MUSEUM OF NEW MEXICO
OFFICE OF ARCHAEOLOGICAL STUDIES

CANYON BOTTOMS OF THE PAJARITO: TESTING AND EVALUATION AT WHITE ROCK Y

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ADMINISTRATIVE SUMMARY

In 1987, the Museum of New Mexico tested 11 archaeological sites and one isolated manifestation, recorded one rock art site, and collected four isolated objects in the proposed White Rock Y construction zone of State Road 4, Santa Fe County, New Mexico. The sites are designated LA 61033 through 61046 and 61050 in the ARMS file at the Laboratory of Anthropology in Santa Fe. The work was performed for the New Mexico State Highway and Transportation Department (NMSHTD) in the fall of 1987.

The testing program showed that only two parts of a very large site, LA 61041, possess structures and other features likely to produce information important to the prehistory of the region. Each area was assigned a new site number, LA 65420 and 65421. A letter was prepared recommending temporary fencing of LA 65420 and LA 65421 for protection during construction, and no further work at other sites listed, as none were found to have the potential for contributing important information through a data recovery program.

MNM Project 41.412
NMSHTD Project F-054-1(5)
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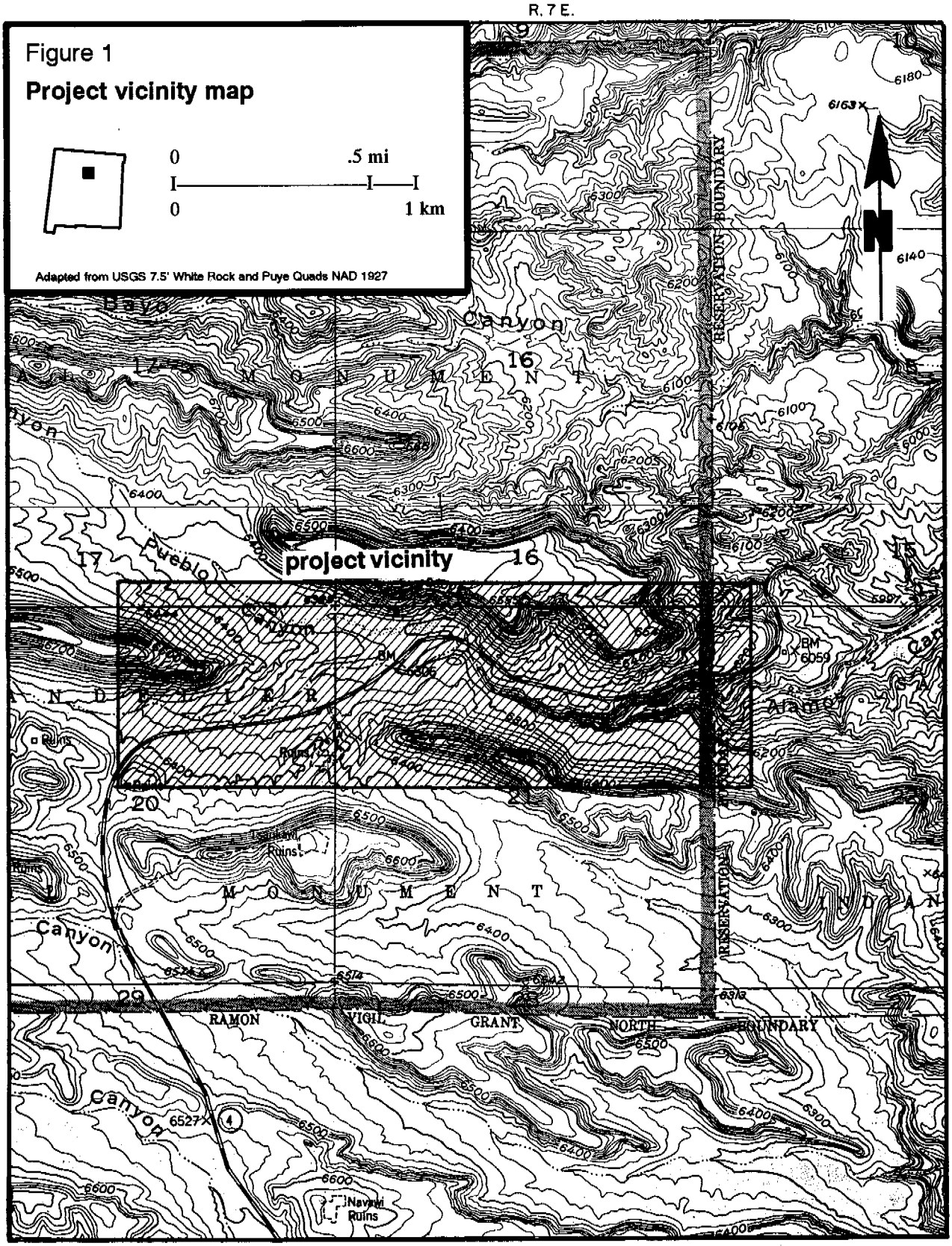
INTRODUCTION

In the summer of 1987 the Office of Archaeological Studies (formerly the Research Section) of the Museum of New Mexico conducted an archaeological survey at the White Rock Y intersection in Santa Fe County, New Mexico (Fig. 1). The project took place at the request of Mr. William L. Taylor of the New Mexico State Highway and Transportation Department.

The survey located 18 sites and 25 isolated occurrences. The report by Wiseman (1987) recommended that all of the sites and one large isolated occurrence be tested to determine their potential for further investigation. In assessing project needs, the Highway Department determined that six sites could be avoided through fencing, thereby eliminating the need to test them.

The present report gives the results of the ensuing testing program for the remaining sites. The field work was done from October 20 through December 10, 1987, by a Museum of New Mexico crew led by Steven R. Hoagland. R. N. Wiseman served as general supervisor.


R. 7 E.
T. 19 N.
Figure 1
Project vicinity map
0 .5 mi
0 1 km
Adapted from USGS 7.5' White Rock and Puye Quads NAD 1927
project vicinity
Bayo Canyon
LA MONUMENTAL
Pueblo Canyon
INDIAN RESERVATION BOUNDARY
Arroyo
Ruins
Navajo Ruins
RAMON VIGIL GRANT NORTH BOUNDARY
16
17
20
29
6163
6180
6140
6527

NATURAL ENVIRONMENT

Topography

The project area is situated in the bottom of a deep, narrow canyon at the confluence of Pueblo and Los Alamos canyons. Both canyons drain the east flank of the Jemez Mountains and flow southeast from the project area. Elevations within the project area range from 1,930 to 1,980 m (6,270 to 6,435 ft). The surrounding mesas reach heights of up to 2,060 m (6,700 ft).

Land forms within the project area include the meandering stream channels, alluviated valley bottom, lower and lower-middle valley slopes of Los Alamos Canyon; a fairly well defined bench along the south side of Pueblo Canyon (no bench occurs on the north side of this sector of Pueblo Canyon); and the sandy ridge extending eastward from the mesa and into the "Y" formed by the confluence of the two canyons. The upper-middle and upper slopes of Los Alamos Canyon and the talus slopes and walls of the mesas lie outside the project area. At the extreme eastern end (downstream) of the project area, beyond the confluence, the channel has cut into basalt and has created a second canyon or entrenchment.

Geology

Rock formations in the project vicinity belong to two major groups of volcanic materials (Dane and Bachman 1965). The mesa tops, cliffs, and talus slopes are Bandelier Tuff. The valley bottoms contain materials belonging mainly to the upper part of the Santa Fe Group, including the Puye Conglomerate and Ancha Formation. All date to the Pliocene or the Pleistocene periods.

Soils

Soils in the project vicinity are classified into five associations (Folks 1975). The canyon bottoms, particularly of Pueblo Canyon, have Bluewing Gravelly Sandy Loam. The bench/terrace along the south side of Pueblo Canyon and the ridge within the "Y" of the confluence are characterized by Guaje Gravelly Sandy Loam. The valley slope along the south side of Los Alamos Canyon has Penistaja Fine Sandy Loam. The canyon bottom starting at the east end of the project area, where the entrenchment starts, is classified as Basalt Rock Land, while the soils of the surrounding mesa tops and talus slopes are Tuff Rock Land.

None of these soils is particularly good for agriculture because they are generally coarse textured and deep. Soil moisture could be a problem in many sectors. However, in all likelihood, aboriginal agricultural methods and field location strategies could have made use of some portions of the Bluewing, Guaje, and Penistaja soils.

Hydrology

The drainages in both Los Alamos and Pueblo canyons, at least in the project area, are intermittent. In July, water was not running in either canyon; however, pools of water could be readily found in bedrock basins at the east end of the project area, where the channel has cut through a layer of basalt.

Flora

The flora in the project vicinity displays an interfingering of two major biotic communities, the Great Basin Conifer Woodland of the valley bottoms and the Petran Montane Conifer Forest of the mesas (Brown and Lowe 1983). An ecotone is expressed in the presence of ponderosa pines, and presumably other Petran plants, along the drainages and occasionally on the colder slopes on the north sides of the mesas.

In the Great Basin Conifer Woodland the dominant species are pinyon *(Pinus edulis)* and juniper *(Juniperus monosperma).* Shrubs and grasses of known economic importance to the prehistoric Indians and available in this community included Indian ricegrass *(Oryzopsis hymenoides)* and several species of oak (*Quercus* sp.) (Kuchler 1964).

The Petran Montane Conifer Forest is dominated by ponderosa pine *(Pinus ponderosa)* and Douglas fir *(Pseudotsuga menziesii).*

Fauna

Numerous species of animals are or were common to the region historically. Those of primary economic interest to the aboriginal settlers would have included elk *(Cervus elaphus),* mule deer *(Odocoileus hemionus),* mountain sheep *(Ovis canadensis),* cottontail *(Sylvilagus auduboni),* and a host of rock squirrels, ground squirrels, tree squirrels, pocket gophers, mice, rats, and woodrats (Findley et al. 1975).

Climate

The region has cool winters and warm summers with a frost-free season of 160 to 180 days (Tuan et al. 1973). The two closest weather stations with records of reasonable duration (both about 60 years) are Los Alamos (10 km west of project area; elevation of 2,259 m or 7,410 ft) and Española (17 km northeast; elevation of 1,733 m or 5,685 ft). Española lies in a structural basin along the Rio Grande, the lowest physiographic feature in the region. The elevation of the project area (1,930 to 1,980 m), then, is about half-way between those two stations.

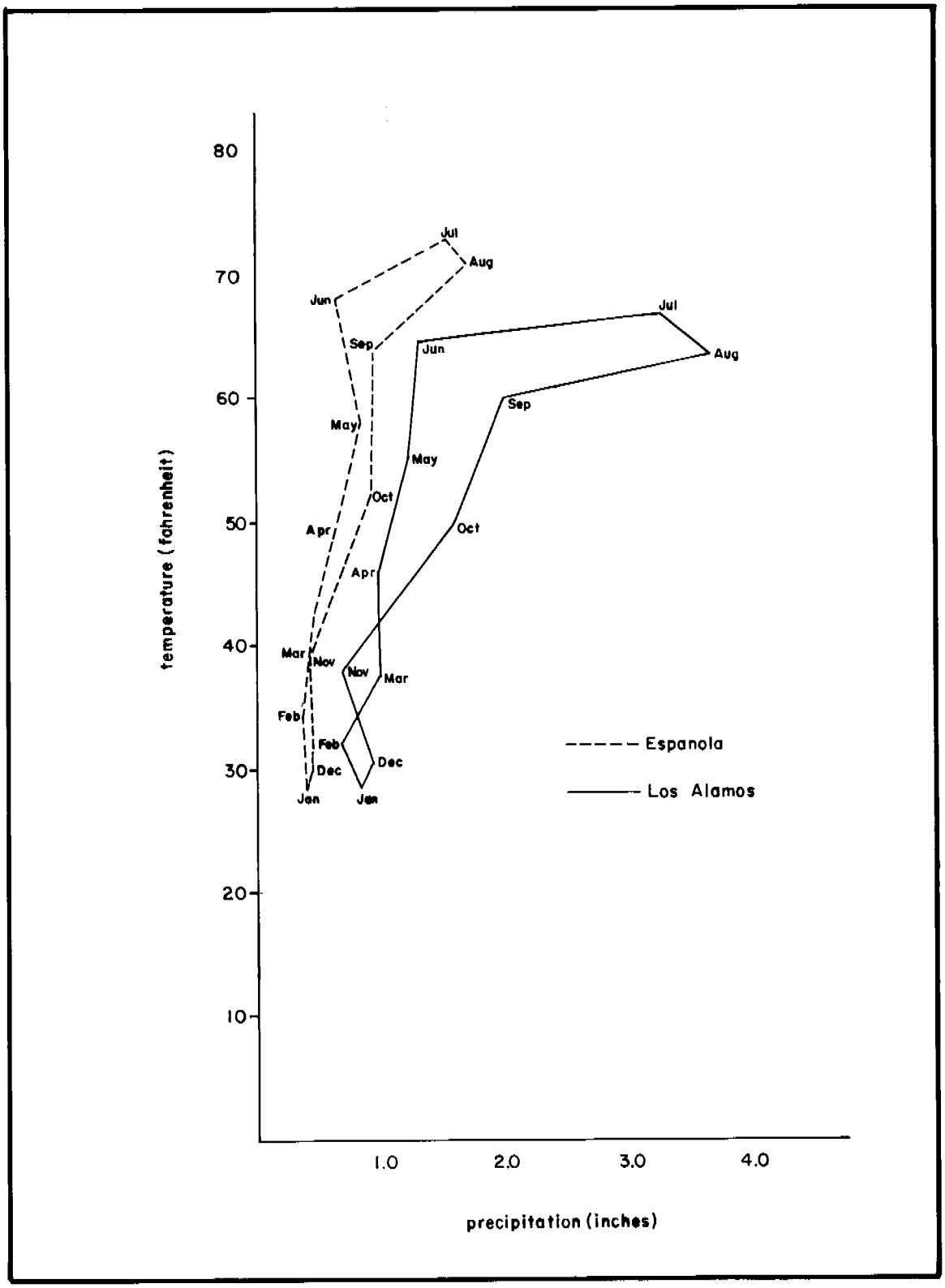


Figure 2. Comparison of precipitation and temperature curves for Los Alamos and Española (data from Gabin and Lesperance [1977]).

The simplest and most instructive way to compare the temperature and precipitation data for Los Alamos and Española is shown in Figure 2. As would be expected from the elevation differences alone, the data are dissimilar. In general, Los Alamos has lower temperatures and more precipitation, and Española has higher temperatures and less precipitation. The one surprise is that in December and January, Española actually has slightly cooler average temperatures but warms more quickly in the spring than does Los Alamos. The reason for this probably relates to the drainage of cold air from the mountains along canyons into the lower basins (Tuan et al. 1973).

Given the above, one might conclude that the climate of the project area is also about half-way between that of Los Alamos and that of Española; however, such is probably not the case. Because the project area is in the bottom of a narrow canyon, the local climate will almost certainly suffer a number of ills, among them, direct cold air drainage, more numerous and higher velocity winds, and highly variable temperatures on a daily basis (Tuan et al. 1973:69, 80, 86).

Deep, narrow canyons are notorious for creating their own temperature regimes that can have both deleterious and unpredictable effects on agriculture. The bottoms are cool in both summer and winter; frosts endanger plant survival even when the upper valley bottom slopes and canyon sides are pleasantly warm.

Winds correlate with time of day, sun angle, and the movement of air masses over broad areas. Winds in narrow canyons tend to be more frequent and stronger because of funneling action. Within such canyons, the narrowest sections and the points at which the canyons change directions can be expected to be the windiest. Strong winds blowing sand and silt are especially destructive to young plants.

In summary, from the standpoint of climate, the best agricultural locations in narrow canyons should be those that are at the widest points outside streams of cold air drainage. Such locations are both few and small at the White Rock Y.

CULTURE HISTORY

The known culture history in the upper Rio Grande region, including the project area, spans a continuum from the Paleoindian period (about 12,000 years ago) to the present. A series of named periods, devised to characterize developments in adaptations, architecture, and artifacts, are discussed below. All but the Paleoindian and the Developmental periods are represented in the sites and isolated finds of the White Rock Y Project. The summary that follows is selected and condensed from Stuart and Gauthier (1981), Wendorf and Reed (1955), Kidder (1962), and Kohler (1989). Readers desiring more details should consult these references.

Paleoindian Period

Aside from a few diagnostic projectile points, remains attributable to this period have not been found north of La Bajada Hill, 30 km south of the project area. The Paleoindian adaptation in the Southwest is generally thought to have centered on hunting now-extinct large mammals such as mammoth and bison, supplemented by wild plant collecting.

Archaic Period

Remains dating to the Archaic period are better known and are believed to have appeared about 7,000 to 8,000 years ago. During this period, the Indians hunted and gathered wild plant and animal species, often by ranging over vast territories. Animals included a variety of deer, rabbits, and smaller species. The introduction of agriculture probably took place near the end of the period or sometime around 1000 B.C. These people also made distinctive projectile points. In the upper Rio Grande the earlier Archaic phases, such as the San Jose, are not as commonly represented as the later ones, such as the Armijo and the En Medio. The En Medio phase generally corresponds to the Basketmaker II period in the Pecos Classification. The Archaic period in the project region may have lasted as late as A.D. 600.

Early Developmental Period

Sites of this period have the first documented structures in the form of pithouses. It is generally assumed by archaeologists that the inhabitants were more sedentary than in previous periods and that agriculture was becoming more important in the diet; however, hunting animals and collecting wild plants still provided a large share of the food. Pottery making and the use of the bow and arrow appeared in the region. This period generally corresponds to the Basketmaker III and Pueblo I periods in the Pecos sequence.

Late Developmental Period

Sites of this period usually consist of a small pueblo of surface rooms and an associated pithouse. Sometimes two or more pueblo-pithouse units occur at a location, suggesting the beginnings of aggregation that later evolved into larger villages. At least one of the multiple unit Late Developmental sites has a great kiva, a structure thought to signify integrated ceremonialism. Significant settlement of some upland areas (such as the Santa Fe region) began during this period. Reliance on agricultural products increased, though wild food products continued to be important. During the last half of the period, the local peoples started making mineral-painted pottery rather than importing it. The Late Developmental period ended about A.D. 1200. The entire period corresponds to the Pueblo II and early Pueblo III periods of the Pecos sequence.

Coalition Period

This period witnessed a continued aggregation of peoples into larger pueblos. This noticeable increase in size and number of sites has led many archaeologists to postulate an influx of peoples from regions abandoned to the west. The settlement of upland areas such as the Santa Fe region continued while that of the Pajarito Plateau began during this period and progressed rapidly. Many areas were settled that previously had seen only occasional, minor use (the Pajarito Plateau was one of these). Although pithouses continued in use as domiciles in some areas, the pueblo rooms became the main household residence. Locally made painted pottery is dominated by carbon-painted wares. An increase in the ratio of storage rooms to living rooms in the pueblos signals increasing storage of food, probably in response to the ascendancy of agricultural produce in the diet. The Coalition period ended about A.D. 1325, or about the end date of the Pueblo III period of the Pecos sequence.

Classic Period

Several significant changes occurred during this period. Upland areas were abandoned except for periodic or seasonal use. Populations moved to the major river valleys and occupied much larger (but fewer) pueblos. Ditch irrigation of agricultural fields would have been possible in these locations, but no one has conclusively shown that this was the case. Agricultural products possibly formed the bulk of the diet. Regional ceramic specialization took place--the Rio Grande glaze sequence started in the Galisteo Basin and adjacent areas. Peoples of the northern Pajarito Plateau and adjacent sections of the Rio Grande and Rio Chama drainages began production of the Biscuit Wares. The Classic period ended at the time of the founding of the first Spanish colony (A.D. 1598), making the Classic period equivalent to the Pueblo IV period of the Pecos sequence.

Historic Period

The coming of the Spaniards and then the Anglo-Americans caused several important changes to Indian lifeways. Eventually, the Indians were confined to specific locations. Their livelihood soon became fully dependent on agricultural products, including plant and animal species introduced by the Spanish. Increasingly, the economy incorporated money earned through the sale of arts and crafts and day labor jobs in nearby towns and cities. The period, Pueblo V, continues to the present.

FIELD METHODS

The sites were investigated in a variety of ways--selected surface collections, auger tests, shovel tests, and test pits.

Selected Surface Collections

The first activity at each site was to pinflag all surface artifacts. Rather than doing this by running transects, and thereby missing artifacts because of relative sun angles, an intensive random-walk approach was used with two or more archaeologists covering every part of the site. This activity also defined the site boundaries more accurately than was possible during the initial survey. An important aspect of the pinflagging was the location and identification of formal artifacts and exotic pieces of lithic material that would be helpful in identifying intra- and interregional exchange.

Once the pinflagging was completed, the density and distribution of artifacts were visually assessed. High density areas were identified and collected. On larger sites, an attempt was made to collect from all defined areas of the site. Collections were made by the dogleash technique using a radius of 1 m; these units are called collection units, or CUs.

All formal lithic artifacts, pottery identifiable to type, and other diagnostic materials located outside CUs were mapped from the nearest CU or mapping station, by noting the bearing and distance (taped) from the center stake. These items were assigned a critical artifact (CA) number and bagged separately.

Finally, several of the isolated objects (IOs) are especially diagnostic and were collected for the permanent record. They are identified by their IO numbers.

Auger Tests

Augering was done using a 3-inch soil auger with sleeve. Auger locations were arranged according to a grid system oriented to the areas of denser surface artifacts. The primary interval was 4 m, but intervals of as little as 2 m were occasionally used in order to better define subsurface manifestations. The depth of auger tests varied from a few centimeters to 1.2 m. Depths were monitored by counting each sleeve-full of soil removed, thereby permitting estimation of the depths of cultural indicators where encountered.

The soil exposed in the tests was generally a volcanic sand. Consequently, notes were made only of the presence or absence of cultural indicators such as soil discoloration due to charcoal staining and the presence of artifacts. All cultural materials were collected, designated by site and auger hole (AH) number, and bagged separately.

For this study, the presence of artifacts below the surface was considered to be of minimal importance unless they were associated with stained soil or burned rock, or unless several adjacent tests produced artifacts. The rationale behind this process derives from studies that have shown that artifacts can easily be displaced downward by as much as 30 cm in sandy soils through human trampling. Thus, a single buried artifact could be fortuitous, but several in proximity (or in conjunction with charcoal or charcoal-stained soil) are indicative of buried deposits.

Shovel Tests

Shovel testing was done between augered areas to increase our confidence that we had not missed major subsurface deposits. Each shovel test involved turning over one to three shovels of soil to a maximum depth of 30 cm. As with the auger tests, cultural indicators (such as stains and artifacts) were noted when encountered, and any artifacts were bagged separately using an ST number as an identifier. As with the auger tests, shovel tests yielding artifacts were not considered particularly meaningful unless they produced multiple artifacts, charcoal, charcoal-stained soils, or burned rock.

Test Pits

The excavation of 1-by-1 and 1-by-2-m test pits was limited to potential features and particularly dense concentrations of surface artifacts at LA 61041. The purpose was to explore surface rock alignments and to determine the presence or absence, depths, and details of both natural and cultural fills. Test pits were excavated by hand; all fill was screened through ¼-inch wire mesh except as noted below.

THE SITES

Table 1 lists the numbers of collection units (CUs), critical artifacts (CAs), auger tests (AHs), shovel tests (STs), test pits (TPs), and other activities performed at each site. Table 2 lists the materials and artifact densities for the CUs. Salient cultural aspects for each site and isolated occurrences are discussed individually below.

LA 61033

LA 61033 is a sherd and lithic artifact scatter measuring approximately 55 by 40 m. The surface of this site has suffered severe disturbance, probably at the time of earlier road construction. We were unable to determine how deep the disturbance extends, but it probably extends 20 to 30 cm below the surface. The deepest auger tests reached 72 to 74 cm below surface, but most reached only 25 to 50 cm (Fig. 3).

Three flakes and one piece of angular debris were recovered from within 20 cm of the surface in four auger holes. Nine flakes and several flecks of charcoal were recovered from seven shovel tests. However, various Euro-American items, such as nuts, bolts, and washers, were recovered from five of the shovel tests, including several of those producing aboriginal artifacts. The seven CAs collected from this site are all flakes (see Lithic Artifact section below). None are temporally diagnostic, and the site cannot be dated.

The three salient features of this site are: (1) widespread mechanical disturbance, (2) low density of the aboriginal artifacts on the surface, and (3) very shallow subsurface aboriginal cultural materials. In our opinion, the site possesses no potential for yielding information important to further our understanding of the prehistory of the area.

LA 61037

This site consists of a single boulder outcrop with rock art figures on three faces. These were recorded by photography and by tracings. The tracing was done by placing clear mylar film over each face and tracing the outlines of each figure with a felt tip marker. Because angles in the outcrop appear to be integrally associated with some of the figures, these angles were marked in the tracings.

