MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

TEST EXCAVATIONS AT TWO SITES ON THE BERNALILLO GRANT IN SANDOVAL COUNTY

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ADMINISTRATIVE SUMMARY

Test excavations were conducted in the area of a proposed borrow pit near the I-25 and NM 44 interchange. Test excavations at LA 85426 and LA 85427 were conducted in December of 1991 in order to determine whether subsurface features exist. Eight 1-m-sq test pits and a series of auger tests indicate that cultural materials are primarily surficial with no artifacts occurring below the upper 15 cm of soil. No features, fire-cracked rock, or charcoal were observed. A Middle to Late Archaic projectile point suggests at least some of the artifacts result from Archaic use of the area.

Neither site is likely to yield important information on local prehistory. No further studies are recommended.

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INTRODUCTION

The sites are located in the area of a proposed borrow pit near the intersection of NM 44 and I-25 at Bernalillo. New Mexico State Highway and Transportation Department archaeologist, Sandra L. Marshall (Marshall 1991), surveyed the 8.36 ha area, recorded the two sites, and recommended a limited testing program to determine the extent and significance of each site.

LA 85426 was recorded as a 25-by-60-m lithic artifact scatter with an artifact density in the hundreds. LA 85427 was smaller at 30-by-30 m and estimated to have tens of artifacts.

Timothy Maxwell served as principal investigator for the project. Nancy J. Akins and Peter Y. Bullock carried out the field work, laboratory analysis, and wrote this report. Ann Noble drafted the figures and Robin Gould edited the manuscript. We would like to thank the land owners, Steve Gudelj and Tom Walsh, for allowing us to work at the sites, Timothy J. Seaman for providing the NMCRIS data, and James L. Moore for his comments on the lithic section of this report.

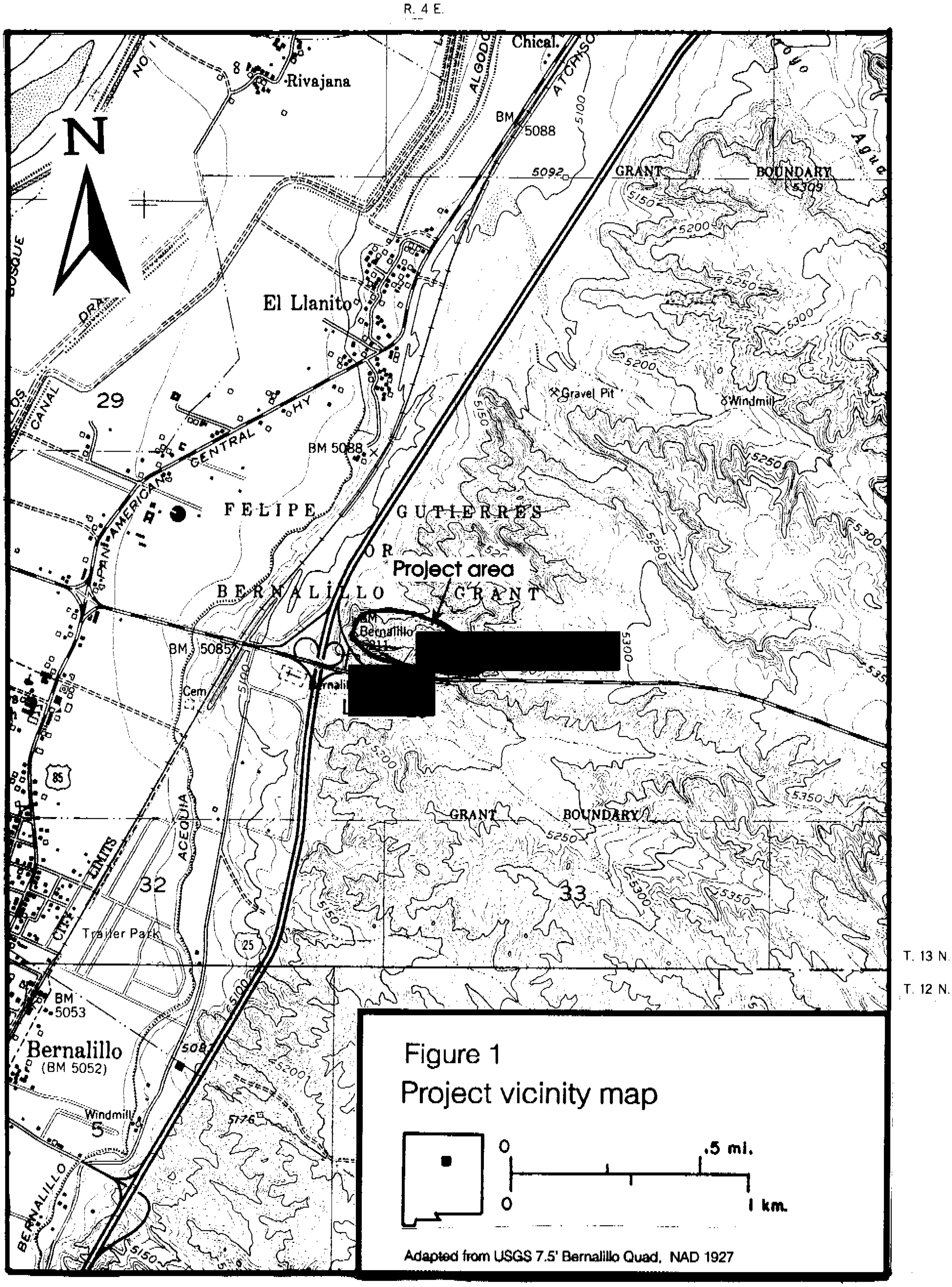

Figure 1
Project vicinity map

ENVIRONMENTAL SETTING

The Bernalillo Grant sites are situated on one of the numerous fingerlike terraces or bajadas overlooking the Rio Grande Valley to the west (Fig. 1). The most prominent geological features are the northern portion of the Sandia Mountains to the east and the Rio Grande Valley to the west. The current river channel is 2.5 km west of the sites.

The Sandia Mountains are faultblock mountains rising to a height of 3,255 m (10,678 ft) at the peak and around 1,829 m (6,000 ft) at the base. A light colored Precambrian granite capped by Pennsylvanian age limestones alternating with shale and sandstone are the primary geological formations (Kelley 1974:5-7).

The Rio Grande lies in a trough, or segment where the earth's crust has subsided between mountain uplifts. This trough is roughly 160 km (100 miles) long and 40 km (25 miles) wide from the mountains on the east. Albuquerque lies almost at the center (Kelley 1974:10). Deposits in the Rio Grande Valley are considered part of the Santa Fe Formation. Composition of this formation varies, depending on the adjacent uplifts. The materials differ with the particular uplift and the rocks being eroded. Axial materials are a mixture of locally derived rocks and those from upper portions of the drainage. Gravel in the narrow strip parallel to the present river channel contains well-rounded cobbly quartzite combined with sand, silt, and mud transported by stream flow from a distant source (Kelley and Northrop 1975:67-68).

Soil on the terrace is of the Ildefonso-Harvey association. Ildefonso soils are very gravelly sandy loam found on edges of dissected bajadas. Harvey loam occurs on the flat areas of the bajadas. Native vegetation associated with this soil type consists of grasses with scattered junipers. The potential natural plant community includes black grama, sideoats grama, little bluestem, blue grama, New Mexico feather grass, galleta, winterfat, and juniper. The average annual precipitation is 25 to 30 cm (10 to 12 inches), annual air temperature is 11 to 12 degrees C (52 to 54 degrees F) and the frost-free period is 120 to 140 days. Ildefonso soils are suited for rangeland and wildlife habitat (Soil Conservation Service [SCS] in press, pp. 170-172).

Between the bajadas, soil is of the Witt-Harvey association. Native vegetation is mainly grasses with the potential natural plant community characterized by black grama, New Mexico feathergrass, winterfat, and blue grama. This association is suited for rangeland (Soil Conservation Service, in press, pp. 143-145).

PREHISTORIC BACKGROUND

Paleoindian sites and isolated finds occur near the sites. Sandia Cave, which has both Sandia and Folsom deposits, lies to the east. Rio Rancho, site of a Folsom campsite, lies south and west (Cordell 1979:12). A Folsom midsection was found in the Los Huertas Valley less than 5 km east of the sites (Marshall et al. 1986:140).

Stuart and Gauthier (1981:31-33) view the earlier Paleoindian groups, such as Clovis, as generalized hunters and collectors, and subsequent groups, such as Folsom, as increasingly dependent on hunting migratory herd animals, especially bison. Later groups, such as those comprising the Cody complex, appear to have exploited a greater range of geomorphic areas indicative of a broader resource base.

A model for Archaic adaptation developed by Irwin-Williams for the Arroyo Cuervo region, north and west of the Bernalillo Grant sites, is generally applicable to the area. According to this model, Early Archaic (5550 to 3550 B.C.) groups were faced with frequent and significant climatic fluctuations and a general desiccation at the end of the Pleistocene glaciation. The Southwest environment was characterized by piñon-juniper savannas alternating with grasslands, decreasing amounts of surface water, and decreases in the size and predictability of bison herds, as well as their replacement by less concentrated and less predictable medium-sized species. The human response was a less specialized economy based on smaller animals and unspecialized gathering, wider niche exploitation, and residential mobility (Irwin-Williams 1979:33, 1984:9).

With an increase in effective moisture between 3500 and 2500 B.C., Middle Archaic (3550 to 850 B.C.) groups further broadened their economic base and began scheduling economic activities. Exploited territory size decreased as groups adopted a residential mobility strategy. Population increased and they may have practiced simple horticulture (Irwin-Williams 1984:9).

Late Archaic (850 B.C. to A.D. 450) changes were triggered by population growth and mobility constraints. As groups became more familiar with the resources in their area of exploitation, scheduling became more accurate, and food processing and storage improved along with the investment in horticulture. Mobility was further reduced and adaptations increasingly localized. Camps located near horticultural plots were occupied for longer periods and specialized task groups provided additional resources (Irwin-Williams 1979:38-40, 1984:9-10).

