MUSEUM OF NEW MEXICO
OFFICE OF ARCHAEOLOGICAL STUDIES

TESTING RESULTS AND DATA RECOVERY PLAN FOR SITES IN THE SAN FRANCISCO MOUNTAINS, CATRON COUNTY, NEW MEXICO

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with a contribution by
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ADMINISTRATIVE SUMMARY

In August and September 1990, the Office of Archaeological Studies of the Museum of New Mexico conducted a testing program at six prehistoric sites located along a 12.1 km (7.6 mi) segment of U.S. 180 extending from the crest of the San Francisco Mountains to the western limit of the village of Luna in Catron County, New Mexico. A survey had been conducted by Oakes (1989). Portions of all sites are within a proposed project to improve and widen U.S. 180 by the New Mexico State Highway and Transportation Department. The sites are on USDA Forest Service land in the Gila/Apache National Forest and on private land.

One of the sites is not likely to yield further information on the prehistory of the region, and no additional work is recommended. Another tested area was found not to be a site. Four of the tested sites have potential to produce important information on the cultural development of the area, and data recovery is proposed for these sites if construction proceeds.

The sites range in age from the Late Archaic period through the Tularosa phase of the Mogollon culture (ca. 2000 B.C. to A.D. 1300). Ceramic types, projectile points, and site architecture were used to date the sites, which include Archaic lithic artifact scatters, pithouse units, and room blocks.

A data recovery plan is presented for each site, emphasizing mobility patterns as influenced by the domestication of cultigens from the Archaic to Pueblo period in the Mogollon Highlands.

MNM Project No. 41.492.
NMSHTD Project No. F-013-2(4) CN 1491.
Gila/Apache National Forest Special Use Permit.

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INTRODUCTION

Between August 27 and September 28, 1990, the Office of Archaeological Studies, Museum of New Mexico, conducted an archaeological testing program along a 12.1 km (7.6 mi) section of U.S. 180 near Luna, Catron County, New Mexico (Fig. 1). The work was conducted at the request of William L. Taylor of the New Mexico State Highway and Transportation Department (NMSHTD) in connection with proposed road construction, Project No. F-013-2(4) CN 1491.

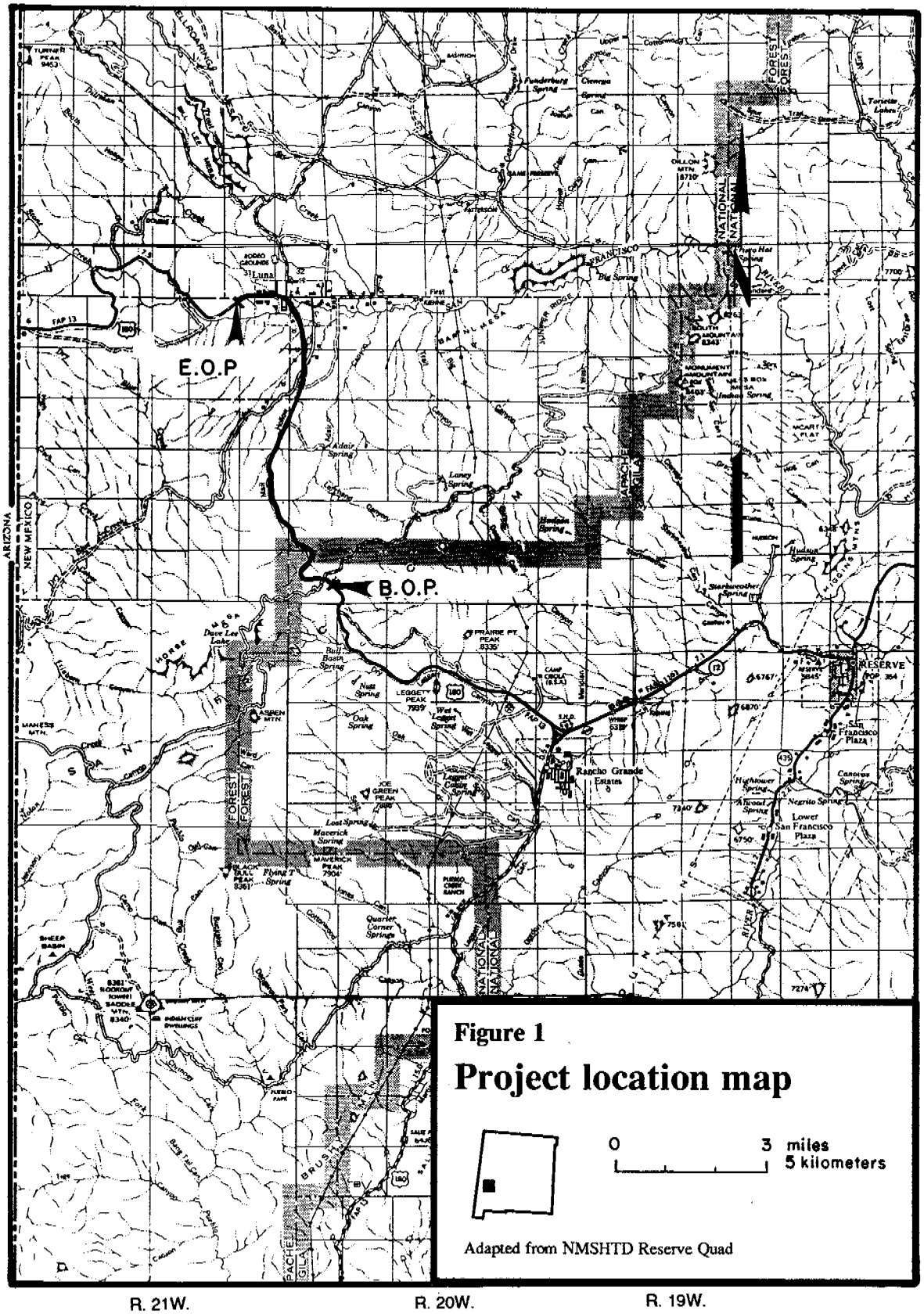
The field crew consisted of Yvonne R. Oakes, project supervisor; Dorothy A. Zamora, assistant supervisor; and crew members Lewis Kimmelman, Kilian Melloy, and Antonio Torres. Joan Gaunt, William Sarracino, and Laurel Wallace served as alternate crew members. David A. Phillips, Jr., served as principal investigator for the project. Richard Newton of the Reserve Ranger District, Gila National Forest, served as the Forest Service liaison. A total of 75 worker-days were spent in the field; 103 worker-days were spent in research and report preparation.

Six sites were tested, and four of them are considered to have the potential to yield important information on the prehistory of the Mogollon region. The portions of these sites within project limits are recommended for data recovery if construction proceeds. The data potential of two of these sites is considered limited, and no further work is recommended. Recommendations for each site are presented in Table 1.

All sites are either within the Gila/Apache National Forest or on private land. Site locations and legal descriptions are provided in Appendix 1. The testing was completed under a Gila/Apache National Forest Special Use Permit.

Table 1. Site Descriptions and Recommendations

Site	*Description*	*Land Ownership*	*Recommendation*
LA 45507	Pithouse village of San Francisco phase	Private/State	Data recovery
LA 45508	Late Archaic/Early Pithouse artifact scatter; possible pits	Private/State	Data recovery
LA 45510	Pithouse complex of San Francisco phase	Apache National Forest	Data recovery
LA 70184	Small cobble pile; not a site	Apache National Forest	No further work
LA 70185	Reserve-phase cobble room block	Apache National Forest	Data recovery
LA 70187	Activity area of Reserve-phase cobble mound	Apache National Forest	No further work


E.O.P
B.O.P
T. 5S.
T. 6S.
T. 7S.
T. 8S.
R. 21W.
R. 20W.
R. 19W.
ARIZONA
NEW MEXICO
Figure 1
Project location map
0
3 miles
5 kilometers
Adapted from NMSHTD Reserve Quad

ENVIRONMENT

Kilian Melloy

The project area is within the Apache National Forest and is bounded by the San Francisco Mountains to the southeast and Adair Canyon to the east. The terrain throughout the project area is mountainous and forested, characterized by steep slopes leading down to deep-cut drainages, with patches of meadowlands occurring near the town of Luna. There, the mountainous character of the landscape gives way to the Luna Valley. The elevation of the project area ranges from 2,213 m (7,260 ft) near the crest of the San Francisco Mountains to 2,158 m (7,080 ft) at the edge of Luna. Major drainages include an unnamed intermittent flow, which runs alongside the highway through Mail Hollow, the San Francisco River, as well as numerous smaller arroyos and another intermittent spring, which drains into a small lake about 1.6 km (1 mi) south of Luna.

The west-central portion of New Mexico as a whole is "dominated by late Eocene-early Miocene volcanic rocks. Highest mountains are resurgent domes of ash-flow tuff cauldrons or andesitic stratovolcanoes, modified by subsequent Basin and Range faulting and erosion" (Elston 1982). About 8.5 km (5 mi) south of Luna, within the project area, the geology is made up of boulder beds and coarse clastic rocks, mainly fragments of volcanic rock. In the midst of this, a narrow zone of Datil group geology intrudes -- rhyolite tuff flows of welded and crystalline nature with brecchias included. Closer to Luna, the geology changes to Gila conglomerate formations. Finally, the town is located just inside an area of Quaternary alluvia, a valley alluvium associated with floodplains (Dane and Bachman 1965). The town rests on terrace and pediment gravels, basalt, and bolson deposits.

The soil association along the project right-of-way is almost entirely Cabezon-Thunderbird-Apache, with a brief patch of Capillo-Tampico-Mirabal, which the highway touches about 6.5 km (4 mi) south of Luna (Maker et al. 1972). The Cabezon-Thunderbird-Apache soils are of volcanic origin, associated with old lava flows and mesas capped with basalt. This type of soil tends to be stony and shallow, and vegetation is limited to a few varieties of shrubs, trees, and cacti, although grasses flourish. The Capillo-Tampico-Mirbal soils are typical of mountainous topography, as are the Cabezon-Thunderbird-Apache soils; a shared trait is the development from igneous parent materials. However, Capillo-Tampico-Mirabal soils are also formed from conglomerate rocks and contain a fair amount of organic matter. The topmost layers are described as gravelly, but in general this type of soil supports timber to such an extent that commercial timber is harvested from these soils. Grasses also flourish in this soil association, as do plants suitable for the browsing of cattle and wildlife (Maker et al. 1972).

The climatic data for the study area is derived from records kept at the Luna ranger station. The elevation in the project area is 2,148.8 m (5,960 ft) to 2,340.8 m (7,860 ft), a difference of 579 m (1,900 ft) along U.S. 180. The mean maximum temperature at the ranger station is 18.3 degrees C (65 degrees F), while the mean minimum temperature

is -3.3 degrees C (26 degrees F) for a 46 year period. Temperatures seldom reach very high readings in the higher elevations of this region. Annual precipitation for this area is a mean of 395 cm (15.58 in) over a 60 year time span. Average annual snowfall at Luna is 1,016 cm (40 in). Frost-free days in the project area range from 87 at Luna to 120 at Reserve (Maker et al. 1972:6-7).

Flora in the project area includes tufted evening primrose *(Oenothera caespitosa)*, prickly pear (*Opuntia* sp.), ponderosa pine (*Pinus ponderosa*), piñon (*Pinus edulis*), alligator juniper (*Juniperus deppeana*), Gambel's oak (*Quercus gambelii*), Indian ricegrass (*Oryzopsis hymenoides*), mullein (*Verbascum* sp.), aster (*Aster* sp.), yellow cone flower (*Rudbeckia laciniata*), purple vetch (*Vicia* sp.), grama grass (*Bouteloua* sp.), sunflower (*Helianthus annuus*), orange sneeze weed (*Helenium* sp.), rocky mountain iris (Iridaceae), accordion flower (*Akkordionus floris*), one-seeded juniper (*Juniperus monosperma*), blue grama (*Bouteloua gracilis*), june grass (*Koeleria cristata*), Harvard oak (*Quercus harvardii*), Mormon tea (*Ephedra* sp.), unidentified species of mint (*Mentha* spp.), matt muhly (*Muhlenbergia richardsonis*), spear grass (*Scleropogon brevifolius*), alkali sacaton (*Sporobolus airoides*), sand dropseed (*Sporobolus cryptandrus*), and a variety of mushrooms (order Agaricales, class Basidiomycetes).

Fauna directly and indirectly encountered in the project area include toad (*Bufo* sp.), horned toad (family Buferidae), elk (*Cervus canadensis*), black bear (*Ursus americanus*), coyote (*Canis latrans*), cottontail rabbit (*Sylvilagus audubonii*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chryseatos*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), rocky mountain tufted ear squirrel (family Sciuridae), garter snake (*Thamnophis* sp.), bullsnake (*Pituophis* sp.), wolf spider (*Lycosa* sp.), mosquito (Culicidae), tarantula hawk (*Hemipepsis* sp.), swallow (Hirundinidae), lubber grasshopper (*Brachystola magna*), northern walking stick (*Diapheromera femorata*), common raven (*Corvus corax*), and frog (suborder Diplasiocoela).

CULTURAL OVERVIEW

The following information is taken from Oakes's (1989) survey report.

Existing Data Base

The project area lies within the heartland of the Mogollon culture. The concept of a Mogollon culture originally created much debate among archaeologists when Emil Haury (1936) defined it as a culture unit from his surveys and excavations in the area from 1931 to 1935. Earlier work had been carried out in the area and specifically at LA 45507 by Hough (1907, 1919), but not until Haury's studies was the Mogollon culture distinguished from those of the Anasazi and Hohokam (Reid 1986:1). Archaeological interest in Mogollon cultural characteristics and their temporal placement ran high in the 1930s. By the late 1930s, Paul Martin had established an archaeological field camp at Pine Lawn near the project area. Martin was joined by John Rinaldo in the Pine Lawn Valley, and they collaborated on site investigations in this area (Martin and Rinaldo 1947; Martin et al. 1949, 1950). Other archaeologists pursuing a keen interest in this region include Danson (1957), Peckham (1958), and Kayser (1972). Later work includes surveys by the University of Texas (Neely 1978), NMSHTD (Koczan 1983), University of New Mexico field schools at the SU site, and several Forest Service surveys on record at the Luna and Reserve ranger stations.

Detailed overviews of the area have been completed by Berman (1979), LeBlanc and Whalen (1980), and Stuart and Gauthier (1981). Recently, scholars have shown a renewed interest in the area, concentrating on problem-solving research. Many have concerned themselves with the origins of horticulture in the project area. Gilman (1983, 1987) focuses on changing house forms as a response to varying resource needs. Minnis (1985) looks at various models for the adoption of cultigens, and Hunter-Anderson (1986) examines the role of increasing population pressure as a cause for intensification of agricultural production. Wills (1988a) studies the geographical characteristics of population changes and mobility leading to the use of domesticates within the project area. More recently, Cordell and Gumerman (1989) have included the Mogollon area in a general scheme of changing adaptations occurring throughout the Southwest between A.D. 200 and 1540.

Further research in the study area is certainly warranted by our increasing data base. We now have an opportunity to examine in even further detail such aspects of Mogollon and pre-Mogollon culture as the shift from hunting and gathering to horticulture, changing settlement sizes through time, clarification of phase designations, locational patterning, reasons for architectural variability, causes of economic stress, population dynamics, and changing resource utilization through time.

