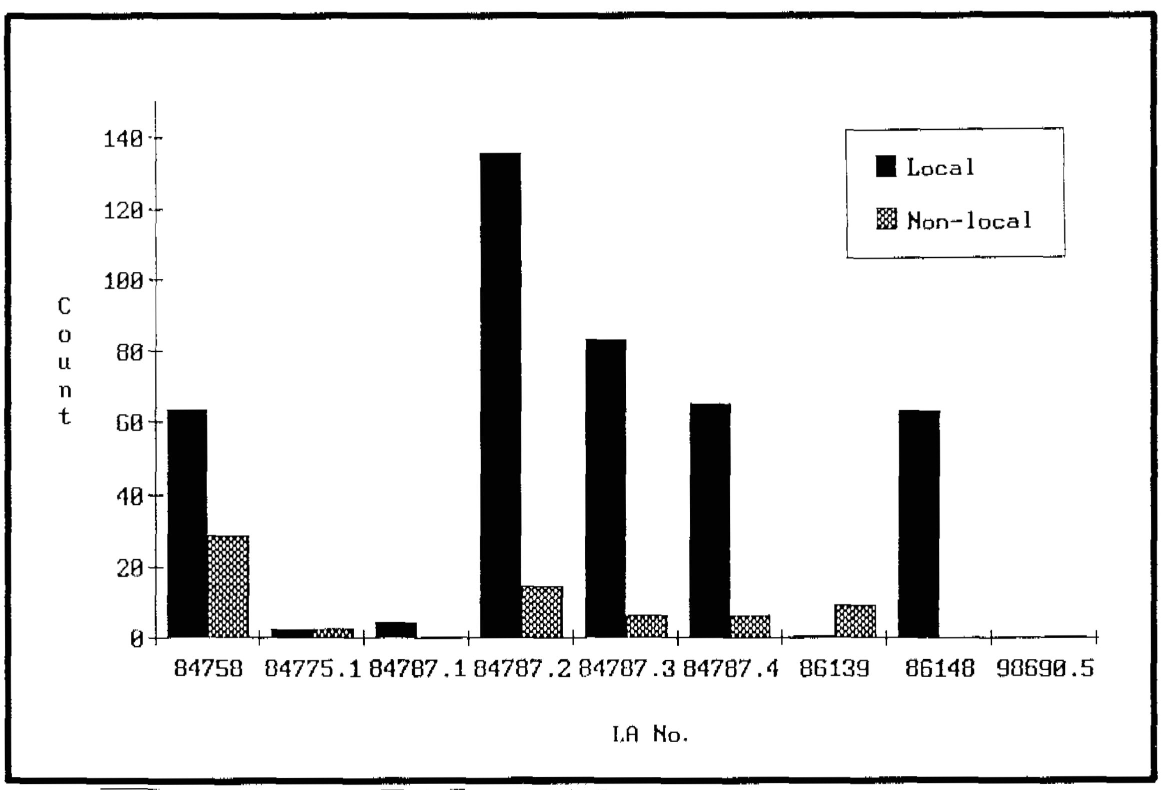

Figure 12.5. Archaic period biface flake material sources.

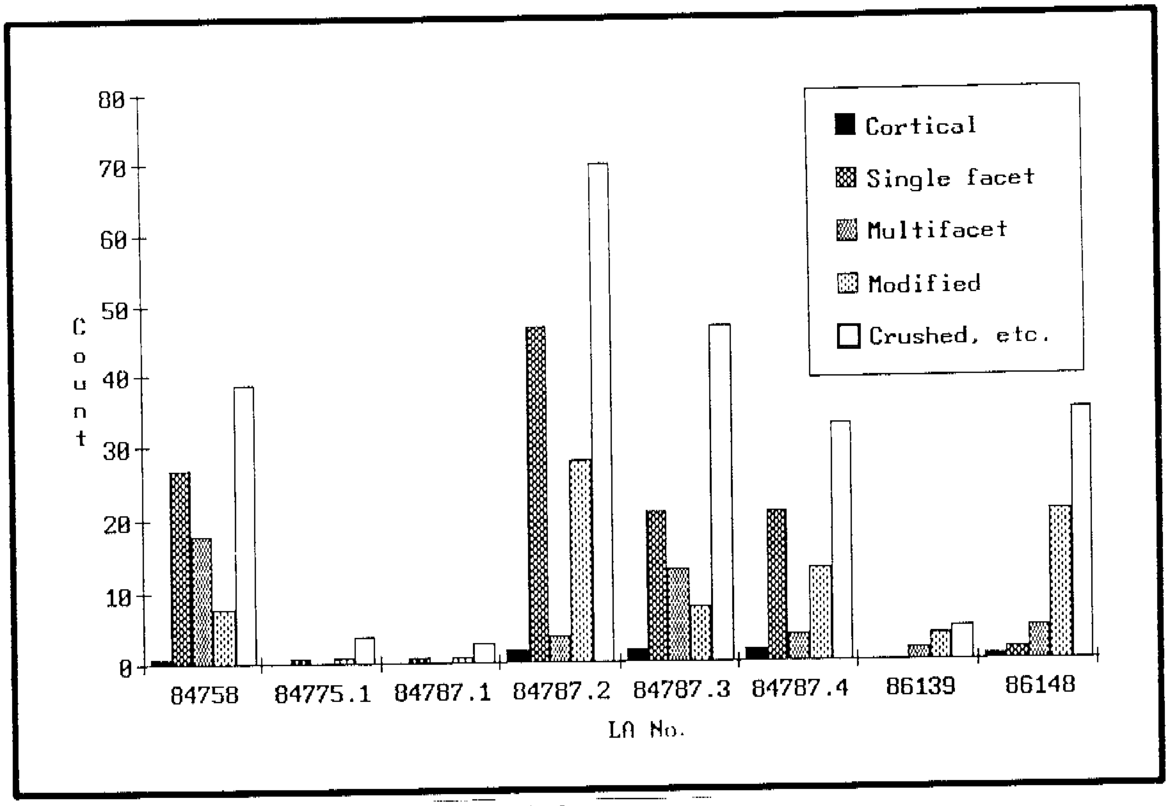

Figure 12.6. Archaic period biface flake platform types.

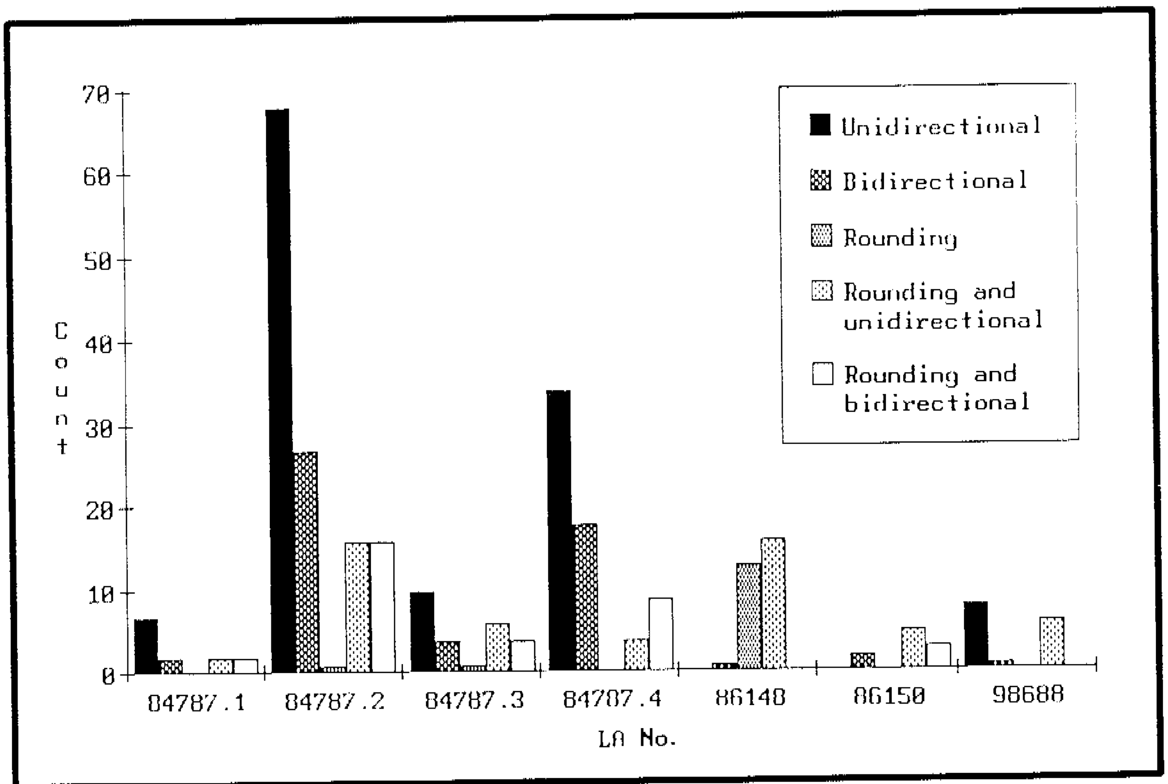

Figure 12.7. Selected OAS sites with utilized debitage edge damage.

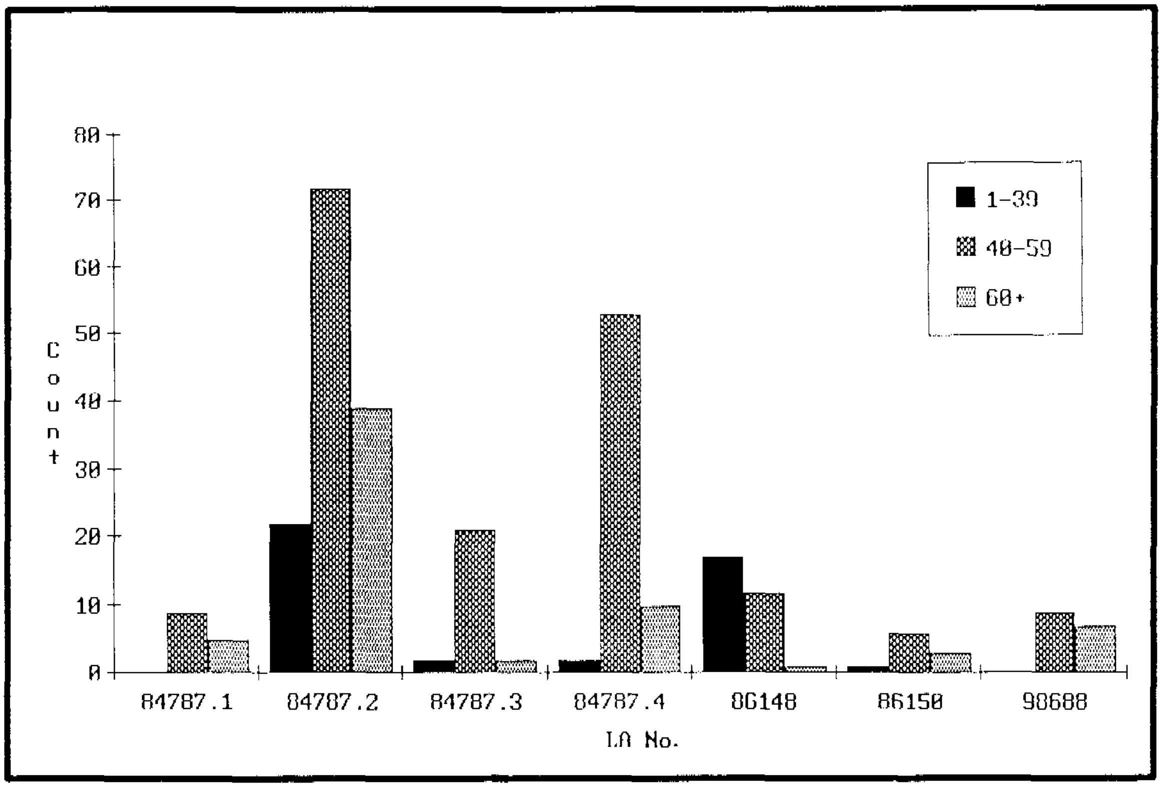

Figure 12.8. Selected OAS sites with utilized debitage, edge angle ranges.

Edge angles are used as an indicator of intended tool use. Used edge angles represent the finished edge rather than the original edge, so they are a rough indicator. Experimentation has shown that 40 degree or less edge angles were optimal for cutting, while greater than 40 degrees were more suited to scraping (Schutt 1982). This is a rigid dichotomy that does not allow for a continuum of scraping activities. This analysis viewed edges of 40 to 60 degrees as scraping or cutting edges, and edges of greater than 60 degrees as more suited to heavy-duty scraping.

Figure 12.8 shows the edge angle distribution for all components. For most components, 40 to 59 degree edges predominate. Cutting edges are rare or nonexistent for most components, except LA 86148. The 40 to 59 degree edge angle suggests that utilized debitage had wide utility and was used as general purpose tools. The presence of relatively high proportions of low and high edge angle tools on LA 84787, Area 2, reflected its longer and more intensive occupation. Longer and perhaps repeated occupations had a greater range of activities and perhaps some reuse of raw materials. LA 86148 shows a high proportion of cutting edges rather than high edge angle tools. This evidence supports the observation that LA 86148 was a more specialized site or that it was occupied during a different season than other Archaic period components. The Pueblo period components have general purpose and heavy-duty edges as would have been necessary to support gathering of plants and fuel wood.

Informal tools show an emphasis on multipurpose or generalized functions, such as cutting and scraping. LA 86148 exhibits different utilized debitage patterns from the other Archaic period sites, supporting the biface reduction evidence for different or specialized function. Pueblo period sites have general purpose tools with edges that were useful for a wide range of tasks associated plant gathering and processing.

Formal Tools

Formal tools are debitage or blanks that were purposely modified to create a specialized shape, edge outline, or edge angle. Flaking patterns are defined by location as unifacial or bifacial and forms are classed by progressive stages as early, middle, and late stage tools. Early stage tools have an irregular outline, a chunky profile, and widely spaced flake scars. Middle stage tools have a more regular outline, more closely spaced and regular flake scars that may extend across the tool face. Late stage tools have regular outlines and closely spaced flake scars that span the tool face. Formal tools are an indication of specialized activities and some use of a curated strategy (OAS Staff 1994).

Formal tools from Las Campanas sites were rare and more often than not were represented by fragments. Formal tools recovered at each site were described in the site reports. This discussion will focus on tool frequencies and type variability.

Table 12.2 summarized the tool data by hand tools and projectile points, bifaces, and other tools by period and local and nonlocal materials. Table 12.8 summarizes the same tool data by period but provides a distinction among chert, chalcedony, and silicified wood (chert, etc.), quartzite, sedimentary, and metamorphic (quartzite, etc.), and obsidian, basalt, and other (obsidian, etc.). For all periods, a total of 72 projectile points and other formal tools and 36 hand tools were recovered.

The Archaic period sites yielded the most abundant and varied tool assemblages accounting for 45 projectile points and other formal tools and 29 hand tools. These sites were occupied the longest and, as a result, tools needed to support a full range of domestic and subsistence activities were present. Residential sites had at least one hand tool and three projectile points and other formal tools. The longest occupied or most frequently reoccupied components, LA 84758 and LA 84787, Area 2, accounted for 19 of the projectile points and other formal tools, and 19 of the hand tools from the Archaic period. Thirty of the 45 projectile points and other formal tools were obsidian or basalt. Twenty-five of the 29 hand tools were chert. This bivariate distribution suggests that Archaic period populations relied on exotic materials for formal tools and local materials for large, heavy-duty processing hand tools. The fact that most of the obsidian (i.e., nonlocal material) formal tools were late stage bifaces suggests that they remained in use for extended periods, were not abundant in the toolkit, and were discarded only when broken, accidentally lost, or were worn out.

Coalition period assemblages yielded fewer projectile points and other formal tools and only two hand tools. Different from the Archaic period pattern is the use of unnotched bifaces and the more common occurrence of undifferentiated bifaces. Undifferentiated bifaces could have been broken in use or manufacture. Their recovery on small, limited activity sites suggests they were a minor part of the forager-hunter toolkit that was discarded when their utility was exhausted. Coalition period bifaces were predominantly made from local material perhaps reflecting less stringent manufacture requirements or a more restricted mobility pattern with reduced access to obsidian or basalt sources.

Classic period and Unknown period sites yielded few formal tools, but they were made from chert (i.e., local) materials and they tended to be undifferentiated bifaces. This pattern is most similar to the Coalition period assemblages. The Mixed period site, LA 98688, exhibited a formal tool assemblage more similar to the Archaic period pattern. Four of the five bifaces were late stage obsidian tools. This assemblage lends support to the hypothesis that at least one site function was related to a highly mobile or logistically organized pattern.

Summary

The OAS Las Campanas excavations recovered 7,769 chipped stone artifacts from 20 sites representing at least 36 components for the Archaic, Coalition, and Classic periods, unknown periods, and a mixed period deposit. The chipped stone data provided information on prehistoric material selection, lithic technology in the form of reduction strategies and stages, and tool production and use. These data inform on site function, subsistence organization, and the possibility of temporal trends in assemblage patterns that could be used to date unknown period sites. The lithic technology data are summarized and the function, subsistence, and temporal data will be integrated into the project level synthesis.

Archaic period sites relied heavily on locally available lithic material from gravel and cobble deposits. The majority of core reduction debris, cores, and informal tools were made from local materials. Nonlocal materials were used to make formal tools with limited core reduction and very few nonlocal material cores were recovered. Most Archaic period sites had at least one piece of obsidian debris. LA 86148 was unusual in that

Table 12.8. Artifact Classes by Material Types and Period

Count Row Pct Column Pct	Core Reduction Debris	Biface Manufacture Debris	Cores	Hand Tools	Projectile Points, etc.	Row total
Archaic period						
Chert, etc.	4103 88.0 90.5	416 8.9 83.0	106 2.3 95.5	25 .5 86.2	15 .3 33.3	4665 89.4
Quartzite, etc.	224 92.2 4.9	12 4.9 2.4	5 2.1 4.5	2 .8 6.9		243 4.7
Obsidian, etc.	208 66.5 4.6	73 23.3 14.6		2 .6 6.9	30 9.6 66.7	313 6.0
Column Total	4535 86.9	501 9.6	111 2.1	29 .6	45 .9	5221 100.0
Coalition period						
Chert, etc.	798 91.2 86.7	22 2.5 68.8	37 4.2 82.2	2 .2 100.0	16 1.8 80.0	875 85.9
Quartzite, etc.	103 91.2 11.2	2 1.8 6.3	8 7.1 17.8			113 11.1
Obsidian, etc.	19 61.3 2.1	8 25.8 25.0			4 12.9 20.0	31 3.0
Column Total	920 90.3	32 3.1	45 4.4	2 .2	20 2.0	1019 100.0
Classic period						
Chert, etc.	56 83.6 64.4	4 6.0 80.0	6 9.0 85.7		1 1.5 100.0	67 67.0
Quartzite, etc.	27 96.4 31.0	1 3.6 20.0				28 28.0
Obsidian, etc.	4 80.0 4.6		1 20.0 14.3			5 5.0
Column Total	87 87.0	5 5.0	7 7.0		1 1.0	100 100.0
Unknown period						
Chert, etc.	187 93.0 97.9	3 1.5 100.0	7 3.5 100.0	3 1.5 100.0	1 .5 50.0	201 97.6
Quartzite, etc.	4 100.0 2.1					4 1.9

Count Row Pct Column Pct	Core Reduction Debris	Biface Manufacture Debris	Cores	Hand Tools	Projectile Points, etc.	Row total
Obsidian, etc.					1 100.0 50.0	1 .5
Column Total	191 92.7	3 1.5	7 3.4	3 1.5	2 1.0	206 100.0
Mixed periods						
Chert, etc.	673 96.7 61.1	3 .4 50.0	18 2.6 94.7	1 .1 50.0	1 .1 20.0	696 61.4
Quartzite, etc.	410 99.3 37.2	1 .2 16.7	1 .2 5.3	1 .2 50.0		413 36.5
Obsidian, etc.	18 75.0 1.6	2 8.3 33.3			4 16.7 80.0	24 2.1
Column Total	1101 97.2	6 .5	19 1.7	2 .2	5 .4	1133 100.0

there was a complete absence of obsidian. Reduction strategy and stages indicated intensive reduction with the intent to produce flakes to be used as informal tools. Raw materials were brought to the sites as unreduced and partly reduced nodules and cobbles. A curated strategy is partly evident for nonlocal materials. Higher percentages of biface manufacture flakes and lower frequencies of primary flakes and secondary flakes with dorsal cortex were present. This mixed reduction strategy would support a residential occupation where domestic processing, manufacturing, and consumption occurred, as well as preparing for long-distance forays. LA 86148 has characteristics of a logistical and residential site. Core reduction predominated but the biface reduction focused on larger products and the use of biface flakes as tools. This strategy is expected if local raw material is unavailable or unsuitable. The LA 86148 pattern and other Archaic period site patterns may reflect differences in season of occupation. LA 86148 assemblage appears to be more related to hunting or meat processing, while the other residential Archaic period sites reflect a more general strategy.

The Coalition, Classic, and Unknown period sites reflect a foraging subsistence strategy. Local material dominated the assemblages as core reduction debris, informal tools, and formal tools. Coalition period assemblage counts were lower than Archaic period sites, reflecting less core reduction and briefer occupations, and early stages of reduction were better represented in Coalition period sites when compared with Archaic period sites. Cortical secondary flakes and primary flakes often occurred as 40 to 60 percent of the assemblage. Angular debris percentages were typically higher. Core flakes tended to be longer and thicker than Archaic period assemblages. Coalition period cores tended to be larger with more cortex and fewer dorsal scars than Archaic period assemblages, reinforcing the evidence for an expedient lithic technology. Informal and formal tools were few on Coalition period sites, with expediently used flakes probably not used enough to create visible edge wear.

The Mixed period site, LA 98688, represented a hybrid Archaic and Coalition period assemblage. Core reduction relied on local chert and quartzite. Core flakes and angular debris predominated, but few pieces of utilized debitage were recovered. Nonlocal materials were best represented by formal tools. Core flakes were shorter and thinner than other assemblages, but late stage platform types were present in frequencies similar to the Coalition period pattern. Cores tended toward small to medium with less dorsal cortex, and nine or more dorsal flake scars were common. The overall pattern for LA 98688 is intensive core reduction of local materials, with the reduction pattern amplified by reoccupation over a 600-year period.

CHAPTER 13
COMPARISON OF SAN JUAN TRENCH KILNS, SANTA FE PIT KILNS, AND OTHER LAS CAMPANAS THERMAL FEATURES

Steven A. Lakatos

Introduction

Considering the importance of prehistoric ceramics to archaeological investigations in the Anasazi culture area, there have been relatively few positively identified pottery-firing features or kilns reported in the North American Southwest, outside of the Northern San Juan region (Sullivan 1988; Purcell 1993). The lack of these features is especially acute in the Northern Rio Grande region. Our ability to identify pottery-firing features appears to have been strongly hampered by the use of ethnographic and modern models of Native American pottery firing methods, as well as minimal archaeological attention paid to small, nonarchitectural artifact scatters.

Ethnographic models of surface firing within or near the village limits has had a strong effect on archaeological expectations for finding pottery-firing features. Cultural and natural processes may have further decreased the archaeological visibility of firing features (Purcell 1993; Schiffer 1987). Some cultural processes that might have affected feature preservation include facility reuse, changing activity area locations, and pueblo expansion. Natural processes of erosion and deflation could have quickly erased shallow firing features. Because of the recognition biases and cultural and natural effects, we needed to look beyond the village limits for the pottery-firing features.

Pottery production is usually inferred from the presence of raw materials and tools such as processed clay, temper, unfired vessels, *pukis*, and sherd scrapers. These materials are often recovered during excavation, but are rarely found associated with pottery-firing locations (Sullivan 1988). An early exception to this rule is the excavation at the Hohokam village Snaketown (Haury 1976), where manufacturing tools and pottery-firing features appear to have occurred together (Sullivan 1988).

Las Campanas excavations identified three sites that yielded what may be the first Santa Fe Black-on-white pottery-firing features recognized in the Northern Rio Grande Valley (Lakatos 1994; Post 1994a; Post and Lakatos 1994, 1995). Sites LA 84793, Feature 1, LA 86159, Feature 1, and possibly LA 86150, Feature 1, exhibited characteristics that are similar to pottery kilns identified in the Northern San Juan region of the Southwest. These sites will be compared with the Northern San Juan trench kilns, as well as other thermal features excavated during the Las Campanas project. The objective of this comparison is to determine if LA 84793, Feature 1, LA 86159, Feature 1, and LA 86150, Feature 1, could have functioned as pottery kilns.

The comparison among sites LA 84793, LA 86159, and LA 86150, and 18 Northern San Juan trench kilns (Purcell 1993) and thermal features from Las Campanas sites (LA 84784, LA 86130, LA 86150, LA 84787, and LA 98690) will examine topography, geographic setting, feature morphology, construction, internal attributes, stratigraphy, associated artifacts, and discard areas.

Northern San Juan Anasazi Trench Kilns, Stratigraphic Sequence, and Pottery Replication

The 18 trench kilns (not including kilns recently excavated at Mesa Verde National Park) included in this study were from sites located north of the San Juan River in Utah, Colorado, and New Mexico (Purcell 1993). Most of these features were not found near habitation sites or in association with tools or raw materials identified with pottery manufacture (Purcell 1993). The discovery of these features indicates that construction and decoration of pots and the firing may have occurred at different locations.

The firing features of the Northern San Juan Anasazi in general are subrectangular trenches 1.5 to 8 m long by .8 to 2.0 m wide and 10 to 30 cm deep. Length shows the greatest variability, while width and depth tend to be consistent with only a few examples exhibiting a width greater than 1.5 m. The bottoms are generally flat with sloping sides (Blinman 1992; Purcell 1993). The trenches are usually excavated to bedrock, often perpendicular to slopes, and are lined with upright sandstone slabs (Purcell 1993). Interior oxidation is usually present, extending onto the sides and bottom of the features forming a "rind." Fire-cracked rock, ash, and black, "greasy" (Helm 1973:213) fill are also distinguishing characteristics. Charcoal and 3 to 5 cm of black earth are found under, as well as over, an irregular layer of rocks in the lower trench fill. These rocks are believed to have provided support for vessels during firing.

Ceramics are the most common artifact type recovered from these features and are usually found above the layer of rocks or kiln furniture. Sherds and vessels from the kilns often display evidence of thermal exposure, such as spalling, oxidation, bloating, or vitrification. Most of the excavated features were used to fire carbon-painted black-on-white pottery during the eleventh and twelfth centuries (Purcell 1993). Recently excavated kilns from Mesa Verde National Park dated to the tenth century A.D. and yielded mineral-painted white ware vessels (Brisbin 1993). Bowls are the most common vessel type recovered, followed by jars, dippers, and pinch pots (Purcell 1993). Detailed descriptions of these features are given by Bradley (1982) and Fuller (1984). Purcell (1993) synthesizes the kiln data from excavations predating 1993.

Based on the stratigraphic information from kiln excavations at Mesa Verde, Colorado (Brisbin 1993), Clint Swink (1993) developed a firing sequence for trench kilns, which serves as a model for the firing of carbon-painted pottery in the Northern San Juan region. The firing sequence is divided into four stages: the "primary fire," the "setting," the "secondary firing," and the "smothering" (Swink 1993).

The primary fire, set in the bottom of the trench, dries out the lining and prepares a thick bed of coals 8 to 15 cm deep. This fire also dries out the kiln furniture (tabular sandstone slabs), and warms vessels that are set around the perimeter (Swink 1993). Juniper was the most common fuel recovered from the primary firing layer in the Mesa Verde trench kilns (Brisbin 1993).

The setting is created by placing a uniform layer of preheated kiln furniture over the bed of coals created by the primary fire. The stones are spaced to allow heat to circulate while still providing support for the vessels. Vessels are placed on the kiln furniture in a single layer and vessels of similar size are grouped together with the bowls inverted (Swink 1993). Cover sherds are placed around and over the vessels to shield them from fuel and extreme temperature fluctuations.

The secondary firing provides the majority of the heat needed to fire the pottery. Fuel is cribbed over the setting with longer pieces spanning the feature, providing support for the crib. The crib is then ignited at the top. A draft is created with this fire, accelerating combustion of the primary fuel layer. Management of the secondary fire is critical to the success of the firing. Fuel type for this stage does not seem to be as important as in the primary stage to the success of the firing (Swink 1993).

The setting is smothered with a thick layer of soil, free of any combustible material. The kiln cools slowly and is ready to open in 18 to 24 hours (Swink 1993). The vessels are covered with ash and need to be brushed, so that the result of the firing can be seen. When the vessels are removed, the ash and charcoal deposit is mixed and scattered.

The replicated firing sequence can account for all of the stratigraphic characteristics of the Northern San Juan Anasazi trench kilns. The rind of oxidation, dense black fill, abundant rock suspended in dark, charcoal-stained soil, and a relatively clean upper layer provides a distinctive stratigraphic sequence. This sequence combined with spalled, bloated, or heat-altered ceramics yields the strongest evidence for prehistoric pottery firing in the Northern San Juan region. These combined characteristics can be used to identify carbon-paint pottery-firing features in other regions of the Southwest, specifically the Northern Rio Grande.

Pit and Trench Kiln Comparison

The Santa Fe Black-on-white pottery-firing features are described and compared with the Northern San Juan trench kilns. The comparison will focus on topography, geographic setting, feature morphology, construction, internal attributes, stratigraphy, associated artifacts, and discard areas. The two kiln types will be referred to as pit kilns and trench kilns. The trench kiln data are derived from Blinman (1992), Purcell (1993), and Swink (1993).

LA 84793, LA 86159, and LA 86150, Subarea 1, were located 6.1 to 7.0 km north of LA 1 (Pindi Pueblo) and LA 2 (Agua Fria Schoolhouse site), the nearest recorded village sites. Trench kilns typically have been found from 1 to 5.6 km from the nearest recorded habitation site. Topographically, LA 84793, LA 86159, and LA 86150, Subarea 1, are on low, gentle, south or southeast-oriented slopes in slightly eroded and deflated settings. This contrasts markedly with the excavated trench kilns, which commonly occur perpendicular to steep slopes and within or near a drainage (Purcell 1993). Recent data from Mesa Verde (Brisbin 1993) and from pottery-firing replications (Blinman et al. 1994; Swink 1993) suggest that steep slopes may not contribute significantly to a successful firing. Pit kiln locations also lend support to the latter interpretation.

The morphology and construction of trench and pit kilns are distinct (Table 13.1, adapted from Purcell 1993). The LA 84793, LA 86159, and LA 86150 pit kilns were shallow, oval to circular-shaped basins and range in size from 1.30 m to 1.71 m long by 1.06 m to 1.20 m wide to 9 to 26 cm deep. Trench kilns are so named for their tendency to be two to seven times longer than they are wide (Purcell 1993). Size differentiation in the trench kilns may reflect scale of production. The smaller pit kilns would have lacked the productive capacity of the trench kilns, possibly reflecting household-level production.

Pit kilns were excavated into native calcium-carbonate impregnated sandy loam. The walls were moderately to steeply sloped. The floors were uneven but level, and the interiors were unlined. The LA 84793 and LA 86159 pit kiln rims were oxidized and hardened by exposure to high heat. Trench kilns were also shallow (average depth of 40 cm) with moderately steep walls. Often, the walls, and sometimes the floor, were lined with tabular sandstone slabs. For both kiln types, shallow depth relative to length and width and a moderately steep wall angle may have been used to control the firing atmosphere and contain the fuel and setting. Slab lining of the trench kilns probably reflected longevity and reuse needs of large-scale production rather than enhancing thermal properties.

A similar array of interior characteristics was displayed among trench and pit kilns (Table 13.2, adapted from Purcell 1993). Two important characteristics of these pottery-firing features are thermal alterations and the stratigraphic pattern. Both kiln types typically exhibit a well-baked and oxidized rind. In the pit kilns this rind consists of light pinkish orange or dark gray stained calcareous sandy loam. On top of the baked rind was a 3 to 12 cm thick layer of homogeneous, dark, charcoal-stained primary fill with charcoal flecks, burned calcareous inclusions, and spalls of fire-cracked rock. This lower layer is analogous to the "primary firing" layer of charcoal and ash in the trench kiln firing sequence (Blinman et al. 1994; Swink 1993).

Each pit kiln contained 20 to 40 burned quartzite cobbles that were suspended on the charcoal-stained soil layer. Most cobbles were lying flat, and few cobbles were in contact with the feature floor or walls. The cobbles appear to have functioned as a platform for the vessels. Tabular sandstone slabs were used in the trench kilns (Purcell 1993), and they are part of the "setting" in the trench kiln firing sequence (Swink 1993). Differences in kiln furniture appear to reflect the availability of geologic raw materials and not functionality. Tabular sandstone is abundant in the Northern San Juan, but is absent from the immediate vicinity of the pit kilns. Quartzite, metamorphic, and igneous cobbles are abundant in the alluvial deposits of the Santa Fe formation.

Located above the cobbles in the pit kilns was a mixed deposit of charcoal-stained, sandy loam with unburned pebbles, and Santa Fe Black-on-white pottery. This mixed deposit appears to be analogous to the "secondary firing" layer (Swink 1993), which collapses on and around the vessels. Above the mixed deposit is clean, sandy soil that may be a remnant of the smothering layer (Swink, pers. comm. 1994).

Artifacts typically associated with trench and pit kilns are ceramics, chipped stone, and bone (Table 13.3, adapted from Purcell 1993). The pit kiln ceramic assemblages were nearly exclusively bowls represented by sherds, spalls, and partly reconstructible vessels. Most sherds within the LA 84793 pit kiln were lying bowl face down. One vessel was identified from 255 sherds recovered from in and around the feature. Most sherds in the LA 86159 pit kiln were lying bowl face up. A minimum of seven vessels were identified from the 597 sherds recovered from the feature and associated discard area. The trench kiln assemblages are also dominated by bowls, but the larger assemblages exhibit greater vessel form diversity. Besides the presence of spalls, trench kiln pottery assemblages include a

Table 13.1. Trench and Pit Kiln Morphology

Site No.	Feature or Kiln No.	Plan View Shape	Profile Bottom	Profile Sides	Dimensions (m) Length	Width	Depth
San Juan Trench Kilns							
42SA2160	1	subrectangular-ovoid	concave, flat	sloping	8.50	1.25*	0.635
5MT6965	1	subrectangular	concave	curved	2.60	1.10	0.50
5MT7143	1	subrectangular	concave	sloping	5.45	1.00	0.35*
5MT7525	1	subrectangular	flat	sloping	3.80	1.50	0.36
	2	subrectangular	concave	sloping	3.60	1.20	1.00
	3	subrectangular	flat	sloping	5.20	2.00	0.45
	4	subrectangular-ovoid	flat	sloping	3.80	1.10	0.38
	5	subrectangular-ovoid	sloping	sloping	1.85	0.90	0.15
5MT7524 (F)	1	subrectangular	flat	near vertical	2.40	1.20	0.20
5MT8451	1	ovoid	concave	sloping	1.79	1.40	0.43
LA61848	1	subrectangular	flat	sloping	2.55	1.00	0.10
	5	subrectangular	flat	sloping	1.54	0.95	0.14
	6a	ovoid	flat	sloping	2.03	1.12	0.225*
	6b	ovoid	flat	sloping	1.50	1.08	-
	7	rectangular	flat	near vertical	3.10	1.20	0.45
LA61888	1	subrectangular	flat	sloping	4.75	1.40	0.33
42SA10275	5	subrectangular	flat	sloping	2.40	0.8*	0.55
5MT9431	1	subrectangular	concave	sloping	8.20	1.60	0.50
5MT9431	3	subrectangular	flat	near vertical	8.60	1.60	0.40
Las Campanas Sites							
LA86150	1	roughly circular	slightly concave	sloping	1.30	1.20	0.14
LA84793	1	oval	flat	steep sloping	1.55	1.06	0.18
LA86159	1	ovoid	flat	steep sloping	1.71	1.10	0.26

* average value

Table 13.2. Trench and Pit Kiln Interior Characteristics

Site No.	Feature/ Kiln No.	Oxidation	Blackening	FCR	Material Type	Cobble Condition	Cobble Placement	Artifacts
San Juan Trench Kilns								
42SA2160	1	present	present	present	sandstone	?	in fill	ceramic
5MT6965	1	?	?	?	sandstone	?	on bottom	ceramic
5MT7143	1	rind	present	present	sandstone	?	on bottom	ceramic
5MT7525	1	rind	?	absent?	sandstone?	?	on bottom	ceramic
	2	rind	?	present	sandstone	?	in fill & on bottom	ceramic
	3	rind	?	?	sandstone	?	on bottom	ceramic
	4	rind	?	present	sandstone	?	in fill & on bottom	ceramic
	5	rind	?	?	sandstone	?	in fill	ceramic, lithic
5MT7424 (F)	1	?	?	absent	-	-	-	ceramic
5MT8451	1	rind	present	present	sandstone	?	in fill	ceramic, bone
LA61848	1	?	present	present	sandstone	?	in fill?	ceramic, lithic
	5	present	?	present	sandstone	?	in fill?	none
	6a	rind	present	present	sandstone	?	in fill	none
	6b	?	present	present	sandstone	?	in fill	ceramic
	7	rind	absent	present	sandstone	?	in fill	none
LA61888	1	rind	present	present	sandstone	?	on bottom	ceramic
42A10275	5	rind	?	absent	-	-	sandstone slabs in fill	none
5MT9431	1	?	present	present	sandstone	?	in fill & on bottom	ceramic
	3	rind	present	present	sandstone	?	in fill & on bottom	ceramic
Las Campanas Sites								
LA 86150	1	absent?	present	present	quartzite	intact & cracked	in fill	ceramic
LA 84793	1	rind	present	present	quartzite	intact & cracked	in fill & on bottom	ceramic/ lithic/bone
LA 86159	1	rind	present	present	quartzite & igneous	intact & cracked	in fill & on bottom	ceramic/ lithic

Table 13.3. Trench and Pit Kiln Ceramic Assemblages

Site No.	Feature or Kiln No.	No. of Vessels Identified	No. of Whole or Reconstructible Vessels	Vessel Form	Amount of Sherds
San Juan Trench Kilns					
42SA2160	1	6	6 partial	6 bowls	432
5MT6965	1	17	11 partial	10 bowls; 6 dipper handles; 1 unknown	-
5MT7143	1	35	35 partial	32 bowls; 2 jars; 1 dipper	1059
5MT7525	1	7	5 partial	5 bowls; 2 dipper handles	-
	2	5	none	5+ bowls; ? dipper handles	0.95 kg bowls; 0.45 kg dippers
	3	46?	2 whole; 22 partial	22-23 bowls; 2 whole mugs; 1 jar; 1 dipper; 1 gray ware jar	21 rim sherds; 4.25 kg
	4	20	4 partial	8 bowls; 5 dippers; 7 jars	20
	5	5	5 partial	2 bowls; 3 gray ware jars	153+?
5MT7424 (F)	1	-	-	1 spalled handle fragment	1
5MT8451	1	1	1 partial	1 Moccasin Gray	64; Note: 107 sherd spalls recovered from ash stain adjacent to Feature 1
LA61848	1	3	1 total; 1 partial	1 jar; 2 pinch pots	60
	5	-	-	-	-
	6a	-	-	-	-
	6b	-	-	-	1 clay bead
	7	-	-	-	-
LA61888	1	23	3 whole; 10 partial	9 bowls; 4 pinch pots	1067
42SA10275	5	-	-	-	2 sherds recovered from Feature 6
5MT9431	1	8	1 whole (miniature); 7 partial	6 bowls; 1 jar; 1 miniature jar	293
	3	18+	1 whole; 15 partial	14 bowls; 2 dippers; unknown no. of jars	143
Las Campanas Sites					
LA 86150	1	1	0	1 bowl	36 in feature
LA 84793	1	1	1 in feature.	1 bowl	89 in feature, 179 adjacent
LA 86159	1	7	1 reconstructible, 3 partial in feature.	7 bowls	69 in feature, 528 adjacent including 2 jar sherds

wider variety of heat-altered ceramics that were oxidized, bloated, or vitrified (Purcell 1993).