Cordell notes that Archaic sites in the Albuquerque area are generally located well above the flood plain on eroded surfaces cut by arroyos and occasionally in rock shelters (Cordell 1979:41). Both Early and Late Archaic sites were encountered in Los Huertas Valley to the east. Two of these are surficial scatters, one has possible hearths, and a fourth was a series of deeply buried hearths located near a water source (Marshall et al. 1986:140-144).

Basketmaker II and Basketmaker III/Pueblo I sites are well represented on the West Mesa of Albuquerque. Basketmaker II deposits indicate a continued degree of mobility with dependence on local mammals and corn. Basketmaker III/Pueblo I pit structures are more common and include early pottery types. Sites are located near intermittent tributaries of the Rio Grande, often on gravel bluffs or low terraces above the river valley (Cordell 1979:41-43). Two sites dating to this period are documented in the Las Huertas Valley. One was a residence found beneath a meter of valley floor sediment. The presence of a wood-frame structure built in a shallow basin, projectile points, corn and wild plants indicate a mixed subsistence base and a degree of mobility (Marshall et al. 1986:145-147).

Pueblo II (beginning about A.D. 900) is primarily defined by Red Mesa Black-on-white and San Marcial Black-on-white ceramics. Pit structures were the primary dwelling form. Site location and subsistence appears to have remained the same as the previous period. Pueblo III (A.D. 1200 to 1300) is marked by the appearance of Santa Fe Black-on-white pottery as well as a diversity of painted types not seen in Pueblo II. Pit structures continue but above-ground room blocks, some very large and referred to as Coalition sites, appear (Cordell 1979:43-45). Pueblo II and III sites in the Los Huertas Valley are located in areas suited to horticulture. Sites are small with minor midden accumulations suggesting short duration occupations or even seasonal use (Marshall et al. 1986:147).

Pueblo IV (or Rio Grande Classic, A.D. 1300 to 1600) is characterized by red-slipped glaze decorated pottery. The population of the Northern Rio Grande reached its peak at this time with large aggregated communities and elaborate material culture (Cordell 1979:45). The Los Huertas Valley has a number of sites occupied during this period. Most are small and located on lower benches and terraces with small middens. Again, these may represent seasonal farming establishments affiliated with large villages, possibly those located in the Rio Grande Valley or Tonque Wash in the Galisteo Basin. One exception is a 15- to 20-room site with coursed adobe construction and a substantial midden, which probably was a permanent establishment (Marshall et al. 1986:150).

Bernalillo and five adjacent USGS topographical quadrangles (Placitas, Alameda, Los Griegos, Santa Ana Pueblo, and San Felipe Pueblo) have 977 components (a site can have up to three components) in the New Mexico Cultural Records Information System (NMCRIS) at the Archeological Records Management Section (ARMS). Table 1 uses the Archaic, Anasazi, and historic Pueblo components and lists them by topographical feature. Archaic components are rare and Anasazi the most numerous. The cultural affiliation or time period is unknown for a large number of components (431 or 44.1 percent) and many are probably undiagnostic lithic scatters like the sites examined in this study.

Archaic components tend to be located on ridges or terraces (38.7 and 22.6 percent), however, terraces are also heavily used by Anasazi (19.2 percent) and historic Pueblo groups (18.2 percent). In addition, 32.7 percent of the components with unknown cultural affinities are found on ridges or terraces.

Table 1. Site Component by Topography

	Archaic		Anasazi		Historic Pueblo	
	n=	%	n=	%	n=	%
Arroyo/wash	4	12.9	27	9.3	1	1.1
Cliff base	1	3.2	2	.7		
Bench	2	6.4	15	5.1	10	11.4
Blow out			8	2.7	2	2.3
Cave			1	.3		
Cliff base			10	3.4	1	1.1
Dune	2	6.4	9	3.1	1	1.1
Flood plain/valley	1	3.2	46	15.8	22	25.0
Hill top			7	2.4		
Hill slope	1	3.2	35	12.0	7	7.9
Low rise			19	6.5		
Mesa/butte			5	1.7	2	2.3
Mountain/mountain front			2	.7	1	1.1
Open canyon			1	.3	2	2.3
Plain			7	2.4	2	2.3
Playa			1	.3		
Ridge	12	38.7	27	9.3	2	2.3
Saddle			3	1.0		
Talus bottom/talus slope			9	3.1	2	2.3
Terrace	7	22.6	56	19.2	16	18.2
Alluvial fan	1	3.2			1	1.1
Malpai			1	.3	16	18.2
Totals	31	99.8	291	99.6	88	100.0

RESEARCH OBJECTIVES

Given the nature of the Bernalillo Grant sites, our objectives are twofold. First, by examining the environmental setting of the sites we should be able to suggest the kinds of activities for which the locale is suited. Activities indicated by the lithic assemblage can be used to define the range of tasks represented. We can also generate a series of expectations regarding when and how the site area was used. The same general use can result in different artifact assemblages depending on the group using the site. A hunting party from a logistically organized pueblo might utilize the space differently than hunters from a nearby seasonal camp. The sites will be evaluated within this context.

SITE DESCRIPTIONS

LA 85426 is a 55-by-60-m lithic artifact scatter located in an unplatted area. It is on the top and north-facing slope of a ridge that lies on a gravel terrace or bajada overlooking the Rio Grande Valley to the west. The elevation is 1,599 m (5,245 ft). Vegetation includes scattered junipers, patches of grass, and occasional yucca and cacti. Junipers occur on the terrace edge and are scattered over the central portion of the site (Fig. 2). Eolian soil has collected at the bases of the junipers and central areas of the site. Accumulations of medium to large quartzite, limestone, granite, sandstone, igneous, chalcedony, and chert gravel are found on the terrace edge and slope. Gravel on the ridge top is usually small with occasional clusters of large cobbles, usually limestone or igneous rocks.

LA 85427 is just east of LA 85426, also at an elevation of 1,599 m (5,245 ft). It covers an area 50-by-60 m. A gravel ridge bisects the site. Lithic artifacts are found in a shallow drainage west of the ridge, a flat area east of the ridge, and a shallow dunelike accumulation south of the ridge (Fig. 3). Junipers rim the terrace edge and gravely ridge top. The distribution of gravel is similar to that at LA 85626, except that the central ridge is covered with medium to large gravel.

General Methods

We began by surveying the site surfaces to delineate the horizontal limits, locate artifact clusters and potential features, and find diagnostic artifacts. Surface artifacts were pin-flagged to mark areas of greatest artifact concentration and individual artifacts for in-field analysis. Both sites were traversed repeatedly at different times of the day to overcome poor visibility caused by the low angle of the sun in December and as patches of snow melted.

Test pits were placed within or adjacent to artifact concentrations and in other areas of possible prehistoric cultural activity. Each pit was given a sequential number. Excavation within a test pit continued until no artifacts were found in two consecutive levels. Pits were hand excavated in 10-cm levels with a shovel or trowel. Fill was screened through ¼-inch mesh. Artifacts recovered from the tests were assigned a field specimen number, bagged, and returned to the laboratory. Forms were completed for each level with information on surface characteristics, opening and closing depths, and soil matrix. Profiles of each test pit were drawn and photographed. An auger test was placed in the bottom of each test pit.

Additional areas of the sites were tested for buried cultural deposits using an auger. These were dug until gravel or rock was reached. Auger test depths were recorded as were observations on the soils encountered.

Main site datums were established for each site and maps produced using a transit, stadia rod, and a 30-m tape. Test pits, auger tests, surface artifacts, and current topographic features were point-plotted. Topographic contours were plotted for accurate depictions of the site's relation to the immediate physical environment.

Figure 2. LA 85426, overview of site looking southwest.

Figure 3. LA 85427, overview of site looking northwest.

The only artifacts collected were those diagnostic of a cultural or temporal affiliation, or excavated materials. All other artifacts were analyzed in the field and left in place. Two small obsidian cobbles were collected as material samples.

No flotation, pollen, or carbon-14 samples were collected, since no intact cultural strata were found. Test pits and auger tests were back-filled once excavation was completed. Materials collected from the sites will be curated at the Archeological Repository, at the Museum of New Mexico. Field and analysis notes will be kept on file at the Archeological Records Management Section of the New Mexico State Historic Preservation Division.

Testing Results

LA 85426

LA 85426 (Fig. 4) proved to be larger than defined by the survey, measuring 60 m north-south and 55 m east-west. Possible fire-cracked rock, noted during survey, was not located. A total of 172 surface artifacts was recorded and two subsurface artifacts were collected. Five 1-by-1-m test pits were excavated. No subsurface cultural features or deposits were found in any of the test pits. Both artifacts came from the upper 10 cm of soil. Ten auger tests were also excavated.

Test Pit 1 was placed in the northern portion of the site adjacent to a small reduction area (1-by-3 m) consisting of 44 artifacts, most of which came from a single core. This area is almost completely bare of vegetation; containing a single clump of grass. Seventy percent of the surface was covered with gravel smaller than 10 cm in size. Two arbitrary 10-cm levels were excavated, terminating 20 cm below ground surface. Beneath the 6 to 8 cm of slightly darker eolian surface duff was a stratum of reddish yellow sandy clay containing relatively dense gravel, large cobbles, and decaying sandstone. An auger test placed in the bottom of the test pit was only dug an additional 4 cm, due to the large amount of rock present. No artifacts or cultural material were recovered.

Test Pit 2 was located in the higher, southern portion of the site in the midst of a surface artifact cluster. The natural deposits in this area were eolian with sparse surface gravel. Several bunches of grass and snakeweed were present on the surface.

Three arbitrary 10-cm levels were excavated, ending 30 cm below the modern ground surface. The upper 4 to 6 cm of duff contained a single lithic artifact. One stratum was recorded below the eolian surface duff, a brown, sandy, silty clay containing some gravel. An auger test in the bottom of the test trench continued 40 cm before stopping at hard, dry gravel.

Test Pit 3 was located between two surface artifact clusters and adjacent to a pile of large rocks. The only projectile point from this project was found at the edge of this pit. Surface cover was mixed scattered grasses and sparse medium-sized gravel.