Cultural Setting

Paleoindian Period (9500-6000 B.C.)

No Paleoindian sites have been located within the project area. Sites have been recorded on the Plains of San Augustine, 45 km to the east (Hurt and McKnight 1949; Bussey and Beckett 1974). Two other late Paleoindian sites have been recorded near Quemado (Honea and Benham 1963; Honea 1969; Eck 1982). Paleoindian projectile point collections have been made by ranchers in the area. These include Clovis points (9500-9000 B.C.) and Cody-complex points (7000-6000 B.C.).

The occurrence of Paleoindian sites in montane areas, such as the project area, is rare. However, some sites have been found in the Sangre de Cristo Mountains in northern New Mexico and at high elevations in Colorado. In general, Paleoindian sites are located in deflated sand dunes at the edges of playas. Isolated diagnostic projectile points are also found in this setting.

Archaic Period (6000 B.C.-A.D. 200)

Archaic sites in the project area occur in a variety of elevational and topographic zones: deflated blowouts, above edges of former lake terraces, along arroyo banks and streams, near springs, and in the high mountains of the Gila/Apache National Forest (Berman 1979:18, 21). Recorded sites include rock shelters, caves, lithic artifact scatters, and one pithouse site. Occupied caves include Tularosa Cave (Martin et al. 1952), O Block Cave (Martin et al. 1954), and Bat Cave (Dick 1965). The open pithouse site is Wet Leggett, adjacent to the project area and recorded by Martin and Rinaldo (1950).

Beckett (1973) thinks that cave sites were used for winter occupation, while lower elevation dune sites were used from spring through fall. However, Heller (1976:18, 21) found some young faunal specimens at Tularosa Cave, suggesting a possible late summer or early fall occupation. Other researchers have disputed Beckett (1973), arguing that winter sites were occupied at the lower elevations, and summer sites were located in the mountains (Davis 1963; Hunter-Anderson 1986).

Two Archaic cultural traditions are known in the general region: Cochise and Oshara. The two traditions are distinguished by projectile point style and geographic distribution of the points. The Cochise is considered to be the basis for the later Mogollon culture in southwest New Mexico, while the Oshara tradition is associated with the Anasazi in northern New Mexico. Boundaries between the two are vague. The Oshara sites date from 5500 B.C. to A.D. 600 based on six separate stages devised by Irwin-Williams (1973). No sites of this type have been found in the study area.

The Cochise tradition was originally considered a manifestation of the Desert Culture, found in southeastern Arizona (Sayles and Antevs 1941). It has long been

thought to include three stages: Sulphur Springs (7500-3500 B.C.), Chiricahua (3500-1500 B.C.), and San Pedro (1500-200 B.C.). Irwin-Williams (1979) has broadened these dates and left a major gap between the Sulphur Springs and Chiricahua phases. Her chronology is: Sulphur Springs (9000-6000 B.C.), Chiricahua (3500-1000 B.C.), and San Pedro (1000 B.C.-A.D. 200). Sayles (1983) fills the gap with the Cazador phase (7000-6000 B.C.). However, the Cazador phase may only be valid for the Arizona area. No sites dating to the early Sulphur Springs phase have been found in New Mexico. Hogan (1985:9) suggests that Archaic populations did not occupy the mountains of the study area until late in the Chiricahua phase, about 3500 B.C.

Several sites of the Cochise tradition have been dated through radiocarbon analysis. A date of 2556 ± 680 B.C. has been obtained for the Wet Leggett Arroyo site (Martin et al. 1949); 3981 ± 310 B.C. for the Chiricahua component at Bat Cave (Dick 1965:105); and 273 ± 200 B.C. for corn from the San Pedro phase at Tularosa Cave (Martin et al. 1952:500). These dates are uncorrected.

As a result of his investigations at Bat Cave, Dick (1965) suggested that maize was present in this area as early as 3500 B.C., in the early Chiricahua phase. Later research has questioned the association of the early date with maize (Berry 1982; Minnis 1985; Wills 1988a). Maize does not appear again in the archaeological record in the study area until around 1250 B.C. at Tularosa Cave (Martin et al. 1952).

The Archaic period ends with the introduction of pottery. No explanation for the adoption of this significant technological change is usually offered (Hunter-Anderson 1986), although the use of ceramics corresponds with the storage and later soaking and boiling of horticultural products for winter use as populations became less mobile.

Mogollon Period (ca. A.D. 200-1350)

The transition between the Archaic and the Mogollon periods is generally marked only by the appearance of brown ware pottery. In the Mogollon period, we see the use of pithouse dwellings with a gradual shift to masonry above-ground structures, ceremonial units, and an increasing use of cultigens. Reasons given for these adaptations include increasing population pressure, restricted mobility, and environmental stress.

The use of various taxonomic designations to describe cultural development in the Mogollon area is somewhat confusing. We shall follow the lead of Berman (1979), who expands the original taxonomic system that Haury (1936) devised specifically for the Pine Lawn Valley. Phase classifications are Pinelawn (ca. 150 B.C.-A.D. 500), Georgetown (A.D. 500-700), San Francisco (A.D. 700-900), Three Circle (A.D. 900-1000), Reserve (A.D. 1000-1100), and Tularosa (A.D. 1100-1350). We understand that there may be problems in assigning sites to rigid phases or time frames, and these difficulties will be examined as we pursue further study in the area. Some researchers classify sites as Pithouse-phase or Pueblo-phase, with a break after the Three Circle phase at approximately A.D. 1000. LeBlanc (1976) therefore considers Pithouse sites as Early (Pinelawn-Georgetown) or Late (San Francisco-Three Circle). Sites from all of the Mogollon phases have been recorded within the Gila/Apache National Forest.

Early Mogollon sites of the Pinelawn and Georgetown phases that have been excavated in or near the project area include Luna Junction (Peckham 1963), Mogollon Village (Haury 1936), Pine Lawn Camp Pithouse (Rinaldo n.d.), Promontory (Martin et al. 1949), Starkweather Ruin (Nesbitt 1938), the SU site (Martin 1943; Martin and Rinaldo 1947), Three Pines Pueblo (Martin and Rinaldo 1950), and Turkey Foot Ridge (Martin et al. 1949; Martin and Rinaldo 1950). The SU site, which lies southeast of the project area, is currently being reexamined by W. H. Wills through the University of New Mexico field school program.

Pithouses during this time indicate both year-round and seasonal use (Lightfoot and Jewett 1986). An attempt to explain these variations in terms of mobility patterns is provided by Hunter-Anderson (1986).

Most early Mogollon sites tend to be in elevated areas such as mesa tops, knolls, ridges, and hilltops. Berman (1979:30) argues that these areas may not necessarily have been selected as defensive locations, but rather for accessibility to water or arable land, protection from flooding, presence of good drainage, or a commanding view of the area. By the San Francisco and Three Circle phases, there is a general shift in site locations to more accessible ridges or terraces, and closer to floodplain areas. Berman (1979) suggests that this may indicate increasing dependence on agriculture. Sites of the San Francisco and Three Circle phases that have been examined within or near the project area include Hillside Pueblo (Peckham 1958), Oak Springs Pueblo (Martin et al. 1949), the Sawmill Site (Bluhm 1957), South Leggett Pueblo (Martin et al. 1950), Starkweather Ruin (Nesbitt 1938), the Switchback Site (Peckham 1957), Three Pines Pueblo (Martin et al. 1950), Wet Leggett Pueblo (Martin et al. 1950), and Y Canyon Cave (Martin et al. 1954).

Most researchers indicate that pithouse sites are randomly laid out with a lack of formal planning (Bullard 1962; Berman 1979; Kayser 1988). However, Lightfoot and Jewett (1986) believe they have isolated a pattern described loosely as circular house clusters around a central ceremonial or social unit. Early pithouses tend to be round (a few are bean-shaped), with a variety of post-support patterns. By the San Francisco phase, houses are generally more square. Entryways range from long and narrow to short and wide and are often stepped; however, there is no consistent doorway alignment. The size of the pithouses varies from site to site. The largest structures (30 sq m) occur during the Pinelawn phase and decrease in size thereafter. Early ceremonial units are frequently larger pithouse types. Extramural hearths, storage pits, and burials are frequently found on pithouse sites.

Mogollon ceramics are usually sparse during the Pinelawn phase, and their presence on these sites is usually sparse. Initial pottery consists of a plain brown ware called Alma Plain with an Alma Rough variant, followed soon after by San Francisco Red. Smudged wares are prevalent by the San Francisco phase, along with Three Circle Red-on-white. By the late Three Circle phase, Reserve Black-on-white begins to appear (Berman 1979).

Subsistence adaptations during these Mogollon pithouse phases include the procurement of wild game and plants and the raising of maize, kidney beans, squash, and various gourds.

By the Reserve phase (ca. A.D. 1000), pithouse dwellings give way to above-ground units. Sites of the Reserve phase that have been excavated within or near the project area are Hillside Pueblo (Peckham 1958), Oak Springs Pueblo (Martin et al. 1949), the Sawmill Site (Bluhm 1957), South Leggett Pueblo (Martin et al. 1950), Starkweather Ruin (Nesbitt 1938), Switchback Site (Peckham 1957), Three Pines Pueblo (Martin et al. 1950), Wet Leggett Pueblo (Martin et al. 1950), and Y Canyon Cave (Martin et al. 1954).

During the Reserve phase, site density was at a peak. Sites also extended further into previously unoccupied areas and at generally lower elevations. Sites are found on benches or terraces above drainages and on low mesas, hills, and valley floors.

In this phase, we see the appearance of above-ground masonry habitation sites. These usually consist of an L-shaped series of contiguous rooms. Units of three rooms or less are generally considered fieldhouses, while permanent residences may contain up to 30 rooms. Jacal structures are present but seem to be uncommon.

Black-on-white ceramics become common during this time. These include Reserve Black-on-white, Tularosa Black-on-white, and Mimbres Classic. Mogollon black-on-white ceramics have been seen as an imitation of Anasazi practices, although research suggests that such pottery developed locally (Minnis 1981).

The latest Mogollon period sites in this part of southwest New Mexico are assigned to the Tularosa phase. Sites of this time frame that have been excavated within or near the project area are Higgins Flat Pueblo (Martin et al. 1957), Hough's Site 69 (Wendorf et al. 1963), Starkweather Ruin (Nesbitt 1938), and the WS Ranch Site (Neely 1978).

These sites are larger than those of preceding phases; however, there are fewer of them, suggesting a consolidation of smaller villages into centralized communities. Sites range from one or two rooms to multistoried structures of over 100 rooms. Sites generally consist of 20 to 25 masonry rooms. The ceramic assemblage includes Tularosa Black-on-white, Tularosa White-on-red, and St. John's Polychrome (a late manifestation). Although the population was primarily agricultural, wild resources were also exploited.

A gradual abandonment of the Mogollon area began around A.D. 1300. Rice (1975) believes the first abandonments occurred along minor drainages, in narrow valleys, and at the higher elevations, above 2,100 m (7,000 ft). The Pine Lawn Valley, with the exception of Starkweather Ruin, was actually abandoned earlier, by the close of the Reserve phase. The San Francisco River area near Luna contains sites dating up to the early Tularosa phase. After ca. A.D. 1350, the Gila/Apache National Forest region seems to have been completely abandoned until the arrival of the Apaches. Local Mogollon peoples may have migrated north to the Zuni area (Bullard 1962:9; Hogan 1985:11).

Apache and Spanish Periods (ca. 1600-1880)

This section is derived primarily from Wozniak (1985). By the end of the sixteenth century and throughout the seventeenth century, the pueblos of Zuni and Acoma, to the north of the project area, were frequently raided by Apaches from the mountains in the Mogollon area (Scholes 1942). The exact locations of Apache strongholds are unknown. Spanish records suggest there were four Apache groups centered south of Zuni (Schroeder 1974). One of these, the Chilinos, occupied the area in and around the San Francisco Mountains. Apaches remained in the area throughout the first half of the eighteenth century.

In 1747, a Spanish expedition reached the Zuni area by way of the San Francisco and Gila rivers (Thomas 1932). The expedition, under Bernardo de Miera, reported Apache rancherias in the San Francisco Valley. By the 1780s, Apaches and Navajos had become allies and made joint raids in Arizona and northern Mexico. In 1788, a Mexican punitive expedition headed north from Sonora, Mexico, and reported the presence of Apaches in the San Francisco Mountains (Thomas 1932). Another incursion from Sonora to Zuni in 1795 traversed the San Francisco and Gila rivers and again noted the presence of Apaches in these mountains.

There are no further accounts of Apaches in this area until the late 1850s. The Apaches seemed to have focused much of their attention south toward Chihuahua and Sonora. However, in 1857 Apaches raided farmsteads near Zuni and returned to the San Francisco River area (Schroeder 1974).

Navajo refugees were reported living south of Zuni by 1859. In 1860, a U.S. military campaign drove Navajos into the San Francisco and Mogollon mountains. Navajos remained in the general area until the establishment of the Navajo reservation in 1868. This left the region open to the Apaches. In 1869, a treaty with the U.S. government supposedly confined the Indians to an area south of the Gallo Mountains. Between 1872 and 1874, various Apache groups were sent to a reservation along Tularosa Creek (Fraser 1965). But in 1874, Fort Tularosa, built to protect government officials against attack in 1872, was abandoned because the Apaches were moved to Ojo Caliente. Through the remainder of the 1870s, Apache outbreaks continued. The defeat of Geronimo in 1885 ended Apache dominance of the Mogollon region.

Historic Period (1874-Present)

Once the Apaches were removed to a reservation in 1874, the Mogollon area became attractive to settlers from other regions. In that year, several families from Socorro settled at Lower San Francisco Plaza, south of present-day Reserve. They were soon joined by soldiers and their families from Fort Tularosa, who settled at Upper San Francisco Plaza. By the 1880s, settlement of the region was spurred by the construction of railroad lines throughout New Mexico and the resulting higher prices for sheep and cattle. In fact, there was a cattle and land boom in the general area around Quemado, culminating in the formation of large land and cattle companies. Severe winters and long

droughts led to economic decline in the late 1880s and early 1890s. Smaller ranching and herding holdings developed after the decline and are the primary economic force in the area today.

TESTING PROCEDURES

The purpose of the testing program was to determine the nature, depth, and extent of possible cultural deposits existing within the proposed highway right-of-way. At all sites, testing operations followed general procedures used by the Office of Archaeological Studies. A primary datum was established for each site. North-south and east-west baselines were laid out with the use of a transit and stadia rod. Stakes were placed at 2 m intervals depending on the size of the site along each baseline. A 1 by 1 m grid system was superimposed on each site. All surface artifacts and possible cultural features were marked with pin flags. Test pits measuring 1 by 1 m were then placed within the grid system at locations of high density or unusual artifacts, possible features, alignments or pit depressions, or areas of charcoal staining. Excavation in each pit continued until sterile soil was confirmed.

Artifacts within each test pit were collected in 10 cm levels and bagged by level. Surface areas around the test pit were collected. Diagnostic sherds, lithic artifacts, and ground stone were also collected by grid proveniences. Testing was conducted with shovels, picks, trowels, and brushes. All soil was screened through ¼ inch mesh screen. Augers were used in each test pit, if possible, to confirm the presence of sterile soil. Augering was also systematically used at 2 to 4 m intervals along site baselines to examine soils between test pits. Several flotation and pollen samples were taken for later analysis. Profiles were drawn when stratigraphic layering was visible, and photographs were taken of any cultural features encountered.