The analysis of pottery recovered from the pit kilns revealed pigment appearance and breakage patterns may be important criteria for identifying kilns. Pigment appearance refers to the hue and bond quality of the paint to the clay body. Thick, thin-streaky, and ghosted describe well to poorly bonded pigment, respectively. The majority of pottery recovered from pit kilns exhibited thin-streaky to ghosted pigment. Poorly bonded organic pigment appears to be associated with pottery-firing failures or over-fired sherds.

The surface condition of pottery recovered from the pit kilns revealed atypical breakage patterns. Sherd spalls and spalled sherds are 17 to 81 percent of the total sherds assigned to each vessel. In the analysis, a sherd with one intact surface was defined as a spall (Fig. 13.1a, LA 84793; Fig. 13.1b, LA 86159; Fig. 13.1c, LA 86150). A sherd with two intact surfaces that exhibited negative spall scars was identified as a spalled sherd (Fig. 13.2a, LA 84793; Fig. 13.2b, LA 86159). One distinctive breakage pattern identified was bilaterally opposed spalling. Bilaterally opposed spalling is recognized by negative spall scars that originate on opposite surfaces and edges of a sherd (Fig. 13.3a, LA 84793; Fig. 13.3b, LA 86159). Spalling may result from rapid heat rise or from vaporization of moisture in a vessel wall (Blinman 1992; Post and Lakatos 1994; Shepard 1968).

Replication studies have yielded breakage patterns that can be compared to the prehistoric example. These studies, which used nonlocal and local Santa Fe area raw materials. The trench kiln firing method has produced breakage patterns that are remarkably similar to the archaeological pattern (Lakatos n.d.). Figure 13.4a and 13.4b show sherd spalls from the nonlocal and local raw material firing failure. Figure 13.5a and 13.5b show spalled sherds from the nonlocal raw material firing failure. Bilaterally opposed spalls have resulted from nonlocal raw material firing failure. Similarity between the replicated and prehistoric breaks is strong support for identifying the Las Campanas features as pottery-firing facilities.

A discard area was located southwest of the LA 86159 pit kiln. It had an irregular shape, covered 10 sq m, and consisted of a 5- to 7-cm-thick charcoal—stained sandy loam that contained sherds and spalls. The mix of sherds and stained soil may reflect discard from cleaning before reuse of the feature. The spalled sherds remain from partial firing failures. Discard areas were reported for three trench kilns, two of which had associated burned sherds (Purcell 1993).

Summary

Clearly, there are numerous similarities between the Northern Rio Grande pit kilns and the Northern San Juan trench kilns. Morphologically, they are shallow relative to length and width, and they have moderately steep-angled sides. The stratigraphic sequence is very similar; only the smothering layer has been difficult to delineate for the pit kiln profiles. Bowls were the most abundant vessel form remaining at the kilns. Both kiln types were used to produce carbon-painted black-on-white pottery. Heat-altered ceramics such as sherd spalls and spalled sherds were recovered from both types of pottery-firing features. Partial or whole reconstructible vessels were associated with the kilns and discard areas. Stratigraphy, and by inference, firing sequence, kiln wall angle, and shallow depth, may be linked to the successful production of carbon-painted black-on-white pottery. The few differences between pit and trench kilns (topographic setting, size and outline, and geologic material used in their construction) are local variants that may be inconsequential to the successful production of carbon-painted black-on-white pottery.

Thermal Feature and Pit Kiln Description and Comparison

The comparison between Las Campanas pottery-firing features and other thermal features will include Archaic and Pueblo period features and focus on feature morphology and construction, internal structure including cobble placement, stratigraphy, and thermal alterations, and associated artifacts. Thermal features for this comparison were selected based on similar size to pit kilns or the presence of fire cracked rock (FCR). Using these criteria, six sites with a total of 24 features were selected for the comparison.

Las Campanas thermal features and pit kilns display similar construction methods, though the morphology among these features varies (Table 13.4). Archaic and Puebloan thermal features were excavated into native sandy loam, which

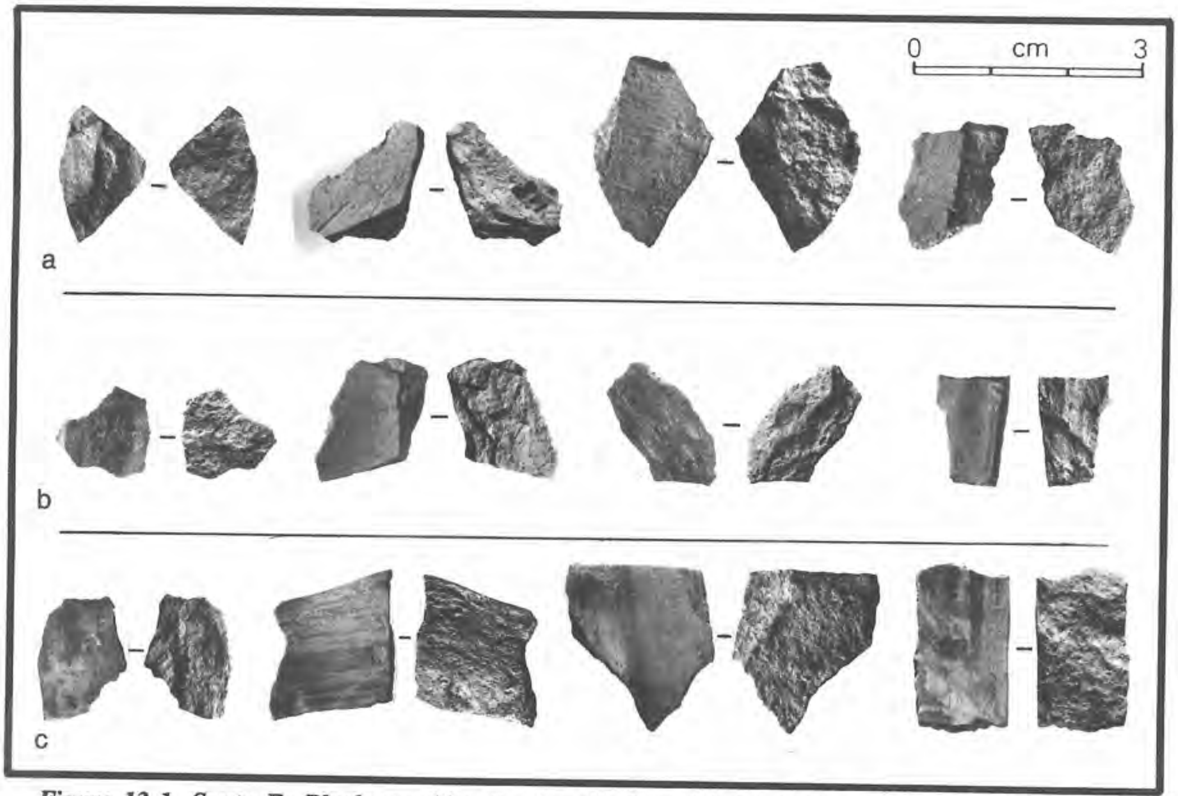

Figure 13.1. Santa Fe Black-on-white sherd spalls from (a) LA 84793, (b) LA 86159, and (c) LA 86150.

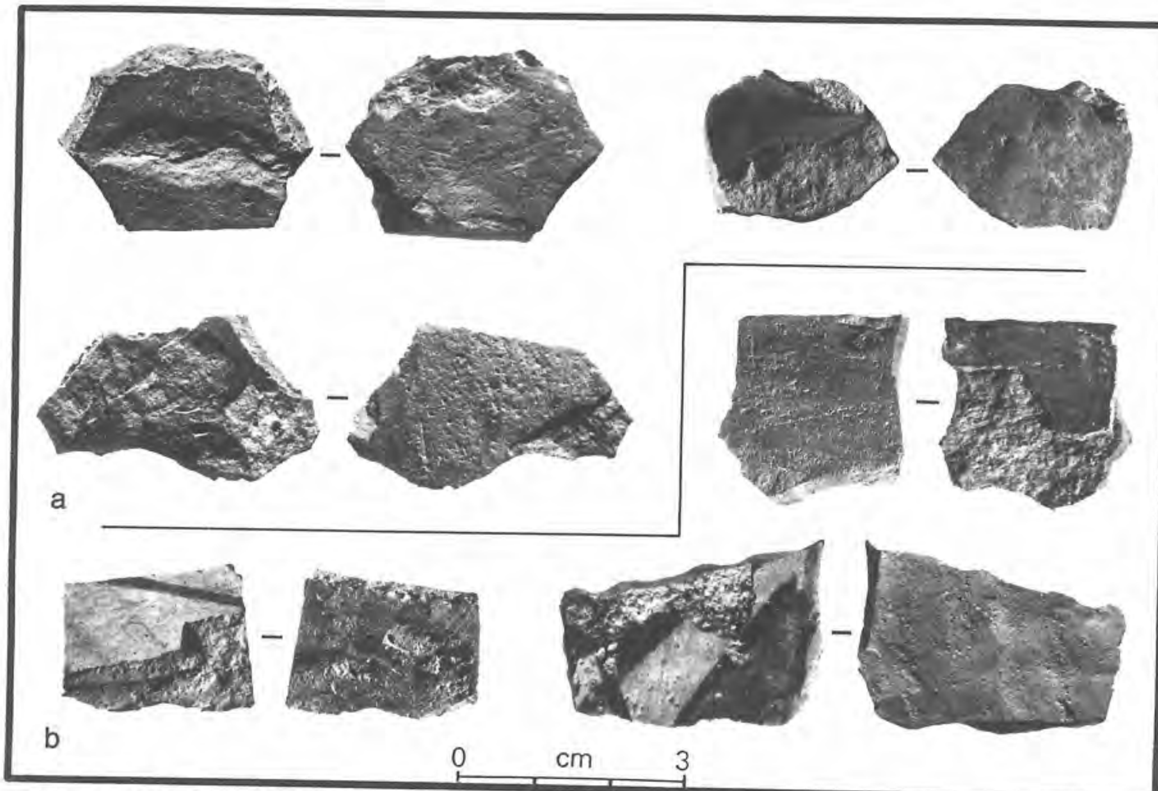

Figure 13.2. Santa Fe Black-on-white spalled sherds from (a) LA 84793, and (b) LA 86159.

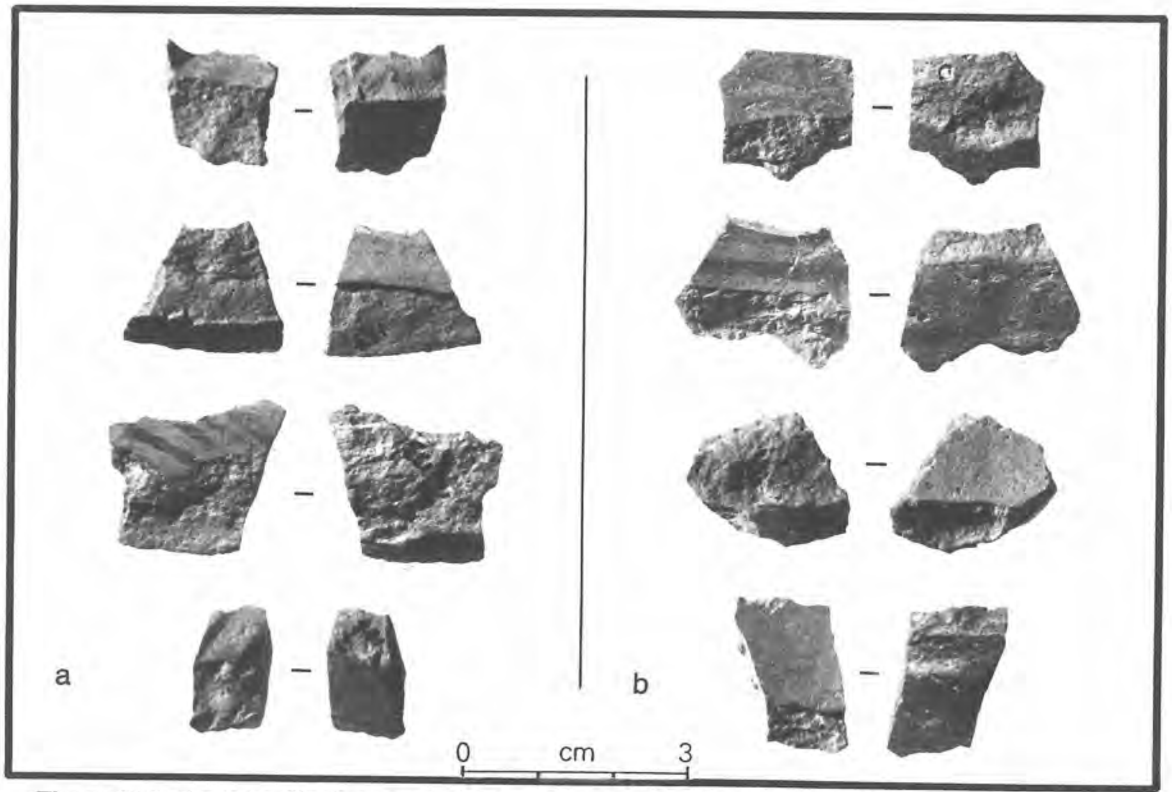

Figure 13.3. Santa Fe Black-on-white bilaterally opposed spalls from (a) LA 84793, and (b) LA 86159.

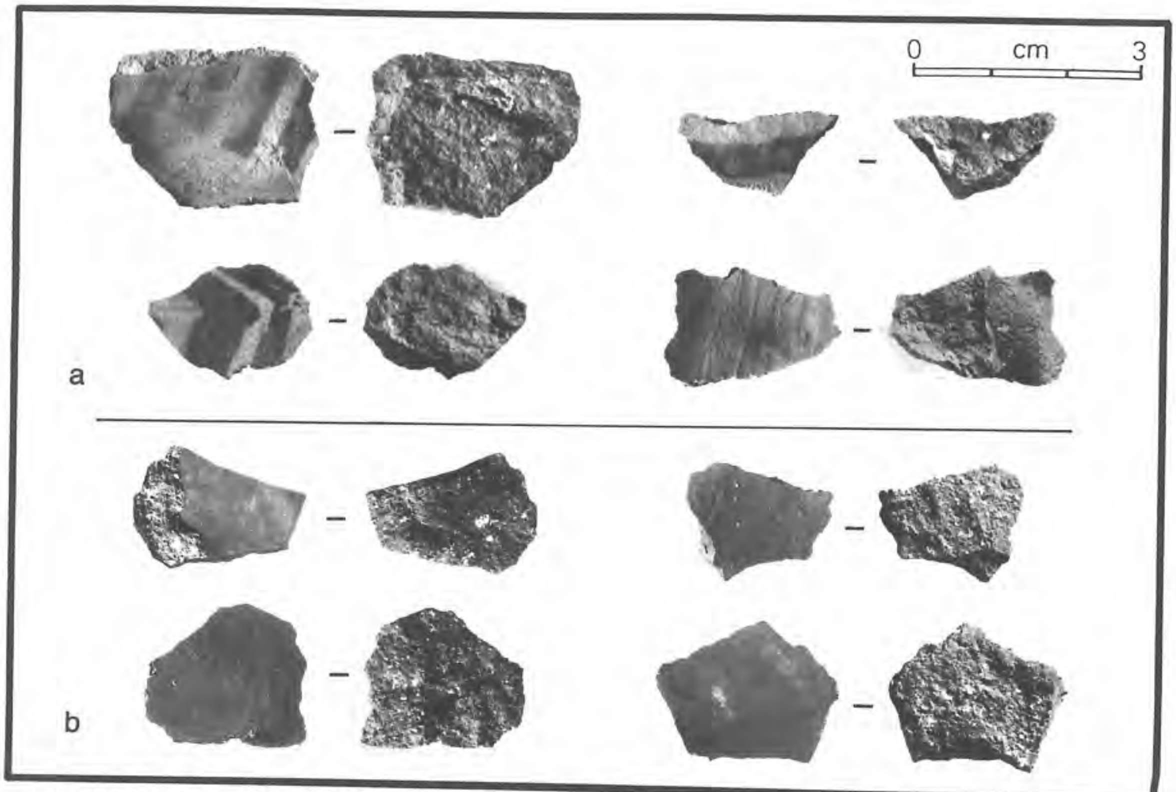

Figure 13.4. Examples of (a) local and (b) nonlocal clay source spalls from replication experiments.

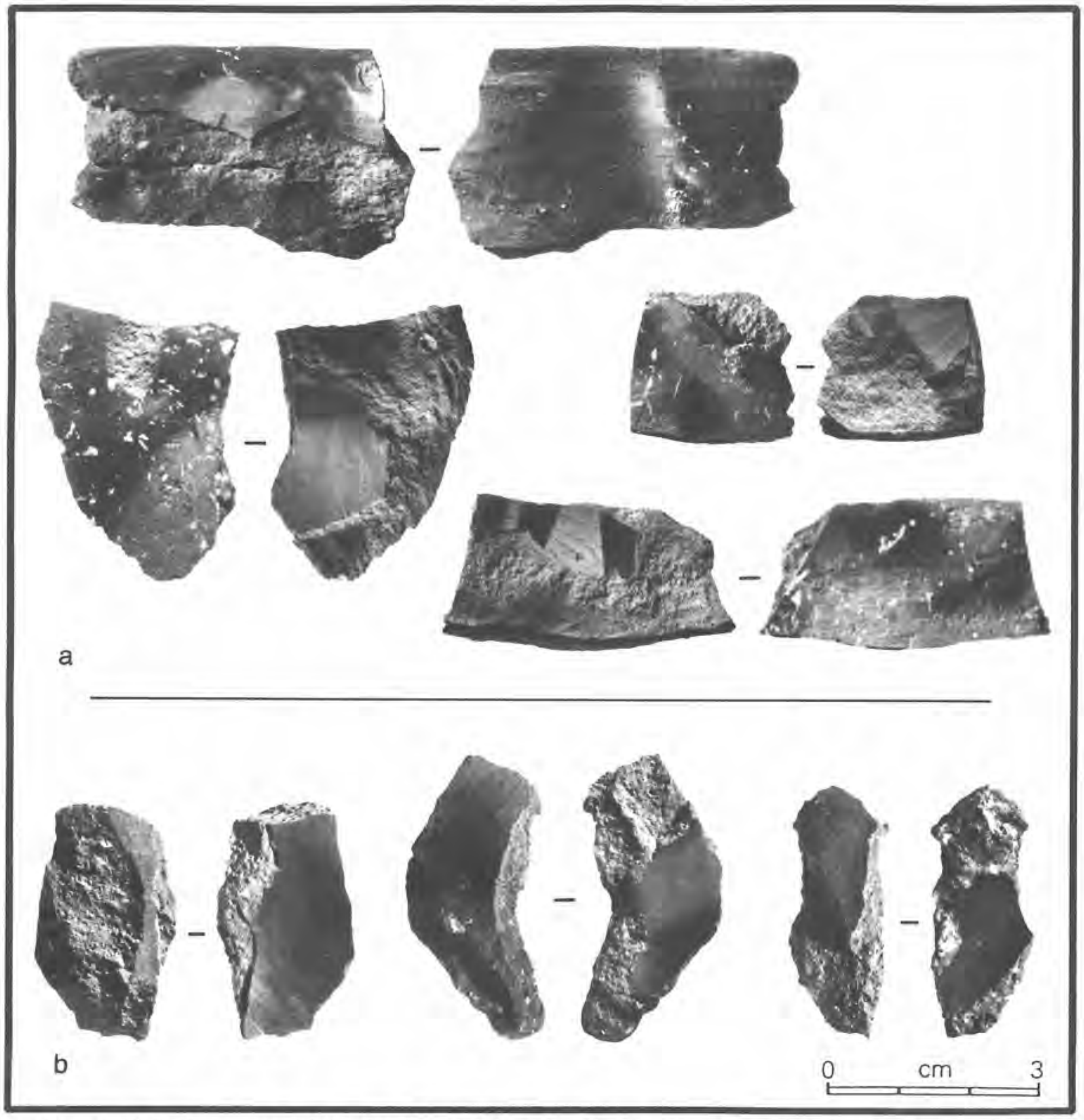

Figure 13.5. Examples of (a) local and (b) nonlocal clay source spalled sherds from replication experiments.

may be impregnated with calcium carbonate. No formalized preparation of the sides or bottoms was apparent in any of these features. Archaic period thermal features are typically circular or oval in shape and range in size from 0.50 to 1.95 m long by 0.35 to 1.45 m wide by 0.10 to 0.38 m deep. The sides range from gently sloping to vertical and the bottoms are typically concave.

Puebloan period thermal features display a variety of shapes including oval, circular, roughly circular, subrectangular, bifurcated, and D-shaped. They range in size from 0.56 to 2.05 m long by 0.55 to 1.57 m wide. Depth of these features ranged from 0.10 to 0.40 m while others were completely deflated. Commonly, these display sloping sides and flat to concave bottoms.

Pit kilns are shallow, oval-shaped basins excavated into native calcium carbonate impregnated sandy loam. No formalized treatment of the sides or bottoms is apparent. Pit kilns range in size from 1.30 m to 1.71 m long by 1.06 m to 1.20 m wide to 0.10 m to 0.26 m deep. These features tend to have steep sloping sides and flat to slightly concave bottoms.

The Archaic period features are similar in shape to the pit kilns, but they display variability in size beyond the pit kiln range. The Pueblo period features also display variability in both size and shape. The range of shapes and sizes of the Archaic and Pueblo thermal features may reflect a wide variety of functions. Pit kilns are consistent in shape and size, which reflects a specialized function.

The interior characteristics of the Las Campanas thermal features and pit kilns vary between feature types (Table 13.5). Archaic thermal features often contain fire-cracked and blackened quartzite cobbles. When cobbles are present, they range in number from 2 to over 60, and typically line or define the feature limits. This is especially apparent in deflated settings.

Puebloan thermal features typically contain many fire-cracked and blackened quartzite cobbles. The number of cobbles range from 25 to over 70. These cobbles generally line the exterior and interior of the feature. Pit kilns contain between 20 and 40 fire-cracked and blackened quartzite cobbles, which tend to be located towards the center of the feature.

Intact stratigraphy of the Archaic and Puebloan thermal features usually consists of no more than two, gray to dark gray charcoal-stained layers, which may contain ceramics or lithics. These layers tend to be well mixed and grade into one another. Mottling of these layers with the native soil is apparent at the bottom and sides of these features. Cobbles in the Archaic features tend to be on feature floors. Cobbles in the Puebloan features are positioned in the fill and on the bottom and edges of the feature.

Pit kilns typically display three distinct stratigraphic layers. The stratigraphy consists of a layer of dark, homogeneous, charcoal-stained primary fill. The fire-cracked and blackened cobbles are suspended at the top of this layer with few cobbles in contact with the feature bottoms or sides. Located above and around the cobbles is a mixed deposit of charcoal-stained, sandy loam with unburned pebbles and Santa Fe Black-on-white pottery. Above this mixed deposit is a layer of clean, sandy soil. These deposits are contained within a well-baked feature lining or "rind." This oxidized rind is apparent on the bottom, sides, and edges of these features and appears to be produced by prolonged exposure to high radiant heat.

Many of the Archaic and Puebloan thermal features were in deflated natural settings, contributing to the mixing of internal feature attributes such as stratigraphy. One significant factor that may influence the rate of deflation and mixing of soil layers in nonkiln features is the lack of a well-baked feature lining. The well-baked walls of the pit kilns appear to impede erosion, partially contributing to their preservation.

Artifacts recovered from Archaic thermal features typically consist of chipped stone and ground stone. Chipped stone and ground stone recovered from these features are usually blackened or burned. Chipped stone tends to be located near the bottom of the feature while ground stone, if present, lines the edges of the feature.

Artifacts recovered from Puebloan period thermal features consist of ceramics, chipped stone, and ground stone. Low numbers of ceramics or chipped stone are recovered from feature fill with no apparent stratigraphic pattern observed. Typically, these artifacts lack evidence of thermal exposure, such as blackening or spalling. The majority of artifacts, including ground stone, are recovered from the excavation area surrounding these features.

Artifacts associated with pit kilns include ceramics, chipped stone, and bone. Unlike other Puebloan thermal features, pit kilns tend to have a larger number of ceramics with a higher percentage of the assemblage recovered from the feature fill above the cobbles. The Santa Fe Black-on-white pottery associated with pit kilns typically display evidence of thermal exposure, such as blackening and spalling.

Pottery was recovered in association with pit kilns and thermal features from Pueblo period sites. Analysis of the associated pottery identified pigment appearance and surface condition as two surface attributes that exhibit important differences between feature types.

Pigment appearance of pottery from the kiln and non-kiln sites exhibits different distributions (Table 13.6). Thin-streaky and ghosted pigment was recorded on 61 to 65 percent of the pottery recovered from pit kiln sites. This is in marked contrast to nonkiln sites, where thin-streaky and ghosted pigment was recorded on only 22 to 35 percent of the pottery. Visible pigment on the majority of pottery recovered from LA 86150, Subarea 1, displayed a thick, well-bonded pigment, however, pigment appearance was obscured on 19 of the 36 sherds. Thin-streaky and ghosted pigment appears to be associated with pottery-firing failures or over-fired sherds.

To test for a significant difference in distribution of pigment appearance, a chi-square test of homogeneity was conducted. The null hypothesis was that the assemblages displayed no significant difference in pigment quality. The 4-by-5 contin-

Table 13.4. Pit Kiln and Thermal Feature Morphology, Las Campanas Sites

Site No.	Feature or Kiln No.	Plan View Shape	Profile Bottom	Profile Sides	Dimensions (in m) Length	Width	Depth
LA 84784	1	oval	flat	sloping	1.50	0.90	0.09
	2*	oval	slightly concave	sloping	1.50	0.80	0.15
LA 86130	1	roughly circular	concave	sloping	1.10	1.00	0.15
	3*	amorphous	concave	sloping	0.70	0.40	0.20
	4*	oval	concave	sloping	1.05	0.90	0.07
LA 86150	1	roughly circular	slightly concave	sloping	1.30	1.20	0.14
	2	circular	concave	sloping	1.60	1.57	0.20
	3	"D" shaped	flat	sloping	0.56	0.38	0.06
	4a	oval	flat	steep sloping	1.75	1.50	0.40
	4b	subrectangular	irregular	steep sloping	1.62	1.50	0.15
	5	roughly circular	deflated	-	0.75	0.65	-
	6	roughly circular	deflated	-	0.62	0.55	-
	7	oval	deflated	-	1.20	0.90	-
	8	oval	irregular	steep sloping	2.05	1.25	0.17
	9	bifurcated	concave	sloping	1.10	0.74	0.25
LA 84793	1	oval	flat	steep sloping	1.55	1.06	0.18
LA 86159	1	ovoid	flat	steep sloping	1.71	1.10	0.26
	2*	oval	flat	gently sloping	1.47	1.22	0.10
	3*	oval	concave	steep sloping	0.55	0.35	0.23
LA 84787	1*	circular	concave	sloping	0.46	0.45	0.15
	2*	circular	concave	sloping	0.54	0.45	0.17
	3*	oval	concave	sloping	1.25	0.70	0.25
	4a*	oval	concave	gently sloping	1.30	0.74	0.38
	4b*	circular	concave	vertical	0.50	0.40	0.30
LA 98690	1	oval	flat	sloping	1.60	1.10	0.25
	2	oval	slightly concave	sloping	1.60	1.05	0.20
	3*	oval	deflated	-	1.95	1.45	0.10

* Archaic period features

Table 13.5. Pit Kiln and Thermal Feature Interior Characteristics, Las Campanas Sites

Site No.	Feature/ Kiln No.	Oxidation	Blackening	FCR	Material Type	Condition	Stratigraphic Placement	Ash	Charcoal	Artifacts
LA 84784	1	absent	preset	present	quartzite; granite	cracked	in fill & on bottom	present	absent?	lithic
	2*	absent	absent	present	quartzite; granite	cracked	in fill	present	-	-
LA 86130	1	absent?	absent	present	quartzite	intact & cracked	in fill	absent	present	ceramic; lithic
	3*	absent	absent	present?	?	?	?	absent	absent	-
	4*	absent	absent	present	quartzite?	intact & cracked	on bottom	absent	absent	lithic
LA 86150	1	absent?	present	present	quartzite	intact & cracked	in fill	absent	present	ceramic
	2	absent	present?	present	?	cracked	in fill	absent	present	-
	3	absent	present?	absent	-	-	-	absent	present?	-
	4a	present	present	present	quartzite?	cracked	in fill & on bottom	absent	present	-
	4b	absent?	present	present	?	cracked	in fill & on bottom	absent	present	-
	5	absent	present	present	quartzite	cracked	deflated	absent	present	-
	6	absent	present	present	?	cracked	deflated	present	absent	-
	7	absent	absent	present	?	intact & cracked	deflated	absent	absent	
	8	absent	present	present	quartzite?	intact	in fill	absent	absent	ceramic
	9	absent	absent	present	quartzite?	cracked	deflated	absent	absent	-
LA 84793	1	rind	present	present	quartzite	intact & cracked	in fill	present?	present	ceramic/ lithic/ bone
LA 86159	1	rind	present	present	quartzite igneous	intact & cracked	in fill	absent	present	ceramic/ lithic
	2*	absent	present	absent	-	-	-	absent	present	-
	3*	absent	absent	absent	-	-	-	absent	present	-
LA 84787	1*	absent	absent	present	quartzite	cracked	on bottom	present?	absent	-
	2*	absent	present?	absent	-	-	-	absent	absent	lithic
	3*	absent	present	absent	-	-	-	absent	present	lithic
	4a/b*	absent	present	absent	-	-	-	absent	present	lithic/ ground stone
LA 98690	1	absent	present	present	quartzite	intact & cracked	on bottom & in fill	absent	present	ceramic
	2	absent	present	present	quartzite	intact & cracked	on bottom & in fill	absent	present	ceramic
	3*	absent	absent	present	quartzite	intact & cracked	deflated	present	absent	-

* Archaic period features

Table 13.6. Pigment Appearance, Pit Kiln and Nonkiln Site Assemblages

Count Row Expected Adjusted Residual	Absent	Thick	Thin-Streaky	Ghosted	Total
LA 84793	47 23.9 39 1.23	30 15.2 45 -2.27	57 28.9 35 3.6	63 32.0 77 -1.59	197
LA 86159	68 16.9 80 -1.36	71 17.6 92 -2.23	60 14.8 72 -1.46	203 50.4 157 3.67	402
LA 86150 Area 1	18 52.9 7 4.31	13 38.2 8 1.85	1 2.9 6 -2.07	2 5.9 13 -3.10	34
LA 86150 Area 4	9 22.5 8 .36	22 55.0 9 4.22	5 12.5 7 -.82	4 10.0 16 -2.94	40
LA 98690 Area 1	2 4.1 10 -2.48	30 61.2 11 5.58	7 14.3 9 -.61	10 20.4 19 -2.08	49
Total	144	166	130	282	722 100.0

Note: Pigment appearance was not recorded on pottery spalls.

gency table had 12 degrees of freedom and a critical value of 26.217 at the .01 significance level. The computed chi-square value was 149.8883, which rejects the null hypothesis. Statistically significant differences do exist, as illustrated by the adjusted residuals. LA 86159 and LA 84793 show significantly greater than expected thin and streaky or ghosted pigment and lower than expected thick pigment. The nonkiln sites show the opposite pattern, with less than expected thin-streaky or ghosted pigment and more than expected thick pigment. This test suggests that pigment on sherds from kiln sites may have been over-fired or oxidized during firing, while sherds used in association with other thermal features tend to display pigment quality that results from successful firing.

The surface condition of pottery recovered from kiln sites and nonkiln sites exhibits different patterns as well (Table 13.7). Spalled sherds and sherd spalls are 40 to 74 percent of the pottery recovered from kiln sites LA 84793, LA 86159, and LA 86150, Subarea 1. The variation in the percentages of spalled pottery among these sites may be attributed to the severity of the failure, number of vessels present, or post-abandonment breakage and dispersal agents. Pottery recovered from nonkiln sites, LA 86150, Subarea 4, and LA 98690, Area 1, typically are intact--spalling was observed on a maximum of 2.5 percent of the pottery. Spalling appears to be an important criterion for identifying kilns (Blinman 1992; Post and Lakatos 1994, 1995; Toll et al. 1991).

Summary

There are broad similarities in feature morphology, stratigraphy, and artifact types among Archaic and Puebloan thermal features and pit kilns. These features are generally shallow basins excavated into the native sandy loam, which may be impregnated with calcium carbonate. No apparent preparation of the sides or bottom of

Table 13.7. Surface Condition of Pottery from Pit Kilns and Other Thermal Features

Site	Absent	Spalled	Spall	Sooted	Total
LA 84793	60 24.5	134 54.7	48 19.6	3 1.2	245
LA 86159	212 35.8	231 39.0	122 20.6	27 4.6	592
LA 86150 Area 1	12 22.6	15 28.3	6 11.3	20 37.7	53
LA 86150 Area 4	39 97.5	1 2.5			40
LA 98690 Area 1	43 100.0				43
Total	366	381	176	50	973 100.0

these features was apparent. Sides range from gently sloping to vertical, and the bottoms range from flat to concave. Thermal features came in a variety of shapes including oval, circular, roughly circular, subrectangular, bifurcated, and D-shaped. Fire-cracked and blackened quartzite cobbles are common in all features, and the stratigraphy typically consisted of two to three gray to dark gray charcoal-stained layers, which may contain ceramics or lithics.

Despite these similarities, pit kilns can be distinguished from Archaic and other Puebloan thermal features by a combination of certain morphological and stratigraphic characteristics as well as the condition of associated ceramics. Pit kilns are consistent in size and shape and have a distinctive stratigraphic sequence contained in a well-baked lining or rind. Pottery associated with kiln sites typically display heat-altered characteristics, such as ghosted pigment, spalling, and blackening.

Conclusions

The comparison between Northern Rio Grande pit kilns and Northern San Juan trench kilns has illustrated parallel technological approaches for the production of carbon-painted pottery in these two regions of the Anasazi culture area. Differences between Las Campanas pit kilns and other Las Campanas Archaic and Pueblo period thermal features are apparent; heavily baked and stained feature interiors and the condition of pottery are strong indicators of pottery firing.

The identification of pit kilns is significant in many ways to archaeological investigations in the Northern Rio Grande region. They demonstrate an enduring tradition of carbon-painted pottery production outside the Northern San Juan region and provide criteria for recognizing pottery-firing features during inventory and excavation. Study of kilns through replication and field identification continue. Unresolved challenges to the interpretation of the pit kilns include the great distance to the Santa Fe River villages and identification of suitable raw materials for Santa Fe Black-on-white production.

CHAPTER 14
LAS CAMPANAS ARCHAEOLOGICAL PROJECT SYNTHESIS: 5,000 YEARS OF OCCUPATION OF THE PIÑON-JUNIPER PIEDMONT NORTH OF THE SANTA FE RIVER

The Las Campanas Archaeological Project is a long-term investigation that began with the inventory of 4,700 acres and identification of 255 archaeological sites in the dissected hills, ridges, and drainage systems north of the Santa Fe River. An archaeological project of this magnitude had never been previously completed for this area. Numerous inventories of smaller project areas (Tierra Contenta [Hannaford 1986]; Santa Fe Community Development Plan [Wiseman 1978]; Northwest Santa Fe Relief Route [Maxwell 1988]) yielded between 12 and 60 sites that hinted at the potential for high site densities, but the magnitude of the Las Campanas findings could not have been predicted.

The five-year excavation project completed by Southwest Archaeological Consultants, Inc. (SAC) and the Office of Archaeological Studies (OAS) investigated 100 sites spanning 5,000 years of human occupation, including the earliest prehistoric and historic residential occupations of the area. Early investigations focused on defining and interpreting the suspected variability in artifact and feature distributions in a large samples of sites (n = 75) with limited excavation data. OAS investigations targeted a smaller number of sites with specific feature or artifact patterns and addressed chronology and function through more intensive excavation strategies.

This report has provided a detailed description and interpretation of the OAS excavation and analysis of Las Campanas site data without providing synthetic frameworks within which the data and research questions can be interpreted. The individual site reports addressed research questions of chronology, site function, subsistence production, occupation history, and land use and tenure. A descriptive and comparative study of pottery kilns and thermal features addressed different thermal feature morphology and function through time and across different site types. Pottery, chipped stone, and ethnohistory have been synthesized and analyzed in terms of chronology, function, technology, culture history, and land use. Specialist reports on paleobotanical and faunal remains provide a perspective on subsistence and problems with preservation of perishable remains in open-air settings. Petrographic analysis of pottery provided baseline data on productive and technological strategies of the Coalition and Classic periods.

This section uses the site-level data and the conclusions drawn from the various material culture synthetic sections to summarize and interpret research issues at the scales of OAS project, Las Campanas investigations, and Santa Fe River Valley. The discussion focuses on chronology, occupation history, site formation, site function, and land-use patterns. The synthesis is organized by broad periods of Archaic, Pueblo, and Historic. Synthetic data presented elsewhere in the report will only be referenced. New data will be presented as needed.

An important information source for many of the analyses is the All Sites Data Base (Appendix IV). This data base consists of 256 prehistoric and early historic sites and components recorded and investigated by SAC and OAS. The data were compiled from the survey reports, preliminary excavation, and testing reports, and from data generously supplied by SAC. The variables include size, location, artifact counts by artifact class (sherds, chipped stone, tools, ground stone), occupation period, and total artifact counts. Because these data were compiled from numerous sources from different stages of investigation, they are not the most current, but they are representative of the overall results. Final SAC component data were not available at the time the file was compiled, multicomponent sites from the same period have been lumped into the main periods: Archaic, Pueblo, and Unknown. This data base lacks observations concerning number of occupation episodes and actual artifact distributions from the SAC investigations. Therefore, assumptions are made about artifact associations based on incomplete data, but they are the best approximation. For site or component dating, an assumption is made that if one or two sherds or diagnostic artifacts are part of a larger, more scattered nondiagnostic artifact scatter, then the scatter is contemporaneous with the diagnostic artifacts. The potential for overlapping noncontemporaneous distributions and the possibility of artifact curation is recognized. Most of the dating error is toward the Pueblo period, which may inflate that pattern at the expense of the Archaic period or early Historic period. This is not viewed as a major problem because the most intensive occupation of the Santa Fe River was between the A.D. 1100 and 1400 period, and the majority of the chipped stone debris probably was left on the landscape during this period. Even with these limitations, the All Sites Data Base is considered one of the most powerful representations of small site patterning for the Northern Rio Grande.