This test pit was excavated in two arbitrary 10-cm levels, ending 20 cm below the modern ground surface. Testing found one stratum below the 4 to 8 cm surface duff layer, a brown, sandy soil with a clay content that increased with depth. Few rocks were present subsurface;

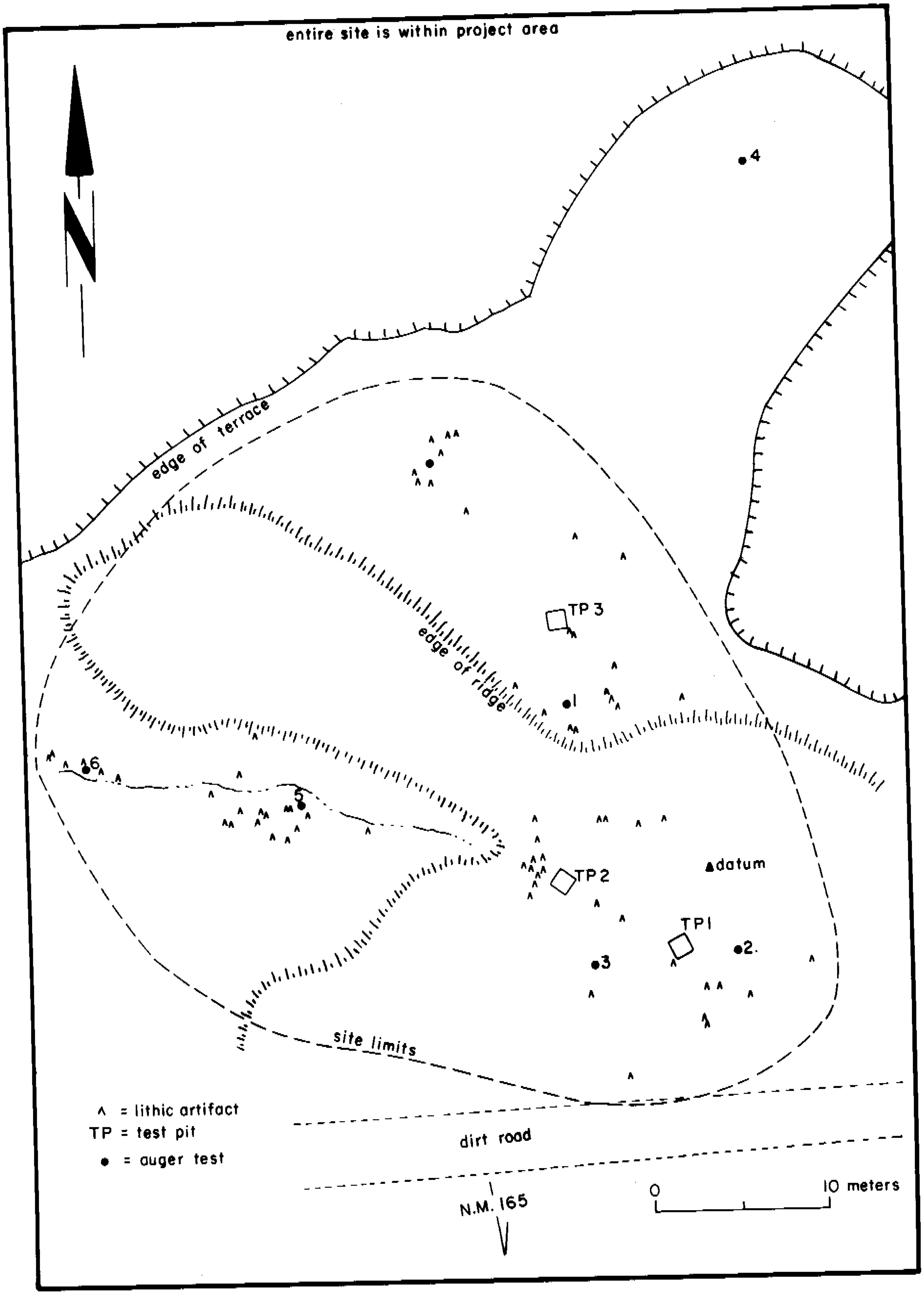

Figure 4. Plan of LA 85426.

however, a clay-wash and gravel layer was reached at the base of Level 2. An auger test revealed an additional 50 cm of sediment before a dry, hard gravel lens was encountered. No artifacts or cultural deposits of any kind were found.

Test Pit 4 was located in an artifact concentration on a north-facing slope. The ground cover consisted of angular surface gravel. It was dug in two arbitrary 10-cm levels, ending 20 cm below the present ground surface. The soil was sandy with the clay content increasing with depth. Sparse gravel was present throughout. Although the lower fill appeared to be a separate stratum, there was only a gradual break with the 4 to 8 cm surface duff layer. An auger test to a depth of 94 cm below the surface revealed a hard, dry, silty soil and gravel lens at 65 cm. No artifacts or cultural deposits were encountered in this test pit.

Test Pit 5 bisected a rough but provocative circle of rock in a flat open area (Fig. 5). The ground surface had an 80 percent coverage of pea-sized gravel. Surface vegetation consisted of mixed grasses and snakeweed. Test Pit 5 was excavated in three arbitrary 10-cm levels to a depth of 30 cm below modern ground surface. The rock arc proved to be surficial and natural with the rocks sitting in 1 to 5 cm of fine, silty sand and gravel. One stratum was found below this silty material, a reddish clay containing a small number of angular cobbles. The auger test stopped at 66 cm below the surface in a dry silt and gravel layer. A single lithic artifact was collected from Level 1; the other levels contained no artifacts or cultural materials.

Ten additional auger tests were placed across LA 85426. No cultural material or deposits were found. Auger test depths and observations can be found in Appendix 1.

Figure 5. Circle of rocks at LA 85426.

LA 85427

LA 85427 also proved to be larger than originally defined, measuring 60 m north-south and 50 m east-west (Fig. 6). Seventy-six surface artifacts were located and recorded. Eleven were recovered in subsurface deposits. Three 1-by-1-m test pits revealed no subsurface cultural features or deposits. The artifacts were all from the upper 20 cm of soil. Auger tests were placed in the bottoms of all test pits and at an additional seven locations.

Test Pit 1 was located in the southern portion of the site near the ridge top and just off the area disturbed by a dirt road. Soil was deeper in this area of the site and we suspect the artifacts may have been displaced downslope from the ridge top. Surface vegetation consisted of bunch grasses and snakeweed. Five cobbles over 5 cm in size and mixed gravel occurred on the modern ground surface.

Test Pit 1 was dug in four arbitrary 10-cm levels reaching a depth of 40 cm below the modern ground surface. Surface duff material 6 to 12 cm deep overlay a brown silty sand with clay inclusions. Caliche occurred toward the base of the test pit. Cobbles were present at the duff and stratum interface, but no rock or gravel was present below this point. Seven lithic artifacts were recovered in the two upper levels of soil deposits. There was no charcoal or indications of cultural deposits. An auger test of an additional 65 cm revealed no change in soil and no cultural material.

Test Pit 2 was located within a cluster of surface artifacts and near the head of a slight erosional channel. Numerous lithic artifacts were found near the pit and in the erosional channel. The modern ground surface was mostly bare with bunch grass and a few small surface gravels present.

Test Pit 2 was excavated in four arbitrary 10-cm levels. The upper two levels contained two lithic artifacts. Beneath the 2 to 6 cm duff layer was a single stratum of fine, probably eolian, sand with a slight clay content toward the base of the test pit. No rock or gravel was present. An auger test of an additional 65 cm indicated a slight increase in clay content. No other soil difference was observed.

Test Pit 3 was located in the central portion of the site, in a clearing adjacent to a number of surface artifact clusters. The ground surface had a heavy cover of gravel and angular rock. Vegetation was sparse, including bunchgrass and snakeweed.

Test Pit 3 was excavated in three arbitrary 10-cm levels, to a depth 30 cm below the modern ground surface. The stratum below the surface gravel and 2 to 5 cm duff layer was brown silty sand. Cobbles, angular rock, and gravel occur throughout the stratum. A slight texture change was noted toward the bottom of the test pit. One lithic artifact was collected from Level 1. No other cultural artifacts or deposits were found. An auger test of an additional 66 cm revealed no cultural material.

Seven auger tests were placed in areas that had the potential of containing cultural materials or deposits. No evidence of any cultural material was found. Auger test depths are included the Appendix 2.