A site map was produced using the transit and stadia rod. Topographic variation, site elevations, drainages, test pit locations, site limits, and extent of the right-of-way were plotted on the maps. For sites not recommended for data recovery, artifacts were piece-plotted.

At one site (LA 45507), a backhoe was used to further test for subsurface cultural materials.

All excavations proceeded in depth until sterile soil was reached. Upon completion of the testing, all pits and trenches were backfilled. After testing, all artifacts were assigned a field specimen number by provenience. Lithic artifacts were analyzed in the laboratory by Lewis Kimmelman. The lithic data were then entered into a computer, and cross-tabulations were generated using the SPSS program. Too few ceramic artifacts were found to warrant statistical analysis; however, ceramics were monitored for vessel form, surface finish, and ceramic type. This analysis was also completed by Lewis Kimmelman and Christine Sterling. The few recovered ground stone artifacts were tabulated by type, material, and presence or absence of striations or shaping. All artifacts will be reexamined upon conclusion of the data recovery program, when additional material will justify detailed statistical analysis.

SITE DESCRIPTION

Site descriptions and evaluations are provided for each of the six sites examined during the testing program. The location of each site is shown on topographic maps in Appendix 1.

The relatively small sample size resulting from the testing program did not allow for complex statistical analyses. Consequently, artifact analysis consisted of the observation of several primary attributes. The lithic analysis monitored material type, cortex, platform type, and flake termination. Only the basic data is presented in the following site descriptions through cross-tabulations. The remaining data will be incorporated into the final report upon completion of the data recovery program. Ceramic analysis consisted of monitoring sherd type, form, and surface finish. Temper analysis, clay sourcing, and other attributes will be studied upon completion of site excavations. Ground stone was recorded by material type, shape, artifact type, profile, condition, and type of striations.

LA 45507 (Luna Village; Hough Site 66)

Site Type: Pithouse village.

Cultural Association: Mogollon, Three Circle phase, ca. A.D. 900 to 1000.

Land Status: Private and existing highway right-of way.

Elevation: 2,181 m (7,080 ft).

Description: This is a large pithouse village situated mostly on a low knoll overlooking the San Francisco River. Modern houses cut a swath through the site. Pottery fragments are concentrated in the northern portion of the site. Only the southern edge of the site extends into the existing right-of-way and continues across U.S. 180 to the south (Fig. 2).

The site measures 200 m north-south and 275 m east-west and covers 55,000 sq m. Approximately 20 percent of the site lies within the existing highway right-of-way. An irrigation ditch cuts through the north portion of the right-of-way. No new right-of-way is needed at this location. Work will be confined to the existing right-of-way.

Six 1 by 1 m test pits were hand excavated on the site. These were placed on level portions of the knoll and on flatter areas of the site surface. Test pits ranged in depth from 0.4 to 1.2 m below ground surface with an average depth of 0.6 m. Soil color ranged from 5 YR 2.5/2 (dark reddish brown) to 10 YR 5/4 (yellowish brown) on the Munsell color scale. Generally, artifacts extended throughout the loose, noncompacted fill of the test pits. Auger tests were conducted within each completed test pit to ensure that sterile soil had been reached.

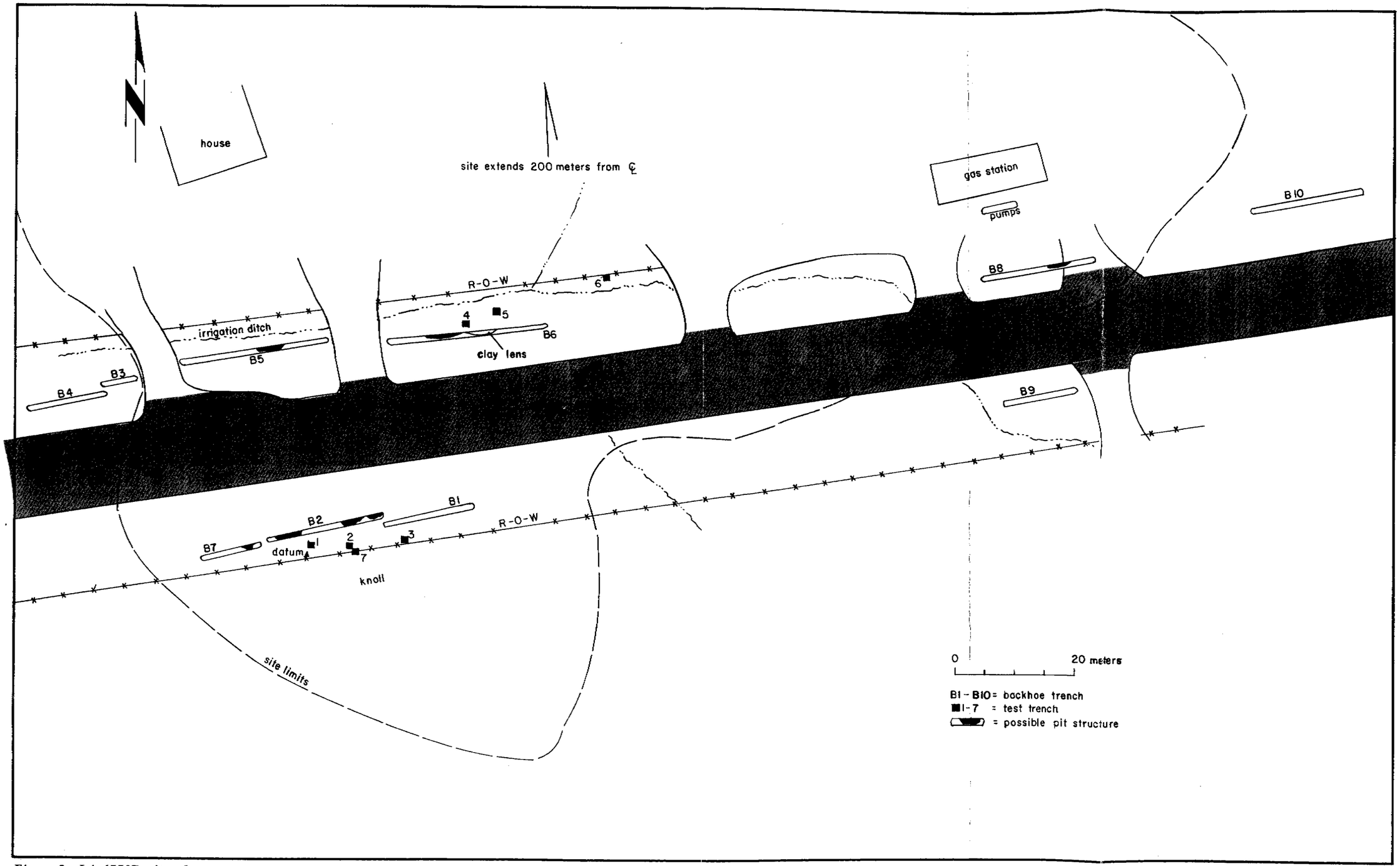


Figure 2. LA 45507, site plan

In Test Pit 5, artifacts extended over 1 m below the surface. We later ascertained that the test pit had been placed in a former stream channel. A clay lens was present in the stratigraphic profile of the pit, and the complete channel was present in Backhoe Trench 6 at a depth of 95 cm. It ranged in thickness from 2.5 to 10 cm. Modern historical artifacts were also found in the test pit, but in no others.

Ten backhoe trenches were placed within the right-of-way along the length of the site. All trenches were 70 cm wide. Each trench was excavated until a sterile red clay was reached. The dimensions of each trench and findings within them are detailed in Table 2.

Table 2. Backhoe Trench Results, LA 45507

Trench	*Length (m)*	*Maximum Depth (m)*	*Findings*
1	15.6	0.80	Dark topsoil to 0.4 m
2	19.8	1.25	Three pit structures
3	4.8	1.25	Sterile
4	13.0	1.00	Sterile
5	25.0	1.10	One pit structure
6	25.5	1.25	One pit structure
7	9.8	1.05	One storage pit
8	18.8	0.85	One pit structure
9	15.0	0.80	Sterile
10	19.0	0.70	Sterile

Four of the backhoe trenches on the northwest and east ends of the potential site area were sterile. However, six of the trenches revealed the presence of pit structures or darkened soil. Ground stone, artifacts, large pieces of charcoal, and burned soil were present in the cuts. A partial brown ware vessel was recovered from Test Pit 8. Five of the pit structures are probably habitation units, while one appears to be a small pit measuring 0.9 m wide and 0.65 m deep. The habitation units range from 2.3 to 6.0 m wide (mean=4.3 m) in the backhoe cut. Depths vary from 0.7 to 1.1 m (mean=0.88 m).

A total of 853 artifacts were retrieved from the site. These include 161 lithic artifacts, 674 sherds, 16 pieces of ground stone, and 2 pieces of animal bone. The lithic assemblage, mostly chalcedony and chert, includes 14 utilized flakes or tools (Table 3). Ceramics include Alma brown wares, San Francisco Red, Mimbres Boldface, Three Circle Red-on-white, and numerous corrugated wares. The ground stone includes one- and two-hand manos, slab and trough metates, and a mortar. The two bone fragments include a long bone diaphysis from a large mammal and a navicular cuboid from a Bovidae.

Table 3. Lithic Artifacts, LA 45507

Artifact Type *Number* *Row Percent* *Column Percent*	*Chert, undiff.*	*Chalcedony*	*Silicifed wood, undiff.*	*Quartz*	*Obsidian, undiff.*	*Basalt*	*Rhyolite*	*Welded tuff*	*Siltstone*	*Total*
Core flake	26	42			18		6	2	1	95
Unutilized	26.0	42.0			18.0		6.0	2.0	1.0	95.0
	61.9	60.9			62.1		75.0	50.0	33.3	59.0
Utilized	2	3								5
	2.0	3.0								5.0
	4.8	4.3								3.1
Biface flake		2			4					6
Unutilized		33.3			66.7					100.0
		2.9			13.8					3.7
Angular debris	13	13		4		1	2	2	2	37
Unutilized	35.1	35.1		10.8		2.7	5.4	5.4	5.4	100.0
	31.0	18.8		100.0		100.0	25.0	50.0	66.7	23.0
Resharpening flake		1			3					4
Unutilized		25.0			75.0					100.0
		1.4			10.3					2.5
Notching flake		2								2
Unutilized		100.0								100.0
		2.9								1.2
Core, undiff.		1								1
Unutilized		100.0								100.0
		1.4								0.6
Multidirectional core		2								2
Unutilized		100.0								100.0
		2.9								1.2
Uniface, undiff.			1							1
Scraper, undiff.			100.0							100.0
			100.0							0.6

Table 3 (continued)

Artifact Type *Number* *Row Percent* *Column Percent*	*Chert, undiff.*	*Chalcedony*	*Silicifed wood, undiff.*	*Quartz*	*Obsidian, undiff.*	*Basalt*	*Rhyolite*	*Welded tuff*	*Siltstone*	*Total*
Uniface, early stage End scraper		1 100.0 1.4								1 100.0 0.6
Uniface, middle stage Side scraper		1 33.3 1.4								1 33.3 0.6
Thumbnail scraper					1 33.3 3.4					1 33.3 0.6
Unidentified corner-notched point		1 33.3 1.4								1 33.3 0.6
Biface, late stage Drill					1 25.0 3.4					1 25.0 0.6
Unidentified projectile point	1 25.0 2.4									1 25.0 0.6
Unidentified corner-notched point					1 25.0 3.4					1 25.0 0.6
Pueblo side-notched point					1 25.0 3.4					1 25.0 0.6
Total	42	69	1	4	29	1	8	4	3	161

Evaluation: The six pit structures found in the backhoe trenches indicate the presence of a large Three Circle-phase pithouse village of the Mogollon Culture. More pit units are undoubtedly present within the right-of-way. This site was first investigated by Hough in 1907; however, site information is scanty on this large site. This is a late pithouse community, and information gathered from this site would allow for comparison with earlier pithouse sites on this and nearby projects. The site is likely to yield important information on the Late Pithouse period in the region. Additional excavation is recommended, if proposed construction proceeds.

LA 45508 (Humming Wire Site)

Site Type: Lithic artifact scatter with pits.

Cultural Association: Possible Late Archaic, ca. 1500 B.C. to A.D. 200/ Early Pithouse Period (Pinelawn phase), ca. A.D. 200 to 400.

Land Status: Private and existing highway right-of-way.

Elevation: 2,145 m (7,040 ft).

Description: This site consists of a lithic artifact scatter cut by U.S. 180, with two Pueblo room blocks on hills directly to the east and west of the lithic scatter. Only the lithic artifact area is within the proposed right-of-way limits (Fig. 3). Lithic artifacts are located on both sides of U.S. 180. They consist of mostly chalcedony and chert flakes and angular debris. Tools found include five projectile points: two Archaic-like, one late Archaic (San Pedro), and one unidentified. Bifaces and unifacially flaked tools were also present. The total number of lithic artifacts collected was 219 (Table 4). A few sherds of Reserve Black-on-white, Alma Plain, and San Francisco Red (N=29) were present on the site surface and are believed to have washed downslope from the nearby Pueblo fieldhouse, although the Alma Plain sherds may be associated with the lithic scatter. Ten pieces of ground stone were recovered: several mano fragments, a one-hand mano, and three basin metate fragments. A single long bone fragment from a medium-size mammal was recovered. In all, 259 artifacts were recovered.

The site measures 60 m north-south by 55 m east-west and covers 3,300 sq m. Approximately 60 percent of the site lies within the proposed right-of-way. The south edge of the site has been cut by a powerline transmission station. Seven test pits were excavated. Test pits varied in depth from 20 cm to 50 cm. Soil color varied from 5 YR 4/3 (reddish brown) to 10 YR 4/3 (brown/dark brown) on the Munsell color scale. Excavations stopped when a clayey, sterile soil was reached at an average depth of 35 cm. Auger tests in each excavation unit confirmed that cultural fill had ended. In addition, 21 auger tests were placed systematically over portions of the site at 2 m intervals. These reached an average depth of 47 cm.