Chronology

The Las Campanas chronology study focused on refining the survey-assigned occupation dates. The inventory-based dates were derived from presence and frequency of temporally diagnostic pottery, chipped stone, and Euroamerican manufactured artifacts. Archaic period projectile point styles from the Cochise and Oshara traditions are poorly dated in the Northern Rio Grande, so absolute dates were necessary to develop a more regionally sensitive temporal framework. Prehispanic era Pueblo pottery has been well-dated through dendrochronological studies and cross-seriation of temporally sensitive types. Systematically collected assemblages were needed for comparison with well-dated assemblages to place sites within the established temporal frameworks. Historic period Euroamerican artifacts were not recovered during OAS studies so their utility for dating the Las Campanas homestead and soil and water control sites could not be tested.

Archaic Period

Until recently, Archaic period occupation of the Santa Fe River Valley had been minimally defined and poorly dated. This situation is compounded by the equally poor chronological data from the surrounding Galisteo Basin, Cochiti area, and Tesuque River Valley. Before 1980 the only excavation of Archaic period sites occurred in the Cochiti area, and those excavations yielded few absolute dates and recovered few temporally diagnostic artifacts (Biella and Chapman 1979). Study of Archaic period settlement, subsistence patterns, and occupation sequences were primarily derived from survey data. Survey data provide a first approximation of the site distribution and content, but as the Las Campanas excavations demonstrated, surface artifact scatters may be just the tip of the iceberg.

Earliest Archaic period occupation of the Las Campanas area was represented by the base of a basalt Bajada-style dart point. The Bajada phase dates 4800 to 3300 B.C. (Irwin-Williams 1973). A Bajada phase site has never been identified in the Santa Fe River area, but a few have been reported in the Galisteo Basin (Lang 1977). Ephemeral use of the Santa Fe area by Bajada phase populations is suggested by two obsidian hydration dates from the Dos Griegos excavations along the Cañada de los Alamos south of Santa Fe (Lang 1992). These dates of 5019 and 3367 B.C. were from two sites with mixed components. Even if the artifacts were not deposited as a result of a curated or recycling strategy, the small amount of associated Bajada phase material and a lack of features suggests a brief occupation. The Bajada phase type site is located along the La Bajada escarpment near the mouth of the Santa Fe River and consists of two spatially extensive artifact scatters (New Mexico Cultural Resource Information System [NMCRIS]). These artifact scatters may have been base camps. Artifact patterning for Bajada phase sites suggests a logistically organized settlement pattern with hunting and gathering territories covering 10,000 sq km. A lack of available surface water may have made the Las Campanas area unsuitable for habitation before 3000 B.C., so that archaeological evidence of Bajada phase or earlier occupations would be from brief, low intensity occupations.

No evidence of San Jose phase (3300 to 1800 B.C.) use of the Las Campanas area was identified by the OAS and SAC inventories or during excavation. San Jose period sites are poorly represented in the Santa Fe area. Only two sites south of Santa Fe along Cañada de los Alamos (Lang 1992) and in the Apache Canyon area have yielded San Jose-style artifacts (Post 1995). Both artifacts are associated with low frequency artifact scatters, suggesting brief occupations. San Jose materials were found on two sites in the San Cristobal area of the Galisteo Basin (Lang 1977). These were small surface artifact scatters located along a canyon. These sites are located in prime hunting areas, suggesting that San Jose populations used the more heavily wooded and well-watered areas with less use of piñon-juniper piedmont areas such as Las Campanas.

As is evident throughout much of the Santa Fe area and the Northern Rio Grande, the first significant increase in site frequency and distribution occurred during the Armijo phase (1800 to 800 B.C.). Armijo phase materials were recovered from LA 86139 and LA 84787 from the OAS excavations. Surface artifacts suggested these sites were Armijo phase manifestations. However, excavation failed to yield sufficient charcoal for reliable radiocarbon dates. Obsidian was recovered from shallow contexts at LA 86139 and deeper mixed strata at LA 84787 that could not be confidently assigned to a particular occupation component. The projectile points from LA 84787 included two Armijo, one Augustin, and one San Pedro style. San Pedro and Augustin style points are commonly associated with the late Chiricahua and San Pedro stages of the Cochise Culture (Sayles 1983; Dick 1965). Radiocarbon dates from contexts associated with San Pedro and Chiricahua stage points suggest considerable overlap, with a potential date range of 3300 to 300 B.C. for some Chiricahua styles (Wills 1988). Augustin-style points are more consistently associated with pre-800 B.C. contexts, suggesting that one component of the LA 84787 occupation occurred during the late Armijo or early En Medio phase (1100 to 600 B.C.). The two Armijo-style points from Levels 5 and 7 of LA 84787, Area 2, support the proposition of a pre-800 B.C. occupation date. For LA 86139 the current Armijo phase date range, 1800 to 800 B.C., can only be suggested.

The presence of Armijo phase sites in the Las Campanas area reflects a wider use of the piedmont and woodland environments throughout the Santa Fe area. This trend is strongly supported by the excavation of three sites on the gentle, dissected slopes south of the Santa Fe River near the Santa Fe Airport. These Armijo phase base camps (LA 54749, LA 54751, and LA 61282) had the remains of shallow pit structures with interior hearths and extensive extramural activity areas, suggesting residential occupation. Radiocarbon dates from the pit structures and associated features range from 1870 to 830 B.C., with center dates suggesting occupations from the tenth through fourteenth centuries B.C., the sixteenth century B.C., and eighteenth century B.C. These dates have implications for settlement patterns that will be discussed later.

The period from 800 B.C. to A.D. 400 shows the greatest increase in occupation and use of Las Campanas and the surrounding areas. En Medio-Basketmaker II-style corner-notched points have been reported from nearly all environmental zones and sites. En Medio-Basketmaker II style corner-notched points are the best evidence of longer occupation and evidence for reoccupation. From Las Campanas, En Medio-Basketmaker II period sites included LA 86148, LA 84787, LA 84775, LA 84758 and isolated projectile points recovered from LA 86150 and LA 86134. Excavation of these sites did not yield sufficient charcoal for radiocarbon dating or suitable obsidian for obsidian hydration. LA 86148 had two typical En Medio-style points with long triangular blades and moderately deep corner notches, suggesting an 800 B.C. to A.D. 1 occupation. LA 86150 had an isolated San Pedro-style point with an elongated, narrow, triangular blade, and shallow corner notches. This San Pedro-style point is associated with a 1500 B.C. to A.D. 1 date range. It is similar to the San Pedro-style point collected from the surface of LA 84787, Area 2, during the testing phase. LA 84787, Area 3, had a single shallow corner-notched style, reminiscent of a San Pedro-like point. The narrow base and the short triangular blade may be late attributes as suggested by Thoms's assignment of the Lumbre Narrow Base-style to the A.D. 300 to 850 period. LA 86134 had a single triangular blade, side-notched projectile point that is typical of the latter part of the En Medio-Basketmaker II period (100 B.C. to A.D. 400). This isolated projectile point reflects more extensive use of the piedmont during the latter portion of the En Medio-Basketmaker II period.

LA 84758 and LA 84775, Area 1, may represent the latest manifestations of the En Medio-Basketmaker II period. These components yielded projectile point styles similar to the Lumbre Narrow Base and Chimayo-Shouldered styles defined by Thoms (1977:150). Thoms assigns an A.D. 300 to 1200 date range to these styles with an overlap between A.D. 500 and 850. This weak evidence suggests that these sites are part of an extended Archaic adaptation that may have continued into the early or middle A.D. 900s in the Northern Rio Grande region.

In the Santa Fe area and the lower Española Basin, excavation has revealed a full range of habitation and special activity sites from the En Medio-Basketmaker II period. Sites with absolute dates from this period have increased significantly in the last 10 years. Habitations have been excavated in the San Ildefonso area (LA 51912, 620 B.C. and A.D. 190 [Lent 1991a:40-41]), southwest Santa Fe (LA 54752, 190 B.C. to A.D. 80 [Schmader 1994:92]), and north Santa Fe along the Cañada Rincon (LA 61315, 175 B.C. to A.D. 440 [Post n.d.b]). However, the artifact assemblages from these sites are dissimilar, which makes it difficult to create a lithic artifact assemblage profile that could be used to date surface artifact assemblages that lack temporally diagnostic materials. Twenty-five other sites with temporally diagnostic artifacts or obsidian hydration dates have been assigned to this period (see Table 3.1). These sites have chipped stone assemblages ranging from 10 to 1,000 artifacts with functional variability indicated by the range of formal tools. Occupation duration and season, reoccupation, group size, suitability of local raw materials, and activities influence assemblage composition and make lithic profiles difficult to develop. Profiles should be developed from single-component sites or discrete components within sites to minimize the effect of reoccupation. Even from Las Campanas sites, lithic artifact profiles are best viewed in the broad temporal terms of Archaic, Coalition, Classic, Multicomponent, and Unknown.

When viewed from a temporal perspective, lithic artifact data only provided weak patterns for the Las Campanas site assemblage. Assemblages from all periods were dominated by the use of local raw materials. Archaic period sites had slightly higher percentages of nonlocal materials, such as obsidian and basalt, than Coalition, Unknown, and the multicomponent site, LA 98688. Archaic period projectile points were most commonly made of nonlocal material (67 percent), although biface manufacture debris was dominated by local raw materials. Core reduction debris dominated assemblages from all periods, however it was two to three times more prevalent during the Archaic period. The majority of Archaic period cores exhibit no dorsal cortex or less than 60 percent coverage, while the other periods exhibit roughly equal percentages. Archaic period cores have greater dorsal scar counts; 65 of 81 cores exhibit five or more dorsal scars. This tendency of greater dorsal scar counts may reflect longer occupations resulting in more intensive reduction of raw material. Archaic period sites tend to have higher frequencies of biface flakes which also relates to longer occupation and a greater mix of activities associated with residential occupation.

Investigation of Las Campanas archaeological sites did not significantly add to the absolute dates and chronological data on the Archaic period in the Santa Fe area. Site data show an increase in use and occupation of the area; habitations indicate longer, seasonal occupations. Artifact assemblage and attribute patterns are associated more with Archaic period occupations than later periods. Recognition of these patterns may be important for dating otherwise temporally nondiagnostic surface artifact scatters.

Pueblo Period

Pueblo period sites were the most numerous in the Las Campanas project area. Fifty-two components could be assigned to the Developmental, Coalition, or Classic periods of the Rio Grande sequence based on pottery types. The Ceramic Synthesis section of this report provides a list of the pottery types and their period of manufacture, and a table of pottery types by site for the excavated sites, and the tested sites in Estates V. The sites with only Santa Fe Black-on-white were combined in this table.

The earliest Pueblo period use of the Las Campanas area as determined by pottery types is the middle Developmental period (A.D. 800 to 1000). This period is typified by Red Mesa style pottery and neckbanded utility ware. LA 835, the Pojoaque Grant site, is the most prominent site from this period in the Santa Fe area (Wiseman 1995). LA 98687 in the Las Campanas area was the only middle Developmental period site, identified by a few sherds of neckbanded utility pottery. Obviously, the Las Campanas project results add little to the existing data base for this period.

The late Developmental period is characterized by the increased frequency of indented corrugated utility pottery and mineral-painted Kwahe'e Black-on-white. LA 86147 and LA 98688 had late Developmental period components. LA 86147 was a dispersed, low frequency scatter that was suggested to be a camp along a ridge top trail. LA 98688 was a multicomponent, high density artifact concentration with three outlying, small, single-component concentrations. The Kwahe'e Black-on-white was associated with the main concentration, which dated from A.D. 1050 to 1600. SAC investigated sites from the late Developmental period including LA 84785, LA 85579, LA 84764, LA 84783, and LA 85566. Only LA 85570 was single component and appeared to be an extensively used hunting camp. It is possible LA 85570 had another nonlate Developmental period component. The other sites had Coalition, Classic, or Historic period components. No absolute dates were associated with these sites, so they were assigned to the broad A.D. 1050 to 1200 period. The most intensive late Developmental period occupations occurred along the Santa Fe and Tesuque Rivers and their primary tributaries (Wiseman 1989). Dendrochronological dates from excavated sites along the Santa Fe River indicate occupations in the mid-1000s to the early 1200s. Developmental period components are beneath Coalition period construction at Pindi Pueblo (Wiseman 1989:10-11).

Coalition period sites or components were the most numerous from the Pueblo period. OAS investigations of 20 Coalition period components yielded two absolute dates and unexpected homogeneity in pottery type frequency and paste and surface attributes. Radiocarbon samples were not submitted for components that had pottery associated with thermal features because the two-sigma ranges and potential for skewing by old wood result in date ranges that span the accepted manufacture periods. Basically, we would be confirming that Santa Fe Black-on-white was made during the Coalition period. Radiocarbon dates were obtained from two features (Feature 4, LA 86150, and Feature 2, LA 86159) that lacked associated pottery and resembled Archaic period thermal features. In these cases, the radiocarbon dating refuted the observation that they were Archaic and placed them during the late Developmental or Coalition period. Though the radiocarbon dates did not refine Pueblo period occupation, they did demonstrate that artifact and feature profiles should be used carefully.

In the absence of radiocarbon dates, excavations were expected to yield pottery type frequencies that could be compared to assemblages from the better-dated village sites of Pindi and Arroyo Hondo Pueblo. Arroyo Hondo components were correlated with tree-ring dates to provide temporal seriation of pottery types that generally showed a high frequency of Santa Fe or Galisteo Black-on-white or roughly equal counts of the two types from A.D. 1315 to 1425. Other types that fluctuate in occurrence were Pindi, Poge, and Wiyo Black-on-white and the inception of Glaze A types (Lang 1993:166-177). Similar patterns are apparent at Pindi, except that Pindi Pueblo was abandoned by A.D. 1350, resulting in the occurrence of low glaze-paint pottery counts. Furthermore, Pindi Black-on-white was a strong temporal marker for the A.D. 1325 to 1350 period (Stubbs and Stallings 1953; Ahlstrom 1989). OAS excavations yielded all Santa Fe Black-on-white. This fact suggests that the sites or components were occupied during the 1200s or early 1300s, before the proliferation of locally distinct varieties or types. SAC excavations yielded greater type variability from Coalition period sites, but those data were not available for this report.

Without the type variability, analysis relied on attribute variability that might be temporally sensitive. Based on paste studies from the Cochiti and Santa Fe area, certain changes in temper were suggested to have temporal significance. Arroyo Hondo (Habicht-Mauche 1993), Pindi (Stubbs and Stallings 1953), and the North Bank site (LA 6462) in the Cochiti area (Lange 1968) exhibited an increase in ash or tuff temper through time. Pottery production during the thirteenth century exhibited less temper variability and more surface finish variability, resulting in the definition of Santa Fe Black-on-white varieties from the North Bank site. Unfortunately, surface finish variability was never quantified in a replicable manner, so that use of the varieties is rare in the literature (Hubbell and Traylor 1982; Lange 1968). Santa Fe Black-on-white pastes from the 1200s tended to be fine and homogeneous with silt temper. Early in the fourteenth century, ash and tuff temper increases dramatically, suggesting production on the Pajarito Plateau and its fringes. The homogeneous pastes identified by the Las Campanas petrographic analysis (Hill, this volume) coincide with patterns indicated for the A.D. 1200s and not the A.D. 1300s. This implies that the nine Las Campanas sites from which sherds were petrographically examined predate the period of maximum growth at Pindi Pueblo and Arroyo Hondo Pueblo and coincide with the North Bank site occupation in the Cochiti area and early settlement of Pindi Pueblo.

At Pindi Pueblo, the first ceramic or first building period construction consisted of 40 rooms, 3 or 4 circular kivas, and 3 rectangular "kivas," and it was tree-ring dated A.D. 1270 to 1305 (Ahlstrom 1989:369). Santa Fe Black-on-white comprised 65 to 90 percent of the decorated pottery from this period. With regard to Santa Fe Black-on-white pottery, Stubbs and Stallings (1953:50) state:

> This pottery can be divided into two stages when examined in large lots, and

with a microscope individual sherds cannot always be clearly defined. The major difference between the early and late forms at Pindi is in relative hardness. The early type in large lots is consistently harder, but medium hard sherds occur. Part of the change in hardness is due to increasing use of tuff temper: this cannot be noted with the eye and does not always produce softer pottery.

The hard paste, self-tempered pottery described by Stubbs and Stallings is very similar to the Las Campanas Santa Fe Black-on-white, suggesting contemporaneity between Las Campanas Coalition period sites and Pindi Pueblo between A.D. 1270 and 1305.

The Unit VI kiva from the North Bank site (LA 6462) was the best-dated context, having 14 cutting dates between A.D. 1278 and 1280. The pottery from LA 6462 is primarily silt or fine, sparse sand tempered. An examination of a small sample of North Bank site sherds from the Laboratory of Anthropology type collections showed remarkable similarity with Las Campanas Santa Fe Black-on-white pottery. This similarity, combined with the lack of other fourteenth century types, is the strongest evidence for a pre-thirteenth century use of the nine sites included in the petrographic analysis.

Las Campanas Santa Fe Black-on-white is similar in paste and temper to pottery associated with the pre-A.D. 1300 occupations of Pindi and the North Bank site. Furthermore, the fine paste variety is most commonly associated with the A.D. 1270 to 1305 period. Similar fine paste Santa Fe Black-on-white pottery was abundant from Arroyo Hondo Pueblo, but Galisteo and Poge Black-on-white were present in the pre-A.D. 1315 contexts. The absence of Galisteo Black-on-white strongly suggests that the OAS Las Campanas sites were occupied before the first decade of the fourteenth century A.D.

Classic period occupation (post A.D. 1350) of Las Campanas was limited. The number of sites and isolated occurrences from this period decline from the Coalition period. The OAS sites with good Classic period components, LA 87459 and LA 98688, have ceramic assemblages that reflect a change in how the Las Campanas area was used. LA 84759 had Glaze A or B, Biscuit A, Biscuit B decorated pottery, and Sapawe Micaceous utility pottery. This assemblage composition is common on early to middle Classic period sites in the Northern Rio Grande. Biscuit A and Biscuit B co-occur with Glaze A and B pottery. This suggests an occupation between A.D. 1400 and 1450. This would correspond to the terminal occupation of Arroyo Hondo Pueblo (Habicht-Mauche 1993) and Agua Fria Schoolhouse site (Lang and Scheick 1989). This period fits well with major occupations of Cieneguilla Pueblo and Los Aguajes (Robinson et al. 1973).

LA 98688 was a multicomponent sites with pottery types dating from A.D. 1050 to 1600. Based on pottery type frequencies, the bulk of the occupation probably occurred during the Classic period. Two occupation spans were identified from the ceramic analysis.

The strongest case for occupation dates comes from the co-occurrence of Biscuit A, Biscuit B, Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, San Clemente Glaze-on-polychrome, and Largo Glaze-on-polychrome pottery, and Sapawe and micaceous utility wares. This array of types is not reported for the Pindi Pueblo assemblage (Stubbs and Stallings 1953). Arroyo Hondo only has a small amount of biscuit ware and glaze-yellow pottery in the Component II contexts that post-date A.D. 1400 (Lang 1993). These types are only minimally present in the Agua Fria Schoolhouse assemblage, although surface distributions suggested a large part of the village that dates to the late A.D. 1300s or early 1400s may have been removed by more recent construction (Lang and Scheick 1989). Assemblages from Arroyo Hondo Pueblo and the Agua Fria Schoolhouse site lack Largo Glaze-on-polychrome and Biscuit B pottery. Both Biscuit B and Largo Glaze-on-polychrome were made between A.D. 1425 and 1450. The full array of types, minus Largo Polychrome, was recovered from Component I of the Alfred Herrera site, LA 6455, at Cochiti Reservoir. Honea (1968:126) suggests that Component I dates between A.D. 1400 and 1425. Pottery from this period was recovered from the three spatial/analytical units at LA 98688. Also, 15 of the 21 identified vessels date to this period. The preponderance of evidence suggests an A.D. 1400 to 1450 occupation.

Later occupations of LA 98688 are indicated by low frequencies of Espinosa Polychrome. Espinosa Polychrome was produced between A.D. 1450 and 1490. It was recovered from Units 2 and 3, but primarily occurred in Unit 2. The restricted distribution and low frequency suggests brief or casual occupation during the mid to late fifteenth century.

Isolated pottery from Las Campanas totaled 624 sherds. Of these, 108 date to the Classic period, with the majority consisting of Glaze A or B and Biscuit A or Biscuit B pottery. This suggests that throughout the A.D. 1350 to 1450 period there was limited and scattered use of the area. Pottery types from the sixteenth and early seventeenth century are rare, which corresponds with the observation that the middle and upper Santa Fe River Valley areas were abandoned by the middle of the fifteenth century A.D.

Evidence of late Classic and Spanish Colonial period use of the Las Campanas area is scarce. Occupation from A.D. 1500 to 1848 is represented by a small component from LA 98688 and an artifact scatter, LA 98693. SAC investigations yielded seven components from this period (LA 84783, LA 84784, LA 84785, LA 85029, LA 85638, LA 85581, and LA 86146). All late Classic or Spanish Colonial period components are associated with earlier components or reflect brief occupation. None of these components provides refinement of late Classic or Spanish Colonial ceramic or assemblage profiles. Instead, they reinforce the previously documented pattern of low site density and brief occupations outside the Santa Fe River Valley.

Territorial to Modern period occupation of Las Campanas has been described and discussed in detail in the Ethnohistory section and in the LA 85036 site report. Prior to the 1880s and early twentieth century, occupation was brief and related to travel between Santa Fe and outlying communities to the north and west, and livestock raising and fuel-wood gathering. Homesteads were established in the 1910 to 1940 period as well as a dairy. Sites reflect activities related to farming of the primary tributaries of the Arroyo Calabasas and Cañada Ancha and ranching on the flat tableland of the piñon-juniper piedmont. More formal ranching facilities were found in Estates I and II. Artifacts suggested a Bond family era (1945 to 1960) occupation.

Occupation History and Site Formation

Occupation history and site formation were examined for each OAS site or component. Thirty-six components were defined using the Lithic Artifact Synthesis divisions. One change in the assemblage is the division of LA 98688 into three components, so that the high density Unit 2 could be separated from the rest of the site assemblage. As used in this study, occupation history primarily relates to the cultural variables that affect site formation. Natural site formation processes, such as deflation, erosion, bioturbation, and deposition, were fairly constant across the sites. Cultural variables that affected site formation and relate to occupation history were duration, intensity, group size, and reuse or sequential occupation. When the site assemblage is examined from the perspective of occupation and site formation history, it provides information that can be used to better understand site function, subsistence production, and land-use patterns. In fact, land-use patterns and occupation history are virtually inseparable.

Occupation history has been defined as the "manner in which a place is reused" (Ebert 1992:145). This implies that to have an occupation history a site must be used more than once. The Las Campanas analysis of occupation history considers reuse and multiple occupation as defined by Camilli (1989:9-10) and single use or episode occupations. This allows for examination of the effects that more than one occupation has on assemblage grain and resolution (Ebert 1992:145-146) when multiple occupation sites are compared with single occupation sites. When examined from the perspective of different or mixed subsistence or settlement strategies, the correspondence between occupation episodes and assemblage characteristics may show significant patterning.

For the Las Campanas area, two main subsistence and settlement organizations are reflected in the site and temporal data. The Archaic hunting and gathering adaptation relied on seasonal mobility for access to critical resources. The Pueblo period occupation along the Santa Fe River was more sedentary with residential mobility existing on a periodic scale of 5 to 50 years between the time of village founding, growth, and abandonment. The difference between the Archaic and Pueblo use of the piedmont is one of mobility, scale of seasonal range, and use intensity as determined by resident population size and occupation duration.

As stated before, the Archaic populations are viewed as highly mobile, with a potentially large seasonal range, but with relatively low intensity use of the land coupled with high intensity activity in specific locations, such as residential base camps. Residential sites located near critical resources should have accumulations of artifacts and features. Daily foraging from residential sites may be invisible or indistinguishable from foraging during other periods. Logistical forays for hunting large game would have extended beyond the piedmont and would not be represented in the Las Campanas site assemblage. Therefore, the occupation history or patterns for Archaic period sites should reflect mixed assemblage content with low resolution among the artifacts, the location, and the specific activities (Ebert 1992:146). Residential sites may be distinguished from reused special activity sites or logistical sites by the presence of facilities, site furniture (Binford 1981), and patterned discard that reflects spatial organization related to activities (Kent 1992; O'Connell 1987).

Pueblo use of the piedmont within the Las Campanas area may have been closely tied to changes in population density and distribution. Smaller populations suggested by the fewer, smaller, and more scattered residences and villages of the Developmental period may have used the areas closer to the Santa Fe River and their residences more intensively. More distant areas, such as the Las Campanas area, were used occasionally, resulting in low site density and limited artifact accumulation on the landscape.

During the Coalition period (A.D. 1200 to 1325) there were larger, more concentrated populations living at Pindi, Agua Fria, Cieneguitas, the School site (LA 1051), and Fort Marcy pueblos. To provide the resources necessary to support a larger population meant an increase in the diurnal foraging range and more frequent trips to the same location annually or periodically. Foraging group sizes may have remained small, so that isolated facilities and low frequency artifact accumulations resulted from each trip. Diurnal foraging and a trip-by-trip basis should produce fine-grained, high resolution artifact and feature distributions (Ebert 1992). However, a large sedentary population over a span of 25 or 50 years may use the landscape in ways that affect artifact distributions and assemblage resolution. Repeated occupation may mix distributions from unrelated activities affecting artifact frequency and diversity and the equifinality of the archaeological record. Accumulations may form that resemble more intensive occupation, but result from numerous, low intensity brief visits. As populations use an area and deplete geologic resources, salvaging and recycling may occur, further affecting assemblage characteristics.

During the Classic period (A.D. 1325 to 1540), as populations moved away from the Santa Fe River, use of the piedmont would have decreased and the foraging strategy would have changed. Early fifteenth-century residents of Arroyo Hondo and Cieneguilla pueblos would have continued to use the piedmont, but resource extraction and procurement would have shifted to areas closer to the pueblos. More distant resource areas, such as the Las Campanas area, were used sparingly or as part of a logistical strategy. If logistically organized use of Las Campanas occurred, then there should be sites and distributions reflecting acquisition and initial processing of resources, and assemblages of items necessary for overnight or longer occupation. These sites, if occupied once, would be fine grained with high resolution. Repeated occupation would result in increased assemblage complexity, but the assemblage would reflect a similar range of activities, and artifact density should increase.

Obviously, the occupation history of sites and an archaeological landscape are more complex than is represented by the artifact and feature distributions. Temporal issues are complicated by the low frequency of diagnostic artifacts and the potential for movement of artifacts between sites or locations. For the OAS site assemblage, individual sites have been discussed in terms of occupation history. Numbers of episodes, duration, and intensity have been suggested based on artifact and feature distributions. To address the occupation history for the Las Campanas area, the OAS excavated sites are examined and compared according to distribution, frequency, density, and diversity of artifacts. Measures are compared for Archaic and Pueblo periods and the two periods are compared. To facilitate the analysis, sites have been divided into obvious components. Defining components implies that a site was occupied more than once and it separates out components that reflect specific activities or strategies versus sites that are accumulations from an unknown number of visits.

Tables 14.1 and 14.2 list the individual component data and the summary data by period.

Site or Component Area

Site or component area was defined by the distribution of artifacts and features. Components within sites were defined by concentrations of artifacts of similar material, reduction strategy, or age. Drainage patterns and erosion were considered when components were defined from

Table 14.1. Summary Spatial and Artifact Data for OAS Excavated Components

LA No.	Area (sq m)	Artifact Count	Artifact Density (sq m)	No. of Types	Tools*	Features	Ratio of Tools:Artifact Count
Archaic period							
84758.2	350	1226	3.50	11	56	13	.05
84775.1	875	24	.03	5	2	0	.08
84787.1	132	164	1.20	8	22	0	.13
84787.2	875	1834	2.10	14	163	3	.09
84787.3	288	857	3.00	9	26	1	.03
84787.4	432	745	1.70	11	73	1	.10
86139.0	1400	97	.07	6	3	1	.03
86148.0	1550	329	.21	7	24	0	.07
98690.5	225	14	.06	3	1	1	.07
Coalition period							
84759.1	696	61	.09	5	6	0	.10
84773.0	6600	142	.02	4	5	0	.04
84793.0	1800	296	.16	4	268	1	.91
86131.0	5500	80	.01	4	2	0	.03
86134.0	3250	80	.02	7	7	0	.09
86150.1	1050	82	.08	2	57	2	.70
86150.2	525	35	.06	2	12	3	.34
86150.3	1696	21	.01	4	7	21	.33
86150.4	625	48	.08	2	42	1	.88
86155.0	1050	50	.05	5	12	0	.24
86156.0	1400	146	.10	5	5	0	.03
86159.1	120	579	4.80	3	569	1	.98
86159.2	400	124	.31	5	6	1	.05
86159.5	256	67	.26	3	28	1	.42
98680.0	300	130	.43	6	3	1	.02
98690.1	450	63	.14	4	50	2	.79
98690.2	160	94	.60	4	94	0	1.00
98690.6	225	35	.16	3	20	0	.57
98861.0	2700	29	.01	4	2	0	.07

LA No.	Area (sq m)	Artifact Count	Artifact Density (sq m)	No. of Types	Tools*	Features	Ratio of Tools:Artifact Count
Classic period							
84759.2	625	143	.23	10	44	1	.31
Unknown period							
84775.2	800	106	.13	5	3	0	.03
86152.0	3200	93	.03	5	3	0	.03
84758.1	3400	29	.00	2	0	0	.00
Mixed periods							
98688.1	2250	28	.01	4	29	0	1.04
98688.2	810	3813	4.70	10	2786	2	.73
98688.3	4800	393	.08	6	318	0	.81

* Tools include formal and utilized debitage

Table 14.2. Central Tendency Statistics for Spatial and Artifact Count Data by Period

AREA					
Period	N	Mean	St Dev	Min	Max
Archaic	9	681	522	132	1550
Coalition	19	1516	1826	120	6600
Classic	1	625			
Mixed	3	2620	2020	810	4800
Unknown	3	2467	1447	800	3400
COUNT					
Archaic	9	584	626	14	1821
Coalition	19	1114	129	21	579
Classic	1	143			
Mixed	3	1411	2087	28	3813
Unknown	3	76	41	29	106
DENSITY					
Archaic	9	1.32	1.34	.03	3.5
Coalition	19	.39	1.08	.01	4.8
Classic	1	.23			
Mixed	3	1.6	2.69	.01	4.7

Unknown	3	.05	.07	.003	.13
TOOLS					
Archaic	9	41	52	1	163
Coalition	19	63	137	2	569
Classic	1	44			
Mixed	3	1044	1515	29	2786
Unknown	3	2	1.7	0	3
ARTIFACT/TOOL RATIO					
Archaic	9	.07	.03	.03	.13
Coalition	19	.40	.37	.02	1.0
Classic	1	.31			
Mixed	3	.86	.16	.73	1.04
Unknown	3	.02	.02	0.0	.03

relatively dispersed distributions, such as were found at LA 86150 and LA 98690.

Components are indicated by a decimal extension after the LA number in subsequent discussions. Area was calculated by multiplying length by width or using a template to tally square meters within a plotted limit. Site or component area is a reflection of the intensity and length of occupation, although erosion and post-depositional processes may increase artifact spacing and dilute the power of density measures.

For the Archaic period components there is a fairly broad range. The 132 to 1,550 sq m range reflects occupation duration and reuse. LA 84787.1 is the smallest component and it appears to be a single episode occupation. By the same token, LA 84775.1, LA 84787.3, LA 84787.4, LA 86148, and LA 86139 are also single occupation components or sites. LA 86139 and LA 84775.1 were on a sloped and eroded surface, which undoubtedly contributed to their larger size. The other sites are in flat settings where artifact movement is not a major factor. These differences in size can be interpreted as evidence of longer occupation. Larger group size is not considered a contributing variable because these components only had one hearth. LA 84787.2 and LA 84758.2 were identified as having two or more components. These sites are in the upper size range, but are not the largest sites. Because they do not cover more area than the single component sites, they may have been reused resulting in superimposition of occupation debris and facilities.

Coalition period components tend to cover more area and they have a greater size range than Archaic period components. Seven of the Coalition period components are larger than Archaic period components yet none have higher artifact counts. The largest components are artifact scatters with one to four low frequency artifact clusters that lack features and consist of a few sherds with a scatter of chipped stone on a ridge top or ridge slope. These components, LA 84773, LA 86131, LA 86134, LA 86156, and LA 98861, have multiple overlapping distributions. These distributions were formed from repeated foraging visits to the ridges and slopes above the Arroyo Calabasas and the tributaries of Cañada Ancha. Two larger components, LA 84793 and LA 86150.3, had features. LA 84793 had a pottery kiln, two artifact clusters, and a general scatter reflecting general and specialized activities. LA 86150.3 had a feature and a dispersed scatter that eroded downslope from the main activity area. The smaller Coalition period components (under 1,400 sq m) mostly result from single occupation episodes. LA 86150 was divided into four subareas that represent six different occupation episodes. Distributions from two of these subareas overlap spatially, but do not represent reuse. Instead, artifact distributions from Subareas 1 and 2 appear to be mixed by erosion. LA 98690 was also divided into eight activity areas based on sherd or feature clustering. Seven of these areas had Santa Fe Black-on-white pottery clustered in small areas. LA 86150 and LA 98690 reflect a pattern of multiple occupation of drainage heads that were more than a 5-km radius from the Santa Fe River villages. The clustering of features and multiple occupation of select locations suggests a change in foraging strategy that accommodated more distant resources.

The Classic period is represented by a single component, LA 84759.2. This component covers 625 m and is similar in size to the Coalition period camps. The Mixed period components, LA 98688.1, LA 98688.2, and LA 98688.3, mainly had Classic period artifacts. The main cluster, LA 98688.2, covered 810 sq m, but had the highest frequency of artifacts encountered on any of the OAS sites. Some high frequency can be explained by livestock trampling, which produced fragmented artifacts. However, the clustering shown in the site report suggests that LA 98688.2 was reused. The other two components, LA 98688.1 and LA 98688.3, cover larger areas and are more similar to the foraging pattern, suggesting larger Coalition period sites. Two of the Unknown period components, LA 84758.1 and LA 86152, reflect repeated use of a ridge top or slope area with one or two small clusters associated with a much larger, but low frequency scatter. LA 84775.2 was a single core reduction episode associated with a scatter. This isolated knapping station, more than 6 km from the nearest village, reflects an embedded material procurement strategy that supported increased foraging distance.

The site area data suggest that single occupation, reuse, and multiple occupations occurred. Single occupations resulted in site areas covering less than 1,000 sq m regardless of the period. A 30-by-30-m area was more than enough area for foraging camps and Archaic period residential sites. The larger sites reflect a multiple occupation pattern, where single artifacts were deposited on ridge slopes and tops, and many visits resulted in the formation of a site.

Artifact Count

Artifact count reflects the intensity of the occupation, activity-specific reduction or production that may produce quantities of debris, occupation duration, or accumulation from many occupations. The OAS site assemblage undoubtedly has elements of all these formation patterns. In addition to human behavior, artifact counts can be increased by post-depositional breakage or degradation. Artifact count alone is not a strong indicator of occupation history, but can be used to determine site area.

The Archaic period components exhibit a wide range of artifact counts. Much of this difference cannot be attributed to reduction strategy, as was demonstrated in the Lithic Artifact Synthesis. A core-to-flake strategy was predominant with a secondary focus on biface production. LA 86148 had the most evidence for specialized reduction, but it does not have the highest artifact count. The artifact count differences undoubtedly reflect length and intensity of occupation. LA 84787.2, which was reused, had the highest artifact count. Camps such as LA 86139 and LA 84787.1 were occupied the shortest time, resulting in lower accumulations of refuse and low numbers of ground stone and tools.

Coalition period sites also display a wide range of artifact counts, from 21 to 579. The majority of the sites were single-episode foraging camps or multiple-occupation foraging locations. These sites usually have less than 100 artifacts. The sites with more than 100 artifacts include LA 86159.1 and LA 84793. These sites had pottery kilns with part of one or more broken and spalled pots remaining. These high counts reflect a specific activity and an extreme breakage pattern. The fact that the highest artifact counts result from these extreme factors strongly supports the observation that most of the Coalition period use was low impact and brief.

The Classic and Unknown period counts are similar to the Coalition period pattern. Most of the counts reflect brief use, such as would be expected if specialized tools were not produced in the field. The low counts also indicate that tools were not used and discarded at a rapid rate and processing of hard or rough materials was uncommon. The Mixed period assemblage from LA 98688.2 has unusually high artifact counts as noted previously. These high counts reflect post-depositional breakage as well as the concentration of core reduction and food consumption or storage in a restricted area. This is a pattern that may be associated with the caching of vessels for water storage or cooking.

Artifact Density

Artifact density within a site or component can be used with other variables to examine occupation history (Camilli 1989:11-12). As stated before, occupations have been characterized as single occupation, multiple occupation, and reuse. A single occupation implies one continuous stay with no obvious subsequent visits or occupations. A single occupation may have lasted a day or 50 years. Multiple occupation is partly overlapping reuse of a location that results in a lower artifact density than if multiple occupations had exactly overlapped (Camilli 1989). Reuse implies that the same location and some of the same facilities were reused. This would be expected with standing architecture or large facilities that were used within a single generation. Reuse should result in the highest artifact density for a commensurate range of activities and occupation duration.

Archaic period components tend to have the highest artifact density with a mean of 1.28 per sq m. Sites that appear to be short-term camp sites or special activity sites, LA 84775.1, LA 86139, and LA 98690.5, have the lowest artifact density, resulting from low discard rate and spreading of the artifact distribution through erosion. Because of a few scattered artifacts outside the main concentration at LA 86148, it also has a low artifact density, even though it was a base camp. The other residential base camps have artifact densities ranging from 1.20 to 3.0 artifacts per sq m, suggesting that for the Las Campanas area this is a typical density for a single-component camp. These numbers are lower than might be expected because of the limited biface production that occurred at these sites. The reused base camps, LA 84787.2 and LA 84758.2, have artifact densities of 3.0 and 3.5 per sq m. Higher artifact densities would be expected for intensively occupied camps. Again these numbers are low, reflecting the heavy reliance on core reduction and flake tools.