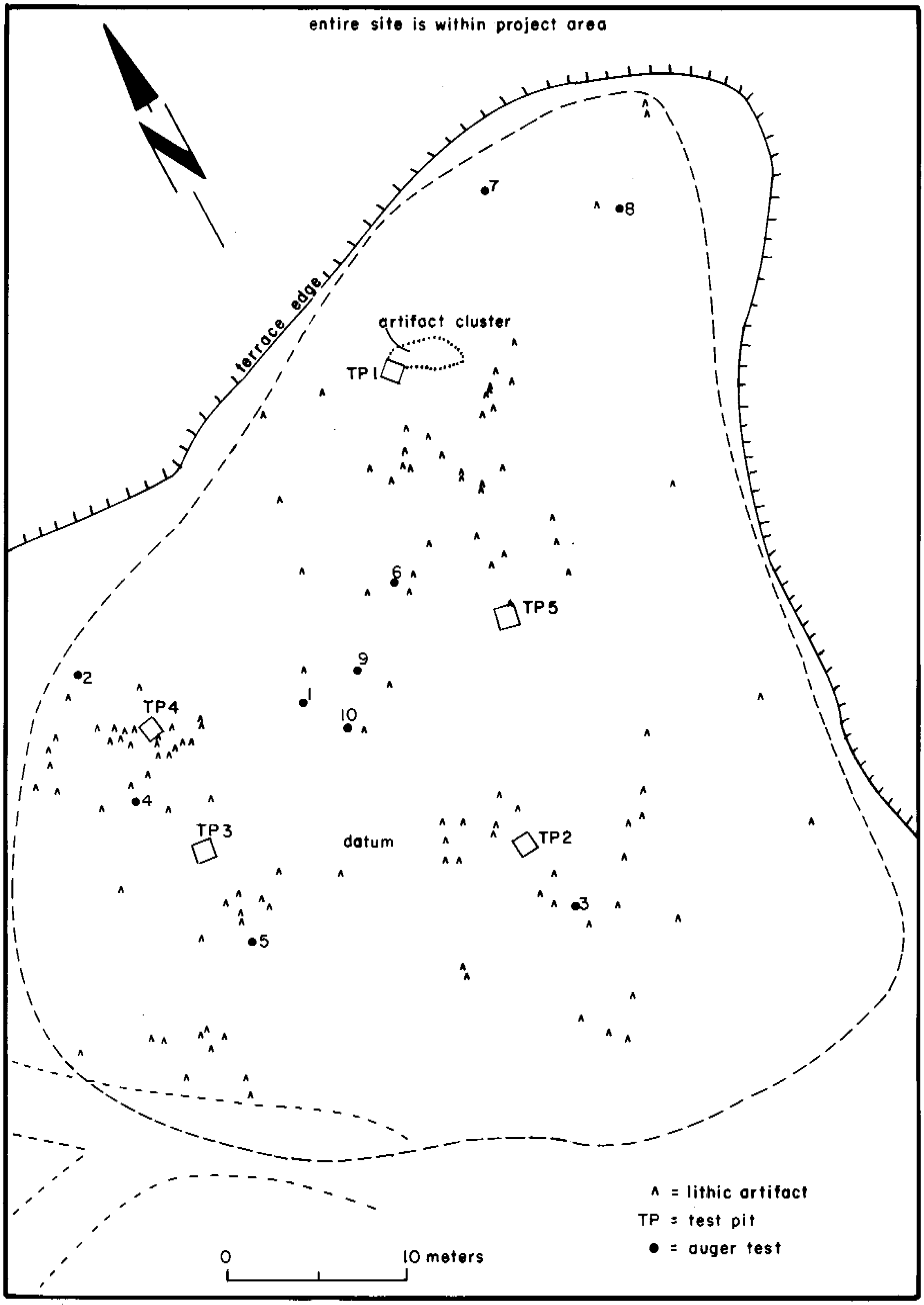

Figure 6. Plan of LA 85427.

LITHIC ARTIFACT ANALYSIS

A total of 326 lithic artifacts from the two sites and a collection of 20 artifacts from disturbed areas adjacent to the sites were analyzed. A majority of the artifacts were from the existing ground surface and analyzed in the field. A small number of subsurface artifacts were collected and analyzed.

Analytical Methods

Attributes chosen for the in-field lithic analysis reflect our desire to achieve the greatest return of useful information in the time allotted. The guidelines and format in the Office of Archeological Studies Standardized Chipped Stone Analysis Manual were followed.

Microwear analysis was deemed too time consuming and impractical for in-field analysis. Furthermore, microwear analysis is limited in its ability to make specific interpretations concerning the worked material (Neusius 1988:211). Relative distinctions in artifact wear can be made based upon the hardness of contact material (Neusius 1988:211), but failure to deal with the variation caused by differences in material properties (Brose 1975), including hardness, makes most analogy interpretations questionable. In areas of active environmental action, such as the site area, weathering also confuses microwear studies (Schnurrenberger and Bryan 1985:137).

Material Type

Codes for material type consist of general material groups unless the material is from a recognized source. For example, even though a wide range of chert occurs on these sites, all were classified as "chert." If a specimen was of a specifically named chert (such as Washington Pass chert), it would have been coded by the specific name.

Material Texture and Quality

Material texture is a subjective measure of material grain size within, rather than between, material groups. Textures are scaled from fine to course, with fine consisting of the smallest grain size and course consisting of the largest. "Glassy" only applies to glass and obsidian.

Material quality reflects the presence or absence of flaws or inclusions within the material. Air bubbles, fossils, and cracks that affect flaking quality are considered flaws.

Morphology

This is a characterization of artifacts by form.

Dorsal Cortex

Cortex is estimated to the nearest 10-percent increment. For flakes this consists of the cortex on the dorsal surface. Cortex on the platform is not included. For other morphological types the percentage of cortex on all surfaces is estimated and added together.

Flake Platform

Flake platform is recorded for whole and proximal flakes. Either the morphology of the impact area prior to flake removal or extreme modifications of the impact area caused by the actual flake removal is coded.

Size

Artifact size is recorded by size category. These categories consist of the maximum dimension measured through a progression of squares measured in square centimeters.

Ground Surface Present

The presence or absence of any form of ground surface was recorded.

Portion

Portion is the portion of the artifact recovered. Flakes and tools can be whole or fragmentary. Angular debris and cores are whole by definition.

Edge Number

Each utilized edge on an artifact was given an edge number. Consecutive numbers were used for artifacts with more than one utilized edge. Artifacts could conceivably have one or more utilized edges. Each edge was analyzed separately for function and wear patterns.

Function

Function characterizes and describes use on all artifacts.

Wear Patterns

Tool modification caused by human use is coded as wear.

Analytical Results

A bias toward larger, more easily observed flakes probably skewed our data regarding at least flake size and morphology. Since large flakes tend to be core flakes from early stages of reduction and core flakes tend to exhibit unmodified platforms, the predominance of core flakes exhibiting cortical or single-faceted platforms in the assemblage may indicate a sampling bias of this type, rather than early stage reduction. Few hammerstone flakes or spalls from hammerstones were found. Angular debris, which occurs at all stages of flintknapping, was found in low quantities. Low ratios of angular debris to flakes are an indication of tool manufacture.

In the following section, the lithic artifact data are presented as three units. Each site assemblage is treated as a separate unit and the isolated artifacts scattered between and around the sites and from the areas altered by blading and construction activities comprise the third unit.

Material Selection

Material use serves as an indication of human decision-making processes regarding the suitability of materials (Young and Bonnichsen 1985:128). The testing of material samples presumed to be useable lithic material, and their subsequent discard for a variety of factors, few readily apparent, indicate the suitability of lithic materials for tool manufacture or use. The chert reduction area at LA 85426 is an example of this process. Chert was tested by the site occupants and found to be satisfactory, as the evidence of subsequent reduction shows. This resulted in a concentrated scatter of 44 core and hammerstone flakes. Though a few were utilized, most were discarded and remained simple debitage. This was the only distinct core reduction area noted at the sites.

The LA 85426 assemblage consists primarily of chalcedony and chert, with other materials occurring in small amounts (Table 2). A majority of the artifacts from LA 85427 are chalcedony. A number of other materials were also present (Table 3). The off-site and disturbed area artifacts are overwhelmingly chalcedony (Table 4).

Chalcedony utilization exceeds that of any other single material type. At LA 85426, utilized artifacts made of chalcedony (both formal and expedient tools) comprise 29.9 percent. Utilized chalcedony tools of both classes at LA 85427 make up 27.6 percent of that assemblage. When chalcedony is compared to all other materials there is a preference for chalcedony in utilized debitage and formal tools in the LA 85427 assemblage, which is statistically significant at the .05 level. The distribution from LA 85626 is not significant (Tables 5-6).

Table 2. LA 85426, Artifact Morphology by Material

Count Row pct Col pct	Chert	Chal- cedony	Sil. Wood	Obsidian	Basalt	Lime- stone	Silt- stone	Quartz- ite	Row Total
Angular Debris	1 50.0 1.6	1 50.0 1.2							2 1.1
Core Flake	54 38.0 88.5	64 45.1 74.4	1 .7 100.0	2 1.4 66.7	5 3.5 83.3	5 3.5 100.0	1 .7 50.0	10 7.0 100.0	142 81.6
Resharp- ening Flake		2 100.0 2.3							2 1.1
Hammer- stone Flake	3 42.9 4.9	4 57.1 4.7							7 4.0
Bidirect- ional Core							1 100.0 50.0		1 .6
Multidirect- ional Core	1 16.7 3.3	10 83.3 11.6							12 6.9
Uniface early	1 33.3 1.6			1 33.3 33.3	1 33.3 16.7				3 1.7
Biface early		3 100.0 3.5							3 1.7
Biface middle		1 100.0 1.2							1 .6
Biface late		1 100.0 1.2							1 .6
Column Total	61 35.1	86 49.4	1 .6	3 1.7	6 3.4	5 2.9	2 1.1	10 5.7	174 100. 0

Table 3. LA 85427, Artifact Morphology by Material

Count Row pct Col pct	Chert	Chal- cedony	Sil. Wood	Obsidian	Basalt	Silt- stone	Quartz- ite	Row Total
Angular Debris		2 100.0 3.4						2 2.3
Core Flake	8 12.1 66.7	46 69.7 77.6	1 1.5 100.0	3 4.5 60.0	1 1.5 100.0	5 7.6 83.3	2 3.0 66.7	66 75.9
Resharp- ening Flake		2 100.0 3.4						2 2.3
Hammer- stone Flake	1 20.0 8.3	3 60.0 5.2		1 20.0 20.0				5 5.7
Multidirect- ional Core	3 42.9 25.0	2 28.6 3.4		1 14.3 20.0		1 14.3 16.7		7 8.0
Cobble Tool							1 100.0 33.3	1 1.1
Uniface early		4 100.0 6.9						4 4.6
Column Total	12 13.8	59 67.8	1 1.1	5 5.7	1 1.1	6 6.9	3 3.4	87 100.0

Table 4. Disturbed Area, Artifact Morpology by Material

Count Row Pct Column pct	Chalcedony	Quartzite	Row Total
Angular Debris	1 100.0 5.3		1 5.0
Core Flake	16 100.0 84.2		16 80.0
Multidirectional Core	1 50.0 5.3	1 50.0 100.0	2 10.0

Count Row Pct Column pct	Chalcedony	Quartzite	Row Total
Biface early	1 100.0 5.3		1 5.0
Column Total	19 95.0	1 5.0	20 100.0

Table 5. LA 85426 Chi-Square

Material	Debitage	Utilized Deb.	Formal Tools	Row Total
Chalc	34	37	15	86 49.4
Other	52	24	12	88 50.6
Column Total	86 49.4	61 35.1	27 15.5	174 100.0

Chi-Square	D.F.	Significance	Cells with E.F. <5
6.84918	2	.0326	none

Table 6. LA 85427, Chi-Square

Material	Debitage	Util. Deb.	Formal Tools	Row Total
Chalc	35	14	10	59 67.8
Other	15	7	6	28 32.2
Column Total	50 57.5	21 24.1	16 18.4	87 100.0

Chi-Square	D.F.	Significance	Cells with E.F. <5
.32915	2	.8483	none

Artifact Morphology and Material

Core flakes make up the largest morphological group in each of the three data sets. Core flakes are also the largest morphological group within each material category. More morphological types occur within the chalcedony material type. This is true for all three data sets (Tables 2-4), indicating that chalcedony was the main material processed and utilized at the sites.

