MANAGEMENT SUMMARY

This report summarizes the results of an archaeological survey of 830 acres along Piedras Marcadas Arroyo, near Paradise Hills. The survey was carried out as part of an arroyo corridor study that had been implemented as called for in the Facility Plan for Arroyos. Archaeological surveys are vital in planning for the identification and possible preservation of the City/County's valuable historical resources.

The archaeological survey of the Piedras Marcadas Arroyo corridor located a total of 18 previously unrecorded sites. Six other sites are known to exist within a previously surveyed 90 acre area along the West Mesa volcanic escarpment. In addition to the sites, 198 isolated artifacts were found and recorded on the survey. Together, the sites and isolated artifacts reveal a pattern of varied human activities that span a 7500 year long period. Stone tools dating from early Archaic occupation of the area some 7500 years ago are some of the oldest evidence for ancient groups in the Rio Grande floodplain. Other major site types date to the Pueblo IV time period (AD 1300 to 1650) and to the turn of the century, when sheep herding and early ranching were of economic importance. Undatable sites, consisting of scatters of rock debris generated in the process of manufacturing stone tools, are likely to span the thousands of years separating early Archaic sites from Pueblo IV sites.

The Piedras Marcadas Arroyo area has also been identified as one that contains major concentrations of petroglyphs. An estimated 5000 petroglyphs exist along the volcanic escarpment that has been eroded by the arroyo. This is one of the most concentrated areas of rock art to be found along the entire escarpment. Most of the petroglyphs also date to the Pueblo IV period, as does a large prehistoric village at the downstream end of the arroyo. Known as the Mann Site (or LA 290), this pueblo contains an estimated 1000 rooms and was the probable home for the creators of most of the rock art found along the arroyo.

The wealth of different kinds of archaeological information in the Piedras Marcadas Arroyo area offers a unique opportunity to preserve some of the City/County's heritage. Much of the surrounding area has not been intensively developed, and the compactness of the escarpment lends itself to recreational opportunities that could include viewing the petroglyphs or other associated sites. This report attempts to put the cultural resources of the Piedras Marcadas area in a context that would allow for such uses. It describes the culture history of the region, the environmental setting of the survey area, and previous archaeological work that has been done nearby. It presents the methods and results of the

survey, including detailed descriptions of the sites and artifacts that have been found. It also presents a synthesis of work that has been done at the large pueblo village (Mann Site), tying together the large and small sites in a pattern of prehistoric and historic land use. Last, the report evaluates the importance of the sites found on survey and places them in a planning framework by making recommendations for treating the sites in the event that they are impacted by development or are to be preserved or interpreted.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

This report presents the methods and results of an intensive archaeological survey of the Piedras Marcadas Arroyo corridor, located on the west side of Albuquerque, New Mexico (Figure 1). The Piedras Marcadas ("Marked Stones") Arroyo is the northernmost drainage network that flows over the the West Mesa and across the volcanic escarpment on its course to the Rio Grande. Other arroyo networks that also cross the volcanic escarpment are the Boca Negra, San Antonio, Rinconada, Ladera, and Mirehaven systems. These drainages all flow past concentrations of petroglyphs (rock art depictions pecked into the surface of dark basalt boulders), but the most spectacular display of rock art is found in the area described by the name "Piedras Marcadas."

The present project was conducted as part of a corridor plan for Piedras Marcadas Arroyo, as a partial implementation of the Facility Plan for Arroyos (City of Albuquerque 1985). Piedras Marcadas Arroyo is rated as the top priority Major Open Space Link for corridor planning and the acquisition of easements or rights-of-way (ibid: 2). Accordingly, funds were allocated to begin corridor planning in Fiscal Year 1987. This archaeological survey and synthesis is a component of the corridor planning process. By including an archaeological study in the development of an arroyo corridor plan, the City of Albuquerque has taken an important positive step toward carrying out policies that have been set forth in the Comprehensive Plan (1975), the Northwest Mesa Area Plan (1980), the Coors Corridor Plan (1984), and the Facility Plan for Arroyos (1985). More recently, the specific recommendation for the inclusion of an archaeological component in the development of ranked City plans has been included in the State's Model Archaeological Ordinance for Local Governments in New Mexico (1985), the City/County's 1986 report by the Archaeological Resources Planning Advisory Committee (ARPAC), and the State/City's report on the archaeological survey of the West Mesa escarpment (Schmader and Hays 1986). Archaeological studies are a vital and necessary part of major planning efforts, and the City's example sets a precedent that addresses the need to study the remains of local heritage while they are still available.

The boundaries of the study area are:
North- along Paradise Blvd; south of homes in Quail Covey and on the south side of Paradise Blvd; due west from the Executive Apartments to the south end of St. Jude Thaddeus Shrine Church parking lot;

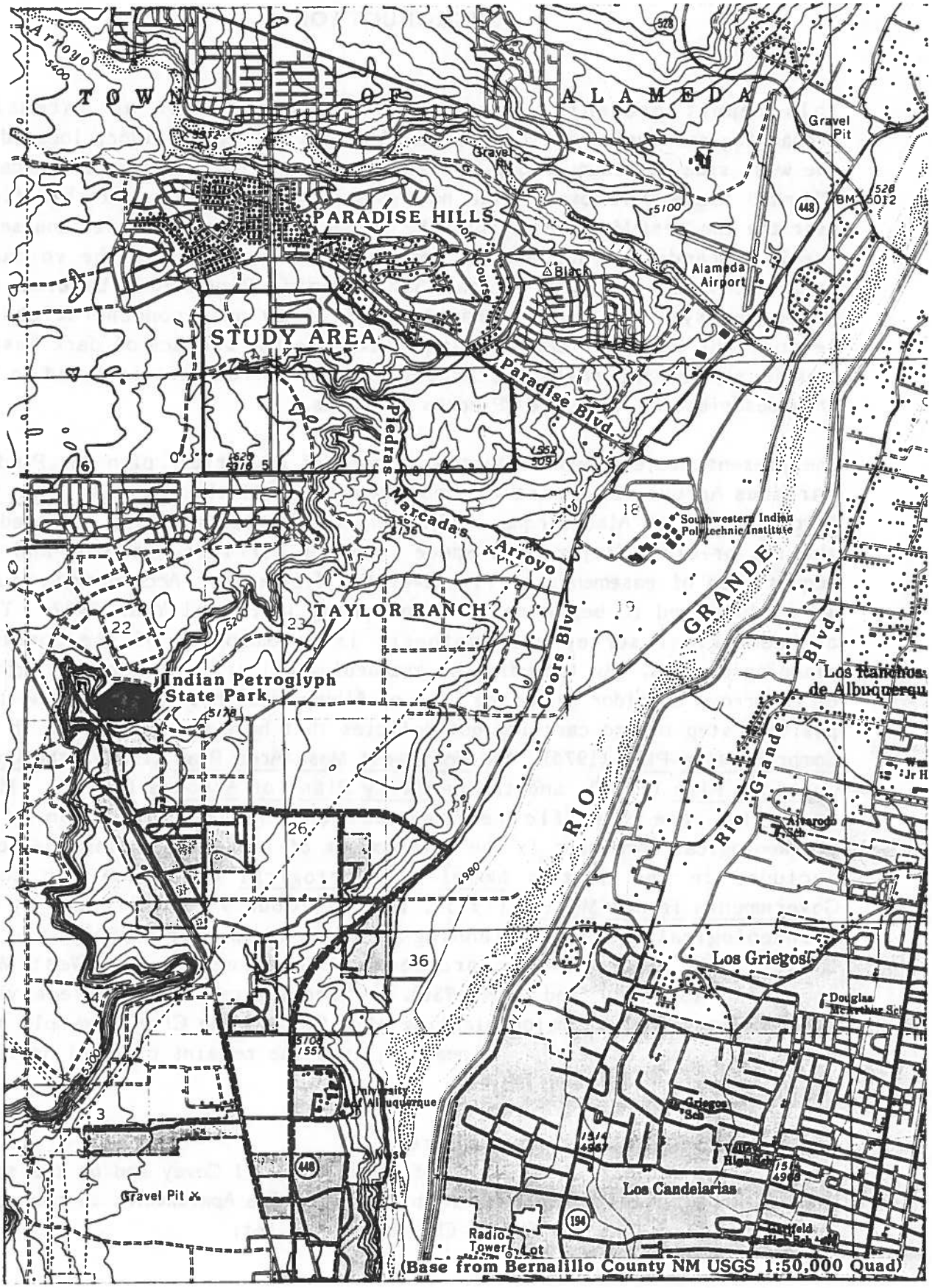


Figure 1. Location of study area near Paradise Hills and Taylor Ranch

West- along the western edge of City Zone Atlas Maps B-11 and C-11 (corresponding to projected Sections 11 and 14 in T11N, R2E of the Alameda Grant);

South- along the southern boundary of the Town of Alameda Grant;

East- along a line projected due south of the intersection of Davenport Street and Paradise Blvd, to the Town of Alameda Grant southern boundary.

The described study area contains approximately 920 acres, 270 of which had been previously surveyed (Harlan 1979; Schmader and Hays 1986). Ninety acres of Harlan's survey were reinvestigated to provide recording consistency with more recent work in the area, and ninety acres of the Schmader and Hays survey were covered to guarantee complete overlap between survey areas. The total newly surveyed area was 830 acres, with 90 acres on the face of the volcanic escarpment not covered by the current project. The term "study area" in this report will refer to the entire 920 acres, while "survey area" will refer to the 830 acres that were inventoried by the present project. Within the 830 acre survey area, 18 sites and 198 isolated occurrences were recorded.

Field work was initiated on August 1, 1986, and the last of eight field days occurred on August 13, 1986. The crew consisted of Matthew Schmader (Principal Investigator/Project Director), Mary Stiner (Crew Chief), Ron Kneebone, and Michael Smyth. Mary Stiner authored the environmental setting section and Appendix B of this report, as well as taking the field notes upon which the descriptions of sites and isolated occurrences are based.

A brief presentation of local cultural history will be presented in Section 2, and a discussion of previous archaeological work is presented in Section 3. Section 4 describes the environmental setting, and survey methods will be presented in Section 5. Descriptions of all sites found within the 920 acre study area are given in Section 6. Section 7 is a synthesis of previous work done at a major pueblo village site (LA 290) downstream on Piedras Marcadas Arroyo. Section 8 is an analysis of past settlement patterns and land use in the study area, and Chapter 9 presents recommendations for the treatment of cultural resources for the Piedras Marcadas area. Descriptions of isolated artifacts found on the survey will be given in Appendix A, and a study of the effects of vegetation on archaeological site visibility is presented in Appendix B.

CULTURAL HISTORY OVERVIEW

The Albuquerque region of the middle Rio Grande has experienced a legacy of 12,000 years of nearly continuous human habitation. Sites that are representative of all major prehistoric and historic time periods are located within just miles of the city's downtown. It is quite likely that no other major city in the United States can boast such a potential to access its local heritage. Albuquerque is in a unique position to take advantage of these resources. Very extensive cultural history overviews can be found in publications by Anschuetz (1984), Biella and Chapman (1977), Cordell (1979), Sargeant (1985), or Stuart and Gauthier (1984). While it was the intent of those authors to provide detailed discussions of some or all of the local culture history, the purpose of this section will be to give a generalized discussion of major trends through time, and to relate the resources of the Piedras Marcadas area to that framework.

PaleoIndian Adaptation

The earliest occupation of the New World took place during what is referred to as the **PaleoIndian** period. Dated from 7500 to 12,000 years ago, PaleoIndian represents an adaptation that relied upon human migration over huge regions. The environment of that era was radically different than the conditions that exist today. The last of the major continental ice ages was ending, and climatic conditions shifted radically due to the amounts of global water locked up in the icecaps. In the Albuquerque vicinity, the Sandia Mountains were glaciated during cold periods, and the Estancia Basin was filled by a huge lake during warm rainy periods. Exotic, extinct animals such as mammoths, mastodons, camels, horses, bison, and giant sloth inhabited the lake edges. Early man, with his range in mobility and skill in creating stone tools, pursued some of these creatures and hunted them down. Major time periods are named after temporally diagnostic projectile points: **Clovis** (12,000 to 11,000 years ago), **Folsom** (11,000 to 10,000), **Belen** (10,000 to 9000), and **Cody** (9000 to 7500 years ago). In the Albuquerque area, PaleoIndian sites are known for Sandia Cave (Hibben 1941), Rio Rancho (Judge and Dawson 1972), and the volcanoes and southwest mesa (Judge 1973). No evidence of PaleoIndian occupation was encountered on the Piedras Marcadas Arroyo survey.

Archaic Adaptation

Gradual changes in the environment led to conditions that were much closer to the present. Fluctuations in temperature and precipitation stabilized, the southwest underwent a generalized desertification, and many large animal species died out. The PaleoIndian subsistence base changed, and so did population densities, mobility strategies, and stone tool technology.

The resulting changes are manifest in what is termed the **Archaic**, dated from about 7500 to 2000 years ago. The Archaic is not so much a time period as it is an adaptive strategy. Groups were still highly mobile, although their ranges may have increasingly become restricted as regions gradually became populated. More generalized subsistence, in the form of hunting smaller game and using a variety of wild plants, has been suggested as an Archaic trait. Certainly there was a change in technology, with the first appearance of stone implements to grind wild seeds, and the appearance of new projectile point types used in hunting. Again, time periods are named for their diagnostic projectile points: **Jay** (7500 to 6800 years ago), **Bajada** (6800 to 5200), **San Jose** (5000 to 3800), and **Armijo** (3800 to 2800 years ago, Irwin-Williams 1973). Archaic sites have been found at the west edge of the West Mesa, and around the volcanoes. A Jay point (I.O. 170) and a Bajada point (I.O. 98) were found during the present survey of Piedras Marcadas Arroyo, providing direct material evidence of man's use of the local area dating back to 7500 years before the present. These tools are some of the oldest that have been found in the local floodplain of the Rio Grande.

Basketmaker II-III Period

As populations increased and group mobility decreased, other major changes occurred in prehistoric adaptation. The first evidence of agricultural reliance in the southwest coincides with the development of early pottery and the appearance of substantial dwellings. These were usually circular and slightly dug into the ground, using support posts to hold up a mud and brush roof. Although the shape of these structures later became square, they are all referred to as pithouses. Along with changes in technology and architecture, an apparent increase in social complexity is evident in the aggregation of pithouses into small villages. In addition, some of the dead were interred in dry caves and have been discovered with beautifully preserved basketry, hence the term "**Basketmaker.**" No evidence of Basketmaker use of Piedras Marcadas was found, but several pithouse villages exist in the Rio Grande floodplain from Corrales (Frisbie 1967) to the South Valley (Vivian and Clendenen 1965). The transition from Archaic to Basketmaker occurred about 2500 years ago, and the period ended about AD 500.

Pueblo I-II Period

As populations increased, changes in habitations and pottery also occurred. More substantial above-ground dwellings began to appear, pithouse village size increased and heavier reliance on agriculture developed. This time period, dated from AD 500 to AD 1200, is underrepresented in the Albuquerque area until the end of the phase. No Pueblo I-II artifacts were found in the survey area.

Pueblo III Period

Major changes took place by the end of the Pueblo II period, resulting in widespread innovations in social organization and material culture. Large blocks of contiguous, above-ground rooms were constructed from masonry. Changes in new pottery types resulted in the appearance of Black-on-white ceramics. Agriculture and sedentism both seem to have increased. At a time when significant cultural development was occurring in the southwest in places such as Mesa Verde, Canyon de Chelly, or Chaco Canyon, the Albuquerque area seems to have been a developmental backwater. The Pueblo III period is dated between AD 1200 and AD 1300, and it is only toward the end of the phase that the local area began to experience population influxes. Some researchers have attributed this to the demise of the Chacoan system and resulting migrations to the middle Rio Grande, but it is plausible that population growth was a completely local phenomenon. Some Pueblo III pottery was found on the Piedras Marcadas survey, but no sites are specifically dated to the time period.

Pueblo IV Period

The real local prehistoric florescence occurred during Pueblo IV times, or what has been termed the **Rio Grande Classic** (Wendorf and Reed 1955). Prehistoric population levels reached their maximum as evidenced by several dozen pueblo villages that were built within 250 years (Figure 2). Large pueblo villages had several hundred rooms built two or three stories high, which were situated around large kivas, or ceremonial rooms. Kivas from the Pueblo IV period are sometimes found with spectacular wall murals that depict the past ceremonial life in detail. Pottery also underwent major innovations with the discovery of glaze paints. Slight changes in the rim form of glaze painted bowls are diagnostic of the period: **Glaze A** (AD 1300 to 1450), **Glaze B** (AD 1400 to 1475), **Glaze C** (AD 1425 to 1490), **Glaze D** (AD 1490 to 1515), **Glaze E** (AD 1515 to 1600), and **Glaze F** (1600 to 1650, Museum of New Mexico 1966). Evidence of Pueblo IV usage of the survey area was extensive. A majority of the sites found on survey were referable to this time period, and site functions are varied enough to suggest an overall pattern of land use in the area (see Section 8). In addition, a very large Pueblo IV village is located downstream from the study area (the Mann Site, see Section 7).

Historic Period

The end of the prehistoric era is dated to the appearance of the first Spanish explorers. Coronado arrived in the Albuquerque area in the winter of 1540, and his chroniclers noted 12 to 16 inhabited pueblos along the Rio Grande between Bernalillo and Isleta, along with others that were in ruins. There is little doubt that the Mann Site was one of the observed pueblos, but the various names given to pueblos by different chroniclers

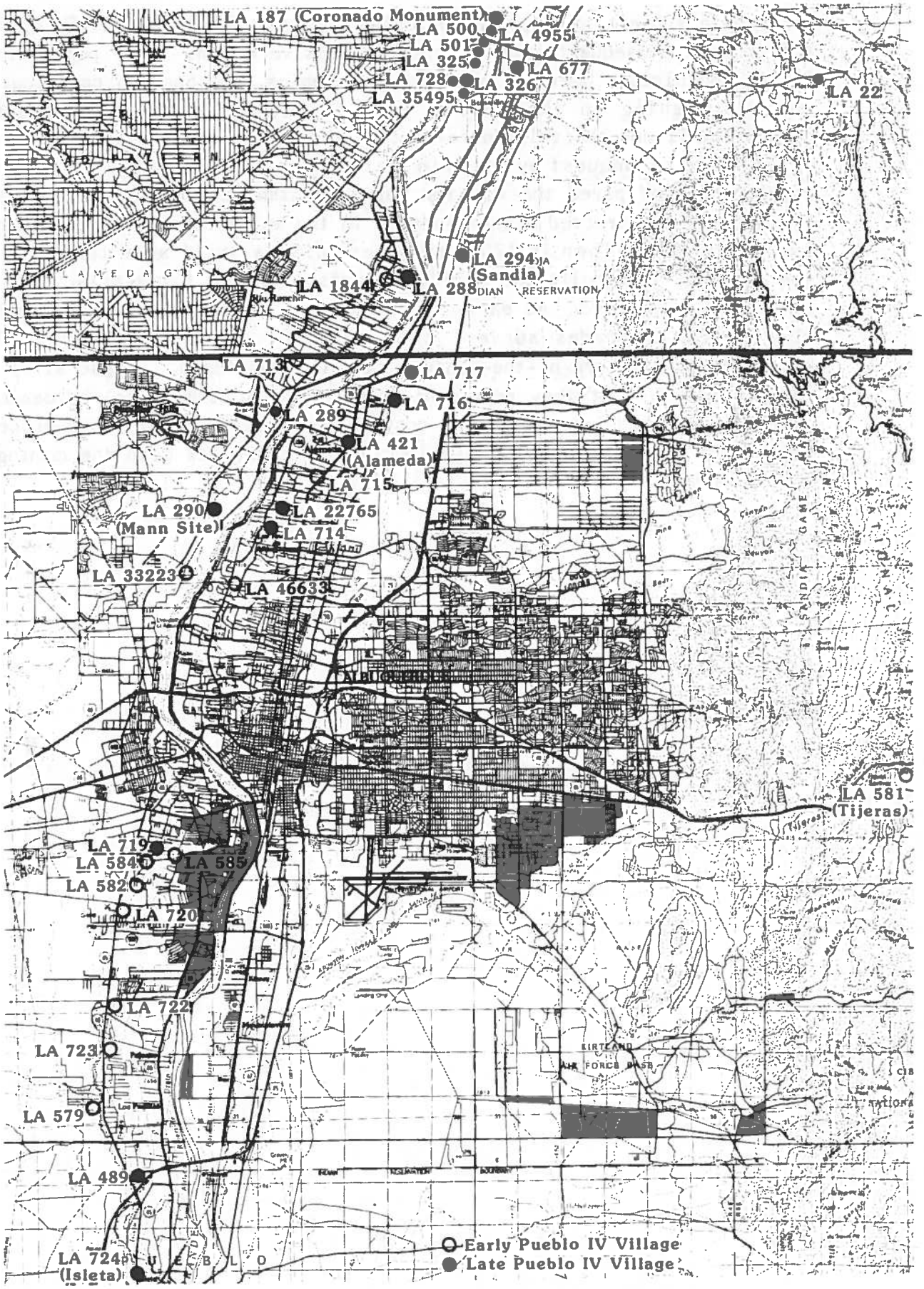


Figure 2. Location of Pueblo IV villages in the Albuquerque area

has been a subject of much inconclusive debate. The impact of Coronado's arrival and subsequent expeditions was massive on the local populations. Strife and disease heavily impacted the pueblos, and Spanish colonization was flourishing in the 1600's. But in 1680, the pueblos staged a successful if not short-lived revolution that drove out the Spanish for 12 years. The reconquest by Otermin in 1692 eventually subdued the native populations and paved the way for rapid Spanish recolonization. Several plazas were constructed around ranchos in the valley areas of Albuquerque, including at Old Town in 1706, and these places still bear the names of the families that built the original plazas: Griegos, Candelaria, Duranes, Padillas, and Armijo. No early colonial sites or artifacts were found on the Piedras Marcadas survey, but important evidence of late 1800's sheepherding and turn-of-the-century ranching was found. These sites are significant in that they represent some of the last material evidence of recently vanished lifeways; they contain information about Albuquerque at around the time that it was experiencing major changes with the coming of the railroad.