Coalition period components also have a wide artifact density range, 0.01 to 4.8 per sq m. The 4.8 artifact density is from LA 86159.1, which had a high sherd count associated with a pottery kiln. Low artifact density reflects brief occupations, low productive or processing activities, and low refuse discard. Single-occupation sites or components with distinct concentrations range from 0.31 to 0.60 artifacts per sq m, suggesting that Coalition period artifact densities were low, but intense, and brief core reduction or resource processing occurred. Components with low frequency clusters or overall dispersed distributions have artifact densities of less than 0.17. This low rate of discard and accumulation may be a strong indicator of daily foraging, embedded raw material procurement, rare overnight visits, a lack of logistical organization, and very limited in-field resource processing.

Artifact Diversity

Artifact diversity was measured by counting the number of artifact classes or types per component and dividing the number of tools by the total number of artifacts. The number of tools may be correlated with assemblage size. Variation in this pattern may result from functional or occupation differences. Variety in artifact classes should be more closely linked to the range of activities conducted at a location than to assemblage size. By the same token, tool frequency should increase as assemblage size increases for sites or components with assemblages generated by similar activities. Sites with a high ratio of tools to assemblage size reflect special activities. Small assemblages with high tool to artifact frequency ratios have high resolution between activity and discard. These sites were occupied for a short time and are probably single component. Sites with low tool to assemblage ratios may reflect more generalized activities, but if the artifact density is low they probably represent discard from many brief occupations.

Both Archaic and Pueblo period sites show a wide range of tool counts. Of course, Archaic period components reflect only stone tools. For Pueblo period sites the ceramics have been included as tools. Each sherd was counted as a tool. This skews the data and restricts cross-temporal comparisons but it provides a better representation of Pueblo period activity diversity.

As would be expected for the Archaic period, the reused components with the highest artifact counts, LA 84758.2 and LA 84787.2, also have the highest tool frequency. They do not have similar tool/count ratios, which suggests functional differences. Unexpected is the similar tool/ratios from the single-component limited activity sites and the longer duration camps. Artifact types increase with artifact count, but the ratio of artifact type to artifact count decreases with occupation duration. The most briefly occupied sites have the highest artifact type to artifact count ratios, reflecting fine-grained and high resolution with respect to activity and discard.

Coalition period components have a wide range of tool counts and tool/count ratios. Components with high sherd frequencies relative to lithic artifact frequencies have the highest tool count and tool/count ratios. These components usually have one or more features. To test if there is a significant difference between components with features and those lacking features, a Student's T-test was conducted at the 0.05 significance level. There was no significant difference in tool/count ratios between sites with and without features. This suggests that components with features do not have disproportionately more sherds than lithic artifacts. Sites with features and sherd concentrations appear to be more specific in function, but they do not have significantly higher tool/count ratios than components lacking features. This suggests that activities conducted at components with features were as highly variable as components without features. Occupation intensity and duration may be reflected in higher tool/count ratios, but presence of a feature does not mean longer or more intensive occupation.

Interpretation of the patterns is difficult when only one variable is examined. The patterns suggest that multiple factors affect occupation history with no one variable more powerful than another. These patterns can be clarified by looking at scatterplots of two variables. Figures 14.1 to 14.3 show scatterplots for combinations of measures by Archaic, Pueblo, Unknown, and Mixed periods. These plots illustrate definite patterns by period that reflect different occupation histories.

Figure 14.1 shows artifact types by artifact count. Archaic period components show a steep linear trend; the number of artifact types increase with artifact count. This reflects the longer occupation duration for the majority of the Archaic period components. The component with the highest artifact count and number of artifact types is LA 84787.2, which was the reused location resulting in higher artifact diversity, though many of the types occurred in low frequencies. The Pueblo period sites show a reverse trend, artifact types increase as artifact counts decrease. This trend reflects the effect of high sherd counts on the distribution. Components with the lowest artifact type counts have the highest sherd counts, which emphasizes the specific activities that occurred at these sites and the more generalized function of many other components. Reuse of a location for similar activities resulting in moderate artifact type counts and high artifact counts is illustrated by LA 98688.2. It has the highest artifact counts, but not the highest artifact type diversity.

Figure 14.2 illustrates the relationship of artifact density to area. Archaic period components tend to be small areas with higher artifact density reflecting occupation intensity or duration. However, the largest component does not have the lowest artifact density, indicating special activity and short occupation duration. Coalition period components show higher artifact density for small sites and decreased artifact density on large sites. This pattern reinforces the observation that Coalition period components reflect high intensity, short duration occupations, as well as low intensity and short duration multiple occupations of the same topographic feature, such as a ridge top or slope. This pattern reflects a more generalized subsistence system that relied on a number strategies. Unknown period components exhibit the increased artifact density with decreased component size trend. This is similar to the Coalition period pattern, when concentrations of ceramics are not present. These sites were multiple, low intensity occupations that were brief as would be expected for a foraging strategy. The Mixed period components reflect the foraging pattern and the high intensity use pattern, but were augmented by multiple occupation. This suggests that LA 98688 used different subsistence strategies.

Figure 14.3 shows the relationship between area and tool/artifact count ratio. Archaic period components exhibit tight clustering. Their low area and tool/artifact count ratios reflect single occupation or reused base camps. Coalition period component distribution shows two patterns. One pattern is the small components with sherd concentrations displayed as low area, high tool-artifact count ratios. The second pattern is the small to large area sites with low tool-artifact count ratios, which result from general foraging. Mixed period components have relatively high tool-artifact count ratios because of the predominance of sherds.

Occupation history can be difficult to interpret from density, distribution, and frequency data. However, there are different patterns during the Archaic and Pueblo periods that reflect the different settlement and subsistence patterns. Archaic period components tended to be single-component residential and special activity sites. There are two examples of reused compo-

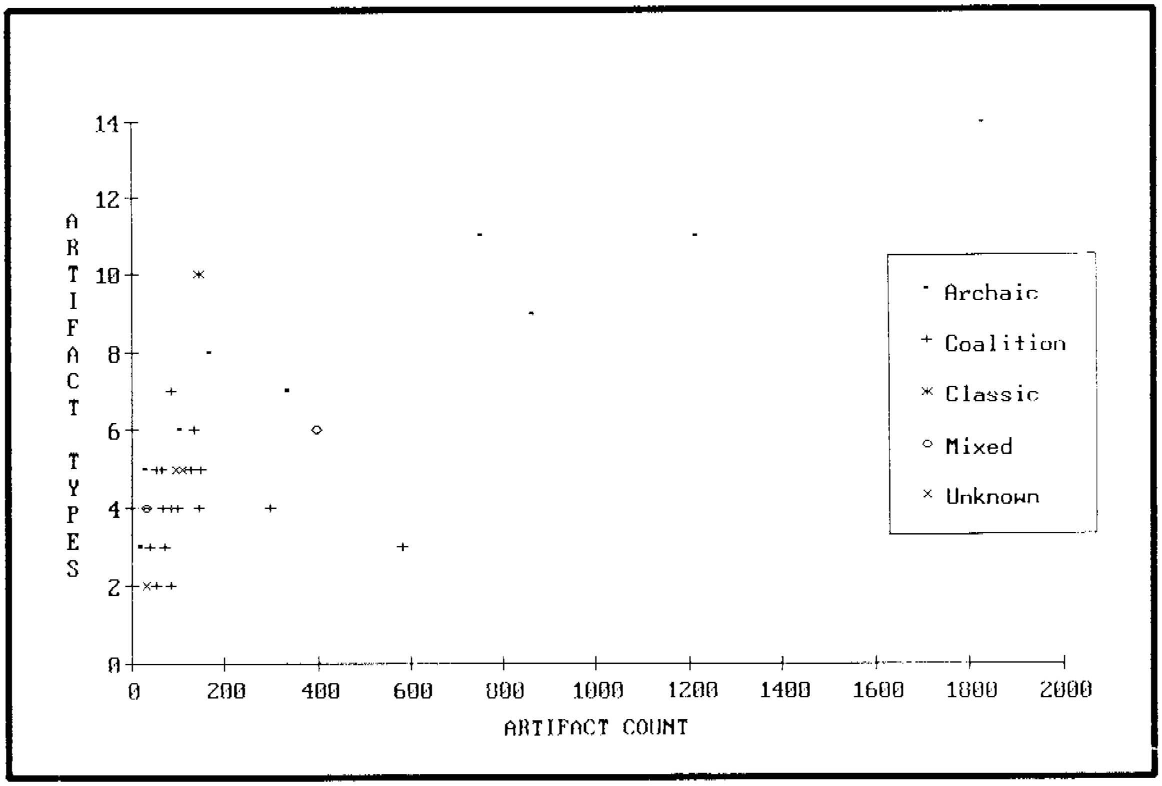

Figure 14.1. OAS site artifact types by artifact count and period.

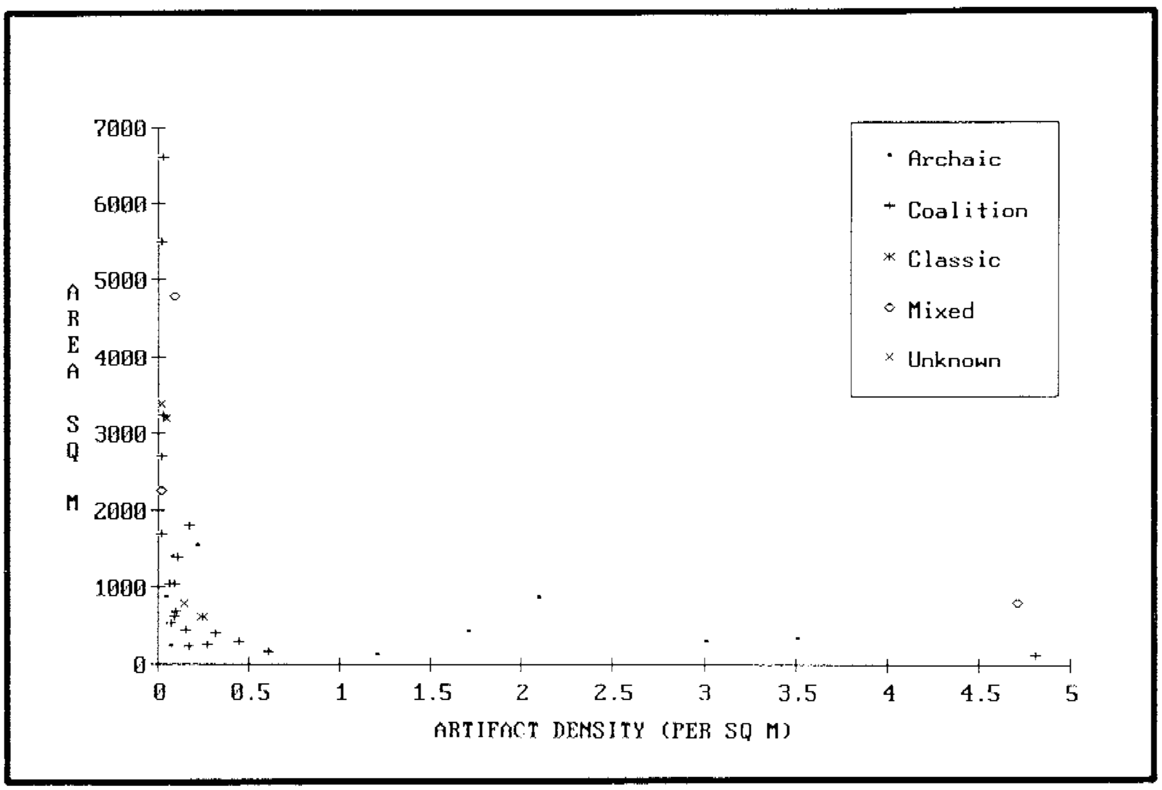

Figure 14.2. OAS site area by artifact density and period.

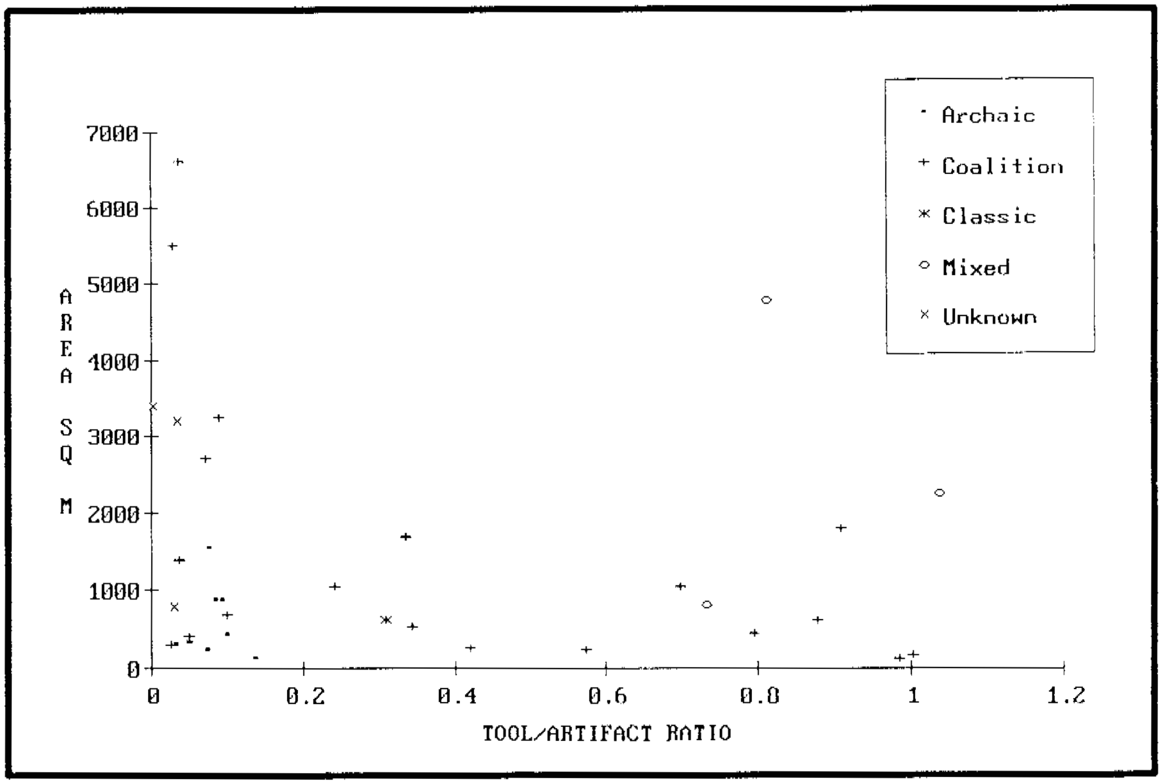

Figure 14.3. OAS site area by tool/artifact count ratio and period.

nents. Patterning in area, artifact density, and tool/count ratios suggests that occupations were by small groups for a single season with reoccupation of an area usually not in the exact location of a previous occupation. For the total Las Campanas area, low frequencies of residential and recognizable special activity components suggests that conditions favorable for occupation were sporadic. Over a potential 2,200-year occupation span, only 13 Archaic components were identified, which is 1 occupation every 170 years.

Pueblo period occupations show a wide range of variability in all analytical categories. Repeated use of certain locations occurs near drainage heads. These occupations marginally overlap and result in usually low frequencies of discarded artifacts. The low artifact frequencies and relatively small areas defining components indicate small group sizes using areas for brief periods. The largest sites are accumulations of artifacts spread over large areas as raw materials are procured, tested, reduced, used, and discarded in support of daily activities. Components with thermal features and concentrations of artifacts reflect specialized activities. This is seen in the lower artifact type counts relative to artifact frequencies.

Site Function: An Examination of Technological Organization, Subsistence Production, and Site Typology

Site function was studied at the site level by looking at technological organization and subsistence production. The analyses incorporated artifact, feature, site, and environmental variables. Artifact analyses focused on lithic material procurement patterns, chipped stone reduction strategies and sequences, chipped stone tool use, and ceramic type and vessel form frequency and distribution. Feature analysis focused on morphology and contents. The synthetic section on thermal features in this report compared pottery kilns with thermal features from other Pueblo and Archaic period sites. Site structure was examined using spatial associations between artifact types, between artifact types and frequency, and features.

Technological organization and subsistence production are used at the project scale to examine sites and components from the perspective of Archaic and Pueblo period economic organization. By bringing together the different analytical variables, inferences can be made about the range of activities that were conducted at each site or component. From a range of activities and associated artifact frequencies site function and type can be inferred. Typological classification of sites may obscure variation, but it is useful for understanding the relationship between the natural landscape and different economic adaptations. Therefore, the purpose of this section is to review the important patterns observed for the Las Campanas site and component assemblage with regard to technological organization and subsistence production. These patterns will be integrated with the SAC data, from which an interpretation will be offered of how the sites and components fit into Pueblo and Archaic period economic organization as reflected by the archaeological record across the Las Campanas landscape. The framework for the interpretations was provided in the Occupation History section of this synthesis.

The study of technological organization and subsistence production looked at where and how raw materials were obtained and reduced and how tools were produced, used, and discarded. Chipped stone artifacts were examined in terms of material procurement patterns and reduction sequences and strategies, tool production, use and discard, and their relationships. Ground stone artifacts were identified according to form, function, and condition. Their main significance in this analysis relates to presence and abundance. Pottery analysis provided information on vessel form and function, secondary modification, and probable manufacture area. Subsistence production was to be directly inferred from the feature morphological and content data. Technological organization and subsistence production combine to provide a basis for site typologies that can be compared to those developed from the research in the San Juan Basin.

Archaic Period

The Archaic period occupation history analysis suggests that the majority of the sites or components were occupied for extended periods (weeks or months rather than days) by a small family or extended family group. Differences in artifact frequencies for most sites reflected occupation duration or evidence for reoccupation. The number of facilities associated with each component supported the group size observation, although more hearths, pits, and a pit structure at LA 84758 suggest it was occupied at a different season, and perhaps, for longer duration than the other components or sites. Sites or components that evidence longer occupations were LA 84758.2, LA 84787.1, LA 84787.2, LA 84787.3, LA 84787.4, and LA 86148. Sites or components that reflected shorter occupations were LA 84775.1, LA 86139, and LA 98690.5. LA 84775.1 and LA 98690.5 had low artifact frequencies within small areas. LA 86139 had a low artifact frequency, but also had a thermal feature and ground stone. Technological data can be summarized in terms of these two groups of sites.

The longer occupation sites or components shared many technological characteristics. All components and chipped stone assemblages exhibited a heavy reliance on locally available lithic raw materials. Even LA 86148, the best example of a biface reduction strategy, had only local material, emphasizing the suitability of local material for all tasks. Archaic period reduction strategy focused on core reduction debris with relatively low emphasis on formal tool production. All stages of core reduction were represented. Dorsal cortex, core flake size, flake platform distribution, and dorsal scar counts on cores suggest that raw materials were intensively reduced. As core reduction progressed, the relative frequency of cortical to noncortical debris should decrease. Thus, it is difficult to assess the actual amount of early stage reduction, although the low frequency of core flakes with more than 50 percent dorsal cortex suggests that material was brought to the sites in a reduced state.

Tool manufacture focused on core flakes as tools. This is evidenced by the greater number of utilized core flakes and relatively rare formal tools that were broken in manufacture. Tool manufacturing debris of local and nonlocal materials was present in low frequencies. Formal tools were more commonly of nonlocal materials, such as obsidian or basalt. This suggests that formal tools were made from local material to replace tools made at previous base camps or logistical camps located closer to obsidian and basalt sources. The manufacture of tools from local material combined with the discard of expended nonlocal formal tools is evidence that logistical forays were staged from the longer occupation sites. Finished products were brought to the Las Campanas sites from previous residential sites, discarded, and replaced with tools made from local material. Utilized flakes or angular debris had a wide range of edge angles and use patterns that indicated scraping, cutting, and sawing. Visible and continuous wear patterns also indicate extended tool use, suggesting heavy-duty or intensive processing.

Some differences exist between long occupation components and LA 86148. LA 86148 had higher biface flake counts, a greater biface flake size range, bifacial cores and early stage biface fragments, and utilized biface flakes. These are characteristics of a biface reduction strategy associated with planned or logistically organized strategies (Kelly 1988). A heavy emphasis on this biface reduction strategy is associated with a residentially mobile strategy or logistically organized hunting. LA 86148 did have core reduction debris, utilized core flakes, and a piece of ground stone, suggesting it was not a logistical hunting camp. Instead, LA 86148 may be a component of a residentially mobile settlement pattern. Researchers have suggested that late Archaic groups may have used residentially stable and mobile strategies during different seasons or in response to variable resource distribution (Elyea and Hogan 1983; Binford 1980). For LA 86148, a different subsistence strategy is suggested by debris from a planned biface reduction strategy and the greater frequency of acute edge-angle flake tools suited to meat processing.

To determine if LA 86148 was significantly different from the other long occupation sites or components (LA 84787.2, LA 84787.3, LA 84787.4, and LA 84758.2), a chi-square test for homogeneity was conducted. The variables included in the test were primary, secondary, decortication secondary, biface flakes, and tools. The data were taken from the All Sites Data Base (Appendix IV). The test was a 5-by-5 contingency table with 16 degrees of freedom conducted at the .01 significance level with a critical value of 31.9999. The test resulted in a chi-square value of 139.2646; the null hypothesis that the five assemblages were homogeneous was rejected. Obviously, the chi-square test revealed considerable variability between the components, but the one of immediate interest, biface flake frequency, was significantly higher than expected for LA 86148 (adjusted residual of 4.25). The other four components had frequencies within the expected range. The test result lends support to the interpretation that LA 86148 was functionally different from the other long occupation components.

The chi-square test points to other differences in the assemblages that may relate to occupation length, function, and analysis bias. Tool frequency exhibits the greatest variability, with LA 84758.2 exhibiting a much lower than expected frequency (adjusted residual -7.36 or 28 percent of the total chi-square value). The low tool frequency can be attributed to the identification of only two utilized flakes. Some of this difference may be related to function because LA 84758.2 has more formal tools than most of the other components, which may reflect a greater focus on hunting. However, it also has more ground stone, fire-cracked rock, and thermal features for plant processing, which would required an expedient tool assemblage. The absence of utilized flakes may result from a short duration or low impact tool use and a recognition bias during the analysis. LA 84787.2 and LA 84787.4 have greater than expected tool counts (adjusted residuals of 4.98 and 4.03), suggesting a similar range of activities with frequency differences reflecting occupation duration. LA 84787.3 has a lower than expected tool count (adjusted residual of -2.78), suggesting a shorter occupation and perhaps less focus on plant processing, an observation that is supported by the low frequency of ground stone artifacts.

Small-scale, shorter duration occupation components, LA 86139, LA 84775.1, and LA 98690.5, display variability in technological organization that reflects special activities and residential mobility. LA 86139, which is the earliest Archaic period site, has a mixed reduction strategy using local and nonlocal materials. Obsidian biface flakes and tools occur, indicating manufacture and use. Local material biface flakes are present in lower numbers, but local material tools were not identified. This is a pattern observed for the larger, longer occupation components, suggesting residential mobility between obsidian source areas and the Las Campanas area. LA 98690.5 and LA 84775.1 had two different special activity assemblages. Core reduction was emphasized at LA 98690.5. It included nonlocal material and may have been oriented to plant processing. LA 84775.1 had more biface flakes and tools, including nonlocal material, and may have been oriented to hunting.

SAC excavated three late Archaic period sites that have slightly different core and biface reduction debris and tool proportions than the OAS sites. LA 83698 is the most striking example of a hunting camp. Tool manufacture and use are reflected by 132 biface flakes and 57 tools. LA 85567 and LA 85622 have a higher proportion of core reduction debris, which is similar to the OAS single occupation, long duration components. However, tools and tool manufacture debris were well represented.

To test these assemblages for a significant difference from the OAS sites, a chi-square test was conducted. The three SAC sites and LA 84787.4, LA 86139, and LA 86148 were selected because they reflect the range of assemblage variability for the OAS sites. The variables included in the test were primary, secondary, decortication secondary and biface flakes, and tools. The data were taken from the All Sites Data Base (Appendix IV). The test was a 6-by-5 contingency table with 20 degrees of freedom conducted at the .01 significance level with a critical value of 37.5662. The test resulted in a chi-square value of 272.5788, rejecting the null hypothesis that the five assemblages were homogeneous. Obviously, the chi-square test revealed considerable variability between the components. LA 83698 had significantly more biface flakes than expected (adjusted residual 8.81) and significantly fewer primary and decortication secondary flakes (adjusted residuals -5.54 and -9.46). This site appears to be a reoccupied hunting camp or it was used by a larger group than those who occupied the OAS long-duration sites. LA 85667 and LA 85622 have higher than expected primary flake counts (adjusted residuals 5.18 and 3.25), higher than expected decortication flakes (adjusted residuals 2.17 and 6.46), and lower than expected biface flakes (adjusted residuals -2.10 and -4.13). These patterns are similar to LA 84787.4, except for the primary flake counts. LA 85667 and LA 85622 have lower artifact counts than LA 84787.4 and may have been occupied for a shorter length of time resulting in less intensive core reduction and higher primary flake counts.

Assemblage variability for Las Campanas Archaic period sites demonstrates differences in technological organization. These differences reflect residentially mobile and logistically organized subsistence strategies. Variability is attributable to different lengths of occupation and different emphasis on core and biface reduction and tool use. The technological data indicate different site types and variability within site types.

Chipped stone technological data provide an indirect measure of subsistence activities and site function. Other indirect indicators are ground stone, feature morphology and condition, and distribution of features and artifacts. Direct evidence, in the form of charred floral and faunal remains, provides a better indication of subsistence. However, direct evidence of subsistence activities was rare, though initially the deposits seemed to have great potential.

At least one hearth was present at each of the long occupation sites, except for LA 86148, and one of the short occupation sites, LA 86139, had a hearth remnant. Ethnobotanical samples were collected and analyzed with poor results. None of the hearths from LA 84787.2, LA 84787.3, LA 84787.4, and LA 86139 or the hearths, pit structure, roasting pits, and undifferentiated pits from LA 84758, yielded a single charred non-wood economic plant taxon (see Toll and McBride, Appendix III). Samples were recovered from features of varying size, depth, and condition. Many features from LA 84758 were heavily burned and used with fire-cracked rock, while features from LA 84787.2, LA 84787.3, and LA 84787.4 were less intensely burned. Poor preservation of charred plant remains is a recurrent pattern for Archaic period sites in the Santa Fe area. Unsuccessful attempts to improve recovery rate included fine screening of soil in the field and 10 to 15 liters of samples collected from thermal features for water screening. It has been suggested by Glenna Dean (see Toll and McBride, this volume) that plant processing may have been a minor function of the thermal features. This is based on the assumption that plant processing would result in the discard of unused parts or spills during processing, thereby leaving charred seeds in or around the processing feature. The presence of numerous manos and metate fragments from LA 84787.2, LA 84787.4, and LA 84758.2 indicate that plant processing was an important activity. This observation is further supported by the high incidence of utilized flakes with edge angles ranging between 40 and 60 degrees. Without the charred plant remains, what was processed cannot be determined, and all plant processing evidence is circumstantial.

Another indicator of plant processing might be the morphology of the thermal features. Binford (1983:157-158) has suggested that outdoor cooking hearths or hearths that require frequent access may be shallow and tend to expand with increased use. Interior hearths used for heating or light cooking or processing are more contained. Using this dichotomy between shallow processing features and deeper heating-cooking features, the majority of the Archaic period features would be similar to interior heating-cooking features. The hearths from LA 84787.3 and LA 84787.4 are small and deep relative to their circumference. The oval-shaped thermal features from LA 84758.2 and LA 84787.2 tend to be relatively deep with steep sides, which would have impeded removal of cooked or processed foods. Therefore, plants or seeds were not processed by placing them into the pit, reducing the probability that charred parts would be left behind. It is also possible that all plant parts were consumed, an observation that is supported by the low charcoal counts recovered from these features.

The ground stone artifacts provide limited additional indirect evidence of plant processing. Their presence always is used to infer plant processing, but observations on the range and intensity of plant processing requires complete metate specimens. Few complete specimens were recovered from the Archaic period components. Basin and slab metates are most common on Archaic period sites. The majority of the Las Campanas Archaic period metates were basin-shaped and undifferentiated. Basin-shaped metates are associated with seed or nut processing, as are slab metates. No Archaic period slab metates were identified, but it is probable that most of the shallow basin metates started as slabs and the basin-shape resulted from use. Ground stone suggests that plant processing occurred. The abundant ground stone fragments on LA 84758.2, LA 84787.2, and LA 84787.4 suggest that plant processing was an important activity, even though there was no direct evidence of plant processing.

Faunal remains also offer direct evidence of subsistence activities and food consumption. Like the plant remains, faunal remains were scarce. Only LA 84758.2 and LA 84787.2 yielded animal bone (Mick-O'Hara, Appendix II). The 18 animal bones recovered from LA 84758.2 were from small, medium, and large mammals. One identified large mammal was *Odocoileus* sp. The deer bone could have been intrusive since it was recovered from upper fill west of the pit structure. Evidence for different intensities of burning of animal bone suggested meat roasting and camp maintenance. The 33 animal bones recovered from LA 84787.2 were mainly from small mammals, such as cottontail rabbit, jack rabbit, prairie dog, and woodrat. Predominance of small mammals and the absence of large mammals indicates total reliance on small mammals. This may relate to the season of occupation, when deer herds were outside the daily foraging range. Evidence from both sites suggests that small mammals were the primary meat source. This pattern might account for the low incidence of formal tools used for butchering and large-game hunting.

Archaic period sites can be classified into a restricted range of types. However, within this restricted range there is considerable variability that relates to the length of occupation, occupation history, subsistence activities as inferred from direct and indirect evidence, and different aspects of the Archaic hunting and gathering adaptation.

Archaic period sites have been classified as base camps, extraction loci, special activity sites, and logistical sites. These site types may reflect the different aspects of residential or logistical mobile settlement and subsistence organization. Residential mobility is the frequent movement of residential camps to the critical resource locations in response to resource abundance, distribution, and maturation or migration schedules (Binford 1980; Ebert and Kohler 1988). This strategy would have been employed in areas of patchy resource availability, but predictable distribution of critical resources. Most resources are available within daily foraging ranges, and when they are not available, a new residential location is selected. Logistical mobility displays fairly stable residential site location near critical resources. Other critical resources outside the daily foraging range are obtained by temporarily moving to and collecting the resource and returning to the residential camp (Binford 1980; Ebert and Kohler 1988). This strategy would be employed where resources are distributed differentially across the landscape, but critical resources were restricted to a few locations within a potential seasonal range. Depending on the season and resource distribution, Archaic populations may have employed both strategies.

The OAS Las Campanas Archaic period sites reflect logistical mobility with base camps occupied for relatively long periods and special activity sites reflecting brief hunting or gathering episodes. The long occupation components, LA 84758.2, LA 84787.2, LA 84787.3, LA 84787.4, and LA 86148, have restricted, but fairly dense, discard patterns focused near thermal features with mixed formal and expedient chipped stone tools and grinding implements. The artifact assemblage combined with limited faunal data suggest that a broad spectrum of plants and animals were procured, processed and consumed, but at low intensity, such as would result from single family consumption and needs. There is little evidence of a technology geared to mobility and processing and consumption of specialized foods and resources. LA 86148 may be the best example of a base camp for a residentially mobile group with higher frequencies of biface reduction debris, bifacial core reduction, use of biface and core flakes, and angular debris as tools and the evidence for more restricted subsistence. LA 84758.2 is at the other end of the spectrum having a pit structure, intramural and numerous extramural features, and associated with fire-cracked rock tools and ground stone. This is a well established base camp in a protected area with interior living space necessary for cold weather occupation. It has evidence of long-term occupation and reoccupation. LA 84787.2, LA 84787.3, and LA 84787.4 represent generalized base camps with occupation debris concentrations, small thermal features, and implements and waste from hunting and gathering. This generalized pattern suggests a single family base camp occupied during a season of relatively high resource availability and diversity. No one activity was focused on and the toolkit suggests that all productive, processing, and consumptive activities could be supported. These assemblages exhibited a strong similarity to Pueblo period sites because of the emphasis on generalized tool production and support for daily foraging activities.

Two short occupation components, LA 84787.1 and LA 86139, have characteristics of base camps and special activity sites. They have low frequency, moderate density assemblages with relatively high proportions of tools or tool manufacture debris. Both have a few pieces of ground stone and LA 86139 had a deflated hearth remnant. The artifact assemblage composition for these components is suggestive of a residentially mobile pattern with a high resolution between activities and discard. Furthermore, LA 86139, has a high percentage of nonlocal material indicating portable cores or blanks were brought from the Jemez Mountain and Pajarito Plateau sources areas. Curation of raw material is a predicted consequence of a logistically organized strategy (Kelly 1988). The characteristics of these two components reinforce the interpretation that Archaic period site types correspond with mobility and subsistence models, but there is considerable internal variability.

The smaller-size and shorter occupation Archaic period components, LA 84775.1 and LA 98690.5, represent different facets of foraging and hunting. These low frequency, low density components have high resolution among the activities and discarded artifacts. Artifacts from LA 84775.2 suggest that it is a successful hunting camp. Light butchering resulted in a few task-specific artifacts. If the projectile point had not been present, the component could not have been assigned to the Archaic period. LA 98690.5 lacked formal tools or subsistence evidence from the deflated hearth. The low frequency of artifacts suggests the stay was brief and may have been related to travel from a logistical camp to a residential base camp.

Archaic period site function and type suggest that the Las Campanas area was inhabited seasonally, but never intensively. Most occupation occurred during seasons when resources were abundant and diverse. Critical resources such as food and fuel were available in the immediate area. Small game were most commonly hunted and could have been found throughout the piedmont area without traveling great distances. Logistical hunting is indicated by tool manufacture debris and discard, but there is little evidence of large game consumption. Water, which was probably a major factor conditioning settlement location and duration, must have been available as a spring or in the nearby Arroyo Calabasas, Arroyo de los Frijoles, and Cañada Ancha.

The Archaic period land tenure pattern was fluid and flexible. Occasional reoccupation of sites or proximate location of components suggests that periodically, conditions on the piedmont were conducive to the hunter-gatherer lifeway. Overpopulation was not a problem and movement in and out of the Las Campanas-Santa Fe River Valley region was accomplished easily and without dispute. Low site frequencies for the Archaic and early Pueblo periods suggest that the Santa Fe area was freely used for hunting and gathering. In poor times, the small groups moved to more suitable and productive locations. Archaic period mobility may have been heavily conditioned by the resources of the Rio Grande and its major tributaries and the distribution of the high country big-game herds of the Jemez and Sangre de Cristo Mountains.

Pueblo Period

Pueblo period sites typically have been divided into five or six functional categories based on artifact assemblages, presence or absence of features and their morphology, and presence or absence of architecture and its size and construction. These site types include habitation, fieldhouse, gathering site, hunting site, religious site, and other. There is much internal variability demonstrated within these classes conditioned by group size, occupation length, and occupation history, among other variables. There is also potential for considerable overlap between similar classes, such as habitation and fieldhouse or fieldhouse and gathering site (Sebastian 1983; J. Moore 1989). Distinguishing between site types may be further complicated by reuse. Fieldhouses may be reused as gathering camps and vice-versa. Internal class variability, overlapping characteristics, and potential reuse underscore the obvious complexity of Puebloan subsistence and settlement strategies and resultant archaeological patterns.

No Pueblo period habitation sites were recorded in the Las Campanas area, fueling the assumption that Pueblo period subsistence and land-use activities were primarily daily or overnight. Agricultural and foraging activities that were diurnal or overnight may be difficult to detect in the archaeological record (Sebastian 1983).

At least five temporal use patterns have been suggested for Puebloan fieldhouses and can be summarized (B. Moore 1979). Daily use would entail returning to the village most nights or occasional overnight stays. Distance to fields would condition the practicality of this strategy. Biseasonal use would require occupation during planting and harvesting, with occasional visits for field maintenance. Late season fieldhouses would be used as the crops mature and harvesting occurs. Sporadic refers to visitation as needed for maintenance. Continual use would be a steady occupation throughout the growing season. Sebastian suggests that daily or sporadic sites would have the least elaborate structures and the lowest rate of refuse accumulation (1983:406). These two patterns seem most probable if any of the Las Campanas sites were field locations.

Daily and sporadic use patterns could have supported agriculture in the Las Campanas area. As travel distances increase beyond a 5 km round trip, however, the feasibility of a daily use strategy decreases (B. Moore 1979; Sebastian 1983:406-407). More distant fields that were supplementary to the primary fields along the Santa Fe River may have been visited sporadically. Ethnographic accounts suggest that daily or sporadic use would have resulted in low frequency accumulations of debris from food preparation and consumption, agricultural tool maintenance, and debris from tool manufacture or core reduction carried out as part of a down-time activity (Sebastian 1983:406). Water bags may have transported water to water jars cached at the field shelters. Accumulation of refuse from regular or repeated use of these locations would have resembled domestic assemblages or continual-use fieldhouses. Periodic or single-use fieldhouses or shelters and foraging sites may be difficult to separate if only ceramics and presence or absence of features are used as distinguishing criteria. Few studies have considered the range of lithic technologies that may have been used. Lithic reduction may be a critical indicator for Las Campanas sites because of the low occurrence of pottery on most sites.

Ethnographic accounts suggest that more often than not, agricultural fieldhouses may have been perishable structures with variable frequencies and diversity of artifacts (Sebastian 1983:404; B. Moore 1979; J. Moore 1989). This means that artifact scatters for single or periodic use field locations may be indistinguishable from gathering locations. Archaeologically, gathering sites have been difficult to classify beyond the most general divisions. Gathering sites are more often classified by what they lack when compared to habitation or fieldhouse sites. Sites that lack architecture, storage features, a suite of thermal features, and complex artifact assemblages are classed by default as gathering or collecting sites or unknown function. Ethnographic accounts for Southwestern groups indicate that gathering sites may accumulate limited refuse and lack characteristics of domestic occupations (Sebastian 1983). Ethnographic references to gathering are brief, do not provide a list of gear, and most often suggest that processing does not occur at the collection point. These historic references to gathering may not be appropriate analogies for prehistoric practices because the introduction of European and American technology would have affected gear and travel time.

Classifying Las Campanas Pueblo period site and components according to functional typologies was difficult. This was primarily due to the lack of habitation and fieldhouse sites as they are traditionally defined. Instead, the sites and components consist of artifact scatters with or without features that are scattered across the landscape, though there is some clustering. Throughout this report Pueblo period sites and components have been interpreted as remnants of a spatially extensive, long duration, foraging strategy. However, limited direct evidence of the foraging activities was recovered. These sites contain a partial record of a 600-year land-use pattern that reflects variability in Pueblo social and economic organization. The question is: What do they tell us about Pueblo subsistence and land use?

Pueblo foraging is viewed as an activity that was secondary to agricultural production, but necessary to provide raw materials for household goods and wild foods to supplement cultivated foods (Wetterstrom 1986). As a secondary activity, foraging is suggested to occur when agricultural activities slowed, were in transition, or they were conducted by folks with limited responsibility to agricultural production or field maintenance (Sebastian 1983; Wetterstrom 1986). This would have put small groups or individuals on the landscape collecting seasonally available resources.