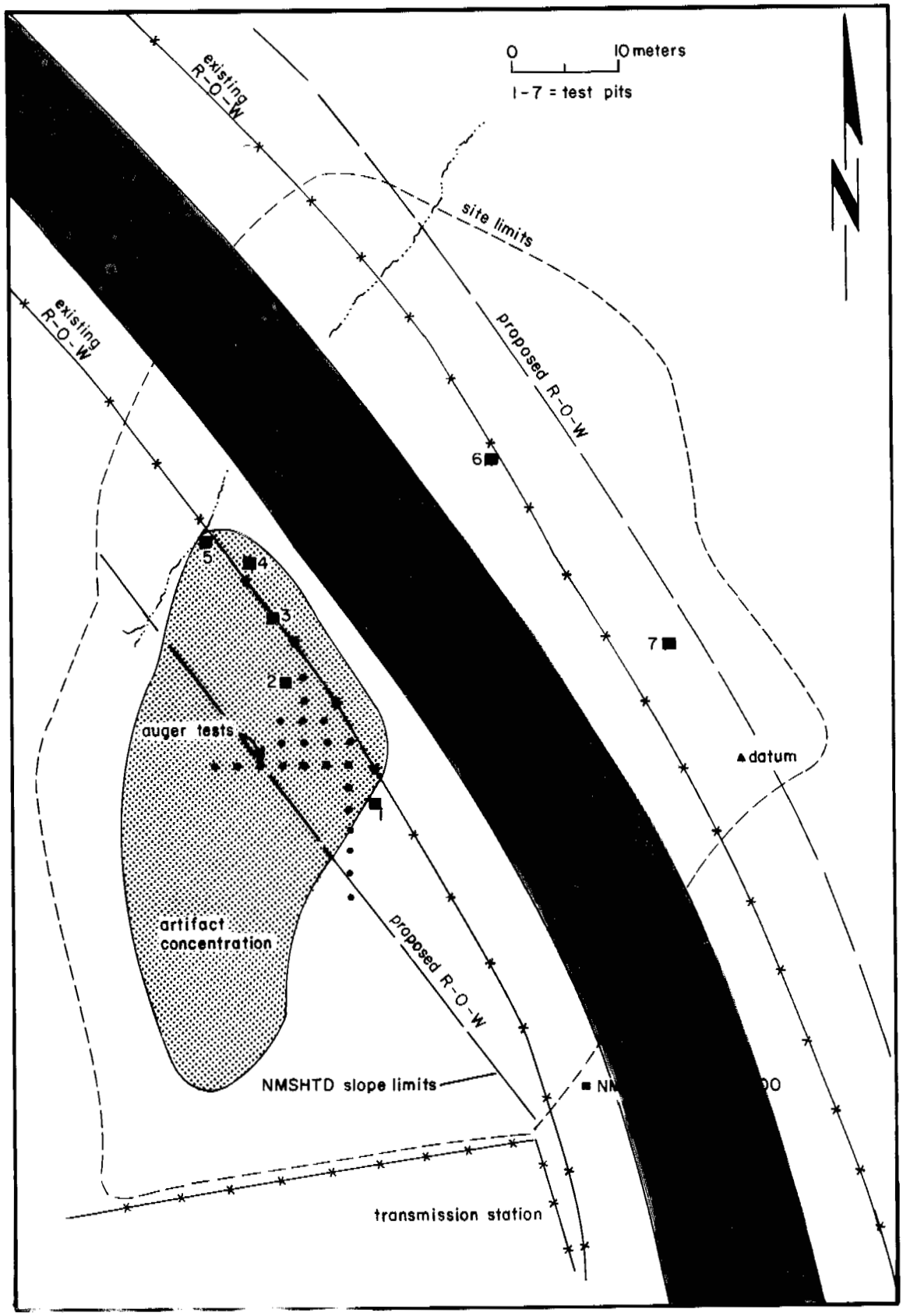


Figure 3. LA 45508, site plan

Table 4. Lithic Artifacts, LA 45508

Artifact Type *Number* *Row Percent* *Column Percent*	*Cheri, undiff.*	*Alibates cheri*	*Chalcedony*	*Silicified wood, undiff.*	*Quartzite, undiff.*	*Obsidian, undiff.*	*Basalt*	*Rhyolite*	*Welded tuff*	*Siltstone*	*Total*
Core Flake Utilized	12 46.2 80.0		9 34.6 69.2			2 7.7 40.0	2 7.7 66.7	1 3.8 100.0			26 100.0 70.3
Angular debris Utilized			1 100.0 7.7								1 100.0 2.7
Uniface, early stage Scraper, undiff.			1 100.0 7.7								1 100.0 2.7
Biface, undiff. Biface, undiff.						1 100.0 20.0					1 100.0 2.7
Biface, early stage Biface, undiff.			1 100.0 7.7								1 100.0 2.7
Biface, late stage Biface, undiff.	1 14.3 6.7						1 14.3 33.3				2 28.6 5.4
Unidentified projectile point	1 14.3 6.7					1 14.3 20.0					2 28.6 5.4
Unidentified Archaic point	1 14.3 6.7					1 14.3 20.0					2 28.6 5.4
San Pedro point			1 14.3 7.7								1 14.3 2.7
Total	74	2	113	1	3	10	5	11	1	2	219

In Test Pit 2, a compacted surface was found at 38 cm below the present ground surface. Artifacts continued throughout the fill down to this level. On this surface was a core, a one-hand mano, and a large sherd of Alma Plain. This excavation unit may be a pit or pit structure. Other test units uncovered no other cultural features, but dark, charcoal-flecked soil appeared in four of the test pits on the west side of U.S. 180.

Evaluation: The presence of Archaic-like projectile points and a few sherds of Alma Plain brown ware suggest the site may be a Late Archaic or Early Pithouse (Pinelawn-phase) occupation. There is a strong possibility that pithouses are present on the site. If this site does represent a transition from Archaic to pithouse adaptions, it will yield important information on the prehistory of the region. If proposed construction proceeds, archaeological excavation is recommended.

LA 45510 (SAK Site; Forest Service Site 56)

Site Type: Pithouse complex.

Cultural Association: Mogollon, Three Circle phase, ca. A.D. 900-1000.

Land Status: Apache National Forest.

Elevation: 2,158 m (7,080 ft).

Description: This large sherd and lithic artifact scatter sits on the crest of a high ridge cut by U.S. 180 (Fig. 4). Twelve small depressions (2-4 m in diameter) dot the site, which measures 140 m north-south by 60 m east-west (6,700 sq m). About 60 percent of the site lies within the proposed highway right-of-way. Two Mogollon pueblos, east and west of the site, are considered part of LA 45510, but they are well outside of the project limits.

Thirteen test pits were hand excavated on the site. They were placed both within and outside of the small depressions. Test pits ranged in depth from 19 cm to 56 cm below ground surface with an average depth of 35 cm. The soil color ranged from 5 YR 4/6 (yellowish red) to 7.5 YR 3/4 (dark brown) on the Munsell scale.

The test pits indicate that cultural materials extend for at least 20 cm below the surface. Three of the test pits were completely sterile (11, 12, and 13). The six test pits placed within the depressions (1, 2, 3, 11, 12, and 13) found no pit structures. After discussion with a Forest Service archaeologist, it was determined that the depressions represented areas where trees had been removed. However, placement of new test units outside of the depressions revealed possible pit structures in Test Pits 5 and 8. In Test Pit 5, a possible posthole was uncovered at 20 cm. It measured 8 by 8.75 cm, with a depth of 2.5 cm. The hole was surrounded by a ring of lightly burned soil, and it was filled with sand. Test Pit 8 revealed the sloping wall of a probable pithouse. Artifacts were varied and numerous in this area.

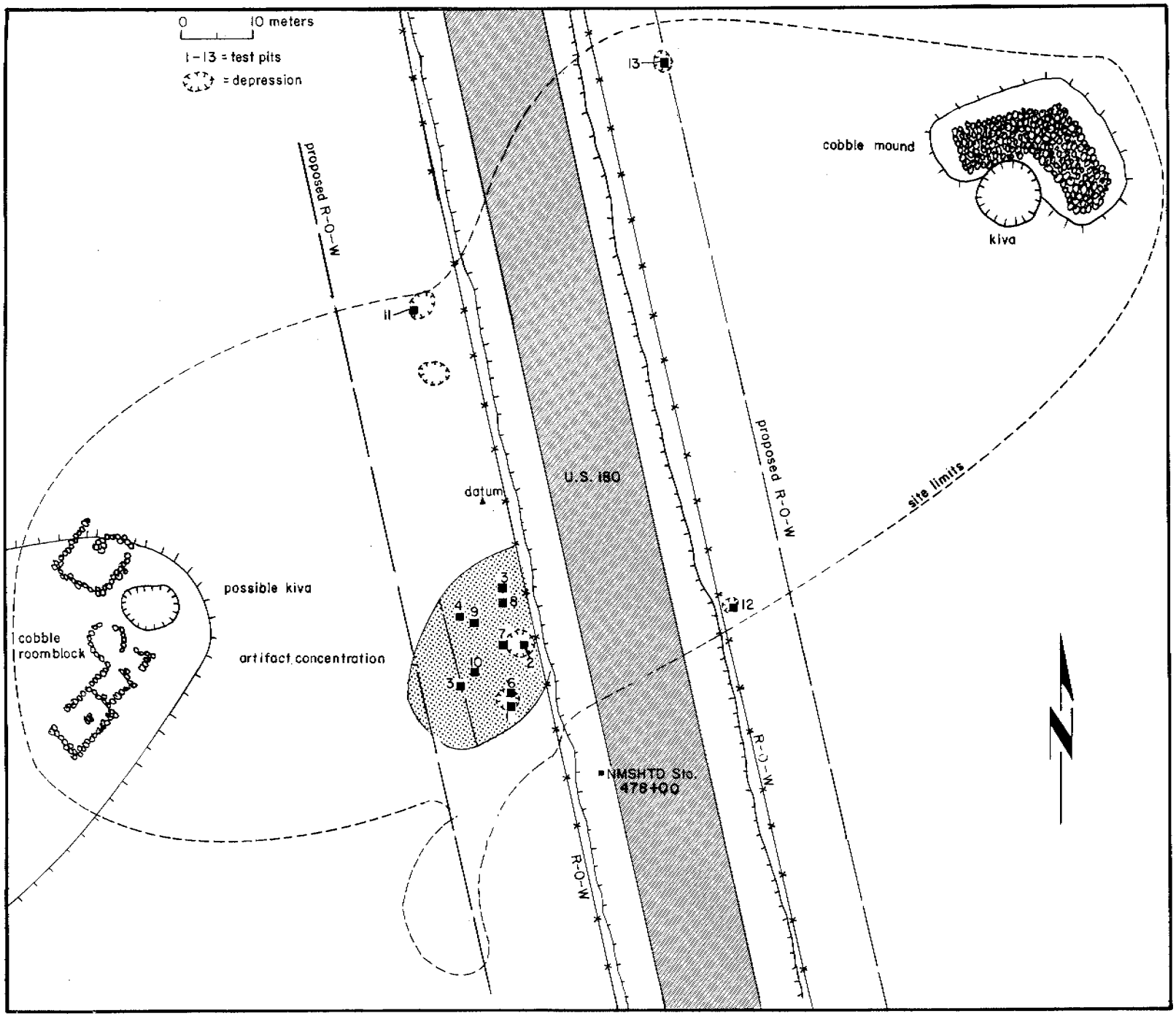


Figure 4. LA 45510, site plan

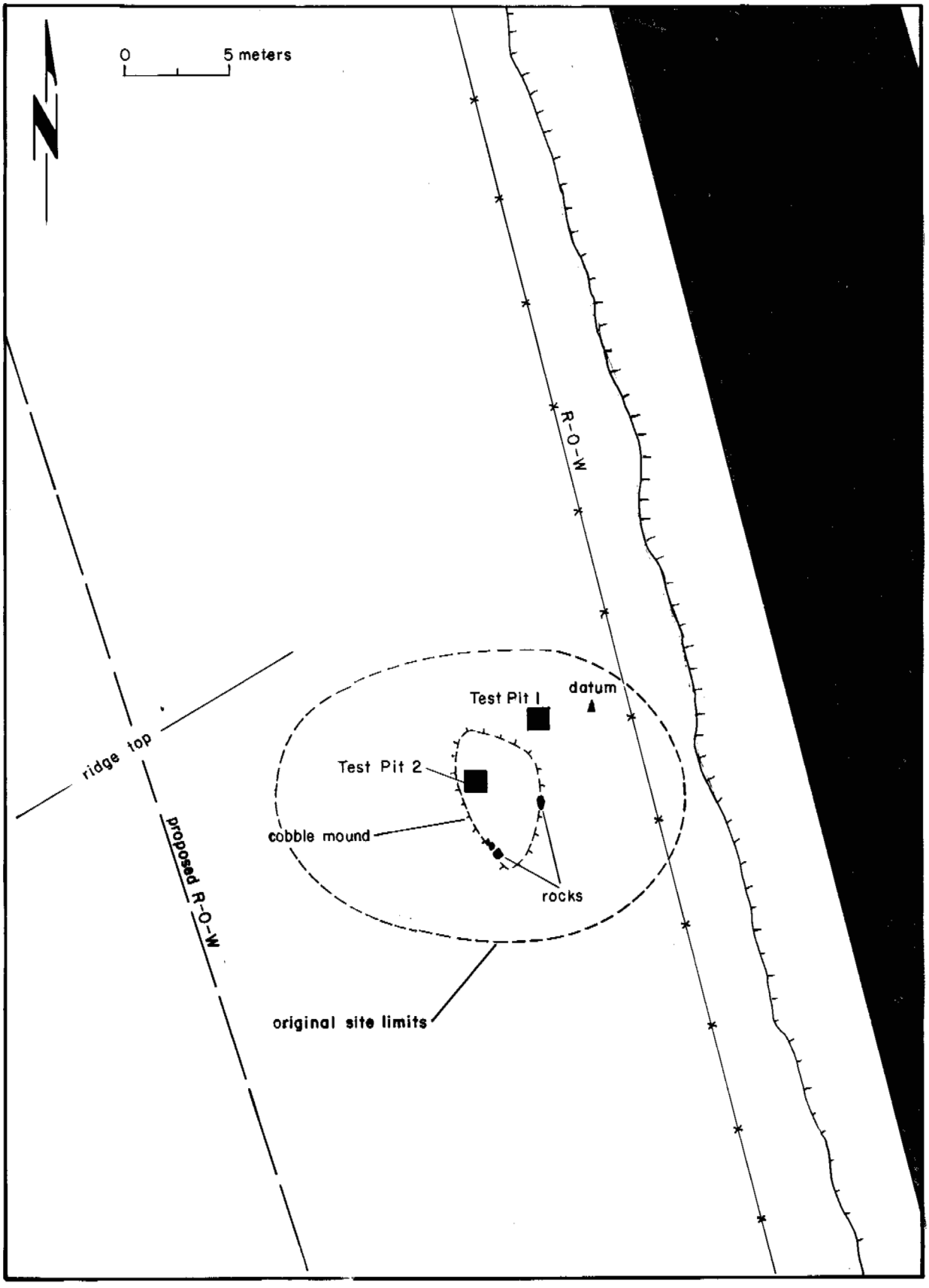


Figure 5. LA 70184, area plan

A total of 1,012 artifacts were recovered from the test pit areas on the site. There were 211 lithic artifacts, 800 sherds, and a single ground stone fragment of vesicular basalt. The lithic assemblage was mostly chalcedony and chert. Bifaces, unifaces, and three projectile points were found. Two are unidentified, and one is a small, side-notched point (Table 5). Ceramics include Alma brown wares; San Francisco Red; a variety of corrugated brown wares, including incised Three Circle Neck Banded; and a spindle whorl of Alma Plain.

Evaluation: This site probably contains several pithouse structures. Artifacts are numerous and varied, indicating a possible long-term occupation. The SAK site may be contemporary with Luna Village. It has the potential to yield important comparative information on the prehistory of the region. If proposed construction proceeds, additional investigations are recommended.

LA 70184

Site Type: Cobble pile.

Cultural Association: None.

Land Status: Apache National Forest.

Description: The site consists of a single 10 by 6 m mound of cobbles, once thought to be cultural in nature, on top of a ridge (Fig. 5). Two test pits were excavated, one within the cobble mound and one immediately outside of the mound. They were dug to 20 and 40 cm. Both proved to be culturally sterile before reaching a clay soil. Munsell colors were 7.5 YR 3/4 (dark brown) and 10 YR 3/3 (dark brown).