PREVIOUS ARCHAEOLOGICAL WORK

At least eight archaeological projects are known to have occurred in the vicinity of Piedras Marcadas Arroyo west of Coors Road. Work that took place east of Coors Road, specifically on the Mann Site (Laboratory of Anthropology [LA] 290), will be discussed later in Section 7.

Although there have undoubtedly been visits to the Piedras Marcadas Arroyo area by amateur and professional archaeologists for years, the first formally reported activity took place in 1968. In that year, surveys led by Ruth and Ellis Armstrong of the Albuquerque Archaeological Society recorded six sites along the volcanic escarpment (LA 9054 through LA 9059, inclusive). All six were petroglyph concentrations, with the exception that LA 9059 also had grinding areas and an associated wall. The survey was probably confined to the volcanic escarpment and most likely did not extend south beyond the Town of Alameda Grant line.

Also in 1968, a dissertation was completed at the University of New Mexico by Theodore Reinhart. He investigated a 105 square-mile area on Albuquerque's west side, locating 147 sites. One of Reinhart's survey areas was Volcano Cliffs (in the context of the name's usage in 1968), where 18 sites were found (Reinhart 1968:203-208). Most of these were south of the Piedras Marcadas Arroyo area, but five sites were reported between the present-day Calle Nortena and the Town of Alameda Grant line (BV-9, BV-10, BV-14, BV-15, BV-16). All are gravel terraces where testing of raw materials had taken place in the process of manufacturing prehistoric stone tools. These sites were later relocated (Schmader and Hays 1986:8.7) and collectively assigned Laboratory of Anthropology number (LA) 52091, since they could not be fully reinvestigated. At present, the site is located within Shenandoah Units IV, V, and VI, a subdivision in the process of being developed. Reinhart's survey probably did not extend north of the Alameda Grant south boundary.

In 1979, a survey was conducted of a 639 acre area in Paradise Hills by Mark Harlan of UNM's Office of Contract Archeology. The survey was east of Coors Blvd, north of the Alameda Grant line, and south of Calabacillas Arroyo. The irregular west boundary followed Golf Course Road, Irving Blvd, Bryan Avenue, Congress Avenue, Davenport Street, and the western boundary of the Riverview Sector Plan. Approximately 90 acres of the 1979 survey were resurveyed by the present project, with good results. Where the Harlan survey had located just one isolated artifact and three modern drainage retention features (Harlan 1979:6-7), the present survey located two archaeological sites and over 30 isolated artifacts.

In 1983, a seminar in cultural resource management taught by Joseph Winter at the University of New Mexico focused its attention on issues related to the preservation of rock art. Two of the sites recorded by the Albuquerque Archaeological Society in 1968 were reinvestigated to determine the research potential of local rock art. These sites were LA 9054 (Hands Canyon Site) and LA 9055 (Kissing Bird Site). Work at the sites consisted of in-depth recording of petroglyphs, including full-sized tracings onto plastic and mapping of petroglyph bearing boulders. About 300 petroglyphs were recorded, and an unpublished series of research papers related to rock art and resource management was assembled.

An east-west linear survey was conducted along the Paseo del Norte corridor in 1984 by Don Clifton of the State Highway Department. The survey was 100 feet (30 meters) wide and 5.2 miles (8.4 kilometers) long, covering a total of 63 acres. The survey located three sites (LA 49628, LA 49629, and LA 49630), one petroglyph concentration (LA 49631), and five isolated artifacts (Clifton 1985:4-5). The petroglyph concentration was recorded again in 1985 as PC:23B:2, with 109 reported glyphs (Schmader and Hays 1986:8.30; Table 8.1). Since the Clifton survey was centered on the Town of Alameda Grant line, it did not locate one site found by the present survey (LA 56118) where the current Paseo del Norte right-of-way diverges slightly north of the grant boundary.

A comprehensive inventory of the West Mesa volcanic escarpment was conducted in 1985 for the State Historic Preservation Division and the City's Open Space Division. It covered an area of approximately 1100 acres, and recorded 59 previously unreported sites and over 10,500 petroglyphs. In the Piedras Marcadas Arroyo area, some 180 acres were inventoried, with eight sites and 19 isolated artifacts located. One-half of that area was reinvestigated by the present survey to insure complete overlap with the previously surveyed area. Importantly, 3516 petroglyphs were documented, with 26 concentrations containing over 10 glyphs and 15 of those containing over 100 glyphs (Schmader and Hays 1986:Chapter 8). In short, over 30% of the escarpment petroglyphs are located on less than 20% of the landform that is within the Piedras Marcadas Arroyo study area. Clearly, the Piedras Marcadas area was one of the most important centers of activity for the creators of local prehistoric rock art.

From 1977 to 1985, the Center for Anthropological Studies (CAS) has been engaged in a series of ongoing surveys in the Taylor Ranch and Hughes Ranch (Riverview Sector Plan) areas under the direction of Albert Ward. These surveys are south of the Alameda Grant line, and encompass the lower reaches of the main branch of Piedras Marcadas Arroyo. Permission to resurvey any areas south of the Town of Alameda Grant line was not

obtained for the present project.

The survey of Taylor Ranch has been in progress for nine years, and information is contained in a preliminary report (Ward 1985). Some 1260 acres have been surveyed, with 40 sites (six of which have been excavated) and 125 isolated artifacts reported. In the Piedras Marcadas Arroyo area, 13 sites (three have been excavated) and an unknown number of isolates were found in an area of approximately 220 acres. Sites consist of prehistoric stone tool manufacturing locations, pebble caches, prehistoric puebloan habitations, and early 20th century EuroAmerican sites. All sites recorded by the Center for Anthropological Studies have an "NM I:" prefix. Of the excavated sites, NM I:14:3 is a small room dating to around AD 1300, containing pottery, lithic debris, and animal bone. NM I:14:11 was a natural depression associated with pottery dating to AD 900 and other lithic debris. NM I:14:13 was reported as an agricultural field system made up of a large U-shaped alignment of boulders, and associated charcoal concentrations, lithic debris, and pottery dating to about AD 1800.

The survey of Hughes Ranch took place in 1985, and covered about 400 acres south of the Town of Alameda Grant line (Ward 1986). Three sites (two of which were excavated), five petroglyph concentrations, and 36 isolated artifacts were found. Excavated sites were Site 1 (NM I:14:1:74) where two postholes, a pit, and pottery dating to AD 1300-1600 were found, and Site 3 (NM I:14:1:76) where a slump boulder room, a sunshade with six posts, a hearth, a trash dump and "several thousand artifacts" with pottery dating to AD 1300-1600. Site 3 was also recorded prior to excavation by the escarpment survey as LA 52099 (Schmader and Hays 1986:8.2-8.3), a basalt outcrop (Figure 3) with 25 grinding areas (Figure 4). A "large number" of artifacts were present, but where the pottery is more precisely dated to AD 1300-1400. Although the artifact scatter has been practically depleted by excavation, the petroglyphs and bedrock grinding areas on the associated isolated basalt outcrop represent an important intact resource. Recommendations as to suggested treatment of the outcrop, located in Riverview Tract H-17, will be presented in Section 9 of this report.

With respect to both the Taylor Ranch and the Hughes Estate investigations by the Center for Anthropological Studies (CAS), it should be noted that the possibility of additional undiscovered sites or artifacts cannot be ruled out. For example, only two of four sites reported by Reinhart in Section 14, T11N, R2E, might have been relocated by CAS surveys. All of the stone tool manufacturing sites in the Taylor Ranch survey are reported to have been totally collected (Ward 1985:Table 1), but the area still

Figure 3. Basalt outcrop setting of LA 52099 (Los Metates), an early Pueblo IV site

Figure 4. Grinding areas (metates) on basalt boulder at LA 52099

appears to be rich in artifacts. The north end of the Hughes Ranch survey is reported to contain few artifacts, mostly pottery, but the present survey located many stone artifacts and a large secondary reduction lithic scatter in the adjacent area just north of the Alameda Grant line. In summary, there is a possibility of other undiscovered cultural resources in previously surveyed areas south of the grant line boundary.

ENVIRONMENTAL SETTING

by

Mary C. Stiner

Description of the Piedras Marcadas Arroyo Study Area

The 1986 Piedras Marcadas Arroyo study area is located on the west side of Albuquerque, in the middle Rio Grande valley of central New Mexico. Lands surveyed encompass mesa top and bottomlands surrounding Piedras Marcadas Arroyo, an arroyo draining the eastern margin of the West Mesa. Elevations within the study area vary from 5370 feet on the mesatop to 5100 feet in the bottomlands. Archaeological sites and isolated finds were encountered throughout the study area, although artifact densities vary between the mesatop, bottomlands and the semienclosed arroyo canyon (Figures 5 and 6).

A variety of environmental impacts can be noted within the study area. The head of the arroyo has been seriously impacted by itinerant dumping (Figures 7 and 8). Bottomland surfaces exhibit a "combed" pattern in recent (1982) aerial photographs, indicating that systematic planting of native and/or exotic plants has occurred in the arroyo vicinity during the past decade. Presumably, plantings were done to enhance fodder for grazing livestock, or to control erosion. Development of an access road network represents a third type of impact that recently has affected the arroyo vicinity. While overall vegetation composition is similar to that found for nearby lands, some changes in habitat quality are inevitably associated with replanting and/or grading in the study area.

Geology of the Study Area

The geology of the Middle Rio Grande Rift system, which includes the West Mesa and Piedras Marcadas Arroyo, is described by Kelley (1952), Joesting, Case and Cordell (1961), and others. Descriptions of the geology in the immediate vicinity of the study area are provided in Kelley and Kudo (1978), and only a very general geological description is provided below.

Several large basins have formed in a roughly north-south line along the Middle Rio Grande Rift, and the study area lies within the southernmost Albuquerque-Belen Basin. Geomorphological features that typify rift systems, such as volcanics and massive faulting, are found along both margins of the basins. The Albuquerque Basin is a large Tertiary sedimentary basin bordered on the east by the Hubbell Springs fault and

Figure 5. Looking east from upper portion of Piedras Marcadas Canyon

Figure 6. Looking east from lower Piedras Marcadas Canyon toward Rio Grande valley

Figure 7. Mounds of dumped trash at head of Piedras Marcadas Canyon

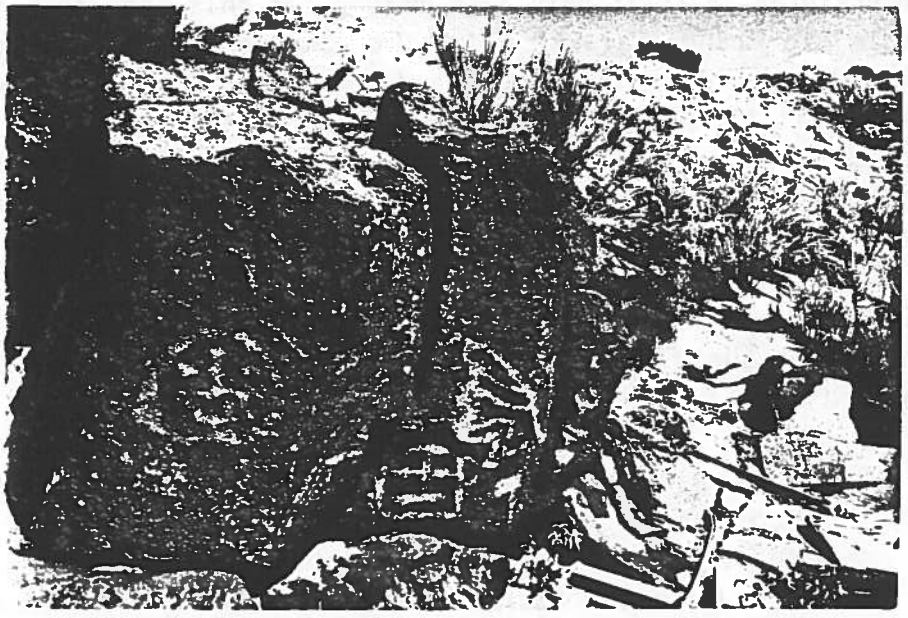


Figure 8. Close-up of dumped trash, note petroglyphs in foreground

the Sandia Uplift. The western margin of the basin is defined by the Ignacio Monocline, the Puerco Platform and the Lucero Uplift (Joesting, Case and Cordell 1961).

The Albuquerque-Belen Basin has been extensively worked by the Rio Grande and the lower Rio Puerco, resulting in a major series of gravel and sand terraces. The West Mesa is a residual sedimentary structure between the Rio Grande and the Rio Puerco valleys, north of their confluence. Fault lines in the mesatop were associated with considerable volcanic activity, and much of the mesa is covered by relatively impervious volcanic basalt caprock. Piedras Marcadas Arroyo is an east-flowing ephemeral drainage dissecting the eastern edge of the West Mesa. The main channel of the arroyo is less than five meters wide, although some bottomland terraces cut by the drainage rise to a height of about ten meters above the main channel.

Climate

The climate of the study area is classified as semiarid, and the area around Piedras Marcadas Arroyo receives between eight inches (Hacker 1977:96) and nine inches (Cordell 1979:6; Map 4) of precipitation annually. Precipitation is evenly divided between winter snow or rainstorms and a short but intense rainy season in late summer. Cordell (1979:Map 5) estimates a growing season of 180 days in the Albuquerque District for frost-sensitive plants like corn. Variability in annual temperatures is relatively less marked for this area than the rest of the Middle Rio Grande Valley, and it is considered to be at least marginally suitable for corn agriculture (ibid:6-7). Spring winds reach high velocities throughout the Albuquerque District and land surfaces in the West Mesa vicinity are particularly prone to deflation . Wind action was especially apparent near the base of the mesa escarpment in the study area, where deep dune deposits have formed.

Soils

Four major substrate zones were observed in the study area during the August 1986 survey:

1. mesatop characterized by very thin soils and frequent basalt outcrops;
2. mesa escarpment consisting of sedimentary talus deposits overlain by basalt boulders that are eroding from the mesa caprock;
3. bottomlands characterized by a mixture of residual sandy-gravel deposits and small to large semistable dunes;
4. bottomlands in the semienclosed arroyo canyon and along the base of the mesa escarpment, dominated by thick dune deposits.

All but the escarpment zone are discussed below. The escarpment zone is excluded from analysis in the present study because this zone was previously surveyed (Schmader and Hays 1986; see Stiner 1986).

Soils of the mesatop zone are characterized by the U.S. Department of Agriculture (Hacker 1977) as Alameda sandy loams on 0% to 5% slopes (Figure 9). The Alameda series consists of well-drained soils developing in aeolian sediments underlain by weathered basalt bedrock. These soils tend to be very calcareous and moderately alkaline (ibid:10-11). Alameda soils on the mesatop are very thin and subject to extreme deflation. Included within the Alameda soil designation are small pockets of winnowed loamy sands, particularly in shallow depressions. These appear as dense, relatively discrete grassy patches.

Soils of the bottomlands surrounding Piedras Marcadas Arroyo are more varied. Two principal soil types, Bluepoint loamy fine sands and Bluepoint-Kokan association, are identified by Hacker for the bottomland zone. The substrate is very undulating and slope varies between 5% and 40%. Also present in the eastern end of the study area are Madurez-Wink association soils on gentler slopes.

The Bluepoint soil series consists of deep sandy soils that are excessively drained. These soils form in sandy sediments of alluvial and eolian origin. Bluepoint soils are particularly common within the arroyo canyon, along the base of the mesa escarpment, and to a lesser degree on the the mesa rim. Large dunes have developed along the base of the escarpment. Large-scale eolian dune deposits are well developed. All Bluepoint soils are subject to pronounced deflation and their surfaces are unstable. Bluepoint-Kokan association substrates are present in the middle-southern and eastern portions of the study area. Bluepoint-Kokan soils are of special interest with respect to the distribution of certain archaeological sites because they are composed of 50% aggrading or deflating Bluepoint loamy fine sands and 50% residual Kokan sandy gravels. Lithic procurement sites often are associated with deflated Kokan gravel substrates (see Appendix B).

As noted above, soils of the Madurez-Wink association also occur at the eastern end of the study area and consist of fine loamy sands or fine sandy loams. Slopes are gentle, runoff is slow and deflated surfaces are common (Hacker 1977:27). Both the Bluepoint-Kokan and Madurez-Wink soils are included in the bottomland zone in the present study. Field observations made during vegetation survey transects indicate that while deflation is a common feature on the bottomland sandy substrates, the effects are not as severe as for the mesatop (see Appendix B).

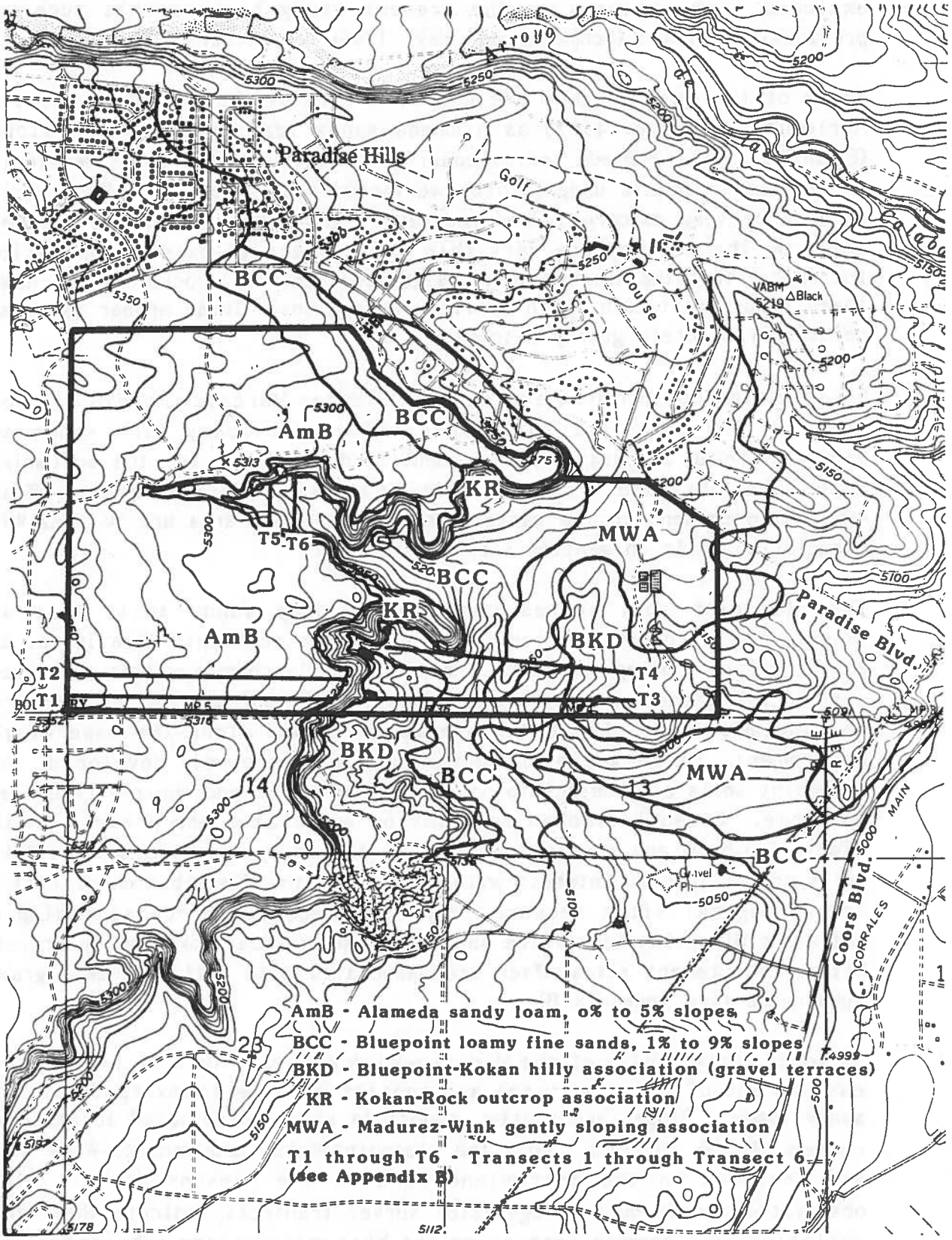


Figure 9. Soils of the Piedras Marcadas Arroyo area

Vegetation: Species Encountered and General Description

When compared to other localities on the eastern side of West Mesa, changes in sedimentation regime caused by construction and grading are moderate in the study area. The exception is land on the eastern end, where a large earthen retention feature has been constructed. Some effort was made to alter natural vegetation cover throughout the eastern half of the study area, though the degree to which plant species composition has been changed is difficult to gauge. Discing patterns can be detected on 1982 aerial photographs of the arroyo vicinity. Exotic annuals that favor disturbed soils, such as Russian thistle (Salsola kali), occur in low to moderate frequencies. The distribution of Russian thistle is strongly correlated with other signs of recent soil disturbance and is more common at the easternmost end of the study area. Areas with pronounced substrate disturbance and high frequencies of exotic annuals were not sampled for the vegetation study presented in Appendix B.