LA 61038

LA 61038 is a sherd and lithic artifact scatter measuring approximately 150 by 30 m. The site was originally larger, but the northern part was removed by the blading of an old road over fifty years ago. This site is long and narrow, at least insofar as we could ascertain

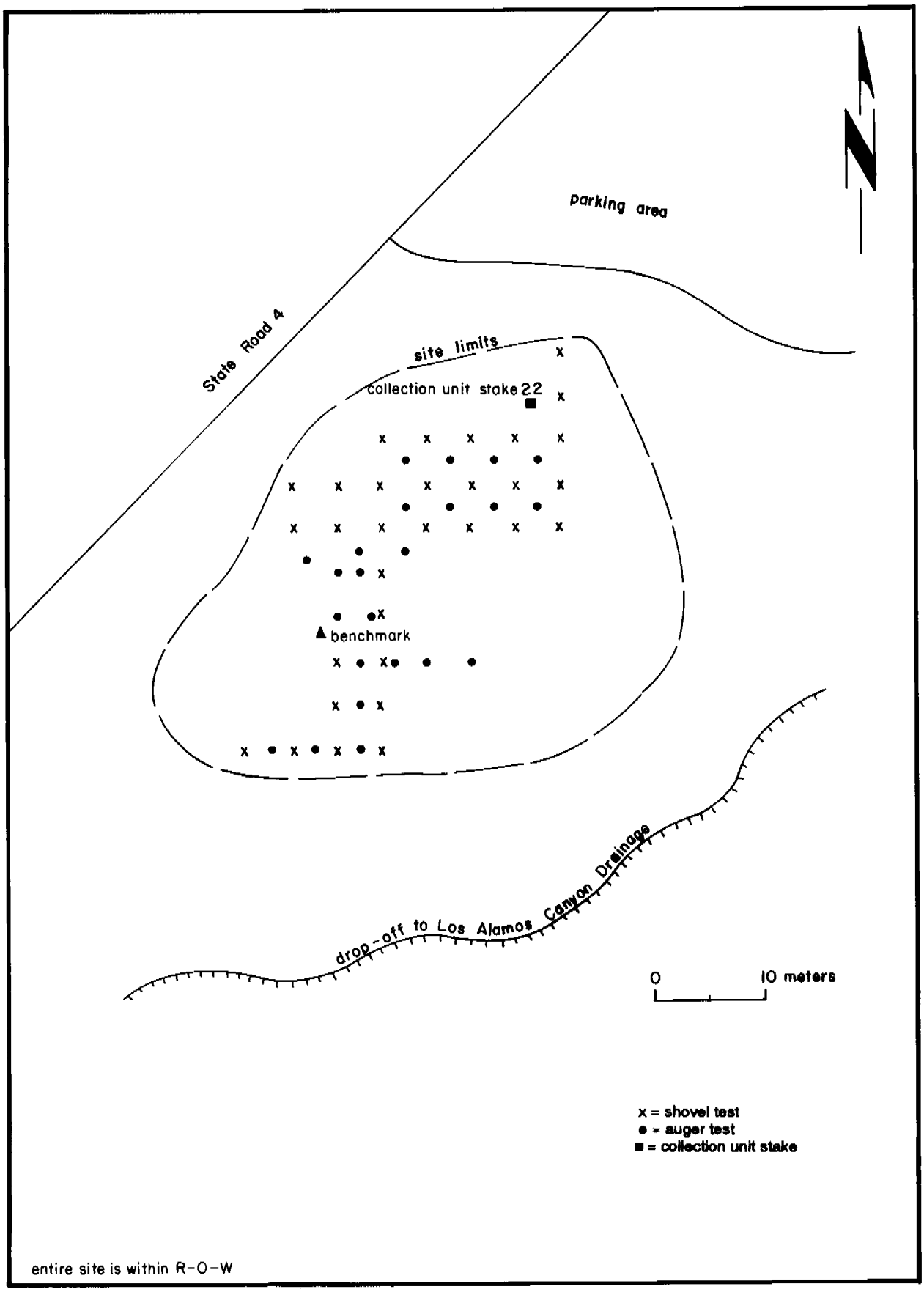


Figure 3. LA 61033 site map.

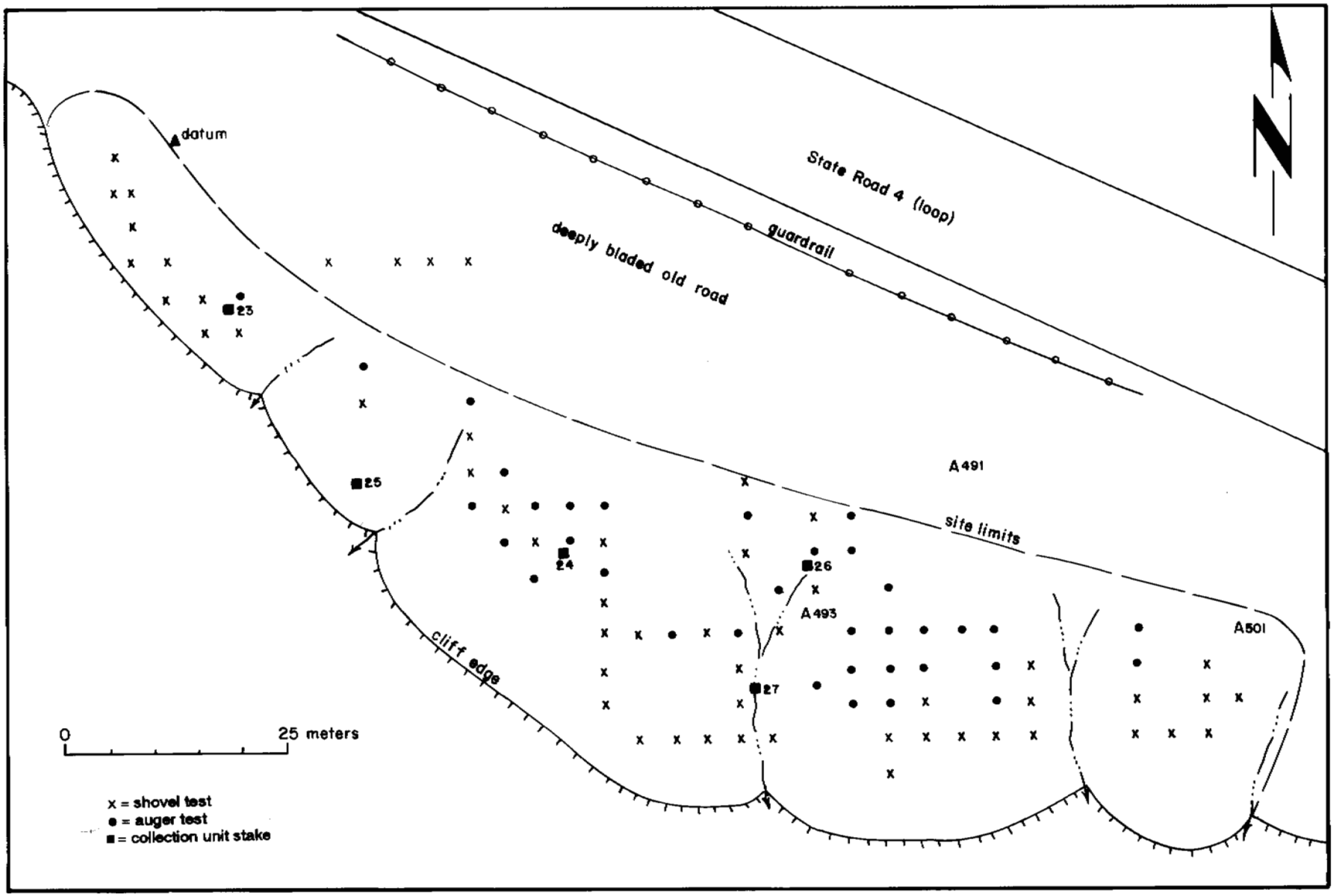


Figure 4. LA 61038 site map.

Table 1. List of Activities by Site

Site	CUs	CAs	AHs	STs	TPs
LA 61033	1	7	23	33	-
LA 61037[a]	-	-	-	-	-
LA 61038	5	54	36	52	-
LA 61039	1	8	15	19	-
LA 61040	1	-	7	11	-
LA 61041	17	396	551	472	6
LA 61042	1	4	19	-	-
LA 61043	2	9	26	-	-
LA 61044	1	2	6	-	-
LA 61045	1	11	55	-	-
LA 61046	-	21	30	-	-
LA 61050	-	6	13	-	-
Totals	30	518	781	587	6

[a] Tracings were made of all the rock art figures at this site. No cultural materials were present in the vicinity of this site, and no tests were made.

Table 2. Artifacts and Artifact Densities for Collection Units

CU no.	Site no.	Sherds	Lithics	Formal Artifacts	Total Artifacts (in CUs)	Density Items/sq m * **
1	61041	1	10	-	11	3 (2.75)
2	61041	2	12	-	14	4 (3.50)
3	61041	-	4	-	4	2 (2.00)
4	(65421)	20	10	-	30	10 (9.55)
5	(65421)	28	4	-	32	10 (10.21)
6	61043	5	10	-	15	5 (4.78)
7	61043	4	4	-	8	3 (2.55)
8	61041	-	30	-	30	10 (9.55)
9	61041	-	34	-	34	11 (10.82)

CU no.	Site no.	Sherds	Lithics	Formal Artifacts	Total Artifacts (in CUs)	Density Items/sq m * **
10	61041	16	10	-	26	8 (8.28)
11	61041	1	32	-	33	11 (10.51)
12	61041	-	28	1	28	9 (8.92)
13	(65420)	28	22	-	50	16 (15.92)
14	61041	1	36	-	37	12 (11.78)
15	61041	4	16	1	21	7 (6.69)
16	61041	3	18	-	21	7 (6.69)
17	61041	-	32	1	33	11 (10.51)
18	61041	-	18	-	18	6 (5.73)
19	61039	4	13	-	17	5 (5.41)
20	61040	2	8	-	10	3 (3.19)
21	61045	2	8	-	10	3 (3.19)
22	61033	-	11	-	11	4 (3.50)
23	61038	9	10	-	19	6 (6.05)
24	61038	2	32	-	34	11 (10.83)
25	61038	2	28	-	30	10 (9.55)
26	61038	1	35	-	36	12 (11.47)
27	61038	-	43	-	43	14 (13.69)
28	61044	-	7	-	7	2 (2.23)
29	61041	3	9	-	12	4 (3.82)
30	61042	14	1	-	15	5 (4.78)

* rounded figure
** actual figure

from the surface (Fig. 4). The true width (north to south dimension) could not be determined because of the presence of the current highway and associated disturbance along the north edge of the site. The remaining site portion is on relatively shallow soils along the canyon rim. One auger test reached 1.35 m below surface where it encountered caliche. A few reached 80 cm below surface, but most were between 30 and 60 cm.

Only three artifacts, all chipped stone, were recovered from auger holes. All came from within 10 cm of the surface, indicating that the cultural deposits are surficial.

The CAs from this site include 3 En Medio points, 1 end scraper, 27 potsherds, and 5 flakes. The En Medio points suggest a Basketmaker II occupation or the period 800 B.C. to A.D. 400. Pottery types include Santa Fe Black-on-white, Abiquiu Black-on-gray, and Sankawi Black-on-cream, indicating ceramic period occupation within the span A.D. 1200-1600.

The low density of cultural materials on the surface and the virtual absence of cultural materials and features below the surface indicate that this site lacks the potential to yield information important to furthering our understanding of the prehistory of the area.

LA 61039

LA 61039 is a thin sherd and lithic artifact scatter measuring approximately 30 by 25 m. Auger tests at this sites were not particularly deep (Fig. 5). They ranged from 6 to 46 cm; most were 20 to 30 cm. All were stopped by rocks, suggesting that a culturally sterile substratum of gravel is present in this area.

A single flake was recovered from within 3 cm of the ground surface in one auger hole, and another came from a shovel test. Otherwise, no charcoal, cultural staining, or features were encountered.

The CAs include a fragment of a possible En Medio point, one smeared indented corrugated sherd, eight flakes, and a core. If the identification of the projectile point fragment is accurate, an occupation during the span 800 B.C. to A.D. 400 is likely. Although the pottery (including those sherds from the CUs) is not highly diagnostic, smeared indented corrugated is most characteristic of the early Pueblo IV period or A.D. 1300 to 1450.

The low density of cultural materials on the surface, the small site size, and the absence of indications of subsurface deposits lead us to believe that this location does not have the potential to yield information important to further our understanding of the prehistory of the area.

LA 61040

LA 61040 is a small sherd and lithic artifact scatter measuring approximatley 15 by 12 m. Auger tests, ranging in depth from 20 to 41 cm, revealed no subsurface cultural materials or features (Fig. 6). A single flake was recovered in a shovel test. Otherwise, no subsurface cultural indicators were noted.

The CAs from this site are two sherds, including one Sankawi(?) Black-on-cream. Assuming the identification is correct, an occupation during the period A.D. 1500-1600 is indicated.

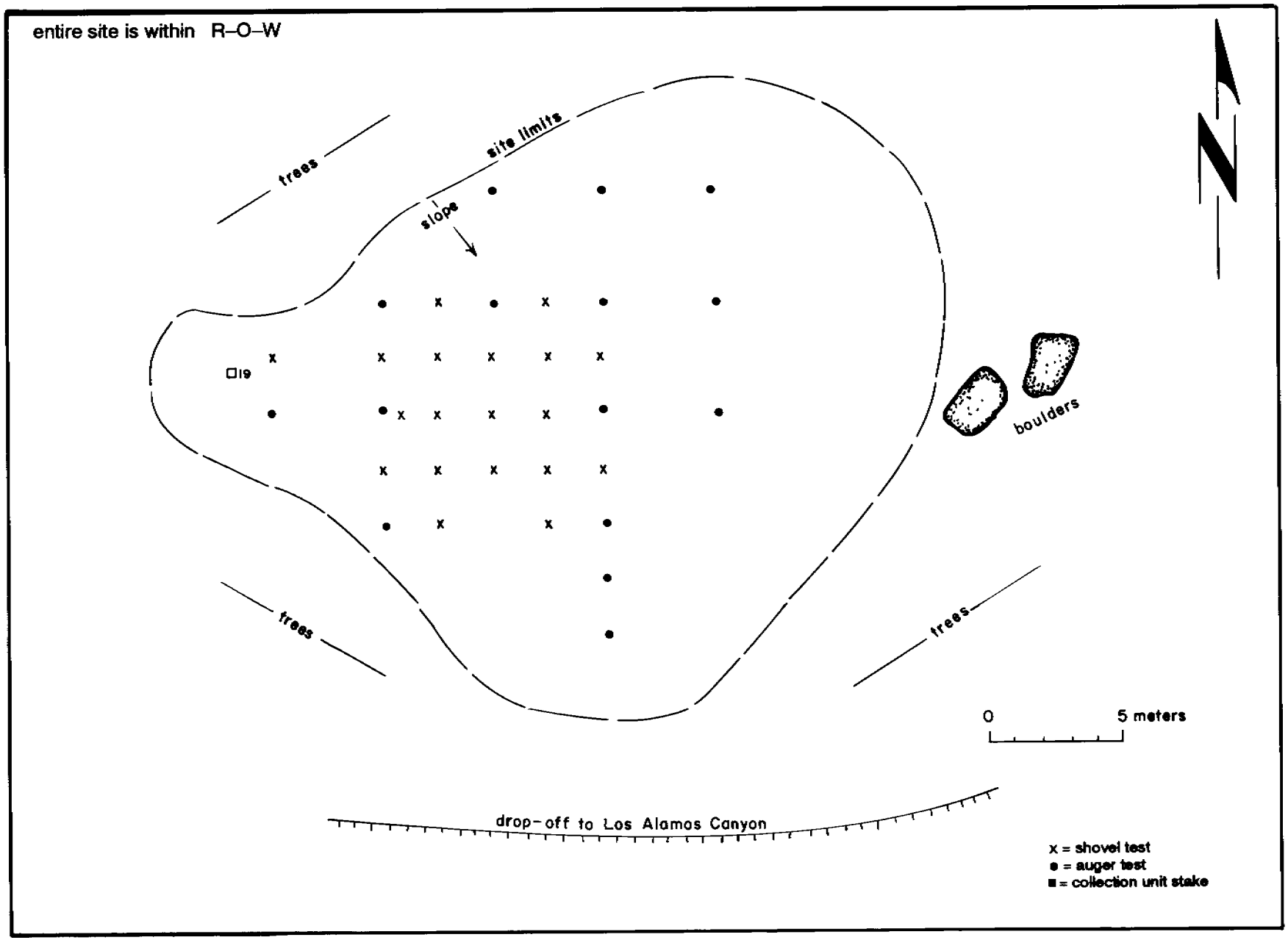


Figure 5. LA 61039 site map.

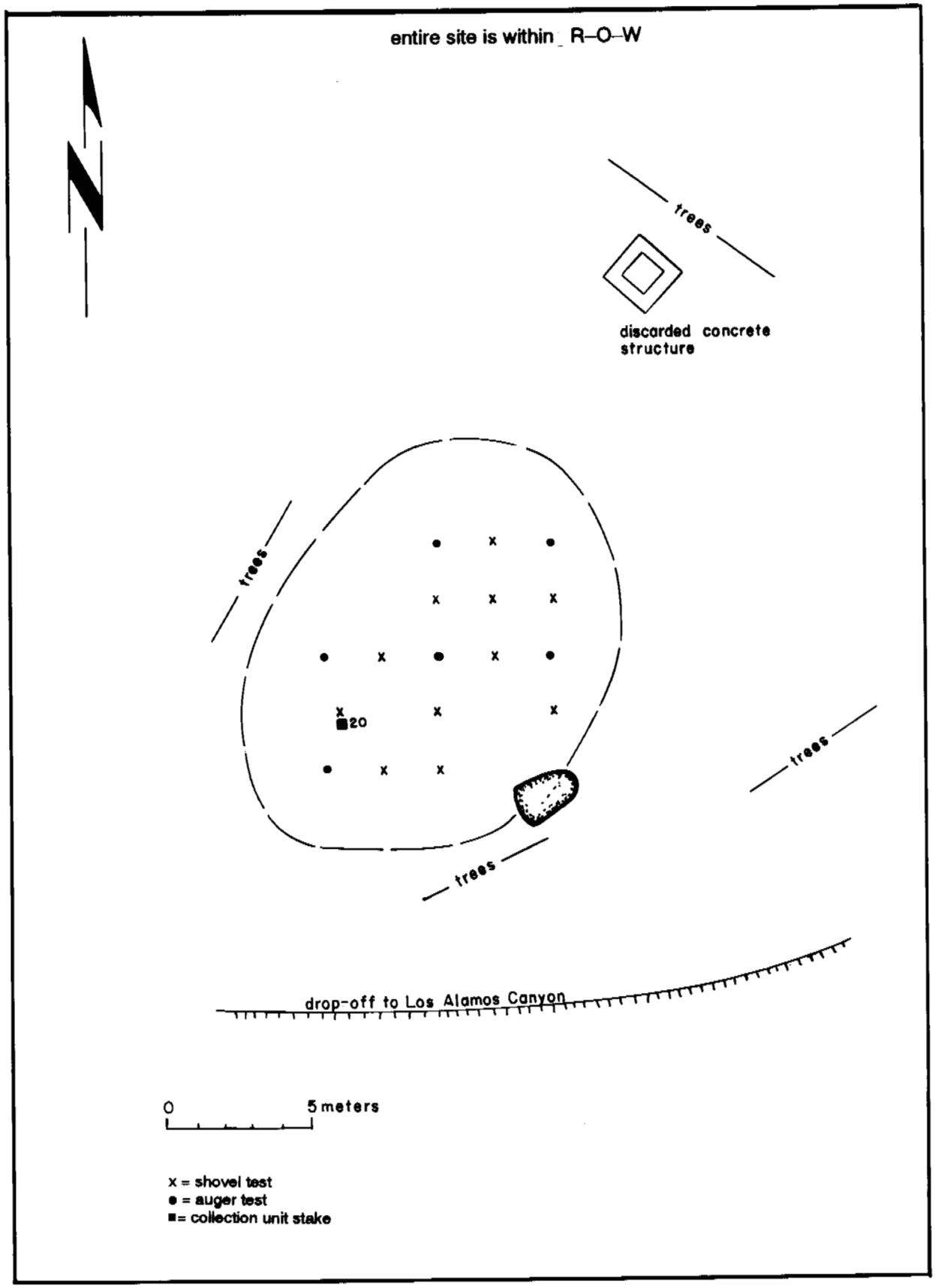


Figure 6. LA 61040 site map.

The thin distribution of cultural materials on the surface, the small site size, and the absence of indications of subsurface deposits lead us to believe that this location does not have potential for yielding information important to further our understanding of the prehistory of the area.

LA 61041

Description

LA 61041 is an extremely large sherd and lithic artifact site located on a ridgelike remnant of the terrace in the Y formed by Pueblo and Los Alamos canyons. Perhaps more appropriately described as a series of sites and use areas, these cultural remains were scattered over a group of stabilized sand dunes and terrace surfaces on the ridge. Overall site size is approximately 700 by 230 m. Two discrete habitational locations at the east end of the ridge were designated separate sites and assigned the numbers LA 65420 and LA 65421.

This site received extensive attention because of its extremely large size, diverse topography, and variable soil cover (Fig. 7). It was clear during the survey that thousands of flakes, sherds, and a few formal artifact fragments were thinly scattered across most of the site area. The density of artifacts was variable; some areas had obvious concentrations, others had thin scatters, and still others lacked cultural materials of any sort. Burned rock was conspicuously absent, except at one location in the south-central part of the site.

The absence of obvious, large, architectural features was particularly striking. In the Los Alamos area, major ridges at the confluences of canyons in heavily occupied districts were favored building locations. The presence of significant eolian sand accumulations on many parts of the ridge could have been masking architectural features, and it was clear that only an intensive testing study could determine whether or not important cultural remains were present.

LA 61041 is so large that a series of mapping stations were established by EDM so that all activities (collection units, auger tests, etc.) on the site could be readily mapped, and so that all these areas could be tied together into a main site map. Twenty-six stations were placed, 13 on each side of State Road 4 (Loop). North of the road they are numbered from east to west and are designated by an N- preceding the station number. South of the road they are numbered west to east and are designated by an S-.

Two small areas that have the potential for architecture were noted during the survey, and a third was discovered through auger testing. In addition, surface observations at other locations suggested that subsurface remains might be present, and that more intensive investigation was therefore required at these locations.

The size of the site, variability in surface soil cover, and character of the surface artifact distribution required several levels of investigation. The first step was to arbitrarily subdivide the site into manageable units, usually on the basis of the number of pinflags available for marking artifacts. Once the pinflags were in place, collection units (CUs) were

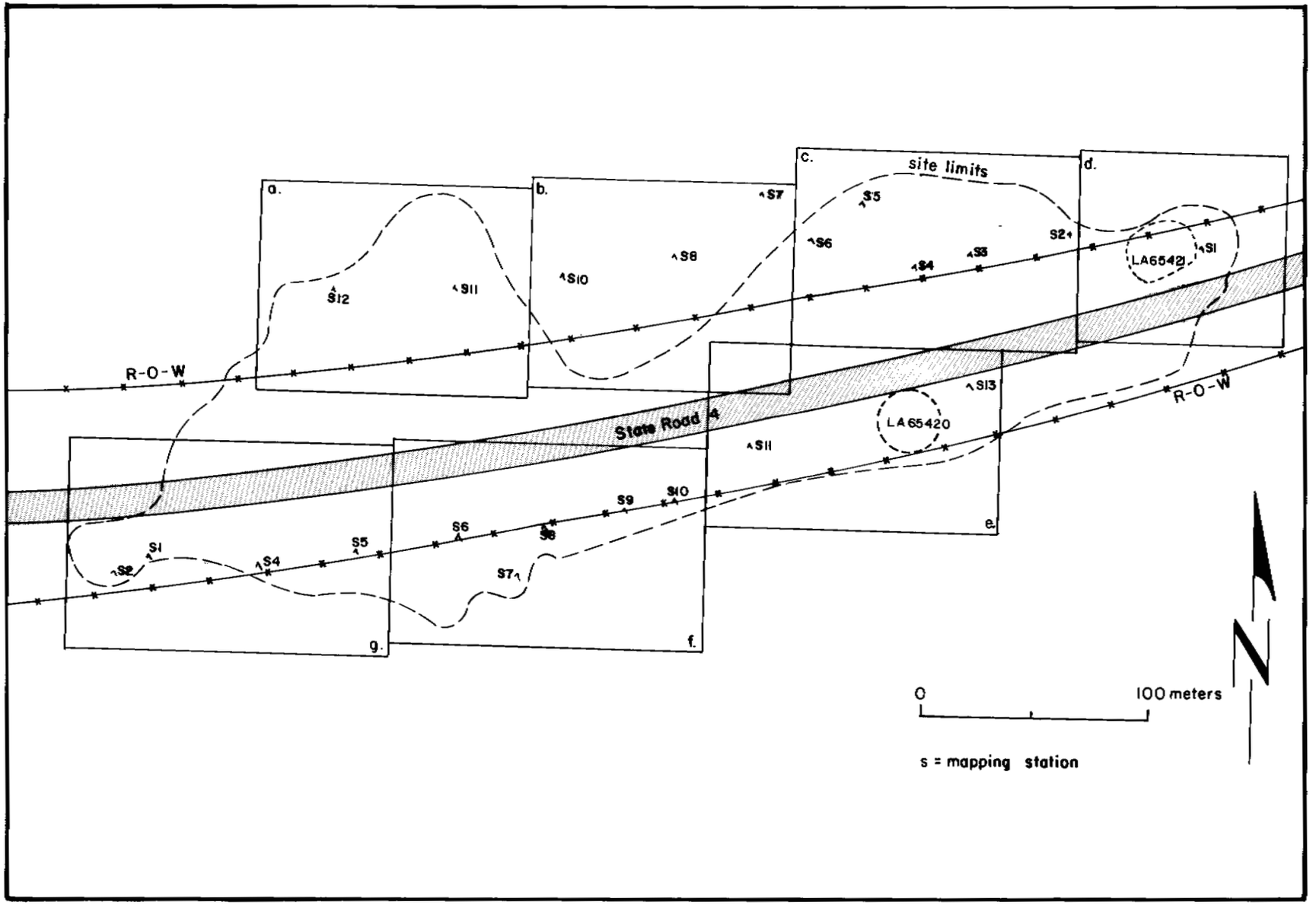


Figure 7. LA 61041 overall site map.