Three artifacts were recovered from the surface around the mound. They include two sherds of Alma Plain and one utilized chalcedony core flake.

Evaluation: Because of the lack of cultural depth and sparseness of artifacts, this area should not be considered a site. Forest Service personnel have suggested the cobble pile was a result of recent brush pilings. The sherds likely derived from a Pueblo-period room block that is not within the project limits. No further archaeological work is recommended.

LA 70185 (DZ Site)

Site Type: Cobble room block.

Cultural Association: Mogollon, Tularosa phase, ca. A.D. 1100 to 1350.

Land Status: Apache National Forest.

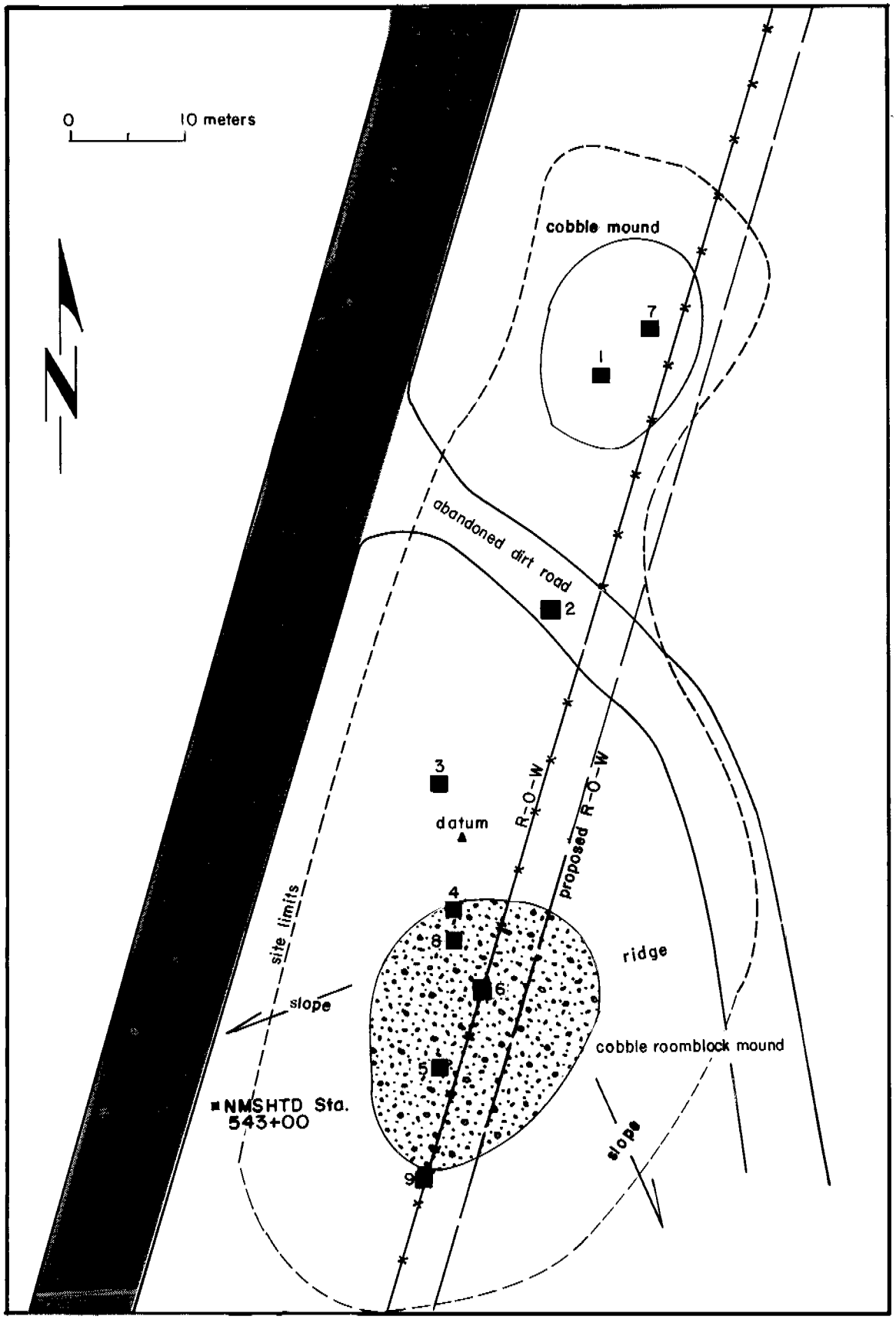


Figure 6. LA 70185, site plan

Table 5. Lithic Artifacts, LA 45510

Artifact Type *Number* *Row Percent* *Column Percent*	*Chert, undiff.*	*Chalcedony*	*Silicified wood, undiff.*	*Quartzitic sandstone*	*Obsidian, undiff.*	*Basalt*	*Rhyolite*	*Siltstone*	*Total*
Core Flake Utilized	4 40.0 100.0	3 30.0 75.0					2 20.0 100.0	1 10.0 100.0	10 100.0 71.4
Biface Flake Utilized		1 100.0 25.0							
Biface, late stage Unidentified projectile point Pueblo side-notched point					2 66.7 66.7 1 33.3 33.3				
Total	105	37	1	2	6	1	28	11	211

Elevation: 2,191 m (7,190 ft).

Description: The site lies on top of a small finger ridge overlooking an intermittent stream. The outlines of six to ten cobble-lined rooms are visible on the surface (Fig. 6). A unused dirt road bisects the north edge of the site. A smaller cobble mound lies north of this road within the proposed right-of-way.

The site measures 45 m north-south by 40 m east-west. Its area is 1,440 sq m. Approximately 75 percent of the site is within the proposed right-of-way.

Nine test pits were excavated on the site. Depths of excavations ranged from 20 to 50 cm below the surface, with an average depth of 35 cm. Soil color varied from 5 YR 3/2 (dark reddish brown) to 10 YR 2/2 (very dark brown) on the Munsell scale. The test pits found no architectural features on the side slopes of the ridge, but room alignments are present on top of the ridge. Tests in the small cobble area to the north were inconclusive. In the cobble alignments, Test Pit 5 reached a depth of 50 cm below ground before reaching a probable floor surface. Lithic artifacts, sherds, burned wood, and a spindle whorl were present in this pit.

A total of 573 artifacts, including 110 lithic artifacts, 460 sherds, and 3 pieces of ground stone were collected from the test pits. Lithic materials recovered were mostly chert, chalcedony, and rhyolite. Most lithic items were unutilized core flakes and angular debris (Table 6). One side scraper and a projectile point were found. The ceramic assemblage includes plain and smudged brown ware, Tularosa Patterned Corrugated, Reserve Black-on-white, and indeterminate white wares. Ground stone consists of one mano, a basin metate, and an indeterminate fragment.

Evaluation: The DZ Site consists of a six to ten room pueblo of the Tularosa phase. It is the only site of this period included in this data recovery plan. As such, it is important for examining variation in subsistence adaptations between this phase and the immediately preceding Reserve phase. If proposed construction proceeds, additional study of this site is recommended.

LA 70187 (Twisted Knee Site; Forest Service Site 89)

Site Type: Mogollon, Reserve phase, ca. A.D. 1000 to 1100.

Land Status: Apache National Forest.

Elevation: 2,182 m (7,160 ft).

Description: Two Reserve phase fieldhouses sit on a low knoll 45 m west of the proposed right-of-way edge. An extensive sherd and lithic artifact scatter extends downslope from these structures toward the right-of-way (Fig. 7). A deeply cut intermittent drainage near the right-of-way edge seems to have effectively stopped the further spread of artifacts.

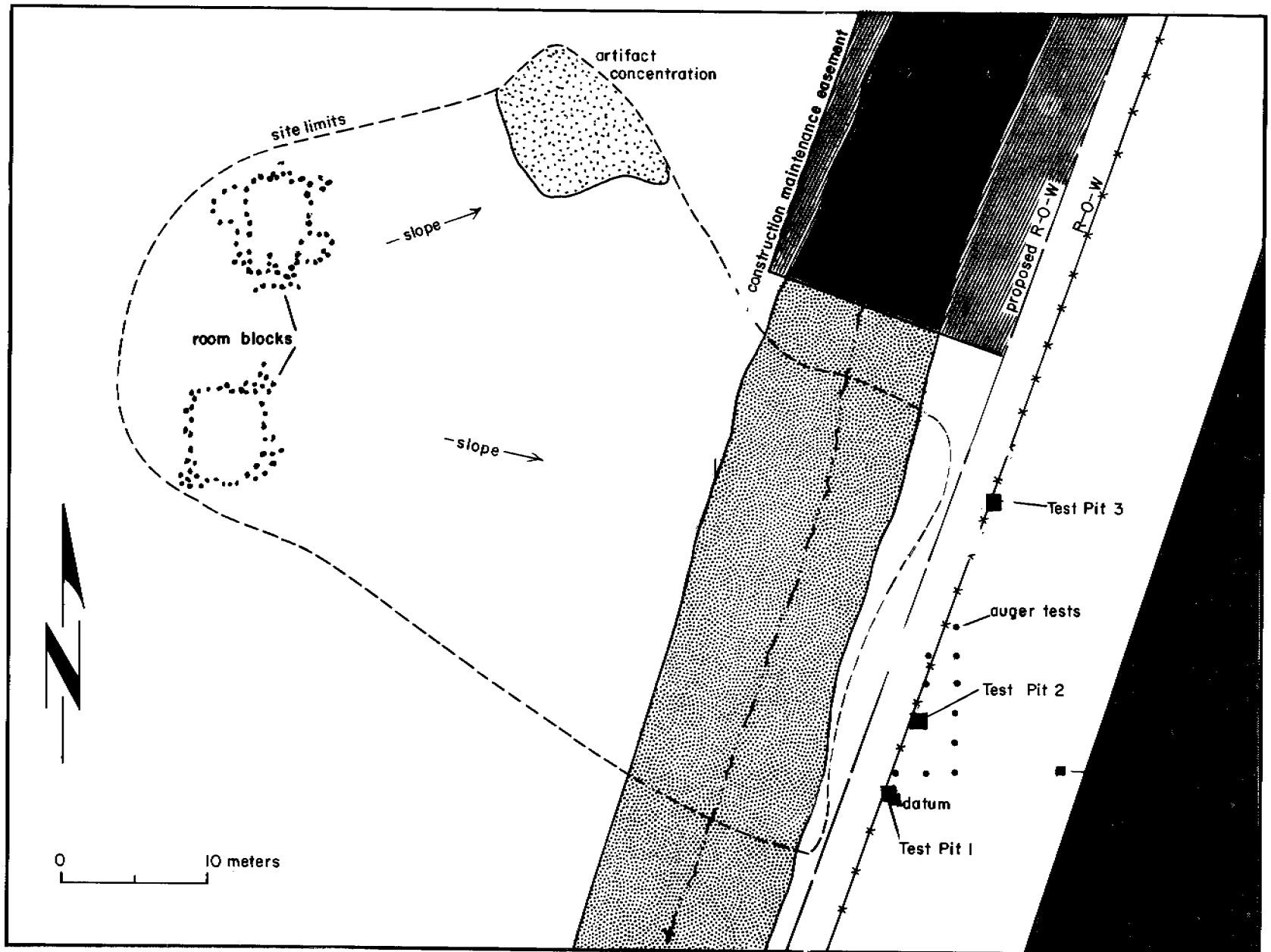


Figure 7. LA 70187, site plan

Table 6. Lithic Artifacts, LA 70185

Artifact Type *Number* *Row Percent* *Column Percent*	*Chert, undiff.*	*Chalcedony*	*Silicified wood, undiff.*	*Igneous, undiff.*	*Basalt*	*Rhyolite*	*Welded tuff*	*Siltstone*	*Total*
Core flake Unutilized	25 30.1 58.1	21 25.3 70.0	1 1.2 100.0	4 4.8 80.0	5 6.0 100.0	12 14.5 60.0	4 4.8 80.0		72 86.7 65.5
Utilized	7 8.4 16.3	3 3.6 10.0				1 1.2 5.0			11 13.3 10.0
Angular debris Unutilized	8 34.8 18.6	5 21.7 16.7		1 4.3 20.0		5 21.7 25.0	1 4.3 20.0	1 4.3 100.0	21 91.3 19.1
Utilized	2 8.7 4.7								2 8.7 1.8
Notching flake Unutilized						1 100.0 5.0			1 100.0 0.9
Multidirectional core Hammerstone						1 100.0 5.0			1 100.0 0.9
Uniface, undiff. Side scraper	1 100.0 2.3								1 100.0 0.9
Biface, late stage Unidentified projectile point		1 100.0 3.3							1 100.0 0.9
Total	5	20	5	1	43	30	1	5	110

A 3.5 m wide depression extends into the proposed right-of-way. The site measures 50 m north-south by 80 m east-west and covers 3,200 sq m. The proposed right-of-way lies just outside of the eastern limits of the site.

Three test pits were hand-excavated within the proposed construction area. They ranged in depth from 30 to 60 cm, with an average depth of 44 cm. Soil color ranged from 7.5 YR 3/2 (dark brown) to 10 YR 4/4 (dark yellowish brown) on the Munsell scale. Soil was generally dark and loamy, alluvial in nature. Also, 11 auger tests were excavated on the site ranging from 10 cm to 1.25 m deep, with an average depth of 52 cm.

Test Pit 3 was placed next to the possible pithouse depression. No charcoal or soil anomalies indicated the presence of a pit structure. At 30 cm, sterile soil was reached.

A total of three artifacts were recovered from the test excavations: two ground stone artifacts and one sherd. The ground stone consisted of a one-hand mano recovered from just under the ground surface in the Test Pit 3. Another ground fragment was found near the surface in Test Pit 1. A single white ware sherd was collected from the surface.

Evaluation: The eastern edge of LA 70187 does not extend into the proposed right-of-way. The few artifacts recovered and the lack of cultural fill in the test pits indicate that cultural material likely to yield important information are not present within the proposed right-of-way. Therefore, we believe that no further archaeological work within the right-of-way is necessary. However, artifacts and cobble structures do exist outside of the right-of-way. It is possible that this outside area has the potential to yield important information on local prehistory.

DISCUSSION

The sites tested within the project area range from the Late Archaic (ca. 1500 B.C., San Pedro phase of the Cochise Culture) through the Tularosa phase (A.D. 1100-1350) of the Mogollon culture. Testing revealed numerous pits or pithouses, room blocks, potential hearths, and use-surface areas. Four of the six sites have intact features within existing and proposed highway rights-of-way. It is anticipated that several of the sites will yield datable remains through absolute methods such as archaeomagnetic sampling, radiocarbon analysis, or obsidian hydration, and secondary dating through projectile point and ceramic typologies and architectural style.

Analysis of artifacts recovered from the testing program was purposely kept to a minimum during this phase of the project. Detailed studies will be performed on this material upon completion of the proposed data recovery program.

A total of 2,704 artifacts were collected on the tested sites. These include 1,967 ceramic artifacts, 32 pieces of ground stone, 3 bone fragments, and 702 lithic artifacts. Tabulations of artifact frequencies and ceramic vessel forms are shown in Tables 7 through 12.