Noticeable differences in modern plant community composition occur within the survey area. The differences correlate with soil matrix (grain size and variability of grain sizes within a particular matrix), water availability, slope, exposure, and degree of habitat disturbance. Vegetation also has been affected by overgrazing and wood cutting in the past. Intense grazing has ceased in recent years, though skeletons and feces of range cattle can still be found just south of the Piedras Marcadas Arroyo vicinity. It is likely that juniper trees (Juniperus monosperma) were more common in prior decades. Other changes in the succession of annual and perennial plant composition caused by changing land use on West Mesa are more difficult to gauge.

Descriptions of plant taxa observed during the August 1986 survey are provided for various substrates below. Species lists for each substrate zone approximate the descending order of their frequencies.

Plant species most commonly observed on the **mesatop** zone are snakeweed (Gutierrezia sarothrae), grama grass (Bouteloua sp.), sand dropseed (Sporobolus spp.), and galleta grass (Hilaria sp.). Moderate frequencies of Indian rice grass (Oryzopsis hymenoides), sand sage (Artemisia filifolia), feather peabush (Dalea formosa, Spellenberg 1979) and vetch (Astragalus sp.) were observed. Several other plant taxa also were encountered, but in much lower frequencies; these are prickly pear (Opuntia spp.), yucca (Yucca sp.), horsenettle (Solanum elaeagnifolium), fleabane (Erigeron sp.), Mormon tea (Ephedra viridis), Russian thistle (Salsola kali), spectaclepod (Dithyrea wislizenii), desert mallow (Spheralcea sp.), indigo bush (Dalea sp.), four-wing saltbush (Atriplex canescens), wild buckwheat (Eriogonum sp.), and heliotrope (Phacelia sp.).

Distributions of certain species, such as four-wing saltbush, heliotrope, feather peabush, yucca and some grasses are noticeably patchy. Patchy distributions are at least partly associated with restricted substrate preference displayed by these taxa. Indian rice grass distributions, for example, are confined to incipient or developed dune substrates.

Plant taxa that predominate in the **bottomland** zone vary significantly between residual gravel knolls and the more common sandy dune substrates. Vegetation on Kokan gravels consists primarily of Mormon tea (Ephedra viridis), feather peabush (Dalea formosa, Spellenberg 1979), and sparse occurrences of grama grass (Bouteloua sp.), fleabane (Erigeron sp.) and groundsel (Senecio sp.). The most common plant species on sandy substrates are snakeweed (Gutierrezia sarothrae), Indian rice grass (Oryzopsis hymenoides) and indigo bush (Dalea sp.). Present in moderate frequencies are sand dropseed (Sporobolus sp.), sand sage (Artemisia filifolia), winterfat (Eurotia lanata) and Mormon tea (Ephedra viridis). Several other species also were encountered in very low frequencies; these are horsenettle (Solanum elaeagnifolium), aster (Chrysopsis sp.), prickly pear and dagger opuntia (Opuntia spp.), four-wing saltbush (Atriplex canescens), Russian thistle (Salsola kali), desert mallow (Spheralcea sp.), vetch (Astragalus sp.), sunflower (Helianthus sp.), galleta grass (Hilaria sp.), fleabane (Erigeron sp.), grama grass (Bouteloua sp.), heliotrope (Phacelia sp.), stickleaf (Mentzelia sp.) and groundsel (Senecio sp.). Some patchiness in the distribution of certain plant species was observed in the bottomland zone, though patch size tends to be greater in the bottomlands than on the mesatop. Grama grass, for example, was generally rare, but occurred in small thick patches when it was encountered.

A third plant/substrate zone in the study area occurs within the semienclosed valley of upper Piedras Marcadas Arroyo and along the base of the mesa escarpment. The substrate is extremely sandy and consists of well-developed dunes with infrequent blowouts. Taxonomic composition is simpler and more homogeneous throughout the zone. Most common plant taxa are snakeweed (Gutierrezia sarothrae), sand sage (Artemisia filifolia), Indian rice grass (Oryzopsis hymenoides), sand dropseed (Sporobolus spp.) and indigo bush (Dalea sp.). Present in moderate frequencies are four-wing saltbush (Atriplex canescens), grama grass (Bouteloua sp.) and purple aster (Chrysopsis sp.). Rare occurrences of prickly pear (Opuntia sp.), Mormon tea (Ephedra viridis), vetch (Astragalus sp.), Russian thistle (Salsola kali), desert mallow (Spheralcea sp.), horsenettle (Solanum elaeagnifolium), stickseed (Mentzelia sp.), heliotrope (Phacelia sp.) and sunflower (Helianthus sp.) also were observed.

Fauna

Several animal species were sighted by survey crew members during the August 1986 field session. Cottontail rabbit (Sylvilagus sp.), jackrabbit (Lepus sp.), ground squirrel (Spermophilus sp.), mourning dove (Zenaida macroura), quail (probably Callipepla squamata), burrowing owls (Athene cunicularia) and a variety of unidentified lizards were encountered. The density of burrowing owls was particularly high in the eastern end of the study area. Disturbed areas and abandoned underground conduits of the earthen retention feature are favored burrow areas. Many of the owls were juveniles, and populations density will certainly drop once young birds become independent of their parents.

SURVEY METHODOLOGY

The initial phase of fieldwork consisted of determining the areas to be investigated by inspecting City Zone Atlas Maps. The major drainages in the Piedras Marcadas Arroyo network were delineated, and a width of 1/4 mile on either side of the arroyo was chosen as a preliminary boundary. Subsequent discussion with City staff expanded some areas and decreased other areas, and permission to survey was not given for any areas south of the Town of Alameda Grant Line. Additional survey was carried out at the far east and west ends of the study area due to a slightly greater rate of coverage than had been originally estimated. This resulted in a study area of approximately 920 acres, 90 of which were excluded because they had been surveyed recently (Schmader and Hays 1986).

The remaining 830 acres are primarily represented on three City Zone Atlas Maps: B-11, C-11, and C-12. A small portion extends onto Map B-12 as well. It is important to note that the scale and detail of the aerial imagery on the Zone Atlas Maps (1"=200', or a ratio scale of 1:2400) is excellent for conducting survey work. The standard map scale that most archaeological survey crews must use is ten times greater (1"=2000', or a ratio scale of 1:24,000), and the USGS maps do not contain many natural landmarks that are visible on air photos (e.g., vegetation or changes in soils). City Zone Atlas Maps, then, are ideal survey tools and they have the additional advantage of tying into the locational system most often used by City planning departments and commissions.

Prior to the initiation of fieldwork, survey transect lines were drawn onto the Zone Atlas Maps. A transect width of 150 feet (45.7 meters) was selected to assure detailed ground coverage. The transects were surveyed by a crew of four archaeologists, so that the average spacing between individuals was about 37.5 feet (11.4 meters). The closeness of spacing between crew members was considered to be appropriate, since it was anticipated that the area would be rich in cultural resources. Frequently archaeological surveys are carried out with a spacing in excess of 65' (20 meters), but this is only appropriate in cases where few resources are anticipated. Not only will wide spacing miss numerous isolated artifacts, but it will also miss small site concentrations of artifacts. The large number (197) of isolated artifacts and some of the small sites found by the survey of Piedras Marcadas Arroyo is testimony to the appropriateness and necessity of close crew spacing in areas that are rich in cultural resources.

Drawing transect lines onto maps prior to surveying also ensured a high level of locational accuracy. By using vegetation, soil changes, or other landmarks, the crew was able at all times to pinpoint its location on the maps, thus affording the City the kind of accuracy it needs for resource management.

Fieldwork was begun on August 1, 1986, at the southwest corner of the study area (west edge of Zone Atlas Map C-11 and along the south boundary line of the Town of Alameda Grant). The crew surveyed eastward until it reached the top edge of the volcanic escarpment, then swung around and surveyed westward until it came up to the starting point of the previous transect. The outside (north) line of each transect was marked by surveying flags, so that the crew could follow along the flag line when surveying back in the opposite direction. All transects were flagged in this manner to ensure locational accuracy and proper ground coverage, and to prevent possible errors that can result if crews survey incorrect transect widths or directions.

The survey progressed north from the Alameda Grant line with the completion of each transect, and continued until the entire mesa top and upper portion of Piedras Marcadas Canyon were surveyed. The survey then moved to the southeast corner of the study area (Alameda Grant line and due south from the intersection of Davenport Street and Paradise Blvd) and surveyed westward in transects that ended at the base of the volcanic escarpment. The survey again progressed from south to north with the completion of each east-west transect, until the Piedras Marcadas Arroyo floodplain and the lower portion of Piedras Marcadas Canyon were inventoried. It took five field days to complete the survey of the mesa top, and three field days to complete the survey of the valley bottom.

The goal of the survey crew was to walk in tandem along each transect, inspecting the ground surface for any evidence of past human activity. Such activity is represented by two kinds of observation units: **isolated occurrences** and **sites.** For the purposes of this survey, an **isolated occurrence** is defined as an item or area in which a limited degree or type of human behavior occurred in the past. Typically, an isolated occurrence consists of one or several artifacts contained in a small area. Over 80% of the isolated occurrences recorded on this survey consisted of three artifacts or less. **Sites** were defined as areas in which there is evidence of more intensive or diverse prior human behavior. As an arbitrary rule, sites usually contain more than ten artifacts in a ten meter by ten meter area. The diversity of items found in an area adds to its importance as a site; small scatters with both ceramic and lithic artifacts are as important as larger scatters with only lithic artifacts.

When a crew member located an artifact, they would stop to inspect it and then call out "I.O." (the acronym for isolated occurrence). The crew would then determine if there were more artifacts in the vicinity, and if a sufficient number (usually 10 or more) were found, the area would be recorded as a site. If few or no more artifacts were located, then the artifact(s) would be recorded as an isolated occurrence. A description of the artifact(s) was entered into the field log, and the location was noted on the field maps. After the first field day, local soil and erosion information was also noted. If an artifact scatter was judged to be a site, then a site form was filled out, the artifacts were analyzed in the field, a sketch map was made, photographs were taken. The site was marked with a spike and attached tag with the site number (prefixed by "PMA:" for Piedras Marcadas Arroyo), the date, and the words "Piedras Marcadas Arroyo." Descriptions of isolated occurrences are presented in Appendix A and the descriptions of sites found in the study area are presented in the following section.

Field numbers were assigned serially from I.O. 1 through I.O. 206 for isolated occurrences, and from PMA:1 through PMA:16 for sites. After the completion of the field work, the status of some I.O.s and sites was changed due to the proximity of the artifact scatters. For example, two separately recorded sites, PMA:2 and PMA:3, were combined into one site. I.O. 103 and 104 were combined with site PMA:11, I.O. 127 was turned into site PMA:17, I.O. 134 became site PMA:18, and I.O. 143 was combined with I.O. 146 to create site PMA:19. I.O. 111 was found to be part of a previously recorded site (LA 52096, Schmader and Hays 1986:8.4). The result of this postfield analysis was a finalized number of isolated occurrences (198) and sites (18). The sites were then assigned Laboratory of Anthropology numbers, which begin with the prefix "LA." The concordance between field numbers and official Laboratory of Anthropology number is listed below:

PMA:11	LA 56101
PMA: 8	LA 56102
PMA: 7	LA 56103
PMA: 9	LA 56104
PMA:10	LA 56105
PMA: 6	LA 56106
PMA:17	LA 56107
PMA:12	LA 56108
PMA: 2 & 3	LA 56109
PMA: 1	LA 56110
PMA: 5	LA 56111
PMA: 4	LA 56112

PMA:14	LA 56113
PMA:18	LA 56114
PMA:19	LA 56115
PMA:16	LA 56116
PMA:15	LA 56117
PMA:13	LA 56118

The reordering of the field numbers to conform with a sequence of Laboratory of Anthropology numbers was done to aid in locating the sites on final project maps. Since the Laboratory number will be the sites' official designation, the numbers reflect the geographic location of the sites, trending from north to south. This makes the "LA" number easier to find on a map, since the "PMA" field number sequence is mixed relative to geographic location.

SURVEY RESULTS

The 830 acre survey of the Piedras Marcadas Arroyo corridor encountered 18 previously unrecorded archaeological sites (Laboratory of Anthropology [LA] 56101 through LA 56118). An additional seven sites (LA 52092 through LA 52098) have been reported previously in the 920 acre study area, as well as the main site to which petroglyph concentrations have been assigned (LA 52100). Figure 10 shows the locations of the 26 sites in the study area, which are described in this section.

Previously Unrecorded Sites in the Study Area

LA 56101 (PMA:11)

The site (15 meters north/south by 50 meters east/west) is divided into two discrete areas (Proveniences A and B) separated by about 20 meters of artifact-free surface. The site is located atop a low rise or basalt outcrop. Much of the site surface is deflated. Visibility of surrounding terrain from the site area is good in all directions.

Provenience A (15 meters north/south by 25 meters east/west) consists of a simple masonry structure that has almost completely collapsed, and a small lithic scatter immediately surrounding the structure. The structure appears to have been an ephemeral habitation. Several basalt rock elements have been robbed for construction of a recent circular hearth located only 1 meter southeast of the structure's rubble scatter. The hearth is filled with fresh charcoal and partly burned juniper. Two ceramic sherds were found in association with Provenience A: a Pueblo IV (Agua Fria, AD 1300-1450) rim sherd with interior band; and a redware glaze bowl sherd with paint on both sides (probably Agua Fria) and has one ground edge.

Provenience B (15 meters north/south by 5 meters east/west) consists of a semicircular masonry wall resembling a windbreak or part of a temporary habitation/shelter. A small lithic scatter was observed on the east side of the structural feature.

Lithic artifacts are on local raw materials, especially chalcedonies and quartzites. Most lithics from both proveniences show secondary reduction and some utilization (especially at Provenience B). Three cores were found at Provenience A. Some quartzite artifacts appear to have been fire-reddened.

NOT FOR PUBLIC REVIEW

Figure 10. Distribution of sites within the study area

LA 56102 (PMA:8)

The site area is 10 meters north/south by 60 meters east/west, and the site consists of two lithic and ceramic sherd scatters (Proveniences A and B) separated from one another by a 30 to 40 meter space lacking in artifacts. Provenience A (10 meters north/south by 20 meters east/west) contains most of the lithic artifacts found on the site, along with a basalt rock pile, (20-30 cobbles) and several ceramic sherds. All stages of lithic reduction are evidenced by the lithic assemblage, and all lithics were manufactured on local raw materials. Provenience A is located at the eastern end of the site area. Provenience B (10 meters north/south by 10 meters east/west) contains some lithics and a substantial quantity of ceramic sherds. Provenience B is located at the western end of the site area.

The site is located on top of a relatively high knoll on the mesa top. Visibility of surrounding lands in all directions is excellent. Both Provenience A and B occur on deflated basalt surfaces, while eolian sands have accumulated around the knoll, and to a lesser degree in the slightly depressed area between Proveniences A and B on the top of the knoll. This may or may not explain the absence of artifacts between Proveniences A and B, though real presence of two discrete behavioral loci is suspected.

This site is distinctive relative to other lithic/ceramic sites found in the study area because of the large quantity of cultural materials found. Artifact distribution seems to reflect two discrete activity areas, and site integrity seems good enough to warrant precise mapping of the site in the future.

Potsherds from Provenience A (N=7) all appear to be early Pueblo IV (AD 1300-1450). Half the sherds are a gray plainware. Other types probably include Agua Fria, San Clemente, and possibly Wingate. Potsherds from Provenience B (N=21) all appear to be mid to late Pueblo IV, and range of types is different than that found for Provenience B. Glaze D types (AD 1490-1515), probably San Lazaro, predominate.

LA 56103 (PMA:7)

The site consists of a small lithic and ceramic sherd scatter within a large dune blowout. Site dimensions are 20 metérs north/south by 10 meters east/west. The general topographic location is on the mesa top, north of Piedras Marcadas Arroyo, and on low flat zone with relatively deep sandy substrate. Vegetative cover is distinctive for this portion of the mesatop in that members of the family Grammaceae dominate. Visibility of surrounding lands is fairly good to the north and east.

Artifact distribution, and therefore site dimensions, appears to be a function of geomorphic rather than cultural factors, since all materials are confined to the blowout. Lithics are on local chert and chalcedony pebbles, and secondary reduction is the dominant phase represented by this assemblage.

LA 56104 (PMA:9)

The site consists of a small lithic scatter with three associated ceramic sherds. The scatter covers an area of 35 meters north/south by 30 meters east/west, and is distributed on top of a low rise/basalt outcrop and down its eastern slope. The site surface is deflated on the outcrop itself but grades into semi-stable eolian sands to the north and east sides of the outcrop. Visibility of surrounding terrain from the site area is excellent in all directions. The site is located on mesa top, near the eastern mesa scarp.

Three ceramic sherds found in association with the lithic artifacts: one redware jar body sherd with burnished exterior and one redware jar body sherd with burnished exterior and black slip interior. Both sherds may be Pueblo IV in age. One early Pueblo IV Glaze A (Agua Fria, AD 1300-1450) sherd also was found.

The lithic assemblage was manufactured on local quartzites and chalcedonies. Most lithics show primary reduction stage, and three cores were found. One fragment of fire-cracked rock was found on the northern margin of the site area.

LA 56105 (PMA:10)

The site consists of several historic features located at two discrete but related proveniences (A and B). Overall site dimensions are 80 meters northwest/southeast by 15 meters northeast/southwest. Provenience A covers an area of 20 meters north/south by 15 meters east/west, and includes a three-sided rectangular structure (3 meters by 4 meters) which opens to the southeast. A scatter of metal containers parts (five sardine cans, one possible lard bucket, two can lids, and two Prince Albert containers) surrounds the structure. An ash pile or ash dump (about 1.5 by 1.5 meters) is located 3 meters southeast of the front of the structure entrance. The structure itself appears to have been some kind of ephemeral shelter or windbreak because it lacks a fourth side. The masonry consists of basalt cobble elements and sandy adobe matrix, and the walls meet one another at right angles. Four lithic artifacts were found near the ash pile and to the north of the structure. One small isolated

pile of basalt rocks was observed 2 meters west of the main structure.

Provenience B (7 meters north/south by 11 meters east/west) is located about 60 meters southeast of Provenience A, and consists of two basalt rock features, one of which clearly was a hearth. The hearth was formed by a semicircular arrangement of cobbles. Ash and charcoal fill was found inside the hearth, evidence of its recent age. The function of the other basalt cobble feature, located 1.5 meters south of the hearth, is unknown. It consists of a roughly circular pile of about 20 basalt cobbles, and no ash, charcoal, or fire-reddening was evidenced. A few metal container parts were found in association with Provenience B. Two additional ash piles or dumps, each 1 meter in diameter, were found at Provenience B. One is only 2 to 3 meters southeast of the basalt cobble feature. The other is located about 20 meters north/northeast of the basalt cobble features.

LA 56106 (PMA:6)

This site consists of a small lithic (N=54) and ceramic sherd (N=7) scatter distributed over a basalt outcrop or low rise on the mesa top. Site area is 10 meters north/south by 7 meters east/west. The lithic assemblage contains some primary flakes, more secondary flakes, and one core. All lithics were manufactured on locally available raw materials. Ceramic sherds appear to be from early through late Pueblo IV period (one large bowl rim sherd of San Clemente Glaze A Polychrome; one body sherd with cream-colored slip, probably Cieneguilla; two redware bowl body sherds with glaze paint, possibly later Pueblo IV due to presence of shoulder; two redware jar sherds with shoulder, and one polychrome bowl body sherd). Sherds probably come from at least three different vessels.