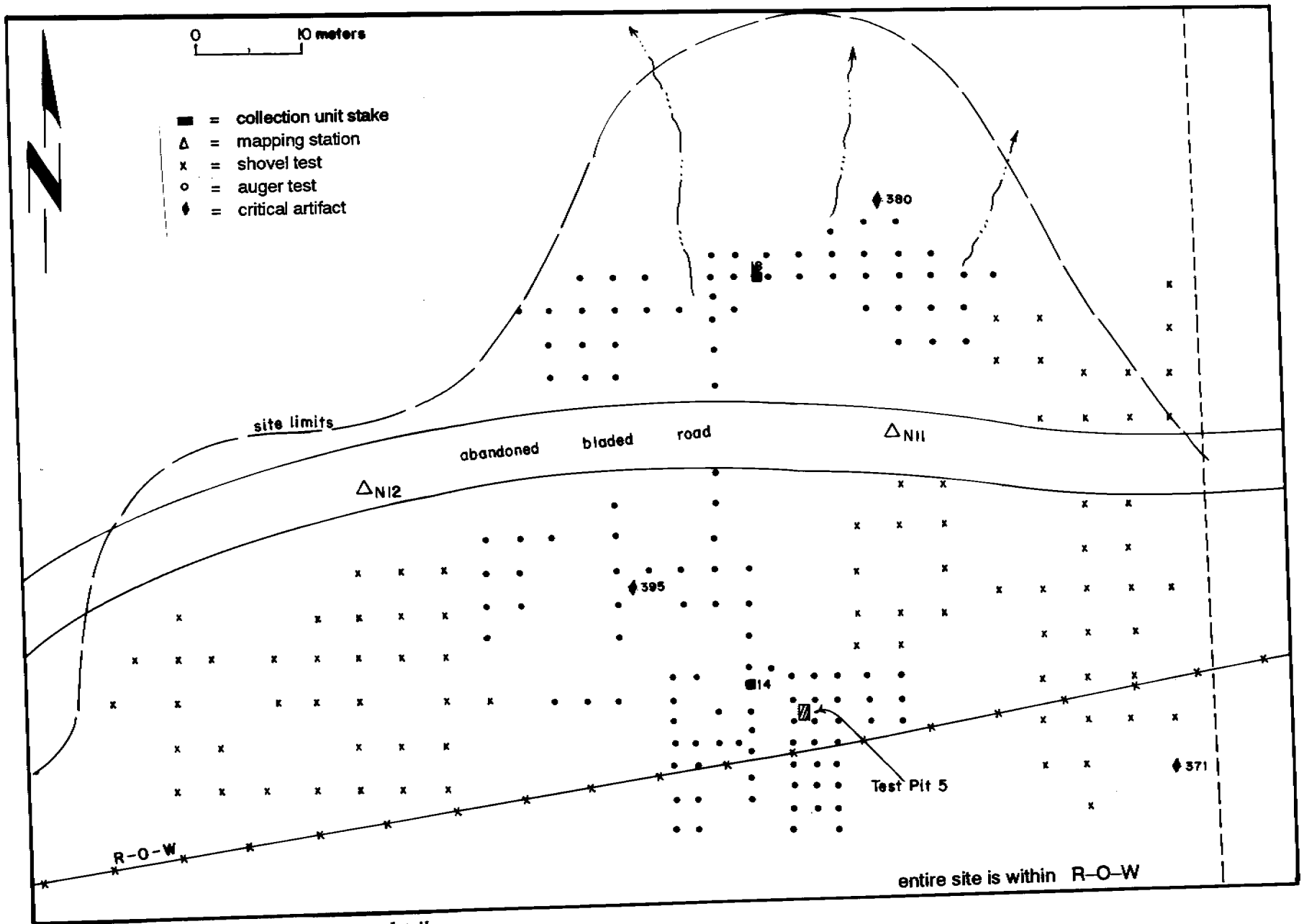


Figure 7. Continued. LA 61041 site map, detail a.

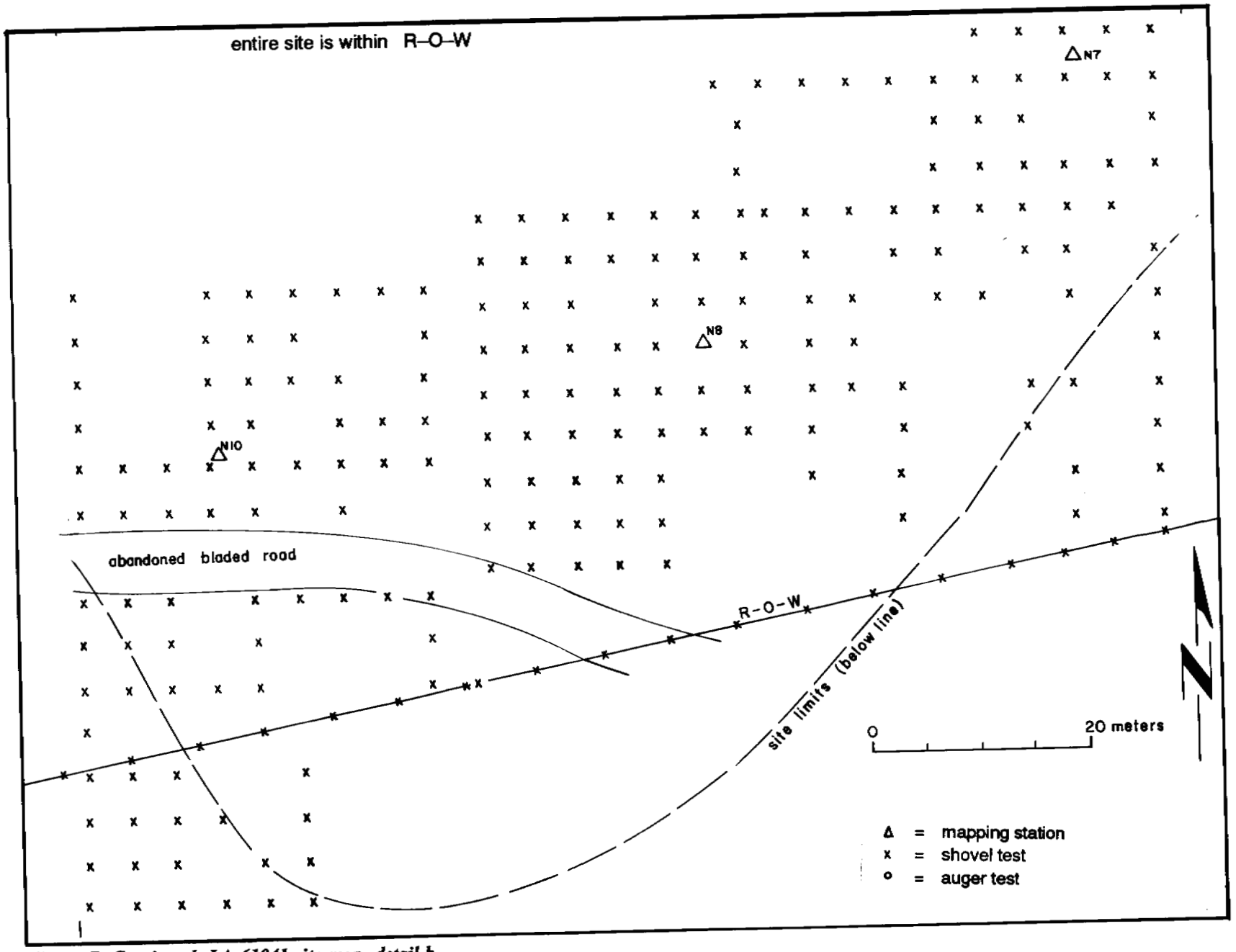


Figure 7. Continued. LA 61041 site map, detail b.

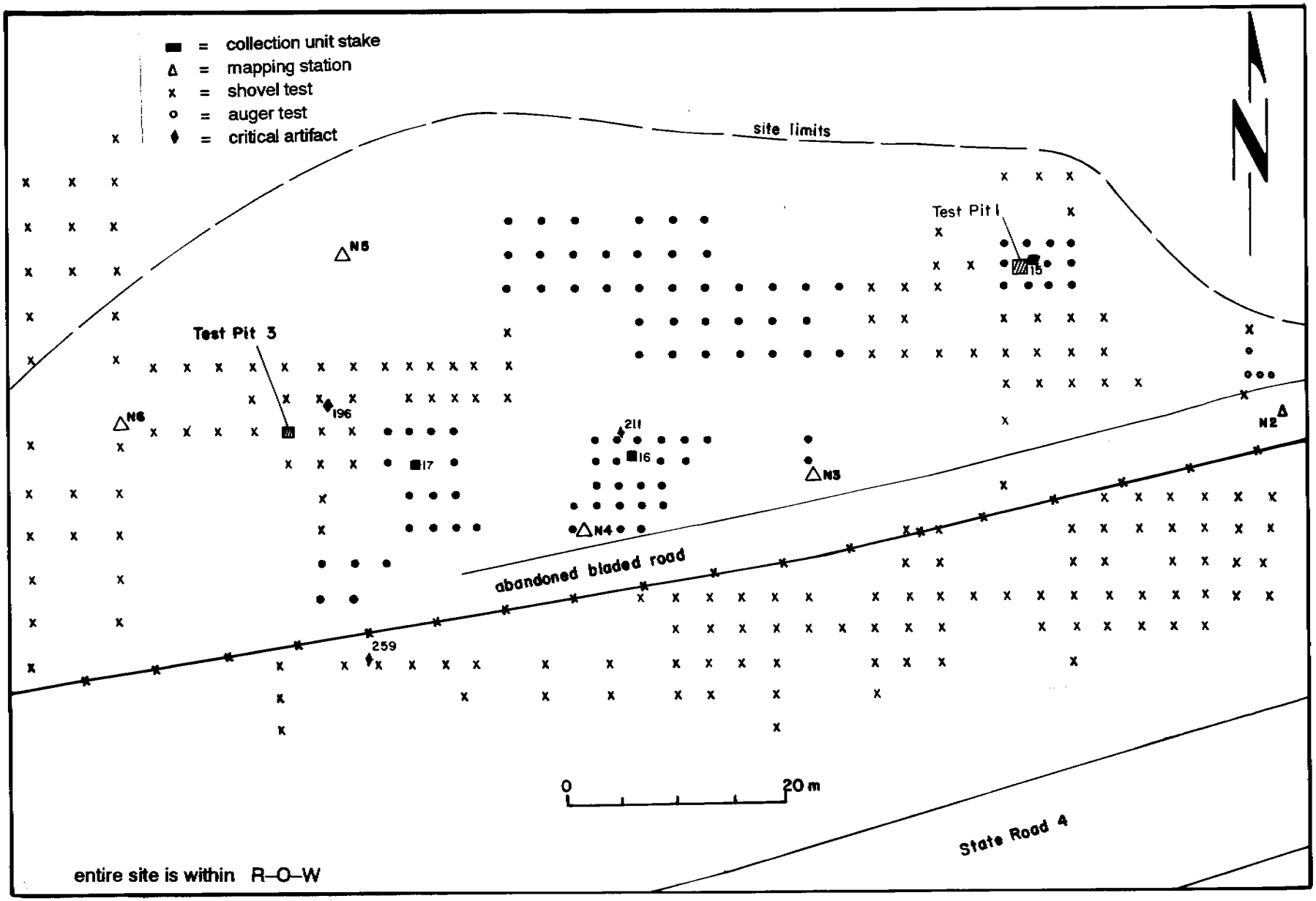
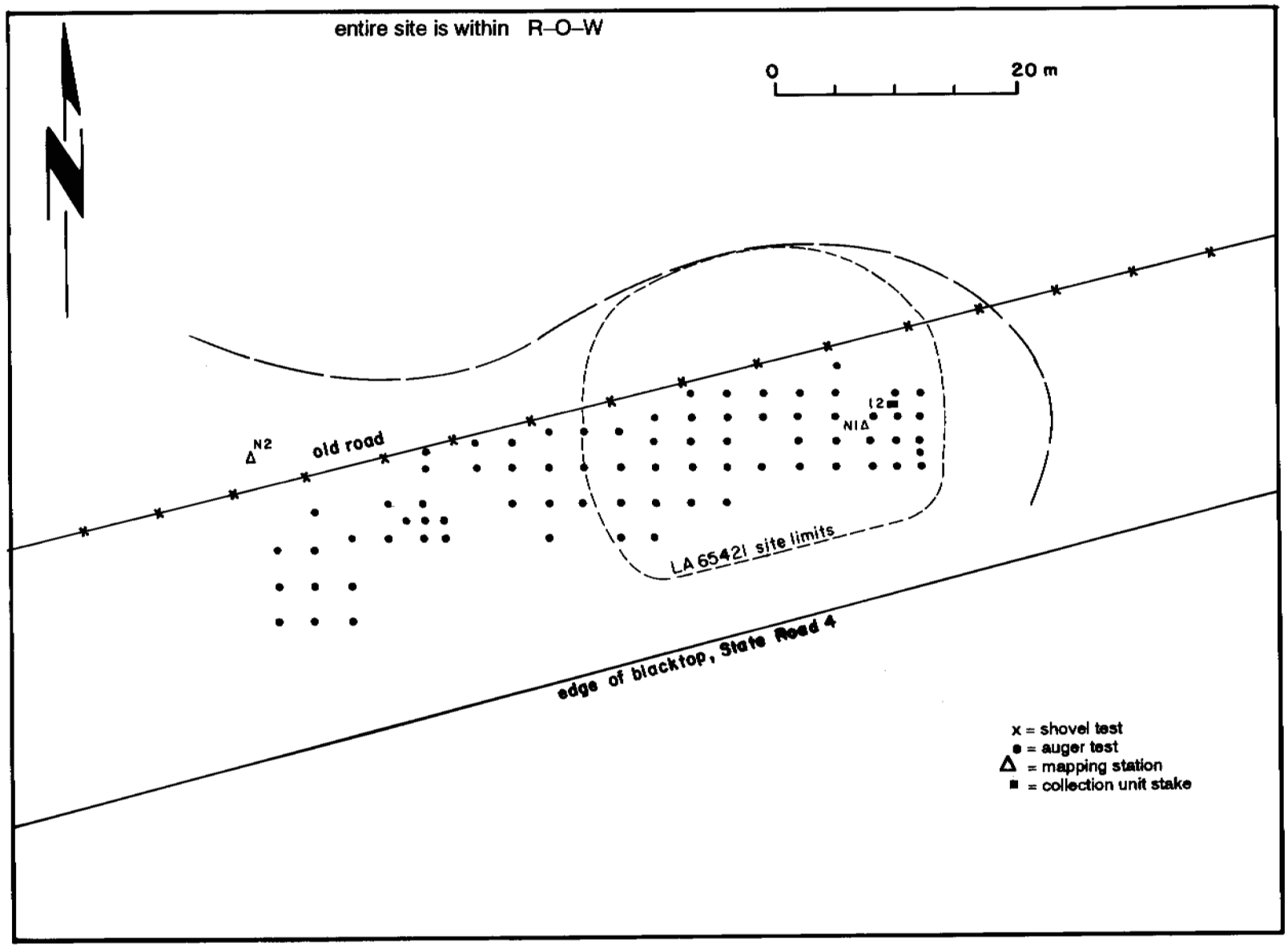


Figure 7. Continued. LA 61041 site map, detail c.



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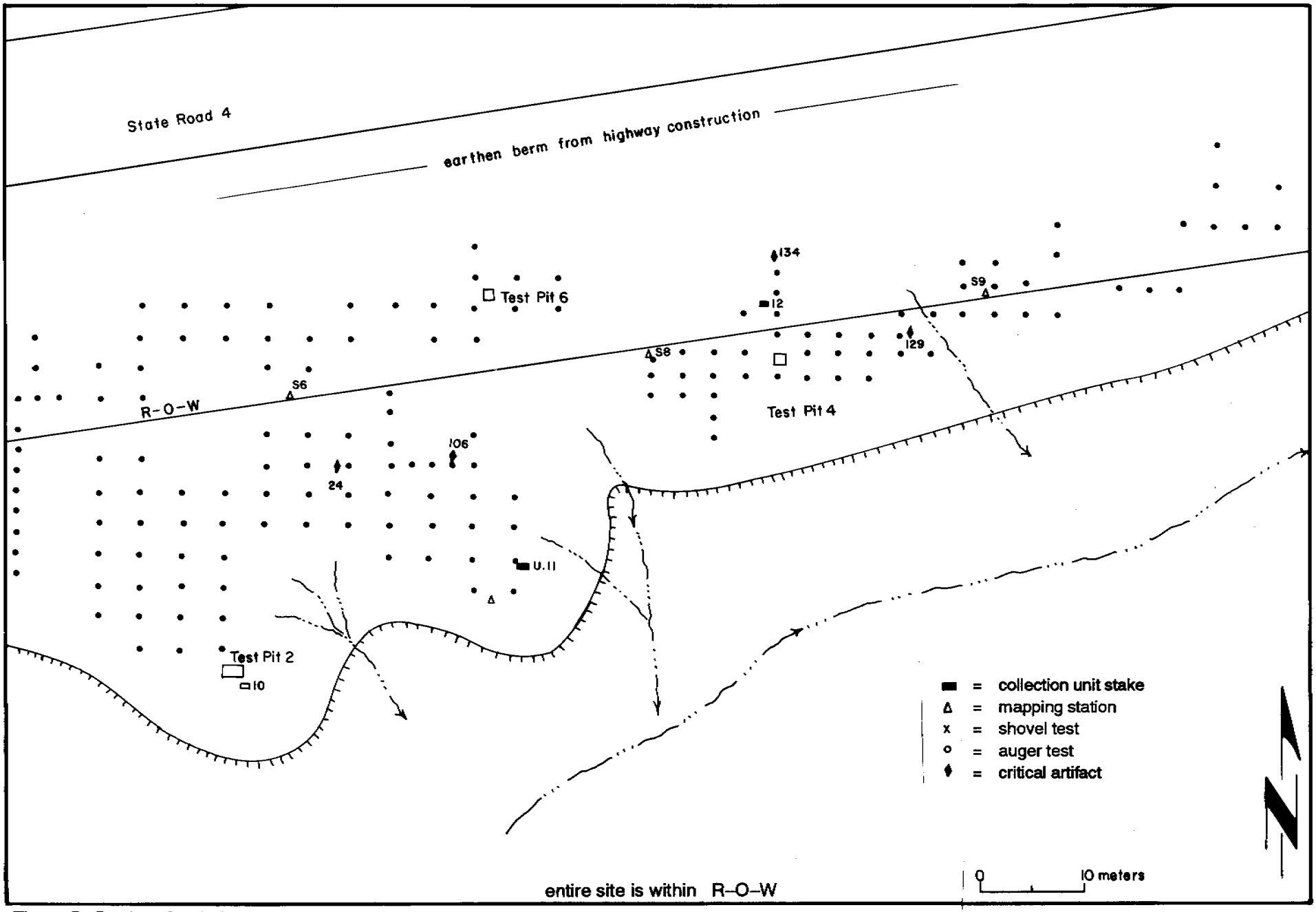


Figure 7. Continued. LA 61041 site map, detail e.

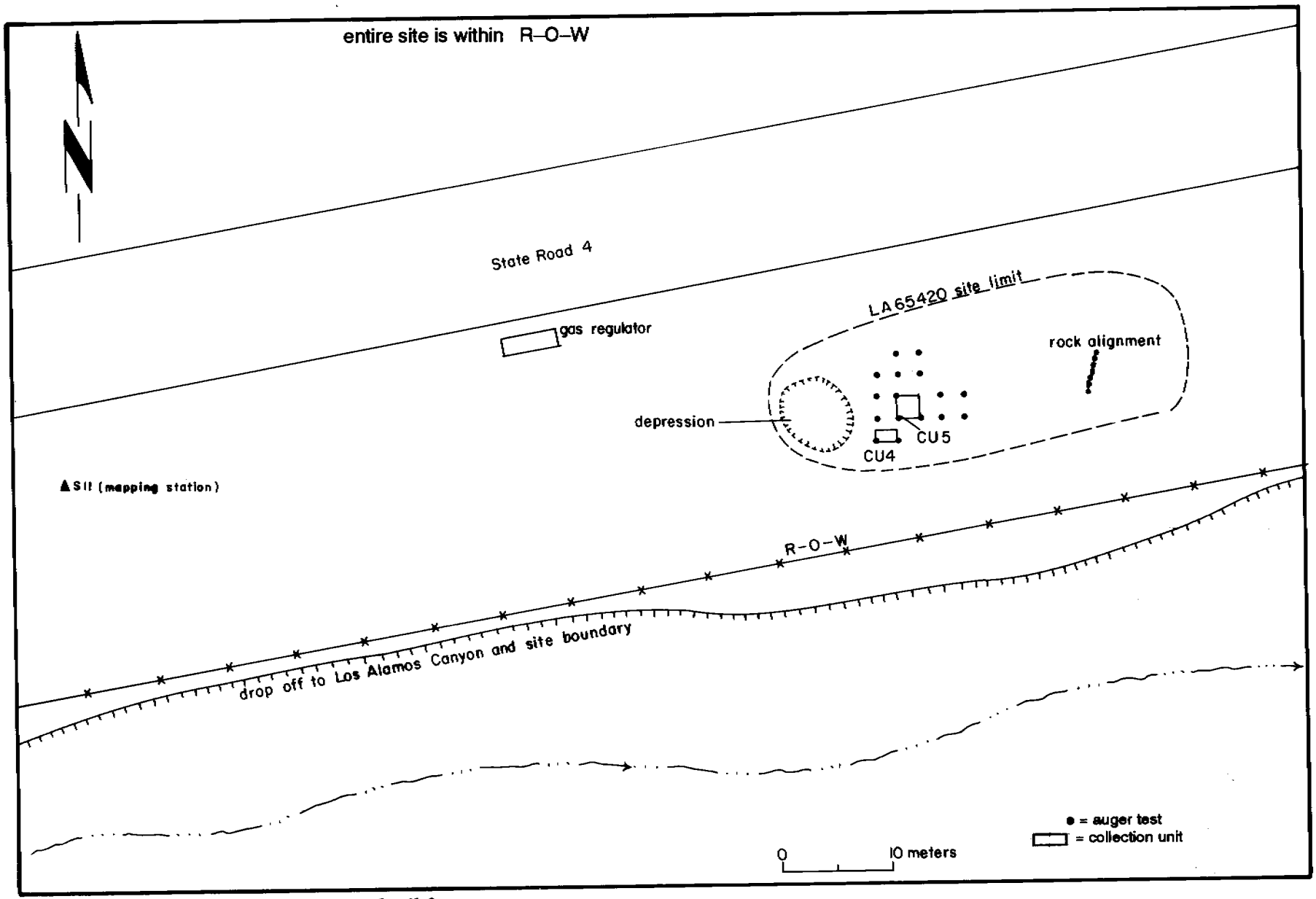


Figure 7. Continued. LA 61041 site map, detail f.

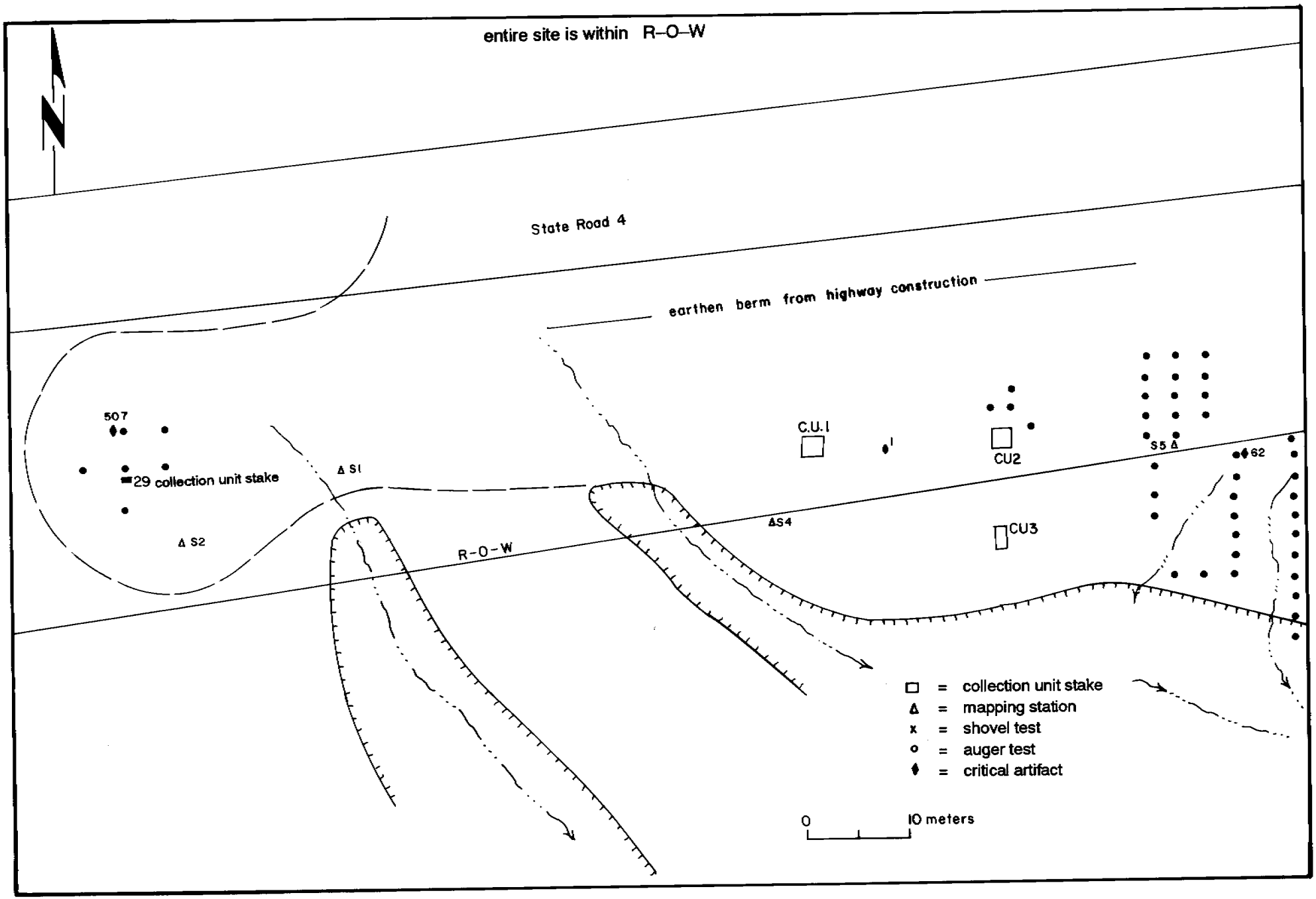


Figure 7. Continued. LA 61041 site map, detail g.

set up within the artifact concentrations, and collections were made. All critical artifacts were then collected, using the center stakes of the nearest CUs or mapping stations as reference points for mapping.