Table 7 indicates that most ceramics are Alma Plain or a variant of this type. The Alma series is a poor temporal indicator because it occurs from the earliest pithouse period, A.D. 200-300, through A.D. 1300. The more temporally diagnostic sherds, such as Reserve Black-on-white, Mimbres Boldface (Style I), and White Mound Black-on-white are rare. Although we have used them to assign Mogollon phases, we are aware that some site classifications may be rather tenuous and could shift slightly upon further archaeological work. Ceramic dates employed for this project are given below. Dates are those suggested at the 1989 New Mexico Archaeological Council Conference on Southwestern New Mexico Ceramics.

Alma Plain/variants	A.D. 250-1300
Mogollon Red-on-brown	A.D. 650-950
Three Circle Red-on-white	A.D. 700
Mimbres Boldface	A.D. 750-900
Reserve Smudged	A.D. 950-1130
Reserve Black-on-white	A.D. 950-1000

Only 32 pieces of ground stone were collected from project sites (Table 9). More were observed outside of right-of-way limits during testing. There is a range in material types and specific artifact types. Future ground stone studies will focus on these variations and their implied functions.

The lithic artifacts represent material types that are almost all locally available (Table 10), with the possible exception of obsidian. While several obsidian sources are known approximately 56 km (35 mi) distant, such as Mule Creek to the south and Red Hill to the north, we believe we have identified at least one closer source, near Gwynn

Table 7. Ceramic Frequencies

Ceramic Type	*LA 45507*	*LA 45508*	*LA 45510*	*LA 70184*	*LA 70185*	*LA 70187*	*Total*
Alma Plain	275	7	319	2	83		686
Alma Polished	226	16	282		224		748
Alma Neckbanded	12		1				13
Smudged Interior	27		25		37		89
Smudged Exterior	5						5
Indeterminate brown wares					2		2
Corrugated	31		89		46		166
Exuberant Corrugated			1				1
Incised	7		3		15		25
Incised Corrugated			1				1
Tularosa Patterned Corrugated					26		26
San Francisco Red	6	4	45		10		65
Reserve Smudged	4						4
Reserve Black-on-white	3	2	1		5		11
Mimbres Boldface	48				1		49
Three Circle Red-on-white	4		1				5
White Mound Black-on-white	4		1				5
Kiatuthlanna Black-on-white			1				1
Undiff. black-on-whites	5		1				6
Undiff. white wares	17		29		11	1	58
Total	674	29	800	2	460	1	1967

Table 8. Vessel Forms

LA Number	*Bowl*	*Jar*	*Indeterminate*	*Total*
45507	234	349	91	674
45508	15	14		29
45510	237	458	105	800
70184	1	1		2
70185	217	236	8	461
70187			1	1
Total	704	1057	205	1967

Table 9. Ground Stone

LA Number	*FS Number*	*Material Type*	*Shape*	*Artifact Type*	*Profile*	*Condition*	*Striation*	*Comments*
45510	389	vesicular basalt	indeterminate	indeterminate	flat	fragment	indeterminate	
70185	632a	quartzitic sandstone	indeterminate	indeterminate	flat	fragment	indeterminate	core flake
70185	521	sandstone	indeterminate	basin metate	flat/concave	fragment	unidirectional	
70185	572	quartzitic sandstone	subrectangular	mano	convex/faceted	fragment	unidirectional	pecking
45508	254	chalcedony	circular	hammerstone	convex	whole	none	
45508	261	vesicular basalt	indeterminate	mano	concave/faceted	fragment	indeterminate	reddened
45508	236	quartzitic sandstone	oval	one-hand mano	flat	whole	bidirectional	pecking
45508	292	vesicular basalt	indeterminate	basin metate	flat	fragment	indeterminate	shallow basin
45508	293	vesicular basalt	indeterminate	basin metate	flat/concave	fragment	indeterminate	shallow basin
45508	293	vesicular basalt	indeterminate	indeterminate	flat/convex	fragment	indeterminate	
45508	313	vesicular basalt	oval	indeterminate	concave/convex	fragment	indeterminate	
45508	298	vesicular basalt	indeterminate	basin metate	flat	fragment	indeterminate	
45508	269	vesicular basalt	indeterminate	indeterminate	flat	fragment	multidirectional	
45508	255	vesicular basalt	oval	mano	flat/convex	fragment	unidirectional	pecking
70187	635	quartzitic sandstone	indeterminate	indeterminate	flat	fragment	indeterminate	
70187	634	vesicular basalt	rectangular	one-hand mano	flat/faceted	whole	unidirectional	pecking
45507	219	vesicular basalt	oval	two-hand mano	flat/convex	whole	multidirectional	reddened
45507	214	rhyolite	indeterminate	trough metate	convex	fragment	unidirectional	
45507	218	vesicular basalt	subtriangular	slab metate	flat	whole	unidirectional	charcoal stained
45507	216	vesicular basalt	subtriangular	slab metate	flat	whole	unidirectional	reddened
45507	206	vesicular basalt	indeterminate	indeterminate	convex	fragment	multidirectional	
45507	206	vesicular basalt	indeterminate	indeterminate	flat	fragment	indeterminate	

Table 9 (continued)

LA Number	*FS Number*	*Material Type*	*Shape*	*Artifact Type*	*Profile*	*Condition*	*Striation*	*Comments*
45507	206	sandstone	indeterminate	indeterminate	flat	fragment	unidirectional	
45507	206	sandstone	subrectangular	one-hand mano	flat/faceted	whole	unidirectional	pecking
45507	207	basalt	triangular	axe	wedge	whole	multidirectional	use wear (light)
45507	217	rhyolite	irregular	slab metate	flat	whole	multidirectional	charred
45507	32	rhyolite	subrectangular	two-hand mano	faceted	fragment	bidirectional	
45507	175	quartzitic sandstone	loaf	one-hand mano	convex	whole	multidirectional	charred
45507	222	quartzitic sandstone	indeterminate	indeterminate	flat/faceted	fragment	indeterminate	
45507	43	granite	indeterminate	indeterminate	flat	fragment	indeterminate	
45507	232	sandstone	indeterminate	mortar	concave	fragment	indeterminate	
45507	223	vesicular basalt	square	one-hand mano	flat/faceted	whole	multidirectional	

Table 10. Lithic Artifact Types

Material Type *Number* *Row Percent* *Column Percent*	*LA Number*					*Total*
	45507	*45508*	*45510*	*70184*	*70185*	
Chert, undiff.	42 15.9 26.1	74 28.0 33.8	105 39.8 49.8		43 16.3 39.1	264 100.0 37.6
Alibates chert		2 100.0 0.9				2 100.0 0.3
Chalcedony	69 25.8 42.9	110 41.2 50.2	57 21.3 27.0	1 0.4 100.0	30 11.2 27.3	267 100.0 38.0
Silicified wood, undiff.	1 25.0 0.6	1 25.0 0.5	1 25.0 0.5		1 25.0 0.9	4 100.0 0.6
Quartzite, undiff.		3 100.0 1.4				3 100.0 0.4
Quartzitic sandstone			2 100.0 0.9			2 100.0 0.3
Quartz	4 100.0 2.5					4 100.0 0.6
Obsidian, undiff.	29 64.4 18.0	10 22.2 4.6	6 13.3 2.8			45 100.0 6.4
Igneous, undiff.					5 100.0 4.5	5 100.0 0.7
Basalt	1 8.3 0.6	5 41.7 2.3	1 8.3 0.5		5 41.7 4.5	12 100.0 1.7
Rhyolite	8 11.9 5.0	11 16.4 5.0	28 41.8 13.3		20 29.9 18.2	67 100.0 9.5
Welded tuff	4 40.0 2.5	1 10.0 0.5			5 50.0 4.5	10 100.0 1.4
Siltstone	3 17.6 1.9	2 11.8 0.9	11 64.7 5.2		1 5.9 0.9	17 100.0 2.4
Total	161	219	211	1	110	702

Canyon, 32 km (20 mi) to the east. This source was initially located by W. H. Wills during recent field sessions at the SU site.

Although the lithic material types seem generally the same on all sites, the proportions employed at different sites is intriguing. We may be seeing temporal variations in material type selection. Excavation would allow us to examine this trend statistically. We will also look at changing material type selection as sites progress north through Pine Lawn Valley to the Luna Valley.

Differences in platform preparation on flakes (not shown in tables) also seem to be evident between nonceramic and ceramic sites. The frequencies observed are so low, however, that we hesitate to make even broad generalizations at this point.

Few diagnostic lithic artifacts are represented in the collected assemblage. Most of these consist of projectile points, although the number of biface flakes suggests manufacture of formalized tools. The projectile points and bifaces range from the Late Archaic through the Mogollon period. When placing these points within a temporal framework, we noted disagreements among researchers, particularly when classifying Archaic points. Agustin points are termed Middle Archaic (ca. 4000-1000 B.C.) by Wills (1988a); however, Dick (1965:32) places them on the interface between Middle and Late Archaic, at 1000 B.C. to approximately 50 B.C. Likewise, San Pedro points were first classified by Sayles and Antevs (1941) and dated from 1500 to 200 B.C. Recently, Upham et al. (1986:84) suggest they may extend to A.D. 1050 in southern New Mexico. We have used a Late Archaic designation for this point type. This disparity in dates makes temporal classification of sites based on projectile point typology a poor choice. However, this is what we have done in several instances because of a lack of other available dating techniques. We expect, therefore, that site classifications based on morphologies of projectile points could vary with further excavation.

Six prehistoric sites were tested by the Office of Archaeological Studies for NMSHTD Project F-013-2(4). Four of these sites (LA 45507, LA 45508, LA 45370, and LA 70185) have extensive subsurface remains, possibly including formal features, and are likely to yield important information on the prehistory of the region. LA 70187 was found to have no subsurface remains and minimal artifacts within the proposed project limits, but significant materials may be present in other portions of the site. No further archaeological work is recommended within proposed project limits. LA 70184 proved not to be a site. Table 11 summarizes site recommendations for the project.

Table 11. Site Recommendations for Project Area

Data Recovery	*No Further Work*
LA 45507	LA 70184
LA 45508	LA 70187
LA 45510	
LA 70185	

The following section presents a data recovery plan for the portions of LA 45507, LA 45508, LA 45510, and LA 70185 within the proposed project limits.

DATA RECOVERY PLAN

Theoretical Orientation

The four sites within the proposed project area range in time from the Late Archaic (ca. 1500 B.C. to A.D.200) through pithouse occupations to Pueblo sites dating to approximately A.D. 1350. Because of the continuum in site types and periods, we believe that the sites have the ability to answer important archaeological questions regarding mobility strategies in the Mogollon Highlands as influenced by the adoption of an increasing reliance on agriculture.

The research design may be set forth in a single premise: In the Mogollon Highlands, if there is a continuum from full mobility in the Archaic period to becoming highly sedentary by the Pueblo period linked to increasing dependence on agriculture, then that shift should be evident in the archaeological record. In other words, we propose a general model that suggests a positive relationship between dependence on cultigens and decreasing residential mobility. The logic of this argument is that as cultigen dependency increases, the bulk of harvested food increases, cultigens are stored, and, because storage entails investment in facilities and the reuse of sites, residential mobility declines. However, this is a traditional model for looking at change in site structure through time. We do not believe our model is as simple as it sounds, nor do we believe this is the way events happened. The model merely provides us with a premise from which we can test mobility strategies in the Mogollon Highlands.

We are broadly classifying project sites as Archaic (N=1), Pithouse (N=2), or Pueblo (N=1) as a basis for comparison. These sites are within the following temporal categories:

Cochise Culture:		
	Early Archaic	1000 B.P. to 8000 B.P.
	Middle Archaic	8000 B.P. to 3500 B.P.
	Late Archaic	3500 B.P. to A.D. 200
Mogollon Culture:		
	Pithouse	A.D. 200 to A.D. 950
	Pueblo	A.D. 950 to A.D. 1350

Each of these groups is posited to exhibit varying degrees of mobility and sedentism as part of its subsistence strategy. The research design presents specific expectations for each category of site. Basically, we want to know what conditions lead from mobility to sedentism among prehistoric populations in the Mogollon Highlands. Did mobility decrease before or after the introduction of cultigens? How mobile were Archaic populations? How sedentary were Pueblo groups? How are Archaic sites structured as opposed to Pithouse and Pueblo sites? Are the terms *hunter-gatherers* and *pithouse dwellers* valid distinctions, or could they define the same population? Do

resources used inform on mobility patterns? Do site artifact assemblages inform on length of occupation?

The research design will focus on two aspects of Mogollon adaptations to examine variability in mobility patterns. We have chosen to study variations in site structure and subsistence activities among these prehistoric groups. Most arguments for or against mobility strategies revolve around the degree to which populations practiced agriculture. Our research will focus on this current dichotomy as it applies to all prehistoric groups in the study area.

Current Theory

The Mogollon Highlands area near Reserve, Luna, and Pine Lawn Valley, and the area near the San Augustine Plains have long been thought to represent the homeland for the adoption of agriculture in the American Southwest. The dating of charcoal lenses supposedly associated with maize at Bat Cave to approximately 6000 to 5600 B.P. (Dick 1965) revolutionized existing concepts about the adoption of agriculture. Because no other southwestern sites yielded such an early date at that time (Tularosa Cave, at 2400 B.P., was the next oldest), Haury (1962) proposed that agriculture was first introduced to the Southwest from Mesoamerica via a mountain route at about 6000 B.P. He believed agriculture was limited to the Mogollon Highland area because of a favorable climatic regime. He then assumed, on the basis of available C-14 dates, that the practice of agriculture did not spread to the rest of the Southwest until over 2,000 years later. Archaic hunter-gatherers were thought to have eventually adopted cultigens in response to environmental stress, ceased their continuous wanderings in search of subsistence goods, settled down by streams and arable land, adopted the use of pottery, and eventually become sedentary, building pithouses and then surface rooms and practicing full-scale agriculture.

Recently, this view has changed, in part because of new investigations carried out by the University of Michigan at Bat Cave (Wills 1988a). The new work has produced revised dates for cultigens (maize and squash) at Bat Cave from 3100 to 2000 B.P., consistent with other sites in the area such as Tularosa Cave. We no longer must postulate a 2,000 year developmental period before the spread of agriculture to other areas. In fact, Wills (1988a:148-149) thinks local agriculture probably originated in the Rio Grande Valley or southern Arizona and notes that by 3000 B.P. it is documented in the Jemez Mountains, San Juan Basin, southern New Mexico, and the Tucson Basin. (However, Hunter-Anderson [1986:106] believes that people in the Mogollon Highlands may have felt the pressure of a high human population and thus opted for domestication of cultigens, implying that it was an indigenous process). Wills (1988a) would argue that the adoption of agriculture is not an inevitable effect of population pressure although he agrees that variations in population size would probably create an unevenness in environmental productivity. The presence of cultigens at Archaic sites has only been documented for cave sites near the San Augustine Plains beginning during the Middle Archaic period. No use of cultigens has yet been documented for the few Archaic sites recorded near the project area.

Growth in Archaic populations in the Mogollon Highlands may have occurred because of the widespread availability and diversity of subsistence resources. Resources known to be present in the uplands include deer, elk, rabbit, antelope, mountain sheep, small game, berries, piñon nuts, available water, lithic raw material, chenopods, and grasses (Wills 1988a; Fish et al. 1990). However, resources are subject to, among other factors, variability in timing and the amount of available moisture, season of availability, degree of utilization by humans, presence of disease, mobility of resource, and low yield. Today, Archaic populations are characterized as loose knit with changing group size, fully mobile, moving freely from resource to resource, and using primarily wild plant foods as availability warranted.