Since the site is located on a low rise, surrounding lands in all cardinal directions are visible from the site area. Site contents suggest that the site was used as some sort of ephemeral camp, based on the presence of sherds from more than one ceramic vessel and dominance of secondary reduction on lithic artifacts. One complete corner-notched projectile point made from clear chalcedony was found on the northwest margin of the site area.

LA 56107 (PMA:17)

This site consists of a thin artifact scatter on a fairly prominent basalt knoll at the west edge of the survey area. Only 11 lithic artifacts were found here, with quartzite the predominant material. A fragment of quartzite groundstone was also found on the site, as was evidence of a

historic hearth. This site was originally recorded as I.O. 127, but evaluation of the range of activities represented changed its status to a site. In addition, it is highly likely that a greater concentration of artifacts exists on slopes of a larger basalt knoll just to the west of the site and outside of the survey boundary. Designation of this knoll as a site is intended to give planning consideration to the general site area.

LA 56108 (PMA:12)

The site consists of a small lithic and ceramic scatter, 15 meters north/south by 25 meters east/west, distributed over a basalt outcrop/low rise. The site is located on the mesa top, south of the head of Piedras Marcadas Arroyo. Ceramics include a Glaze D, late Pueblo IV sherd (San Lazaro, AD 1490-1515). The lithic assemblage (N=40) consists of artifacts manufactured on local raw materials, including obsidian gravels available from terrace deposits near West Mesa. This is one of the few sites found on survey where obsidian artifacts were observed. Secondary reduction dominates, and six cores were present. Five or six flakes show signs of retouch and utilization. Most of the site surface appears deflated, although eolian sands occur all around the basalt outcrop.

LA 56109 (PMA:2/3)

PMA:2 consists of a small lithic scatter, 6 meters north/south by 13 meters east/west, distributed over a low rise/basalt outcrop. The site surface has undergone deflation, so that a substantial amount of bedrock is exposed. Visibility of the surrounding landscape is excellent in all directions. Lithic raw materials are local in origin, and most artifacts exhibit high percentages of cortex suggesting primary reduction. Subsequent discovery of site PMA:3 nearby the following day led to combining PMA:2 and PMA:3 together as a single site.

PMA:3 consists of two small lithic scatters distributed on two discrete volcanic outcrops (Proveniences A and B). The proveniences are roughly 30 meters apart, and the overall site size is 20 meters north/south by 40 meters east/west. Provenience A (25 meters north/south by 7 meters east/west) is comprised of a possible single course high rock alignment approximately 1 meters long, one ceramic sherd (thin-walled plain grayware), several lithic flakes, and at least seven small petroglyphs pecked into small basalt boulders. Petroglyph images include two probable faces, three geometrics, and two possible zoomorphs. A hearth containing substantial quantities of ash, charcoal, and a few fragments of burnt bone (probably lagomorph) was found at the base of basalt boulders

in Provenience A. Associated with the hearth is a small pile of juniper wood. The hearth appears to be historic. Provenience B (15 meters north/south by 7 meters east/west) is comprised solely of lithic artifacts, including one mano with bashed edges and one possible quartzite cobble core/hammerstone.

PMA:3 is located on a low rise (volcanic outcrop) from which surrounding lands to the north, west, and east are visible. Artifacts were observed on deflated surfaces only, and substrate between Proveniences A and B consists of eolian sand fill. Cultural materials may or may not be present in subsurface sand fill between and around exposed volcanic outcrops. Thus, separation of Proveniences A and B may be due to geological or cultural phenomena. The site is located on the mesatop, south of Piedras Marcadas Arroyo.

The site appears to be of ephemeral type, with a limited set of activities evidenced and limited occupations. Lithics display primary and secondary reduction phases, though secondary reduction dominates. Raw material types represented are all locally available.

LA 56110 (PMA:1)

This site consists of a dispersed lithic scatter (N=20), 15 meters north/south by 10 meters east/west, distributed over the top of a volcanic outcrop and down the southeastern slope of the rise. One Pueblo IV Glaze A bowl body sherd (Agua Fria, AD 1300-1450) was also found. As is true for all low rise/volcanic outcrop features on the mesa top, general visibility of surrounding lands is very good from this site. Most of the site area is limited to deflated surfaces, but also to a small blowout in the eolian sand deposits below the outcrop. It is likely that cultural materials are buried in aeolian fill southeast of the outcrop. The estimated size of the site nevertheless would be quite small.

Two or three clusters of piled basalt rocks occur on the eastern edge of the volcanic outcrop. Associations with other site contents is unknown. General patterns exhibited by the lithic assemblage are: a wide range of lithic raw material types (including high quality, brown chert or jasper, rhyolite, local cherts, and chalcedonies); and primary and secondary reduction, although secondary reduction predominates.

LA 56111 (PMA:5)

The site consists of a small but dense lithic scatter (N=about 25) distributed over a basalt outcrop/low rise. The site area is 4 meters

north/south by 7 meters east/west, and has undergone considerable eolian deflation. Most lithic artifacts are secondary flakes made on various local cherts, chalcedonies, and basalt. The assemblage seems to represent a single episode of lithic reduction.

The site is located on the mesa top, near the eastern mesa edge, and south of Piedras Marcadas Arroyo. Visibility of surrounding lands in all directions is excellent. All lithic artifacts were made on locally available raw materials.

LA 56112 (PMA:4)

This site consists of a small but dense lithic scatter located in a blowout in eolian sand substrate. The scatter is distributed over an area of 10 meters north/south by 12 meters east/west. Virtually all lithic artifacts are secondary basalt flakes (one chalcedony flake was also found), and the site seems to represent a single episode of lithic reduction.

The site is located on the mesatop, near the east edge, and south of Piedras Marcadas Arroyo. Surrounding lands in all cardinal directions are visible from the site area. The spatial integrity of the chipping cluster seems very good. Artifact burial probably is minimal for this site, and precise mapping of the lithic distribution should be performed if mitigation is required in the future.

LA 56113 (PMA:14)

The site consists of four or five basalt rock alignments oriented north to south on a dune and gravel slope at the base of the mesa escarpment. The site area is 20 meters north/south by 100 meters east/west. The rock alignments may be water control features, but are placed perpendicular to the 25% slope. One Pueblo IV Glaze A jar body sherd (Cieneguilla, AD 1300-1450), five cores, and seven flakes were found in association with the rock alignments. A few additional lithic artifacts and another small rock alignment occur west of the main site area. The rock alignment is approximately 60 meters to the west, high up in the head of the arroyo and immediately below the mesa scarp. The three largest rock alignments located on the eastern side of the site have the following dimensions: 12 meters (about 25 elements); 17 meters (about 30 elements); 7.5 meters (25 elements).

The site is located at the base of the escarpment on a sandy gravel surface, and on the south bank of the head of the middle branch of Piedras

Marcadas Arroyo. The site is in a relatively sheltered location and is surrounded by basalt outcrops on the north, south, and west sides. Exposure is generally eastern and visibility of surrounding terrain to the east is very good.

LA 56114 (PMA:18)

This is a small artifact scatter located near the base of the escarpment just north of the Alameda Grant line. Only 14 lithic artifacts were recorded, but some diversity of activity is reflected by the presence of a core and a fragment of fire-cracked rock. In addition, the entire general area of gravelly hills at the base of the escarpment may have been used as a lithic quarry for long periods of time. Often these sites are difficult to identify due to the presence of numerous naturally fractured cobbles. Only upon closer inspection do artifact scatters become visible, and generally when there are a few artifacts there will be small concentrations that could be classified as sites. This site had enough artifacts in a small area to warrant further investigation and planning consideration.

LA 56115 (PMA:19)

This site consists of two small artifact scatters in close proximity to each other. They are located near the base of the escarpment, at a point where the escarpment juts out as a small peninsula along the south side of the middle branch of the arroyo. The scatters are near LA 52094, a previously recorded historic site with tent base and corral features. Rather than add the prehistoric scatters to the obviously historic site, a new site designation seemed appropriate. The escarpment at the tip of the peninsula has a petroglyph concentration, and the presence of a number of other lithic I.O.s nearby strengthens the interpretation of a generalized prehistoric site area. Provenience A (originally I.O. 143) consists of at least 11 lithic flakes, but 10 of these are basalt and most have no cortex. This is the type of complete reduction on basalt material that is common in Archaic lithic strategies, and it should be noted that both Archaic projectile points found on this survey were within several hundred meters of the site. Provenience B (formerly I.O. 146) contained 11 flakes and evidence of moderate onsite reduction of a quartzite core. In addition, two plain grayware jar body sherds of unknown temporal or cultural affiliation were found.

LA 56116 (PMA:16)

The site consists of a localized lithic scatter, 25 meters north/south by

15 meters east/west, distributed on top of a low rise. The scatter is confined to a blowout in eolian sands that overlie a residual gravel terrace. The site is located about 100 meters east of Piedras Marcadas Arroyo, in the bottomlands zone. Because the site rests on a low rise, surrounding lands to the south, west, and north are visible from the site. Site exposure is generally to the west.

The presence of three lithic secondary flakes with prepared platforms in a 1 to 2 square meter area on the site suggests that spatial integrity of some activity area(s) may be fairly good. Secondary reduction dominates the assemblage, and retouch/utilization is relatively common. All lithics were manufactured on locally available raw materials, though chalcedony is by far the most common material represented in the assemblage.

LA 56117 (PMA:15)

The site consists of a localized lithic scatter distributed over an area of 25 meters north/south by 15 meters east/west, and is located on top of a low rise on bottom lands east of Piedras Marcadas Arroyo. The rise appears to be a residual gravel ridge/terrace capped by eolian sands. The scatter itself is confined to a blowout in the eolian deposits. Visibility of surrounding lands is excellent in all directions.

Secondary reduction on local raw materials (especially chalcedony) dominates in the lithic assemblage. Retouched/utilized edges are fairly common on flakes.

LA 56118 (PMA:13)

The site consists of two separate areas, Proveniences A and B, which are described separately. Provenience A consists of a fairly extensive lithic scatter (N=about 85) distributed over an area of 45 meters north/south by 30 meters east/west. The scatter is located on top of and on the sides of the upper faces of a residual ridge/terrace deposit. The terrace formation is comprised of alluvial gravels capped by eolian sands, and is located just east of the main channel of lower Piedras Marcadas Arroyo. Surrounding terrain to the north, east, south, and west are visible from the site area, as the ridge/terrace is considerably higher than most other portions of the bottomlands.

One gray plainware olla body sherd with sand temper and a smoothed interior was found associated with the lithic scatter. The lithic assemblage is typical of those found at other sites in the study area, in that virtually all artifacts were manufactured on local raw materials.

Primary and secondary reduction phases are represented in the assemblage, although primary reduction seems to dominate. Numerous cores were found, many of which appear to have been tested and discarded. Four examples of conjoinable artifacts (from the same core) were found, suggesting that spatial integrity of the site may be quite good.

Provenience B consists of a discrete lithic scatter (N=about 30) located about 15-20 meters north of Provenience A. Separation of the two scatters may be due to geological rather than behavioral phenomena, however, since the two proveniences are on either side of a shallow saddle on the hilltop. Sediments within the saddle appear to be aggrading while both Provenience B and Provenience A are located within large blowouts.

Provenience B covers an area of 30 meters north/south by 45 meters east/west. The lithic assemblage is similar to that observed for Provenience A, and a few artifacts made on distinctive cherts may be from the same cores as artifacts found in Provenience A. This observation lends support to the idea that Proveniences A and B are a single site with differential exposure of artifacts on the present surface. No cores were found at Provenience B, although common in Provenience A.

Previously Recorded Sites in the Study Area

LA 52092

This site is located at the base of the escarpment and just north of the Paseo del Norte right-of-way. It consists of several possible walls, one to two courses high, that have been eroded. These walls may be the remains of shelters or fieldhouses, and there is a thin scatter of artifacts associated. Lithic materials are mostly quartzite, and may have originated from one of the numerous gravel terraces nearby. Two plainware jar sherds were also found. There is a major concentration of at least 109 petroglyphs just west of the site (PC:23B:2), and four boulder metates were also located (Schmader and Hays 1986:8.6-7).

LA 52093

This multicomponent site consists of a light scatter of lithic debris, including cores, hammerstones, and primary flakes. The materials no doubt are derived from one of the many small gravelly hills nearby in this side drainage of Piedras Marcadas Arroyo. There are also important historic herding features at the site, including a 2 meter by 2.5 meter walled enclosure of basalt cobbles several courses high. This structure is an apparent tent base built to incorporate some large in situ boulders, and

it may have an opening on the east side. A possible pen area is among some boulders just to the south of the tent base, and a probable brush corral area is in the head of a drainage about 35 meters to the north. Historical artifacts date to the late 1800's and include glass, hardware, and possible wagon parts. A fine concentration of at least 150 petroglyphs (PC:24A:1) is located on the slopes around the site (ibid:8.6).

LA 52094

This is another historic site that bears a close resemblance to nearby site LA 52093. It consists of a 2.5 meter square basalt feature, probably a tent base with an entrance at the southeast corner. Turn-of-the-century glass, ceramics, and metal are east of the tent base, and a small corral area with several courses of large basalt cobbles is 20 meters to the west. Since no lithics were noted at the site, nearby concentrations of lithic debris were given a separate site designation (PMA:19). In addition, a large petroglyph group with at least 192 glyphs (PC:24A:2) is on the escarpment above the site area (ibid:8.5).

LA 52095

This is a set of large basalt structures at the head of upper Piedras Marcadas Canyon. It consists of a large bisectioned corral formed from large boulders that would have required considerable effort to put in place. Due to the scale of this site, it can be interpreted as a more permanent facility than some of the other ephemeral sites on the escarpment, and it may have housed animals other than sheep. The site area is being heavily impacted by trash dumping (see Figures 7 and 8), so that associated artifacts are impossible to locate. The site may date to the early part of this century, but is still a rare representative of that time period (ibid:8.5).

LA 52096

This site contains three semicircular structures positioned at the base of the escarpment along the north side of upper Piedras Marcadas Canyon. Each structure is an enhancement of naturally occurring boulders, achieved by piling small basalt cobbles between boulders. Most wall alignments are one or two courses high, and the average size of the structures is about 2.5 meters in diameter, spaced at an interval of 10 to 15 meters from one another. As many as five water control alignments made of small basalt cobbles are located about 75 meters northeast of the structures. They average seven meters in length and cut across the drainage in a northwest

to southeast direction. Only two lithic artifacts were found in this area (ibid:8.4).

LA 52097

This is a small lithic scatter containing quartzite cores, primary flakes, and secondary flakes. It is situated at the base of the escarpment on the north side of upper Piedras Marcadas Canyon, and a concentration of at least 208 petroglyphs (PC:26A:2) is located between this site and LA 52096 (ibid:8.4).

LA 52098

This site is located on a stabilized dune near the head of lower Piedras Marcadas Canyon. From three to six rock alignments are positioned southeast/northwest across the slope of the hill area. The alignments average 10 meters in length and parallel each other in parts; they are probably prehistoric water or soil control devices. A small lithic scatter containing mostly chalcedony flakes was noted, and one red-slipped bowl sherd was also found. The site area is immediately east of two large petroglyph concentrations (PC:27A:5 and PC:27A:6) that have at least 600 glyphs combined (ibid:8.3-4).

LA 52100

This is the overall site designation for all petroglyph concentrations that exist on the volcanic escarpment. This site number supercedes previous numbers that referred to individual concentrations (e.g., LA 9054 through LA 9057, in Piedras Marcadas Canyon). The entire escarpment rock art site is known to contain about 10,500 recorded petroglyphs out of an estimated 15,000 total. Piedras Marcadas ("Marked Stones") Arroyo, which is named after the petroglyphs, contains an estimated 5000 petroglyphs (one-third of the total) in about 20% of the length of the escarpment. The density of petroglyphs and the wonderfully executed style of this area's rock art makes the Piedras Marcadas concentrations truly outstanding indeed. Because of its easy access and compactness of area, Piedras Marcadas has been suggested as an ideal location for a major interpretive facility designed for the public. This type of use for the area is appropriate and desirable when considering the alternatives of infill occurring near the escarpment, and the area is well suited for the establishment of trails and other accompanying facilities. Some examples of fine petroglyph panels have been redrawn from photographs and are presented on the following pages (Figures 11 and 12).

Figure 11. Petroglyph motifs from the Piedras Marcadas Arroyo area

Figure 12. Petroglyph motifs from the Piedras Marcadas Arroyo area

SYNTHESIS OF ARCHAEOLOGICAL WORK AT LA 290 (MANN SITE)

This section presents a synthesis of archaeological work done at a large prehistoric pueblo at the downstream end of Piedras Marcadas Arroyo (see Figure 13). The pueblo is located north of the Southwest Indian Polytechnic Institute, on the east side of Coors Blvd. The site has been known or identified by a variety of names, including Santa Catalina, Los Guajolotes, Alameda, Tiguex, Site 7, and LA 290. Known locally and colloquially as the Mann Site (after the family that has owned most of the site property for decades), it will be referred to throughout as LA 290, its official designation by the Laboratory of Anthropology in Santa Fe.

There has been at least 60 years of scholarly interest in LA 290 by historians and archaeologists. Meacham (1926) and Vivian (1932), in separate reviews of early Spanish chronicles, both identified it as the possible site of Santa Catalina. Vivian also suggested the name of Los Guajolotes, based upon Luxan's description of Espejo's 1583 expedition.

The site was first formally recorded as Site 7 in Reginald G. Fisher's (1931) report on his survey of the "Pueblo Plateau." Fisher referred to the site as Alameda Pueblo, another name that Vivian had suggested based upon the proximity of the modern village of Alameda.

The site was probably registered at the Laboratory of Anthropology as the official site number, LA 290, on May 30, 1929 by reknown local archaeologist Dr. Harry P. Mera (a dentist). LA 290 is included in his 1933 article on Rio Grande Glaze pottery types, and in a later landmark paper on population changes in the Rio Grande area (Mera 1940). Importantly, he called the site Tiguex Pueblo and named a pottery type Tiguex Glaze Polychrome (Rio Grande Glaze D and E shouldered bowl forms, dated from AD 1490 to 1625) after the site (Mera 1933:8). Mera visited the site and probably made pottery collections on at least three separate occasions: March 14, 1930, July 29, 1932, and January 12, 1939. He noted the presence of numerous pottery types that suggested an occupation of the site from at least the 1200's to the 1500's. A collection of 188 sherds made by Mera is still housed at the Laboratory of Anthropology (Peckham 1984).

In the fall of 1937, and continuing on into early 1938, Lolita H. Pooler directed excavations at LA 290. She was a teacher at what was then known as Sandia School (presumably now Sandia View Academy):

> It was to this delightful spot that a group of girls, equipped with the necessary tools-- geologist's picks, trowels, whiskbrooms, paper sacks, etc. gathered at the northernmost and largest of the three mounds on September 25, 1937. (Pooler 1940:84-85)

They excavated two parallel north-south trenches, 3 feet wide by 60 feet long. There they found pottery, chipped and ground stone artifacts, animal bone, and charcoal. They also found adobe chunks, walls, hearths, room interiors, and a human burial with a cache of bone needles. Pooler also reported on damage to the west end of the north mound that had been caused by a conservancy ditch and by later pot hunting that had been done by a team of horses pulling a scraper. The location of notes or artifacts related to the Sandia School excavations is unknown at this time.

Limited excavations by the Albuquerque High School Archaeology Club, under Elaine Dorrington, reportedly took place in the late 1940's to early 1950's. Attempts to locate notes, artifacts, or more information related to that work have not been successful (Marshall 1985:7.2). It has also been reported that excavations were conducted by Dr. Frank C. Hibben of the University of New Mexico in the early 1950's, but no records or artifacts from that work have been located either. A small collection of artifacts, including a possible porcupine effigy pot, was made by Stewart Peckham of the Laboratory of Anthropology in 1951 (Marshall 1985:7.2).

In February of 1970, Dr. John P. Wilson, then of the Laboratory of Anthropology, visited LA 290 and made limited pottery collections at several unknown parts of the pueblo. At least 93 sherds, mostly earlier types, were later analyzed by Helene Warren of Albuquerque (Peckham 1984). Intermittently from 1979 to 1984, a resident in the neighborhood near the site conducted a series of limited excavations on the middle and south mounds. Room floors were found some six feet below the ground surface, along with walls and a mass grave of eighteen individuals. Several shallow rectangular pithouses less than six feet across with hearths along the south walls were also excavated near the southeast corner of the site (Marshall 1985:7.2).