Technology needed to support this low-level subsistence activity would have been expedient. A personal toolkit or gear would have been brought into the field, but produced and discarded at the residence (Binford 1981). Pottery vessels may have been cached in the field for repeated use. Partial vessels may have been included as part of personal gear, and discarded chipped stone tools and debris and pottery discarded in the field may have been recycled (Camilli and Ebert 1992). The archaeological record of such a Pueblo subsistence strategy would consist of many locations concentrated near the most productive resource areas with gathering and processing resulting in a concentration of artifacts or features and gathering resulting in low density artifact scatters and isolated occurrences. Since lithic raw materials were available along the Arroyo Calabasas and Arroyo de los Frijoles, material procurement, core reduction, and tool use may have been closely associated, making it difficult to differentiate expedient tools from unutilized reduction debris. Formal tools would be rare and nonlocal materials would be almost nonexistent since suitable material was available.

Pueblo period sites and components were sherd and lithic artifact scatters and concentrations (Figure 14.4). Of the 55 sherd and chipped stone assemblages, 17 were associated with one or more thermal features. Components with more than 20 sherds were associated with 1 or more thermal features at 10 components, suggesting a slightly stronger relationship between features and sherd concentrations than features and low sherd counts. Ground stone was recovered from 9 of the 29 OAS components. Ground stone and thermal features were associated on 5 of the 29 OAS components, suggesting a weak relationship. The artifact and feature associations display a lack of distinct patterning. Indistinct, weak patterns would be an expected consequence of hundreds or thousands of low intensity, brief foraging episodes. Daily or seasonal strategies would have been adapted to annual changes in abundance and distribution of resources.

Plant gathering and processing sites should have been located in the most productive and abundant areas. Reoccupation or reuse of these areas would be expected. A more extensive pattern with less reuse or construction of facilities would be expected for scattered or less abundant resources. Differences in occupation pattern and activities may be reflected in artifact frequencies and relationships.

Most analyses of site types focus on pottery assemblages and vessel form distributions. Another way to view assemblages is simply as the relationship between two artifact classes, such as pottery and chipped stone. Differences in the distribution and association of chipped stone classes and pottery may relate to the range of activities and site function. A correspondence analysis plot was produced for all Pueblo period sites using NCSS Correspondence Analysis module. Counts for primary, decortication secondary, secondary flakes, tools, and sherds were included. The correspondence plot shown in Figure 14.5 accounted for 86.8 percent of the total variance. The X-axis shows a definite split between components with high sherd counts and components dominated by core reduction debris and tools. This is a strong pattern, accounting for 75.8 percent of the total variance. The Y-axis accounts for 11 percent of the variance and it relates to the core reduction trajectory with cores and decortication flakes and secondary flakes and angular debris closely associated; primary flakes were intermediate. The plot shows some differentiation between material procurement and early stage reduction and middle and late stage reduction. This indicates that the components do not represent a homogeneous or random pattern, and

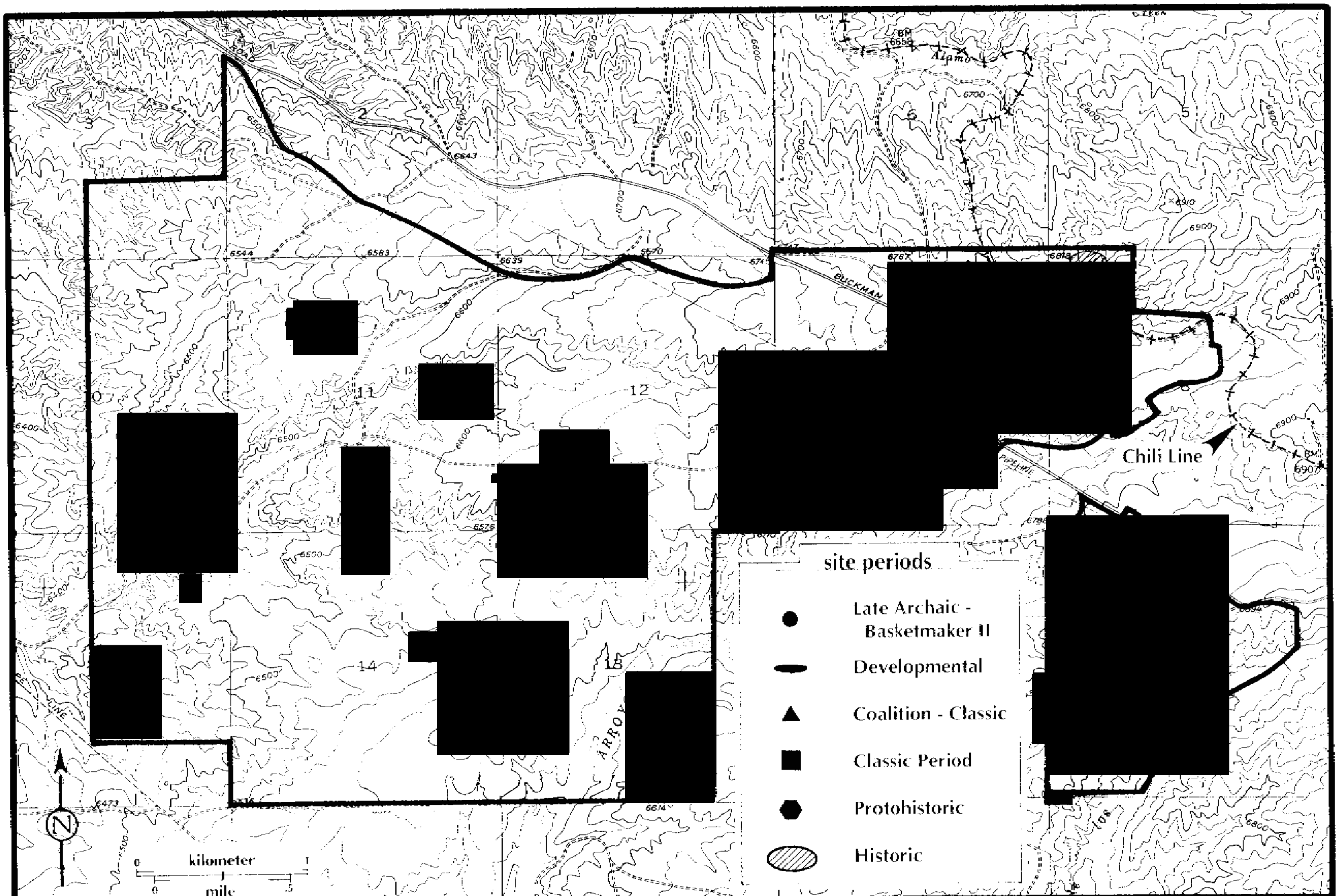

Figure 14.4. Las Campanas Pueblo period site locations.

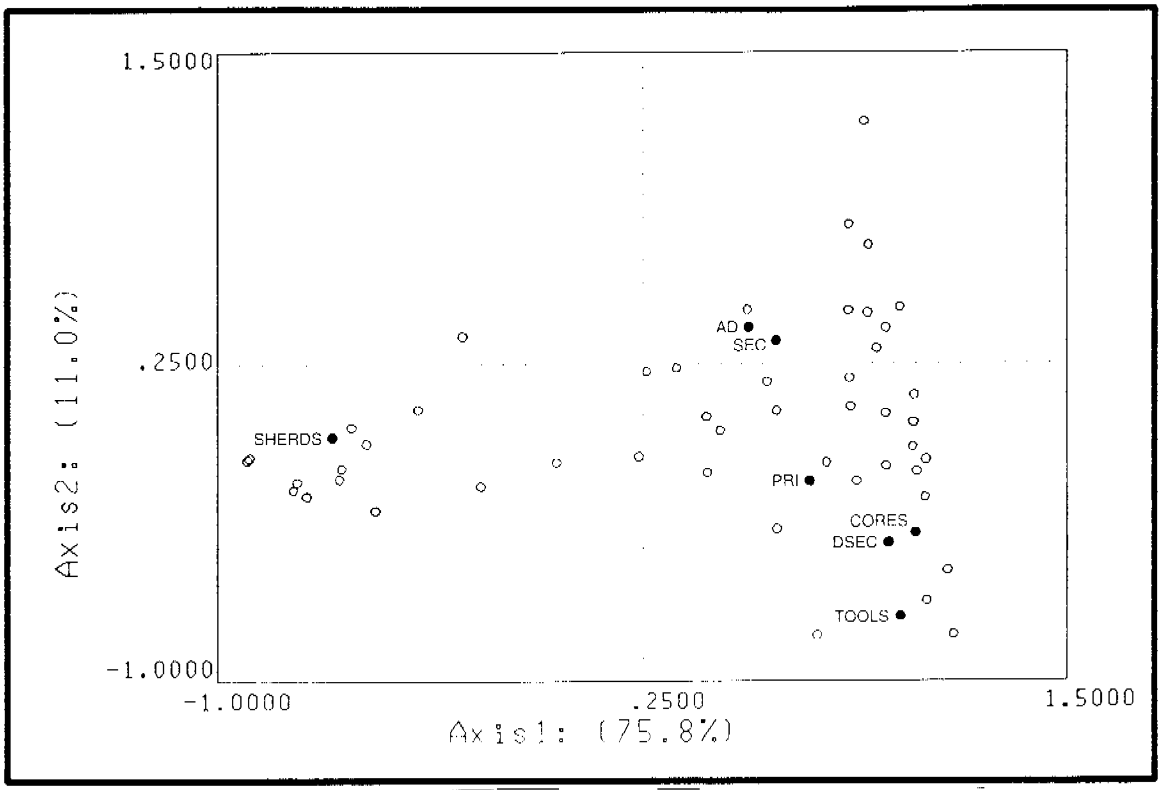

Figure 14.5. Correspondence plot of sherds and lithic reduction classes.

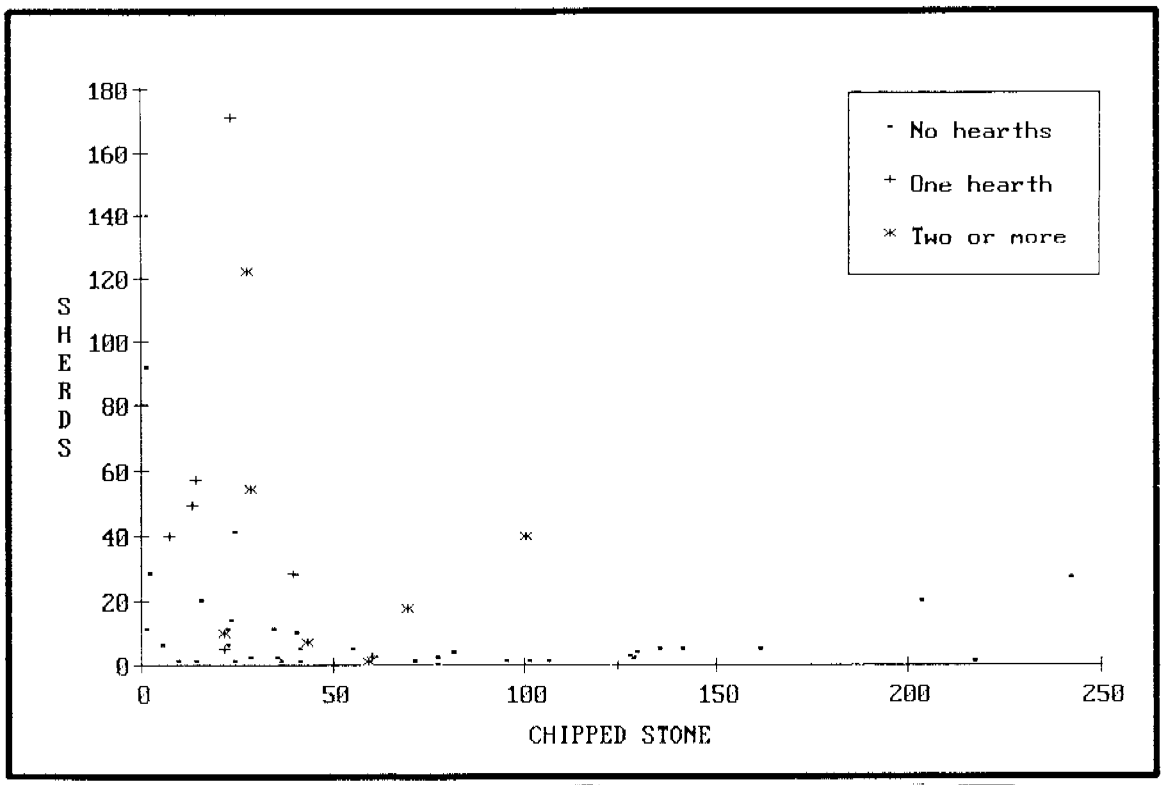

Figure 14.6. Pueblo period sherd and chipped stone counts by feature frequency.

that single or repeated occupations focused on similar activities. Components distributed between the reduction cluster and sherd cluster have increasing numbers of sherds as the points extend to the east. This plot suggest a fairly strong differentiation between components based on sherds counts and may represent two main foraging strategies or different components of landscape use. It is also possible that field locations are represented by components with higher sherd counts and lower chipped stone frequencies. Sherds used as plates or containers for meals could have been brought to the field from the primary residence.

Another perspective on artifact type distribution is shown in Figure 14.6. This scatterplot is of Pueblo period sherd and chipped stone counts by feature frequency. The two kiln components, LA 86159.1 and LA 84793, and LA 98868.2 and 3 are not included in this plot because they have unusually high sherd frequencies and are recognized as special activity sites. LA 85008, 85551, LA 85544, and LA 85570 have been culled because they have much higher chipped stone counts than the norm. By removing these obvious outliers, the scale is decreased and resolution is increased for examining the smaller site and component patterns. The scatterplot shows a strong inverse relationship between sherd and chipped stone counts (r = -0.25. The highest chipped stone counts are associated with low sherd counts. High sherd counts are associated with low to middle range chipped stone counts. Feature distribution shows no strong patterning, but the majority of components with one or more features tend to have more than 20 sherds and less than 60 chipped stone artifacts. Except for LA 86159.2 and LA 84759.2, most of the sites with more than 100 chipped stone artifacts lacked features, and only LA 85544 and LA 85606 had more than 20 sherds. This suggests that activities most reliant on material procurement and chipped stone tools did not require containers or formal hearths or thermal features. By the same token, sites with less than 100 chipped stone artifacts showed a much wider spread of sherd counts and thermal features. This pattern is partly influenced by the division of OAS sites into smaller components, which reduced feature and artifact counts, but it also suggests that activities requiring hearths also required chipped stone and pottery, though intensive core reduction and tool production was rare. The two exceptions, LA 86159.2 and LA 84759.2, were special activity sites; LA 86159.2 resembled a hunting camp and LA 85759.2 resembled a domestic occupation site.

Pottery was recovered or recorded on 55 sites, but typological and functional data are available only from OAS sites and four SAC sites, LA 84764, LA 84783, LA 84785, and LA 85011. Pottery was used to identify five Developmental period components, LA 84764, LA 86147, LA 86150, LA 98688.2, and LA 98687. All four components had fewer than 10 sherds and all were from jars, except one bowl from LA 84764 had a bowl represented. Jar sherds may represent water storage or transportation. The low counts suggest the sherds were from partial vessels that were brought into the field as temporary food containers. None of the sherds were directly associated with features. LA 84764 and LA 98688.2 were mixed with Coalition or Classic period assemblages.

Coalition period components show a heavy bias toward bowl sherds, which reduces vessel form diversity as a discriminator of site function. Sherd counts from Pueblo period sites in general can be compared with chipped stone classes to examine assumptions about relationships between reduction and procurement and tool use and pottery.

Correspondence analysis shows an inverse relationship between chipped stone and ceramics. But does this pattern hold true for sherds and individual chipped stone artifact types? A correlation matrix of sherds, primary, decortication secondary, secondary, and biface thinning flakes, angular debris, cores, tools, and all chipped stone statistically illustrates the inverse relationship between sherds and all chipped stone types (Table 14.3). An increase in sherds is not positively correlated with any of the chipped stone artifact classes. This indicates that sherds or pots were used differently and accumulated independent of chipped stone.

To further examine relationships between sherds and specific chipped stone classes, cores and tools were plotted with sherd counts. Cores and tools are considered two of the best indicators of reduction strategy and chipped stone use.

Cores and sherd counts were plotted with the assumption that high frequencies of cores represent earlier stages of reduction and may reflect proximity to a source. Material procurement would not require domestic implements and likely occurred as an individual was heading to a field location or gathering site or picking up raw material for use at the village. Figure 14.7 shows no strong relationship between high core

Table 14.3. Pearson's Correlation Matrix for Sherds and Lithic Reduction Classes for Pueblo Period Components

	Sherds	Primary	Secondary	Decort. Secondary	Biface flakes	Angular Debris	Cores	Tools	Chipped Stone
Sherds	1.000	-.137	-.289	-.127	-.129	-.288	-.198	-.032	-.251
Primary	-.137	1.000	.560	.865	.010	.399	.856	.119	.796
Secondary	-.289	.560	1.000	.586	.459	.650	.517	.281	.881
Decort. Secondary	-.127	.865	.586	1.000	.003	.406	.871	.170	.829
Biface Flakes	-.129	.010	.459	.003	1.000	.179	-.016	.343	.345
Angular Debris	-.288	.399	.650	.406	.179	1.000	.409	.253	.706
Cores	-.198	.856	.517	.871	-.016	.409	1.000	.145	.769
Tools	-.032	.119	.281	.170	.343	.253	.145	1.000	.439
Chipped Stone Count	-.251	.796	.881	.829	.345	.706	.769	.439	1.000

counts and low frequencies of sherds, which is borne out by the Pearson's r-value of -.198. Generally, components or sites with 20 or fewer sherds have fewer than 10 cores. The instances where 20 or more sherds and more than 10 cores occur suggest moderate sherd counts may occur in probable material procurement settings. Material procurement was bundled with other activities and was rarely the only activity on a Pueblo period site. In contrast, sites or components with more than 30 sherds usually have fewer than 6 cores. This suggests that sites with higher sherd counts are located away from primary material sources and cores are brought in fewer numbers or they are more completely reduced.

Sherd to tool frequencies were examined because higher frequencies of tools are often assumed to indicate hunting and gathering activities rather than low level consumption, which would have occurred at daily or sporadic-use fieldhouses. Similar to the core-sherd relationship, there is an inverse relationship between sherds and tool counts as shown in Figure 14.8 and indicated by the Pearson's r-value of -0.032. This is a weaker negative correlation than is present for other chipped stone classes and sherds. This suggests that tool and sherd counts were unrelated. Except for three sites with more than 20 sherds and more than 10 tools, sites with sherd counts of 20 or greater have 10 or fewer tools. This suggests that high frequencies of tools are not associated with consumption or processing activities. Therefore, high frequencies of tools may be good indicators of hunting and gathering.

These analyses demonstrate a weak or inverse relationship between sherds and chipped stone counts and classes on Pueblo period sites. Sherds and chipped stone did not accumulate at a regular rate relative to each other. In most cases, high frequencies of sherds did not mean high chipped stone counts. This pattern may be due to many factors, including proximity to chipped stone raw material sources, continual movement of sherds or partial vessels across the landscape, and the transport and use of low numbers of whole or partial vessels at certain types of foraging sites, such as for wood or yucca fiber gathering. As sherd counts increased, so did the occurrence of sites with one hearth and 20 to 50 chipped stone artifacts, indicating the more generalized support of foraging activities or perhaps the sporadic use

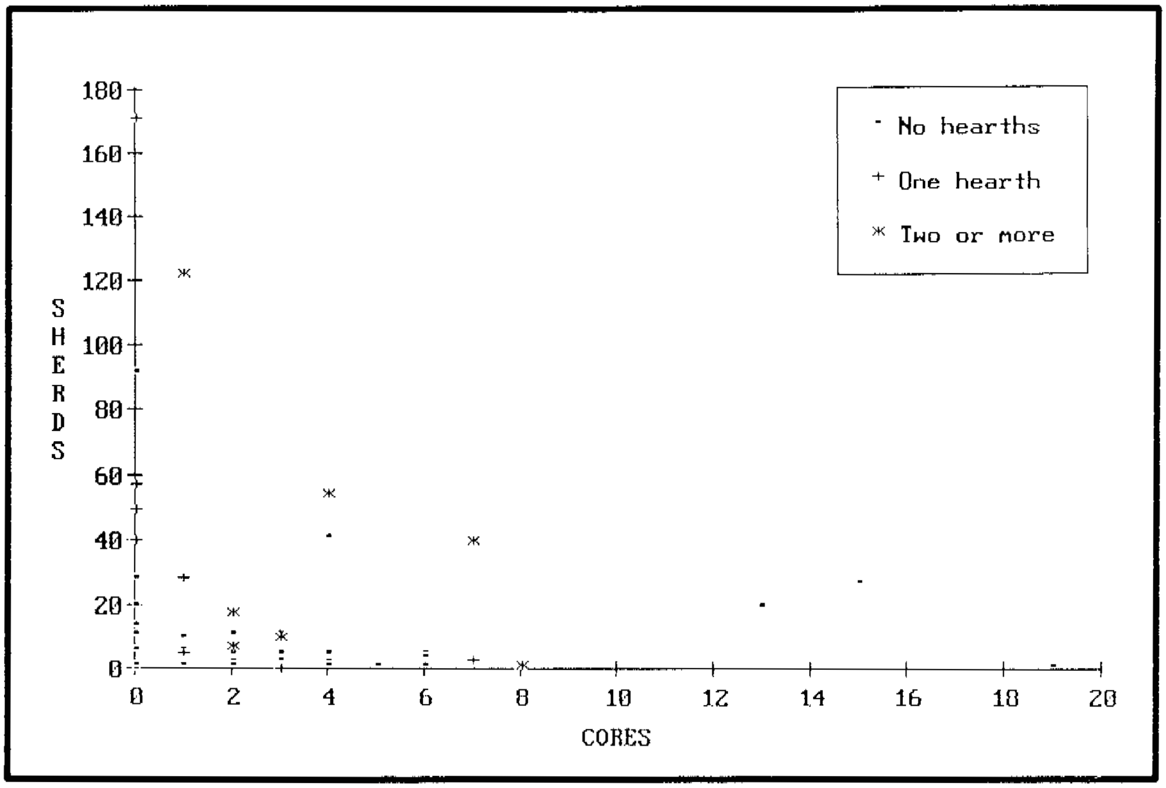

Figure 14.7. Pueblo period sherd and core counts by feature frequency.

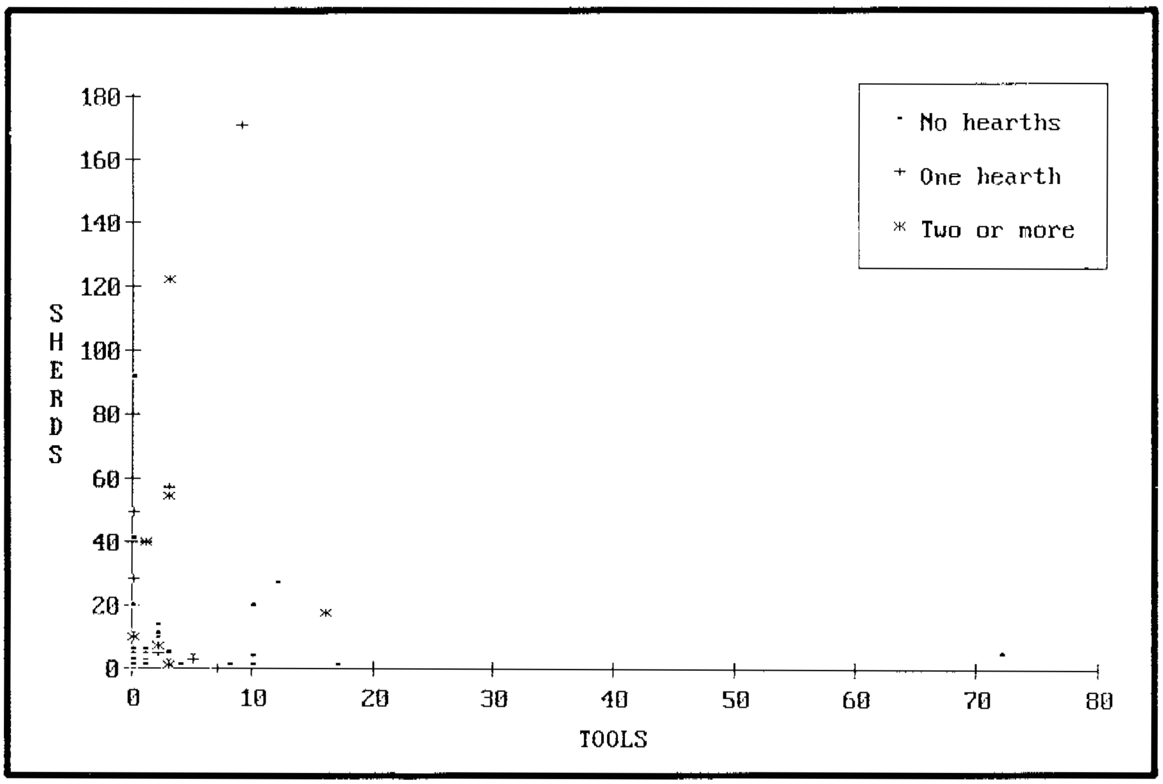

Figure 14.8. Pueblo period sherd and tool counts by feature frequency.

of fieldhouses.

From 20 Coalition period components, 1,199 sherds were analyzed, of which only 7 were jar sherds. Three more jar sherds were recorded at LA 98683 during the OAS inventory and they were associated with a shallow hearth or roasting pit (Post 1992:45). For Las Campanas Coalition period components, jar sherds are poor indicators of site function and contributed little to the extra-village technological repertoire (Schlanger 1992). Low decorated jar sherd counts are well-documented for village assemblages from most of the Upper Middle Rio Grande. Factors contributing to the low occurrence of decorated jars are not well understood. This pattern does not conform to the demonstrated patterns described for the Cibola and Mesa Verde regions during the Pueblo II and Pueblo III periods. In those regions, decorated jar sherds are common and were an important part of village and small site vessel assemblages (Sebastian 1983).

Utility jars are abundant in all village assemblages from Arroyo Hondo Pueblo, Agua Fria Schoolhouse, Pindi Pueblo, Pueblo Alamo, and Cochiti Dam sites. Yet Coalition period utility jar sherds or partial vessels were virtually nonexistent on Las Campanas sites or as isolated sherds (7 percent of all isolated sherds). Utility jars were the pottery vessel of choice at the village sites, but Santa Fe Black-on-white was used almost exclusively in the field. The absence of utility jars and the limited evidence of cooking on Santa Fe Black-on-white bowl sherds suggests that cooking and food processing were a low priority. These patterns would be consistent with daily or sporadic-use field shelters or diurnal foraging.

A total of 1,192 of the Santa Fe Black-on-white bowl sherds were recovered from OAS excavated sites. Of these sherds, 852 or 71 percent were recovered from the two pottery kiln components, LA 84793 and LA 86159.1. The remaining 340 bowl sherds arrived in the field as sherds and partial vessels. Bowl sherds occurred as isolated artifacts with chipped stone scatters on ridge tops and slopes without features, suggesting that in some instances that they were part of the foraging toolkit, but probably were not used as containers. Santa Fe Black-on-white sherds were common isolated occurrences throughout the Las Campanas area, accounting for 42 percent of all isolated sherds. Concentrations of 10 or more bowl sherds were recovered from six components with at least one thermal feature. Two features were pottery kilns. The remaining features may have been combination roasting or cooking pits as suggested by their oval shape and shallow depth. Sherds were rarely sooted or recovered from within features, suggesting that they were not used as cooking vessels. Some sherds were used as scrapers, and bowl rims are relatively common, suggesting the sherds could have been scoops. Bowl sherds were recycled between components on the same site and they may have moved across the landscape as raw material and tool sources. The lack of variety in the vessel forms combined with low sooting frequency suggest sherds were tools and not containers associated with domestic activities, such as would have been used to support overnight or seasonal fieldhouses.

The Classic period components from OAS sites LA 98688.1, LA 98688.2, LA 98688.3, and LA 84759.2 and SAC sites LA 84783 and LA 84785, have pottery assemblages of decorated jars and bowls and utility jars. The assemblages are similar to assemblages recovered from fieldhouses along the Caja del Rio (Snead 1995) and at Cochiti Reservoir (Biella 1979). The small assemblage from LA 84759.2 reflects a single occupation with a domestic component. The LA 98688 components are accumulations from multiple occupations between A.D. 1400 and 1450. LA 84783 and LA 84785 are primarily multiple occupation sites dating between A.D. 1350 and 1600. Classic period village assemblages display a similar vessel form assemblage to the small site assemblages. With the advent of glaze-paint pottery, decorated jars were produced and they appear on the landscape at the small sites. Seven of the 22 vessels identified from LA 98688 and five of six vessels from LA 84759 displayed primary function use wear or post-firing modification. This high frequency of use wear suggests intensive use of pottery and the transport of used pottery from village sites to the field. The use wear and post-firing modification suggest planned technological organization in support of domestic activities. These Classic period assemblages are similar to fieldhouses excavated at Cochiti Reservoir (Biella 1979). These sites had vessel form assemblages of decorated bowls and jars and utility ware jars. Sherd frequencies were low, such as is evident of LA 84759.2, but vessel forms were diverse. Similarities between the LA 98688.2 and LA 84759.2 and the Cochiti Reservoir fieldhouses are strong enough to classify the OAS sites as fieldhouses.

Chipped stone debris and tools were the most abundant artifact type found in the Las Campanas area. From the Pueblo period components, an average of 63 chipped stone artifacts was recovered or recorded. Material procurement, core reduction, and tool production debris combine with discarded formal and expedient tools to provide a record of some of the site or component activities. The chipped stone site and OAS synthetic analyses demonstrate that the patterns are rarely clear-cut and that considerable mixing of reduction strategies and tool use and discarded occurred at Pueblo period sites. Even with the mixing of deposits from reuse or multiple occupation, chipped stone distributions can be used to refine site or component function.

The chipped stone data from the OAS and SAC excavations have been combined into a Pueblo period data set. All but one site or component were included in the correlation matrix already shown in Table 14.3. LA 98688.2 was excluded because it has an unusually high frequency of sherds and lithics. OAS data were reworked to fit the SAC analysis reduction categories. Tools were the combined total of formal and expedient tools identified on a component. Combining the two tool classes obscures some of the variability that might lead to further subclasses of site types, but allowed identification of strong patterns resulting from high tool counts relative to other artifact classes. The chipped stone classes examined were primary, decortication secondary, secondary, and biface thinning flakes, angular debris, cores, tools, and all chipped stone.

The correlation matrix data provide support for the pattern observed in the correspondence analysis plot (see Fig. 14.5). There are strong linear relationships between artifact classes that result from similar stages of core reduction or tool production. Material procurement or early stage core reduction is represented by primary and decortication flakes and cores. Primary and decortication flakes have a Pearson's r of .87. Primary flakes and cores have a Pearson's r of .86. Cores and decortication flakes have a Pearson's r of .87. These values indicate that primary and decortication flakes and cores increase in a linear fashion, so that as core counts increase so do primary and decortication flakes. This pattern is consistent with an emphasis on material procurement and core reduction such as would be expected from a quarry or lithic procurement site. Quarry and lithic procurement sites should have higher proportions of primary and decortication flakes relative to secondary flakes and angular debris.

Material procurement and early stage core reduction debris always occur with late stage core reduction debris, and usually with a few tools. Sites cannot be identified as material procurement locations based only on primary and decortication flake counts, but should be examined relative to secondary flakes and angular debris. A reduction index of total primary and decortication flakes divided by total secondary flakes and angular debris provides a measure of early and late stage reduction. Figure 14.9 shows the reduction index plotted against total chipped stone counts for Pueblo period sites and components minus LA 98688.2. An inverse relationship is shown between chipped stone counts and the reduction index. As the chipped stone count decreases, the reduction index favors a greater proportion of early stage reduction debris. There are no clear breaks suggesting a natural progression that results in lower proportions of early stage reduction debris as reduction progresses. Seven sites have a reduction index of 1.4 or greater. These sites are the best possibilities for lithic procurement areas, four sites have hearths suggesting mixed activities. The three sites with the highest chipped stone count and early stage reduction focus are separated by 1.6 km (1 mi) along the Arroyo de los Frijoles (LA 85606), near the headwater of a primary tributary of the Arroyo de los Frijoles (LA 85544), and a primary tributary of the Arroyo Calabasas (LA 85008). This spatial distribution suggests that raw material concentrations were spread out. The smaller assemblages with a 1.4 or greater reduction index may represent incidental procurement areas reflecting the wide, but low frequency distribution of raw materials. Two sites, LA 84784 and LA 84785, are primarily Classic or early Historic period sites with relatively low chipped stone counts and 18 and 122 sherds, respectively. Rather than material procurement sites, these may be camp sites along travel routes or logistical gathering sites. Casual reduction of raw materials during a brief occupation would produce low accumulation of reduction debris. Overnight stays are suggested by the presence of decorated and utility wares and one or more hearths.

Mixed reduction strategies are indicated by sites or components with reduction indices between 0.51 and 1.39. These 28 components represent 50 percent of the total components and are widely distributed. The majority of the sites or components are located near the Arroyo

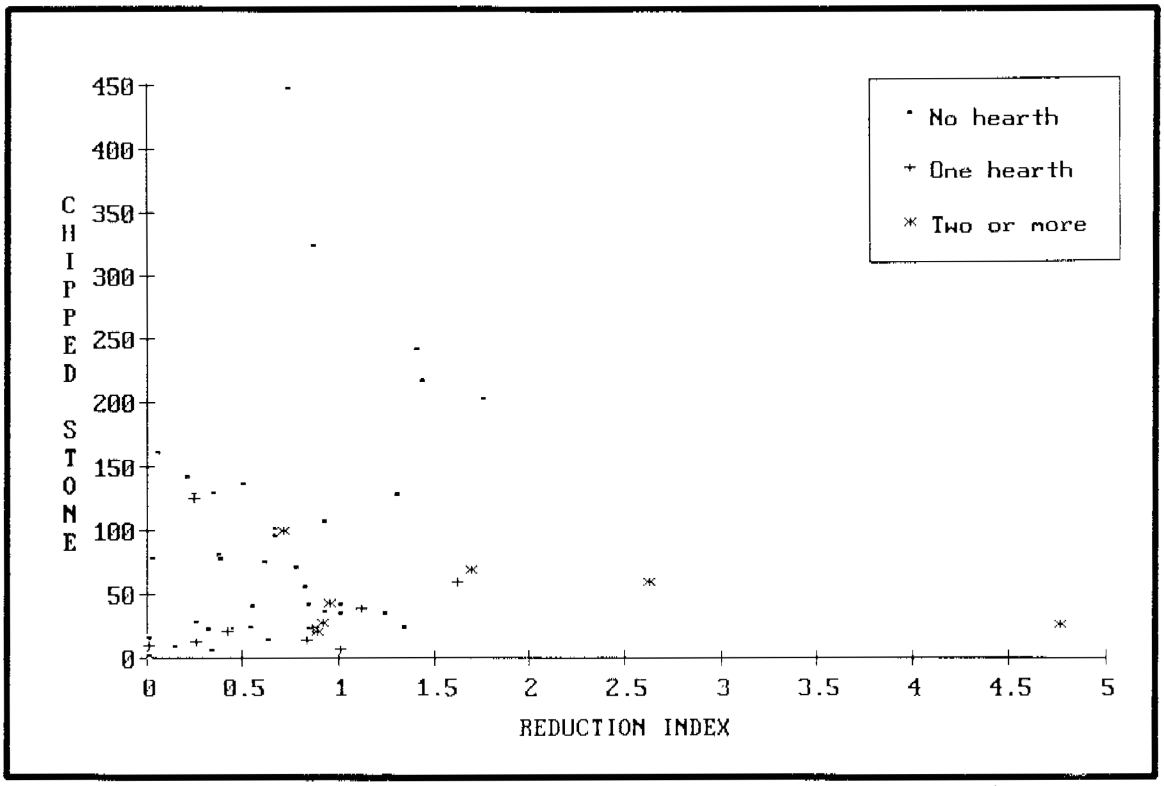

Figure 14.9. Pueblo period reduction index and chipped stone count.

Calabasas or Arroyo de los Frijoles. Proximity to and location on slopes above the major drainages suggest exposed raw material sources during the A.D. 1050 to 1600 period. This site distribution corresponds with the highest concentration of undated sites, which cluster near the major drainages. There is, however, one outlying cluster along an east-west tributary of Cañada Ancha. Mixed reduction components have sherd counts ranging from 1 to 318, although the majority of the components with 10 or more sherds are in the west portion of the project area above the Arroyo Calabasas and along the tributaries of Cañada Ancha. Two sites, LA 98690 and LA 86150, each have at least four spatial components, and a majority have hearths. The chipped stone counts from these components are low, suggesting importation of reduced raw material in support of foraging or collecting activities. Mixed reduction components reflect a full range of occupation history. Single occupations are represented by the low frequency chipped stone assemblages that have hearths and ceramics. Multiple occupations result in increased chipped stone counts, not necessarily more sherds, and the sites may cover a large area.

Late stage reduction strategy is represented by 21 sites and components with reduction index values of .05 or lower. These assemblages have ratios of at least 2 to 1 noncortical to cortical debris. Only three sites occur east of the Arroyo Calabasas and none were along the Arroyo de los Frijoles. Sherd counts associated with these assemblages tend to be low except for a kiln site, LA 86159.1, the LA 98690 components, and LA 98688.2. LA 98688.2 was a mixed component site with predominantly Classic period materials. The intensive core reduction at LA 98688.1 is attributed to repeated occupations and reuse of previously deposited materials. In other words, the site was the raw material source. Other components with low sherd counts may be foraging sites with artifact assemblages reflecting increased distance from the village and the primary raw material sources. Hunting sites have the lowest reduction index values. This pattern is especially illustrated by LA 86149 and LA 84753. These sites had high proportions of noncortical debris, unusually high counts of biface thinning flakes, and LA 84753 had the highest tool to debris ratio of any Las Campanas site.

Pueblo period site function is difficult to assign. Sites consisting of hearths associated with mixed reduction strategy assemblages are widely distributed across the project area. The more generalized site distribution overlaps with areas dominated by early and late reduction stage assemblages. The chipped stone assemblages reflect a continuum of raw material procurement, reduction, and use that could only result from broad-based and relatively long-term exploitation. The raw material procurement sites are mostly located along the major drainages, but even they evidence multiple activities. Mixed reduction strategy sites have a full range of reduction debris and are widely located with respect to major drainages, tributary systems, and potential lithic raw material sources. The only likely fieldhouse, LA 84759.2 (early Classic period), has a mixed reduction strategy assemblage, a diverse, but small pottery assemblage, is located adjacent to the most arable land in the western project area, and is in a sheltered location. No other sites show this combination of attributes. The late reduction strategy sites tend to be located away from the main raw material sources, are increasingly farther from the Santa Fe River villages, and have two sites with assemblages that emphasize hunting. Other specialized activities or strategies in support of long-distance travel or resource procurement are represented by sites with diverse vessel form assemblages and chipped stone assemblages that reflect almost no use of local raw materials to intensive reduction of raw materials left by previous occupants. Although it has been difficult to assign one-dimensional site types to most assemblages, differences do exist that relate to Pueblo subsistence organization and its relationship to the landscape and biotic and geologic resources.