Next, the center stakes of the CUs were used to establish baselines of grids oriented to magnetic north and its cardinal directions. Auger tests were made at the grid intersections at intervals judged to be the most appropriate for each area. The areas of the main artifact concentrations were augered, but thin scatters of artifacts frequently continued beyond. To ensure that cultural features were not being overlooked in these marginal areas, shovel tests were employed along a continuation of the grid as a quick check.

As the last step, test pits were placed to further investigate specific phenomena, including locations of possible architecture, groups of auger holes that produced artifacts, and shovel tests that produced burned rock.

Results

Auger Tests. Not surprisingly, the auger test depths varied greatly as a consequence of the thickness of the sand mantle and the location of the test with respect to the landform itself. Locations higher up on the ridge have more soil and sediment depth because of eolian accumulation. On the slopes, bedrock boulders and Santa Fe Group gravels are fairly close to the surface.

Cultural material was recovered from 73 auger tests. Most were flakes, but sherds, burned rock, pieces of charcoal, and charcoal-stained soil are all represented (Appendix 1). Most of the artifact-producing auger holes were widely scattered, but in four instances sufficient materials were retrieved from adjacent tests and further action was warranted.

Auger tests 200, 206, 207, 208, 210, 211, and 213 produced so much charcoal and artifacts throughout their depths that the presence of a pit structure was clearly indicated. To highlight the special nature of this location, a new Laboratory of Anthropology number, LA 65421, was assigned to it.

Auger tests 424, 428, and 429 produced several flakes at great depths. Test Pit 5 was excavated to investigate the location in greater detail.

Auger tests 142, 144, 145, 151, and 154 produced several flakes, a sherd, and a piece of burned rock. Test Pit 6 was excavated to investigate this location in greater detail.

Auger tests 549 and 554 produced several sherds and some charcoal. Although the amount of cultural material is not particularly great, the test results indicate that this location has a structure and associated refuse. To highlight the special nature of this location, a new Laboratory of Anthropology number, LA 65420, was assigned to it.

Shovel Tests. Twenty-nine artifacts and other cultural material were recovered in shovel tests (Appendix 2). Most were flakes, but sherds, burned rock fragments, and charcoal were also represented. Most of the artifact-producing tests were scattered, but in one instance (ST 211),

Test Pit 3 was dug to investigate what had been reported as several pieces of burned rock.

Test Pits. Test Pit 1: This 1-by-1-m test was placed within a small concentration of what appeared to be burned rock and artifacts located in the northeastern part of the site. Excavation proceeded in 10 cm levels to a maximum depth of 30 cm, and all fill was screened. The fill was typical of weakly developed natural soil profiles and contained few artifacts. A lightly charcoal-stained lens (30 by 20 by 10 cm) was noted just under the surface in the southwest quadrant of the square. It lacked charcoal, charcoal flecks, reddish coloration, and an obvious outline to identify it as a hearth; it may be a natural stain.

Test Pit 2: A possible fieldhouse located in the southwest part of the site was investigated by excavating a 1-by-2-m test pit placed over what appeared to be two rock alignments that formed a corner (Fig. 8). Initially, excavation took place in 5-cm levels to facilitate the identification of floors or use-surfaces, but after completion of the excavations, the collections were combined into 10 cm levels. Overall, excavations were carried to 30 cm below surface, but a small, deep test in the west part of the west square was excavated to 45 cm below ground surface. All rocks smaller than 10 by 10 cm, including several pieces of burned rock, were removed in order to allow the discovery and definition of rock alignments. All fill was screened through ¼-inch mesh.

Once the smaller rocks were removed, the possible rock alignments noted on the surface disappeared. Lower down, four large rocks aligned in an arc were noted. However, no definable floor or use-surface could be identified in association with the alignment. Thus, we could not be certain whether the rocks were part of a structure. Even if they were, it is clear that virtually nothing remained of the structure, if that is what it was, which would permit the retrieval of information useful to furthering our understanding of prehistory.

Test Pit 3: This 1-by-1-m test pit is located 15 m south and 61 m west of Test Pit 1. Its purpose was to investigate what had been reported as a burned rock concentration discovered by a shovel test (ST 211). No burned rock (other than the piece turned up in the shovel test) and only two flakes were recovered in the first 10 cm. This, plus an absence of charcoal and cultural staining, led us to end the test at 10 cm below present ground surface.

Test Pit 4: This 1-by-1-m pit was placed in the center of a concentration of surface artifacts located in the south-central part of the site; it was 30 m north and 51 m east of Test Pit 2. Excavation was in 10 cm levels, and all fill was screened through ¼-inch mesh. Final depth was attained at 1.3 m where bedrock, composed of several large boulders, was encountered. The fill was a uniform volcanic sand from surface to bedrock. No stratification could be discerned in pit profile. Flakes were recovered from most levels including the lowest one, but too few (n = 48; density of 37 artifacts/cu m) were found to indicate that data recovery would be useful at this location.

Test Pit 5: The purpose of this 0.7-by-1.4-m pit was to rapidly investigate a concentration of artifact-producing auger tests in the northwest sector of the site. Excavation proceeded in 25 cm levels to 1.2 m below surface in the south half and to 1.6 m in the north half. The main objective was to determine whether stratigraphy was present and whether more intensive work would be necessary. Consequently, the fill was not screened, but instead was carefully turned for visual inspection and artifact recovery.

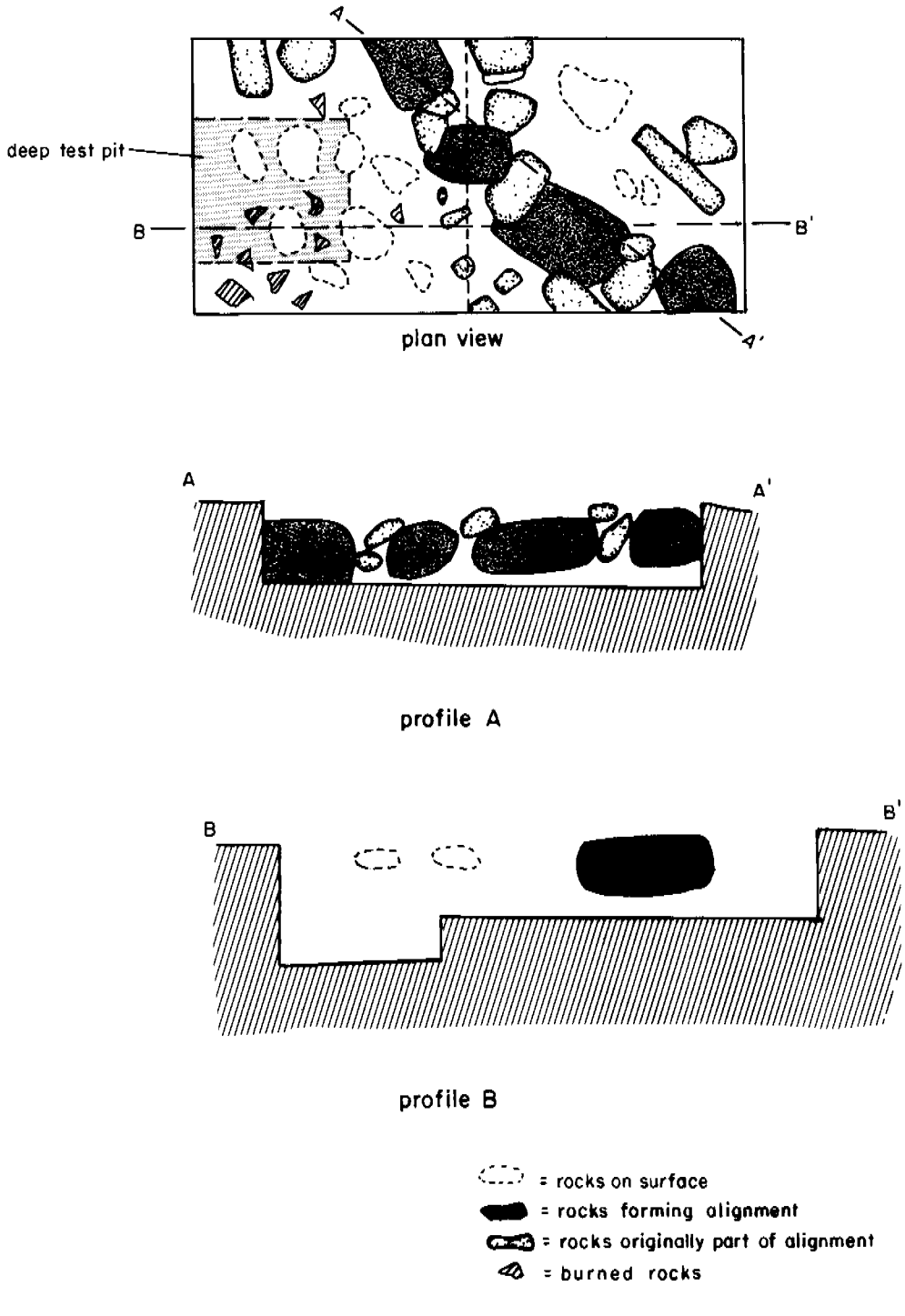


Figure 8. LA 61041, Test Pit 2, plan and profile.

The fill was volcanic sand lacking in stratigraphy, natural or cultural. The only artifacts recovered were a mano preform and three flakes, all coming from the uppermost 50 cm. The total depth of the volcanic sand was not determined, but judging from the configuration of the slope and its position with respect to the prevailing winds, it could continue for another couple of meters. Overall, there was insufficient evidence to justify data recovery in this locality.

Test Pit 6: This 1-by-1-m pit, located south of the highway and 35 m northeast of Test Pit 2, was excavated within a group of several artifact-producing auger tests. The fill from the three 30-cm levels was all screened through ¼-inch wire mesh. Final depth was 90 cm. The fill of volcanic sand lacked stratigraphy or evidence of cultural materials other than flakes (n = 11; density of 12 artifacts/cu m). In our opinion, data recovery in this locale is not warranted.

The CAs at LA 61041 includes an En Medio point, a drill, a biface fragment, numerous potsherds, numerous flakes, and a metate fragment. Diagnostic artifacts from CUs include a possible Plainview point fragment and a San Jose point fragment. The pottery includes Santa Fe Black-on-white, Wiyo Black-on-white, Abiquiu Black-on-gray, Bandelier Black-on-gray, and Sankawi Black-on-cream. Thus, several occupations, including possible Paleoindian (ca. 10,400 to 9300 B.C.), Middle Archaic (San Jose; ca. 3200 to 1800 B.C.), Basketmaker II (800 B.C. to 400 A.D.), and late ceramic period (A.D. 1200 to 1600), are indicated.

Site Summary

The surface artifact collections from LA 61041, taken from the areas of greatest surface artifact density, show that surface cultural materials are generally sparse. The auger tests indicate that some subsurface remains can be found at the site. In most cases, however, the density of subsurface remains is so low that natural disturbance factors rather than subsurface features appear to account for their presence.

The two exceptions were located through auger tests and hand-excavated test pits. These two locations, which appear to represent the remains of extensive subsurface cultural deposits and perhaps structures, have been assigned individual Laboratory of Anthropology site numbers. These two locations do appear to be able to yield important information on local prehistory.

Based on the results of auger testing, two other locations were chosen for hand-excavated test pits. In these two cases, few subsurface artifacts were recovered, and no subsurface features or stratigraphy were noted. It therefore appears that these final two locations lack the potential to yield important information on local prehistory.

LA 61042

LA 61042 is a sherd and lithic artifact scatter measuring approximately 25 by 15 m. The auger tests in this site were uniformly deep, 1.46 to 1.58 m (Fig. 9). Rocks and pebbles were infrequent; most of the fill was loose volcanic sand.

Two of the auger holes produced one flake each; both were recovered in the sleeves approximately 1.30 m deep. In both cases, however, the flakes may have been dislodged from the sides of the hole at lesser depths. The softness of the fill resulted in enlargement of the holes during insertion and extraction of the auger. Whatever the case, no other cultural indicators (such as charcoal and soil stains) were noted in the auger samples.

The CAs include three sherds and one flake. The pottery includes Biscuit jar sherds and Potsuwii Incised, suggesting a date span of A.D. 1400 to 1525+. The low density of artifacts on the surface, the small site size, and the absence of indications of subsurface deposits lead us to believe that this location does not have the potential to yield information important to furthering our understanding of the prehistory of the area.

LA 61043

LA 61043 is a sherd and lithic artifact scatter measuring approximately 50 by 25 m. Augering this site was difficult because of the high gravel content of the soil. Some tests reached 1.10 to 1.20 m, and most were 60-90 cm (Fig. 10).

A single sherd was recovered from a depth of 30 cm in one of the auger tests. No other subsurface cultural indications were noted. The CAs are all sherds, including Santa Fe Black-on-white and Bandelier Black-on-gray. Together with the Abiquiu Black-on-gray and Potsuwii Incised recovered from the CUs, one or more occupations within the span A.D. 1200 to 1525+ is indicated.

The low density of cultural materials on the surface, the small site size, and the absence of indications of subsurface deposits lead us to believe that this location does not have the potential to yield information important to furthering our understanding of the prehistory of the area.

LA 61044

LA 61044 is a sherd and lithic artifact scatter measuring approximately 20 by 15 m. Two rock features were present; one was a concentration of river cobbles and the other a group of small boulders. These two concentrations of rock are among the few surface features noted on the project sites (Fig. 11). One is near the head of a small, shallow drainage and appears to be a modern erosion control device (possibly constructed during the CCC program of the 1930s). No soil accumulated behind it, nor in the interstices among the cobbles.

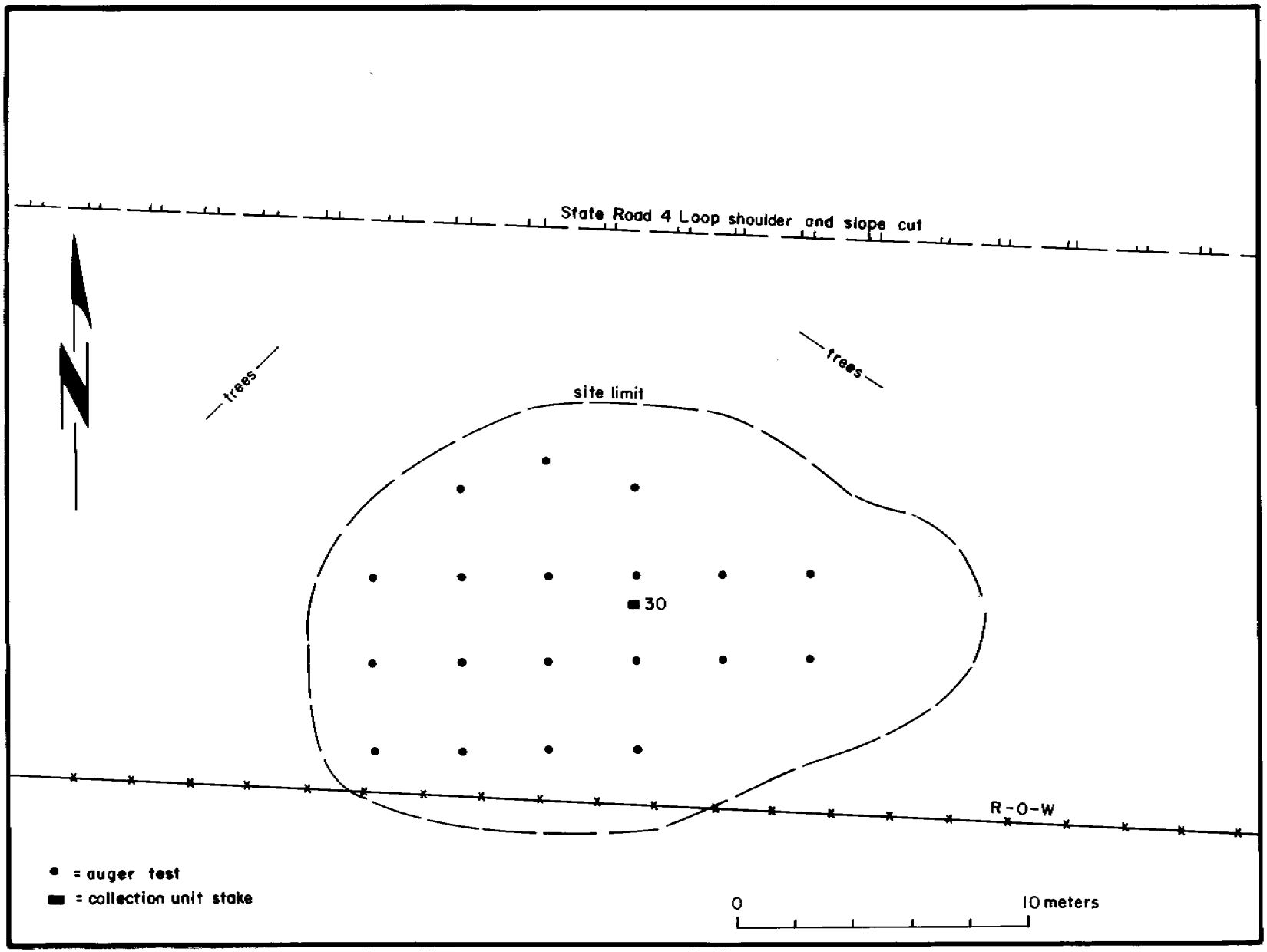


Figure 9. LA 61042 site map.

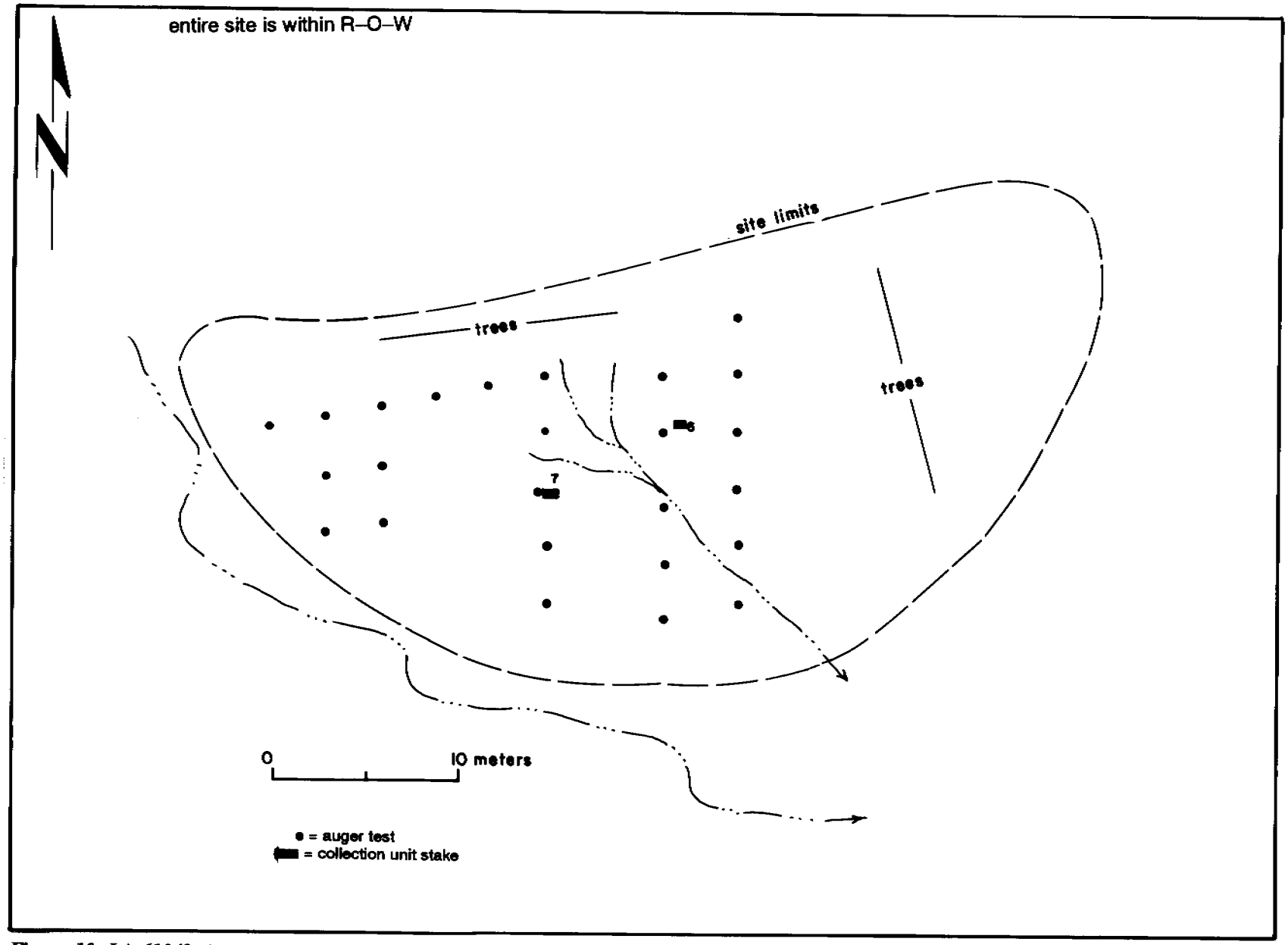


Figure 10. LA 61043 site map.

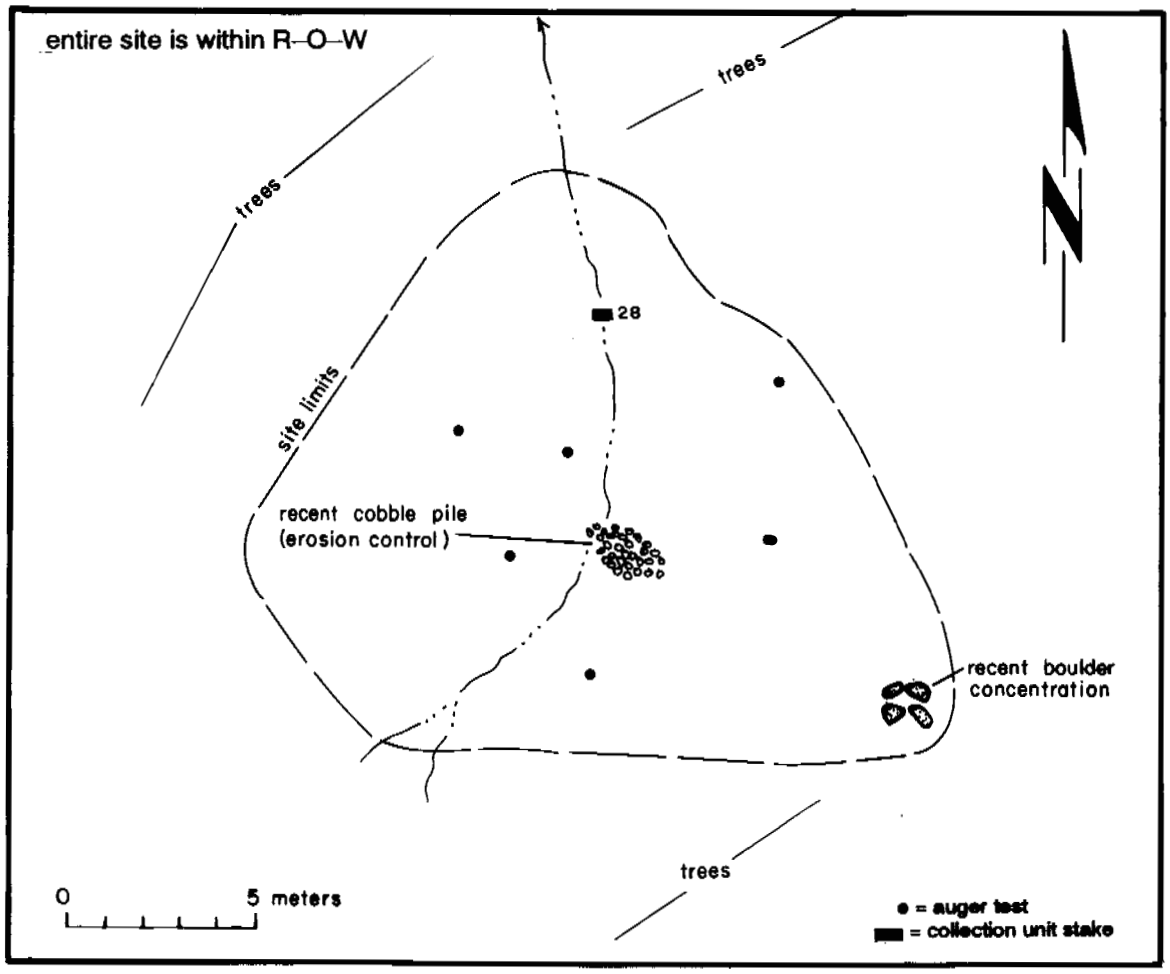


Figure 11. LA 61044 site map.

The second group of rocks is nearly hidden among a cluster of trees in the southeast part of the site. It consists of a half-dozen rocks and small boulders of various sizes. We originally suggested on the survey forms that the rocks might be part of a prehistoric or early historic Indian fieldhouse. Closer examination reveals this to be unlikely; the rocks are resting on top of the ground and are tightly grouped as if placed there by a piece of heavy equipment sometime in the recent past.

The auger tests were placed in the more promising areas of the site (on minor topographic rises). Depths, though variable (35 to 104 cm), were generally satisfactory in that they revealed the expected depth of sterile, given the topographic relief. No cultural materials were recovered.