Thus, we have a traditional picture of Archaic hunters and gatherers moving freely over the landscape prior to the utilization of agriculture. In recent years, debate has focused on the nature of Archaic mobility patterns in the Mogollon Highlands. Most recent models of Archaic settlement patterns postulate winters spent in the highlands and summers in the lowlands because of temporal and spatial variations in the abundance of resources (Hunter-Anderson 1986:49). Evidence of this pattern has not yet been found archaeologically. Winter residences in the mountains are expected to be small and the location dependent on the availability of game (Hunter-Anderson 1986). Wills (1988a:93) believes populations wintered not in the mountains but in lowlands to the south, where resources such as agave, sotol, mesquite, and cacti were plentiful. He maintains that high-elevation sites such as Bat Cave and Tularosa Cave imply a spring occupation (Wills 1988b:477).

Obviously, the archaeological record is necessary for testing the various models of Archaic mobility patterns. Spielmann (1990) suggests we look more carefully at resources and their patterns of availability and seasonality of distribution in the environment.

We do know that between 3100 and 2000 B.P., maize and squash had made their appearance at several cave sites in the Mogollon Highlands. At some point, therefore, Archaic peoples incorporated cultigens into their subsistence systems. Traditionally, the introduction of cultigens has perhaps simplistically implied an end to mobility, the beginning use of ceramic vessels, and a shift to permanent residences. Researchers debate the causes for agricultural adoption, which vary from human population stress on available resources (Cordell and Gumerman 1989; Hunter-Anderson 1986) to a strategy for enhancing resource availability (Irwin-Williams 1973; Ford 1981; Cordell 1984; Minnis 1985). Actually, Wills (1988a:5) sees the two models as noncompeting. Increasing populations lead to the employment of agriculture as a security measure, enhancing subsistence strategies already in place. He thinks the environment of the highlands would not have yielded enough surplus winter consumption, making the practice of agriculture a necessary rather than optional choice (Wills 1988a:146).

The cultivation of plants in the Mogollon Highlands requires planting of crops in the spring and harvesting in the fall. Repeated return to fields during the growing season is also necessary. Thus, Wills (1990:324) points out that the conception of agriculture as a casual or simple adaptation is incorrect. The practice of agriculture places potential limitations on mobility patterns. Mountain cultivation may indicate a

conscious decision to stay in the uplands and utilize the resources there from spring through fall. Wills (1988b:477), however, cautions that spring use of mountains may have already been part of the Archaic seasonal round.

The use of storage facilities on early agricultural sites would allow populations to maintain mobile lifestyles between highland and uplands (Wills 1988b:477), but as noted by Hunter-Anderson (1986), it may also have permitted them to reduce movement. As Wills (1988b:461) notes, this issue is unresolved because no early sites have yet yielded storage facilities.

The presence of residential architecture or ceramics have also not been documented in the Mogollon Highlands until after the adoption of agriculture. Thus, Wills (1988a:479) believes agriculture is not a necessary prerequisite for sedentism. We tend to think that a dependable resource, such as cultigens, is a prerequisite for sedentism. However, if agriculture was initiated as a supplement in the highlands, not a substitute (Johnson 1989:372) to foraging strategies, then sedentism is not tied to the development of agriculture. Archaeologically, we must not equate the practice of agriculture with sedentism (Wills 1988b:479, 482). The very quality, quantity, and diversity in resources that permit hunter-gatherer mobility, as pointed out by Fish et al. (1990:77-78), may also encourage sedentism.

A recent argument ties increasing sedentism to increasing population density (Sarah Schlanger, personal communication, 1990). People may be forced to reduce their residential mobility because permanent residence near producing fields is necessary for crop maintenance and because there may be increasing populations in the area that would tend to occupy prime land left unattended by part-time horticulturalists.

In the Mogollon Highlands, it is generally believed that maize agriculture did not play a significant role in the subsistence economy of late Archaic populations (Gilman 1987). However, current thinking views foraging with associated mobility or sedentism as part of continuously changing subsistence strategies practiced throughout much of the prehistoric occupation of the highlands (M. Nelson 1990). As needs vary, site use may shift on a seasonal basis, site populations vary periodically, and structures change. In the words of Ben Nelson (1990:157), "Today, we expect diversity rather than unity, adaptive change as not necessarily permanent, and different trajectories occurring possibly simultaneously in the same area."

Research Expectations

Site Structure

Mobile and sedentary adaptions should be reflected in site structure. Analysis will examine structural and temporal diversity between sites on the project and compare them to other excavated sites in the nearby region such as the SU site, Turkey Foot Ridge, Starkweather Ruin, the Wet Leggett Arroyo site, and Promontory Peak.

Full mobility is traditionally thought to be characteristic of hunter-gatherers or Archaic populations. If this premise is true, site structure at LA 45508 should primarily reflect short-term occupation of the three Archaic sites. Expectations for fully mobile adaptations include expedient investment of labor in dwellings, hearths, and storage facilities, if present. Also, artifact assemblages should be consistent with short-term occupation data. Domestication of cultigens is not probable, although possible. If Archaic peoples maintained a seasonal round between highlands and lowlands, only seasonal resources of either winter or summer acquisition should show up in the archaeological record. Schlanger (1990) has developed a testable model for predicting length of site occupation from comparisons of types and ratios of artifacts deposited on sites that may be useful for this study.

Expedient lithic reduction is generally associated with sedentary populations and curation with mobile societies. However, J. Moore (n.d.) cautions that there can be many factors that allow these two strategies to be used by either group. Generally, the use of large, generalized bifaces during the Archaic period is usually thought to represent a curated lithic reduction strategy, while expedient tool production is characteristic of later, more sedentary groups. The differences between these two strategies are explained in detail in J. Moore (n.d.). These differences in technological modes can be monitored and quantified for all project sites.

The diverse features and facilities at Archaic sites suggest differing site functions. The presence of hearths, dwellings, and storage facilities on some documented Archaic sites (O'Laughlin 1980) and not on others informs us that a variety of activities were pursued.

J. Moore (1989:18) has presented three basic site types for hunter-gatherer systems based on work by Binford (1980) and Fuller (1989). He postulates that sites should consist of either residential or base camps, field camps for collection, and resource extraction locales (i.e., quarries). The residential base camp occupied by foraging groups will exhibit a broad range of maintenance, production, and food processing activities. There should be a low investment in habitation units and storage. Structures, if present, should be ephemeral and indicate short-term use. Residential camps occupied by collectors would exhibit the same wide range of activities but with a higher construction investment, indicating a longer, perhaps seasonal occupation. Field camps are temporary locales used for specialized activities, with no storage (expect perhaps caching), and ephemeral structures if any. Resource extractive locales are not believed to be represented in the project sites.

J. Moore (1989:21) notes that it is difficult to distinguish short-term residential camps of foragers from field camps of collectors. In addition to examining site structure, he believes that lithic artifact assemblages will vary with the type of site and that general-purpose biface manufacture in general reflects mobility in a group. He suggests using a model such as Kelly's (1988), which examines variation in biface production between the several site types. In Kelly's model: (1) Biface manufacturing flakes are common at base camps and rare at field camps. (2) Utilized flakes are common at field camps as opposed to base camps. (3) Residential base camps exhibit a wide range of activities.

Because the Archaic site on the project (LA 45508) represents a mixture of lithic artifacts, including bifaces, projectile points, and biface flakes, this model will be used to provide a basis for defining site activities and site types.

The presence or absence of storage facilities on Archaic sites is dependent on the type of site and the activities pursued. Storage is a viable choice when mobility is restricted. Storage facilities may be either temporary, located near gathering sites, or more permanently located near long-term residences (Hunter-Anderson 1986:35). J. Moore (1989:26) believes foraging base camps would have no storage because resources are for expedient use. However, base camps for collecting groups could have storage facilities. Field camps may have limited storage. If his propositions are correct, then we may expect some Archaic sites to possess storage units and others not.

Length of site occupation may be determined from an examination of site structure and from artifact analyses such as recommended by Schlanger (1990) and J. Moore (1989). A seasonal occupation might be evidenced by depth of dwellings, presence of interior hearths, storage facilities, labor investment in structures, and types of resources recovered from sites.

Pithouse populations in the Mogollon Highlands range in age from A.D. 200 to A.D. 1000. They are typically characterized as sedentary, with a labor investment in dwellings, hearths, and storage facilities. Occupation lengths are thought to vary from seasonal to annual or longer. If pithouse sites do represent mobile populations, then use should reflect seasonality or short-term occupation by groups employing collecting strategies.

Site structure on pithouse sites ranges from single pit units to villages of pithouses with intramural and extramural hearths, storage pits, and outside work areas. To look at the problem of mobility among pithouse dwellers, we must, for example, look at site layout and labor investment for the two pithouse sites on the project (LA 45507 and LA 45510). We must ask if the floors and walls have prepared surfaces. Are there numerous ancillary features within the structures? Is there a plan to site layouts? Are hearths formally constructed, or do they exhibit expediency in preparation? Are hearths both inside and outside of structures? Are storage facilities both inside and outside of structures? Are there specific work areas?

Seasonal or repeated use of pithouses may be evidenced by reconstruction within structures, ample storage facilities, layering of floor levels, and overlapping features.

The number of storage pits on a site relative to dwellings is an indicator of the quantity of goods being stored. The nature of stored resources and the form in which they are stored may indicate whether immediate or future use is intended. Storage facilities outside of pithouse structures are thought to indicate seasonal use.

Length of occupation can be determined by the same factors used to examine Archaic sites, for example, Schlanger's artifact deposition model (1990), labor-investment comparisons, and degree of storage dependency.

Dependence on cultigens is traditionally assumed for pithouse sites. However, this is an assumption that has persisted throughout archaeological literature and may or may not be correct. Hard (1990) has developed a simple but apparently effective model to assist in the quantification of degree of agricultural dependence. He uses a mean mano length index to show that through time, manos increase in length and grinding surface, which he believes suggests a greater dependence on cultigens. Hard's methods can be applied to the mano assemblages from all project sites for verification of his model.

Pueblo sites of post A.D. 1000 in the Mogollon Highlands are represented by supposedly permanent structures, storage facilities, middens, and dispersed fieldhouses, such as LA 70185. The shift from storage pits to above-ground storage rooms may be indicative of the shift to greater agricultural dependency (Hunter-Anderson 1986:49). It is thought that mobility was greatly constrained for these populations because of the substantial labor investment and strong dependence on agriculture.

In opposition to hunter-gatherer sites, pueblo residences produced expedient lithic flake tools. Bifaces such as projectile points and knives were prepared for specific purposes rather than general use. Therefore, fieldhouses and camps will possess mostly expediently used artifacts and few bifaces (J. Moore 1989:24).

Schlanger's (1990) model can again be applied to compare Pueblo ratio of artifact deposition with those of Archaic and Pithouse populations.

Subsistence Adaptations

The study of subsistence adaptations will focus on the types of resources used by each group of site occupants, whether the resources were expediently prepared, and whether storage was a part of subsistence systems. The various subsistence strategies such as foraging, collecting, and farming will be examined in relationship to their effects on mobility. Seasonality of resource availability will be calculated and potential seasonal rounds proposed, following a model by Hofman (1984). At this point, archaeologists do not have the data to confirm seasonal rounds between highlands or lowlands or in highland areas only. Sourcing of specific resources such as lithic raw material, ceramic clays, and trade wares are necessary to provide information on the mobility of people and goods through the cultural systems.

We will also study the balance between utilized floral and faunal resources as a key to determining seasonal mobility strategies.

The presence of domesticated cultigens on sites, particularly maize and squash, will be evaluated in terms of their relative presence in the food assemblages. Variations in ceramic vessel form, ground stone assemblages, and lithic tool use will also aid in the determination of subsistence practices for each site.

If Archaic populations were fully mobile, then subsistence activities at LA 45508 should represent only the range of resources available or easily transported in the

immediate environment. However, if they employed a collecting strategy, a wider range of resources could be expected in site assemblages. Fully mobile people would tend to prepare items for immediate consumption or use, while those less mobile might be expected to cache or store resources. All Archaic people probably hunted; however, to what extent is unknown.

Dependence on cultigens is not expected, but possible at LA 45508. Hearths and storage pits will be carefully excavated to ensure that potential cultigens are recovered. The presence of storage pits suggests repeated or seasonal use of a site. Storage pits and the presence of cultigens could be indicative of constrained mobility, at least to some degree.

Ground stone implements may retain some of the materials that were ground and suggest whether immediate or future use was intended. Hearths are another source for recovering food items.

If Pithouse peoples at LA 45508 and LA 45510 were limited in their mobility, then subsistence activities would have been more labor intensive, indicating planning for future use. Resource items may include those brought in from longer distances as well as those locally available.

Drying of food items indicates preparation for future use. Dried foods may be present in storage pits and ceramic vessels. The shift to preparation of dried food may have encouraged the use of pottery for boiling food prior to processing and preservation (Hard 1990). It is possible that the number of cooking vessels will increase as the use of dried food increases. A comparison of ratios of cooking vessel sherds with other artifacts in site assemblages may indicate such an increase.

Certain food items, such as maize and squash, require intensive scheduled monitoring, harvesting, and processing before being consumed or stored. If pithouse site assemblages indicate a stronger dependence on other floral and faunal resources than on maize and squash, then we may assume that site dwellers were not to the point of being constrained by agricultural pursuits. Whether crops were necessary subsistence items, however, must be ascertained from comparison with other food resources.

The Pueblo site (LA 70185) in the project area is thought to be a small pueblo unit or fieldhouse. The size of this small structure suggests a temporary occupation with limited activities. Other larger, primary residences, such as Starkweather Ruin, occur nearby in the region. The value of small pueblo sites lies in their emphasis on a limited range of activities that are amenable to archaeological discovery.

Fieldhouses tend to correlate with aggregated local populations, are thought to be used seasonally, and are generally near producing fields. They may or may not contain storage facilities. Trash deposits should be surficial or very shallow. B. Moore (1978:10) has developed several expectations for fieldhouses. These include: (1) Fieldhouses should be independent units with no more than one to three contiguous rooms. (2) No kivas or ritual features should be present. (3) Nearby agricultural fields should be within unrestricted view of fieldhouses. (4) Period of use can range from daily

to seasonal to continuous throughout the farming season. (5) The range of activities should be limited.

Wilcox (1978) distinguishes farmsteads from fieldhouses and notes that farmsteads are year-round family residences that can have more than three rooms. Other structures could be nearby. Arable land should be present but not necessarily within view of the site. Trash middens should be present and represent a wide variety of activities.

B. Moore (1978:31) comments that it may be very difficult to distinguish fieldhouses from farmsteads. He notes that cold-season architecture, interior hearths, and ritual features should be lacking in fieldhouses. Year-round farmsteads should have substantial architecture with interior hearths for cooking and heating.