Flake Morphology and Flake Portion

The largest category of flake portion in the site assemblages is whole flake. Proximal flake fragment is the second largest category in all three data sets, and across all flake types, except resharpening flakes. All the resharpening flakes are proximal fragments. Proximal fragments outnumber distal fragments by a ratio greater than 2 to 1 at both LA 85426 and LA 85427. The ratio of proximal fragments to distal fragments for the disturbed area is 10 to 1, but there are few flakes in this data set (Tables 7-9).

Dorsal Cortex and Platform Type

The amount of cortex on lithic artifacts and the predominance of core flakes exhibiting cortical or single-facet platforms can provide evidence of the stage of lithic reduction. Cortical and single-facet platforms predominate (Tables 10-12), and cortex is present on 59.2 percent of the artifacts from LA 85426 and on 65.5 percent of the artifacts from LA 85427 (Tables 13-15). The largest percentages are found in the 0-40 percent range (73.6 percent of the artifact total on LA 85426 and 65.5 percent of the artifact total on LA 85427). This suggests that some preliminary core preparation occurred on at least the chalcedony prior to the material arriving at the sites. A sampling bias toward large flakes may have made these percentages, though high, lower than they should be.

Utilization by Material

Utilized single function artifacts at LA 85426 are predominately chalcedony (Table 16). The only functional categories that span a number of material types are utilized debitage, utilized/retouched debitage, hammerstone flakes, notches, and side scrapers. A similar range of utilization is observed for LA 85427 concerning chalcedony. Here, however, only utilized debitage, utilized/retouched debitage, and hammerstone flakes exhibit the same range of material types observed for LA 85426 (Table 17). Chalcedony also predominates the utilized assemblage recorded for the disturbed area (Table 18).

Artifacts exhibiting multiple functions mirror the single function artifacts with regard to material. Chalcedony predominates, extending across the widest range of artifact types. Utilized debitage and utilized/retouched debitage again show the greatest range of materials used (Tables 19-21).

Table 7. LA 85426, Flake Morphology by Flake Portion

Count Row pct	Whole Flake	Proximal	Medial	Distal	Lateral	Row Total
Core Flake	68 47.9	31 21.8	16 11.3	15 10.6	12 8.4	142 94.0
Resharp. Flake		2 100.0				2 1.3
Hammer. Flake	4 57.1	3 42.9				7 4.6
Column Total	72 47.7	38 25.2	16 10.6	15 9.9	12 7.9	151 99.9

Table 8. LA 85427, Flake Morphology by Flake Portion

Count Row pct	Whole Flake	Proximal	Medial	Distal	Lateral	Row Total
Core Flake	26 39.4	19 28.8	8 12.1	8 12.1	9 13.6	66 90.4
Resharp. Flake		1 50.0			1 50.0	2 2.7
Hammer. Flake	2 40.0	2 40.0			1 20.0	5 6.8
Column Total	28 38.3	22 30.1	8 11.0	8 11.0	11 15.1	73 99.7

Table 9. Disturbed Area, Flake Morphology by Flake Portion

	Whole Flake	Proximal	Medial	Distal	Lateral	Row Total
Core Flake	4 25.0	10 62.5		1 6.2	1 6.2	16 99.9

Table 10. LA 85426, Flake Morphology by Platform Type

Count Row pct Col pct	Cortical	Single facet	Single and Abraded	Multifacet	Multi. and Abraded	Row Total
Core Flake	37 26.1 97.4	57 40.1 95.0	1 .7 100.0	7 4.9 87.5	1 .7 100.0	103 95.4
Resharpening Flake				1 50.0 12.5		1 .9
Hammerstone Flake	1 14.3 2.6	3 42.9 5.0				4 3.7
Column Total	38 35.2	60 55.5	1 .9	8 7.4	1 .9	108 100.0

Table 11. LA 85427, Flake Morphology by Platform Type

Count Row pct Col pct	Cortical	Single Facet	Multi-facet	Retouched	Collapsed	Crushed	Absent	Row Total
Core Flake	19 28.8 95.0	22 33.3 91.7			8 12.1 88.9	1 1.5 50.0	16 24.2 100.0	66 90.4
Resharpening Flake		1 50.0 4.2	1 50.0 100.0					2 2.7
Hammerstone Flake	1 20.0 5.0	1 20.0 4.2		1 20.0 100.0	1 20.0 11.1	1 20.0 50.0		5 6.8
Col Total	20 27.4	24 32.9	1 1.4	1 1.4	9 12.3	2 2.7	16 21.9	73 99.9

Table 12. Disturbed Area, Flake Morpology by Platform Type

Count Row pct	Cortical	Single facet	Multi-facet	Collapsed	Absent	Row Total
Core Flake	3 20.0	8 53.3	2 13.3	1 6.6	1 6.6	15 99.8

Table 13. LA 85426, Cortex by Material

Count col pct	Chert	Chal- cedony	Sil. Wood	Obsid- ian	Basalt	Lime- stone	Silt- stone	Quart- zite	Row Total
0%	17 27.9	46 53.5		1 33.3		2 40.0		5 50.0	71 40.8
1-40%	24 39.3	24 27.9	1 100.0	2 66.7	3 50.0			3 30.0	57 32.8
41-69%	8 13.1	9 10.5			1 16.7		1 50.0	1 10.0	20 11.5
70-99%	11 18.0	6 7.0			2 33.3	3 60.0	1 50.0	1 10.0	24 13.8
100%	1 1.6	1 1.2							2 1.1
Column Total	61 35.1	86 49.4	1 .6	3 1.7	6 3.4	5 2.9	2 1.1	10 5.7	174 100

Table 14. LA 85427, Cortex by Material

count col pct	Chert	Chal- cedony	Sil. Wood	Obsid- ian	Basalt	Silt- stone	Quartz- ite	Row Total
0%	2 16.7	24 40.7	1 100.0	2 40.0			1 33.3	30 34.5
1-40%	6 50.0	16 27.1		2 40.0	1 100.0	2 33.3		27 31.0
41-69%	3 25.0	10 17.0				1 16.7		13 14.9
70-99%	1 8.3	7 11.9				1 16.7	2 66.7	11 12.6
100%	1 8.3	2 3.4		1 20.0		2 33.3		6 6.9
Column Total	12 13.8	59 67.8	1 1.1	5 5.7	1 1.1	6 6.9	3 3.4	87 100.0

Table 15. Disturbed Area, Cortex by Material

count col pct	Chacedony	Quartzite	Row Total
0%	9 47.4		9 45.0
1-40%	6 31.6	1 100.0	7 35.0

count col pct	Chacedony	Quartzite	Row Total
41-69%	1 5.3		1 5.0
70-99%	3 15.8		3 15.0
Column Total	19 95.0	1 5.0	20 100.0

Table 16. LA 85426, Single Function Artifacts by Material

Count Row Pct Col pct	Chert	Chal-cedony	Obsidian	Basalt	Lime-stone	Silt-stone	Quartz-ite	Row Total
Utilized Debitage	12 26.1 60.0	24 52.2 46.1	1 2.2 50.0	2 4.3 40.0	1 2.2 100.0		6 13.0 85.7	46 52.3
Retouched Debitage		4 100.0 7.7						4 4.5
Utilized/ Retouched Debitage	1 9.1 5.0	9 81.8 17.3					1 9.1 14.3	11 12.5
Utilized/ Retouched Core		2 100.0 3.8						2 2.3
Hammer-stone flake	4 50.0 20.0	4 50.0 7.7						8 9.1
Notch	1 33.3 5.0	1 33.3 1.9		1 33.3 20.0				3 3.4
Denticulate						1 100.0 100.0		1 1.1
End Scraper			1 100.0 50.0					1 1.1
Side Scraper	2 33.3 10.0	2 33.3 3.8		2 33.3 40.0				6 6.8
End-Side Scraper		1 100.0 1.9						1 1.1

Count Row Pct Col pct	Chert	Chal- cedony	Obsidian	Basalt	Lime- stone	Silt- stone	Quartz -ite	Row Total
Biface		2 100.0 3.8						2 2.3
Knife		3 100.0 5.8						3 3.4
Column Total	20 22.7	52 59.1	2 2.3	5 5.7	1 1.1	1 1.1	7 7.9	88 99.9

Table 17. LA 85427, Single Function Artifacts by Material

Count Row pct Col pct	Chert	Chal- cedony	Sil. Wood	Obsidian	Silt- stone	Quartz- ite	Row Total
Utilized Debitage		12 75.0 50.0	1 6.3 100.0	1 6.3 50.0	2 12.5 50.0		16 43.2
Utilized/ Retouched Debitage	1 20.0 20.0	2 40.0 8.3		1 20.0 50.0	1 20.0 25.0		5 13.5
Utilized/ Retouched Core	1 100.0 20.0						1 2.7
Hammerstone Flake	3 33.3 60.0	4 44.4 16.7			1 11.1 25.0	1 11.1 100.0	9 24.3
Notch		1 100.0 4.2					1 2.7
End Scraper		1 100.0 4.2					1 2.7
Side Scraper		1 100.0 4.2					1 2.7
Uniface		3 100.0 12.5					3 8.1
Column Total	5 13.5	24 64.9	1 2.7	2 5.4	4 10.8	1 2.7	37 99.9

Table 18. Disturbed Area, Single Function Artifacts by Material

Count Row pct Column pct	Chalcedony	Quartzite	Row Total
Utilized Debitage	7 100.0 58.3		7 53.8
Utilized/Retouched Debitage	3 100.0 25.0		3 23.1
Utilized/Retouched Core	1 50.0 8.3	1 50.0 100.0	2 15.4
Biface	1 100.0 8.3		1 7.7
Column Total	12 92.3	1 7.7	13 100.0

Table 19. LA 85426, Multiple Function Artifacts by Material

Count Row pct Col. pct	Chert	Chalcedon y	Obsidian	Basalt	Limestone	Quartzite	Row Total
Utilized Debitage	5 38.5 100.0	6 46.2 50.0		1 7.7 100.0		1 7.7 50.0	13 56.5
Retouched Debitage			1 100.0 50.0				1 4.3
Utilized/ Retouched Debitage		3 60.0 25.0	1 20.0 50.0			1 20.0 50.0	5 21.7
Notch		1 50.0 8.3			1 50.0 100.0		2 8.7
Knife		2 100.0 16.7					2 8.7
Column Total	5 21.7	12 52.2	2 8.7	1 4.3	1 4.3	2 8.7	23 100.0

Table 20. LA 85427, Multiple Function Artifacts by Material

Count Row pct Col. pct	Chert	Chalcedony	Row Total
Utilized Debitage	1 16.7 50.0	5 83.3 100.0	6 85.7
Utilized/ Retouched Core	1 100.0 50.0		1 14.3
Column Total	2 28.6	5 71.4	7 100.0

Table 21. Disturbed Area, Multiple Function Artifacts by Material

Count Row pct Column pct	Chalcedony	Quartzite	Row Total
Utilized Debitage	4 100.0 80.0		4 66.7
Utilized/ Retouched Debitage	1 100.0 20.0		1 16.7
Utilized/ Retouched Core		1 100.0 100.0	1 16.7
Column Total	5 83.3	1 16.7	6 100.0

Material Quality

The majority of the single function utilized artifacts (artifacts with a single utilized edge) from all areas of the sites consist of fine-grained flawed material. This is expected since chalcedony is the primary material utilized. Medium grained and flawed material also occurs. Obsidian accounts for the glassy and flawed quality material present (Tables 22-24).