LA 290 has received increased attention more recently, as the pressures of development and efforts to conserve the site have stepped up. A 1981 class in cultural resource management, taught by Dr. Joseph Winter at UNM, visited the site to perform mapping and surface artifact analysis. An informative assessment of some of LA 290's identities resulted from that class (Davis and Sargeant 1981). The site has been further mapped, analyzed, and documented by Michael P. Marshall as part of a survey of

middle Rio Grande pueblos for the State Historic Preservation Division. Marshall's work includes an updated map of the site to clearly show the present extent of its three mounds and major impacts, ceramic analysis that is more accurately tied into specific parts of the site, and the identification of an earlier small component of the pueblo just to the north (Mesa de la Presa). Most important, Marshall's nomination of the site to the State Register of Historic Places has been accepted and forwarded to the Keeper of the Federal Register for consideration to be included.

A composite picture of the archaeology of LA 290 has emerged from the various informal or limited investigations that have occurred there. The site is clearly very large, consisting of three mounds along a north-south axis that cover an area over 300 feet wide and nearly 1000 feet long (100 meters east-west by 300 meters north-south). The mounds are the result of a process of deterioration and gradual meltdown of an estimated 1000 adobe rooms (Marshall 1985:8.2) that once made up the pueblo. In places the accumulation is so great (nearly 10 feet higher than the surrounding floodplain) that the pueblo was likely to have been two or three stories high.

The northernmost of the three mounds is the largest and highest, measuring about 100 meters in diameter (Davis and Sargeant 1981:4) and having a pair of possible wing wall extensions at the north end. The remaining two mounds to the south are not as large and only about half the height of the north mound. The mounds are separated by lower, relatively artifact-free areas that could be interpreted as plazas. Evidence from datable pottery found on the three mounds indicates that the north mound may have been built first and occupied the longest, which may explain its greater size and height. Surface pottery also suggests that expansion of the pueblo proceeded to the south, with the south mound being added first and later followed by the middle mound (Marshall 1985:7.3).

Datable pottery also gives clues as to the span of occupation at LA 290. Black-on-white types such as Santa Fe, Kwahe'e, Galisteo, and Wiyo are diagnostic of the Pueblo III period (AD 1100-1300). In addition, small pit structures at the north and south ends of the site indicate an occupation prior to the construction of the large north mound. The major episodes of construction at the site are clearly from the early 1300's, as indicated by associated Pueblo IV Glaze A types such as Agua Fria,, San Clemente, Cieneguilla, and Los Padillas. Later Glaze B through Glaze E types (Largo, Espinosa, San Lazaro, Puaray, Trenaquel, Pecos, Kuaua, and Tiguex) demonstrate a continuity in the pueblo's occupation into the 1600's, and general trends in its expansion. While the range of possible

site occupation is from AD 1100 to 1650, the pueblo itself was probably most heavily occupied from just after AD 1300 until just before AD 1600.

In addition to the pottery, LA 290 contains a very large number of other artifacts. Lithic debris and the by-products of stone tool manufacture litters the site surface. Numerous pieces of basalt, sandstone, or quartzite groundstone used for seed or grain processing are found scattered in concentrations. Unshaped basalt and other cobbles occur in areas that imply the use of stone added to adobe for strength in the construction of lower walls. Human burials, animal bone, charcoal, and ash also add to the melted adobe that makes up the mound areas.

Various impacts to the site have occurred over the past 60 years. In the late 1920's, Fisher noted evidence of severe pot hunting damage that had left a gaping hole in the middle mound. In the early 1930's, Mera stated that the highest standing portion of the site (presumably the north mound?) had been "badly wrecked." In the late 1930's, Pooler described the site as "badly scarred" and referred to scraping that had impacted the west end of the north mound. The same portion of the site was dug through to create a conservancy ditch, and the residence located on the north mound at present was constructed in the mid-1950's (Davis and Sargeant 1981:7). Archaeological collections and excavations of varying quality, performed by known and anonymous individuals, have contributed to the types of impacts the site has endured.

Despite this checkered history of work, it can safely be said that LA 290 still possesses an extraordinary potential for research that will advance knowledge of local history. The site can be utilized to answer many types of research questions. By bringing the site into the current state of archaeological techniques and excavation methods, much more can be learned about it than has been found out in the past 60 years. While it is unfortunate that such an important site has been so poorly preserved, it is the sheer size of LA 290 that guarantees much more has yet to be discovered. The City has been negotiating some type of purchase agreement with the present site owners to secure a 9 to 10 acre lot encompassing the main site area. If successful, the City will have purchased a resource that can serve the community in many beneficial ways.

SITE DISTRIBUTIONS AND PREHISTORIC SETTLEMENT PATTERNS

The present survey of the Piedras Marcadas Arroyo area has provided important additional information to the existing data base on past land use. The 1985 survey of the volcanic escarpment covered an area only 150 feet (50 meters) wide along the top and base of the landform. Sixty-seven sites were encountered on that survey, and expectations that high site densities might exist along the escarpment were confirmed. It remained to be seen, however, whether the intensity of prehistoric land use was associated with the escarpment itself, or with a generalized usage of the West Mesa.

The Piedras Marcadas Arroyo survey covered a contiguous area of 830 acres that included mesa top above the escarpment and floodplain below it. The escarpment trends north-south roughly through the middle of the survey area; about three-fifths of the surveyed acreage was on the mesa top. It was vital to have large blocks of land surveyed adjacent to the escarpment to assess differences in the density of archaeological sites. The basic pattern that has emerged is that the association between sites and the escarpment is very high (about one site every 20 acres), but it is also high for the mesa top (about one site every 40 acres). Site density is moderate for the floodplain (about one site every 80 acres), but this may in part be due to site visibility problems related to aggrading soil surfaces (see Appendix B of this report). The distribution of sites in the study area, and additional sites downstream on Piedras Marcadas Arroyo, is shown in Figure 13.

Table 1 summarizes the artifact content, topographic setting, and estimated dates for 26 recorded sites within the confines of the study area. Within the study area, there are eight lithic scatters, five lithic and ceramic scatters, eight sites with lithics and/or ceramics associated with construction features, and four historical sites. In addition, there is the large petroglyph site along the volcanic escarpment. Of the prehistoric sites, seven could not be assigned to a specific time period due to the lack of diagnostic artifacts, while six can be dated to the Pueblo III-Pueblo IV general time period, and eight others are definitely Pueblo IV sites. The petroglyphs date from at least Pueblo IV times to recent historic in age.

South of the study area, and downstream on the arroyo, five more lithic sites and three "pebble caches" are located on other gravel terraces. There are an additional three prehistoric sites that had apparent habitations, and two historical sites (Ward 1985). To the east, in the

Figure 13. Distribution of sites along Piedras Marcadas Arroyo

TABLE 1. Site type, estimated dates, and topographic setting

Site #	Site Type	Date	Topography
LA 56101	59 lithics, 21 ceramics, walls, hearth	Pueblo IV AD 1300-1450	mesa top/ low knoll
LA 56102	78 lithics, 28 ceramics, cairn	Pueblo IV AD 1300-1515	mesa top/ low knoll
LA 56103	10 lithics, 2 ceramics	Pueblo III-IV ca. AD 1300	mesa top/ blowout
LA 56104	22 lithics, 3 ceramics	Pueblo IV AD 1300-1450	mesa top/ low knoll
LA 56105	tent base, hearths, ash dumps, historic trash	early 20th century	mesa top/ flats
LA 56106	52 lithics, 7 ceramics	Pueblo IV AD 1300-1450+	mesa top/ low knoll
LA 56107	11 lithics, historic hearth	prehistoric-historic	mesa top/ low knoll
LA 56108	38 lithics, 10 ceramics	Pueblo IV AD 1490-1515	mesa top/ low knoll
LA 56109	33 lithics, 1 ceramic, wall, 7 petroglyphs	Pueblo IV AD 1300-1650	mesa top/ low knoll
LA 56110	20 lithics, 3 ceramics, 3 rock piles	Pueblo IV AD 1300-1450	mesa top/ low knoll
LA 56111	19 lithics	prehistoric	mesa top/ low knoll
LA 56112	52 lithics	prehistoric	mesa top/ blowout
LA 56113	12 lithics, 1 ceramic 5 rock alignments	Pueblo IV AD 1300-1450	base of escarpment
LA 56114	14 lithics	prehistoric	floodplain
LA 56115	22 lithics, 2 ceramics	prehistoric	floodplain
LA 56116	67 lithics	prehistoric	floodplain
LA 56117	36 lithics	prehistoric	floodplain
LA 56118	113 lithics, 1 ceramic	prehistoric	floodplain (continued)

TABLE 1. (continued)

Site #	Site Type	Date	Topography
LA 52092	wall rubble, thin lithic scatter, 2 ceramics	prehistoric	base of escarpment
LA 52093	tent base, corral, historic trash	late 19th century	base of escarpment
LA 52094	tent base, stone corral, historic trash	late 19th century	base of escarpment
LA 52095	large stone corral (early ranching?)	early 20th century	head of canyon
LA 52096	3 rock shelters, 5 rock alignments, 2 lithics	prehistoric	base of escarpment
LA 52097	light lithic scatter	prehistoric	base of escarpment
LA 52098	6 rock alignments, lithic	prehistoric	base of escarpment
LA 52100	thousands of petroglyphs	prehistoric-historic	face of escarpment

Riverview Sector Plan area, five petroglyph concentrations and three lithic/ceramic scatters were recorded (Ward 1986). A significant combination of petroglyphs on a basalt outcrop (see Figure 3) and an associated high density artifact scatter is located in the present Tract H-17 of Riverview. This has been designated LA 52099 (Los Metates site), and the artifact scatter has been excavated by the Center for Anthropological Studies. Los Metates is an important site due to the large number of artifacts found there, the presence of over 100 petroglyphs and 25 boulder metates, and its proximity halfway between the LA 290 (Mann Site) and the escarpment.

What is important about this information is the presence of a number of different site types that relate to varying economic behaviors over a wide range of time periods. The Piedras Marcadas Arroyo survey area, then, contains a good representative sample of changes in human adaptation that have occurred in the middle Rio Grande region over thousands of years.

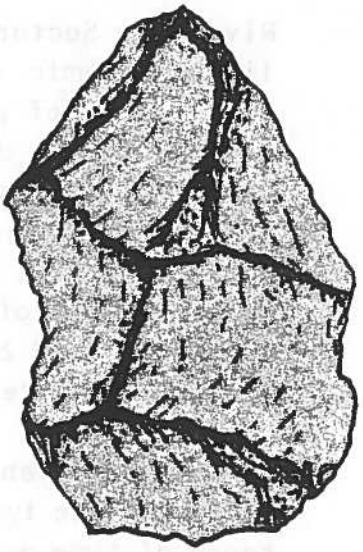
Archaeological analysis of settlement patterns involves an assessment of site types from different time periods and their distribution across the landscape. In the Piedras Marcadas area, it is clear that there has been a variety of activities that have occurred over many centuries. The earliest direct evidence of human use of the study area is the presence of isolated projectile points (Figure 14). I.O. 170 has been identified as an early Archaic Jay phase type (Janette Elyea, personal communication), dated from 6800 to 7500 years before the present. It is made from basalt and has been heavily resharpened so that the blade end is about half of its original length. The lateral edges are ground very smooth to avoid cutting through twine that may have held the point in place, and the base probably snapped off early in the use-life of the tool.

I.O. 98 is an early Archaic Bajada phase type, dated from 5200 to 6800 years ago (Irwin-Williams 1973:6-7). It is also made from basalt, but its tip has snapped off above the shouldered midsection. The lateral edges are smoothed, although not as heavily as I.O. 170, and the intact basal end is concave. Another tool, I.O. 206, is a probable Archaic basalt knife blade. It is larger than the two projectile points, but is of the same material and workmanship and was found very near I.O. 98. These three isolated tools are important material evidence of Archaic use of the area up to 7500 years ago. The Piedras Marcadas Arroyo area probably provided good wild plant foods and hunting opportunities, with the views of the floodplain from the mesa edge.

Another resource that has attracted people for many years are gravel terrace lag deposits at the base of the escarpment. These terraces are

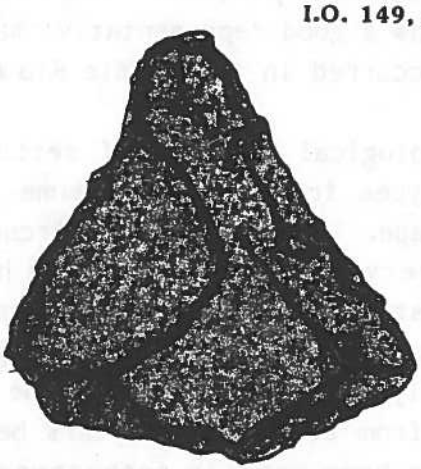
I.O. 22, chert biface

from LA 56112, Puebloan chalcedony arrow point

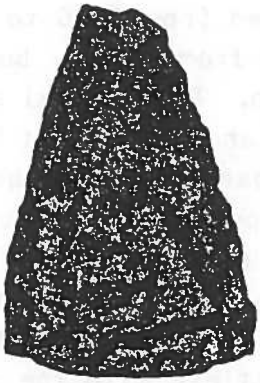


I.O. 149, chert biface

from LA 56112, basalt uniface

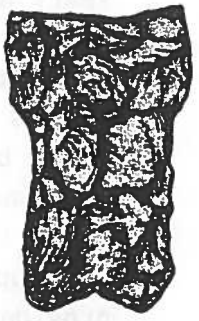


I.O. 160, basalt uniface



I.O. 206, probable Early Archaic knife/biface

I.O. 170, Early Archaic spear point (Jay phase, 5500-4800 BC)



I.O. 98, Early Archaic spear point (Bajada phase, 4800-3200 BC)

Figure 14. Stone tools found within the survey area

heavily dissected by lateral drainages of the middle and south branches of Piedras Marcadas Arroyo. They contain quantities of cobbles that can be used as a source material in the manufacture of stone tools. Examples of stone tools found in the survey area are shown in Figure 14. The quality of the rock is variable, however, due to the fact that the cobbles have been rolled heavily by hydrological forces. The ancient land use pattern was to employ the terraces as literal quarry areas where the testing of raw material quality took place. The byproducts of this quality testing are numerous fragments of split rock strewn on the surfaces of the gravel terraces. Although such artifacts are not datable, it can be assumed that their accumulation has taken place over a long time by people from different time periods. While the lower quality materials were simply left on the terraces, the better material was removed to other spots for further working and reduction.

This is the type of lithic reduction strategy that has led to the creation of most of the sites in the study area. In fact, every site located by the present survey had at least some lithic debris on it. The salient differences between the sites are not based upon the presence or absence of lithic artifacts, but on the density of artifacts and the kind of reduction that occurred. Some sites are clearly locations where lithic reduction was not extensive, in which case a larger proportion of the stone artifacts will have greater percentages of cortex, or external platforms. Other sites will have more secondary reduction, which is recognizable by more pieces with little or no cortex, and by more internal platforms. Interestingly, most lithic sites on the mesa top also had associated pottery (i.e., a lithic/ceramic scatter), but the four sites in the floodplain were pure lithic sites. The two pure lithic sites on the mesa top (LA 56111 and LA 56112) both had secondary reduction only, and were located near each other.

Lithic and ceramic scatters are potentially datable if the pottery is of a recognizable type made within a known time range. It can be problematic, however, if an earlier site is visited at a later time by individuals who may have used some of the lithic debris while occupying the site. There is a strong correlation between the presence of artifacts and prominent topographic features on the mesa top. Nearly all of the low basalt knolls or ridges on the mesa had some artifacts, and most of the sites located were found on or around these high spots. Not only did such locations offer a better view of the surrounding landscape, they also offer some shade, since trees frequently grow in cracks formed within the knoll. These spots have obviously been used for a long time and for a variety of activities, some of which left behind lithic and ceramic artifacts.

When pottery is found in the survey area, it is predominantly from the Pueblo IV period. A few sherds date to mid or late Pueblo III times, but no definitely earlier types were noted. Within the Pueblo IV glaze types, the majority are Glaze A varieties, which date from AD 1300 to 1450. Glaze D types (AD 1490 to 1515) make up the remainder of datable pottery in the surveyed area. Nine of fourteen sites found on the mesa top or along the base of the escarpment contained Pueblo IV pottery. This indicates an extensive use of the landscape during the Pueblo IV period, when local prehistoric populations were at their greatest.

When other major nearby sites outside the survey area are considered (such as LA 290 and LA 52099), then a variety of subsistence and economic activities can be interpreted. It is probable that in the Piedras Marcadas area, most of the Pueblo IV populace was housed at LA 290. Stopping off at LA 52099 on their way to or from the mesa, people used the outcrop intensively for grinding wild (or possibly agricultural) seeds. Pottery was clearly used there, and stone tools were probably also made there. In addition, some petroglyphs were pecked into the basalt outcrop, but the escarpment was the obviously favored spot for creating rock art.

An estimated 5000 petroglyphs exist along the portion of the escarpment that is drained by Piedras Marcadas Arroyo, and these are of high quality and a distinctive style that may be explainable by the presence of a large single community at LA 290. Rock art and the escarpment were not the only objectives of Pueblo IV people in the vicinity, and the Piedras Marcadas Arroyo survey has helped establish that fact. At least eight sites, centered on knolls and low ridges (Figure 15), are found on the mesa top. Other similar topographic situations abound in mesa top areas adjacent to the present survey, and hopefully the emergent pattern of late prehistoric land use will be further tested by more survey work.

There is little evidence in the study area to indicate significant activities from the end of the Pueblo IV through the colonial periods. A few isolated artifacts date to the middle or late 1800's, after which time the area has experienced many changes. Although sites that date to the turn of the century may not sound terribly significant, the study area contains four sites of that time period that are of particular interest. Three were located by the 1985 survey of the escarpment (LA 52093, LA 52094, LA 52095, Schmader and Hays 1986:8.5-6), and the fourth one by the present project (LA 56105). These sites should all be considered as significant resources, because they are some of the few remaining examples of a time when Albuquerque was a small southwestern town. LA 52093 (Figure 16) and LA 52094 are both probable shepherd habitation sites, which distinguishes them from more numerous sites that have evidence of

Figure 15. View of LA 56109 (on low basalt knoll), typical of site locations on the mesa top

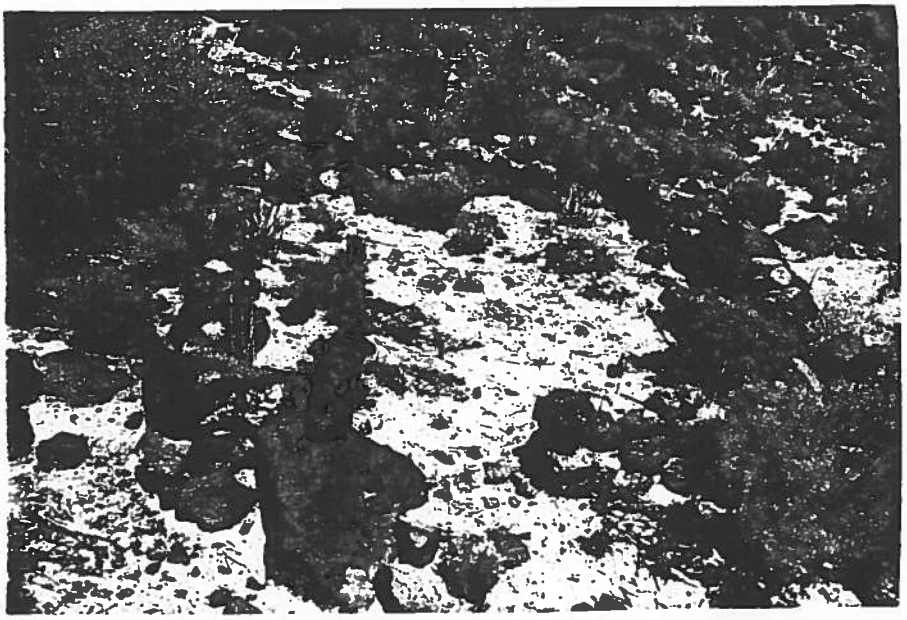


Figure 16. View of square tent base at sheep herding site (LA 52093)

sheep herding only. LA 52095 is a substantial construction that may date to early ranching days when the head of Piedras Marcadas Arroyo was turned into a corral area. LA 56105 is also a probable habitation with hearths and ash dumps, and may possibly be one of the few intact early ranching sites left in the vicinity. These sites should be thoroughly investigated before they are allowed to sustain major impacts.

MANAGEMENT RECOMMENDATIONS

A variety of recommendations can be suggested for the management of cultural resources that have been found along Piedras Marcadas Arroyo. Recommendations are based on the relative significance of the sites, to planned development or impacts in the area, and to recreational uses.