The CAs are all sherds, including Bandelier Black-on-gray. Occupation within the span A.D. 1400 to 1500/1550 is indicated.

The dearth of cultural materials on the surface, the small site size, and the absence of indications of subsurface deposits lead us to believe that this location does not have the potential to yield information important to furthering our understanding of the prehistory of the area.

LA 61045

LA 61045 was a thin sherd and lithic artifact scatter measuring approximately 50 by 40 m. The only cultural features on the surface of this site are a hunter's or camper's rock-ringed campfire and a "push-pile" of dirt made with heavy equipment (Fig. 12). Both are recent, probably dating to the last two to three decades.

All but 14 of the auger tests at this site reached depths in excess of 1 m. The shallowest was 17 cm (stopped by a rock), and the deepest was 1.56 m.

Sites such as this one, located on a broad, low rise on the valley side-slope, are considered to be good candidates for structures. The recovery of only three artifacts, all flakes, from the subsurface tests is surprising. All came from within 50 cm of the surface. No other subsurface cultural indications were noted.

CAs include four potsherds and seven flakes. The pottery types are Wiyo Black-on-white and Bandelier Black-on-gray, suggesting one or more occupations within the estimated span of 1300 to 1450.

This site consists of a relatively few, broadly scattered artifacts on the surface and no subsurface deposits and features. Thus, we believe that it has no potential to yield information important to understand the prehistory of the area.

LA 61046

LA 61046 is a sherd and lithic artifact scatter with overall dimensions of 15 by 12 m, though most artifacts were clustered within an area half that size. This site is small but had a fairly dense concentration of artifacts on the surface (Fig. 13). Rather than collect a CU, we mapped all critical artifacts from a central point. A small group of rocks, originally thought to be the rubble of a fieldhouse, appears to be a lag gravel bar deposited by a nearby drainage. Auger tests were generally discouraged by subsurface rocks and gravel, and most were less than 20 cm deep. Seven of the tests ranged from 20 to 98 cm. No subsurface cultural materials were noted.

CAs are all potsherds and include Wiyo Black-on-white, Bandelier Black-on-gray, Sankawi Black-on-cream, and Cieneguilla Glaze-on-yellow. Thus, one or more occupations took place within the span of A.D. 1300 to 1600.

For the current project, the density of surface artifacts at this site was notable; however, the absence of formal surface and subsurface features and subsurface deposits lead us to conclude that this site lacks the potential to yield information important to further our understanding of the prehistory of the area.

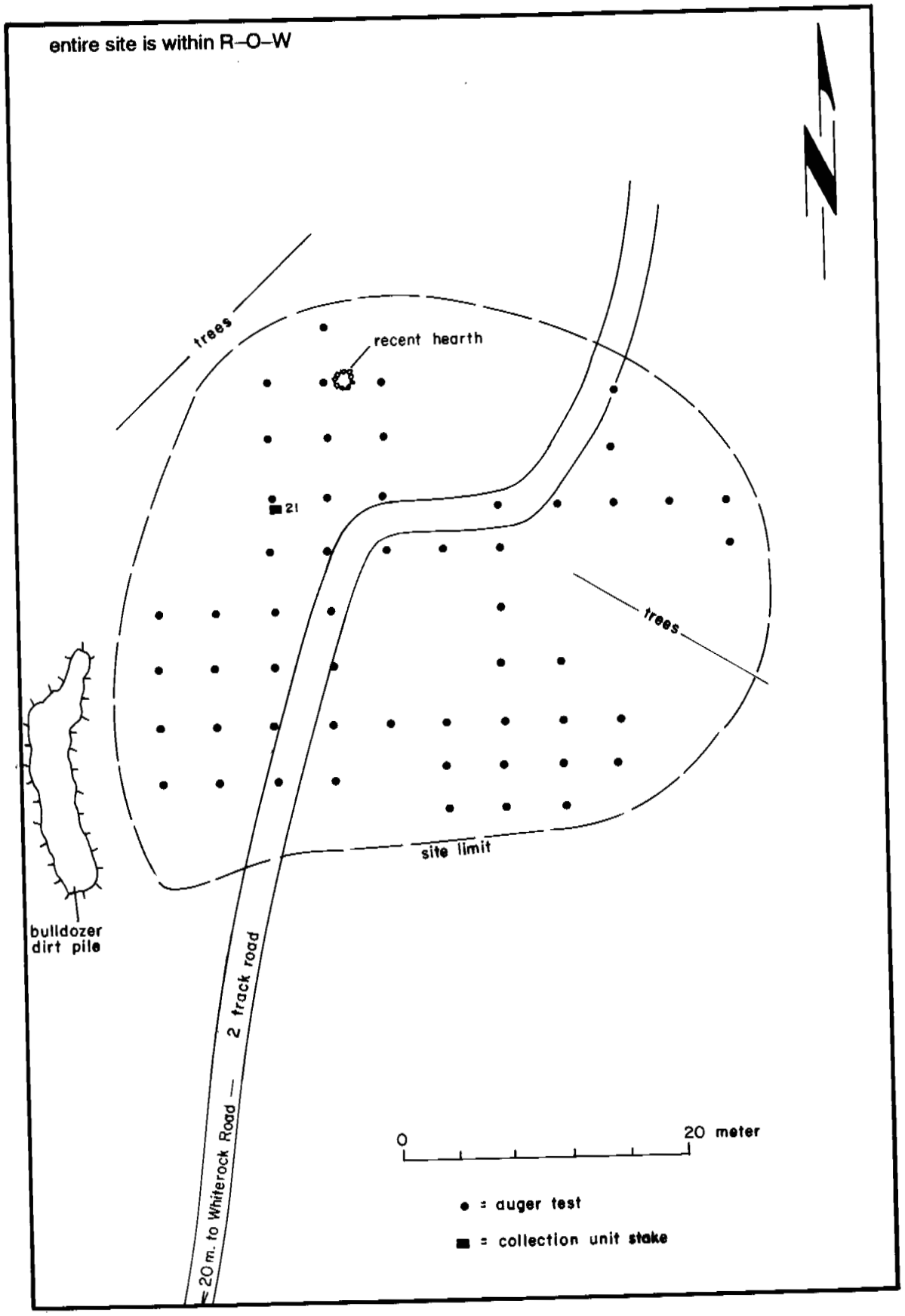


Figure 12. LA 61045 site map.

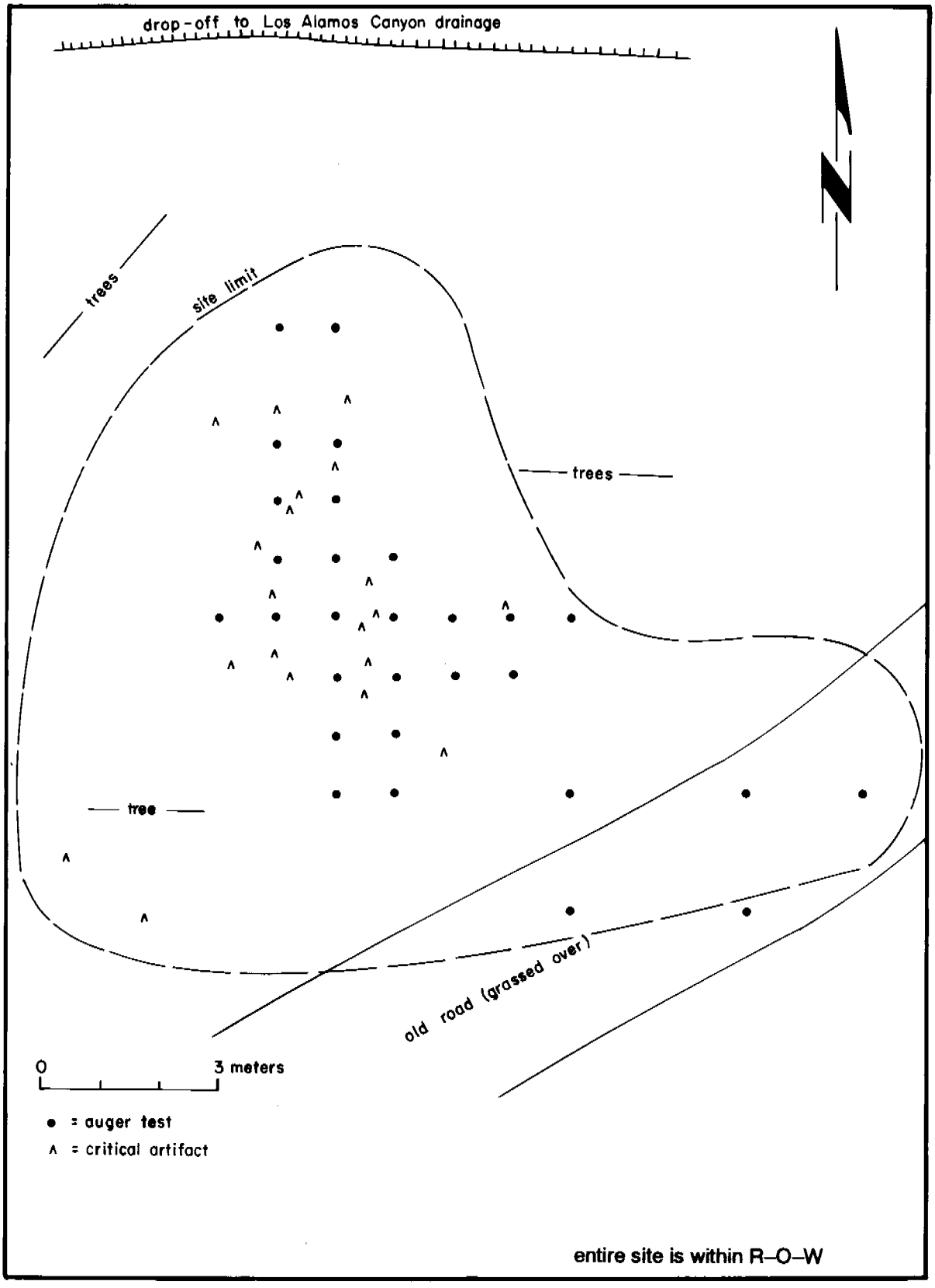


Figure 13. LA 61046 site map.

LA 61050

LA 61050 is a small sherd and lithic artifact scatter measuring approximately 23 by 6 m. An arroyo cutting the west end of the site revealed possible cultural deposits as deep as 20 cm. The location of this site on the canyon bottom alluvium, with its comparatively great soil depth and suggestive coloration in one of the drainage cutbanks, raised the possibility that structural remains were present. Accordingly, an auger interval of 1 m was used (Fig. 14). Additionally, the possible cultural staining exposed in the cutbank was closely examined under better conditions than available during survey. The testing efforts indicate that any coloration was natural rather than cultural.

In one auger test, a single flake was recovered from a depth of 30 cm. Otherwise, no charcoal, charcoal staining, or other indicators of subsurface cultural activity were revealed in the augering.

The CAs were several potsherds and two flakes. Identifiable pottery types include San Clemente Glaze-Polychrome, Abiquiu Black-on-gray, Bandelier Black-on-gray, Potsuwii Incised, and Sankawi Black-on-cream. One or more occupations within the span A.D. 1375 to 1600 are indicated.

The smallness of the site and the absence of subsurface remains indicate that this site has no potential to yield information important to our understanding of the prehistory of the area.

LA 65420

LA 65420 is a sherd and lithic artifact scatter with a pithouse/kiva depression and a rock alignment that may represent a one- or two-room surface structure. The site measures approximately 30 by 10 m. This number was assigned to the pit structure located during testing at the east end of LA 61041 on the north side of State Road 4 (Loop) (Fig. 7). In this report, the data pertaining to this site are found in discussions of auger testing and CUs 4 and 5 under LA 61041. Associated pottery indicate occupation within the span of A.D. 1200 to 1350.

LA 65421

LA 64521 is a sherd and litic artifact scatter with one or more possible pithouses. At least one pithouse was suggested by augering results. This site measures approximately 30 by 25 m. This number was assigned to the pit structure located during testing at the east end of LA 61041 on the south side of State Road 4 (Loop) (Fig. 7). In this report, the data pertaining to this site are found in discussions of auger testing and CU 13 under LA 61041. Associated pottery indicates occupation within the span A.D. 1200 to 1350 or 1400.

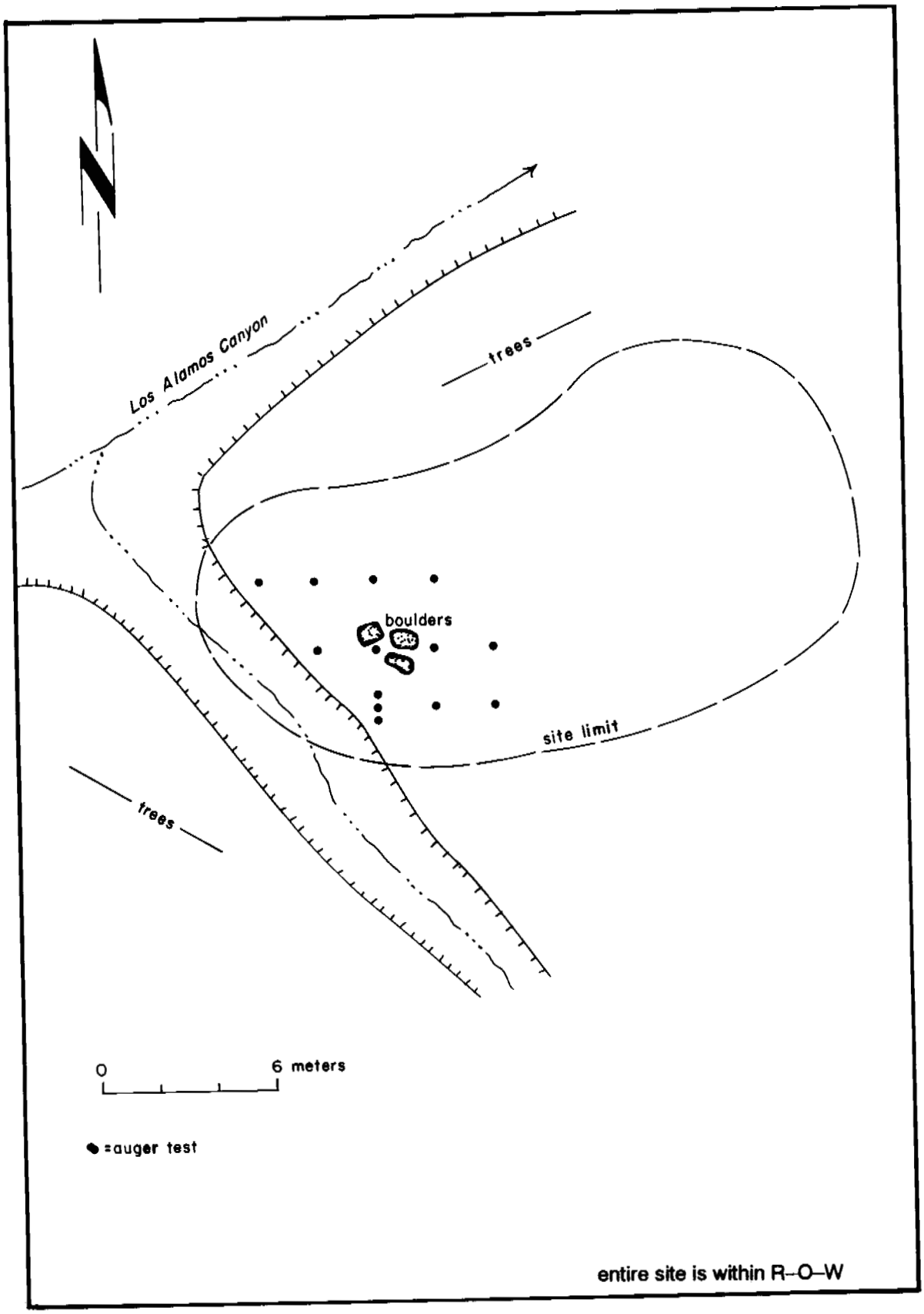


Figure 14. LA 61050 site map.

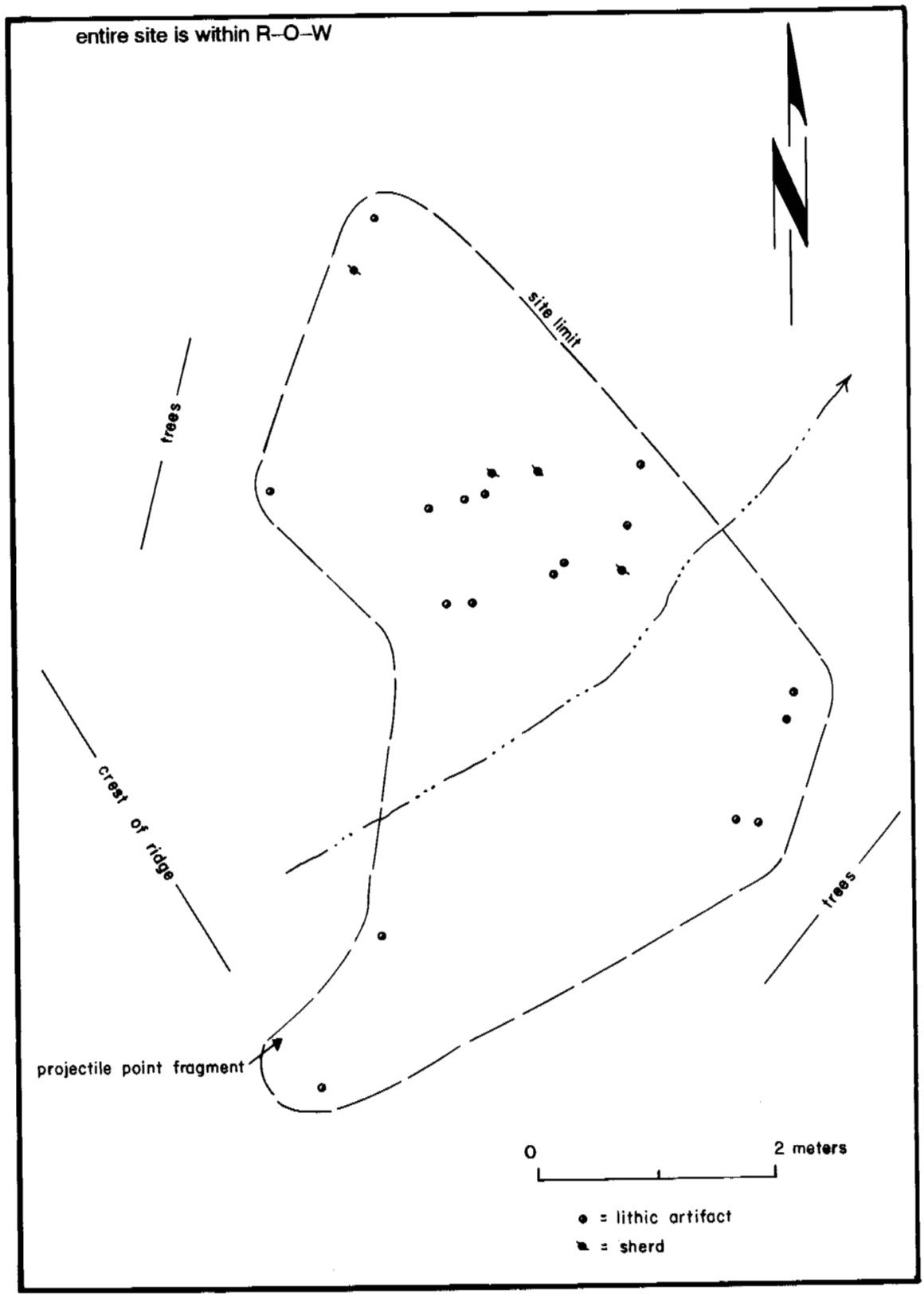


Figure 15. IO-11 site map.

Isolated Object 10

IO 10 is a projectile point fragment that was collected; see Fig. 16b.

Isolated Object 11

This manifestation was accorded treatment similar to designated sites because it had, upon subsequent inspection, a total of 21 flakes, sherds, and artifacts scattered over an area measuring approximately 8 by 5 m. These were mapped and collected (Fig. 15). The absence of a soil mantle precluded subsurface testing.

Isolated Object 12

IO 12 is a San Jose point fragment that was collected; see Fig. 16n.

Isolated Object 18

IO 18 is a rust-red obsidian flake that was collected.

ARTIFACT DESCRIPTIONS AND PROVENIENCES

Formal Artifacts

Surprisingly few formal artifacts were recovered in spite of the concerted examination of all site surfaces. The 16 items represent 7 artifact categories. Projectile points (N = 8) are the most common, followed by mano fragments (N = 3), a metate fragment, an end scraper, a biface fragment, a winged drill, and an edge-trimmed flake. The Archaic, Early Basketmaker, Late Prehistoric (Ceramic), and perhaps the Paleoindian periods are represented.

Projectile Points

Paleoindian(?) Point. A possible Midland point fragment was recovered from CU-15 of LA 61041 (Fig. 16l). The basal portion has a slightly indented base, convex lateral edges, and basal grinding. The well-executed flaking appears to be baton or soft-percussion, resulting in broad, shallow flake scars reminiscent of Paleoindian technology. Neither side is fluted. It is 22 by 24 by 5 mm and is made of tan and light gray, fine-grained quartzite.

Archaic Point. The Late Archaic period is represented by two small basal fragments (Fig. 16m). A late San Jose point from CU-12 of LA 61041 measures 11 by 18 by 4 mm and is made of ash-speckled black obsidian (not Polvadera obsidian). The minimum stem width is 15 mm.

The second fragment, designated IO-12, is from a late San Jose or Armijo Point (Fig. 16n). It measures 9 by 23 by 4 mm and is made of hazy black obsidian (perhaps with a slight greenish tinge) with a few ash particles. The minimum stem width is 16 mm. The find spot was on the valley floor 50 m southeast of LA 61043 and about 30 m south of LA 61041.

Basketmaker II Points. The Early Basketmaker period is well represented with seven En Medio Points (Fig. 16). All are basal or lower blade sections. Descriptions are in Table 3.

Late Prehistoric Points. The ceramic period is represented by four arrow points, one corner-notched, two side-notched, and one triple-notched (Fig. 16). Two tiny points, the corner-notched specimen, and a crude, side-notched point may be children's toys. Descriptive data and proveniences are in Table 3.

End Scraper

The scraping edge on this artifact is technologically correct in that it is located on the distal edge of a long flake (Fig. 16o). All other edges have been unifacially trimmed, probably to dull them for hafting. A large notch in the left edge is a large, deep flake scar made prior to the removal from the core. The artifact is opaque black obsidian, measures 46 by 26 by 7 mm and has a scraping edge angle of 35-40 degrees. The provenience is LA 61038, CA-501.

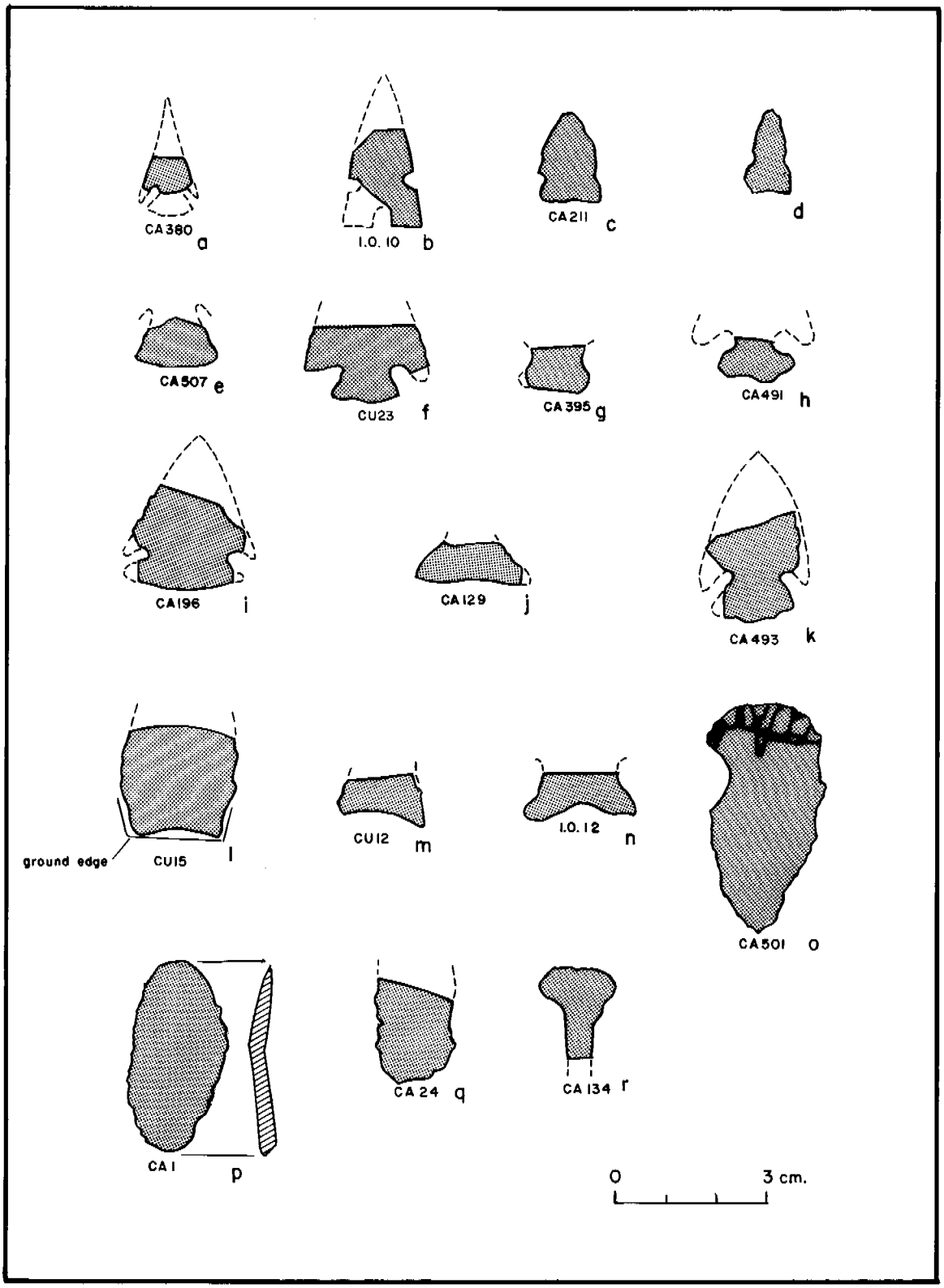


Figure 16. Projectile points and other artifacts (refer to text).