The material quality of multiple function artifacts (artifacts with more than one utilized edge) at the sites follows the pattern observed in the single function artifacts (Tables 25-27). Fine grained and flawed material dominates the assemblage, followed by small quantities of medium grained and flawed, and glassy and flawed.

The material quality of both utilization classes (single utilization and multiple utilizations) indicate selection for finer-grained lithic materials. These tend to be chalcedony, chert, fine-grained quartzite and obsidian, the cryptocrystalline, isotropic, and highly silicious lithic materials with elastic qualities considered the most desirable for reduction (Crabtree 1972:4-5). These are also materials that produce the sharpest cutting edges, as opposed to coarser grained materials that produce more durable edges.

Table 22. LA 85426, Single Function Artifacts by Material Quality

Count Row pct Col pct	Glassy and Flawed	Fine-grained Flawed	Medium-grained Flawed	Coarse-grained Flawed	Row Total
Utilized Debitage	1 2.2 50.0	41 89.1 53.2	4 8.7 50.0		46 52.3
Retouched Debitage		4 100.0 5.2			4 4.5
Utilized/ Retouched Debitage		8 72.7 10.4	2 18.2 25.0	1 9.1 100.0	11 12.5
Utilized/ Retouched Core		2 100.0 2.4			2 2.3
Hammerstone flake		8 100.0 10.4			8 9.1
Notch		3 100.0 3.9			3 3.4
Denticulate			1 100.0 12.5		1 1.1
End Scraper	1 100.0 50.0				1 1.1
Side Scraper		5 83.3 6.5	1 16.7 12.5		6 6.8
End/Side Scraper		1 100.0 1.3			1 1.1
Biface Undiffer-entiated		2 100.0 2.6			2 2.3

Count Row pct Col pct	Glassy and Flawed	Fine-grained Flawed	Medium-grained Flawed	Coarse-grained Flawed	Row Total
Knife		3 100.0 3.9			3 3.4
Column Total	2 2.3	77 87.5	8 9.1	1 1.1	88 100.0

Table 23. LA 85627, Single Function Artifacts by Material Quality

Count Row pct Col pct	Glassy and Flawed	Fine-grained Flawed	Medium-grained Flawed	Row Total
Utilized Debitage	1 6.3 100.0	15 93.8 46.9		16 43.2
Utilized/ Retouched Debitage	1 20.0 50.0	4 80.0 12.5		5 13.5
Utilized/ Retouched Core			1 100.0 33.3	1 2.7
Hammerstone Flake		1 77.8 21.9	2 22.2 66.7	9 24.3
Notch		1 100.0 3.1		1 2.7
End Scraper		1 100.0 3.1		1 2.7
Side Scraper		1 100.0 3.1		1 2.7
Uniface, Undiffer-entiated		3 100.0 9.4		3 8.1
Column Total	2 5.4	32 86.5	3 8.1	37 100.0

Table 24. Disturbed Area, Single Function Artifacts by Material Quality

	Fine-grained and Flawed	Percent
Utilized Debitage	7	53.8
Utilized/Retouched Debitage	3	23.1
Utilized/Retouched	2	15.4
Biface, Undifferentiated	1	7.7
Column Total	13	100.0

Table 25. LA 85426, Material Quality of Artifacts with Multiple Functions

Count Row pct Col. pct	Utilized Debitage	Retouched Debitage	Utilized/Retouched Debitage	Notch	Knife	Row Total
Glassy and Flawed		1 50.0 100.0	1 50.0 20.0			2 8.7
Fine-grained & Flawed	12 63.2 92.3		4 21.1 80.0	1 5.3 50.0	2 10.5 100.0	19 82.6
Medium-grained & Flawed	1 50.0 7.7			1 50.0 50.0		2 8.7
Column Total	13 56.5	1 4.3	5 21.7	2 8.7	2 8.7	23 100.0

Table 26. LA 85427, Material Quality of Artifacts with Multiple Functions

Count Row pct Column pct	Utilized Debitage	Utilized/ Retouched core	Row Total
Fine-grained and Flawed	6 100.0 100.0		6 85.7
Medium-grained and Flawed		1 100.0 100.0	1 14.3
Column Total	6 85.7	1 14.3	7 100.0

Table 27. Disturbed Area, Material Quality of Artifacts with Multiple Functions

	Utilized Debitage	Utilized/ Retouched Debitage	Utilized/ Reouched Core	Row Total
Fine-grained and Flawed	4	1	1	6
Percent	66.7	16.7	16.7	100.0

Tools

Diagnostic artifacts are lacking at the sites. An assignment to the Middle or Late Archaic is largely based on the occurrence of a single Middle to Late Archaic projectile point mid-section (Fig. 7) with a portion of a barb on one side. This projectile point is made of a clear and dark brown mossy chalcedony, possibly the chalcedony found in the quarry areas along Los Huertas Creek (Marshall et al. 1986:104).

Use of the sites as logistical or resource extraction locations rather than residential sites should be supported by the presence of bifaces and biface resharpening flakes. A biface is a flake or core blank that has been reduced on both faces from two parallel but opposing axes (Kelly 1988:718). Bifaces can be used as either tools or cores without further modification, thus maximizing tool edges while minimizing the amount of stone transported and providing durable long use-life tools. Bifaces have the advantage over other lithic tools of being reliable, easy to maintain, and have the potential for reshaping as raw material. Kelly (1988:721-723) suggests that there should be a difference in biface occurrence on residential versus logistical sites. The production and use of bifaces in residential sites should result in large proportions of biface flakes, low numbers of utilized biface flakes, low numbers of simple cores but a high frequency of simple flake tools as opposed to utilized biface flakes. Furthermore, bifacial tools would be produced and maintained in residential sites while at logistical sites bifaces would be used as tools and/or cores that would result in higher numbers of utilized biface flakes.

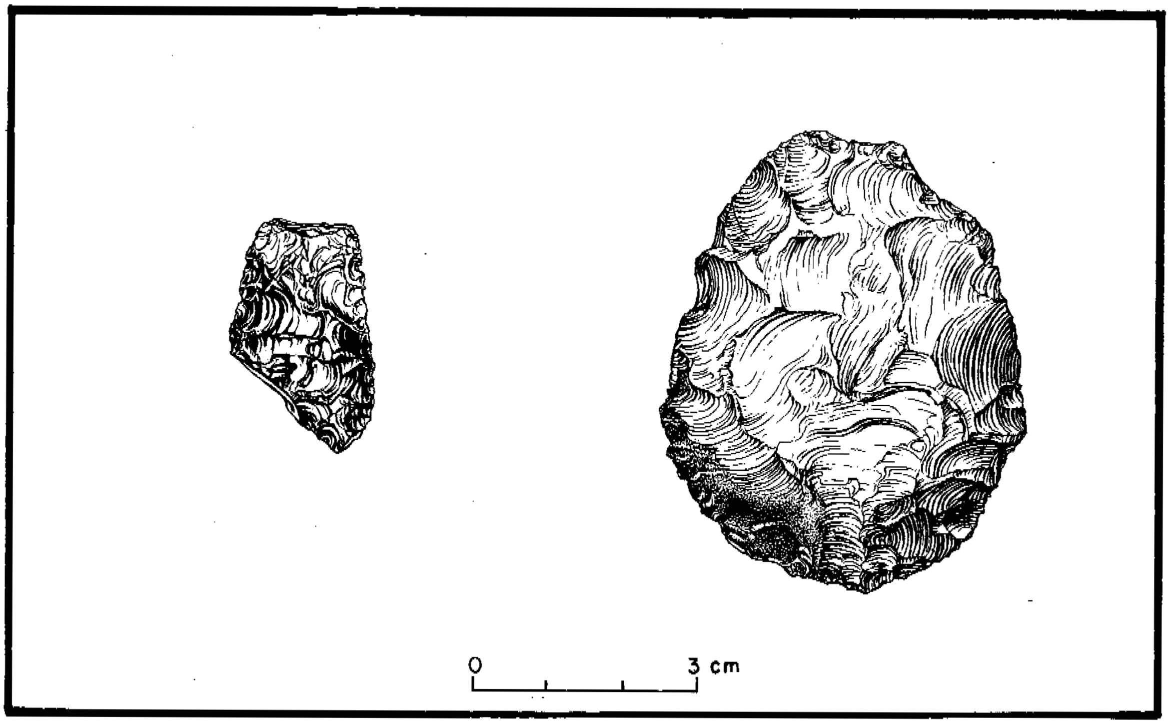

Figure 7. Projectile point and biface recovered from LA 85426.

Unfortunately, our artifact totals in all categories are too small to fully evaluate the assemblage using Kelly's model. The assemblage does have limited evidence of bifaces utilized as long-use tools and cores. Both bifaces and biface resharpening flakes occur in small numbers. Far more common are cores and core flakes, perhaps because raw materials were readily available and the distance from the camp was short (see Kelly 1988:719).