The relative significance of any archaeological site is best evaluated with reference to some set of local criteria. "Significance" is not a very meaningful concept unless it includes what is already known about an area, and what can be answered by further study at certain sites. It is also important to bear in mind that a formal determination of a site's significance is only made by the State Historic Preservation Division, usually in consultation with federal authorities. For that reason, the following assessment of sites found on the Piedras Marcadas survey as an informal evaluation of the sites' **relative** significance. These informal evaluations are routinely offered by professional archaeologists working on projects; the evaluations are normally concurred with by the State Historic Preservation Division.

The relative significance of the 18 sites found in the survey area is presented in Table 2. The various criteria set forth to evaluate the sites are based upon properties of the sites, and their potential to yield further information about the area's history and prehistory. The size of the site, the density of its artifacts, and the condition of the site are all presented as important factors in evaluating significance. Small sites with few artifacts may still possess important information, but large sites with many artifacts are not likely to be unimportant. Sites that are eroded or otherwise impacted may also contain important data, but intact sites yield information that can answer a greater range of research questions. Two other criteria, site rarity and impending impacts to the site area, are intended to take more local issues into account. If certain types of sites are rare, they will be worthy of more intensive investigation even if they are small, or sparse, or eroded. Similarly, sites that are threatened by immediate impacts may warrant immediate investigation, while other preservable sites may not need to have further work for a longer period of time.

The five main criteria (size, density, condition, rarity, and impacts) were scaled from 1 to 10 for each of the 18 sites. Sites with an aggregate "score" of 35 or more can be regarded as extremely significant. Those with scores of 30 to 35 are evaluated as being very significant, and those from 25 to 29 are significant. Sites with scores of 20 to 24 are

TABLE 2. Relative Significance of Sites Found on Survey

Site Number	Site Size	Artifact Density	Site Condition	Site Rarity	Impacts	TOTAL
LA 56101	8	6	6	6	8	34
LA 56102	7	9	7	7	8	38
LA 56103	3	3	3	4	4	17
LA 56104	5	4	6	5	6	26
LA 56105	6	4	7	9	7	33
LA 56106	4	6	7	6	6	29
LA 56107	4	3	5	5	5	22
LA 56108	4	7	7	7	6	31
LA 56109	6	4	6	6	6	28
LA 56110	3	5	7	4	6	25
LA 56111	3	7	7	5	5	27
LA 56112	3	9	9	7	4	32
LA 56113	8	4	6	7	5	30
LA 56114	3	3	5	4	7	22
LA 56115	5	4	6	6	5	25
LA 56116	4	7	6	6	6	29
LA 56117	4	6	6	5	7	28
LA 56118	8	8	7	7	9	39

Site Size: 10= very large 5= medium 1= very small
Artifact Density: 10= very dense 5= moderate 1= very sparse
Site Condition: 10= excellent 5= fairly intact 1= poor
Site Rarity: 10= very rare 5= not very common 1= common
Impacts: 10= immediate 5= within 2 years 1= preserved

TOTAL: **over 35**= extremely significant **30 to 35**= very significant
25 to 29= significant **20 to 24**= not very significant
under 20= probably not significant

considered to be not very significant, and those scoring under 20 are probably not significant at all. To reiterate, this evaluation of the sites' relative significance is informal, and formal determinations are only made by the appropriate officials.

The relevance of the informal evaluation is that varying degrees of field work may be necessary for each site, based on its significance. If the site is to be impacted, the amount of work done at the site should be scaled to its relative significance and to the degree of impact. This type of consideration comes under generalized treatments for sites called "mitigation of adverse effects" by the appropriate authorities. The following recommendations are suggested as ways to mitigate adverse effects to sites having different levels of significance.

Sites that are characterized as extremely significant may need to have a number of actions taken to mitigate effects. The distribution of surface artifacts should be mapped in detail, and all surface artifacts should be collected. The site may need to be totally excavated, unless it is too large. Extensive postfield analysis of the collected or excavated artifacts would also be necessary. Very significant sites would require the same types of actions, but scaled down in extent. Treatment of surface artifacts would be the same, but the total excavated area could be a major portion of the site, short of the entire site area. Postfield analyses would still need to be extensive. Significant sites would require detailed mapping and collection of surface artifacts, and more limited excavations. Sample excavations that cover about half of the site area may be sufficient. The analysis of recovered artifacts is still necessary, but may not need as great an amount of detail as for the more significant sites. Sites that are not very significant may only require limited mapping, collection and excavation strategies, and insignificant sites may require very little collection or excavation.

Since the evaluation of sites is based upon artifacts or features visible on the surface, it is also important to recommend that surface grading or subsurface trenching by mechanical equipment should be monitored by archaeologists or other qualified individuals. The less significant the site appears to be on the surface, the more important it will be to monitor subsurface disturbance. This is true because seemingly more important sites will require greater amounts of field work in the first place, but less important sites may have buried items of greater importance. Evaluating a site's relative significance can be difficult if the site is located in areas where soils are aggrading, or where the surface erosion results in "patchy" visibility of archaeological materials (see Appendix B).

The following is a discussion of probable impacts that may occur in various portions of the study area. Sites that may be impacted are identified, impacts are discussed, and some mitigative actions are presented. Actual treatments for various sites or areas must take into account the immediacy of any impacts, and the relative significance of the site(s) or resources involved.

Paseo del Norte Corridor: The Paseo del Norte corridor, which conforms to the southern boundary of the survey area, will impact a number of archaeological resources by construction and related grading. Specifically, it will affect three sites: LA 52092, LA 56114, and LA 56118. LA 52092 is a lithic and ceramic scatter associated with possible wall rubble and a major petroglyph concentration (PC:23B:2, Schmader and Hays 1986:8.6-7). It is situated north of the right-of-way and will need to be monitored closely to evaluate the impacts of grading and heavy equipment traffic related to the roadway construction. Excavation will very likely be necessary to mitigate site impacts, since Paseo del Norte is not likely to be realigned in the vicinity of the site area. LA 56114 is a small lithic scatter north of the right-of-way and should be collected or monitored in the course of construction activities.

LA 56118 is the densest lithic scatter found on the present survey. Containing at least 113 artifacts, it is the site of a substantial amount of secondary lithic reduction. This is important, since its relationship with primary lithic source areas on gravel terraces to the west can be determined. Proveniences A is directly in the center of the planned roadway, while Provenience B is just north of it. There is little chance that the alignment can be shifted south to avoid this site, so that a detailed mapping, artifact collection, and analysis is recommended as the minimal treatment of LA 56118. At present, the developer of the site area has expressed a willingness to fund this recommended treatment of the site. Both LA 56114 and LA 56118 should also be test excavated to determine if there are subsurface artifacts or features present. In addition to the sites, the Paseo del Norte corridor will impact a number of Isolated Occurrences, listed in order from west to east: 125, 124, 114, 113, 1, 2, 3, 4, 5, 6, 132, 131, 130, 129, 128, and 141. If possible, these artifacts should be collected, mapped and analyzed.

Golf Course Road: The planned alignment of Golf Course Road will apparently have direct impacts on very minor resources. Only Isolated Occurrences 135 and 168 will be affected, and they should be relocated and collected if possible.

Areas east of Golf Course Road and north of Paseo del Norte: This area is slated for fairly intensive development and grading of the land surface. Several minor arterials and the southwest corner of a planned subdivision (Davenport Street and Nunzio Avenue) are present at the east end of the survey area. The latter will directly affect site LA 56117 and I.O.s 183-187 and 191. LA 56117 should be mapped, collected and analyzed if impacts to the site cannot be avoided. The isolated artifacts should also be collected. Site LA 56116 is along the west edge of a minor proposed north-south arterial to the east of Golf Course Road. It will also probably experience direct impacts that cannot be redirected, and the site should be mapped, collected, and analyzed. Both sites should be test excavated to determine the presence of any subsurface artifacts or features. Isolated Occurrences that are located between the major and minor arterials include 142, 147, 152, 165, 181, 182, and 191. These should be relocated and collected if possible.

Unser Blvd: The new alignment of Unser Blvd, a major north-south arterial located on the mesa top, will fortunately affect few resources. It is now planned as the extension of Kimmick Road and will go due north until it passes the head of Piedras Marcadas Canyon, at which point it will swing east to meet up with its former planned intersection at Paradise Blvd. Over that course, it will affect only I.O.s 1, 11, 12, 60, and 74, which should be collected if possible. The nearest sites that may be affected are LA 56109 (240' east of the centerline) and LA 56106 (200' west of the centerline). These sites should be easily avoidable, but if they are to be impacted, then they should be mapped, collected, tested, and analyzed. The old alignment of Unser Blvd would have gone directly through sites LA 56110 and LA 56103, as well as having difficulties traversing the head of Piedras Marcadas Canyon. Its present alignment has much less impact on cultural resources and the environment.

Paradise Hills Unit 1: A planned subdivision just east of the former Unser Blvd alignment, named Paradise Hills Unit 1, will have major impacts on cultural resources. The planned location of the subdivision is being adhered to despite the relocation of Unser Blvd. In order to create access to the new Unser Blvd, several additional minor arterials will be needed. The result is that all resources located in the subdivision will be affected. Two quite significant sites, LA 56101 and LA 56102, will require mitigation of adverse impacts through a minimum of mapping, artifact collection , and analysis. Both sites warrant additional work in the form of excavations to determine if there are subsurafce artifacts or features present. Isolated Occurrences that would also be affected are 68, 70, 71, 72, 77, 102, 107, and 108. The last two are walls that will require mapping and photography before being dismantled.

A proposed area zoned SU-1 for C-1 purposes exists some 1400' east of Paradise Hills Unit 1. This C-1 area will directly affect I.O.s 78, 82, 83, 89, and 90. These should be relocated and collected if possible. More importantly, site LA 56105 is located at the west edge of the zone. This is a very significant and fragile early ranching site that will require mapping, collection, artifact analysis, test excavations and detailed analyses of the contents of hearths and ash dumps located at the site. LA 56105 should be avoided by all impacts if possible.

Other types of impacts will occur within the study area. Alteration of the drainage channels of the north and middle branches of Piedras Marcadas Arroyo will take place to help channelize flow and reduce lateral erosion. Plans for channelization of the drainage in the narrow transition zone between upper and lower Piedras Marcadas Canyons must be carefully designed to avert damage to the fine concentrations of petroglyphs on the escarpment (PC:27A:5 and 6). Close communication with the Albuquerque Metropolitan Area Flood Control Authority will be necessary throughout the design and implementation of drainage channel alteration.

While these projects will directly affect relatively few cultural resources, they will have a substantial effect on the environment of the area. Of particular importance is the relationship between naturally occurring stands of forage plants for rodents. Once the soil in these plant communities is disturbed, invader species such as tumbleweed (Salsola kali) tend to take over habitats. The result is a reduction in the numbers of rodents and small birds, which has effects reaching to the top of the food chain, in this case predatory birds and snakes. When this balance is upset, the biological communities located in the Piedras Marcadas Arroyo drainage will be permanently and irreversibly altered. The character of the biota as we know it today will not be maintained, so it is incumbent that management of the area includes setting aside places that will not be highly disturbed and will be preservable.

The establishment and maintenance of such areas logically falls under the Open Space Division. In fact, the successful management of the entire study area rests upon the City's ability to secure and maintain parks and open space along the escarpment and arroyo channels. If this can be done, then an excellent recreational network can be established that would preserve the area's character while making it accéssible to the general public. The establishment of a facility at LA 290 would attract attention in local prehistory and would also fit very well with planned recreational uses of the Piedras Marcadas Arroyo area. It may one day be possible to ride a bicycle along the base of the escarpment to view thousands of petroglyphs in Piedras Marcadas Canyon, then ride along the arroyo,

stopping at Los Metates (LA 52099) to view the bedrock grinding areas, and then continue across Coors Blvd to see what the most recent work at the Mann Site has uncovered. Excavations of pothunted areas can be initiated to clean up those portions of the site. This will allow local residents, school children, and interested tourists an opportunity to view an ongoing professional archaeological excavation. Such opportunities are rare indeed; many residents or visitors to the City have expressed great interest in local archaeology, but no facility exists where ongoing excavations can be viewed.

Since Piedras Marcadas has been designated by the Facility Plan for Arroyos as the top priority Major Open Space Link, it will be crucial to design and establish pedestrian, bicycle, and equestrian trails that link different kinds of open space. Piedras Marcadas offers many opportunities to join together open spaces that present a variety of experiences. An important goal to be strived for is the acquisition of the LA 52099 (Los Metates) outcrop area in Riverview Tract H-17. This outcrop is a perfect stopping place when travelling along Piedras Marcadas Arroyo between Coors Blvd and the escarpment. It is an obvious center of prehistoric activity, where the inhabitants of nearby LA 290 probably worked while going back and forth between the pueblo and the escarpment. Over 100 petroglyphs exist on the outcrop today, and it would make an ideal link in a recreational system that joined the cultural and natural resources of the Piedras Marcadas area.

As a final set of recommended guidelines to treat the known archaeological resources of the Piedras Marcadas area, it should be remembered that this is one of the city's richest collections of heritage. The nature and degree of direct and indirect impacts should always take cultural resources into consideration. If it is possible to avoid disturbance, those alternatives should be pursued. It they are not feasible, the mitigation of adverse impacts to the resources should entail careful documentation (including mapping techniques such as piece-plotting artifact locations) and a provision for subsurface testing to guarantee that the site does not contain deeply stratified deposits.

All plans or projects that require City approval should also take cultural resources into account. No City-initiated or approved project should be undertaken without researching the potential to create impacts on sites or their associated environments. Therefore, it will be necessary to circulate the information contained in this report to various City departments, especially Engineering, Transportation, Current Planning, and Parks and Recreation. At the same time, it will be necessary to maintain confidentiality as to the locations of sites, so that no impacts are

incurred by making site locations too generally known.

Finally, the development of ranked plans that affect the area (Northwest Mesa Area Plan), or similarly sensitive portions of the adjacent mesa top (Volcano Cliffs Sector Plan) should include a specific archaeological component. Site development plans that will affect the area (Paradise Hills Unit 2; Albuquerque West; relevant sections of Riverview) should be updated with this current site information as quickly as possible to avert possible losses of irreplaceable cultural and historical resources.

REFERENCES CITED

Anschuetz, Kurt F.
1984 Prehistoric Change in Tijeras Canyon, New Mexico. Unpublished Masters Thesis, Department of Anthropology, University of New Mexico, Albuquerque.

Biella, Jan V. and Richard C. Chapman
1977 Archeological Investigations in Cochiti Reservoir, New Mexico. Volume 1: A Survey of Regional Variability. Office of Contract Archeology, University of New Mexico, Albuquerque.

City of Albuquerque
1975 Albuquerque/Bernalillo County Comprehensive Plan Policies Plan. Albuquerque/Bernalillo County Planning Division, Municipal Development Department, Albuquerque.

1981 Northwest Mesa Area Plan. Albuquerque/Bernalillo County Planning Division, Municipal Development Department, Albuquerque.

1984 Coors Corridor Plan. Municipal Development Department/Planning Division, Albuquerque.

1985 Facility Plan for Arroyos: Multiple Use of Albuquerque's Arroyos and their Floodplains. Draft report, Municipal Development Department/Planning Division, Albuquerque.

1986 Report of the Albuquerque/Bernalillo County Archeological Resources Planning Advisory Committee. Municipal Development Department/Planning Division, Albuquerque.

Clifton, Don
1985 An Archaeological Survey of the Proposed Paseo Del Norte, Albuquerque, NM. New Mexico State Highway Department, Santa Fe.

Cordell, Linda S.
1978 Cultural Resources Overview: Middle Rio Grande Valley, New Mexico. USDA Forest Service, Southwestern Region, Albuquerque; and Bureau of Land Management, New Mexico State Office, Santa Fe.

Davis, Mary, and Kathryn Sargeant
1981 The Mann Site: A Pueblo Site of the Tiguex Area, Albuquerque, New Mexico. Unpublished ms. in possession of authors.

Fisher, Reginald
1931 Second Report of the Archaeological Survey of the Pueblo Plateau, Santa Fe, Sub-Quad A. Museum of New Mexico, Santa Fe.

Frisbie, Theodore R.
1967 The Excavation and Interpretation of the Artificial Leg Basket Maker III - Pueblo I Sites Near Corrales, New Mexico. Unpublished Masters Thesis, Department of Anthropology, University of New Mexico, Albuquerque.

Hacker, Leroy W.
1977 Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico. U.S. Department of Agriculture Soil Conservation Service and Forest Service; and United States Department of the Interior, Bureau of Indian Affairs, and Bureau of Land Management.

Harlan, Mark E.
1979 An Archeological Survey of Approximately 640 Acres in Paradise Hills for Bellamah Corporation. Office of Contract Archeology, University of New Mexico, Albuquerque.

Hibben, Frank C.
1941 Evidences of Early Occupation in Sandia Cave, New Mexico and Other Sites in the Sandia-Manzano Region. Smithsonian Miscellaneous Collections 99(23):1-44.

Irwin-Williams, Cynthia
1973 The Oshara Tradition: Origins of Anasazi Culture. Eastern New Mexico University Contributions in Anthropology 5(1). Eastern New Mexico University, PaleoIndian Institute, Portales.

Joesting, H.R., J.E. Case, and L.E. Cordell
1961 The Rio Grande Trough Near Albuquerque, New Mexico. In New Mexico Geological Society Guidebook of the Albuquerque Country, 12th Field Conference, pp. 148-150. Socorro.

Judge, W. James
1973 The PaleoIndian Occupation of the Central Rio Grande Valley, New Mexico. University of New Mexico Press, Albuquerque.

Judge, W. James and Jerry Dawson
1972 PaleoIndian Settlement Technology in New Mexico. Science 176:1210-1216.

Kelley, Vincent C.
1952 Tectonics of the Rio Grande Depression of Central New Mexico. In New Mexico Geological Society Guidebook of the Rio Grande Country, 3rd Field Conference, pp. 93-105. Socorro.

Kelley, Vincent C. and A.M. Kudo
1978 Volcanoes and Related Basalts of Albuquerque Basin, New Mexico. New Mexico Bureau of Mines and Mineral Resources, No. 156. Socorro.

Marshall, Michael P.
1986 Nomination to the Register of Historic Places for LA 290 (Mann Site), for the Rio Medio Project. Unpublished ms. on file at the State Historic Preservation Division, Santa Fe.

Meacham, J. Lloyd
1926 The Second Spanish Expedition to New Mexico. New Mexico Historical Review 1:265-291.

Mera, H.P.
1933 A Proposed Revision of the Rio Grande Glaze-Paint Sequence. Laboratory of Anthropology Technical Series, Bulletin 5. Santa Fe.

1940 Population Changes in the Rio Grande Glaze Paint Area. Technical Series of the Laboratory of Anthropology, Bulletin No. 9. Museum of New Mexico, Santa Fe.

Museum of New Mexico
1966 Eighth Southwestern Ceramic Seminar: Rio Grande Glazes. Unpublished ms. on file, Museum of New Mexico, Santa Fe.

Peckham, Stewart
1984 Letter to Matthew Schmader, dated December 20, 1984, regarding LA 290 artifacts. Unpublished ms. in possession of author.

Piper, June-el, Matthew F. Schmader, and Richard C. Chapman
1985 Model Archaeological Ordinance for Local Governments in New Mexico. Office of Contract Archeology, University of New Mexico, Albuquerque.

Pooler, Lolita
1940 Alameda Pueblo Ruins. El Palacio 47(4):84-88.

Reinhart, Theodore R.
1968 Late Archaic Cultures of the Middle Rio Grande Valley, New Mexico: A Study of the Process of Culture Change. Unpublished Ph.D. Dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Sargeant, Kathryn
1985 An Archaeological and Historical Survey of the Village of Los Ranchos. New Mexico Historic Preservation Division, Office of Cultural Affairs, Santa Fe.

Schmader, Matthew F. and John D. Hays
1986 Las Imagines: The Archaeology of Albuquerque's West Mesa Escarpment. Prepared for Open Space Division, Parks and Recreation Department, City of Albuquerque; and the Historic Preservation Division of the Office of Cultural Affairs, State of New Mexico.

Spellenberg, Richard
1979 The Audubon Society Field Guide to North American Wildflowers. Alfred A. Knopf, New York.

Stiner, Mary C.
1986 Ecology of the West Mesa Escarpment. Chapter 3 in Las Imagines: The Archaeology of Albuquerque's West Mesa Escarpment, by Matthew F. Schmader and John D. Hays. Prepared for Open Space Division, Parks and Recreation Department, City of Albuquerque; and the Historic Preservation Division of the Office of Cultural Affairs, State of New Mexico.

Stuart, David E., and Rory P. Gauthier
1981 Prehistoric New Mexico: Background for Survey. New Mexico State Historic Preservation Bureau, Santa Fe.

Vivian, Gordon
1932 A Restudy of the Province of Tiguex. Unpublished Masters Thesis, Department of Anthropology, University f new Mexico, Albuquerque.