Table 3. Projectile Point Descriptions

Provenience	L x W x T	MSW*	Material	Remarks
En Medio Points				
61038, CA-491	8 x 16 x 3	8	smokey black obsidian	base; Fig. 16h
61038, CA-493	22 x 20 x 4	10	clear black obsidian	large frag.; reworked; Fig. 16k
61038, CU-23	17 x 25 x 5	10	clear black obsidian	lower half; Fig. 16f
61041, CA-129	9 x 22 x 4	13	clear black obsidian	base; Fig. 16j
61041, CA-196	20 x 24 x 5	16	dark gray chert	large frag.; Fig. 16i
61041, CA-395	9 x 14 x 5	11	hazy black obsidian	base with ground edges; Fig. 16g
61041, CA-507	11 x 16 x 4	10	clear black obsidian	base; Fig. 16e
Late Prehistoric Points				
61041, CU-29 vicinity	17 x 9 x 3	6	clear black obsidian	side-notched; Fig. 16d
61041, CA-211	20 x 14 x 4	11	Polvadera obsidian	side-notched; Fig. 16c
61041, CA-380	7 x 10 x 2	3	clear black obsidian	corner-notched; Fig. 16a
IO 10	21 x 15 x 3	7.5	hazy black obsidian	triple-notched; Fig. 16b

* Minimum stem width. All measurements in millimeters

Wing-Tipped Drill

This artifact of white chalcedonic chert has a shaft with a diamond-shaped cross section and a triangular hafting element (Fig. 16r). It measures 19 by 16 by 4.5 mm and comes from LA 61041, CA-134.

Biface Fragments

A fragment of a small biface has a serrated edge, is made of opaque black obsidian, and measures 21 by 16 by 4 mm (Fig. 16q). One face is clearly more weathered than the other. The provenience is LA 61041, CA-24. Its function is uncertain.

A second fragment of a small biface or possible projectile point is made of black basalt and measures 31 by 20 by 5 mm. It comes from LA 61041, CA-371.

Edge-Trimmed Flakes

A large biface thinning flake of reddish orange Alibates material has been unifacially edge-trimmed to an elongated oval shape (Fig. 16p). It measures 39 by 20 by 5 mm and comes from LA 61041, CA-1. Some archaeologists would classify this artifact as a side scraper.

A flake of clear black obsidian has been unifacially and bifacially edge-trimmed to a triangular shape; the original configuration of the bottom is unknown because of breakage. It measures 24 by 19 by 3 mm and comes from LA 61041, CA-62. Its use, if any, is unknown.

Manos and Mano Preform

End fragments of two one-hand cobble manos were noted. Both may have been burned, accounting for the pinkish orange coloration.

One, made of light gray to pink granite, has a single poorly developed grinding surface. It measures 5.0 by 10.0 by 5.5 cm, and comes from LA 61041, CA-106.

The other mano, made of coarse gray-orange sandstone, has two well-developed grinding surfaces that form a wedge shape in the longitudinal profile; one surface is strongly convex and the other only moderately so. It measures 6.0 by 8.0 by 4.7 cm and comes from LA 61041, CU-17.

A third "mano" is probably more properly termed a preform. This large, coarse tan quartzite cobble has pecked areas on both faces and on the two longest edges, probably as the initial step in shaping it into a one-hand mano. One of the faces also has some grinding attrition. The artifact measures 12.5 by 11.6 by 7.0 cm and comes from Test Pit 5 (Level 1, 0-25 cm) at LA 61041.

Metate Fragment

A small fragment of a blue-gray porphyry metate has one well-developed grinding surface and no other modification. Both the grinding surface and bottom side are burned reddish orange. It measures 6.5 by 14.0 by 5.5 cm and comes from CA-106, LA 61041.

Informal Artifacts

Fifteen flakes have one utilized edge each. Of the three flakes recovered from LA 61038, two have unifacial wear and one has bifacial wear. The remaining twelve flakes all come from LA 61041. Of these, eleven have unifacial wear, and one has bifacial wear.

Pottery

The sherds recovered from 12 of the project sites represent the Coalition through the Classic periods (ca. A.D. 1200 to 1600) of Upper and Middle Rio Grande prehistory. Eleven previously defined painted and utility types are present. A few remarks about several of the types and groupings are provided for clarification. Those lacking remarks basically fit published descriptions, and the reader is directed to the relevant sources for details (see Oppelt 1988). Summaries of the ceramics from the sites are in Tables 4 and 5, and detailed provenience information by types and groups are in Appendix 3.

The analytical approach used here is a typological one; no attempt was made to define temper types or manufacture locales. However, many of the sherds were examined under a 30-power binocular microscope and were found to contain crushed volcanic materials, including rhyolitic tuffs, vitric tuffs, and related materials from the Jemez region. Several of the glaze-painted sherds contain andesite, and a couple have a distinctive mauve scoria. Most of the utility pottery (some of which might be ascribed by some analysts to defined types such as Tesuque Smeared Indented; Oppelt 1988:293) are herein discussed in terms of descriptive groupings. The utility wares, for the most part, are tempered with rather large quartz grains and, occasionally, fragments of tuff.

Remarks about the Analytical Types and Groups

Santa Fe Black-on-White. Most of the sherds ascribed to this type are classic examples (Oppelt 1988:289). A few, however, possess certain qualities of slip and design that make it difficult to distinguish them from Wiyo Black-on-white. All questionable sherds are typed here as Santa Fe because of the general thinness and hardness of the sherds.

Wiyo Black-on-White. The assignment of these sherds to this type (Oppelt 1988:303) is probably acceptable for the most part, though several might be called Santa Fe Black-on-white by others. Mera (1934) states the type to be uncommon on the Pajarito.

Vallecitos Black-on-White. The two carbon-paint sherds are provisionally assigned to this type (Oppelt 1988:300) on the basis that they do not fit the descriptions for either Santa Fe or Wiyo Black-on-white, nor do they appear to be any of the types made outside of the Jemez region. Thus, the identifications given here cannot be considered final.

Table 4. Summary of Painted Pottery Distributions

	LA number (last 2 digits only)										IO 11	Total
	38	39	40	41	42	43	44	45	46	50		
Santa Fe B/w												
bowl	1			15		2						18
jar				4								4
Wiyo B/w												
bowl				2				2				4
jar				2				1	2			5
Vallecitos(?) b/w												
bowl				1		1						2
Abiquiu B/g Biscuit A	1			4		3		3	1	2		14
Bandelier B/g Biscuit B				13		1	2		6	2	1	25
Biscuit jar	3			6	3		1		1	1		15
Misc. Biscuit				1						1		2
Biscuit/Sankawi												
bowl	2			1								3
jar					1							1
Sankawi B/c jar	6		1	3	2			5	1	2		20
Potsuwii Incised					1	1			1			3
RG Glaze A Red jar		1										1
Cieneguilla G/y												
yellow jar								1				1
white jar								2				2
San Clemente G-P bowl									3			3
Misc. RG Glaze	3				1	3						7
White Ware	4			1	11		2					18
Totals	20	1	2	64	7	11	5	6	18	11	3	148

Table 5. Summary of Utility Pottery Distributions

	LA Number (last 2 digits only)										IO 11	Total
	38	39	40	41	42	43	44	45	46	50		
PII-III indented corrugated				4								4
PIII indented corrugated	1			23	1	3	1					29
Smeared-indented corrugated												
nonmicaceous	9	3		106	4	2			1		1	126
micaceous					1							1
tool smeared				1		1				1		3
Flattened-indented corrugated	2			19								21
Clapboard corrugated												
nonmicaceous				1								1
micaceous				1								1
Plain utility												
nonmicaceous	2			5	4	3				1		15
micaceous	1						1		3			5
Sapawe Micaceous Washboard										1		1
Misc. Gray Ware	6	1		14		1						22
Total	21	4	0	174	10	10	2	0	4	3	1	229

Biscuit/Sankawi. These sherds are clearly part of the Biscuit series (Abiquiu Black-on-gray, Bandelier Black-on-gray, Sankawi Black-on-cream; Oppelt 1988:239, 241, 288), but they possess a combination of traits belonging to both Abiquiu and Bandelier, and Sankawi. That is, one or the other surface may be tan, the thickness may be thin or thick, and the designs may be thin or heavy. The particular combination of traits frequently differs from sherd to sherd, thereby precluding the formulation of a separate type.

Sankawi Black-on-Cream. Most of these sherds are good examples of the type (Oppelt 1988:288), but a number are questionable assignments. Some are rather thick, others have somewhat wider lines than considered normal, and still others have thick white slips. The questionable sherds, however, more clearly belong to this type than do those described as Biscuit/Sankawi.

White Ware. These sherds include the unidentified black-on-white sherds as well as sherds from the unpainted portions of vessels.

PII-III Indented Corrugated. The corrugations on these sherds are generally larger and somewhat deeper than normally found on PIII indented corrugated sherds, yet the indentations are not usually as deep as those of PII types such as Exuberant Corrugated. It is possible that the PII-III sherds represent transitional examples, but this is not certain. The term as used here merely indicates that the sherds do not have the more typical PIII treatment of relatively narrow coils and very shallow indentations.

PIII Indented Corrugated. These sherds have the typically narrow coils and shallow indentations for the period. The corrugations are not smeared or flattened.

Smeared Indented Corrugated. These sherds belong to Pueblo III indented corrugated vessels, the corrugations of which were partially obliterated by rubbing during manufacturing. The degree of obliteration varies, but extreme smearing is rare in the White Rock Y collections. A tool was used to smear the corrugations in several examples.

Flattened Indented Corrugated. These vessels also started out like the PIII indented corrugated, but a large flat object was pressed against the surface while the clay was still wet. As a result, the high points of the corrugations are flat.

Clapboard Corrugated. This type of treatment is rare in the project sites. Though both sherds are small, it evident that the widths of the coils varied considerably, even within the same coil. Widths, as measured from the ridge of one coil to the ridge of the next, varied from 7 to 12 mm.

"Plain" Utility. These sherds lack evidence for corrugation or any other form of plastic state manipulation. This may be because they are bottom sherds of textured vessels and the corrugations were obliterated when the vessels were set down while still in the plastic state. Or, they may actually be from the lower, plain portions of upper-body corrugated vessels (such as clapboard corrugated).

Comments

The pottery types, varieties, and groups present on the White Rock Y sites are primarily those that would normally be expected for the Pajarito Plateau (Mera 1934; Gauthier 1982). The majority of the painted sherds represent the Biscuit Wares (Abiquiu and Bandelier Black-on-gray, Biscuit jar, and Biscuit/Sankawi), and Sankawi Black-on-cream, the types ancestral to the historic Tewa series. All of these types and groups are common at the numerous sites in the area, including Tsankawi Ruin on the mesatop along the south side of the project area and the Otowi sites (or Potsuwii I and II) located less than 2 km up Pueblo Canyon.

Santa Fe Black-on-white and the Rio Grande glaze-paint types are common intrusives on the Pajarito Plateau. Their manufacture locales border the Pajarito on its eastern and southern margins. Perhaps the only feature of note about the ceramic assemblage is the presence of two Vallecitos Black-on-white sherds. This ancestral Jemez type was made to the north and west of the Pajarito and therefore is not totally unexpected at White Rock Y.

The utility wares are likewise to be expected in the region. It might be noted that micaceous varieties, so common at the Biscuit sites in the Chama River drainage along the north side of the Pajarito, are apparently scarce on the White Rock Y sites (see Gauthier 1982).

Lithic Debitage

Raw Materials

The raw materials used to make chipped lithic artifacts include ten primary rock and mineral categories and numerous varieties. The chalcedonies and translucent obsidians comprise 80 percent of the flakes and shatter recovered from the collection units. The distributions of materials by site and CU are given in Tables 6 and 7.

Imported materials are comparatively rare and include two pieces of Alibates material from the Texas Panhandle or possibly the Tucumcari area of east central New Mexico and one piece of a rust-colored obsidian.

Material Descriptions

Chalcedony. These translucent to nearly clear silicious materials embody a variety of colors, including clear, white, yellow, red, gray, black, brown, and combinations of these colors. Many of the varieties are consistent with Pedernal chert, which originates on the northwest side of the Jemez, but can be found throughout the Chama and Rio Grande drainages as well. Most, if not all, of the White Rock Y specimens probably came from the gravels of the Santa Fe Formation; outcrops can be found in the canyon bottoms within a kilometer east of the project area.

Table 6. Chipped Stone Raw Material Frequencies

		Material Types										
LA no.	CU	Ct	SW	Cl	Q	QS	V	R	Iu	Ot	Oo	N
20	13			9		3				10		22
21	4			9						1		10
	5			2					1	1		4
33	22			3	1					7		11
38	23			3						4	2	9
	25			12			3			13		28
	24			14			1			10	7	32
	26			4		1	1			26	3	35
	27	1	2	21						14	5	43
39	19									13		13
40	20			2						6		8
41w	29			2			4			3		9
41sw	1			4	1					4		9
	2			8			1			2		11
	3			4			1			1	2	8
	8		1	13			5			10	1	30
	9	1	1	14			7			9	2	34
	10			7			1		1	1		10
	11		1	21						9	1	12
41s	12		1	7			5			14	1	28
41ne	15			2		1				10	3	16
	16	1		2						12	3	18
	17	1		13		3	3			11		31
41nw	14			19			2			13	1	35
	18			3			1	1	1	9	3	18
42	30										1	1
43	6	2		6			1	1				10
	7			3						1		4

		Material Types										
LA no.	CU	Ct	SW	Cl	Q	QS	V	R	Iu	Ot	Oo	N
44	28			1						5	1	7
45	21			6			2					8
46	No CUs collected											
50	No CUs collected											
Total		6	6	214	2	8	38	2	3	219	36	534

Key:
Cl = chalcedony
Ct = chert
Iu = igneous, unidentified
Oo = obsidian, opaque
Ot = obsidian, translucent
Q = quartzite
QS = quartzitic sandstone
R = rhyolite
SW = silicified wood
V = vitrophyre

Table 7. Chipped Lithic Raw Material Percentages

LA No.	CU No.	Material Types										Row %
		Ct	SW	Cl	Q	QS	V	R	Iu	Ot	Oo	
20	13			41		14				46		4
21	4			90						10		2
	5			50					25	25		1
33	22			27	9					64		2
38	23			33						44	22	2
	25			43			11			46		5
	24			44			3			31	22	6
	26			11		3	3			74	9	7
	27	2	5	49						33	12	8
39	19									100		2
40	20			25						75		2
41w	29			22			44			33		2
41sw	1			44	11					44		2
41sw	2			73			9			18		2
41sw	3			50			13			13	25	2
41sw	8		3	43			17			33	3	6

LA No.	CU No.	Material Types										Row %
		Ct	SW	Cl	Q	QS	V	R	Iu	Ot	Oo	
41sw	9	3	3	41			21			27	6	6
41sw	10			70			10		10	10		2
41sw	11		3	66						28	3	6
41s	12		4	25			18			50	4	5
41ne	15			13		6				63	19	3
41ne	16	6	11							67	17	3
41ne	17	3		42		10	10			36		6
41nw	14			54			6			37	3	7
41nw	18			17			6	6	6	50	17	3
42	30										100	<1
43	6	20		60			10	10				2
	7			75						25		1
44	28			14						71	14	1
45	21			75			25					2
46	No CUs collected											
50	No CUs collected											
Column %		1	1	40	<1	2	7	<1	1	41	7	

Key:
Cl = chalcedony
Ct = chert
Iu = igneous, unidentified
Oo = obsidian, opaque
Ot = obsidian, translucent
Q = quartzite
QS = quartzitic sandstone
R = rhyolite
SW = silicified wood
V = vitrophyre

Chert. These opaque silicious materials also come in a wide variety of colors and color combinations. The colors include white, gray, light brown, dark brown, greenish brown, reddish brown, reddish gray, white/brown/gray, and pink to purple. Most, if not all, also come from the gravels of the Santa Fe Formation.

Igneous, Unidentified. These materials possess poor fracture attributes and undoubtedly derive from the Jemez Mountain volcanics.

Obsidian. Many of these volcanic glasses are clear black without inclusions, but some have inclusions such as ash flow lines and ash dust particles. Far fewer pieces are black and opaque. Selective chemical characterization of project obsidians indicate that probably all varieties derive from Jemez Mountains sources (Appendix 4).

Quartzite. This material is rare in the CU collections. The colors are gray and gray-tan. The source is presumably the Santa Fe Formation gravels.

Quartzitic Sandstone. Partially silicified sandstone is a little more common than quartzite and probably derives from the sedimentary strata exposed along the Rio Grande. Colors include white, tan, brownish gray, and reddish brown.

Rhyolite. Both examples of this material are gray and probably derive from the project vicinity.

Silicified Wood. Varieties of this rare material include gray and red, gray and reddish brown, and grayish brown. The source is probably the Santa Fe Formation gravels.

Vitrophyre. This natural glass with its gray spherules evidently derives from the Jemez Ridge area south of the project area.

Imported Materials. The only readily identifiable imported material is Alibates silicified dolomite from the Texas Panhandle. One item is a marginally retouched biface thinning flake (see artifact descriptions above). Designated CA-1, it was recovered from the southwestern part of LA 61041. The other is also a biface thinning flake but is unmodified; CA-259 measures 21 by 18 by 3 mm and comes from the northeastern part of LA 61041.

Discussion

Overall, volcanic glass (translucent obsidian, opaque obsidian, and vitrophyre) is the most common material on the project sites. As far as individual categories are concerned, chalcedony and translucent obsidian are the primary materials. Chalcedony and translucent obsidian each account for 40 to 41 percent of the CU totals, but their range is highly variable (55 to 100 percent in CU collections) where they are present. In three instances each, however, chalcedony and translucent obsidian are absent, though only one CU lacks both.

The next most common materials are opaque obsidian and vitrophyre, each accounting for 7 percent of the total CU materials. Each was recovered from 15 CUs, but only 5 CUs have both. All other materials--chert, silicified wood, quartzite, rhyolite, quartzitic sandstone, and unidentified igneous--account for about 6 percent of the total lithic assemblage.

Lithic materials imported to the project sites are rare. However, the presence of the two Alibates items is important from the standpoint that it closes the exchange loop between the Plains and the Southwest.

Cores

The seven cores are small and light weight. They have been classified into two basic types--single platform (N = 6) and two-platforms-adjacent (N = 1). Sizes range from 39 by 30 by 28 cm to 60 by 53 by 34 cm and weights from 16.5 to 89.1 g. Materials include Pedernal

chalcedony, opaque black obsidian, medium-gray silty chert with black speckles, and various local chalcedonies and chalcedonic cherts. Proveniences include LA 61039 (CA-512) and LA 61041 (CU-1, CU-2, CA-50, CA-97, CA-347, and TP 5, Level 2).

Flakes

A total of 491 flakes was recovered from the 30 CUs of the various sites. Three more were collected from LA 61050, and none were observed or collected from LA 61046 (Table 8). Too few complete flakes were recovered to permit a meaningful analysis on a CU by CU or even site by site basis. In addition, it should be remembered that several ceramic periods and possibly one or more Archaic periods are represented at the sites.

The few complete specimens indicate that the statistically average flake from testing measures 18 by 16 by 4 mm and weighs 3 g (Table 9). Although few flakes approach this ideal, it does indicate that the project flakes are generally small and light.

Two other aspects of the flakes deserve mention. An assessment of the dorsal cortex reveals that of 46 complete flakes, 91 percent lack cortex, 7 percent have less than 50 percent cortex, and only 2 percent have more than 50 percent cortex. These figures generally conform to expected values for assemblages which represent the full range of reduction activities (that is, core reduction to artifact manufacture).

The second aspect, distal edge or flake termination type, is useful for assessing the degree of flake-detachment success. Of the 129 cases recorded (complete flakes and distal fragments), 41 percent have hinged or stepped terminations, indicating a high failure rate. Hinged or stepped flakes create problems from several standpoints. They make further flake removals from cores difficult or impossible. Regarding the flakes, hinging reduces the number of edges which can be used "as is" for cutting and scraping tasks. And, since rounded edges are troublesome to trimming and thinning, hinged flakes are usually not desirable for the production of formal tools such as projectile points and drills. The White Rock Y materials, then, indicate a high rate of raw material waste.

Shatter

Only 32 pieces of shatter were recovered from the 30 CUs. Of all materials recovered (cores, flakes, shatter), this represents 5 percent. Judging by the descriptive statistics for 27 of the specimens (Table 10), the average size and weight of the pieces of shatter are similar to those of the flakes. Three-quarters of the pieces of shatter are chalcedony and the rest are obsidian. The high proportion of chalcedony is not surprising; the rough, tumbling action during river transport from the source areas creates numerous internal fractures in chalcedony cobbles.

Table 8. Debitage Distributions by Site (Frequencies)

LA Number	CU Number	Flakes	Shatter	Total
20	13	22		22
21	4	6	4	10
	5	4		4
33	22	11		11
38	23	8	1	9
	25	28		28
	24	31	1	32
	26	33	1	34
	27	41	2	43
39	19	12	1	13
40	20	8		8
41w	29	9		9
41sw	1	7		7
	2	9	1	10
	3	7	1	8
	8	27		27
	9	32	1	33
	10	10		10
	11	23	8	31
41s	12	25	2	27
41ne	15	15	1	16
	16	18		18
	17	31		31
41nw	14	30	4	34
	18	17	1	18
42	30	1		1
43	6	9	1	10

LA Number	CU Number	Flakes	Shatter	Total
	7	3	1	4
44	28	7		7
45	21	7	1	8
46	No CUs collected			
50	No CUs collected			
Totals		491	32	523

Table 9. Descriptive Statistics for Flakes, All Sites Combined

	Mean	Median	Modes	S.D.	Range	N
Length	17.7	15.0	13	9.4	7-55	46
Width	16.4	14.5	9 & 17	10.6	5-62	46
Thickness	4.3	3.0	1 & 6	3.9	1-19	46
Weight	3.0	0.7	0.1 & 0.8	9.0	0.1-58.4	46

Table 10. Descriptive Statistics for Shatter, All Sites Combined

	Mean	S.D.	Range	N
Length	18.1	6.3	7-31	27
Width	12.8	5.3	6-23	27
Thickness	7.3	3.6	2-14	27
Weight	1.8	2.1	0.1-8.3	27

Summary

Ten basic raw materials were used to make chipped stone artifacts. Chalcedony and translucent obsidian are the dominant materials, followed by opaque obsidian and vitrophyre. All others occur in small amounts only. Only seven cores were recovered from the project sites. All are small and light weight, none has more than a few flakes removed, and most appear to be tested raw material units.

A total of 491 flakes was recovered from the collection units at the various sites. Because so few complete flakes were recovered from the project sites, the flakes for all sites are combined for statistical description. In general, the flakes are small, light, and only slightly longer than they are wide. The very low percentage of dorsal cortex on the flakes suggests that the full range of knapping, from core reduction to artifact manufacturing, were performed at the project sites. The high incidence of hinge- and step-fractured distal terminations on flakes indicates a relatively low degree of flake removal success and a high degree of material waste.

The 32 pieces of shatter are generally small and light, and mostly chalcedony. The material was probably collected as cobbles from the Santa Fe Formation gravels.

Rock Art of LA 61037

LA 61037 consists of a series of petroglyph figures pecked into the surfaces of a small basalt outcrop on the north side of the canyon immediately west of LA 61038. Most of the figures are on three faces of a protruding section of basalt (Fig. 17), but a few individual figures were also found on two adjacent surfaces (Fig. 18).

The figure outlines were produced by pecking and perhaps a little grinding. Some are fairly distinct, but most are so shallow that they require side lighting to be seen. The main panel contains both prehistoric and historic glyphs. The prehistoric glyphs include:

-two shield figures;
-a mask or face placed on a corner;
-a circle with a cross in the center; numerous bullet depressions are around the upper periphery;
-a second circle placed on a corner and around a natural vug; a series of circles and squares append to this circle;
-two and possibly four snakelike figures placed vertically with the heads on the upward end;
-several short segments of straight and curved lines scattered throughout the panel.

The historic glyphs include:

the initials D A;
an arrow pointing upward.

The figures on adjacent surfaces include two pairs of snakelike figures. The two longer figures are oriented horizontally, and one has an elaborate head suggestive of either the horned or the plumed serpent (Fig. 18a). The snakelike figures of the second pair are shorter and are oriented vertically (Fig. 18b).