Unknown Period Sites and Components

The unknown period site and component assemblage has 58 cases. Forty-six sites were investigated by SAC and 12 sites or components were studied by OAS. One of the major questions about the unknown sites and components is to what period do they date? Perhaps the best way to address this problem is to compare the technological and functional data with the Archaic and Pueblo period components. One working assumption is that similarity in a suite of assemblage and site structural traits may indicate a similar range of site activities and functions, and by inference, a similar period. The unknown period component data are briefly presented and then compared with Pueblo and Archaic period component assemblages.

Figures 14.10 and 14.11 show Unknown period sites and components by reduction index and size or chipped stone count. The majority of the Unknown period sites cover less than 2,000 sq m. One general trend for size and reduction index is that as reduction index increases toward more cortical debris, site size does not increase. A second trend is that the largest sites tend to have mixed assemblages. Reduction indices range between 0.51 and 1.39. The majority of sites fall within this range, which is a pattern similar to Pueblo period sites. Reduction index by chipped stone count exhibits a dispersed distribution. Sites with more early stage debris (greater than 1.39) tend to have fewer than 100 chipped stone artifacts. These are the limited procurement sites. Sites with a mixed reduction assemblage (0.51 to 1.39) have the widest assemblage count range with more sites with more noncortical debris. Core reduction focused on flake production for tools, although some early stage reduction occurred. These sites were probably repeatedly occupied and each trip contributed small increases in core reduction debris. Late stage reduction (0.5 or lower) is represented by the lowest number of sites. These sites exhibit a spread similar to mixed assemblage sites, but are dominated by sites with less than 100 chipped stone artifacts. These more specialized sites had partly reduced material transported to them or cobbles were incidentally procured and reduced on-site. Generally, the reduction index to chipped stone count distribution is similar to the Pueblo period sites, although the variable ranges for Pueblo period sites tend to be greater.

Generally, the Unknown period sites exhibit patterning that is similar to Pueblo period sites. To further test the visual indicators, statistical comparisons were made with ANOVA tests for Archaic, Pueblo, and Unknown periods, and chi-square tests were performed for Pueblo and Unknown periods. Archaic period components are not included in the chi-square tests because the sample size is too small. Variables that are compared are site size, chipped stone count, and reduction index. The null hypothesis in these tests is that there is no significant difference between periods.

Site or component size reflects the length and

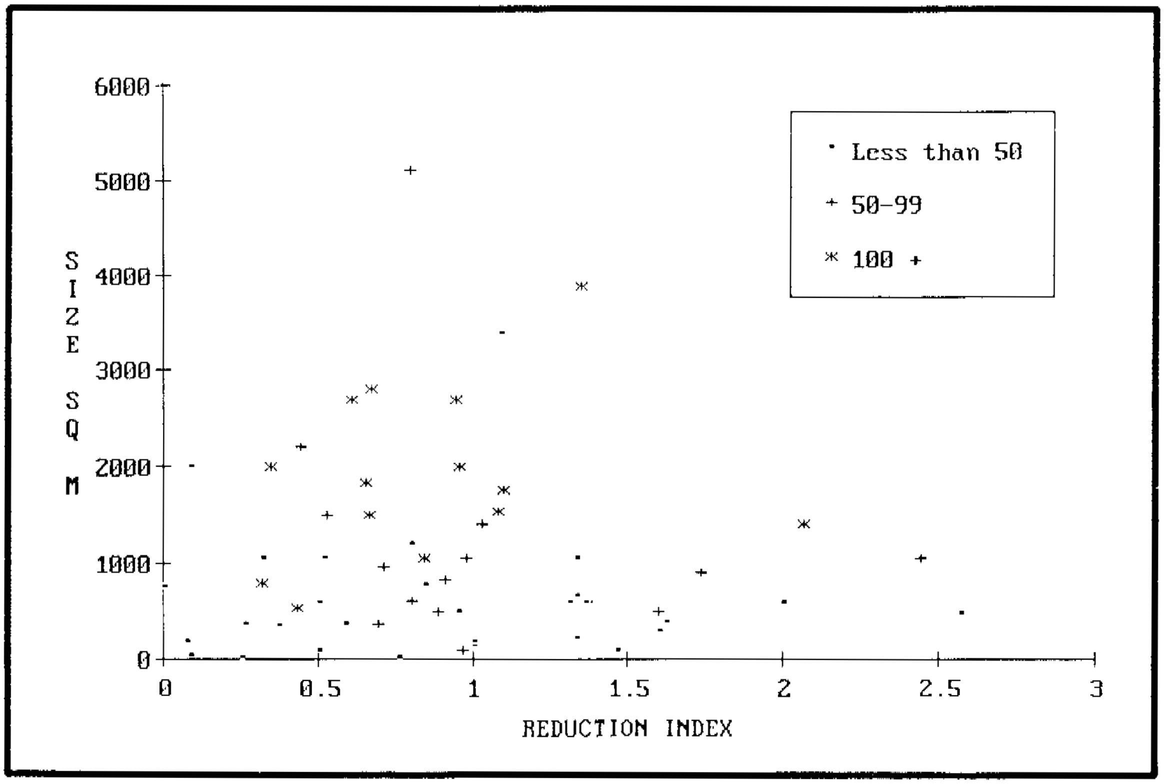

Figure 14.10. Unknown period sites and components by reduction index and size.

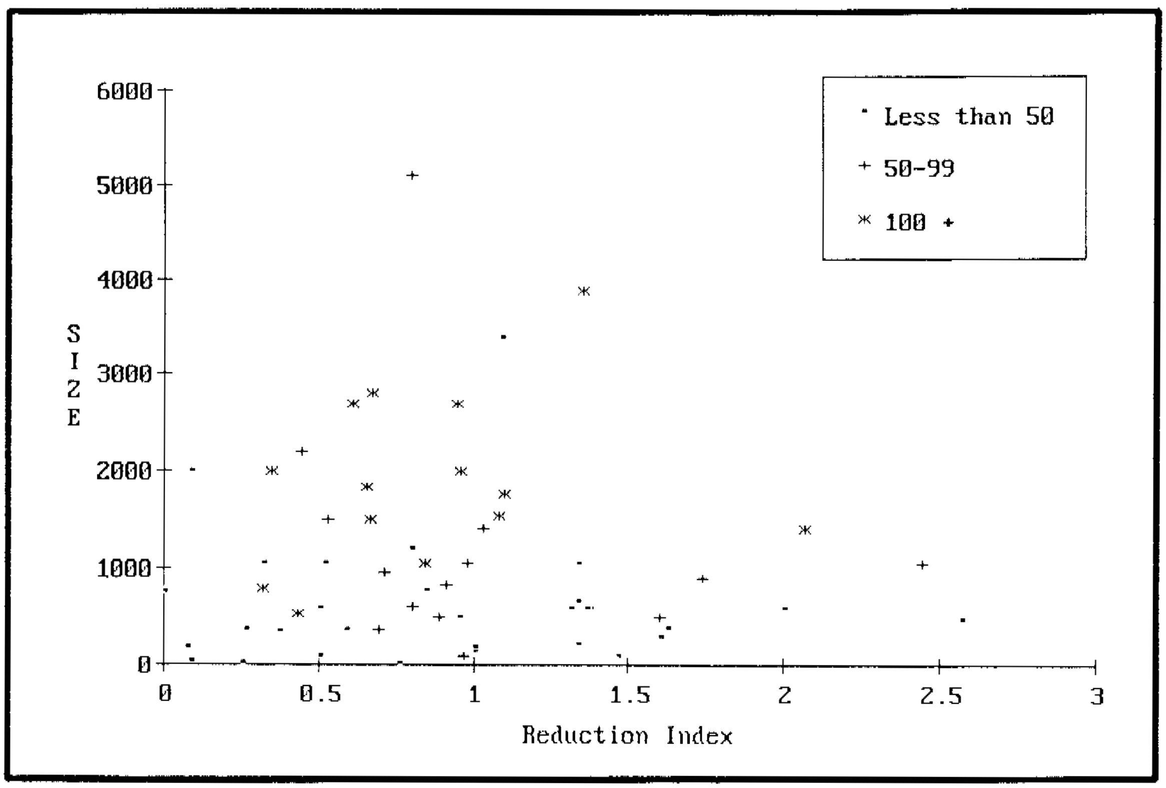

Figure 14.11. Unknown period sites and components by reduction index and chipped stone count.

type of occupation. Archaic period components were primarily residential with activities and refuse limited to a relatively small area. Pueblo components displayed a wider size distribution range reflecting the more generalized nature of the occupation pattern and procurement and subsistence activities. Unknown period sites have wider size ranges than Pueblo components, but have a standard error similar to Archaic components and much lower than Pueblo components (Unknown = 134.05; Archaic = 164.92; Pueblo = 304.16). This indicates that fewer Archaic and Unknown period sites deviate greatly beyond the standard deviation. The ANOVA test showed that Archaic and Unknown components were not significantly different, but both have significantly smaller areas than Pueblo period sites. The wide range in Pueblo component sizes stems from the ability to reduce Pueblo sites to smaller components, which resulted in a much greater size range. Size is probably not a good discriminator of time in this assemblage.

Chipped stone counts showed a remarkable similarity between Pueblo and Unknown period sites and a significant difference between them and Archaic period components (ANOVA test significantly different at the .05 level). This difference can be partly attributed to sample size differences, but it is also due to difference in occupation pattern. Archaic period components were primarily residential occupations, while Pueblo period components were occupied daily or overnight, resulting in less accumulation of occupation debris. The Unknown period chipped stone count distribution is statistically similar to Pueblo period, which was visually apparent in the scatterplots. The null hypothesis is rejected with a significant difference between Archaic and Pueblo and Unknown period sites.

Reduction index showed a similar pattern. Pueblo and Unknown period assemblages were statistically similar, though only Unknown period assemblages were significantly different from Archaic period assemblages (ANOVA test with statistically significant differences at the .05 level). Archaic period assemblages emphasize late stage reduction, while Pueblo and Unknown period sites show a more mixed reduction strategy. Again, this reflects the difference in residential occupation and more intensive reduction of raw materials and greater emphasis on tool production. The Pueblo and Unknown period assemblages reflect repeated, brief visits that would have had a wide range of requirements, result in less intensive reduction, and support a more generalized subsistence strategy. Again, the null hypothesis is rejected; the Archaic period assemblages are different from the Unknown period, and Pueblo period assemblages are similar to both. The difference between Pueblo and Unknown period assemblages is small and probably results from the broader assemblage range that was defined by breaking Pueblo sites into components.

To further test the null hypothesis of similarity between Pueblo and Unknown period sites, three chi-square tests were conducted (Tables 14.4 to 14.6). They were 2-by-3 tables with 2 degrees of freedom, a .05 significance level, and with a critical value of 5.99. The tests were for Pueblo and Unknown period by size, count, and reduction index. Variables were divided into three 33 percentile frequency classes. All three tests failed to reject the null hypothesis. There was no significant difference between the variable classes by period. An examination of the adjusted residuals show that none of the cells from the three tests contributed significantly to the chi value.

Results from the statistical tests strongly suggest that Pueblo and Unknown period sites result from a closely related set of behaviors. Differences can be attributed to the more finely tuned assessment of Pueblo period components, which also reflects the presence of features and highly specialized activities, such as pottery firing. Differences between Unknown and Archaic period components reflect the residential aspect of Archaic occupation. Unknown period site types could not be assigned specific names or classes. They do reflect the generalized pattern that results from a long-term subsistence pattern based on daily or overnight visits to the piñon-juniper piedmont for seasonally available resources. The range of assemblage and site sizes and reduction strategies indicate this was not a homogeneous set of activities, nor were the activities so specific as to result in a restricted range of assemblage characteristics.

Summary

Defining site function and type was far from a simple exercise. An examination of direct and indirect evidence revealed clear differences between Archaic and Pueblo period sites and close similarities between Pueblo and Unknown period components.

Technological data suggest that Archaic and

Table 14.4. Site or Component Size (sq m) by Period

Count Expected Row Percentage Column Percentage Adjusted Residual	Less than 600	600 to 1399	1400 or larger	Total
Pueblo	22 19.9 37.9 59.5 .9	19 17.7 32.8 57.6 .5	17 20.4 29.3 44.7 -1.4	58 53.7
Unknown	15 17.1 30.0 40.5 -.9	14 15.3 28.0 42.4 -.5	21 17.6 42.0 55.3 1.4	50 46.3
Total	37 34.3	33 30.6	38 35.2	108

Table 14.5. Site or Component Chipped Stone Count by Period

Count Expected Row Percentage Column Percentage Adjusted Residual	1-49	50-99	100 or more	Total
Pueblo	30 30.6 51.7 52.6 -0.6	14 12.9 24.1 58.3 .5	14 14.5 24.1 51.9 -.2	58 53.7
Unknown	27 26.4 54.0 47.4 .2	10 11.1 20.0 41.7 -.5	13 12.5 26.0 48.1 -.2	50 46.3
Total	57 52.8	25 22.2	27 25.0	108

Table 14.6. Site or Component Reduction Index by Period

Count Expected Row Percentage Column Percentage Adjusted Residual	Less than .50	.50-1.39	1.40 or greater	Total
Pueblo	12 1.4 20.7 40.0 -1.9	37 33.9 63.8 59.7 1.2	9 7.7 15.5 64.3 .8	48 45.3
Unknown	18 13.6 37.5 60.0 1.9	25 28.1 52.1 40.3 -1.2	5 6.3 10.4 35.7 -.8	48 45.3
Total	30 28.3	62 58.5	14 13.2	106

Pueblo period organization was quite different. Archaic period technological organization focused primarily on production and use of expedient tools made from local material. Utilized debitage was more common than formal tools, such as bifacial knives, projectile points, scrapers, drills, etc. Nonlocal materials occurred as finished products and as debris for core reduction and tool reduction. Local materials occurred as core reduction and tool production debris and utilized debitage, but rarely as formal tools. Logistically organized forays were staged from the Archaic period sites, but only two sites appear to represent logistical or special activity locations. This pattern contrasts with the Developmental and Coalition period pattern of short duration occupations with very low accumulations of chipped stone debris, tools, and pottery. Pottery kilns had the highest proportion of sherds to chipped stone and represent the most identifiable specialized use. Different technological organization is suggested by the inverse relationship between sherds and chipped stone. The higher frequencies of sherds were more commonly associated with thermal features. The Classic period occupations reflect a third occupation pattern. The technological organization was geared to domestic activities, including food storage, processing, and consumption. For all Pueblo period components, core reduction and expedient tool use were common. Specialized hunting camps were rare. The best example is the LA 86159.2 component, which had discarded formal tool fragments associated with a shallow, deflated hearth.

Identification of specific activities or resources was rarely accomplished except on the general level of local lithic raw material use and hunting, gathering, foraging, or processing. Assemblage content and site structure segregated residential Archaic period occupations from Pueblo and Unknown period special activity sites. Variability within Archaic period components reflected length, rate, and possibly the season of occupation. Variability within Pueblo and Unknown period sites reflects the broad-based and long-term use of the landscape by a larger population during the thirteenth and early fourteenth centuries. After the early A.D. 1400s, the Las Campanas area was used for logistical farming (fieldhouses), hunting and gathering, and as a travel route between villages.

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APPENDIX I
PETROGRAPHIC ANALYSIS OF CERAMICS AND CLAY SAMPLES FROM LAS CAMPANAS AND ELSEWHERE IN THE SANTA FE AREA

David V. Hill

Introduction

A total of 60 ceramic samples from ten sites in the Las Campanas area were examined by petrographic analysis. The ceramic samples fall into two groups. One group consists exclusively of Santa Fe Black-on-white from eight different sites, two of which possessed prehistoric pottery-firing features. These sites included LA 84793, LA 86134, LA 86150, LA 86155, LA 86156, LA 85159, LA 98680, and LA 98690. The other groups were derived from sites in the same area where, based on the ceramics present, the major period of occurrence was during the Pueblo IV period. These two sites were LA 84759 and LA 98688.

Two slightly different research programs were conducted for each of the two groups. In the case of Santa Fe Black-on-white, petrographic analysis was oriented towards providing detailed characterizations of the ceramic pastes and comparing the samples within and between the sites.

In addition to the ceramics, six clay samples were examined from the Culebra Lake formation. Analysis was undertaken to see if this clay-rich deposit could have served as a source of raw material for prehistoric potters in the Santa Fe area through the examination of natural inclusions in the clay and comparison with the samples of Santa Fe Black-on-white.

Ceramics from the two Pueblo IV sites were examined to identify the sources of those ceramics based on previous ceramic petrographic work in north-central New Mexico and the extant geological literature. Based on this source information, the origins of the populations that utilized the Las Campanas area could be inferred.

Methodology

The ceramics and clay samples were analyzed by the author using a Nikon Optiphot-2 petrographic microscope. The sizes of natural inclusions and tempering agents were described in terms of the Wentworth Scale, a standard method for characterizing particle sizes. These sizes were derived from measuring a series of grains using a graduated renticle built into one of the microscope's optics. The percentages of inclusions in untempered ceramics were estimated using comparative charts (Matthew et al. 1991; Terry and Chilingar 1955).

Analysis was conducted by first going through the total ceramic collection and generating a brief description of each of the sherds. A second phase created classification groups based on the similarity of the paste and temper between sherds. This process also allowed for the examination of the variability within each grouping. Additional comments about the composition of individual sherds were made at this time. A third phase compared the samples of Santa Fe Black-on-white to samples of clays collected from the Culebra Lake formation. Prior to thin-sectioning, the clay samples were fired to 900 degrees C to stabilize them.

Santa Fe Black-on-White

Santa Fe Black-on-white was examined from LA 84793 (1 sherd), LA 86134 (1 sherd), LA 86150 (7 sherds), LA 86155 (1 sherd), LA 86156 (1 sherd), LA 86159 (5 sherds), LA 98680 (1 sherd), and LA 98690 (14 sherds). In addition, two sherds of undifferentiated white ware with pastes similar to the Santa Fe Black-on-white were also examined petrographically. One white ware sherd came from LA 86150 and the other from LA 86159.

The paste of the Santa Fe Black-on-white sherds from these eight sites was remarkably uniform. None of the sherds contained an added tempering agent. However, differences in the amount and types of natural inclusions in the

Table I.1. Paste Grouping of Santa Fe Black-on-white from Las Campanas

	Paste Group 1	Paste Group 2	Paste Group 3	Paste Group 4	Paste Group 5
LA 84793		7			
LA 86134		8			
LA 86150	9, 10, 11, 12, 14, 15, 16		13		
LA 86155		17			
LA 86156	18				
LA 86159		19, 21, 22, 23, 24		20	
LA 98680					25
LA 98690	27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39	26, 35			

ceramic were used to define two broad compositional groups and three singular specimens (Table I.1).

The largest of the two groups (Group 1) was identified by the abundance of fine to very fine sand constituting between 30 and 40 percent of the clay matrix. Occasional medium-sized sand grains, and less commonly rock fragments, are present in these sherds. Quartz was the dominant mineral observed in these specimens. The quartz grains often display undulose extinction indicating the grains intrusive igneous or metamorphic origin. Feldspars are also present, predominately orthoclase and plagioclase. These feldspars are usually altered to sericite and clay minerals. Also present are fine laths of green or brown pleochroic hornblende. Fine books of brown biotite are also present. The biotite has usually been altered to hematite and clay mineral making this material visible as black opaque laths. Also present in all of the samples were rounded clay pellets. When rock fragments are present they consist of aggregate masses of quartz and feldspar, most likely derived from a granite. These nonquartz inclusions account for less than 5 percent of the paste. Sherds examined during this analysis that make up this group include LA 86150 Samples 9, 10, 11, 12, 14, 15, 16; LA 86156 Sample 18; and LA 98690 Samples 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, and 39.

The other paste grouping (Group 2) within the Santa Fe Black-on-white sample is made up of sherds where the very fine and fine sand makes up less than 20 percent of the paste. These sherds also contain medium-sized sand grains and occasional rock fragments that make up only about 5 percent of the paste. Like the previous group, quartz, often with an undulose extinction, is the predominant mineral in the paste of these specimens. Like the previous set of samples, altered feldspars, hornblende, biotite, and rounded clay pellets were present in limited amounts in this group of specimens as well. This group includes the sherds from LA 84793 Sample 7; LA 86134 Sample 8; LA 86155 Sample 17; LA 86159 Samples 19, 21, 22, 23, 24; and LA 98690 Samples 26 and 35.

Sample 13 (Group 3) represents an intermediate between the two compositional groups. The very fine to fine sand fraction accounts for about 20 percent of the matrix. Like the previous group, medium-sized sands make up less than 5 percent of the observed mineral grains. Brown biotite, hornblende, and rounded clay pellets were also present in limited quantities.

Sample 20 (Group 4) has a brownish gray paste and contains around 10 percent very fine to fine quartz sand. Also present are several rounded siltstone fragments that fall in the medium-sized sand range. The most distinctive feature of this sherd is the presence of abundant very fine to fine black laths in about the same proportions as the sands. These laths represent brown biotite that has been altered to hematite and clay minerals.

Sample 25 (Group 5) has a gray paste that contains about 20 percent very fine to fine sand. Larger inclusions are present and consist of a few larger quartz sand grains and one fragment each of highly altered basalt and one of pumice. Glass shards from pumice vesicles were present in the paste of this sherd, but in limited amounts.

The similarity in paste color and the gradational differences in the amount of inclusions present in the paste of Groups 1 and 2 and Sample 13 suggests that they may have been produced using the same or a geologically related clay source. Sample 20 with its abundance of altered biotite may also be from the same source due to its otherwise similar color to the sherds in the two groups.

All of the sherd samples from LA 86159, with the exception of Sample 13, belonged to Group 2. LA 86159 also produced a pottery-firing feature. The single sherd examined from LA 84793, the other site in the area with a documented pottery-firing feature, also belonged to Group 2. With the exception of the single sample from LA 86134, sherds with Group 2 style pastes occurred only in limited numbers at the other sites.

Limited petrographic study has been conducted regarding the composition of Santa Fe Black-on-white. Regional variability in the paste of this type has been widely reported (Hill 1995; Warren 1976). Untempered Santa Fe Black-on-white containing very fine to fine quartz sand in the paste has been reported from Arroyo Hondo (Habicht-Mauche 1993).

The single sample from LA 98680 containing volcanic ash resembles samples from Arroyo Hondo. Based on the availability of volcanic ash within the Tesuque formation, Santa Fe Black-on-white containing volcanic ash was thought to have originated in the Española Basin (Galusha and Blick 1971).

One characteristic observed in many of the Santa Fe Black-on-white sherds was the complete or partial infilling of some voids in the ceramics with calcium carbonate. Whether this material is the result of prehistoric use of the vessels for holding water or from surface water after the vessel had been broken is unknown.

Clay Samples

A field trip by the author and Steven Lakatos of the Museum of New Mexico, Office of Archaeological Studies, was made to collect clay samples from the Culebra Lake formation. This source was chosen due to its size and close proximity to contemporary sites in the Santa Fe area. This formation is characterized by a series of varved clay deposits that are located within the Rio Grande trench between the Cañada Ancha and White Rock Canyon, mostly on the eastern side of the present river channel. These varved deposits resulted from the seasonal melting of a glacier during a period when the Rio Grande had been blocked by volcanic activity that resulted in the formation of a small lake. These deposits consist of yellowish to light brown beds made up of laminated deposits of clays, silts, and sands (Emmanuel 1967; Galusha and Blick 1971; Kelley 1948). An initial examination of thin-sections of six clay samples that were derived directly from the Culebra Lake formation found that no mineral inclusions were visible in any of the samples. A second series of samples were collected from the slopes of the Culebra Lake formation. These six samples are described below.

Submix

The clay matrix contains only about 10 percent very fine to fine rounded quartz sand grains. The clay contains several types of medium-sized inclusions. Fine books of altered biotite are present, and are slightly less common than the quartz. The most common inclusions are rounded silty clay pellets. Also present were medium to very coarse sized fragments of a fine-grained arkosic sandstone.

Sample 3

The matrix of this clay sample is relatively free from inclusions. Fine rounded quartz and feldspar grains make up less than 5 percent of the matrix. A few fine laths of pleochroic green and brown hornblende were observed. Two rounded grains of a volcaniclastic siltstone were present as were a few rounded clay pellets.

Sample 4

This sample contained an abundance of fine to very fine sand constituting between 30 and 40 percent of the clay matrix. Occasional medium-sized sand grains, and less commonly rock fragments, are present in these sherds. Quartz is the dominant mineral observed in this specimen. The quartz grains often display undulose extinction indicating the grains are of intrusive igneous or metamorphic origin. Feldspars, predominantly orthoclase and plagiocalse, are also present. These feldspars are usually altered to sericite and clay minerals. A few laths of brown-green pleochroic hornblende were observed. Rounded clay pellets were present but uncommon.

Sample 5

This sample is very similar to Sample 3. Very fine to fine rounded quartz and feldspar grains make up less than 5 percent of the matrix. Rounded clay pellets were observed. One granitic rock fragment and one pleochroic brown-green hornblende were present.

Sample 6

This sample is also relatively free from inclusions. Very fine to fine quartz and feldspar rounded sand grains make up less than 5 percent of the clay matrix. More rounded clay pellets were present in this sample than those described previously. Several granitic rock fragments were also present.

Sample 8

This sample contains less additional material than the other clay samples. Fine subrounded quartz and feldspar sands make up less than 5 percent of the matrix. A few rounded clay pellets were also observed.

All of these samples contained the same minerals that were observed in the two major compositional groups and in Samples 13 and 20. Sample 4 from the Culebra Lake formation most closely resembles the amount of very fine to fine quartz, the amount of larger quartz grains, and the trace minerals and clay pellets found in the larger composition group of Santa Fe Black-on-white. It is suggested that the Culebra Lake formation served as the source for at least this compositional group of Santa Fe Black-on-white sherds.

Discussion of Santa Fe Black-on-White

The two petrographic compositional groups differ from one another only in the amount of very fine to fine sand in a matrix of very similar clays. However, these two paste groups are found almost exclusively in different sites. It is likely that at least some of the sherds from LA 86159 and the possibly the sherd from LA 84793 were produced there or used the same clay source. The difference between the two ceramic compositional groups indicates that while both could have been made using the same source clay, the clay source was variable.

Given the size and sedementological history of the Culebra Lake formation, it is possible that ceramics from the second group and Samples 13 and 20 were also made from these clays as well. However, additional petrographic and chemical analysis of both Santa Fe Black-on-white and clay samples would be necessary to provide stronger evidence for the use of the Culebra Lake clays for the production of Santa Fe Black-on-white.

Pueblo IV Ceramic Assemblages

Ceramics from two sites, LA 84759 and LA 98688, were also examined. These sites were occupied during the Pueblo IV period. Previous petrographic studies conducted in north-central New Mexico have delineated the sources of many of the ceramics recovered within that area. Comparison of the results of the current analysis with previous data will be used to indicate the sources of vessels from these two sites.

LA 84759

Sample 1. Biscuit B. The paste of this sherd is a uniform yellowish gray color. A few fine to medium-sized individual grains of sanidine and a single microcline were natural constituents of the ceramic clay. These feldspars are slightly kaolinized. These grains range from subrounded to rounded in shape.

The paste is abundantly tempered with crushed glassy pumice. Abundant vesicles and vesicle fragments are present in the paste of the sherd.

Sample 2. Glaze/Red-Matte Red. The paste of this sherd is a brownish red mottled with a lighter tan color. Outside of a few fine subangular black opaque spots, the paste is relatively free from inclusions.

The paste is tempered using crushed grayish rhyolitic tuff. The groundmass of the tuff ranges from cryptocrystalline to microcrystalline. Some tuff fragments display evidence of compaction. The tuff matrix contains sparse fine dark opaque inclusions. A few tuff fragments contain porphyritic sanidine. This sanidine appears fresh to slightly kaolinized. Isolated angular grains of sanidine and a few fragments of volcanic quartz are also present in the paste and may also have been derived from the tuff. The tuff fragments and isolated mineral grains range in size from medium to very coarse.

Sample 3. Biscuit B. The paste of this sherd is a light brown color. The paste contains a moderate amount of silt-sized to fine flakes of reddish brown biotite. Also present in the paste, in a proportion similar to the biotite, are isolated fine rounded quartz and altered feldspar grains. These isolated grains are subrounded to rounded.

The parent vessel was tempered using crushed glassy pumice. Fragments of vesicles were abundant in the paste of this sherd.

Sample 4. Wiyo Black-on-white. The paste of this sherd superficially resembles that of Sample 3. The paste of the sherd is a tannish brown. However, the paste of the current specimen, while containing fine isolated quartz and feldspar grains, lacks the biotite so common in the previous specimen. Only a few fine flakes of biotite were present in the paste of this sample.

The paste was tempered using crushed glassy pumice. Vesicle fragments were common in this specimen.

Sample 5. Undifferentiated White Ware. The paste of this sample is grayish brown. The paste is not tempered, but does contain silt-sized to medium isolated mineral grains. These inclusions constitute between 10 and 20 percent of the paste. These grains are subangular to rounded in shape. Quartz and feldspar make up the majority of these grains. The feldspars are altered to sericite and clay minerals making identification equivocal, but a few grains of andesine plagioclase could be discerned. A few fine flakes of reddish brown biotite are present. Also present are a few rounded silty pellets representing natural inclusions in the source clay. A few fine black opaque fragments are also present, these particles probably represent highly altered biotite.

Sample 6. Sapawe Micaceous. The paste of this sherd is a very dark brown. Due to the abundance of temper the presence of natural inclusions could not be determined.

The paste was abundantly tempered using crushed granite. The rock fragments range from coarse to very coarse in size. Judging from the inequigranular nature of rock fragments, the parent source probably had a porphyritic texture. One rock fragment displays granophyric texture. In general, the feldspars appear fresh, however some of the plagioclase and orthoclase are slightly altered to sericite and clay minerals usually along twinning lamellae. Some microcline is present, but only in a few rock fragments. Quartz is present and often displays undulose extinction. Mica in the form of brown biotite and muscovite are present in most larger rock fragments and as isolated books within the paste.

LA 98688

Sample 40. Glaze/Yellow-Cream and Red Matte Paint. The paste of this sherd is a light grayish brown. Due to the abundance of temper, naturally occurring inclusions found in the paste could not be recognized.

The paste of this sherd was tempered using crushed augite latite. The groundmass of the rock consisted of laths of plagioclase ranging in composition between oligoclase and andesine. The plagioclase is usually kaolinized. Due to the reduction of the parent rock fragments during their preparation for temper, identification of the texture of the parent rock is equivocal. The texture of the rock fragments appears to have been variable. Textures observed in the larger rock fragments were subhedral granular and trachytic. Also present in the rock fragments were black opaque ferromanganese cubes. The rock fragments around these cubes are usually stained a dark brownish red. A few of the rock fragments also contained laths of pleochroic blue or yellow-pink augite. Augite is more common in isolated mineral grains. A few isolated grains of pleochroic green-brown hornblende and quartz were also present. The quartz displays undulose extinction. The rock fragments and isolated mineral grains range in size from medium to very coarse grained.

Sample 41. Undifferentiated Glaze on Yellow/Cream. The paste of this sherd is a tannish red mottled with abundant red spots. These spots represent alteration of iron-rich minerals present in the clay, most likely biotite or highly altered fragments of fine-grained basalt. It is likely that some basalt was present in the source clay due to the high degree of alteration observed in some of the fine-grained fragments.

The parent vessel was tempered using crushed basalt. These rock fragments range in size from medium to coarse-grained. The basalt is equigranular and fine-grained. The basalt is made up primarily of laths of andesine plagioclase. Contained interstitially within the plagioclase laths are augite, pale reddish brown glass, and occasional ferromanganese cubes. A few basalt fragments also contain iddingsite, possibly the product of the alteration of olivine. A few fragments of a trachyitic basalt were observed.

Also present in the sherd are fragments of light gray tuff. The tuff fragments are nearly as common in the paste as the basalt. The tuff has a cryptocrystalline groundmass and contains fine porphyritic plagioclase. Sanidine and augite are present as isolated mineral grains.

Sample 42. Wiyo Black-on-white. The paste of this sample is a light tannish gray. A few rounded silty pellets that appear to be natural inclusions in the source clay were observed. These pellets range from coarse to very coarse in size.

The paste of this sherd was abundantly tempered using crushed pumice. Fragments with the typical wine glass shape of broken glass vesicles were commonly observed.

Sample 43. Plain Polished Gray. The paste of this sherd strongly resembled the paste of Group 1 of the Santa Fe Black-on-white samples. The paste of the sherd was a brownish gray color. A few rounded pellets were observed in the paste. This paste was not tempered but contained fine to very fine sand constituting between 30 and 40 percent of the clay matrix. Quartz was the dominant mineral observed in the sand. Some of the quartz grains display undulose extinction.

Sample 44. Undifferentiated White Ware/Organic Pigment. The paste of this sherd is a light yellowish gray. A few fine rounded quartz grains and a single fragment of an arkosic sandstone are present as natural inclusions in the paste. Very coarse sized rounded clay pellets that are virtually the same color as the paste are also present as natural inclusions.

The sherd contains very abundant fragments of glassy pumice. These transparent to grayish glass shards often display the characteristic "wine glass" shape of vesicle fragments.

Sample 45. Undifferentiated White Ware. The paste of this sherd is a light yellowish brown. Like Sample 44, this sherd also contains fine rounded quartz grains. These grains are more common in the present sample. Also present in the paste are abundant fine to medium-sized fragments of devitrified tuff and pumice vesicles. It is possible that this sample was made from clays containing these materials rather than their being additions to the ceramic paste.

Sample 46. Biscuit A. The paste of this sherd is a light gray color. The suite of inclusions observed in the present sample are similar to those observed in Sample 45. Their was a much greater amount of devitrified tuff and glassy pumice fragments in this sample than in Sample 45.

Sample 47. Undifferentiated Glaze Polychrome. The paste of this sherd is a yellowish tan. Abundant rounded silty pellets that do not contrast with the paste are present in the paste as well. Also present in the paste are amorphous reddish to black opaque very fine to medium-sized inclusions. This material probably represents highly altered biotite.

The paste of the sherd contains abundant fine to medium-sized isolated mineral grains and a few rock fragments of crushed hornblende latite. The most common mineral is an andesine plagioclase. The plagioclase appears fresh. Plagioclase also occurs in the few rock fragments as the porphyritic mineral in a light gray cryptocrystalline groundmass. The next most common mineral in the sherd is brown hornblende. Brown hornblende is also present in the matrix of one of the rock fragments containing plagioclase. A few laths of blue-green augite are also present in the paste.

Sample 48. Glaze Red and White/Gray Unpainted. The paste of this sherd is a light grayish brown. Due to the abundance of temper, any natural inclusions in the paste could not be discerned.

The paste of this sherd was tempered using crushed fine-grained basalt and resembles the material observed in Sample 41. The basalt consists primarily of andesine plagioclase. The basalt displays an intergranular texture and contains augite, pale brownish glass and ferro-manganese. The rock fragments range in size from medium to very coarse.

Sample 49. Glaze Yellow/Cream Unpainted. The paste of this sample is a light gray color. Coarse to very coarse sized rounded opaque silty pellets are common in the paste of this sample. These pellets are very similar in color and texture to the untempered clay of the sherd. A few dark gray to black silty inclusions are also present.

The tempering agent in this sherd strongly resembles that of Sample 47. The paste of the sherd contains abundant fine to medium sized isolated mineral grains and a few rock fragments. The most common mineral is an andesine plagioclase. The plagioclase appears fresh. A few of the plagioclase laths appear to be compositionally zoned. Plagioclase also occurs in the few rock fragments as the porphyritic mineral in a light gray cryptocrystalline groundmass. The next most common mineral in the sherd is brown hornblende. Brown hornblende is also present in the matrix of several of the rock fragments containing plagioclase. Like Sample 47, laths of blue-green augite are also present in the paste. However, there appears to be slightly more augite in this sample than in Sample 47.

Sample 50. Plain Polished Gray. The paste of this sherd is a light gray. No added tempering material could be discerned in the paste of this sherd. The paste does contain silt-sized to fine black opaque spots and quartz grains giving a "salt and pepper" appearance to the paste. A few coarse-sized rounded silty clay inclusions were also observed. Also present in the paste are a few weathered shards of glassy pumice. A few voids are present in the paste that are surrounded by carbonaceous halos. These voids probably reflect combustion of organic matter naturally present in the source clay.

Sample 51. Glaze on Yellow/Cream. The paste of this sherd is brownish gray. Due to the abundance of temper, natural inclusions could not be distinguished.

The paste of this sherd contained crushed augite latite. The paste and temper of this sherd strongly resemble Sample 40.

Sample 52. Plain Polished Brown. The paste of this sherd is a golden brown. Numerous silt-sized black opaque grains are present in the paste. Fine plagioclase laths are also present in the paste. This material is most likely derived from the tempering agent, a crushed basalt or diabase. The size of the basalt temper particles ranges from medium to very coarse.

The basalt has a subophitic texture in which some of the plagioclase laths are partially or completely embedded in larger augite crystals. Also present in many of the basalt fragments was olivine. This olivine was usually altered to iddingsite. Occasional ferro-manganese cubes were also present in the basalt fragments.

Sample 53. Glaze-on-Yellow/Cream. Although the paste is a light brownish gray, the paste and temper strongly resemble that of Sample 40. Like Sample 40, this sherd was tempered using crushed augite latite.

Sample 54. Undifferentiated Glaze-on-White/Gray. The paste of this sherd is a reddish brown color. Due to the abundance of temper, any naturally occurring inclusions could not be distinguished. The paste of this sherd contained crushed augite latite like that observed in the previous specimen.

Sample 55. Undifferentiated Glaze-on-White/Gray. The paste of this sherd is a light reddish tan. Numerous rounded silty inclusions are present in the paste. The paste and temper of this sherd, a hornblende latite, are virtually identical to that observed in Sample 47.

Sample 56. Glaze-on-Yellow/Cream. The paste of this sherd is a dark gray. Due to the abundance of temper, natural inclusions could not be distinguished.

The paste of this sherd was tempered using crushed augite latite. While this is the same tempering material found in Samples 40 and 53, rock fragments in the present sample are much coarser grained and also larger. Most of the rock fragments in this specimen are in the very coarse size range.

Sample 57. Glaze-on-Yellow/Cream. The paste of this sherd is a light brownish gray color. Due to the abundance and wide size range of the inclusions present in this sample, the identification of natural inclusions in the paste is not possible. A single void surrounded by a carbonaceous halo was observed. This void most likely resulted from the combustion of plant material that was present in the ceramic clay.

The paste of this sherd contains abundant crushed hornblende latite. The groundmass of the hornblende latite is cryptocrystalline and is usually clouded by alteration of the feldspars. Andesine plagioclase and green-brown hornblende are contained porphyitically within the white matrix.