Vivian, R. Gwinn and Nancy Wilkinson Clendenen
1965 The Denison Site: Four Pit Houses Near Isleta, New Mexico. El Palacio 72(2):5-26.

Ward, Albert E.
1985 Taylor Ranch: A Summary of Ongoing Archaeological Investigations by Personnel from the Center for Anthropological Studies. Center for Anthropological Studies, Albuquerque.

1986 An Archaeological Survey of the Hughes Estate Property Addition, Taylor Ranch Subdivision, Albuquerque, New Mexico. Center for Anthropological Studies, Albuquerque.

Wendorf, Fred and Erik Reed
1955 An Alternative Reconstruction of Northern Rio Grande Prehistory. El Palacio 62:131-173.

APPENDIX A: DESCRIPTION OF ISOLATED OCCURRENCES

I.O. 1 - 3 pieces plain redware bowl, possibly late due to shoulder

I.O. 2 - small rock pile consisting of about 20 basalt elements arranged in pile or ring. May be old (possibly prehistoric)
- chalcedony flake, 10% cortex, interior platform
- quartzite flake, 10% cortex, cortical platform
- chalcedony flake, no cortex, interior platform

I.O. 3 - chalcedony flake, 50% cortex, cortical platform
- chalcedony flake, no cortex, possible edge utilization and retouch

I.O. 4 - large basalt flake, 20% cortex

I.O. 5 - white chert flake, 30% cortex, cortical platform

I.O. 6 - chalcedony flake, 20% cortex

I.O. 7 - pink quartzite flake, 100% cortex, cortical platform

I.O. 8 - jasper/chert flake, 20% cortex, interior platform
- jasper/chert flake, 40% cortex, interior platform

I.O. 9 - chalcedony flake, 40% cortex, interior platform

I.O. 10 - Pueblo IV polychrome jar rim sherd

I.O. 11 - rhyolite flake, no cortex, no platform

I.O. 12 - chalcedony flake, 40% cortex, interior platform

I.O. 13 - vesicular basalt mano fragment, rounded edge and flat unifacial grinding surface

I.O. 14 - vesicular basalt possible mano fragment, flat grinding surface

I.O. 15 - fine plain grayware body sherds (all same vessel), possibly basalt temper

I.O. 16 - chalcedony flake, 10% cortex, interior platform

I.O. 17 - quartzite flake, 40% cortex, cortical platform
- basalt flake, 30% cortex
- grayware rim sherd, sand tempered, small-necked jar, thick walled, slightly everted lip

I.O. 18 - white chert small angular debris, 45% cortex

I.O. 19 - collapsed pile of 15-20 basalt cobbles

I.O. 20 - chalcedony flake, 20% cortex, interior platform

I.O. 21 - chalcedony flake, no cortex, interior platform, bifacial retouch

I.O. 22 - thin black chert biface base fragment (snapped tip)

I.O. 23 - 3 or 4 basalt rock alignments, each one course in height
- quartzite flake, 10% cortex, irregular shape
- quartzite flake, 20% cortex, cortical platform

I.O. 24 - quartzite cobble with possible flaking and grinding on edge

I.O. 25 - chalcedony flake, no cortex, interior platform

I.O. 26 - quartzite large angular debris, 50% cortex
- quartzite flake, 10% cortex, no platform
- chalcedony angular debris, 20% cortex, no platform
- chalcedony angular debris, 30% cortex, few flake scars on dorsal side
- large rhyolite flake, no cortex, interior platform

I.O. 27 - ring of 10 basalt rocks

I.O. 28 - chalcedony large angular debris, 25% cortex

I.O. 29 - chalcedony angular debris, no cortex

I.O. 30 - 2 Pueblo IV Glaze A ceramic sherds (Agua Fria, AD 1300-1450)

I.O. 31 - possible quartzite pecking stone
- large dark quartzite core, flakes detached from both ends
- dark quartzite flake, 40% cortex, cortical platform, from core above

I.O. 32
- 1 Pueblo IV Glaze D bowl body sherd (San Lazaro, AD 1490-1515)
- chert flake, 40% cortex, cortical platform, possibly retouched and utilized

I.O. 33
- 1 Pueblo IV Glaze A bowl rim sherd with wide band hatching on exterior (Agua Fria, AD 1300-1450)

I.O. 34
- 2 redware jar body sherds, white-slipped interior, possibly Pueblo IV
- 2 redware jar body sherds, red-slipped interior, possibly Pueblo IV
- chert flake, no cortex, interior platform

I.O. 35
- white chert flake, no cortex, interior platform
- quartzite flake, no cortex, interior platform
- redware bowl body sherd, possibly St. John's Polychrome (late Pueblo III/early Pueblo IV, ca. AD 1300)
- 2 redware body sherds, black slipped exterior (1 with utilized edges)

I.O. 36
- concentration of about 50 petrified wood chunks and a few flakes. All sizes of debris are present, yet cluster is in high runoff zone and appears to be modern.

I.O. 37
- [combined with LA 56112]

I.O. 38
- chalcedony core fragment, 50% cortex

I.O. 39
- dark gray bowl rim sherd, burnished in interior and exterior, possibly Kapo Gray (18th-19th century)

I.O. 40
- possible basalt groundstone mano with bashed edges
- 2 possible quartzite cobble manos or hammerstones

I.O. 41
- chert flake, 10% cortex, cortical platform
- chert flake, 30% cortex, cortical platform
- chalcedony core, 75% cortex, 4 flake scars
- chalcedony angular debris, 40% cortex, several flake scars, edge wear
- chalcedony flake, no cortex, interior platform
- large rhyolite flake, 20% cortex, cortical platform is possibly bipolar flake
- chalcedony angular debris, no cortex

I.O. 42 - white chert flake, 10% cortex, cortical platform

I.O. 43 - white chert angular debris, 40% cortex, cortical platform

I.O. 44 - chalcedony angular debris, 30% cortex, has a few flake scars on dorsal surface

I.O. 45
- chert flake, no cortex, interior platform
- redware jar body sherd, brown-slipped interior
- chalcedony angular debris, 50% cortex
- chalcedony flake, 100% cortex, cortical platform
- chalcedony flake, 20% cortex, no platform
- large quartzite cobble core, 40% cortex, 7 flake scars
- chalcedony angular debris, 35% cortex
- quartzite cobble with edge battering (hammerstone/core?)
- 2 thin redware bowl? body sherds, slipped on both sides

I.O. 46
- chalcedony angular debris, 50% cortex
- 6 orange plainware body sherds with gray paste, all probably from same vessel
- Pueblo IV Glaze A body sherd (Cieneguilla, AD 1300-1450)
- chalcedony flake, 60% cortex, cortical platform
- chert flake, 80% cortex, cortical platform
- bedrock grinding slick, about 25 cm in diameter
- 2 burned thoracic vertebrae, probably small ungulate or large canid

I.O. 47
- chalcedony flake, 50% cortex, cortical platform
- chalcedony flake, 100% cortex, no platform
- chert flake, 5% cortex, interior platform
- chalcedony flake, no cortex, interior platform
- 1 piece fire-cracked rock

I.O. 48 - basalt flake, 60% cortex, cortical platform, 1 flake scar on dorsal side

I.O. 49
- 3 white/tan chert flakes, 10% cortex, cortical platforms
- gray chert flake, 40% cortex, interior platform
- chalcedony angular debris, 25% cortex
- chert core (small), 10% cortex, at least 5 flake scars
- chalcedony flake, 10% cortex, interior platform

I.O. 50 - large quartzite flake, 20% cortex, cortical platform (crude)
- small quartzite flake, 20% cortex, cortical platform
- chalcedony flake, 20% cortex, interior platform
- basalt flake, 30% cortex, cortical platform
- chalcedony angular debris, 50% cortex
- quartzite core, 40% cortex, at least 5 flake scars
- very large quartzite flake, 50% cortex, cortical platform
- chalcedony flake, no cortex, no platform

I.O. 51 - redware jar body sherd, probably glaze painted exterior

I.O. 52 - chalcedony flake, 20% cortex, interior platform, unifacial retouch, possibly utilized

I.O. 53 - chalcedony flake, 10% cortex, cortical platform

I.O. 54 - rhyolite flake, 30% cortex, cortical platform, possibly retouched

I.O. 55 - quartzite flake, no cortex, internal platform
- red quartzite angular debris, 50% cortex

I.O. 56 - unifacial vesicular basalt groundstone, possibly a very small metate

I.O. 57 - quartzite flake, 80% cortex, cortical platform

I.O. 58 - small cairn with 10-15 basalt cobbles

I.O. 59 - line of 6 basalt cobbles on south edge of Piedras Marcadas Arroyo (middle branch of main arroyo)

I.O. 60 - chalcedony flake, 5-10% cortex, cortical platform, unifacial retouch

I.O. 61 - pumice block, shaped/ground on all sides

I.O. 62 - large quartzite cobble with 2 flakes removed
- chert flake, 50% cortex, no platform
- chert flake, 60% cortex, internal platform, possible utilization

I.O. 63 - rock alignment/check dam, 6 elements, runs southeast-northwest

I.O. 64 - 1 Pueblo IV Glaze A polychrome bowl body sherd, red exterior, glaze-on-white interior (probably San Clemente Polychrome, AD 1300-1400)

I.O. 65 - large quartzite cobble core, 30% cortex, 8 flake scars

I.O. 66 - large chalcedony flake, 60% cortex, interior platform

I.O. 67 - 2 collapsed basalt rock piles, each with several dozen cobbles
- another basalt rock pile further to the north

I.O. 68 - chalcedony flake, 20% cortex, interior platform

I.O. 69 - chert flake, 30% cortex, no platform

I.O. 70 - basalt flake, 100% cortex, cortical platform

I.O. 71 - chalcedony flake, no cortex, interior platform

I.O. 72 - quartzite flake, 50% cortex, cortical platform
- chalcedony flake, 60% cortex, cortical platform, possibly retouched
- chalcedony flake, 40% cortex, interior platform, possibly retouched
- small petrified wood core, 35% cortex, 4-5 flake scars

I.O. 73 - chalcedony flake, 25% cortex, interior platform
- redware bowl rim sherd, probably Pueblo IV Glaze A

I.O. 74 - chert flake, 30% cortex, interior platform
- quartzite flake, 60% cortex, cortical platform, possibly retouched
- redware bowl body sherd, glaze painted interior

I.O. 75 - U-shaped ring of basalt cobbles, one course high, cleared center area. Orientation is southeast-northwest
- quartzite angular debris, 20% cortex, probably a core fragment

I.O. 76 - plain redware body sherd, probably a jar sherd, red-slipped on both sides
- white quartzite flake, no cortex, interior platform
- white quartzite cobble core, 70% cortex, 3 flake scars
- brown quartzite flake, no cortex, interior platform

I.O. 77 - quartzite flake, 10% cortex, interior platform
- quartzite flake, 10% cortex, cortical platform

I.O. 78 - chalcedony angular debris, 40% cortex

I.O. 79 - Black-on-white bowl body sherd, burnished interior, white slip and carbon paint, late Pueblo III (AD 1200-1300)

I.O. 80 - basalt flake, 40% cortex, interior platform

I.O. 81 - silicified wood flake, 60% cortex, cortical platform

I.O. 82 - thick-walled redware body sherd, probably from a jar, some edges utilized

I.O. 83 - 2 grayware jar body sherds, burnished exterior

I.O. 84 - chalcedony angular debris, 50% cortex

I.O. 85 - chalcedony core, no cortex, about 8 flake scars

I.O. 86 - chert flake, 100% cortex, cortical platform
- chalcedony flake, 10% cortex, cortical platform

I.O. 87 - chalcedony flake, 10% cortex, interior platform
- basalt flake, 100% cortex, no platform

I.O. 88 - quartzite hammerstone, pecking on both ends

I.O. 89 - basalt flake, no cortex, interior platform, utilized edge

I.O. 90 - chalcedony flake, no cortex, interior platform

I.O. 91 - chert flake, 20% cortex, interior platform
- basalt flake, no cortex, no platform
- quartzite flake, 60% cortex, no platform
- basalt flake, 100% cortex, cortical platform
- basalt flake, 40% cortex, cortical platform

I.O. 92 - large chalcedony flake, no cortex, interior platform, retouched and utilized on one edge

I.O. 93 - chalcedony flake, no cortex, interior platform

I.O. 94 - black chert flake, no cortex, cortical platform

I.O. 95 - chalcedony flake, 30% cortex, cortical platform
- chalcedony flake, 80% cortex, cortical platform

I.O. 96 - amorphous basalt rock pile, about 20-25 elements

I.O. 97 - pink quartzite flake, 40% cortex, interior platform
- brown quartzite core, 30% cortex, 6-8 flake scars

I.O. 98 - Early Archaic projectile point base made from basalt (Bajada phase, 4800-3200 BC)

I.O. 99 - 2 basalt rock piles, about 10 elements in one, 4 elements in second. Possible east-west rock alignment for larger rock pile

I.O. 100 - chert flake, 10% cortex, retouched edge, interior platform, possibly a scraper

I.O. 101 - white quartzite flake, 90% cortex, cortical platform
- petrified wood flake, 100% cortex, cortical platform

I.O. 102 - concentration of basalt rocks, possibly cultural?; associated with basalt outcrop
- also possible rock alignment, associated with basalt outcrop

I.O. 103 - [combined with LA 56101]

I.O. 104 - [combined with LA 56101]

I.O. 105 - rhyolite flake, 10% cortex, cortical platform, utilized on one edge

I.O. 106 - groundstone (quartzite) mano

I.O. 107 - masonry semicircular wall of basalt cobbles (2-3 meters long)
- quartzite flake, 30% cortex, cortical platform
- 2 basalt rock piles (about 20 elements)

I.O. 108 - basalt rock pile (about 30 elements)

I.O. 109 - purple quartzite flake, 30% cortex, cortical platform

I.O. 110 - chalcedony flake, 20% cortex, cortical platform

I.O. 111 - small rock alignment
- quartzite flake, 20% cortex, cortical platform
- silicified wood angular debris, 40% cortex
- chalcedony flake, no cortex, interior platform
- chalcedony flake, 20% cortex, interior platform
- quartzite flake, 20% cortex, interior platform

I.O. 112 - quartzite flake, 10% cortex, cortical platform

I.O. 113 - oblong/horseshoe-shaped arrangement of basalt cobbles

I.O. 114 - large quartzite core, 90% cortex, 6 flake scars

I.O. 115 - quartzite flake, 40% cortex, cortical platform

I.O. 116 - rhyolite flake/core fragment, 40% cortex, interior platform

I.O. 117 - chert angular debris, 20% cortex, fire-reddened

I.O. 118 - rhyolite flake, no cortex, interior platform
- basalt flake, 60% cortex, cortical platform, possible utilization
- red chalcedony angular debris, no cortex, no platform
- quartzite flake, 80% cortex, interior platform
- chalcedony core/angular debris, 20% cortex, no platform
- large basalt rock pile, (N=about 40)
- one brownware bowl sherd, cream slip interior, plain exterior
- 3 redware bowl sherds with white-slipped interior -- may be part of brownware bowl sherd mentioned above

I.O. 119 - basalt flake, 20% cortex, cortical platform

I.O. 120 - redware, clapboard corrugated, smoothed interior

I.O. 121 - quartzite flake, no cortex, no platform

I.O. 122 - broken purple glass bottle
- chalcedony flake, no cortex, cortical platform

I.O. 123 - chalcedony flake, no cortex, interior platform

I.O. 124 - fine chert flake, 10% cortex, interior platform

I.O. 125 - basalt flake, 20% cortex, cortical platform
- chalcedony flake, no cortex, interior platform
- quartzite flake, 50% cortex, cortical platform
- chalcedony flake, no cortex, interior platform
- fossiliferous chert angular debris, 5% cortex
- redware bowl body sherd, glaze paint interior, slip gone
- brown chert flake, 5% cortex, cortical platform
- brown chert angular debris, 10% cortex

I.O. 126 - gray corrugated body sherd

I.O. 127 - [reclassified as site LA 56107]

I.O. 128 - grinding slick on basalt boulder

I.O. 129 - quartzite flake, no cortex, interior platform
- brown chert flake, 60% cortex, cortical platform
- chalcedony flake, 20% cortex, cortical platform

I.O. 130 - chalcedony angular debris, 20% cortex
- chert flake, no cortex, interior platform
- chalcedony angular debris, 40% cortex, cortical platform

I.O. 131 - tested black quartzite cobble (uniface chopper-like) with 3 flake scars
- chert flake, 40% cortex, interior platform, possibly retouched

I.O. 132 - large fire-cracked rock fragment

I.O. 133 - basalt flake, 50% cortex, cortical platform

I.O. 134 - [reclassified as site LA 56114]

I.O. 135 - chalcedony flake, 30% cortex, interior platform

I.O. 136 - rhyolite flake, no cortex, no platform
- chalcedony flake, 100% cortex, cortical platform

I.O. 137 - basalt core, 75% cortex, 3 flake scars
- quartzite core, 70% cortex, 4 flake scars
- chert flake, 60% cortex, cortical platform
- chert flake, 80% cortex, cortical platform

I.O. 138 - chert flake (split pebble with bulb), 100% cortex, cortical platform, heat treated

I.O. 139 - chalcedony core, 40% cortex, 9 flake scars

I.O. 140 - small chalcedony core, 40% cortex, 4 flake scars
- chalcedony flake (from core above), 80% cortex, cortical platform

I.O. 141 - redware jar body sherd, black mineral paint on exterior, black interior
- 2 thin grayware bowl sherds from same vessel, mineral paint on interior, one is a rim sherd

I.O. 142 - chalcedony flake, 50% cortex, cortical platform
- chalcedony angular debris, 35% cortex, no platform
- chalcedony flake, 70% cortex, cortical platform
- chalcedony flake, 100% cortex, cortical platform

I.O. 143 - [reclassified as site LA 56115]

I.O. 144 - dark quartzite, 50% cortex, cortical platform

I.O. 145 - large rock alignment, 15 meters long, oriented northeast/southwest, located at base of mesa scarp on north side of head of middle branch of Piedras Marcadas Arroyo
- chalcedony flake, 10% cortex, interior platform
- chalcedony flake, no cortex, no platform

I.O. 146 - [reclassified as LA 56115]

I.O. 147 - black quartzite flake, 30% cortex, interior platform

I.O. 148 - one fragment purple bottle glass
- white chalcedony flake, no cortex, interior platform
- white chalcedony flake, no cortex, interior platform

I.O. 149 - chalcedony flake, 10% cortex, interior platform
- large, rough, red chalcedony/chert biface less than 10% cortex
- red chalcedony/chert angular debris, 40% cortex, interior platform
- chalcedony flake, 30% cortex, interior platform
- pink chert core, 40% cortex, 5 flake scars

I.O. 150 - chalcedony flake, 50% cortex, cortical platform
- redware jar body sherd, unsmoothed interior, highly burnished brown exterior
- large Pueblo IV Glaze A bowl body sherd, thin white-slipped interior with glaze paint, plain red exterior (San Clemente Polychrome, AD 1300-1400)

I.O. 151 - chalcedony flake, no cortex, interior platform, possible utilization

I.O. 152 - chalcedony flake, 20% cortex, cortical platform

I.O. 153 - basalt flake, 100% cortex, cortical platform

I.O. 154 - chalcedony flake, no cortex, interior platform

I.O. 155 - chalcedony flake, 40% cortex, interior platform
- quartzite flake, 40% cortex, cortical platform

I.O. 156 - chalcedony flake, 45% cortex, interior platform

I.O. 157 - chalcedony flake, 60% cortex, cortical platform

I.O. 158 - chalcedony flake, 20% cortex, cortical platform, bipolar morphology
- basalt flake, no cortex, interior platform, unifacial retouch
- chalcedony flake, 10% cortex, interior platform

I.O. 159 - chalcedony flake, no cortex, no platform

I.O. 160 - large basalt uniface, no cortex, utilized edge

I.O. 161 - chalcedony flake, 10% cortex, cortical platform
- basalt flake, no cortex, interior platform

I.O. 162 - chalcedony angular debris, 50% cortex

I.O. 163 - chalcedony flake, 20% cortex, interior platform
- chert flake, 40% cortex, cortical platform

I.O. 164 - chalcedony large angular debris, 40% cortex
- chalcedony flake, 20% cortex, cortical platform
- chalcedony flake, no cortex, interior (prepared?) platform
- chalcedony flake, 10% cortex, cortical platform, possibly retouched
- chalcedony angular debris, 30% cortex
- chalcedony angular debris, 30% cortex

I.O. 165 - chalcedony flake, 10% cortex, cortical platform
- chalcedony flake, no cortex, no platform
- large chalcedony core, 60% cortex, 4 flake scars
- chalcedony flake, 100% cortex, cortical platform
- small chalcedony core, 20% cortex, 9 flake scars

I.O. 166 - chalcedony flake, 10% cortex, interior platform, possibly retouched
- chert flake, 30% cortex, no platform
- chalcedony flake, 15% cortex, interior platform