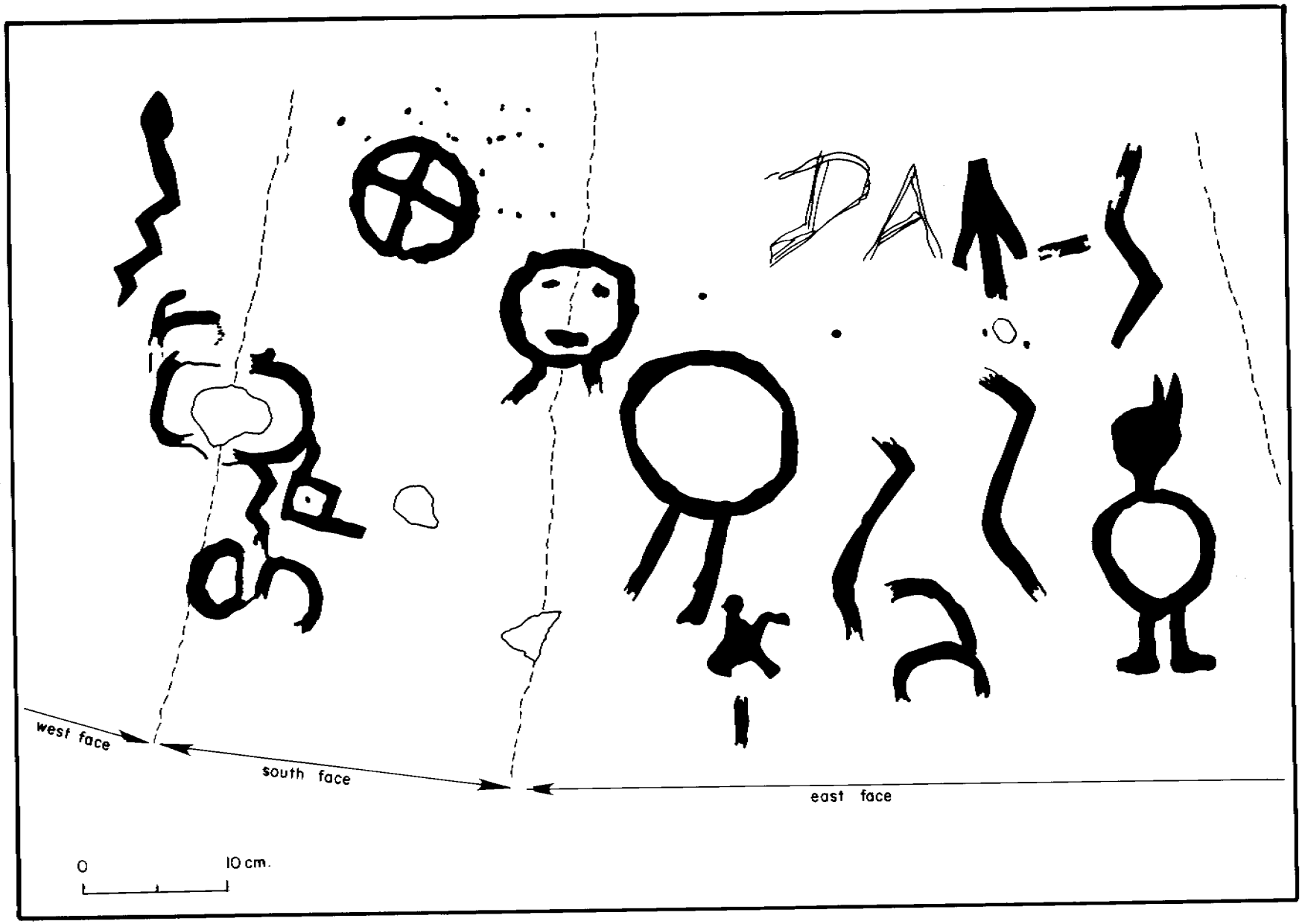


Figure 17. LA 61037, main petroglyph panel.

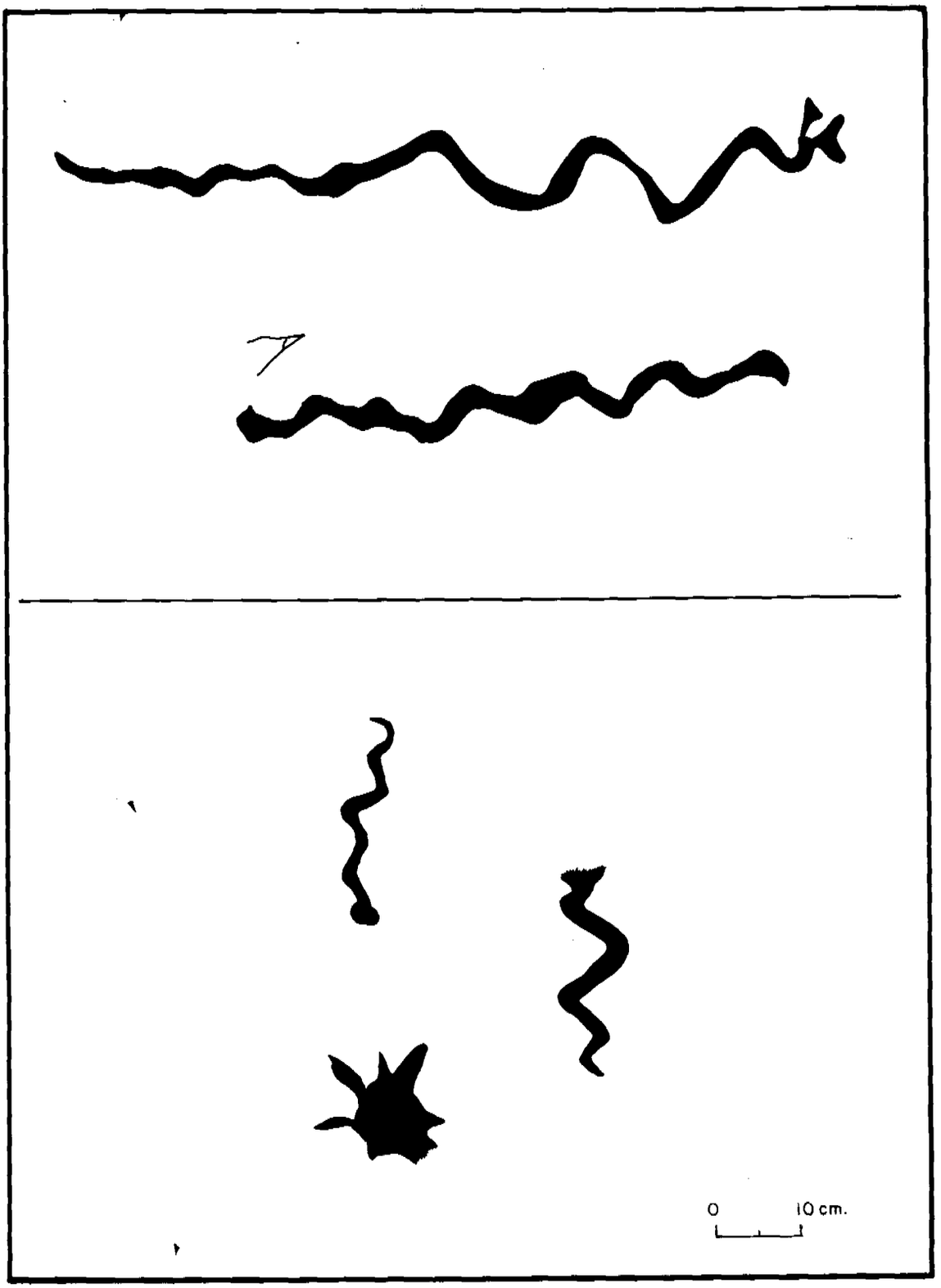


Figure 18. LA 61037, minor petroglyph panels.

DATING THE OCCUPATIONS AND SITES

Diagnostic projectile points and pottery are available to date the various occupations of the sites. The projectile points represent the Paleoindian, Archaic, and pottery periods, while the pottery represents the late prehistoric and early historic segments.

Paleoindian Period

The possible point belonging to this period cannot be taken as absolute evidence of Paleoindian use of the project area; the identification is uncertain and a single object may have been curated by later Indians in the area. If the point from CU-15, LA 61041, is a Plainview point and if it was dropped there by its makers, the area was used between 10,400 and 9300 B.C. (Cordell 1979:14).

Middle and Late Archaic Periods

Two fragments of San Jose and San Jose/Armijo points from CU-12, LA 61041, and IO 12 represent this period. It is possible that they were also brought in by later people. However, the small sizes of both items make this scenario unlikely. Instead, because they are basal fragments, they were very likely discarded on the spot during refurbishment of atlatl darts. San Jose points date ca. 3200 to 1800 B.C. and Armijo points date ca. 1800 to 800 B.C. (Irwin-Williams 1973, fig. 7).

Basketmaker II Period

En Medio points from LA 61038 (CAs 491 and 493; CU-23) and LA 61041 (CAs 129, 196, 395, and 507) are generally believed to represent the Basketmaker II period in northern New Mexico. The type has been dated between 800 B.C. to A.D. 400. The number of specimens indicate that LA 61038 and LA 61041 were occupied during this time period.

Ceramic Period

The pottery allows us to date the ceramic components of the project sites (Tables 11-12). Understandably, given the nature of the artifact assemblages of the sites (mainly lithic debitage) and the fact that pottery was not abundant on many of them, these dates cannot be considered necessarily representative of all occupations.

Table 11. Dates for Pottery Types Found at White Rock Y

Type	Dates A.D.
Santa Fe Black-on-white	1200-1350
Wiyo Black-on-white	1300-1400
Abiquiu Black-on-gray	1375-1450
Bandelier Black-on-gray	1400-1500/1550
Sankawi Black-on-cream	1500-1600
Potsuwii Incised	1425-1525+
Rio Grande Glaze A (or I)	1300-1450

from Breternitz 1966

Table 12. General Dates of the Ceramic Components of the White Rock Y Sites

Site	Dates A.D.
LA 61038	1200-1600
LA 61039	1300-1450
LA 61040	1500-1600
LA 61041	1200-1600
LA 61042	1400-1525+
LA 61043	1200-1525+
LA 61044	1400-1500/1550
LA 61045	1300-1450
LA 61046	1300-1600
LA 61050	1375-1600
LA 65420*	1200-1350
LA 65421**	1200-1350/1400

* Based on pottery from CU 4-5
** Based on pottery from CU 13.

Perhaps the most striking aspect of the date ranges for most sites is the fact that they are quite broad. Clearly, most locations were used to greater or lesser degrees during the general occupation of the region starting in Coalition times and ending sometime in the Classic period.

The absence of earlier pottery types such as Red Mesa and Kwahe'e Black-on-white is noteworthy. This cannot be attributed to sampling procedure because an attempt was made to locate and collect all diagnostic pottery.

The absence of later types such as the historic period matte-paint and plain wares, however, is problematical. Sherds of Kapo Black were noted but not collected from a detached component of LA 61049. This site was not tested and evaluated because it was excluded from the construction zone early in the planning process.

The distribution of projectile points and pottery sherds is not uniform in the project area. Although one cannot expect to make definitive statements from survey materials because of the vagaries of surface artifact studies, it is useful to examine distributions for patterning in data simply as an heuristic device for subsequent research. This is done here, first for the intrasite patterning for LA 61041 and then for the project sites as a whole. This approach is used because slightly different patterns are evident between LA 61041 and the rest of the project area as a whole.

Table 13. Brief Descriptions of Project Sites[1]

LA Number	Site Type	Dates (A.D.)	Size (m)	Max. artifact density
61033	L & S[2]	1500-1600	45 x 38	4
61038	L & S	1200-1600	170 x 75	6-14
61039	L & S[3]	1300-1450	23 x 15	5
61040	L & S	1500-1600	18 x 12	3
61041	L & S[4]	1200-1600	450 x 150	2-12
61042	S & L	1400-1525+	23 x 15	5
61043	L & S	1200-1525+	70 x 30	3-5
61044	L & S	1400-1550	15 x 15	2
61045	L & S	1300-1450	46 x 38	3
61046	S & L	1300-1600	15 x 15	1
61048	L & S	1200-1550	46 x 23	undeter.
61049	P	1200-1350	107 x 53	undeter.
61050	S & L	1375-1600	5 x 5	est. 3
65420	PH	1200-1350		10
65421	PH	1200-1400		10

[1] site types are: L & S = lithic and sherd scatter; S & L = sherd and lithic scatter; P = pueblo; PH = pithouse. Maximum artifact densities according to CUs; majority of site areas have lower artifact densities; figures are artifacts per square meter; [2] A Sankawi Black-on-cream sherd was reported during the survey but was not observed or recovered during testing and evaluation; [3] Potsherds were not observed during survey, leading to the designation of this site as a lithic scatter in earlier documents; [4] Does not include the two Santa Fe components with architecture (LAs 65420 and 65421) at the east end.

Two sites recorded in the original survey are included here to enlarge the sample. They were not tested during the second (present) phase of the project because they were excluded from the project area following the survey.

LA 61041

Figure 19 shows the distributions of Archaic projectile point and pottery types across the site. Looking at the pottery types chronologically, several patterns appear and can be summarized as follows:

1. Santa Fe Black-on-white is quite common and has two principal centers--the two pithouse sites (LA 65420 and LA 65421) at the east end of the site and a group of CUs in the south-central and southwestern portion of the site.

2. Abiquiu Black-on-gray (Biscuit A) is poorly represented and all sherds were recovered from the north half of the site, particularly the northeastern quadrant.

3. Bandelier Black-on-gray (Biscuit B) is well represented and centers primarily in the south-central and southwestern areas.

4. Sankawi Black-on-cream is sparse and limited to the northeastern quadrant of the site.

Three other types of some importance were also recovered and have spotty but interesting distributions at LA 61041. Vallecitos(?) Black-on-white and an unspecified Rio Grande glaze sherd were recovered from the south-central sector. Wiyo Black-on-white is a little more common but comes from several loci spread across the site. It should be noted that Wiyo, Vallecitos(?), Santa Fe, and Bandelier were all recovered from CU-10 in the south-central part of the site.

The distributions of the primary pottery types at LA 61041 can be summarized by period and breadth of distribution. Santa Fe Black-on-white, representing the earliest ceramic period use of the ridge, was found on essentially all parts of the ridge. The A.D. 1200 to 1350 occupation appears to have been the most intensive one in late prehistory.

The ridge evidently saw little use in the late 1300s and perhaps early 1400s when Abiquiu Black-on-gray was a major regional type. Starting some time in the 1400s and lasting into the late 1400s or early 1500s, when Bandelier Black-on-gray was a major regional pottery type, the ridge again saw fairly intensive use. Use of the ridge diminished during the early to mid-1500s, for Sankawi Black-on-cream is poorly represented and is restricted to the northeastern sector of the site. The project area as a whole reflects somewhat different temporal patterns, as discussed below.

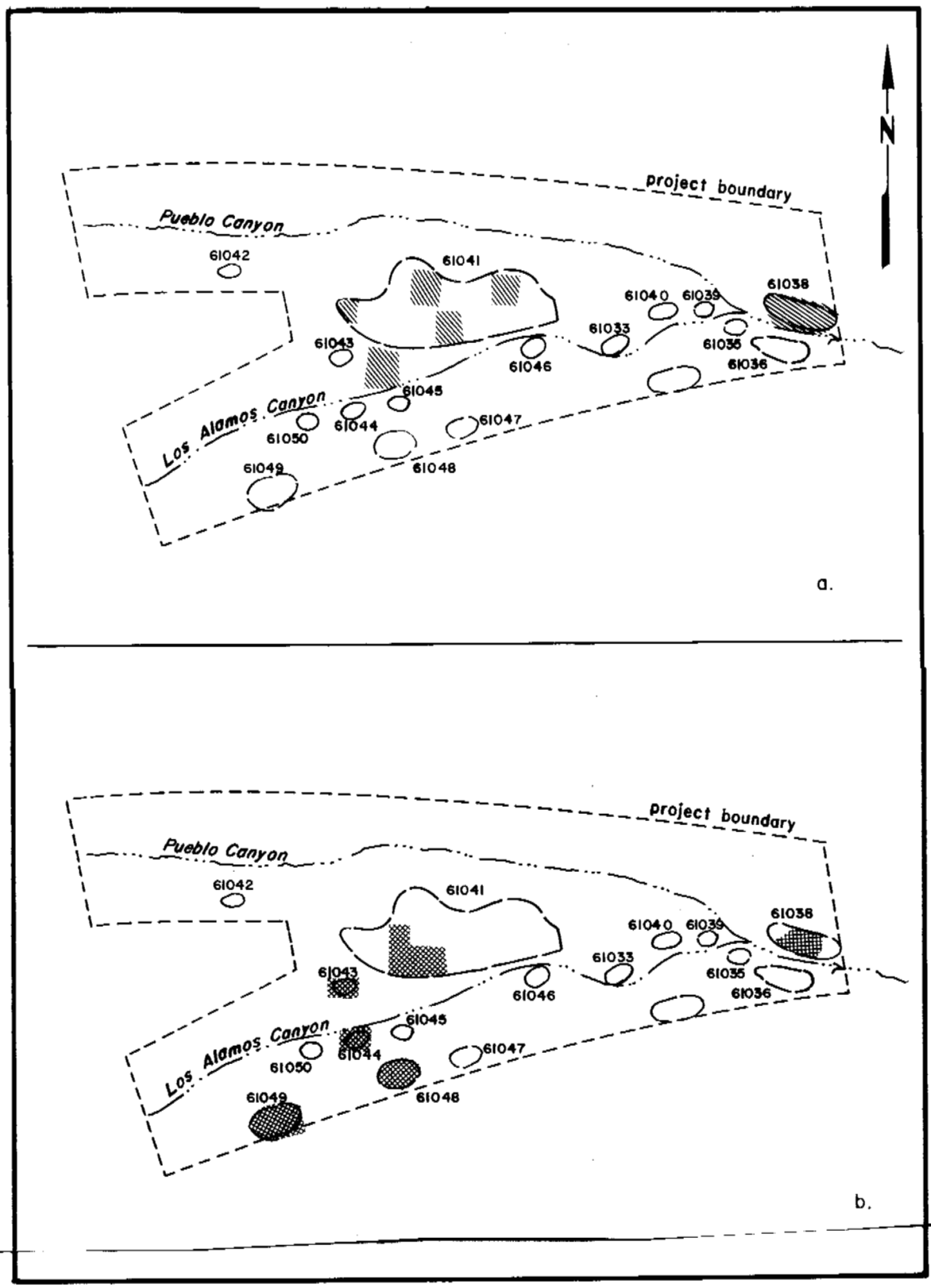


Figure 19. (a) Prehistoric occupation of the White Rock Y, sites with Middle and Late Archaic artifacts; (b) Sites with Santa Fe Black-on-white ceramics.

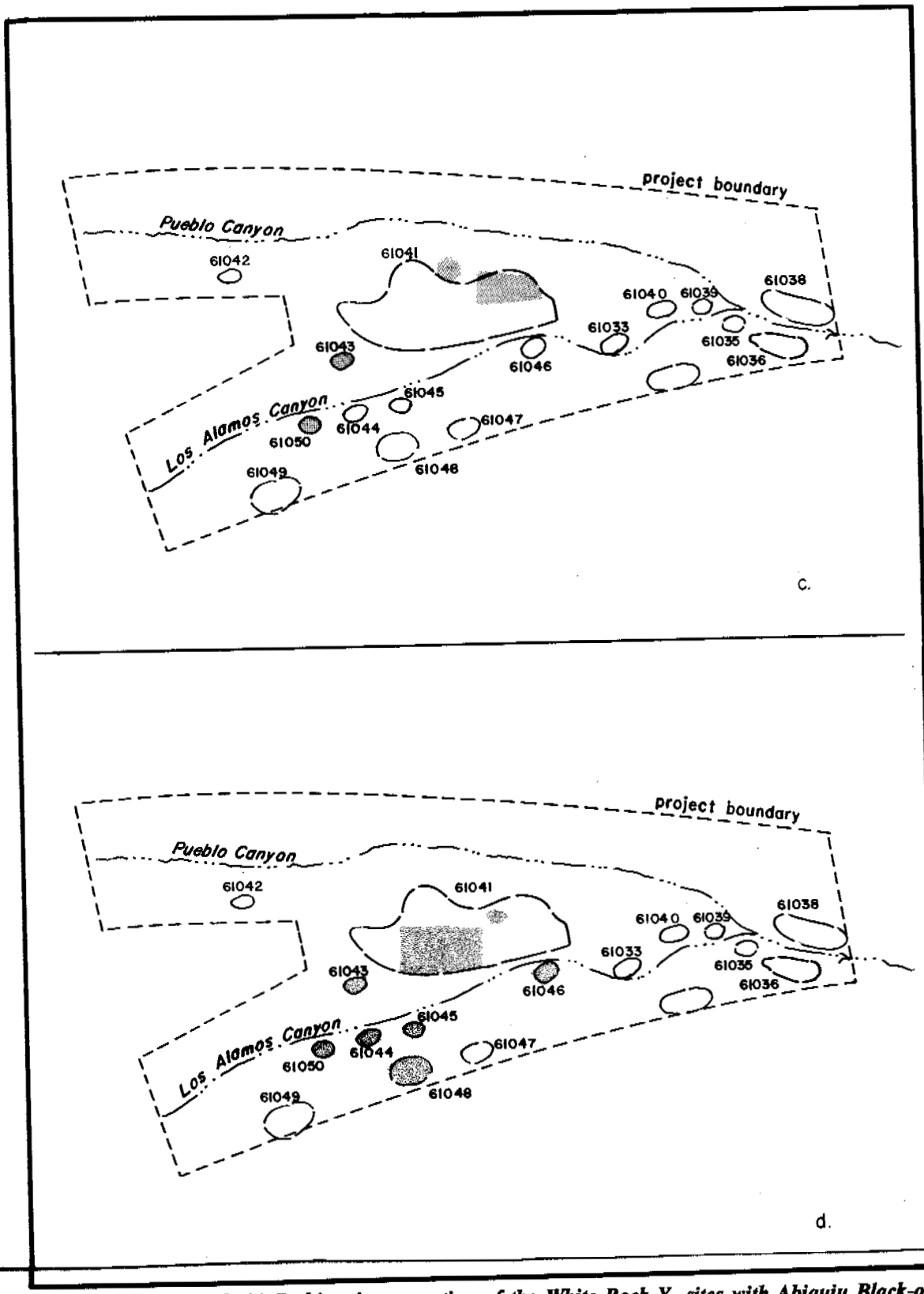


Figure 19. Continued; (c) Prehistoric occupation of the White Rock Y, sites with Abiquiu Black-on-gray ceramics; (d) Sites with Bandelier Black-on-gray ceramics.

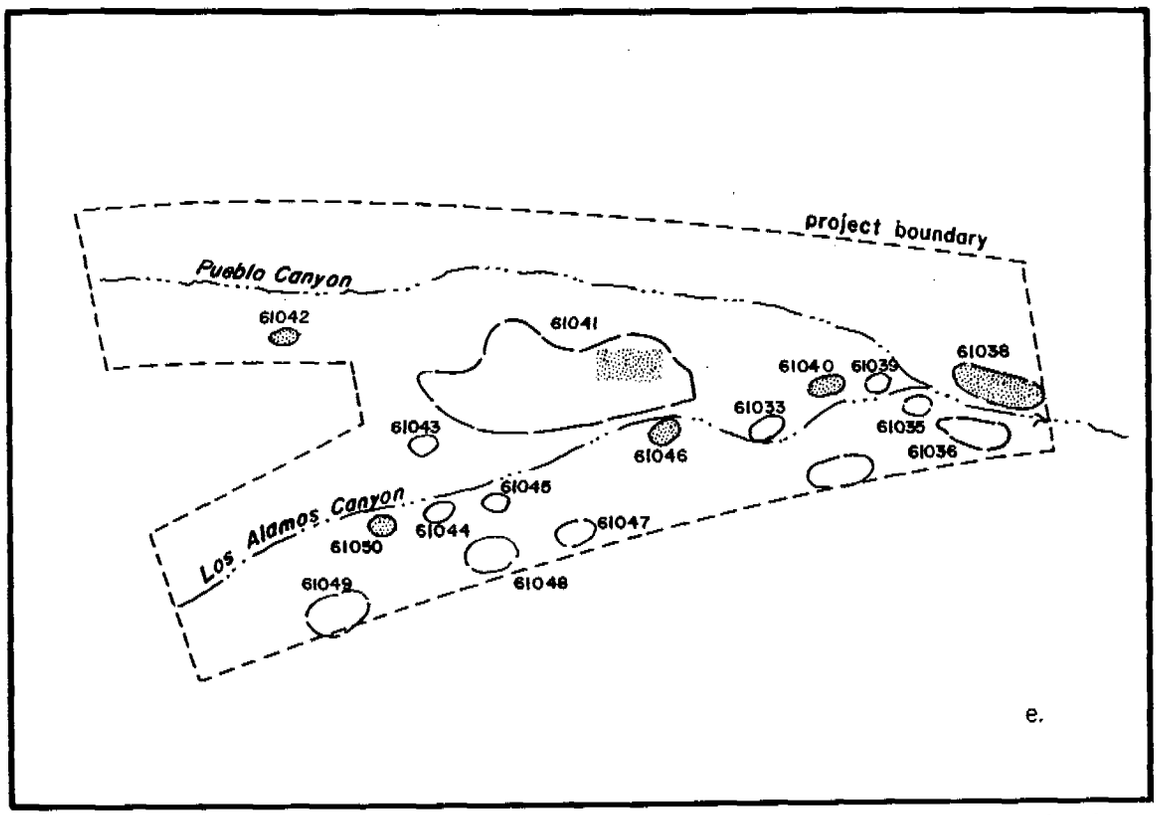


Figure 19. Continued; (e) Prehistoric occupation of the White Rock Y, sites with Sankawi Black-on-cream ceramics.

Project Area

Figure 19 shows the distributions of Archaic projectile point and pottery types across the project area. Looking at the various types chronologically, several patterns appear and can be summarized as follows:

1. The project area was used sporadically, if at all, during the Paleoindian period as suggested by the possible Plainview point from LA 61041.

2. The same is true for the Middle Archaic period when the area was used for hunting by Indians carrying San Jose atlatl points that date to the period 3200 to 1800 B.C.

3. The Basketmaker II period, dated 800 B.C.to 400 A.D. as denoted by En Medio points, appears to have centered in the canyon narrows downstream from the confluence.

4. The 1300s (Santa Fe Black-on-white times), like at LA 61041, are well represented in the project area.

5. The late 1300s and early 1400s are not well represented; only a few sherds of Abiquiu Black-on-gray were recovered from four sites. Use of the project area evidently was not as intense during this time as it was both earlier and later. The areas of focus, as judged

by the distribution of the sherds, include the alluvial bottom southwest of LA 61041, the north slopes of LA 61041, and LA 61038 at the downstream narrows.