The ratio of utilized debitage to formal tools varies between the sites. LA 85426 utilized debitage comprise 24.1 percent, with 18.4 percent formal tools, for a ratio of 1.3:1. At LA 85427, 35.1 percent of the total artifact assemblage was utilized debitage and 15.5 percent of the total assemblage consisted of formal tools (a ratio of 2.3:1). The disturbed area assemblage was 50.0 percent utilized debitage, and 15.0 percent formal tools (a 3.3:1 ratio). These ratios should not be considered significant. The predominance of proximal flake portions suggests significant post-reduction impact, a conclusion supported by the high percentage of edge damage on debitage from the disturbed areas.

Artifacts exhibiting utilization make up 52.9 percent of the LA 85426 assemblage, with 37.5 percent exhibiting unidirectional utilization, 3.6 percent bidirectional utilization, 4.6 percent battering, and .6 percent rounding. The LA 85427 assemblage has 28.7 percent unidirectional utilization, 3.4 percent bidirectional utilization and 10.3 percent battering, for a total of 42.5 percent. Sixty percent of the artifacts from the disturbed area have wear; unidirectional utilization, 45 percent; bidirectional utilization, 5 percent; and battering, 10 percent.

The proportion of formal tools comprising prehistoric lithic tool kits tend to change through time and space, reflecting the range and duration of activities conducted (Christenson 1987:77). The size and nature of the assemblage is such that, in this case, elaboration of cultural affiliation beyond an "Archaic" designation and a designation of "Middle" or "Late" is not possible. Though tool location has been demonstrated to aid in site occupation interpretation (Schlanger 1991), these sites are too badly deflated for this to be successfully attempted. The occurrence of utilized debitage as expedient tools indicates a wider range of activities occurred than those represented by the formal tools alone. Utilized debitage may indicate unplanned or unexpected activity such as repairing clothing or equipment, or processing a chance kill (Parry and Kelly 1986).

Discussion

Limited exploitation of the local lithic resources and reduction of the chalcedony took place at the sites. The river terrace gravel contains a variety of materials: quartzite, basalt, limestone, poor quality chert, silicified wood, and obsidian (possibly originating in the Jemez Mountains) in the form of waterworn nodules. Chalcedony occurs rarely as small nodules. Larger, better quality pieces of chalcedony occur to the northeast and east along Los Huertas Creek (Marshall et al. 1986:104, 144). Long-term exploitation of this lithic material is indicated by extensive prehistoric quarrying along Los Huertas Creek. The proximity of the Bernalillo Grant sites to the quarries tends to affirm this as the main chalcedony source.

Material percentages at the sites show that processing of local material was not the sole focus of lithic activity. The artifact assemblage indicates that the transported chalcedony had little prior reduction (based on the occurrence of cortex). Joint occurrences of local and nonlocal (or local but not immediately available) lithic materials are common on Archaic sites (Parry 1987b:225).

Gross interpretations of wear patterns are the extent of our capability. Bidirectional wear is traditionally considered an indication of cutting and slicing, while unidirectional wear is thought to indicate scraping. Experiments conducted by Vaughan (1985) and Moore (James L. Moore, pers. comm., February 1992) show that wear patterns are unreliable indicators of the type of use.

Notches and denticulates are more specialized tool forms and may be indicators of specific activities connected with the manufacture and maintenance of tools constructed from perishable materials (Wikle 1977:14-15). As with other tools, they may also have been used in a variety of ways for which they were not designed.

The range of recorded wear patterns on artifacts from the sites indicates a number of activities that involved more than tool manufacturing and finishing were carried out within this locale. Short-term and temporary utilization areas, as well as prehistoric quarry areas (Green 1985:14; Parry 1987a:33; Richie and Gould 1985:44), are commonly associated with limited base camps. This, combined with a lack of habitation evidence, suggests the sites are the product of a short-term occupation or repeated short-term use by a local population (Green 1986; Johnson 1977).

DISCUSSION

As noted, both sites lie on a bajada overlooking the Rio Grande Valley. To the north is a fairly narrow but deep ravine (Fig. 8) that terminates about .5 km east of the sites. The southern ravine is broader with a more gradual termination 2 km east of the sites. The south edge of the terrace or bajada is cut by the highway. A right-of-way fence, utility poles, and roadways cross the terrace. The entire west tip of the bajada has been removed for gravel. Because of the land modification, we cannot be sure that similar sites did not overlook the southern ravine and the Rio Grande Valley itself. LA 85426 and LA 85427 are on the north slope of the bajada in view of the northern ravine; therefore, we must assume the sites are related to the ridge top/edge and utilization of the adjacent ravine.

The Soil Conservation Service study indicates the area is best suited for grazing or wildlife habitat. Indeed, deflation in the site area has left little soil for grasses. While sparse grasses and juniper may have been exploited, it is more likely that the site area was used to monitor the movement of game in the ravine.

The Rio Grande Valley contains a large number of habitats. Ivey (1957:491-492), who studied a transect reaching from west of the Rio Puerco over the Sandia Mountains, identified six communities in the Canadian or high altitude zone, two in the transition zone, eleven upper sonoran and two lower sonoran. Jack rabbits are most often found in the arroyos of the slopes forming the valley sides and salt grass flats in the river bottom. Cottontail rabbits are found in many habitats but are especially numerous where eroded hillsides are cut by arroyos (Ivey 1957:493-494). Pronghorn live in open areas and open valleys migrating from higher cool plains in the summer to lower more sheltered valleys in the winter (Bailey 1931:26). Mule deer generally occupy open forest, brush and shrub lands associated with rough or broken terrain, especially mountain-foothill habitats (Mackie et al. 1982).

The distribution and habits of these mammals suggest that deer and occasional rabbits were the most likely prey monitored at the sites. Hunters would be more likely to wait for deer moving from valley to foothill habitats than for rabbits. Rabbits could be tracked to their burrows, which are more likely to occur in the ravine bottom.

This is not to say that other activities did not take place at the site. The lithic artifact assemblage suggests a number of activities. Hunters processing game, maintaining or supplementing their tool kit, or simply passing time would leave a varied assemblage.

Determining when and who used the area is a more difficult task. The following is based on Binford's (1980) model of hunter-gather subsistence systems, Irwin-Williams's (1984) descriptions of Early and Late Archaic subsistence and mobility, and observations of prehistoric and historic Pueblo subsistence practices. There is enough variation in how these groups might have utilized the same resource to begin to evaluate the Bernalillo Grant assemblages.

According to Irwin-Williams's model (1984:9), Early Archaic groups were essentially what Binford (1980:5-9) labels foragers; groups who move their residential base frequently and gather food on a daily basis during short forays from these bases. Specialized work parties, such as

Figure 8. Ravine north of the Bernalillo Grant sites looking east.

hunters, make longer resource procurement trips resulting in "extractive locations." These locations are used for short periods of time and result in low rates of exhaustion and abandonment of tools. Archaeologically, Early Archaic tools should reflect high cost acquisition and curation, and a wide niche exploitation based on smaller animals and unspecialized gathering. Greater mobility and dependence on hunting could translate into use of nonlocal lithic resources and a greater technological skill, even when food resources were taken opportunistically or as encountered. The longer the foray, the greater the amount and complexity of the gear (Kelly 1988:720). Marshall et al. (1986:143) observe that lithic artifact assemblages from two Early Archaic sites in the Los Huertas area lacked cores, and the amount of cortex in the assemblage indicate that primary reduction was performed elsewhere. This and a relatively high amount of nonlocal material are consistent the higher degree of mobility suggested for the Early Archaic.

Later Archaic groups would be classed as collectors (Binford 1980:10), or groups who live on stored food at least part of the year and gather food in logistically organized food procurement groups. Middle and Late Archaic groups with broader economic bases and higher population densities should produce assemblages indicative of reduced exploitative areas, more scheduling of resource acquisition, and of storage (Irwin-Williams 1984:9-10). Food would be acquired by task-oriented groups traveling to a resource that could be gathered in quantity for storage (Chatters 1987:337). Middle and Late Archaic assemblages should be dominated by local lithic materials. Task-oriented sites should contain specialized tools designed for the particular task.

More is known about Anasazi/Pueblo subsistence practices. Unlike Archaic groups, their more permanent residences have produced both faunal and lithic assemblages. Excavated sites in the

Albuquerque area consistently contain remains of cottontail rabbit, jack rabbit, deer, pronghorn, and turkey. Sites in the Rio Grande Valley have more jack rabbit than cottontails and sites in mountain or foothill locales have proportionately more turkey, deer, and pronghorn than valley sites (Akins 1987:168-170).

Historic accounts generally indicate different strategies for hunting rabbits and artiodactyls. According to White (1974), residents of Zia hunted small game as individuals while herding or gathering plants. Communal rabbit hunts entailed planning by the war chiefs, song, ritual and prayer prior to the day of the hunt. On the day of the hunt there was more prayer and instructions (White 1974:301). Deer hunts were requested by the war chiefs. Rituals and meetings were held before the hunt was announced to the village. Hunts usually lasted six days and took place in the Jemez Mountains (White 1974:302). No information on timing or preparation is given.

Santa Clara Pueblo residents hunted deer in the fall when the animals were in better condition and there was less pressure from other economic activities. Two to four hunters, usually from the same household, began to prepare days before by examining and mending equipment and acquiring food for the trip. Buffalo, pronghorn, and rabbits were hunted communally and individually. Pronghorn were hunted in the plains and foothill areas by groups of six to ten hunters. A hunt was announced three days prior, requesting moccasins and weapons be examined and repaired, and food gathered for the trip. Circle and entrapment methods were used and a base camp established for processing. Rabbits were hunted communally for ceremonial and economic purposes. Individuals hunted near the village using trained dogs, bows and arrows, or clubs. Rabbits were also tracked in snow and removed from their burrows by flooding or with sticks (Hill 1982:47-52).