More common in the paste than the rock fragments are isolated mineral grains. In descending order of prominence these mineral include andesine plagioclase, hornblende, and quartz. These last three minerals were only observed in trace amounts. The plagiocalse appears fresh, however some of the laths appear to contain vacuoles. Presumably these mineral grains were derived from the crushed rock temper. In occasional rock fragments, the hornblende has been altered to hematite and clay minerals leaving black opaque areas. Spots of hematite surrounding fine cubes of ferro-manganese are present in most rock fragments.

Sample 58. Glaze-on-Yellow/Cream. The paste of this sherd is light brownish gray. A few voids are surrounded with carbonaceous halos formed by the combustion of the plant materials that were present in the paste during firing.

The sherd contains crushed augite latite. This specimen strongly resembles the paste of Samples 53 and 57.

Sample 59. Undifferentiated Organic Pigment-on-White. The paste of this sherd is a brownish gray and was tempered using crushed augite latite. The paste and temper of this sherd strongly resembles that of Samples 53, 57, and 58.

Sample 60. Glaze-on-Yellow/Cream. The paste of this sherd is a brownish gray and was tempered using crushed augite latite. The paste and temper of this sherd strongly resembles that of Samples 53, 57, 58 and 59.

Discussion

Glaze Wares

Samples 40, 51, 53, 56, and Samples 58 through 60 were tempered using crushed augite latite. This material was characterized by aggregates of stubby anhedral laths of slightly kaolinized plagioclase along with blue-green augite and cubes of ferro-manganese.

Augite latite outcrops in the Cerrillos Hills as part of the Espinosa Volcanics (Stearns 1953). These outcrops are near the pueblo of San Marcos (LA 98). San Marcos Pueblo is thought to have produced glaze ware types A through F, although the pueblo apparently served as the major supplier of A through C Glaze-on-yellow using augite latite for temper (Warren 1976, 1979).

Samples 47, 49, 55, and 57 were tempered using crushed hornblende latite. In general, more isolated mineral grains than rock fragments were observed in these samples. The most common isolated mineral grains were plagioclase and brown or blue-green hornblende. Rock fragments have a cryptocrystalline groundmass and contain plagioclase and porphyritic hornblende.

Like the augite latite, hornblende latite is also derived from volcanic flows in the Espinosa volcanics (Stearns 1953). Traditionally, the production of glaze wares containing hornblende latite was thought to have taken place at Tonque Pueblo (LA 240) (Warren 1974, 1976). Tonque Pueblo produced glaze ware types A through E (Warren 1979). Samples 47 and 55 have the pale orange to light brown paste characteristic of glaze wares produced at Tonque (Warren 1976:101B). Sample 49 has a light gray paste and may have been derived from this source as well.

Sample 57 differed from the others in that the paste was a dark gray color and contained more abundant silt-sized quartz and feldspar than the other sherds containing hornblende latite. This sherd contained more isolated quartz grains than did the other sherds with the same temper. San Cristobal is thought to have produced hornblende latite tempered glaze wares with a sandy paste as did Galisteo and San Lazaro pueblos (Warren 1976). These latter two sites produced glaze wares into the historic period (Warren 1981). The extensive areas of outcrop of hornblende latite within the Cerrillos Hills and vicinity undoubtedly contributed to this material use as temper at a number of settlements (Disbrow and Stoll 1957; Stearns 1953).

Samples 41 and 48 were tempered using a fine-grained basalt with an intergranular texture consisting primarily of plagioclase laths enclosing altered olivine, augite, glass, and some ferro-manganese cubes. Intergranular basalt was first recognized by Anna Shepard as having a distribution from the present site of Santo Domingo Pueblo to the northern Pajarito Plateau (Shepard 1942). A center of production appears to have centered in the San Felipe area. While glaze ware ceramics tempered using this intergranular basalt were produced with A and B style rims, few Glaze C or later rim forms were produced in this area (Warren 1976).

Sample 2 was the only glaze ware sherd tempered using crushed volcanic tuff. Volcanic tuffs are widely distributed in north-central New Mexico (Bailey et al. 1969; Stearns 1953). Glaze ware vessels tempered using rhyolitic tuff were likely to have been produced between the Cochiti area and the northern Pajarito Plateau (Warren 1976; Shepard 1942). Tuff-tempered glaze wares were produced through the entire Glaze A through F sequence.

White Wares

The two examples of Biscuit B from LA 84759 were derived from different locations. Sample 1 contains abundant glass shards, pumice, and sparse isolated rounded quartz and feldspar grains in a grayish paste. Sample 3 contains both tuff fragments and glass shards. Little petrographic study has been conducted regarding the compositional makeup of Biscuit wares and their regional variability (Habicht-Mauche 1993; Kidder and Shepard 1936; Warren 1976). As mentioned previously, volcanic tuffs are widely available in the Jemez Mountains and the Galisteo Basin.

Samples 4 and 42, Wiyo Black-on-white, were tempered using crushed glassy pumice. The use of glassy pumice has been reported in Wiyo Black-on-white from Arroyo Hondo (Habicht-Mauche 1993). However, the sources of the ceramic clay were different for the two vessels. Sample 4 had a light tannish paste, different from the gray paste of Sample 42. Sample 42 also contained rounded silty inclusions that were not present in the paste of Sample 4. Sample 44, an undifferentiated white ware was also pumice tempered.

Samples 5 and 43 were not tempered, but contained very fine to fine quartz sands that were naturally present in the source clay. Sample 43 strongly resembles that of the sherd belonging to Group 1 of the Santa Fe Black-on-white. The paste of Sample 5 resembles the samples of Santa Fe Black-on-white belonging to Group 2, those sherds with a smaller percentage of inclusions. However, the paste of this specimen is a slightly browner color than the sherds in that group. Sample 5 may represent a vessel from the same source as the less sandy paste group, but was fired under slightly different conditions. This sherd then represents evidence of an earlier occupation of the site.

Samples 45, 46, and 50 were not tempered but were made using clays derived from tuffs. Based in the differences in the color of the paste these samples were derived from different productive sources.

Miscellaneous Ceramics

Sample 52, a plain polished brown sherd, was tempered using a crushed subophitic basalt. This type of basalt-diabase is characteristic of the Zia area (Kidder and Shepard 1936; Warren 1976). Ceramics tempered with the characteristic basalt-diabase were produced throughout the glaze ware sequence, but were not widely distributed until the historic period (Warren 1976).

Sample 5, an undifferentiated white ware, bore a strong resemblance in terms of paste color and characteristics of the inclusions to the samples of Group 2 of the Santa Fe Black-on-white samples described previously. It is likely that this sherd represents this earlier ceramic type.

Sample 6, Sapawe Micaceous, was tempered using crushed granite. Granites are widely distributed throughout north-central New Mexico including the Manzanos, Sandias, and Sangre de Cristos. The use of granite as a tempering agent in utility wares is also quite common in these areas (Habicht-Mauche 1993; Hill 1995; Warren 1980).

The sources of the ceramics from LA 84759 and LA 98688 are quite different from one another. With the exception of the granite-tempered sherd of Sapawe Micaceous and the undifferentiated white ware sherd that may represent a local product, all of the sherds from this site were tempered using volcanic pumice or tuff or were made using clays that contained these materials. As the major sources of tuff and pumice are located to the west and north of the site, it is suggested that the site was used by peoples from these areas.

The petrographic sample from LA 98688 is dominated by glaze wares that were produced within the Galisteo Basin and from the San Felipe and Zia areas. Only the white wares on this site were produced on the Pajarito Plateau.

This site was most likely utilized by persons who originated to the south or southeast of the site.

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LAS CAMPANAS PETROGRAPHIC SAMPLES			
SITE NUMBER	SAMPLE NUMBER	CERAMIC TYPE	TEMPER TYPE
LA 84793	7	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 86134	8	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 86150	9	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	10	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	11	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	12	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	13	UNDIFF. WHITEWARE	NOT TEMPERED: 20% FINE SAND
LA 86150	14	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	15	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86150	16	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86155	17	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 86156	18	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND

LAS CAMPANAS PETROGRAPHIC SAMPLES			
SITE NUMBER	SAMPLE NUMBER	CERAMIC TYPE	TEMPER TYPE
LA 86159	19	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86159	20	SANTA FE B/W	NOT TEMPERED: 10% FINE SAND
LA 86159	21	UNDIFF. WHITEWARE	NOT TEMPERED: 30-40% FINE SAND
LA 86159	22	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 86159	23	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 86159	24	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 98680	25	SANTA FE B/W	NOT TEMPERED: 20% FINE SAND/ WITH SPARSE GLASSY PUMICE
LA 98690	26	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 98690	27	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	28	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	29	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	30	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND

LAS CAMPANAS PETROGRAPHIC SAMPLES

SITE NUMBER	SAMPLE NUMBER	CERAMIC TYPE	TEMPER TYPE
LA 98690	31	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	32	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	33	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	34	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	35	SANTA FE B/W	NOT TEMPERED: LESS THAN 20% FINE SAND
LA 98690	36	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	37	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	38	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 98690	39	SANTA FE B/W	NOT TEMPERED: 30-40% FINE SAND
LA 84759	1	BISCUIT B	ABUNDANT GLASSY PUMICE, w. SPARSE SANIDINE, AND VOLCANIC QUARTZ, 1 LATITE FRAGMENT, 1 MICROCLINE

LAS CAMPANAS PETROGRAPHIC SAMPLES			
SITE NUMBER	**SAMPLE NUMBER**	**CERAMIC TYPE**	**TEMPER TYPE**
LA 84759	2	GLAZE/RED/MATTE RED	WELDED TUFF FRAGMENTS w. VOLCANIC QUARTZ, SANIDINE
LA 84759	3	BISCUIT B	ABUNDANT GLASSY PUMICE, FINE ROUNDED QUARTZ AND BIOTITE IN THE CERAMIC SOURCE CLAY
LA 84759	4	WIYO B/W	GLASSY PUMICE, FINE QUARTZ, BIOTITE IN CERAMIC CLAY (PASTE AND TEMPER LIKE 3 w. LESS BIOTITE)
LA 84759	5	UNDIFF. WHITE WARE	NO TEMPER: CLAY CONTAINS MODERATELY WELL SORTED SANDS w. QUARTZ, ORTHOCLASE, PLAGIOCLASE, AND BIOTITE
LA 84759	6	SAPAWE MICACEOUS	CRUSHED GRANITE IN A BIOTITE-RICH CLAY
LA 98688	40	G/YELLOW/CREAM & RED MATTE	AUGITE LATITE
LA 90688	41	GLAZE ON YELLOW/CREAM UNDIFF.	BASALT
LA 90688	42	WIYO B/W	GLASSY PUMICE

LAS CAMPANAS PETROGRAPHIC SAMPLES			
SITE NUMBER	SAMPLE NUMBER	CERAMIC TYPE	TEMPER TYPE
LA 90688	43	PLAIN POLISHED GRAY	SIMILAR TO S/F B-W NOT TEMPERED: 30-40% FINE SAND
LA 90688	44	ORGANIC/WHITE UNDIFF.	ABUNDANT DEVITRIFIED TUFF/PUMICE
LA 90688	45	UNDIFF. WHITE WARE	NOT TEMPERED ? CLAY DERIVED FROM ALTERATION OF VOLCANIC ASH.
LA 90688	46	BISCUIT A	SAME PASTE AS 45.
LA 90688	47	GLAZE POLYCHROME UNDIFF.	HORNBLENDE LATITE
LA 90688	48	GLAZE RED & WHITE/ GRAY UNPAINTED	BASALT
LA 90688	49	GLAZE YELLOW/CREAM UNPAINTED	HORNBLENDE LATITE
LA 90688	50	PLAIN POLISHED GRAY	NO TEMPER? CLAY DERIVED FROM ALTERED PUMICE
LA 90688	51	GLAZE ON WHITE/GRAY UNDIFF.	SANDY HORNBLENDE LATITE
LA 90688	52	PLAIN POLISHED BROWN	"ZIA" BASALT
LA 90688	53	GLAZE ON YELLOW/CREAM	AUGITE LATITE

LAS CAMPANAS PETROGRAPHIC SAMPLES			
SITE NUMBER	**SAMPLE NUMBER**	**CERAMIC TYPE**	**TEMPER TYPE**
LA 90688	54	GLAZE ON WHITE/GRAY UNDIFF.	AUGITE LATITE
LA 90688	55	GLAZE ON WHITE/GRAY UNDIFF.	HORNBLENDE LATITE
LA 90688	56	GLAZE ON YELLOW/CREAM	AUGITE LATITE
LA 90688	57	GLAZE ON YELLOW/CREAM	AUGITE LATITE
LA 90688	58	GLAZE ON YELLOW/CREAM	AUGITE LATITE
LA 90688	59	ORGANIC/WHITE UNDIFF.	AUGITE LATITE
LA 90688	60	GLAZE ON YELLOW/CREAM	AUGITE LATITE

APPENDIX II
THE ANALYSIS OF FAUNAL REMAINS RECOVERED DURING THE LAS CAMPANAS PROJECT

Linda S. Mick-O'Hara

Introduction

Excavations undertaken by the Office of Archaeological Studies at the Las Campanas community north of Santa Fe, New Mexico, resulted in the recovery of 69 bone fragments from eight of the sites investigated. All sites had shallow deposits and bone preservation was problematic. The identifications of the faunal remains are presented for each site in Table II.1. It is obvious from a general consideration of Table II.1 that the majority of remains were recovered from three sites with only a few fragments isolated from the remaining five locations. An emphasis in the discussion of faunal materials is given to those sites having the most faunal materials but all sites will be covered.

The site treatment plan (Post 1993) indicates that the research efforts at Las Campanas have been designed to approach questions of temporal placement of sites, the structure of the sites investigated, and to interpret site function. In the following report on the faunal materials, temporal placement, site structure, and site function are used to interpret the small amount of faunal remains recovered. The paucity of bone precludes the use of this material category in providing insight into site structure but the locations from which bone was recovered are used to address site function or locality function where possible. Each site containing faunal remains is presented separately. Distributional studies were done on three sites (LA 84758, LA 84759, and LA 84787) which produced the bulk of the faunal material. The recovery context of all remains are considered when discussing them at the site level along with their possible intrusive or cultural deposition in site context.

Methodology

All faunal remains recovered during the excavation phase of the project were returned to the Office of Archaeological Studies for processing and analysis. The faunal materials were dry brushed to remove dirt from all surfaces so muscle attachments, other identifiable surface features, and processing marks would be visible if present.

The remains were then identified to the most specific level possible using the comparative faunal materials housed at the Museum of New Mexico, Office of Archaeological Studies, Santa Fe, and the Museum of Southwest Biology, University of New Mexico, Albuquerque. Identifications were also aided by using guides to the taxonomic and element identification of mammals and birds (Olsen 1964, 1968; Gilbert et al. 1985; Gilbert 1990). Guides were used only for preliminary identification and all specimens were specifically compared to osteological specimens for final identification.

Identification of all specimens included taxonomic level, element, portion, completeness, laterality, age, and developmental stage. In addition, each specimen was assessed for any environmental, animal, or thermal alteration which may have been present. Finally, any butchering marks (cuts, impacts, etc.) (Olsen and Shipman 1988; Fisher 1995) were noted along with any apparent modification for tool manufacture or use (Semenov 1964; Kidder 1932).

The data recorded for these variables was then entered in a SPSS data base and used in the analysis of the faunal remains in this report.

LA 84758

Survey and excavation at LA 84758 revealed two lithic concentrations. Excavation disclosed the remains of an Archaic structure and several hearth areas in the southern concentration, and all faunal remains were recovered from this area. The 18 bone fragments recovered from excavation at LA 84758 are presented by taxonomic and element identification in Table II.1. Small bone

Table II.1. Taxonomic and Element Identifications of Faunal Remains, Las Campanas

Taxon	LA 84758		LA 84759		LA 84787		LA 84793		LA 86159		LA 98688		Total	
Element	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Mammal (indet.) Indet. fragment									2	100.0			2	5.4
Small mammal Indet. fragment	4	22.2	3	37.5	1	25.0	1	100.0					9	24.3
Vertebra, nfs			1	12.5									1	2.7
Femur			1	12.5									1	2.7
Medium mammal Indet. fragment	2	11.1											2	5.4
Large mammal Indet. fragment	4	22.2			1	25.0							5	13.5
Perognathus flavescens Cranial complex	1	5.6											1	2.7
Neotoma albigula Cranial complex											1	25.0	1	2.7
Mandible					1	25.0					1	25.0	2	5.4
Scapula			1	25.0							2	50.0	3	8.1

Taxon	LA 84758		LA 84759		LA 84787		LA 84793		LA 86159		LA 98688		Total	
Element	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Canis sp. Metacarpal, nfs					1	25.0							1	2.7
Order Artiodactyla Tooth (indet.)	6	33.3											6	16.2
Odocoileus sp. Humerus	1	5.6											1	2.7
Ovis/Capra (indet.) Tarsal, nfs			1	12.5									1	2.7
Family Corvidae Humerus			1	12.5									1	2.7
Total	18	100.0	8	100.0	4	100.0	1	100.0	2	100.0	4	100.0	37	100.0

nfs: not further specified

fragments (n = 10) were assigned to small, medium, and large mammal categories on the basis of cortical tissue thickness. One almost complete cranium could be identified to the species *Perognathus flavescens* (Plains pocket mouse), and from the context, probably represents part of a disturbed burrow death. Tooth fragments (n = 6) could be identified to the order Artiodactyla (Even-toed hoofed mammals). These fragments could not be refitted but are probably from a single shattered artiodactyl tooth. Only a single humerus fragment could be identified to *Odocoileus* sp. (deer). Deer have been frequently sighted in the project area and produced the tooth identified to the Aartiodactyla Order. Generally, the recovered faunal material indicates the use of small and large mammals by the site occupants.

Burning was noted on seven bone fragments from the small, medium, and large mammal categories. Burning was graded from light to heavy on four fragments and calcined on three others. The light to heavy gradation on single specimens suggests that some meat was probably roasted on the bone causing a graded thermal effect on four of the bone fragments depending on the thickness of the meat and the length of time the element was exposed to heat (Buikstra and Swegle 1989:252; Lyman 1994:387). The presence of calcined bone in the assemblage would indicate that some elements were discarded into an active fire resulting in the almost complete combustion of the organic matrix of the bone (Buikstra and Swegle 1989). This primary discard into a fire suggests that some site maintenance activities were being performed.

The distribution of the faunal remains recovered may shed some light on site function and how animals were used at LA 84758. Table II.2 presents the faunal assemblage from LA 84758 by excavation unit. Grids 75N/91E and 75N/90E are two units northeast of the structure (Feature 1). These units contained long bone fragments assigned to large mammal, along with a partial humerus and tooth fragments identified as deer and artiodactyl, respectively. It is hard to interpret this small number of bones but this could have been a discard area from Feature 1 or a toss zone from Features 7 or 8 (hearth areas). Such door-side dumps and toss zones have been described and plotted by Binford (1983). The two pieces of bone assigned to medium mammal and burned black and calcined were located in the floor fill of the late Archaic structure isolated on this site (Feature 1) along with the pocket mouse cranium discussed earlier. The medium mammal bone fragments may have been associated with the occupation of the structure or, because of the shallow depositional context, introduced from the area around the structure. These burned bone fragments were probably associated with the occupation of the site and with the use of the structure.

One piece of burned small mammal bone was recovered to the west of Feature 3 (a hearth area) (Grid 90N/92E), in the northernmost feature concentration at the site. The other three pieces of small mammal bone and a fragment of large mammal bone were recovered from areas northwest and southwest of Features 10, 11, and 12, hearth areas that predate Feature 1 at LA 84758. Though the small faunal assemblage precludes any extensive interpretation, the bone recovered would suggest that use and discard areas at LA 84758 were proximate, indicating that occupations using the hearth areas were of short duration.

LA 84759

This site is located on a rock ledge and talus slope. Along with the lithic and ceramic materials recovered, the site location suggests that it could have been a fieldhouse location dating to the early Classic period, though the structure was not located during excavation. Only eight pieces of bone were recovered during the limited excavations undertaken at this site. The taxonomic and element identifications are included in Table II.1. The majority of the bone was small mammal (n = 6), although a single scapula could be identified to the species *Neotoma albigula* (white-throated woodrat).

The other two bone fragments identified were from the surface of the site and probably represent specimens intrusive into the site context. A single eroded naviculocuboid from a sheep or goat and the humerus of a crow or crowlike bird were weathered from surface exposure and appear to have been recent additions to the site faunal materials. Sheep grazed in this area historically, and various members of the crow family can be located in the study area today (Ligon 1961). These two elements came from the surface of the possible midden to the west and up slope from Feature 1.

Table II.3 presents the remains recovered by excavation unit. One piece of burned small

Table II.2. Faunal Remains by Excavation Unit at LA 84758

Taxon Element	Excavation Units																					
	75N/91E		75N/90E		75N/88E (fl. fill)		74N/88E (fl. fill)		73N/88E		90N/92E		77N/91E		79N/91E		78N/90E		80N/90E		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Small mammal Indet. frag.	.	.	.	.	.	.	.	.	.	.	1	100.0	1	100.0	1	100.0	1	100.0	.	.	4	22.2
Medium mammal Indet. frag.	.	.	.	.	1	100.0	1	100.0	.	.	.	.	.	.	.	.	.	.	.	.	2	11.1
Large mammal Indet. frag.	3	75.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	100.0	4	22.2
Perognathus flavescens Cranial complex	.	.	.	.	.	.	.	.	1	100.0	.	.	.	.	.	.	.	.	.	.	1	5.6
Order Artiodactyla Tooth (indet.)	.	.	6	100.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	33.3
Odocoileus sp. Humerus	1	25.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	5.6
Total	4	100.0	6	100.0	1	100.0	1	100.0	1	100.0	1	100.0	1	100.0	1	100.0	1	100.0	1	100.0	18	100.0

Table II.3. Faunal Remains by Excavation Unit at LA 84759

Taxon Element	Excavation Units						Total	
	139N/91E		146N/92E		146N/91E		N	%
	n	%	n	%	n	%		
Small mammal Indet. frag.	1	100.0	.	.	2	40.0	3	37.5
Vertebra, nfs	.	.	.	.	1	20.0	1	12.5
Femur	.	.	.	.	1	20.0	1	12.5
Neotoma albigula Scapula	.	.	.	.	1	20.0	1	12.5
Ovis/Capra (indet.) Naviculocuboid(tarsal)	.	.	1	50.0	.	.	1	12.5
Family Corvidae Humerus	.	.	1	50.0	.	.	1	12.5
Total	1	100.0	2	100.0	5	100.0	8	100.0

mammal bone was recovered from Level 4 of an excavation unit located at the ledge area (Grid 139N/91E). The rest of the bone was recovered from the possible midden area (Grids 146N/91E and 146N/92E) and includes the surface intrusive bone just mentioned along with five pieces of small mammal bone. Since a scapula was identified as woodrat and all of the other small mammal bone was recovered from the the same level, these other small mammal bones were probably parts of the same individual. Their occurrence in Level 1 may also suggest that these woodrat remains were also intrusive in the site context.

Any interpretation of the faunal assemblage from LA 84759 is hampered by small sample size and recovery context. Most of the bone recovered during site excavation appears to be intrusive with exception of one bone from the ledge area. This single specimen shows the use of small mammal species by the site occupants but no other inference can be made.

LA 84787

This site is a lithic concentration dating to the Late Archaic period. Excavations resulted in the recovery of 33 pieces of bone. Table II.1 presents the identifications of the specimens by taxon and element and illustrates the presence of small, medium, and large mammal categories at the site. The single metacarpal assigned to *Canis* sp. (Dog, coyote, wolf) was recovered from the surface of an excavation unit in Area 1 and appears to be intrusive to site context. The remainder of the bone was recovered from subsurface context in excavation Area 2 and was probably associated with the late Archaic occupation at this site.

Table II.4 presents the taxa and elements identified at LA 84787 by excavation unit. All units are from Area 2, except Grid 116N/35E, which contained the canid metacarpal from Area 1. The majority of the bone recovered from Area 2 came from contiguous units and may represent sheet trash associated with the occupation. The density of bone recovered per unit is low for all units, except Grid 126N/76E contained the partial remains of at least two prairie dogs along with bone that may have been prairie dog but was reduced to the extent that it could only be identified as small mammal. The breakage noted on these specimens and the presence of only a few elements indicates that they were probably used as part of the diet of the former occupants. Arguments for the assessment of bone as cultural versus intrusive (Thomas 1971; Lyman 1994)

Table II.4. Faunal Remains by Excavation Unit from LA 84787

Taxon Element	Excavation Unit								
	116N/35E		122N/75E		123N/77E		124N/75E		124N/76E
	n	%	n	%	n	%	n	%	n
Small mammal Indet. frag.	.	.	.	.	.	.	.	.	.
Medium mammal Long bone frag.	.	.	.	.	.	.	.	.	.
Large mammal Indet. frag.	.	.	.	.	.	.	1	100.0	.
Cynomys gunnisoni Mandible	.	.	.	.	.	.	.	.	.
Single pelvis	.	.	.	.	.	.	.	.	.
Ulna	.	.	.	.	.	.	.	.	.
Femur	.	.	.	.	.	.	.	.	.
Tibia	.	.	.	.	.	.	.	.	.
Neotoma albigula Mandible	.	.	.	.	.	.	.	.	.
Tibia	.	.	.	.	.	.	.	.	.
Sylvilagus audubonii Radius	.	.	.	.	1	100.0	.	.	.
Lepus californicus Vertebra, nfs	.	.	.	.	.	.	.	.	.
Femur	.	.	1	100.0	.	.	.	.	.
Tibia	.	.	.	.	.	.	.	.	.
Metatarsal, nfs	.	.	.	.	.	.	.	.	.
Canis sp. Metacarpal, nfs	1	100.0	.	.	.	.	.	.	.
Total	1	100.0	1	100.0	1	100.0	1	100.0	1

Table II.4. Continued.

Taxon Element	Excavation Unit								
	124N/76E	124N/77E		124N/78E		125N/72E		125N/75E	
	%	n	%	n	%	n	%	n	%
Small mammal Indet. frag.	.	.	.	.	.	.	.	.	.
Medium mammal Long bone frag.	.	.	.	.	.	.	.	.	.
Large mammal Indet. frag.	.	.	.	.	.	.	.	1	50.0
Cynomys gunnisoni Mandible	.	.	.	.	.	.	.	1	50.0
Single pelvis	.	.	.	.	.	.	.	.	.
Ulna	.	1	100.0	.	.	.	.	.	.
Femur	.	.	.	.	.	.	.	.	.
Tibia	.	.	.	.	.	.	.	.	.
Neotoma albigula Mandible	.	.	.	.	.	1	100.0	.	.
Tibia	.	.	.	.	.	.	.	.	.
Sylvilagus audubonii Radius	.	.	.	.	.	.	.	.	.
Lepus californicus Vertebra, nfs	100.0	.	.	.	.	.	.	.	.
Femur	.	.	.	.	.	.	.	.	.
Tibia	.	.	.	3	100.0	.	.	.	.
Metatarsal, nfs	.	.	.	3	100.0	.	.	.	.
Canis sp. Metacarpal, nfs	.	.	.	.	.	.	.	.	.
Total	100.0	1	100.0	3	100.0	1	100.0	2	100.0

Table II.4. Continued

Taxon Element	Excavation Unit								
	125N/76E		125N/77E		126N/72E		126N/75E		126N/76E
	n	%	n	%	n	%	n	%	n
Small mammal Indet. frag.	.	.	.	.	.	.	1	100.0	6
Medium mammal Long bone frag.	.	.	.	.	1	100.0	.	.	.
Large mammal Indet. frag.	.	.	.	.	.	.	.	.	.
Cynomys gunnisoni Mandible	.	.	.	.	.	.	.	.	.
Single pelvis	.	.	.	.	.	.	.	.	1
Ulna	.	.	.	.	.	.	.	.	.
Femur	1	100.0	.	.	.	.	.	.	3
Tibia	.	.	.	.	.	.	.	.	1
Neotoma albigula Mandible	.	.	.	.	.	.	.	.	.
Tibia	.	.	.	.	.	.	.	.	.
Sylvilagus audubonii Radius	.	.	.	.	.	.	.	.	.
Lepus californicus Vertebra, nfs	.	.	.	.	.	.	.	.	.
Femur	.	.	.	.	.	.	.	.	.
Tibia	.	.	1	100.0	.	.	.	.	.
Metatarsal, nfs	.	.	.	.	.	.	.	.	.
Canis sp. Metacarpal, nfs	.	.	.	.	.	.	.	.	.
Total	1	100.0	1	100.0	1	100.0	1	100.0	11

Table II.4. Continued.

Taxon Element	Excavation Unit					Total	
	126N/76E	126N/77E		126N/79E		Total	
	%	n	%	n	%	n	%
Small mammal Indet. frag.	54.5	1	50.0	4	100.0	12	36.4
Medium mammal Long bone frag.	.	.	.	.	.	1	3.0
Large mammal Indet. frag.	.	.	.	.	.	2	6.1
Cynomys gunnisoni Mandible	.	.	.	.	.	1	3.0
Single pelvis	9.1	.	.	.	.	1	3.0
Ulna	.	.	.	.	.	1	3.0
Femur	27.3	.	.	.	.	4	12.1
Tibia	9.1	.	.	.	.	1	3.0
Neotoma albigula Mandible	.	.	.	.	.	1	3.0
Tibia	.	1	50.0	.	.	1	3.0
Sylvilagus audubonii Radius	.	.	.	.	.	1	3.0
Lepus californicus Vertebra, nfs	.	.	.	.	.	1	3.0
Femur	.	.	.	.	.	1	3.0
Tibia	.	.	.	.	.	1	3.0
Metatarsal, nfs	.	.	.	.	.	3	9.1
Canis sp. Metacarpal, nfs	.	.	.	.	.	1	3.0
Total	100.0	2	100.0	4	100.0	33	100.0

would include incomplete specimens representing only a few skeletal elements of any individual, such as the identified prairie dog elements, in the cultural segment of the faunal assemblage, supporting this assessment. Throughout the units excavated in Area 2, small mammals, including prairie dogs, cottontails, and jackrabbits, are the majority of the assemblage (87.9 percent). The two specimens identified as white-throated woodrat are included in these cultural remains because the mandible exhibited evidence of burning.

Burning was noted on 8 of the 33 bones recovered or on 24.2 percent of the sample. Burning ranged from light tan to brown discoloration to bone specimens grading from black to calcined. Light tan to brown discoloration is noted on bone that has roasted while meat is still covering most surfaces (Buikstra and Swegle 1989). The mandible of a *Neotoma albigula* (white-throated woodrat) exhibited graded thermal discoloration from brown to black and four other pieces of small mammal bone with evident thermal alteration would add support to the use of small mammals as part of the diet at LA 84787. A single radius fragment assigned to cottontail, one bone fragment assigned to medium mammal, and a single piece of large mammal long bone also exhibit evidence of burning. This indicates that animals from all of these body-size categories were used by the site occupants, but that small body-sized vertebrates were more readily available and more heavily utilized at this Archaic period site.

Bayham's (1979) article examining Archaic patterns of animal exploitation used an optimal diet model to explain the increased use of smaller game species during the Archaic period. Using this model the only acceptable conclusion is that smaller species are utilized when larger, more preferred species, are unavailable for exploitation. Though this may explain the Archaic patterns of animal use in many locations, Archaic patterns of resource exploitation as a whole suggest that their use of the landscape is quite different from earlier periods. They were using a more generalized pattern of resource exploitation from both residential and logistical sites. Using this generalized strategy, the frequency of small mammal procurement should increase dramatically if animals, regardless of size are taken on an encounter basis. Given the greater number of small species available, their rate of reproduction, and the number of offspring compared to larger game species, any general pattern of animal use would look like a concentration on small mammal utilization.

LA 84793

Only one piece of small mammal bone and a partial humerus assigned to the family Phasianidae were recovered from this lithic and ceramic concentration (see Table II.1). The small mammal bone fragment was recovered 48 cm below present ground surface and could be associated with the occupation of this Coalition period site suggesting the use of this size category of mammal in the diet. The bird humerus, however, came from the site surface and showed carnivore tooth marks indicating that this element was probably the result of more recent carnivore activity in the area.

LA 86159

There were two pieces of burned mammal bone recovered from Feature 1 (a possible kiln) at this coalition period site (see Table II.1). The burning on these specimens and their feature association indicate that they were of cultural origin and may have been discarded into this feature while the contents were still hot enough to thermally alter the specimens (Shipman et al. 1984; Buikstra and Swegle 1989). Perhaps this feature had more than one use.

LA 98680

A single piece of small mammal bone was isolated during the data recovery phase at LA 98680. Since it was recovered from Level 1 and exhibited carnivore gnawing, it was probably intrusive in site context.

LA 98688

The four pieces of bone recovered from the surface of this Classic period site were identifiable as *Neotoma albigula* (white-throated woodrat). These specimens are similar in size, indicating that they were probably parts of a single individual. The occurrence of these bones together on the surface of the site would indicate that they are not cultural and may have been the result of animal predation.

LA 98690

One piece of large mammal long bone was recovered from level one during the excavation of LA 98690. It could have been associated with the occupation of the site but exhibited no distinctive breakage pattern and was unburned. It does suggest that large game was taken in this area and used at some of these short-term habitations and resource extraction locations.

Discussion and Conclusions

The small amount of bone recovered from eight sites during the Las Campanas project can only suggest the use of faunal resouces for the periods during which these sites were occupied. The bone recovered from the late Archaic sites LA 84758 and LA 84787 indicate the use of both small and large mammal taxa with small game species dominating the assemblages. The distribution of bone at LA 84758 and the burning of bone at both sites suggest that roasting was one method of cooking utilized by the occupants. The presence of calcined bone outside of hearth features at LA 84758 also suggests that occupation was short term but of sufficient duration that some site maintenance took place.

The small faunal assemblage from LA 84759 suggests that small animals were a part of the diet during the early Classic period. The intrusive nature of the woodrat remains at LA 98688 along with the occurrence of the species in the general area suggest that the cultural association of woodrats is tenuous if burning or other cultural modification is not noted.

The faunal remains recovered from the two Coalition period sites, LA 84793 and 86159, suggest only that some animals were being used at sites that may have been specialized activity areas. Generally, at these sites and the others from which faunal remains were recovered, the small amount of faunal material prevents a great deal of inference regarding behavioral correlates.

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APPENDIX III
BOTANICAL ANALYSES AT LAS CAMPANAS: ARCHAIC TO EARLY CLASSIC SMALL SITES (LA 847580, 84787, 86139, 16159, 86150, 84793, 98690, 84759)

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Introduction

Flotation and charcoal samples from 11 sites in Las Campanas provide information to evaluate prehistoric plant utilization in the piñon-juniper woodland zone on the north side of present day Santa Fe. Floral data derives from base camps, repeatedly occupied sites, limited activity sites, and some substantial possible kiln features, from the Archaic to Classic periods (Table III.1).

Archaeobotanical studies in the Santa Fe area are complicated by a tiny available data base. Early sites tend to be shallow and deflated and lack structures (all traits mitigating against preservation of perishables, or even carbonized perishables). In addition to being rare, early Santa Fe area sites (and smaller, limited activity sites of all periods) suffer from lack of botanical analyses (Gossett and Gossett 1991; Schmader 1987) or very low recovery of cultural botanical remains in the sampled proveniences (Dean 1993a, 1993b; Toll 1994). Schmader's work on the southwestern edge of the city at Tierra Contenta (1994:12-14) documents the existence of structural sites dating to at least the late Archaic and possibly earlier. A rich array of recovered weedy annual, grass, and perennial seeds at the Tierra Contenta sites points to broadly based subsistence activities, and encourages the pursuit of such information at other sites.

In the Coalition and Classic periods, occupation includes a variety of small site types (some apparently geared to specific short-term activities and some occupied repeatedly but for short periods) and much fewer, very large pueblos. The economic and social ties between these very different contemporary site types are of particular interest. The substantial, protective masonry or adobe structures of the large pueblos hold the possibility of far better preservation conditions for plant materials. Pindi (LA 1) was excavated in the 1930s, when flotation was not considered a part of archaeological analysis; a small collection of macrobotanical remains were collected during excavation, and happily reported in print by Volney Jones (in Stubbs and Stallings 1953:140-142). Excavation of Arroyo Hondo by the School of American Research was a model of thoroughness for archaeology of the early 1970s. Botanical studies gave attention to some vital interpretive and comparative issues, such as nutritional adequacy and productive capacity with respect to changing environmental and demographic traits (Wetterstrom 1986). The down side to such attention to interpretive objectives are difficulties in reconstructing the data used to support conclusions. Agua Fria Schoolhouse (LA 2) was excavated recently, but only partially; the data here are clear and dependable, but meager (five flotation samples; Cummings 1989). Thus, data available from large, complex, and potentially well preserved pueblos is very uneven, and the contemporary, small, limited activity sites have very little floral data at all (Cummings and Puseman 1992; Toll 1989). We are left with a common interpretive conundrum: does this lack of floral remains at small sites represent a genuine difference between site types in handling of subsistence resources, or is it an artifact of systematically different preservation conditions?

Las Campanas is located in the Great Basin Conifer Woodland biotic community, which includes the piñon-juniper, ponderosa pine-piñon-juniper, rabbit brush, and riparian vegetational zones (Brown 1982). Plant taxa that occur in these zones include piñon, juniper, gray oak, rabbit brush, snakeweed, wolfberry, big sagebrush, currant, four-wing saltbush, curly dock,

[1] Museum of New Mexico, Office of Archaeological Studies, Technical Series 31.

prickly pear and cholla cacti, and a variety of annual and grass species. Horsetail, cattail, and bulrush would have been available in the nearest true riparian setting, which may have been the Santa Fe River corridor. This wide range of exploitable plant species encompasses early spring to fall harvests, available prehistorically within a 4.5 to 7 km radius of the site.

A variable and relatively short frost-free season likely mitigated against an economy heavily dependent on farming. Dendroclimatic analyses at the Arroyo Hondo site (about 13 km to the southeast of Las Campanas) indicated varying precipitation dependability, which may also have affected the success of agricultural pursuits in the Santa Fe area during the Coalition/early Classic Period (Rose et al. 1981). Spring and early summer rainfall patterns were most variable, with critical effect on seed germination and early crop growth. Late summer rainfall was relatively dependable, insuring a decent crop yield in those years with adequate early soil moisture, without an early frost. Gravelly soils with low soil moisture and poor organic matter content, and exposure to drying winds, would have made much of the Las Campanas area a poor choice for agriculture; moister, protected sidestream and valley bottoms were more suited for success. Biological resources of Las Campanas likely lay in the realms of hunting, perennial fruit, nut, and fiber crops, and fuel wood.

Methods

The 53 soil samples collected during excavation were processed at the Museum of New Mexico's Office of Archaeological Studies by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Flotation samples were measured in liters, ranging in size from 1 liter to 13 liters, and averaging about 2 liters in volume. Each sample was immersed in a bucket of water, and a 30-40 second interval 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.