I.O. 167 - chalcedony flake, no cortex, interior platform
- chalcedony flake, 100% cortex, cortical platform

I.O. 168 - chalcedony flake, no cortex, interior platform
- petrified wood flake, 20% cortex, cortical platform

I.O. 169 - fossiliferous chert flake, 30% cortex, cortical platform
- chalcedony flake, 40% cortex, cortical platform

I.O. 170 - Early Archaic basalt projectile point, heavily resharpened (Jay phase, 5500-4800 BC)

I.O. 171 - chalcedony pyramidal core, 20% cortex, 7 flake scars

I.O. 172 - basalt wall built up to large basalt boulders. Wall is roughly semi-circular in shape, and is up to 8 courses high. Feature is a shelter, and probably historic. Shelter is located on lower mesa scarp, just outside survey area.
- quartzite flake, 80% cortex, cortical platform
- a few petroglyphs (face, geometrics), and one grinding slick (20 meters east of shelter) on boulders in vicinity of historic shelter

I.O. 173 - redware jar body sherd, unsmoothed interior, dark brown burnished exterior
- redware jar body sherd, unsmoothed interior, red burnished exterior

I.O. 174 - chalcedony angular debris, no cortex
- chalcedony flake, no cortex, interior platform

I.O. 175 - Black-on-white bowl body sherd, slipped and painted on both sides, thin carbon-paint lines, probably Pueblo III (AD 1100-1300)

I.O. 176 - petrified wood flake, 100% cortex, cortical platform, marginal retouch

I.O. 177 - chalcedony flake, 40% cortex, interior, platform, retouched edge
- large chalcedony core, 50% cortex, 8 flake scars
- small chalcedony core fragment, 4 flake scars, no cortex

I.O. 178 - large pink quartzite cobble core, 50% cortex, 7 flake scars

I.O. 179 - chalcedony angular debris, 50% cortex

I.O. 180 - black basalt hammerstone, pecking on several surfaces

I.O. 181 - redware jar body sherd, pinkish interior slip, brown exterior slip
- quartzite flake, 70% cortex, cortical platform, possibly retouched

I.O. 182 - quartzite flake, 20% cortex, cortical platform, possible utilization

I.O. 183 - petrified wood core, 10% cortex, 14 flake scars

I.O. 184 - chalcedony angular debris, 40% cortex

I.O. 185 - large chalcedony flake, 30% cortex, interior platform

I.O. 186 - chalcedony angular debris, 50% cortex, cortical platform

I.O. 187 - chalcedony flake, no cortex, interior platform, possible utilization

I.O. 188 - grayware bowl body sherd with unfinished exterior and smoothed interior, and drill hole
- quartzite flake, 60% cortex, interior platform

I.O. 189 - petrified wood flake, 30% cortex, cortical platform

I.O. 190 - large chalcedony core fragment, 30% cortex, 5 flake scars

I.O. 191 - chalcedony flake, 30% cortex, cortical platform

I.O. 192 - brown quartzite flake, no cortex, interior platform, utilized at distal end

I.O. 193 - basalt rock alignment at base of mesa scarp. Extends 13 meters, running northwest/southeast. On north side of Piedras Marcadas drainage head.

I.O. 194 - basalt flake, 40% cortex, cortical platform

I.O. 195 - chalcedony flake, 20% cortex, interior platform
- quartzite flake, no cortex, cortical platform

I.O. 196 - quartzite core, 80% cortex, 4 flake scars
- small chalcedony core, 15% cortex, 5 flake scars
- 2 refittable black-on-white bowl sherds, checkerboard mineral paint design on interior. Probably Santa Fe Black-on-white, late Pueblo III (AD 1200-1300)
- gray bowl rim sherd, with barely visible black paint on interior

I.O. 197 - chalcedony angular debris, no cortex

I.O. 198 - purple quartzite flake, 90% cortex, interior platform

I.O. 199 - basalt flake, no cortex, interior platform

I.O. 200 - basalt flake, 100% cortex, cortical platform
- chalcedony flake, no cortex, internal platform
- chalcedony flake, 60% cortex, internal platform, possible utilized edge
- chalcedony flake, no cortex, internal platform
- basalt flake, no cortex, no platform, possible utilized edge

I.O. 201 - large check dam across head of north tributary of the middle branch (at base of mesa scarp) of Piedras Marcadas Arroyo. Approximately 8 meters across.

I.O. 202 - quartzite core, 70% cortex, 4-5 flake scars

I.O. 203 - 3 basalt biface thinning flakes, no cortex, prepared platform
- basalt angular debris, no cortex

I.O. 204 - basalt flake, no cortex, interior platform
- basalt flake, no cortex, no platform (i.e., platform missing)
- basalt flake, no cortex, interior platform
- basalt flake, no cortex, no platform (missing), possibly utilized
- chert flake, no cortex, no platform, marginal retouch
- chalcedony flake, no cortex, no platform

I.O. 205 - chalcedony core, 20% cortex, 5-6 flake scars
- chalcedony core, 80% cortex, 5 flake scars

I.O. 206 - basalt biface, probable Archaic knife blade with basal end snapped off (ca. 1000-5500 BC)

APPENDIX B: INVESTIGATION OF THE EFFECTS OF VEGETATION AND SUBSTRATE ON ARTIFACT VISIBILITY

by

Mary C. Stiner

Archaeological sites were encountered in virtually all portions of the Piedras Marcadas Arroyo study area, although artifact and site densities vary between the **mesa top,** the **bottomland,** and the **semienclosed arroyo valley/ escarpment base** zones (see Section 4 of this report). During the 1986 field session, it became apparent that archaeological visibility may be conditioned by substrate and vegetation cover, particularly since cultural resources were only recorded as surface manifestations. A systematic study was initiated in order to determine how vegetation cover and the relative frequencies of geological substrate types might affect artifact visibility in the study area. The goal of the vegetation/substrate investigation was to isolate variables useful for predicting archaeological resource distributions on modern land surfaces around West Mesa as well as other areas of the southwest. The investigation specifically examines how controlled data on substrate and vegetation cover correlate with observed artifact distributions.

Soil data available from the U.S. Department of Agriculture (Hacker 1977) proved helpful for predicting surface densities of artifactual materials, yet more specific variables are desirable for understanding how artifact visibility might be affected by noncultural processes. Variables such as deflating versus aggrading sediments, detailed information on soil matrix composition, and the frequency of substrate transition within any particular zone seemed to be particularly significant conditioners of cultural resource distributions on the modern landscape. Because the variables investigated represent common geological and vegetative phenomena, methods and results presented by this investigation may be applicable to other archaeological surface investigations in the Albuquerque District and elsewhere in New Mexico.

In the Piedras Marcadas Arroyo study area, aggrading sediments consist primarly of eolian sands originating from local alluvial deposits. All soil units recorded by Hacker (1977:Map 10) for the study area include eolian components, although considerable variation in degree of surface deflation was observed between soil types within each series. The most pronounced eolian sediment buildup (aggradation), in the form of large dunes, is associated with Bluepoint loamy fine sands of upper Piedras

Marcadas Canyon and the western portion of the bottomlands beginning at the escarpment base. Nearly half of the bottomlands in the study area fall in the Bluepoint soil category. Small scale build-up of eolian sediments also occurs on the mesa top, especially along the mesa rim. Soils on the mesa top are defined as Alameda sandy loams by Hacker (see Figure 9 of this report). Here sediment build-up is limited, however, and predominant substrate processes involve deflation rather than aggradation.

Deflating or otherwise eroding substrate surfaces (slopewash) are more varied in content. Deflated substrate types include blowouts on thin Alameda soils underlain by basalt caprock on the mesa top. They also include bottomland blowouts on sandy Bluepoint and Madurez-Wink dunes and residual Kokan gravel surfaces exposed by a combination of eolian deflation and slopewash. Despite variation in deflated substrate types, all represent geological "windows" that enhance archaeological resource visibility. Virtually all deflated gravel and basalt surfaces in the study area are quite ancient, and most or all predate the appearance of human groups in the southwest.

Vegetation cover also affects ground surface visibility, and therefore cultural resource visibility. Systematic investigation of vegetation cover and composition was performed in conjunction with the substrate study.

Methods

Informal field observations were made during archaeological survey and later were employed for designing the vegetation/substrate sampling study. The three substrate zones -- mesa top, bottomlands, and semi-enclosed arroyo valley -- were thus defined and targeted as areas for transect and areal sampling. A pair of transects, along which areal vegetation samples and substrate type frequencies were recorded, was placed in each of the three zones.

Two classes of data were collected in the vegetation/substrate investigation. The first class consists of linear, point-specific information on the coverage of each substrate type along the transect and the type of substrate represented. From these data, the average frequency of substrate transition was calculated and comparisons of substrate "grain" (patchiness) were drawn. Six transects were walked in the study area (see Figure 9). Transects on the **mesa top** (Transects 1 and 2) and on the **bottomlands** (Transects 3 and 4) varied between 1065 meters (3515 feet) and 1290 meters (4260 feet) in length. Areal vegetation samples were taken at approximately 100 meter (330 foot) intervals along each transect (Table B.1). Transects 5 and 6 in the **enclosed arroyo canyon** zone were

TABLE B.1. Areal vegetation sampling increments (in meters) listed by transect

	Transect# 1	2	3	4	5	6
Sample # 1	0	0	0	0	0	0
2	100	100	100	100	50	50
3	200	204	200	150	100	100
4	303	300	300	200	150	155
5	400	400	400	300	200	200
6	506	500	500	400	250	250
7	600	600	600	500		300
8	702	700	700	600		370
9	893	800	800	700		
10	1008	900	900	800		
11	1065	1000	1000	914		
12		1100	1100	1010		
13		1200	1178	1100		
14		1290		1200		
Total Area Sampled (m^2)	48	56	52	56	24	32

Note: 1) Transects 1 and 2 began on the west and ended at the mesa edge to the east. Transects 3 and 4 began on the east and ended at the base of the escarpment to the west. Transects 5 and 6 began on the south side of Piedras Marcadas Canyon and ended on the north side.

2) Final increment at the end of each transect represents the location where the zone ends on that transect.

3) Transects 5 and 6 are short due to the nature of the semi-enclosed arroyo canyon topography. Areal samples were taken at shorter increments (50m) in this zone.

much shorter due to the natural boundaries of the zone, and ranged between 250 meters (825 feet) and 370 meters (1220 feet) in length. Areal vegetation samples were taken at 50 meter (165 foot) increments along Transects 5 and 6 in order to render the the total area sampled comparable to those for other zones (Table B.1).

The second data class consists of comparing the areas of vegetation cover to present ground surface, and determining relative frequencies of species. Vegetation and substrate data were recorded simultaneously along each transect. The vegetation sampling procedure was not designed to provide an accurate sample of all plant species in each zone. Rather, the procedure yields reliable information on all but rare taxa in the study area. Rare species (less than 2% presence) often were missed by areal sampling, but notes were taken of their presence near each areal sample. Thus, rare species are listed in the vegetation lists provided in the previous chapter. Areal vegetation data taken along transects facilitates comparisons of vegetation cover and composition on two scales (within and between the predefined zones) and to check the integrity of the predefined zones.

Areal vegetation data were collected as 2 meter by 2 meter (4 square meter) samples distributed at 100 meter increments along the entire length of each transect. A portable 1 meter by 1 meter grid was turned over four times to obtain a contiguous 2 meter by 2 meter area. The portable grid consisted of a sturdy, light-weight wooden frame subdivided by a 10 cm by 10 cm string network. The contents of each 10 cm by 10 cm square were recorded. Vegetation cover versus ground surface was averaged within each square. The sampling procedure was not suitable for sampling tree density in the study area, as their distribution occurred on a much larger scale than the occurrences of herbaceous plants. Juniper trees are relatively common on the mesa top and escarpment, and an estimate of their frequencies was calculated from airphotos.

Results

Results of the vegetation/substrate investigations are summarized in Tables B.2 through B.4. Table B.2 illustrates the averaged relative frequencies of various plant taxa to overall surface area for each transect. All values are expressed as percentages. Plant species exhibiting the greatest variation in their distributions between zones are marked by an asterisk. Table B.3 compares vegetation cover to exposed ground surface between transects and between zones. Table B.4 presents summary data on relative percentages of substrate types within each zone and the average interval of substrate transition for each zone. Data for each pair of transects in a zone were combined in Table B.4 because of the

TABLE B.2. Relative frequencies of plant genera for each transect (Values expressed as percentages)

	Mesatop		Bottomlands		Arroyo Valley	
Transect	T1	T2	T3	T4	T5	T6
Genus						
Gutierrezia	.31	.64	.29	.14	.29	.21
Sporobolus	.19	.05	.05	.06	.06	.04
Bouteloua	.26	.13	.02	.16	.05	.12
Hilaria *	.15	.03	.01	<.01	---	---
Oryzopsis *	.02	---	.29	.23	.25	.14
Artemisia *	---	.05	.02	.05	.07	.28
Dalea (Indigo)*	---	.01	.18	.22	.14	.02
Dalea f. *	.02	.03	---	---	---	---
Ephedra	.01	.01	.03	.06	.02	.01
Atriplex *	---	<.01	.03	.01	.05	.06
Salsola	<.01	<.01	.01	.03	---	<.01
Eurotia	---	---	.05	.01	---	---
Yucca	.01	---	---	---	---	---
Opuntia	.01	<.01	.01	---	.01	---
Astragalus	.01	.03	<.01	---	.02	<.01
Spharalcea	---	<.01	<.01	---	---	<.01
Erigeron	<.01	---	---	<.01	---	---
Chrysopsis	---	---	<.01	.01	.03	.08
Dithyrea	<.01	<.01	<.01	---	---	---
Solanum	---	<.01	.01	.01	.01	<.01
Baileya	---	---	---	<.01	---	---
Mentzelia	---	---	<.01	<.01	---	<.01
Helianthus	---	---	<.01	<.01	---	<.01
Phacelia	---	---	<.01	---	---	<.01
Juniperus	(between 1% - 2% of mesa top sampled)					

NOTE: 1) Genera marked by an asterisk best reflect differences in substrate (and edaphic) quality between zones.
2) Frequencies for Juniper were calculated separately, based on airphotos.

TABLE B.3. Percentages of vegetation cover to ground surface area for each transect

Zone	Transect #	Averaged Percent Vegetation Cover
Mesatop	1	9%
	2	8%
Bottomlands	3	8%
	4	6%
Arroyo Canyon	5	8%
	6	8%

NOTE: Transect 4 exhibited highest occurrences of gravel outcrops, and the relatively low value for vegetation surface cover may be due to slightly lower plant cover on gravel outcrops for the study area in general.

TABLE B.4. Summary data on relative percentages of substrate types and average interval of substrate transition for each transect pair

M E S A T O P (Transects 1 and 2)

Substrate Type:	Blowout	Basalt Outcrop	Eolian Sands/Dune
	43%	21%	36%

Deflating surface = 64%
Aggrading surface = 36%
Average interval of substrate transition = 16.0 meters
Average site size = 14.0 meters

B O T T O M L A N D S (Transects 3 and 4)

Substrate Type:	Blowout	Gravel Outcrop	Eolian Sands/Dune
	52%	12%	36%

Deflating surface = 64%
Aggrading surface = 36%
Average interval of substrate transition = 27.5 meters
Average site size = 30.0 meters

ENCLOSED CANYON/ESCARPMENT BASE (Transects 5 and 6)

Substrate Type:	Blowout	Eolian Sands	Large Dune
	27%	42%	30%

Deflating surface = 27%
Aggrading surface = 72%
Average interval of substrate transition = 32.7 meters
(No sites found in this zone)

NOTE: All values given for transect pairs rather than single transects because values between pairs are very similar.

similarity in transect content for the pair. While identical proportions of deflating versus aggrading substrate surfaces exist for the mesa top and bottomland zones, substrate types and the average interval of transition vary between zones.

Artifact visibility on modern land surfaces is an important concern for management of archaeological resources, particularly as it affects the assessment of artifact distributions. Determinations of archaeological materials on the modern land surface can also be used to draw general inferences about what may be buried below the surface. Some knowledge of geologic and vegetative factors affecting archaeological visibility is therefore an important component of any accurate resource assessment.

Vegetation cover is a factor briefly discussed in many archaeological reports, and is systematically investigated here. Vegetation cover proved to be very sparse, and approximately 92% (Table B.3) of modern soils are exposed in the study area. Interestingly, the proportion of vegetation cover to exposed ground surface is constant between all zones in the study area. Differing sedimentation regimes, such as dominance of deflation versus aggrading processes, had no apparent affect on the density of vegetation cover. A minor exception occurs on exposed gravel deposits on the western end of Transect B.4, where vegetation cover is slightly less than for other areas. Vegetation cover alone bore no relationship to artifact distributions in the study area.

Table B.2 illustrates variability in habitat preferences between plant species. Differences in vegetation composition between zones is more a matter of degree than presence or absence. Many species can tolerate the full range of conditions throughout the study area without significant changes in density. These taxa are not particularly helpful for identifying geological characteristics of substrate that affect artifact visibility on the modern ground surface. Common species such as snakeweed and sand dropseed and several rare species are nondiagnostic with regard to substrate conditions in the study area. Other plant taxa exhibit more limited substrate tolerances. Juniper, feather peabush, grama grass and galleta grass are most common on the mesa top. Juniper and feather peabush tend to grow on or near craggy basalt outcrops, their roots extending down into fractures in the bedrock. Grama and galleta grass, on the other hand, usually occur in dense but restricted patches on the mesa top, especially where fine loamy sands have accumulated in shallow depressions. Deflating gravel surfaces in the bottomland zone are also dominated by an unique set of species such as Mormon tea, fleabane, grounsel, feather peabush and dagger opuntia. Species such as Indian rice grass, aster, four-wing saltbush, sand sage and indigo bush exhibit a very

different substrate preference, and are most commonly found on aggrading eolian sediments. All but four-wing saltbush clearly "prefer" dune substrates, while saltbush is more common at the margins of dunes where they meet the lower mesa escarpment.

Results presented in Table B.4 show significant differences in the range of substrate types and the "grain" between zones. Individual samples within each transect (data not presented) show that considerable patchiness exists within each zone, but no large-scale gradients could be found along transects. A minor gradient in substrate content was found in the immediate vicinity of the mesa escarpment where the dichotomy between dune formation and deflated basalt surfaces is most extreme. Overall homogeneity in zone content (substrate and vegetation), however, was evidenced from multiple samples taken along transect pairs. Patches of similar content appeared randomly distributed between transects in each pair.

A measure of substrate "grain", called the average interval of substrate transition (Table B.4), allows comparison of the relative proportions of deflated to aggrading substrates between zones. The mesa top zone shows the most frequent substrate transition interval (finest grain) at 16.0 meters. The bottomland zone has an intermediate value of 27.5 meters. The enclosed arroyo canyon/lower escarpment zone has the largest transition interval at 32.7 meters. Frequency of substrate transition is positively correlated with site density and site diameter in the study area. Conversely, substrate transition interval values contrast markedly with values for the distances (proportion) of deflating versus aggrading substrate types for each transect pair.

Relationship of Substrate and Vegetation to Cultural Resource Distributions

Comparisons of linear and areal transect data established that a relative measure of substrate grain between zones in the study area is relevant for predicting artifact presence. On highly deflated surfaces, a fairly accurate picture of cultural resource distribution can be obtained. Archaeological visibility is more limited, however, on aggrading substrates. While such an observation is to be expected, means for accurately gauging the degree to which geological factors affect artifact distributions is valuable for assessing cultural resources in an area despite varying visibility on the surface. Visibility of artifactual materials on surface surveys represents an important management concern, since survey results represent the **minimum** archaeological record in a given area.

Certain plant species can also serve as an indirect indicators of artifact densities on differing substrate types. Relative proportions of deflating versus aggrading surfaces were significant for predicting distances between sites and site sizes. Substrate data (and indirectly vegetation data) indicate that sites are rarer In aggrading sediment regimes. This means that site density could be similar throughout the study area, but site visibility is best only in areas with high proportions of deflated surface. Knowledge of aggrading versus deflating substrates therefore allows optimal planning for subsurface testing between zones to check surface survey results.

Not all results derived from the vegetation/substrate investigation have clear implications for understanding artifact distributions. Values for substrate grain between zones in the study area are remarkably similar to average site diameters between zones. Mesa top sites average 14.0 meters in diameter, while the substrate transition increment is 16.0 meters. Bottomland sites average 30.0 meters, while the substrate transition increment is 27.5. No comparison could be made for the enclosed arroyo canyon/escarpment base zone because no sites were found in this zone. Further, site density is highest on the mesa top where grain size is the smallest. The relationship between eroding land surface patch dimensions and site size may only be informative about the "windows" through which they can be seen on modern land surfaces. The true character of site size requires selective subsurface testing where aggrading sediment regimes dominate.