In general, modern Pueblo deer hunts were scheduled around agricultural activities, planned in advance and accompanied by much ritual activity. Hunt groups tended to be small and hunts lasted several days. Hunting methods include pit trapping (The Zuni People 1972:6), tracking (Hill 1982:50), encircling (Goldfrank 1927:87) and chase (Beaglehole 1936:6). Because these hunt groups had a definite focus and goal, we would expect a relatively high degree of preparation. The equipment needed would be anticipated and transported from the habitation site. Since there was less dependence on hunting than in nonagricultural groups, we might also expect less technological expertise. Assemblages from excavated Anasazi residential sites reflect an expedient technology with flakes primarily produced for use as short-term tools (Vierra 1987:27-28). Formal tools, other than projectile points, are rare (for example, Frizell 1982:95-102; Larralde 1994; Vierra 1987:27-28).

A number of researchers have used lithic artifact attributes to distinguish Archaic from Anasazi artifact assemblages. Archaic assemblages tend to have more formal tools and the small flakes produced during formal tool manufacture. Larger flakes tend to be produced during core reduction or expedient tool production (Elyea and Eschman 1985:250). While material selection may depend on local availability as well as what the knapper intended to make, studies have demonstrated different material preferences for Archaic and Anasazi groups (Elyea and Eschman 1985:246). Assemblages from the San Juan Basin show a clear difference in the amount of cortex found in Archaic and Anasazi sites. Presumably, this is a function of a formal (or biface) versus expedient technology. In the latter, core flakes are used with little or no modification. As a result, the core need not be reduced as far as when the end goal is a formal tool (Elyea and Eschman 1985:246-247).

A set of expectations derived from subsistence pattern, degree of mobility, and technology is summarized in Table 28. It suggests that material use should help distinguish Early from Late Archaic and Archaic from Anasazi lithic assemblages.

Table 29 takes a number of these potentially time sensitive attributes and compares the Bernalillo Grant sites with others from the Middle Rio Grande. LA 44535, 44536, 45501, and 44506 are in or near Los Huertas Creek just east of the project area, Kuaua is 3 km to the west on the other side of the Rio Grande, LA 288 is in Corrales, Nuesta Señora in Bernalillo, Coors Road and LA 26999 are on Albuquerque's West Mesa and La Cantera is on the Sandia Indian Reservation on an east bank terrace overlooking the Rio Grande.

The sites are all relatively close and the inhabitants should have had access to similar lithic resources. A range of time periods and site types are represented and different analysts are involved.

From the table, we can first rule out the possibility that our sites were primarily quarry sites. The Los Huertas quarry site, LA 45506, shows a high degree of redundancy in material represented, few flakes with no cortex, a large cortical to noncortical ratio, few flakes as compared to angular debris and a high proportion of cores. The gravel terrace quarry, LA 26999, has a greater diversity of materials, a smaller cortical to noncortical ratio, but high proportions of cores and angular debris. Our sites have a diversity of materials and intermediate amounts of cortex--indicating some primary reduction, but large proportions of flakes as compared to angular debris, intermediate numbers of cores and a fairly high percent of bifaces at LA 85626.

The Early Archaic sites in the Los Huertas Valley have higher percentages of basalt and obsidian than found in the other artifact assemblages. This can be interpreted as supporting the curative, logistical strategy suggested by Irwin-Williams and the foraging model. Also supporting this interpretation are low cortical to noncortical ratios, high flake to angular debris ratios, and high proportions of bifaces.

Table 28. Expectations for Early and Late Archaic and Anasazi Lithic Assemblages

	Early Archaic	Late Archaic	Anasazi
Subsistence pattern	forager	collector	collector
Degree of mobility	high	intermediate	low
archaeological result: lithic materials	more nonlocal	few nonlocal	few nonlocal
Technology	biface	biface	expedient
archaeological results: cortical noncortical ratio	low	low	high
flake to angular debris ratio	high	high	low
bifaces	present	present	few

Table 29. Comparison of Selected Lithic Assemblage Attributes with Sites in Los Huertas and the Rio Grande Valleys

Site name or number	LA 85626	LA 85627	LA 44535	LA 44536	LA 45501	LA 45506
time period	Archaic?	Archaic?	Early Archaic	Early Archaic	BM III	unknown
site type	scatter	scatter	scatter	scatter	habitation	quarry
number of lithics	174	87	88	60	87	197
material %						
chalcedony	49.4	67.8	36.4			99.4
chert	35.1	13.8	2.3	11.7	33.3	
obsidian	1.7	5.7	27.3	45.0	26.4	.5
basalt	3.4	1.1	26.1	41.7	1.1	
other	10.3	11.5	7.9	1.7	39.1	
cortex (% with)						
0%	40.8	34.5	77.0	66.1	48.7	13.9
1-30%	24.7	31.0	4.6	18.4	[1-49] 39.5	[1-49]
31-60%	19.4	14.9	7.0	13.6		47.3
61-99%	13.8	12.6	11.5	1.7	[50-99] 5.3	
61-90%			23.1	33.7		[50-99]
91-100% [*100%]	* 1.1	* 6.9			* 6.6	22.4
						* 16.4
cortical:noncortical ratio	1.45:1	1.9:1	.30:1	.51:1	1.05:1	6.17:1
flake:angular debris ratio	75.5:1	36.5:1	82:1	53:1	18:1	2.3:1
% of whole flakes	47.7	38.3				
% cores	6.9	8.0	0	0	5.7	16.2
% bifaces	2.9	0	4.5	8.3	1.1	0

(Source: LA 44535, LA 44536, LA 45501, and LA 45506--Marshall et al. 1986:72, 76, 91-92, 107.)

Table 29. Continued

Site name or number	Kuaua	LA 288	Nuesta Señora	Coors Road	LA 26999	La Cantera
time period	1350-1700	A.D. 1300s	A.D. 1400s	A.D. 1200	unknown	P IV
site type	pueblo	pueblo	pueblo	pithouses	quarry	camp
number of lithics	281	339	2378	440	473	578
material %						
chalcedony	48.3	68.6	52.6	46.8	65.3	57.0
chert	19.5	3.0	.9	34.8	21.1	1.7
obsidian	15.6	17.6	1.2	1.1		1.7
basalt	5.3	3.2	19.1	7.5	.4	16.4
other	10.3	7.6	20.2	9.8	13.1	23.2
cortex (% with)						
0%	60.9	83.9	2.4+	56.6		1.6
present	39.0	16.0		41.1		
100%	.0		13.8	2.0		
cortical:noncortical ratio	.6:1	.2:1		.8:1	2.17:1	2.0:1
flake:angular debris ratio	3.6:1	2.0:1	1.6:1	3.8:1	2.52:1	3.4:1
% of whole flakes	94.0	26.8		94.5		
% cores	5.0		3.2	1.4	15.9	6.0
% bifaces	.4			.2		

Sources: Kuaua (Vierra 1987:29); LA 288 (Vierra 1987:29); Nuesta Señora (Frizell 1982:90-91; Vierra 1987:29); Coors Road (Vierra 1985:16, 1987:29); LA 26999 (Lancaster 1984:12-15); La Cantera (Condie 1986:11-17; Vierra 1987:29).

Anasazi material selection is similar to that seen in our assemblages, presumably because both groups acquired materials locally. The cortical to noncortical ratios are generally low, but in contrast to the study sites and Archaic sites, the flake to angular debris ratios are low and bifaces rare.

This pattern of local material use paired with technological attributes similar to the Early Archaic sites suggests that LA 85626 and LA 85627 were used during the Middle to Late Archaic. The characteristics of the site location further suggest that the primary tasks performed at the site concerned hunting and processing of mammals, probably deer.

RECOMMENDATIONS

LA 85626 and LA 85627 were tested to determine the nature and extent of subsurface remains within the area of a proposed borrow pit. Artifact densities are generally low, only one semidiagnostic artifact was recovered and there was no evidence of hearths or other features at the site. The area is deflated and the artifacts are largely surficial. Neither site is likely to yield additional information on local prehistory. No further studies are recommended.

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APPENDIX 1. LA 85426 AUGER AND TEST PIT DEPTHS AND COMMENTS

LA 85426, Test Pit Beginning and Ending Depths (cm Below Site Datum)

	Test Pit 1	Test Pit 2	Test Pit 3	Test Pit 4	Test Pit 5
Beginning Depths	11 to 14	+15 to +17	10 to 13	35 to 39	7 to 13
Ending Depths	31 to 35	11	33 to 35	55 to 57	30

LA 85426, Auger Tests

Test Number	Beg. Depth cm BSD	End Depth cm BSD	Selection Criteria	Comments
Test No. 1	+ 5	65	artifact cluster	gravel at 65 cm BGS
Test No. 2	72	158	artifact cluster	sandy soil, stopped at gravel
Test No. 3	+15	85	high point	silty soil, gravel below 50 cm BGS
Test No. 4	34	79	artifact cluster	surface gravel, brown sandy soil
Test No. 5	12	62	artifact cluster	heavy gravel at 20 cm BGS, light gravel after 35 cm BGS
Test No. 6	5	55	between test pits	sandy soil, stopped at gravel
Test No. 7	6	26	point of terrace	rock and gravel
Test No. 8	85	85	point of terrace	no depth possible
Test No. 9	19	54	sandy area	sandy soil, stopped at rocks
Test No. 10	1	91	beneath juniper	orange sandy soil, gradually turns to gravel

APPENDIX 2. LA 85427 AUGER AND TEST PIT DEPTHS AND COMMENTS

LA 85427, Test Pit Beginning and Ending Depths (cm Below Site Datum)

	Test Pit 1	Test Pit 2	Test Pit 3
Beginning Depths	11 to 14	32 to 35	61 to 69
Ending Depths	51 to 53	71 to 73	98 to 102

LA 85427, Auger Tests

Test Number	Beg. Depth cm BSD	End Depth cm BSD	Selection Criteria	Comments
Test No. 1	42	105	circle of rocks	red brown sandy soil, stopped at gravel
Test No. 2	+3	44	high point	brown silt, stopped at gravel
Test No. 3	25	100	ridge top	red brown silt, stopped at gravel
Test No. 4		56 cm BGS	ridge	red brown silty sand and gravel
Test No. 5	133	168	artifact cluster	silt with a sand and gravel lens from 35 cm-49 cm BGS
Test No. 6	216	293	artifact cluster	red brown coarse sandy soil
Test No. 7	142	164	artifact cluster	red brown sandy soil, stops at gravel