Flotation data are reported as a standardized count of seeds per liter of soil, rather than an actual number of seeds recovered. Samples completely empty of floral remains are not listed in the tables of flotation results. To aid the reader in sorting out botanical occurrences of cultural significance from the considerable noise of post-occupational intrusion, data in tables are sorted into categories of "Probably Cultural" (all carbonized remains), "Possibly Cultural" (indeterminate cases, usually of unburned, economically useful taxa either found together with burned specimens of the same taxon, or found in relatively good preservation conditions), and "Probably Contaminant" (unburned materials, especially when of taxa not economically useful, and when found in disturbed contexts together with modern roots, insect parts, scats, or other signs of recent biological activity).

From each flotation sample with at least 20 pieces of wood charcoal present, a sample of 20 pieces of charcoal was identified (10 from the 4 mm screen, and 10 from the 2 mm screen). Otherwise, all charcoal from the 4 mm and 2 mm screens was identified. Each piece was snapped to expose a fresh transverse section, and identified at 45x to 90x. Prior to submission for radiocarbon dating, charcoal samples were examined in the same fashion, but selection was adapted to securing a minimal sufficient sample (the objective was 5 g) with the fewest pieces, rather than aiming to examine both large and small pieces. 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.

Results

Archaic Base Camps (LA 84758 and 84787)

LA 84758 consisted of a pit structure with 14 associated features, comparable to residential complexes recently excavated at Tierra Contenta by Schmader (1994). Flotation samples were analyzed from eleven of the features along with one from the pit structure fill. Flotation sample analysis produced disappointing results, as only

5 of the 14 samples examined yielded plant remains (Table III.2). An interior hearth and ashpit complex (Feature 5, FS 349) from the pit structure contained a single, eroded but uncharred goosefoot seed. A flotation sample from Level 5 in the pit structure (FS 207) contained no plant remains. Two extramural pits filled with fire-cracked rock (Features 2 and 14) are considered to be formal processing features used during short-term foraging expeditions from residential sites located outside the Las Campanas project area (Post 1993); uncharred goosefoot, purslane, groundcherry, and stickleaf seeds as well as juniper scale leaves provide no clue as to original economic use of these features. Two extramural basin-shaped pits (Feature 7 and 12) produced a similar array of relatively recent plant materials, while Features 3, 4, 9, 10, 11, and 13 contained no floral remains at all. Two large pieces of unburned juniper wood, possibly modern roots, were encountered in Level 3, and charred wood in Level 7 included juniper, piñon, and undetermined conifer (Table III.3).

LA 84787 was a nonstructural site consisting of three thermal features, an oblong pit, and a hearth. All six samples analyzed from LA 84787 yielded plant remains. Uncharred plant remains recovered from Feature 2 (hearth), Feature 3 (oblong pit), and Feature 4 (thermal feature) included goosefoot and hedgehog cactus seeds (Table III.4). The uncharred seeds, like those from LA 84758, are probably contaminants. Juniper charcoal was present in Features 1, 2, and 3, and piñon charcoal was present in Features 1 and 2 (Table III.5). Conifer bark was recovered from Features 4 and 5. The charred wood and bark most likely represent taxa used for firewood.

Archaic Limited Activity Sites (LA 86139)

LA 86139 consisted of a lithic artifact scatter and a deflated hearth, which was located along the edge of an erosion channel. Juniper wood charcoal was the only plant remain recovered from the single sample analyzed from the hearth (Feature 1; Table III.6). This probably represents firewood residue from the last use episode of the feature.

Coalition Period Repeatedly Occupied Sites (LA 86150, LA 98690, LA 86159)

Sampled proveniences at LA 86150, a nonstructural site, consisted of a possible pit kiln (Feature 1), three basin-shaped pits with fire-cracked rock (Features 2, 8, and 9), a pair of superimposed pits (Features 4A and 4B) filled with fire-cracked rocks, an oval pit (Feature 3), and three deflated fire-cracked rock concentrations (Features 5, 6, and 7). Only 4 of the 13 flotation samples examined yielded floral remains (Table III.6). This could be interpreted as a disappointing return, but a charred bugseed seed recovered from Feature 2 is the *only* positively identified cultural nonwood plant remain from the entire project. Uncharred goosefoot (Feature 4, pit complex) and juniper seeds (Feature 2, hearth), and juniper scale leaves (Features 5 and 6, fire-cracked rock concentrations) may all be post-occupational intrusives. A tiny amount of charcoal, largely piñon, was recovered from the Feature 4 pit complex (Table III.7).

LA 98690, another nonstructural site, incorporated three hearths, including one cobble-lined (Feature 3) and one cobble-filled (Feature 1). Feature 1 was excavated in quadrants, with the northeast quadrant sample containing only juniper and piñon charcoal (Table III.7), and a sample from the center of the hearth (FS 130) empty of all floral remains. The northwest quadrant sample produced conifer charcoal and a variety of unburned conifer parts. One sample analyzed from Feature 2 (FS 124, Table III.7) yielded juniper and piñon charcoal. Feature 3 was bisected during excavation: samples from both halves produced uncharred conifer duff, largely juniper twigs and piñon needles. The tiny amount of charcoal from Feature 3 was juniper.

Coalition Period Possible Kilns (LA 84793, 86150, and 86159)

Thermal features of particular interest from the Las Campanas project are substantial oval pits that may have served a specialized function as pottery kilns. Fill consisted of fire-cracked cobbles and spalls, with ceramic debris concentrated in the center of the pits. Species composition of the charcoal (concentrated at the bottom of features) provides some helpful insight as to selection of fuel wood for a task with exacting thermal requirements. Ancillary botanical materials found in the features should help to confirm or disprove the notion of specialized, not food processing, utility.

Flotation samples from the kiln (Feature 1) at LA 84793 included two from the testing phase and three from the excavation phase. Testing phase samples yielded only uncharred plant remains, which included goosefoot, pigweed, purslane, and spurge seeds (Table III.10). Upper and lower feature fill were sampled separately during the excavation phase. Upper and lower fill samples had many plant remains in common including uncharred goosefoot, juniper, and purslane seeds, uncharred piñon nutshell, and juniper and piñon charcoal (Table III.11). Uncharred conifer wood and male cones and uncharred cheno-am seeds were recovered from the upper fill exclusively, while uncharred hedgehog cactus and prickly pear cactus seeds as well as uncharred conifer bark were restricted to the lower fill.

Botanical remains were absent from the possible pit kiln (Feature 1) sample from LA 86150.

LA 86159 had three components: possible kilns dating to the Coalition period, an amorphous stain of unknown age, and a hearth (Feature 2) associated with the Coalition period. The single flotation sample from Feature 2 produced a variety of uncharred floral materials: goosefoot and juniper seeds, juniper twigs, and piñon needles (Table III.8). Juniper and piñon wood charcoal were also recovered (Table III.9).

Plant remains from the upper fill sample analyzed from LA 86159 included uncharred goosefoot, juniper, and purslane seeds and uncharred conifer bark. Lower fill samples yielded an uncharred juniper male cone. Charred juniper, piñon, and unknown wood were recovered from the upper fill sample and charred juniper wood was recovered from the lower fill sample.

Classic Period Limited Activity Site (LA 84759)

LA 84759 is a multicomponent site with Coalition and Classic period components. A possible fieldhouse and a fire-cracked rock concentration were associated with the Classic period at the site. A single sample from the fire-cracked rock concentration (Feature 1) was analyzed from LA 84759. Plant remains recovered were limited to charred juniper, piñon, and indeterminate conifer wood (Table III.12).

Unknown Period Limited Activity Site (LA 86159)

An amorphous stain (Feature 3) at LA 86159 could not be associated with any particular time period. The two samples analyzed from Feature 3 yielded uncharred goosefoot seeds and partially charred juniper twigs (Table III. 13). Piñon, juniper, indeterminate conifer, and nonconifer wood charcoal were also recovered (Table III.14).

Discussion: The Impact of Preservation on Interpretation of Prehistoric Plant Utilization in the Santa Fe Area

Signs of recent biological activity were abundant in Las Campanas flotation samples, occurring with few plant remains that could be linked unequivocally to prehistoric cultural activity. Roots were common in all samples, particularly in the larger screens, and small scats (size indicates insect rather than rodent) proliferated in the smaller screens with less than 1 mm aperture. Insect exoskeleton parts and small land snails were other indicators that the sample locations were in a zone of recent disturbance. Juniper parts, especially twig fragments, were most numerous and widespread, and indicated a broad range of age since deposition by color and degree of erosion. Piñon needles occurred widely, but were considerably less numerous. Intrusion of modern plant materials included no grasses, only two nontree perennials (two samples with prickly pear or hedgehog cactus), and in most samples, a short list of annuals (goosefoot was the only widespread species). All of the above inclusions point clearly to near-surface deposits impacted by recent biological activity, including mechanical and chemical degradation.

Poor preservation of organic materials is a fact of life at these small and briefly occupied sites of the Santa Fe area. How then do we evaluate the distinct possibility that another reason for the scarcity of recovered plant remains is because there were never many in the first place? Dean submits that "the paucity of charred plant remains strongly suggests that the hearth and fire pit features were rarely, if ever, used for processing of plant foods"; when burn features were used to cook foods, "some evidence of plants discarded in the hearths or fire pits will often remain, whereas disposal in locations away from sources of heat (and hence preservation) may well leave no record" (Dean 1993a:20-21). Just from three phases of Las Campanas (this study; Dean 1993a, 1993b) and the Santa Fe Bypass (Toll 1989) we have over 230 liters of soil from small sites of Archaic to early Classic time periods, with practically no cultural plant debris; Dos Griegos (Cummings and Puseman 1992) and Airport Road (Toll 1994) would add to that cumulative, poorly producing volume if sample sizes had been recorded.

Of particular significance is the lack of fragmentary corn cob debris in small sites of the agricultural era (see Table III.15); this uniquely durable category of plant waste is barely evident at small sites and ubiquitous at Arroyo Hondo, Agua Fria School House, and Pindi. Additional crop plant remnants at large pueblos include beans, cucurbit peduncles, rind, seeds, and flesh at Arroyo Hondo (Wetterstrom 1986), cucurbit pollen at Agua Fria (Cummings 1989), and cucurbit peduncles and an entire pot of burned beans at Pindi (Jones 1953). This disjunctive pattern is reasonable confirmation that at least some categories of plant resources are being processed and utilized in entirely different patterns at small sites compared to the few much larger pueblos of the Coalition-early Classic periods.

In the past, the meager recovery of plant remains from flotation samples has been attributed to poor preservation. Dean (1993a, 1993b) has suggested that the disappointing recovery of plant remains from ephemeral sites encountered in the Santa Fe area may be a reflection of site function rather than poor preservation and that these sites were an important component in the regional use of the landscape prehistorically. Smaller, ephemeral sites, like most of those encountered at Las Campanas, could represent localities used briefly when in transit from one location to another or while collecting wild plants or other resources which were then carried back "home" to be processed.

Wood use from sites in the Santa Fe area, as evidenced by charcoal remains, appears to be distinguished more by continuity and general similarity than by any distinctive differences between time periods (Table III.16). From all time periods and site types, wood recovered was predominantly coniferous, lacking a significant presence of shrubby or riparian species. This general continuity of fuelwood taxa through time in the Santa Fe area indicates that a consistent source of these coniferous wood taxa was present.

Previous studies in southern Colorado (Kohler and Matthews 1988) and northeast Arizona (McBride 1994b) have suggested that over-harvesting of preferred (coniferous) wood species led to pockets of deforestation as evidenced by a marked drop in the percent presence of preferred wood species over time. With the exception of a tiny fraction of riparian (cottonwood-willow) wood at Dos Griegos (Cummings and Puseman 1992), coniferous wood reigns supreme as fuel in all time periods (Table III.16). Even at Airport Road, where present-day junipers and especially piñons are considerably sparser, there is no sign of saltbush use (Toll 1994), suggesting density and duration of population pressure was not sufficient to impact availability of preferred fuel types.

Summary

Cultural plant remains consisted of only wood charcoal from all sites, with the exception of a single charred *Corispermum* seed from the Coalition period site LA 86150. Lack of cultural floral remains at these shallow, unprotected sites could reasonably be attributed to physical and chemical degradation, but the uniform repetition of this pattern at many small sites around the Santa Fe area suggests instead that little plant processing or utilization is occurring at these sites. The absence of particularly durable *Zea mays* cob parts is an important element in this argument. Negative data are used here to support the interpretation of Coalition to Classic period small sites as short-term, special-use sites, with all major processing and storage steps centralized at large pueblos. If small sites served, among other uses, as camps for collection of important perennial crops such as piñon nuts, cactus or yucca fruits, or yucca leaves, archaeobotanical assemblages from these sites as yet provide no direct evidence of such activities.

At least some local occupation in the Archaic period indicates longer term, more entrenched living patterns: pit structures with substantial burn areas, multiple extramural burn features and pits, accompanied by extensive tool kits and plant remains, signifying broadly based subsistence activities (Schmader 1994). Las Campanas sites, which appeared to fall into this site type, contained no substantiating floral remains.

Species composition of charcoal from Las Campanas sites was most notable for its uniformity and consistency: all site assemblages were dominated by a mix of juniper and piñon wood, with no signs of depletion of these preferred fuel types over time. Of particular interest was the selection of fuel types for large, possible pit kilns of the Coalition period, where burn attributes would presumably need to meet more exacting requirements. These features were also marked by selection of an all conifer fuel array, dominated by juniper, and with no consistent difference between species composition of upper and lower fill.

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Table III.1. Sample Universes by Time Period and Site

Period	Site type	Site	Flot. Samples	Wood Samples
Archaic	Base camps	847580	20	4F 3M
		84787		
	Limited activity	86139	2	2F
		86159 Feature 2		
Coalition	Repeatedly occupied	86150	19	5F
		98690		
	Possible kilns	84793 Feature 1	5	5F
		86150 Feature 1		
		86159 Feature 1		
Early Classic	Limited activity	84759	1	1F 1M
Unknown	Limited activity	86159 Feature 3	2	2F
Total			49	19F 4M

Wood samples: **F** from flotation samples
M macrobotanical samples

Table III.2. Archaic Base Camp (LA 84758): Flotation Results[1]

	Extramural Features				Within pit-structure
	FCR pit F.2 FS 85	Hearth F.12 FS 320	FCR pit F.14 FS 335	Pit F.7 FS 348	Hearth F.1 FS 349
Noncultural Annuals: *Chenopodium* (goosefoot)	1.0	.3		1.7	1.0
Mentzelia (stickleaf)			.6		
Physalis (groundcherry)			1.1		
Portulaca (purslane)	1.0	.3			
Perennials: *Juniperus* (juniper)	+sl	+sl			
Pinus edulis (piñon)					
TOTAL TAXA	3	3	2	1	1

[1] Nine additional flotation samples contained no floral remains: FS 207 (Feature 1), FS 140 (Feature 2), FS 176 (Feature 3), FS 179 and 188 (Feature 4), FS 295 (Feature 9), FS 319 (Feature 10), FS 318 (Feature 11), and FS 336 (Feature 13)
sl [scale leaf]

Table III.3. Archaic Base Camp (LA 84758): Species Composition of Macrobotanical Wood.

	Level 3 Unburned wood		Level 7 Charcoal	TOTAL
	87N/93E FS 94	86N/93E FS 108	87N/92E FS 216	
Juniperus juniper	4.47g 100%	9.58g 100%	.19g 13%	14.24g 92%
Pinus edulis piñon			.35g 24%	.35g 2%
Undetermined conifer			.91g 63%	.91g 6%
TOTAL	4.47g 100%	9.58g 100%	1.45g 100%	15.50g 100%

Table III.4. Archaic Base Camp (LA 84787): Flotation Results[1]

	Hearth F.2 FS 792	Pit F.3 FS 2021	Hearth F.4 FS 2036	Thermal feature F.5, FS 2080
Cultural Perennials: Undetermined conifer			+ bark	+ bark
Noncultural Annuals: *Chenopodium* (goosefoot)	.3	.1	.2	
Perennials: *Echinocereus* (hedgehog cactus)	.5			
TOTAL TAXA	2	1	1	0

+ 1-10 items

[1]Two additional flotation samples contained no floral remains: FS 462 (Feature 1) and FS 770 (Feature 2).

Table III.5. Archaic Base Camp (LA 84787): Species Composition of Wood from Flotation Samples

	Feature Hearth	Feature 2 Hearth		Feature 3 Pit	TOTAL
	FS 462	FS 770	FS 792	FS 2021	
Juniperus juniper	.01g 50%	.05g 56%	.01g 100%	.01g 100%	.08g 62%
Pinus edulis piñon	.01g 50%	.04g 44%			.05g 38%
TOTAL	.02g 100%	.09g 100%	.01g 100%	.01g 100%	.13g 100%

Table III.6. Archaic Limited Activity Sites (LA 86139 and 86159): Species Composition of Wood from Flotation Samples

	LA 86139	LA 86159	TOTAL
	Feature 1	Feature 2 Hearth	
	FS 16	FS 248	
Juniperus juniper	.75g 100%	.99g 92%	1.74g 95%
Pinus edulis piñon		.09g 8%	.09g 5%
TOTAL	.75g 100%	1.08g 100%	1.83g 100%

Table III.7. Archaic Limited Activity Site (LA 86159): Flotation Results

	Hearth F.2 Area 2 FS 248
Noncultural Annuals: *Chenopodium* (goosefoot)	1.5
Perennials: *Juniperus* (juniper)	.7 +++ twigs
Pinus edulis (piñon)	+ needle
TOTAL TAXA	3

Numerical quantities refer to seeds or fruits per liter of soil. Nonreproductive parts are listed by abundance: + 1-10 items, ++ 11-25 items, +++ more than 25

There were no floral remains from FS 16. Archaic limited activity site LA 86139.

Table III.8. Coalition Period Repeatedly Occupied Sites (LA 86150 and 98690): Flotation Results.

	LA 86150				LA 98690		
	Hearth F.2 FS 123	Pit F.5 FS 124	Roasting pit F.4A FS 127	Hearth F.6 FS 130	Hearth F.1 FS 125	Hearth F.3, S½ FS 508	Hearth F.3, N½ FS 509
Cultural							
Annuals:							
Corispermum (bugseed)	.4						
Noncultural							
Annuals:							
Chenopodium (goosefoot)			.3				
Perennials:							
Juniperus (juniper)	.8	+sl		+sl	.5 +tw	+tw	+tw
Pinus edulis (piñon)						+n	+n
TOTAL TAXA	1	1	1	1	1	2	2

[1]Twelve additional flotation samples contained no floral remains: from LA 86150, FS 121, 122, 125, 126, 128, 129, 131, 132, and 133; from LA 98690, FS 124, 131, and 130.
Numerical quantities refer to seeds or fruits per liter of soil. Nonreproductive parts are listed by abundance: + 1-10 items, ++ 11-25 items, +++ more than 25

Table III.9. Coalition Period Repeatedly Occupied Sites (LA 86150 and 98690): Species Composition of Wood from Flotation Samples

	LA 86150	LA 98690				TOTAL
	Feature 4 Pit complex	Feature 1 Hearth		Feature 2 Hearth	Feature 3 Hearth	
	FS 127	NW ¼ FS 125	NE ¼ FS 131	SW ¼ FS 124	S ½ FS 508	
Juniperus (juniper)	.06g 8%		.59g 68%	.15g 94%	.01g 100%	.81g 45%
Pinus edulis (piñon)	.64g 86%		.28g 32%	.01g 6%		.93g 52%
Undetermined conifer	.04g 6%	.01g 100%				.01g 3%
TOTAL	.74g 100%	.01g 100%	.87g 100%	.16g 100%	.01g 100%	1.79g 100%

Table III.10. Coalition Period Possible Pit Kilns (LA 84793 and 86159): Flotation Results

	LA 84793 Feature 1				LA 86159 Feature 1	
	FS 16	FS 17	Upper fill FS 132	Lower fill FS 132	Upper fill FS 43	Lower fill FS 49
Noncultural Annuals: *Amaranthus* (pigweed)	1.0					
Chenopodium (goosefoot)	5.5	12.7	2.6	5.1	2.6	
Cheno-am (goosefoot/pigweed)			.4			
Euphorbia (spurge)		.7				
Portulaca (purslane)	5.5	16.0	.6	.4	1.0	
Perennials: *Echinocereus* (hedgehog cactus)				.1		
Juniperus (juniper)			1.3	.3	1.1, +twigs	+♂cone
Opuntia (pricklypear)				.1		
Pinus edulis (piñon)				.1		
Undetermined conifer			+♂c	+b	+b	
TOTAL TAXA	3	3	5	6	4	1

FS 121 from Feature 1 at LA 86150 had no floral remains.
Numerical quantities refer to seeds or fruits per liter of soil. Nonreproductive parts are listed by abundance: + 1-10 items, + + 11-25 items, + + + more than 25
♂c [male cone], b [bark]

Table III.11. Coalition Period Possible Pit Kilns (LA 84793, 86150 and 86159): Species Composition of Wood from Flotation Samples

	LA 84793		LA 86150	LA 86159		
	upper fill FS 132	lower fill FS 132	FS 121	upper fill FS 43	lower fill FS 49	TOTAL
Juniperus juniper	.56g 89%	.46g 60%	.15g 68%	.30g 86%	.30g 100%	1.77g 78%
Pinus edulis piñon	.01g 2%	.12g 16%	.02g 9%	.04g 11%		.19g 9%
Undetermined conifer			.05g 23%			.05g 2%
Unknown	.06g 9%	.18g 24%		.01g 3%		.25g 11%
TOTAL	.63g 100%	.76g 100%	.22g 100%	.35g 100%	.30g 100%	2.26g 100%

Table III.12. Early Classic Period Limited Activity Site (LA 84759): Species Composition of Wood from Flotation and Macrobotanical Samples

	Feature 1	
	FS 72	FS 73
Juniperus juniper	13.51g 77%	.11g 4%
Pinus edulis piñon		2.64g 96%
Undetermined conifer	3.83g 23%	.01g <1%
TOTAL	17.64g 100%	2.76g 100%

Table III.13. Unknown Period Limited Activity Sites (LA 86159): Flotation Results

	Feature 3	
	FS 529 0-10 cm	FS 530 10-20 cm
Noncultural Annuals *Chenopodium* (goosefoot)	4.0	0.5
Perennials *Juniperus* (juniper)	0.2	+ twigs
Total taxa	2	2

Numerical quantities refer to seeds or fruits per liter of soil. Nonreproductive parts are listed by abundance: + 1-10 items

Table III.14. Limited Activity Site of Unknown Period (LA 86159): Species Composition of Wood from Flotation Samples

	Stain		
	FS 529	FS 530	TOTAL
Juniperus (juniper)	.09g (31%)	.15g (100%)	.24g (55%)
Pinus edulis (piñon)	.03g (10%)		.03g (7%)
Undetermined conifer	.01g (4%)		.01g (2%)
Undetermined nonconifer	.02g (7%)		.02g (5%)
Unknown	.14g (48%)		.14g (32%)
TOTAL	.29g (100%)	.15g (100%)	.44g (100%)

Table III.15. Comparative Carbonized Flotation Remains from Santa Fe Area Sites of the Archaic, Coalition, and Early Classic Periods (Percent of Samples Found In)

Project/Site	n of samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
Archaic: Las Campanas [LA 84758, 84787, 86139, 86159]	22			conifer bark 9%		
Airport Road[1]	17	undet. 6%		*Pinus edulis* nutshell (macrobotanical sample)		
Tierra Contenta[2]	40	*Amaranthus* 3% cheno-am 30% *Chenopodium* 28% *Corispermum* 8% *Cycloloma* 10% *Portulaca* 10% *Croton* 3%	Gramineae 3% *Sporobolus* 3%	*Juniperus* seeds 30%, twigs 25% *Pinus edulis* nutshell 3%, umbos 8%	*Platyopuntia* 5%	
Archaic to Early Developmental: Veteran's Cemetery[3]	18	cheno-am 6% *Chenopodium* 61% *Corispermum* 6% *Helianthus* 6%	Gramineae culm 6% *Oryzopsis* 6%	*Juniperus* berry 6% seed 67% twig 6% *Pinus* bark 11%		
Coalition: Las Campanas [LA 84759, 84793, 86150, 86159, 98683, 98690]	26	*Corispermum* 4%				
Coalition-Early Classic: Agua Fria[4]	5	cheno-am 80% *Chenopodium* 40% *Portulaca* 20% *Cycloloma* 20% *Cleome* 20% undet. 40%	Gramineae 20%	*Juniperus* twigs 100% *Pinus* needles 80%, nutshell 40%, umbos 60% *Pseudotsuga* needle 20% *Quercus* acorn cap 20%	*Echinocactus* 20% *Equisetum* stem 20%	*Zea* 80% (*Cucurbita* pollen)
Arroyo Hondo[5]	174	cheno-am 34% *Portulaca* 16% *Cycloloma* 9% *Physalis* 5% *Cleome* 5% *Helianthus* 3%	*Oryzopsis* 7%	*Juniperus* berry 1% *Pinus* nutshell 4%, umbos also present	*Echinocereus* 10% *Mammillaria* 2% *Opuntia* 2% *Yucca* 3% *Prunus* 1%	*Zea* 82% *Cucurbita* 5% *Phaseolus* 7%
Developmental-Mid-Classic Dos Griegos[6]	5			*Pinus* bark-scales 60%		*Zea* 40%

Project/Site	n of samples	Annuals	Grasses	Trees	Other Perennials	Cultivars
Unknown Age: Las Campanas [LA 86159, 98694, 98685]	5					
Santa Fe ByPass[7]	4			*Pinus* bark 25% [unburned *Juniperus* twigs 75%, seeds or berries 50%		*Zea* 25%
Arroyo Frijoles[8]	2			*Pinus edulis* needles 50%, *Juniperus* scale leaves 50%		

Specimens are seeds unless otherwise specified.
[1]Toll 1994
[2]McBride 1994a
[3]McBride 1995
[4]Cummings 1989
[5]Wetterstrom 1986:Table 34
[6]Cummings and Puseman 1992
[7]Toll 1989: Table 1
[8]Dean 1993b

Table III.16. Comparative Carbonized Wood Remains from Santa Fe Area Sites of the Archaic and Other Periods (Percent Composition by Weight)

Project/Site	n of samples [total weight or pieces]	*Juniperus*	*Pinus*	Other species/ Comments
Archaic: Las Campanas [LA 84787, 86139, 86159]	9 [17.46g]	92%	3%	5% undetermined conifer
Airport Road[1]	6 [22.60g]	37%	54%*	9% undetermined conifer
Tierra Contenta[2]	3	dominant in 2 samples	dominant in 1 sample	
Coalition-Early Classic: Las Campanas [LA 84759, 84793, 86150, 86159, 98690]	10 [6.81g]	40%	55%	1% undetermined conifer 4% unknown
Agua Fria Schoolhouse[3]	4	dominant in 2 samples; co-dominant in 1	dominant in 1 sample; co-dominant in 1	
Arroyo Hondo[4]	[1108 pieces]	21%	37%*	33% ponderosa pine, 4% doug-fir, 6% other
Developmental-Mid-Classic: Dos Griegos[5] [site 283-3]	5 [108 pieces]	18%	80%*	2% Salicaceae

Project/Site	n of samples [total weight or pieces]	*Juniperus*	*Pinus*	Other species/ Comments
Unknown Date: Las Campanas [LA 86159]	2 [.44g]	55%	7%	2% undetermined conifer 5% undetermined non-conifer 32% unknown
Santa Fe ByPass[6]	2 [40 pieces]	43%	53%*	4% undetermined conifer

* *Pinus edulis* (piñon)

[1]Toll 1994
[2]McBride 1994
[3]Cummings 1989
[4]Creamer 1993, Table 7.1
[5]Cummings and Puseman 1992
[6]Toll 1989, Table 1

Appendix IV. All Excavated Sites Data Base

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
84758.1	3400	1	8	11	5	3	0	0	0	0	0	0	1	28	28
84775.2	800	8	42	15	2	31	1	0	0	0	0	2	1	101	101
84777.0	150	1	1	0	0	0	2	0	0	0	0	0	1	4	4
86152.0	2200	12	38	14	1	21	3	1	0	0	0	3	1	92	93
98678.0	25	2	6	0	0	2	2	0	0	0	0	0	1	12	12
98679.0	1050	5	18	2	0	4	1	0	0	0	0	0	1	30	30
98681.0	375	4	9	1	0	10	0	0	0	0	0	0	1	24	24
98684.0	600	3	6	0	0	0	1	0	0	0	1	0	1	10	10
98685.0	759	0	7	0	1	0	0	0	0	0	2	1	1	9	9
98686.0	321	10	0	0	2	0	0	0	0	0	0	1	1	13	13
98689.0	180	0	23	2	11	4	0	0	0	0	0	0	1	40	40
98692.0	2000	1	9	0	3	3	0	0	0	0	0	0	1	16	16
84746.0	832	13	20	16	2	12	8	0	0	0	0	4	2	75	75
84755.0	100	4	8	15	0	5	3	0	0	0	0	1	2	36	36
84761.0	1200	0	5	4	0	0	5	0	0	0	0	2	2	16	16
84762.0	600	3	7	8	0	1	2	0	0	0	0	6	2	27	27
84765.0	352	1	12	6	6	7	0	0	0	0	0	2	2	34	34
84778.0	491	7	5	11	0	2	8	0	0	0	0	2	2	35	35
84779.0	5100	10	34	20	1	4	8	0	0	0	0	3	2	80	80
85007.0	1058	26	58	37	1	17	14	0	0	0	0	8	2	161	161
85016.0	1536	26	44	45	3	22	7	0	1	0	0	11	2	158	159
85017.0	1500	23	50	24	3	21	5	0	0	0	0	10	2	136	136
85019.0	375	4	7	6	0	10	3	0	0	0	0	1	2	31	31

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
85022.0	966	8	15	9	1	9	5	0	0	0	0	3	2	50	50
85031.0	500	20	22	23	1	5	0	0	0	0	0	0	2	71	71
85032.0	2000	7	48	17	7	22	0	0	0	0	0	6	2	107	107
85035.0	600	2	1	2	0	1	0	0	0	0	0	0	2	6	6
85545.0	375	8	12	12	2	17	1	0	1	0	0	2	2	54	55
85547.0	180	4	8	6	0	2	3	0	0	0	0	3	2	26	26
85548.0	500	9	11	11	1	10	3	0	0	0	0	0	2	45	45
85549.0	225	5	4	3	0	2	2	0	0	0	0	1	2	17	17
85552.0	770	3	8	8	0	5	0	0	1	0	0	4	2	28	29
85554.0	96	2	6	2	0	2	6	0	0	0	0	2	2	20	20
85559.0	384	6	6	7	0	2	4	0	0	0	0	1	2	26	26
85561.0	1760	41	67	50	7	16	13	0	0	0	0	24	2	218	218
85562.0	1500	12	22	11	1	22	7	0	0	0	0	4	2	79	79
85563.0	1820	37	62	15	7	18	7	0	0	0	0	9	2	155	155
85564.0	540	17	67	20	20	19	4	0	0	0	0	14	2	161	161
85568.0	2000	22	30	16	11	10	6	0	0	0	0	8	2	103	103
85574.0	500	10	21	13	5	5	0	0	0	0	0	3	2	57	57
85576.0	1050	12	28	24	2	9	4	0	0	0	0	0	2	79	79
85583.0	20	7	14	12	0	11	2	0	0	0	0	1	2	47	47
85584.0	616	7	21	17	0	9	5	0	0	0	0	4	2	63	63
85585.0	100	10	21	18	0	8	4	0	0	0	0	3	2	64	64
85591.0	600	9	8	12	1	8	1	0	0	0	1	3	2	42	42
85596.0	1050	18	9	21	1	7	5	0	0	0	0	5	2	66	66
85598.0	1050	5	7	7	1	2	0	0	0	0	0	2	2	24	24
85609.0	1408	24	22	16	2	17	11	0	0	0	0	2	2	94	94

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
85611.0	3900	75	85	86	5	35	42	0	0	0	0	17	2	345	345
85612.0	2700	21	27	24	0	21	3	0	0	0	0	8	2	104	104
85621.0	2700	33	112	49	9	24	3	0	0	0	1	8	2	238	238
85627.0	594	7	9	8	0	2	0	0	0	0	0	5	2	31	31
85629.0	1050	6	23	7	0	2	2	0	0	0	0	1	2	41	41
85634.0	2800	31	91	51	9	32	13	0	0	0	3	25	2	252	252
85637.0	900	8	9	18	0	6	3	0	0	0	0	7	2	51	51
85646.0	1400	30	35	71	2	14	11	0	0	0	0	2	2	165	165
86133.0	306	1	2	7	0	3	0	0	0	0	0	2	2	15	15
86143.0	672	10	9	14	0	9	3	0	0	0	0	2	2	47	47
84775.1	875	2	9	3	6	0	2	0	0	1	0	2	1	24	24
84787.1	132	11	58	36	5	26	6	5	0	1	0	16	1	158	163
84787.2	875	123	817	249	142	304	36	29	0	1	3	134	1	1805	1834
84787.3	288	27	405	113	85	185	13	2	0	1	1	27	1	855	857
84787.4	1400	27	377	113	66	151	14	13	.	1	1	66	1	814	827
86139.0	1400	9	41	15	11	16	2	0	0	1	1	4	1	98	98
86148.0	1550	26	168	24	54	21	8	2	0	1	0	24	1	325	327
98690.5	225	2	6	1	1	3	0	0	0	1	1	0	1	13	13
83698.0	162	2	220	0	132	7	2	0	0	1	0	57	2	420	420
84758.2	350	83	611	166	90	165	29	41	0	1	14	14	2	1158	1198
85567.0	900	10	13	10	2	12	10	0	0	1	0	4	2	61	61
85622.0	1600	20	75	51	11	15	5	0	0	1	0	14	2	191	191
85566.0	960	7	4	4	0	8	5	0	1	2	0	8	2	36	37
85579.0	660	25	35	40	3	15	7	0	2	2	0	3	2	128	130
85620.0	1500	6	13	11	1	4	2	0	1	2	0	4	2	41	42

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
84759.1	696	14	14	9	0	14	4	1	5	3	0	0	1	55	61
84759.2	625	13	39	23	5	12	7	3	40	3	2	1	1	100	143
84773.0	6600	20	55	22	1	29	6	0	5	3	0	2	1	135	140
86131.0	6500	10	41	9	1	9	7	0	2	3	0	0	1	77	79
86134.0	3250	5	41	13	1	8	3	0	4	3	0	10	1	81	85
86147.0	2700	4	14	1	0	2	0	0	14	3	0	2	1	23	37
86149.0	1050	1	44	0	31	1	0	0	0	3	0	0	1	77	77
86150.1	1050	6	6	4	0	5	4	2	54	3	2	3	1	28	84
86150.2	525	3	8	5	1	1	3	4	10	3	3	0	1	21	35
86150.3	1696	2	7	3	1	5	1	1	5	3	1	2	1	21	27
86150.4	625	2	1	1	0	2	0	.	40	3	1	1	1	7	47
86151.0	4950	10	10	5	0	5	4	0	2	3	0	1	1	35	37
86155.0	1050	9	18	4	0	6	1	0	10	3	0	2	1	40	50
86156.0	1400	10	57	13	4	54	2	0	5	3	0	1	1	141	146
86159.1	120	0	2	0	1	7	0	0	569	3	1	0	1	10	579
86159.2	400	4	72	17	7	14	3	0	0	3	1	7	1	124	124
86159.5	256	9	14	11	0	4	1	0	28	3	1	0	1	39	67
98680.0	250	10	77	13	5	19	3	1	3	3	0	0	1	127	131
98682.0	2100	3	11	2	0	5	1	0	6	3	0	0	1	22	28
98683.0	520	0	0	1	0	0	0	0	11	3	0	0	1	1	12
98687.0	900	4	7	2	0	7	2	0	11	3	0	0	1	22	33
98688.1	2250	0	0	2	0	0	0	0	28	3	0	0	1	2	30
98688.2	810	136	517	103	5	259	14	0	2771	3	2	19	1	1053	3824
98688.3	4800	18	33	8	1	10	5	0	318	3	0	0	1	75	393
98690.1	450	0	6	2	3	2	0	1	49	3	1	0	1	13	63

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
98690.2	160	0	1	0	0	0	0	1	92	3	0	0	1	1	94
98690.6	225	0	10	0	4	1	0	3	20	3	0	0	1	15	38
98691.0	465	0	3	1	0	0	0	0	6	3	0	1	1	5	11
98861.0	2290	1	8	4	0	12	2	0	2	3	0	1	1	28	30
84749.0	1400	12	40	19	5	7	2	0	1	3	0	10	2	95	96
84764.0	2800	1	5	4	0	1	0	0	57	3	1	3	2	14	71
84780.0	962	7	16	9	0	3	3	0	5	3	0	3	2	41	46
84783.0	3300	3	7	3	1	0	0	0	171	3	1	9	2	23	194
84784.0	5400	7	10	25	0	9	2	0	18	3	2	16	2	69	87
84785.0	4500	6	4	13	0	0	1	0	122	3	4	3	2	27	149
85008.0	3705	38	51	68	1	23	19	0	1	3	0	17	2	217	218
85009.0	750	9	25	29	0	32	6	0	1	3	0	0	2	101	102
85011.0	442	5	12	2	0	1	4	0	41	3	0	0	2	24	65
85018.0	720	23	34	24	0	17	4	0	1	3	0	4	2	106	107
85023.0	707	4	5	1	0	3	0	0	1	3	0	1	2	14	15
85029.0	2250	16	38	12	7	45	6	0	4	3	0	5	2	129	133
85033.0	500	5	9	7	0	0	2	0	1	3	0	1	2	24	25
85551.0	1360	52	156	97	41	47	14	0	7	3	0	40	2	447	454
85558.0	500	4	10	12	0	3	3	0	11	3	0	2	2	34	45
85570.0	3584	56	112	69	7	32	14	0	3	3	0	34	2	324	327
85590.0	800	9	13	10	0	7	2	0	7	3	2	2	2	43	50
85606.0	11000	40	67	83	4	21	15	0	27	3	0	12	2	242	269
85638.0	36	6	30	24	0	9	1	0	1	3	0	1	2	71	72
85642.0	540	8	11	21	1	7	7	0	3	3	1	5	2	60	63
86130.0	2000	14	10	20	1	3	8	0	1	3	4	3	2	59	60

LA	Size	Primary Flake	Secondary Flake	Decortication Flake	Biface Flake	Angular Debris	Cores	Ground Stone	Sherds	Period*	Features	Tools	Org†	Chippped Stone	Total Assemblage
98693.0	880	0	6	1	0	1	0	0	1	4	0	1	1	9	10
84753.0	962	1	45	2	15	25	1	0	5	5	0	72	2	161	166
85544.0	1950	59	53	53	4	11	13	0	20	5	0	10	2	203	223

* Period: 0 = Unknown; 1 = Archaic; 2 = Developmental; 3 = Coalitoin/Classic; 4 = Historic Pueblo; 5 = Mixed

† Org: Organization conducting excavation - 1 = OAS; 2 = SAC