If LA 70185 is a fieldhouse, chipped stone material should be used for the upkeep of farming implements and hunting game. The lithic reduction technology should be expedient, with no formal tool production. J. Moore (1989:32) states that ground stone should not be present; however, I believe that the processing and grinding of food items for ease of transport back to primary residences is a viable option for fieldhouse users. J. Moore (1989) also expects faunal remains to be present only in extensive trash deposits. However, I believe that horticulturalists will focus on the taking of game near their fields (the garden-hunting hypothesis developed by Linares [1976]). In fact, Speth and Scott (1989) believe that large game was often hunted in this farming environment, rather than small game, as proposed by Linares. This trend to large mammal hunting seems to increase as dependency on cultigens goes up. Comparison of large versus small mammal remains on project sites can examine this hypothesis for the Mogollon Highlands.

If some project sites are year-round farmsteads, the lithic artifact assemblage should indicate a wide variety of activities with formal tools made for specific uses. Ground stone tools should also be present. More faunal remains should be present on farmsteads.

The analysis of floral and faunal resources from both fieldhouses and farmsteads should help determine if these sites were used seasonally or year-round or if there are quantifiable differences between fieldhouses and farmsteads in terms of mobility or dependence on maize. Determination of length of occupation should be confirmed by previously mentioned methods.

We have assumed agricultural dependency for Pueblo-period sites. By excavating small units such as fieldhouses, farmsteads, and work areas, we may be able to assess the degree of agricultural dependence in the subsistence economy of these people as opposed to other floral and faunal resources.

In conclusion, we are proposing to use the four sites recommended for data recovery as a data base for examining current research questions about occupation of the Mogollon Highlands. Deeply stratified cave sites of the Archaic period and large pithouse and pueblo villages have been excavated in this area. However, there is a lack of smaller, early, open-air and later pithouse and fieldhouse sites to balance the skewing of the existing data base. We believe the project sites have the integrity and the variety

to provide such a balance.

Some questions may prove to be easily answered through the implementation of the research design. Were Late Archaic populations present in the Mogollon Highlands? Do their sites evidence storage facilities? Do site remains indicate a seasonal taking of resources as proposed by Wills (1980)? What resources were used by the various groups in the area? At what time period do cultigens appear on the sites and in what proportions to other resources? Does increasing mano length correspond with greater dependency on agriculture on these sites? Does Schlanger's (1990) artifact ratio model work? Were ceramics being traded into sites or were they locally made? From how far away were lithic raw materials actually obtained?

Answers to the proposed research questions may be obtained through the compilation of appropriate data sets. Artifacts will be subject to traditional analyses and those proposed in this report. To address the question of residential mobility, lithic artifact analysis will include a detailed study of biface manufacture and discard, following Kelly's (1988) model. We will also look at the amount of lithic manufacture versus the amount of lithic maintenance, the investment in storage facilities and domestic architecture, length of site occupation, and amount of reuse or reconstruction.

Sourcing of resources -- floral, faunal, lithic raw material, and ceramic -- is important for understanding the mobility patterns of each prehistoric group. Floral and faunal resources are especially useful for information on foods consumed and season of use. To examine the dependency on cultigens, we have developed several lines of evidence to measure that dependency: amount of cooking vessels present, percent of surface on manos, amount and kind of storage facilities, and relative amount of faunal resources.

When necessary, specialists will be employed to undertake these studies. Additionally, we will take palynological, phytolith, and macrobotanical samples from available pits, structures, hearths, floors, and cultural fill.

Placing structures and sites in an accurate temporal framework is critical for useful comparisons between site units and sites. Presently, we have only a few temporally diagnostic sherds to indicate the time of occupation on some sites. We shall obtain absolute dates from C-14, dendrochronological, archaeomagnetic, and obsidian hydration samples whenever possible.

Data will be compared to the other larger, excavated prehistoric sites in the Mogollon Highlands to broaden the subsistence data base for the region. Through the examination of mobility patterns from the Archaic through the Pueblo periods, our knowledge regarding the diversity in subsistence adaptations by these groups within the Mogollon area should be expanded significantly.

Site-Specific Research

LA 45507

LA 45507 is an extensive Late Pithouse (ca. A.D. 900-1000) site with numerous pit structures inside of the proposed right-of-way and extending well beyond. The frequency of ceramics and lithic artifacts on the site surface is high. This is the largest pithouse complex of this project.

The number and variety of pit units should provide valuable site structure data in terms of evidence of long-range planning, seasonality of use, evidence of reuse or additional construction, and ratio of storage units to dwellings.

Subsistence strategies should be discernable from the numerous artifact types present. In addition to the actual subsistence items present at the site, tool use will be evaluated and the information used to determine the ratio of floral and faunal use. Storage facilities and interiors of cooking vessels should also yield food remains. The number and layout of storage facilities is important for assessing long-term planning and mobility strategies. Ground stone should be amenable to testing Hard's (1990) model of agricultural dependency.

The artifact assemblage can test Schlanger's model (1990) of long-term use and propositions by J. Moore (1989) that biface production on such sites should be highly specialized.

The site may be the same age as LA 45510, another Late Pithouse site. Data from these sites can be compared in terms of variations in subsistence adaptations, long-term planning, and site function.

LA 45508

The site is probably a Late Archaic/Early Pithouse (ca. 1500 B.C.-A.D. 200) campsite with associated pits. Numerous artifacts, including projectile points and biface flakes, are present on the site surface. The site provides an excellent opportunity to examine a site of this time frame in the Mogollon Highlands. All other known sites lie on the southeast slopes of the San Francisco Mountains, a distance of about 16 km.

The chipped stone material will provide data for the comparative study of biface manufacture and maintenance by Archaic or early Mogollon populations, following Kelly's (1988) model. Tool function, as related to hunting, foraging, or collecting strategies, can be addressed with this assemblage. Schlanger's test (1990) for site longevity can also be examined with this artifact assemblage. Subsistence items, such as floral and faunal remains, could be recovered from the pits on the site. These should provide important information on resource use, seasonality of acquisition, and the question of whether or not long-range planning took place.

LA 45510

This site represents a pithouse complex of the Late Pithouse period (ca. A.D. 900-1000). There are probably two pit structures present on the site.

The structures should contain floral and faunal remains that will identify types of resources used by the site occupants and allow for an assessment of the season of use and type of food preparation. Evidence of storage should be present. The examination of manos and cooking vessels will provide data on food preparation techniques and dependency on cultigens. Studies of food resource ratios will also provide this information. The balance between expedient (showing little use or wear) and curated tools will be explored and applied to our theories on residential mobility. Site structure, the relationship between pit units, the type of construction, and any evidence of reuse will allow for estimates of occupation length, seasonal use or reuse, and labor-investment in the site.

Another, larger Late Pithouse complex, LA 45507, is located within the same valley area. Comparative data will be extremely useful for determining different site functions, length of use, and seasonality of occupation.

LA 70185

This site dates to the Late Pueblo occupation (Tularosa phase) of the Mogollon Highlands, A.D. 1100-1300. It is the only site of this late time period to be excavated in this region. It consists of a cobble-walled room block of six to ten rooms. Preservation of the site appears to be excellent.

Site structure for such late sites in the Mogollon Highlands is not well known. LA 70185 provides the opportunity to examine site layout, relationship of pits to above-ground dwelling units, and use of various facilities. Artifact analysis, following Schlanger's (1990) and Kelly's (1988) models, will be used to document site function and assist in the determination of relative dependence on cultigens. Mano and cooking vessel analyses will also be used for this determination. An approximation of the seasonality of use is important for this late site and will enable us to compare lengths of site use through time in the project area.

Field and Analysis Methods

Expectations for the type of features and cultural materials at the project sites and how they will answer the proposed research questions are detailed under "Research Expectations." Basically, the following standard field and analysis techniques will be used to extrapolate the specific structural and temporal data required by the research design. These include an accurate chronometric ordering of sites through various dating mechanisms such as radiocarbon analysis, archaeomagnetic sampling, obsidian hydration, and dendrochronology. Determination of time frames for each site is also important for

dating the use of cultigens and other resources by site occupants. The data recovery plan also commits us to examine site structure in detail in terms of expedient versus reuse or long-term use. We plan on collecting sufficient macrobotanical and palynological samples to assess subsistence adaptations. These will be taken from floors and walls and fill of structural units on each site. The chronometric data will be taken from burned structural material, hearths, and pit fill, if possible. Ceramic artifacts will also be used to augment the dating of sites and to assess site function. For determining the functional differences between Archaic, Pithouse, and Pueblo sites, we will test the various proposed artifact analysis models put forth in the research design. Variations in artifact assemblages are important to our study and recovery of statistically valid artifact samples are critical. In addition, the collection of adequate floral and faunal remains is vital to our understanding of the various subsistence adaptations that may be present on our sites. These samples will be collected wherever possible, for example, pit fill, hearths, floor surfaces, ground stone surfaces, and trash areas.

Field Methods

A primary datum will first be established for each of the four sites on the project, from which at least two baselines will be run. From these, a 1 by 1 m grid system will be imposed over each site. Surface collections and initial excavation units will be made within the grid system. Hand tools such as trowels, shovels, picks, brushes, and dental picks will be used for the excavation of cultural material and features. Mechanical equipment will be used, if necessary, to strip disturbed or sterile overburden from portions of sites.

Excavation units will consist of 1 by 1 m grids placed initially within known cultural features. They will be dug in 10 cm arbitrary levels unless natural or cultural stratigraphic breaks are evident. If natural breaks are defined, excavations will continue in levels determined by the depth of the strata. The excavation units will be expanded out from the exploratory grids to determine the nature and extent of any cultural deposits and features that are encountered. Surface stripping will be used to ensure that all subsurface features will be found.

Soil recovered from excavation procedures will be screened through ¼-inch mesh hardware cloth, and all artifacts will be bagged by level. However, artifacts recovered from floors or other use surfaces will be mapped in place and bagged separately. Pollen and flotation samples will be collected from all cultural strata, including middens, floors, or other use surfaces. In addition, an off-site pollen control sample will be collected for comparison with other site samples. Flotation samples will be taken from each cultural stratum and feature encountered. If available, charcoal, archaeomagnetic, and tree-ring samples will be collected to determine the dates of the sites.

Soil augers will be used to investigate areas of the sites where cultural features are not visible. Any artifacts collected in this manner will be bagged by depth and saved for later analysis. Subsurface cultural deposits encountered in any auger tests will be further examined through grid excavations or trenched by a backhoe to determine their extent.

We will attempt to locate all site features through the above methods. Features that have the potential to answer the questions posed by the research design will be completely excavated. Other features will be sampled to determine their data potential. Individual field forms will be filled out for each level excavated, detailing depth of level, type and amount of artifacts recovered, and soil type and color based on the Munsell scale (see Appendix 2 for an example of the field form).

All stratigraphic levels and feature profiles will be drawn along with plan views of each feature. Features will be photographed before and after excavation. The site, including all cultural features, locations of excavation units, and topographic changes will be mapped with a transit and stadia rod.

Should human remains be discovered during the data recovery program, standard archaeological excavation techniques will be employed. These include the definition of the burial locale, the use of small hand tools to expose skeletal materials, mapping and photographing the skeleton and any associated grave goods, and retrieval of soil for pollen and coprolite analysis.

The field treatment of any human remains and other sensitive cultural materials will be based on the Museum of New Mexico Rule 11, "Policy on Collection, Display, and Repatriation of Culturally Sensitive Materials," adopted January 17, 1991. If human remains or other sensitive materials are uncovered, appropriate law enforcement agencies and Indian tribal groups will be notified. No person will be allowed to handle or photograph the remains except as part of scientific data recovery efforts. Photographs of sensitive materials will not be released to the media or general public.

If human remains (including any associated burial goods) are recovered, their disposition will be based on consultations carried out in accordance with federal regulations through the Forest Service. No disposition of the remains will be completed until the wishes of the nearest Indian community, Zuni, are known. Unless an alternative disposition is established through the consultation process, the remains will be submitted to the Museum of New Mexico Archaeological Repository for physical storage at the Department of Anthropology, University of New Mexico. Remaining artifacts will be submitted to the Archaeological Repository for physical storage.

Laboratory Analysis

Laboratory analyses will be conducted by the staff of the Office of Archaeological Studies and specialized professional consultants. When brought in from the field, artifacts will first be washed, sorted, and catalogued. Any remains that do not appear to be stable will be treated in consultation with the museum's conservation department.

Ceramic Artifacts. To assign dates, function, and cultural affinity to the ceramic artifacts, a detailed analysis of morphological attributes will be undertaken. Artifacts will be identified by existing type name, vessel and rim form, vessel diameter, paste texture and color, temper material, surface color and finish, slip, design style, thickness,

presumed function, and presence of attributes such as burning, smudging, mending, or reworking. A binocular microscope will be used to facilitate the analysis. A sample of sherds of each type will be submitted for petrographic analysis and for x-ray refraction analysis to determine the origin of the sherds. Clay sources for pottery production will be sought during the field excavations and matched with sherd samples in the laboratory.

Lithic Artifacts. Lithic artifacts will be analyzed for material type and texture, artifact type, breakage type, use, and presence of thermal treatment. Attributes to be monitored with formal and informal tools include edge angle and shape, type of modification, and/or wear. A binocular microscope will be used to identify retouch and wear patterns. Debitage will be examined for evidence of reduction strategy, reduction stage, platform type, percentage of dorsal cortex, platform lipping, artifact portion, direction of dorsal scarring, and size. These studies should allow an evaluation of reduction technology, tool production and use, and raw material procurement strategies. A specialized analysis will involve the study of biface manufacture and use to test Kelly's (1988) model for differential biface use between hunter-gatherers and sedentary farmers.

Comparison of lithic artifact data with other sites on the project and in the nearby region may assist in the identification of specific manufacturing techniques and use patterns that may help identify varying subsistence strategies of the different cultural groups in the project area.

Faunal Remains. The faunal analysis will focus on the identification of species, age, and bone elements to assist in determining species used as food resources and portions used by each prehistoric population. Season of death for faunal remains will be determined for young species, if possible. Butchering and processing methods will be examined. We will also investigate the use of faunal materials as tools. Information from the faunal analysis will be used to aid in the determination of season of occupation on sites, hunting patterns and dependency, and subsistence strategies pursued.

Floral Remains. Floral remains will be identified by specific species when possible and compared with plant data from other sites to determine floral resources used by the various groups. It will also be used to help determine the season of use and subsistence strategy employed at each site. Identification of plant types will help determine if domestication of cultigens was practiced.

Human Remains. The main goal of the skeletal analysis, if any, will be a nondestructive study of remains to add to the data base on prehistoric populations from the Mogollon area. The analysis will include standard metric studies, aging and sexing of the remains, and documentation of pathologies, particularly those related to food stress. If bone tissue samples are present, these will be submitted for carbon isotope studies to determine the relative proportion of maize in the diet of site populations.

Analysis Results

The final data recovery and analysis report will be published in the Museum of New Mexico's Office of Archaeological Studies *Archaeology Notes*. The report will present

the results of the excavations, analysis, and interpretation of the data. It will include photographs, site and feature maps, and data summaries. Field notes and maps, analytic data sheets, and photographs will be deposited with the Archaeological Records Management System of the State Historic Preservation Division, located at the Laboratory of Anthropology in Santa Fe.

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Luna Testing Lithic Anaysis

Site Number	Grid North	Grid East	Level	Field Specimen #	Material Type	Material Texture	Artifact Morphology	Artifact Function	Dorsal Cortex	Artifact Portion	Flake Platform Type	Flake Termination