6. Bandelier Black-on-gray, a major type during the mid to late 1400s and early 1500s, was relatively common on several sites. Its distribution is restricted to LA 61041 and sites south thereof. It should be noted that the distribution of sherds from Biscuit jars (generally thought to equate with Bandelier Black-on-gray) deviates from this pattern and may negate it.

7. Occupation during the mid to late 1500s, signalled by Sankawi Black-on-cream, is well represented in the project area (in contrast to LA 61041; see above). It occurs on sites throughout the project area, but in contrast to Bandelier Black-on-gray, it occurs in small quantities, suggesting less intensive but wider use of the area than before 1500.

Four other pottery types deserve mention. Vallecitos Black-on-white occurs at only one site other than LA 61041. That site, LA 61043, is immediately southwest of LA 61041 and adjacent to CU-10, the provenience of the LA 61041 specimen. Wiyo Black-on-white is fairly common in the project area but occurs only on LA 61041 and a few sites to the south and southwest. Rio Grande glazes, some of them are Glaze As, are more common than the LA 61041 data suggest and are found on six sites scattered through the project area. Potsuwii Incised, a common companion of Bandelier Black-on-white and Sankawi Black-on-white elsewhere in the Northern Rio Grande, is represented by only two sherds, one each at LA 61042 and LA 61043.

Following the survey, our initial interest in the project sites focused on the facts that the project area lies in the bottom of a major canyon confluence and that sites with structures larger than fieldhouses appeared to be absent. Sites of all sizes are present in the surrounding

Table 14. Site Types by Major Ceramic Association

Major Ceramic Association	Type 1, Habitation	Type 2, Fieldhouse	Type 3, Lithic/sherd scatter
Coalition Period (Santa Fe, Wiyo B/w)	61049, 65420, 65421	61041, TP2	61038, 61041, 61043, 61045, 61046, 61048
Early Classic (Abiquiu B/g)			61038, 61041, 61043, 61050
Middle Classic (Bandelier B/g)			61041, 61043, 61044, 61045, 61048, 61050
Late Classic (Sankawi B/c)			61038, 61040, 61041, 61042, 61046, 61050

region, indicating that a large population was present during the Coalition and Classic periods. While it was possible that one or more large villages were masked by massive sand deposits on the main ridge (for example, at LA 61041), the situation was nonetheless perplexing because of our expectations about aboriginal settlement practices in these situations.

Two basic types of sites are represented (not including the rock art site LA 61037)--architectural sites (pueblos, pithouses, field houses) and lithic artifact and sherd scatters (Table 14). This simple dichotomy allows us to view the two groups as representing two levels of labor investment in the sites. From this, we can infer the degree to which the occupants anticipated: (1) living at the locations; (2) returning to the locations on a predictable basis, thereby making an investment in structures worthwhile; or (3) using the sites on a casual basis. Archaeological correlates to these conditions, and the White Rock Y examples, are, respectively:

1. pueblo and/or pithouse sites:
   LA 61049 (pueblo)
   LA 65420 (pithouse site at east end of LA 61041)
   LA 65421 (pithouse site at east end of LA 61041)

2. fieldhouses:
   CU-10 and Test Pit 2 of LA 61041

3. thin scatters of artifacts (including pottery):

LA 61033	LA 61042	LA 61046
LA 61038	LA 61043	LA 61048
LA 61039	LA 61044	LA 61050
LA 61040	LA 61045	LA 61041 (all proveniences except those listed above)

The next step, then, is to look for temporal patterning of these features. Given the obvious multicomponent nature of most of the sites, this can best be accomplished by taking the major pottery types and listing the sites types associated with each (Table 12).

Summary

The Coalition period, denoted by Santa Fe Black-on-white, is represented by the highest number of sites and the only structural remains within the project area. The Indians evidently were living on the canyon bottom for extended periods, probably months or even years.

During the early part of the Classic period (Abiquiu Black-on-gray), evidently very little activity took place with in the project area. The activities were limited and fairly evenly scattered throughout the project area.

During the middle of the Classic period (Bandelier Black-on-gray), the project area was again fairly intensively used. However, architecture is lacking, indicating residence was

elsewhere. The activities that left artifacts on the ground were focused along the main ridge and in the valley bottom to the south.

Late Classic (Sankawi Black-on-cream) use of the project area was about the same as during the middle Classic. However, the activities, as indicated by the distribution of the sites, again encompassed most of the project area. The absence of architecture indicates that the people were living elsewhere, probably Tsankawi Ruin on the mesa immediately to the south.

Site Function

The assessment of site function on the basis of survey and testing data is always risky and will not be attempted here beyond the consideration of two assumptions. One is that all of the sites, whether architectural or not, were probably related to agriculture. This is believed to be true because very few other options would have been available. The canyon bottom in the project area would have had only limited wild plant food resources available even in the best years. Space for plant growth is limited in size, is confined by steep slopes and cliffs, and has special climatic problems (see description of the environment).

The same factors would have restricted available animal species as well, particularly considering the high density of Coalition and Classic period sites (and corresponding high population densities?) on the surrounding mesas. This is not to say that desirable species were absent, but that, given high human activity in the area, few deer, elk, and rabbits would have inhabited the area.

If we can accept these propositions as valid, the only major human use for the project area could have been habitation and farming. As discussed in the environmental description, farming the canyon bottom would have been precarious at best and probably not possible except on a small scale and in particularly sheltered locations. The comparatively few sites, their generally small size, and the sparsity of artifacts support this interpretation.

RECOMMENDATIONS

Based on the testing program described earlier in this report, only two locations within the White Rock Y project area appear to contain subsurface archaeological deposits that have the potential to yield important information on local and regional prehistory. As a result of the testing, these two locations were assigned separate Laboratory of Anthropology site numbers (65420 and 65421).

The NMSHTD subsequently determined that LA 65420 and LA 65421 could be avoided during the proposed construction. In a letter to the NMSHTD, Phillips (1987) recommended that the two sites in question be fenced during construction to prevent accidental disturbance of the remains. Otherwise, no further work was recommended with regard to any of the sites described in this report.

REFERENCES

Brown, David E., and Charles H. Lowe
1983 *Biotic Communities of the Southwest.* General Technical Report RM-78, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Tempe, Arizona.

Cordell, Linda S.
1979 *Cultural Resources Overview: Middle Rio Grande Valley, New Mexico.* Southwestern Region, USDA Forest Service and New Mexico State Office, USDI Bureau of Land Management, Albuquerque and Santa Fe.

Dane, Carle H., and George O. Bachman
1965 *Geological Map of New Mexico.* U.S. Geological Survey, Arlington, Virginia.

Findley, James S., A. H. Harris, D. E. Wilson, and C. Jones
1975 *Mammals of New Mexico.* University of New Mexico Press, Albuquerque.

Folks, James J.
1975 *Soil Survey of Santa Fe Area, New Mexico.* USDA Soil Conservation Service and Forest Service and USDI Bureau of Indian Affairs, Washington, D.C.

Gabin, Vickie L., and Lee E. Lesperance
1977 *New Mexico Climatological Data.* W.K. Summers and Associates, Socorro.

Gauthier, Rory P.
1982 Notes on Biscuit Wares and Some General Ceramic Trends in the Northern Rio Grande. *Pottery Southwest* 9(2-3):6-7, 1-5. Albuquerque Archaeological Society, Albuquerque.

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

Kidder, Alfred Vincent
1962 *An Introduction to the Study of Southwestern Archaeology.* Revised edition edited by Irving Rouse. Yale University Press, New Haven, Connecticut.

Kohler, Timothy A.
1989 *Bandelier Archaeological Excavation Project: Research Design and Summer 1988 Sampling.* Reports of Investigations 61, Department of Anthropology, Washington State University, Pullman.

Kuchler, A. W.
1964 *Potential Natural Vegetation of the Conterminous United States* (Map and Booklet). American Geographical Society Special Publication No. 36, New York City.

Mera, H. P.
1934 *A Survey of the Biscuit Ware Area in Northern New Mexico.* Laboratory of Anthropology, Technical Series Bulletin No. 6, Santa Fe.

Oppelt, Norman T.
1988 *Southwestern Pottery: An Annotated Bibliography and List of Types and Wares.* Second edition, revised and expanded. The Scarecrow Press, Inc., Metuchen, New Jersey and London.

Phillips, David A., Jr.
1987 Letter to the New Mexico State Highway and Transportation Department. On file, Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Stuart, David E., and Rory P. Gauthier
1981 *Prehistoric New Mexico: Background for Survey.* State Historic Preservation Division, Office of Cultural Affairs, Santa Fe.

Tuan, Yi-Fu, C. E. Everard, J. G. Widdison, and I. Bennett.
1973 *The Climate of New Mexico--Revised Edition.* New Mexico State Planning Office, Department of Finance and Administration, Santa Fe.

Wendorf, Fred, and Erik K. Reed
1955 An Alternative Reconstruction of Northern Rio Grande Prehistory. *El Palacio* 62(5-6):131-173.

Wiseman, Regge N.
1987 *Archaeological Survey at the White Rock Y.* Laboratory of Anthropology Notes No. 398, Museum of New Mexico, Santa Fe.

APPENDIX 1. CULTURAL MATERIALS RECOVERED FROM AUGER TESTS AT LA 61041

Auger Test no. and final depth	Area of Site	Cultural material	Nearest CU and depth
6; 50 cm	South-central	1 flake	CU 2; 0-50 cm
9; 131 cm		2 flakes	CU 2; 0-22, 23-32 cm
12; 132 cm		2 flakes	CU 2; 0-15, 16-50 cm
33; 113 cm		1 flake	CU 2; 30-40 cm
43; 40 cm		1 flake	CU 10; 30-40 cm
46; 74 cm		2 flakes	CU 2; 0-25, 26-50 cm
65; 128 cm		1 flake	CU 10; 0-12 cm
69; 118 cm		1 flake	CU 11; 0-26 cm
74; 127 cm		1 flake	CU 11; 0-25 cm
83; 80 cm		1 sherd	CU 11; 0-10 cm
88; 135 cm		1 flake	CU 12; 0-100 cm
90; 90 cm		2 flakes	CU 12; 0-15, 16-37 cm
98; 145 cm		1 flake	CU 12; 0-30 cm
99; 90 cm		2 flakes	CU 12; 0-15, 16-36 cm
100; 93 cm		2 flakes	CU 12; 0-31, 32-45 cm
102; 103 cm		2 flakes	CU 12; 0-5 cm
107; 72 cm		1 flake	CU 12; 0-15 cm
109; 116 cm		1 flake	CU 12; 0-50 cm
120; 44 cm		1 flake	CU 12; 0-10 cm
121; 30 cm		1 flake	CU 12; 20-25 cm
123; 72 cm		1 flake	CU 12; 0-22 cm
136; 92 cm		1 flake	CU 12; 0-44 cm
138; 120 cm		1 flake	CU 12; 0-114 cm

Auger Test no. and final depth	Area of Site	Cultural material	Nearest CU and depth
139; 105 cm		1 flake	CU 12; 0-30 cm
142; 140 cm		charcoal	CU 12; 28-43 cm
144; 146 cm		1 flake	CU 11; 15-32 cm
145; 117 cm		1 flake	CU 11; 0-44 cm
151; 125 cm		2 flakes	CU 11; 0-10, 65-75 cm
153; 115 cm		1 sherd	CU 11; 0-35 cm
154; 144 cm		burned rock?	CU 11; 30-36 cm
182; 140 cm		1 flake	CU 8; 0-14 cm
200; 90 cm	northeast	ashy soil	CU 13; 70-80 cm
206; 94 cm		1 flake/ashy soil	CU 13; 20-30, 85-90 cm
207; 78 cm		1 sherd/charcoal	CU 13; 0-74 cm
208; 86 cm		artifacts/charcoal	CU 13; 30-86 cm
210; 115 cm		1 flake/gray soil	CU 13; 40-50 cm
211; 111 cm		artifacts/gray soil	CU 13; 20-90 cm
213; 78 cm		2 sherds/charcoal	CU 13; 20-65 cm
214; 88 cm		1 flake	CU 13; 0-5 cm
215; 103 cm		1 sherd	CU 13; 20-30 cm
217; 98 cm		1 flake	CU 13; 30-40 cm
C; 140 cm	?	1 flake	?; 50-70 cm
226; 94 cm		1 flake	CU 13; 14-24 cm
247; 118 cm		1 flake	CU 13; 0-18 cm
250; 114 cm		2 flakes	CU 13; 30-43 cm
J; 96 cm		1 flake	CU 16; 0-90 cm
WWW; 86 cm		1 flake	CU 16; 0-10 cm
255; 38 cm		charcoal	CU 15; 7-12 cm
270; 122 cm		charcoal	CU 15; 0-37 cm

Auger Test no. and final depth	Area of Site	Cultural material	Nearest CU and depth
293; 93 cm		1 flake	CU 13; 0-80 cm
405; 139 cm	northwest	1 flake/groundstone	CU 14; 0-16, 105 cm
420; 153 cm		2 flakes	CU 14; 0-28, 29-40 cm
421; 145 cm		1 flake	CU-14; 0-140 cm
424; 133 cm		1 flake	CU 14; 0-73 cm
428; 137 cm		2 flake	CU 14; 0-102 cm
429; 135 cm		1 flake	CU 14; 0-135 cm
432; 140 cm		1 flake	CU 14; 0-84 cm
433; 140 cm		1 flake	CU 14; 0-14 cm
446; 120 cm		1 flake	CU 14; 0-120 cm
449; 140 cm		1 flake	CU 14; 0-86 cm
466; 146 cm		1 flake	CU 14; 0-146 cm
470; 86 cm		1 flake	CU 14; 0-72 cm
473; 158 cm		1 flake	CU 14; 0-46 cm
474; 142 cm		1 flake	CU 14; 0-60 cm
482; 136 cm		1 flake	CU 18; 0-16 cm
483; 140 cm		1 flake	CU 18; 0-36 cm
488; 138 cm		1 flake	CU 18; 0-60 cm
498; 140 cm		1 flake	CU 18; 0-15 cm
508; 133 cm		1 flake	CU 18; 0-30 cm
518; 123 cm		1 flake	CU 18; 0-40 cm
536; 152 cm	southwest	1 flake	CU 29; 24-36 cm
549; 75 cm		charcoal	CU 5; not recorded
554; 90 cm		4 sherds	CU 5; not recorded

APPENDIX 2. CULTURAL MATERIALS RECOVERED FROM SHOVEL TESTS AT LA 61041

Shovel Test number	Area of Site	Cultural Material	Nearest Mapping Station
2	northeast	1 flake	N-6
50	north-central	1 flake	N-6
91		1 flake	N-8
129		1 flake	N-8
149		1 lithic	N-8
164	northeast	burned rock	N-2
173		1 flake	N-3
175		charcoal	N-3
183		1 flake	N-3
201		1 flake	N-5
211		flake/burned rock	N-6
213		1 flake	N-5
220		1 flake	N-6
228		1 flake	N-2
248		1 flake	N-2
256		1 flake	N-3
271		1 sherd	N-3
272		1 flake	N-3
301		1 flake	N-4
324	north-central	1 lithic	N-10
353	northwest	1 flake	N-10
361	north-central	1 flake	N-10
376	north-central	1 flake	N-10
418	northwest	bone	N-11

Shovel Test number	Area of Site	Cultural Material	Nearest Mapping Station
419		2 flakes	N-11
438		3 flakes	N-12
468		1 flake	N-13
469		1 flake	N-13
471		1 flake	N-13

APPENDIX 3. POTTERY BY PROVENIENCE

LA 61038

CU-23: 1 Sankawi B/c jar
2 smeared indented corrugated
1 plain utility
5 misc. gray ware

CU-24: 2 Biscuit jar

CU-25: 2 flattened indented corrugated

CU-26: 1 prob. Sankawi B/C jar

(One artifact only unless otherwise specified)

CA-450: white ware jar
CA-452: white ware jar
CA-457: micaceous plain
CA-460: Biscuit/Sankawi bowl
CA-462: Biscuit/Sankawi bowl
CA-465: white ware jar
CA-467: PIII indented corr.
CA-468: Abiquiu B/g
CA-469: Sankawi(?) B/c
CA-471: smeared indent corr.
CA-472: smeared indent corr.
CA-477: smeared indent corr.
CA-478: Sankawi(?) B/c
CA-480: Santa Fe B/w bowl
CA-481: smeared indent corr.
CA-482: Sankawi B/c jar
CA-484: smeared indent corr.
CA-485: utility ware
CA-488: glaze/w or poly jar
CA-489: white ware bowl
CA-494: Rio Grande Glaze/red jar
CA-496: smeared indent corr.
CA-498: smeared indent corr.
CA-499: plain utility
CA-500: Sankawi B/c jar
CA-502: Biscuit jar
CA-503: Rio Grande Glaze-poly jar

LA 61039

CU-19: 1 Rio Grande G/r (prob. A)
2 smeared indented corrugated
1 utility ware

CA-398: 1 smeared indented corrugated

LA 61040

CU-20: 1 painted unknown jar
1 Sankawi(?) B/c jar

LA 61041

CU-1: 1 smeared indented corrugated

CU-2: 2 smeared indented corrugated

CU-4:
1 Santa Fe B/w bowl
1 white ware
1 PIII Indented corrugated
15 smeared indented corrugated
2 flattened indented corrugated

CU-5:
2 Santa Fe B/w bowl
1 Santa Fe B/w jar
6 PIII indented corrugated
12 smeared indented corrugated
2 flattened indented corrugated
5 miscellaneous utility

CU-10:
3 PIII indented corrugated
9 smeared indented corrugated
3 flattened indented corrugated
1 miscellaneous utility

CU-11: 1 Bandelier B/g

CU-13:
2 Santa Fe B/w bowl
1 Wiyo(?) B/w bowl
5 white ware
1 PII-III indented corrugated
1 PIII indented corrugated
17 smeared indented corrugated
1 flattened indented corrugated

CU-14: 1 micaceous clapboard corrugated

CU-15:
2 Santa Fe B/w bowl
2 smeared indented corrugated

CU-16:
1 white ware
1 PIII indented corrugated
1 miscellaneous utility

CU-29: 3 smeared indented corrugated

(One artifact each unless otherwise specified):
CA-2: smeared indent corr.
CA-3: clapboard corr.
CA-200: Sankawi B/c jar
CA-217: prob. Sankawi B/c jar

CA-4: Biscuit jar
CA-5: Bandelier B/g
CA-6: smeared indent corr.
CA-19: flattened indent corr.
CA-23: Santa Fe B/w bowl
CA-25: smeared indent corr.
CA-27: Bandelier B/g
CA-28: PII-III indent corr.
CA-41: smeared indent corr.
CA-42: plain utility
CA-46: Bandelier B/g
CA-54: PII-III indent corr.
CA-64: Bandelier B/g
CA-91: Bandelier B/g
CA-92: Bandelier B/g
CA-93: Santa Fe B/w bowl
CA-96: PIII indented corr.
CA-100: Bandelier B/g
CA-101: Bandelier B/g
CA-102: smeared indent corr.
CA-104: plain utility
CA-111: Biscuit jar
CA-115: Biscuit jar
CA-122: smeared indent corr.
CA-133: smeared indent corr.
CA-142: 2 smeared indent corr.
CA-144: smeared indent corr.
CA-145: 2 smeared indent corr.
CA-155: smeared indent corr.
CA-156: Santa Fe B/w jar
CA-157: smeared indent corr.
CA-158: Santa Fe B/w bowl
CA-160: smeared indent corr.
CA-161: plain utility
CA-162: plain utility
CA-164: Santa Fe B/w jar
CA-165: Santa Fe B/w bowl
CA-167: smeared indent corr.
CA-168: Santa Fe B/w bowl
CA-169: white ware bowl
CA-171: PIII indented corr.
CA-183: Biscuit/Sankawi bowl
CA-187: smeared indent corr.
CA-193: smeared indent corr.
CA-221: PIII indented corr.
CA-237: PIII indented corr.
CA-247: flattened indent corr.
CA-250: smeared indent corr.
CA-251: smeared indent corr.
CA-254: Abiquiu B/g
CA-256: smeared indent corr.
CA-257: Wiyo B/w bowl
CA-267: smeared indent corr.
CA-268: white ware bowl
CA-270: utility ware
CA-272: smeared indent corr.
CA-276: Abiquiu B/g (FS 276)
CA-276: smeared indent corr (FS 325)
CA-279: smeared indent corr
CA-281: PIII indented corr.
CA-291: Santa Fe(?) B/w bowl
CA-293: smeared indent corr.
CA-294: Biscuit jar
CA-304: Bandelier B/g
CA-305: Bandelier B/g
CA-306: misc. Biscuit
CA-307: prob. Bandelier B/g
CA-313: white ware bowl
CA-316: Bandelier B/g
CA-323: white ware jar
CA-326: plain utility
CA-330: smeared indent corr.
CA-340: flattened indent corr.
CA-348: smeared indent corr.
CA-349: Biscuit jar
CA-350: Biscuit jar
CA-354: Santa Fe B/w bowl
CA-355: smeared indent corr.
CA-359: flattened indent corr.
CA-364: Wiyo(?) B/w bowl
CA-369: Abiquiu B/g
CA-388: smeared indented corr.
CA-390: smeared indent corr.
CA-504: Santa Fe B/w bowl

CA-114: misc. Rio Grande Glaze
CA-209: white ware

AH in LA 65420: 3 smeared indented corrugated.
1 flattened indented corrugated.

AH-83:	1 Bandelier B/g
AH-153:	1 smeared indented corrugated
AH-207:	1 Santa Fe or Wiyo B/w jar
AH-208 (53-60 cm):	2 smeared indented corrugated
	1 PIII indented corrugated
AH-208 (60-70 cm):	1 flattened indented corrugated
AH-208 (70-78 cm):	4 flattened indented corrugated
AH-208 (78-82 cm):	1 smeared indented corrugated
AH-213:	2 smeared indented corrugated
AH-215:	1 smeared indented corrugated
AH-271:	1 miscellaneous utility

Test Pit 2:

West half, Level 1:	2 PIII indented corrugated
West half, Level 2:	1 Wiyo B/w jar
	2 PIII indented corrugated
	1 tool-smeared indented corrugated
	2 miscellaneous utility
East half, Level 1:	3 smeared indented corrugated
East half, Level 2:	1 Vallecitos(?) B/w bowl
	1 PII-III indented corrugated
	1 PIII indented corrugated
	1 flattened indented corrugated
East half, Level 3:	1 smeared indented corrugated

LA 61042

CU-30:	1 Biscuit jar
	1 Biscuit/Sankawi jar
	2 Sankawi B/c jar
	1 PIII indented corrugated
	4 smeared indented corrugated
	1 micaceous smeared indented corrugated
	4 plain utility
CA-508:	1 Biscuit(?) jar
CA-510:	1 Biscuit jar
CA-511:	1 Potsuwii Incised

LA 61043

CU-6:	2 Biscuit A
	1 PIII indented corrugated
	1 smeared indented corrugated

1 miscellaneous utility

CU-7: 1 Santa Fe B/w bowl
1 Glaze/red jar
1 Potsuwii Incised
1 PIII Indented corrugated

(One artifact each unless otherwise specified)

CA-10: Santa Fe B/w bowl
CA-11: Bandelier B/g
CA-12: smeared indent corr.
CA-13: Bandelier B/g
CA-14: Vallecitos(?) B/w bowl
CA-15: PIII indent corr.
CA-16: Glaze/red jar
CA-17: smeared indent corr.
CA-18: Rio Grande Glaze A Red jar
CA-29 (AH): 3 plain util.

LA 61044

CU-28: 1 Biscuit jar
2 white ware
1 PIII indented corrugated
1 micaceous plain utility

CA-505: 1 Bandelier B/g
CA-506: 1 Bandelier B/g

LA 61045

CU-21: 2 Bandelier B/g

(One artifact each unless otherwise specified)

CA-405: Wiyo B/w bowl
CA-409: Wiyo B/w jar
CA-410: Wiyo B/w bowl
CA-413: Bandelier B/g

LA 61046

(One artifact each unless otherwise specified):

CA-421: Bandelier B/g
CA-422: Sankawi B/c jar
CA-423: Bandelier B/g
CA-424: Bandelier B/g
CA-425: smeared indent corr.
CA-426: 2 Wiyo B/w jar
CA-427: 2 micaceous plain util.
CA-429: micaceous plain util.
CA-430: prob. Sankawi B/c jar
CA-431: Sankawi B/c jar
CA-432: Biscuit(?) jar
CA-433: 3 misc. utility
CA-434: Cieneguilla G/y jar
CA-435: 2 Cieneguilla G/y
CA-436: Bandelier B/g
CA-437: Sankawi B/c jar
CA-438: Bandelier B/g
CA-440: Bandelier B/g
CA-440: Bandelier B/g
CA-441: Sankawi(?) B/c jar

LA 61050

(One artifact each unless otherwise specified):

CA-415: 2 Abiquiu B/g
CA-415: 2 Bandelier B/g
CA-415: 1 Biscuit jar
CA-415: 1 misc. Biscuit
CA-416: Sankawi B/c jar
CA-417: 3 San Clemente G-Poly bowl
CA-418: Potsuwii Incised
CA-418: plain utility
CA-419: Sapawe Micaceous Washboard
CA-420: tool-smeared indented corr.

Isolated Object 11

1 Bandelier B/g
1 Sankawi B/c jar
1 smeared-indented corr. (nonmicaceous)

CA 9: Sankawi B/c jar

APPENDIX 4. THE SOURCING OF A SELECTED SAMPLE OF OBSIDIAN

EASTERN NEW MEXICO UNIVERSITY Portales 88130
Agency for Conservation Archaeology

February 14, 1991

Mr. Regge Wiseman
Museum of New Mexico
Laboratory of Anthropology/Research Section
P.O. Box 2087
Santa Fe, NM 87504-2087

Dear Regge:

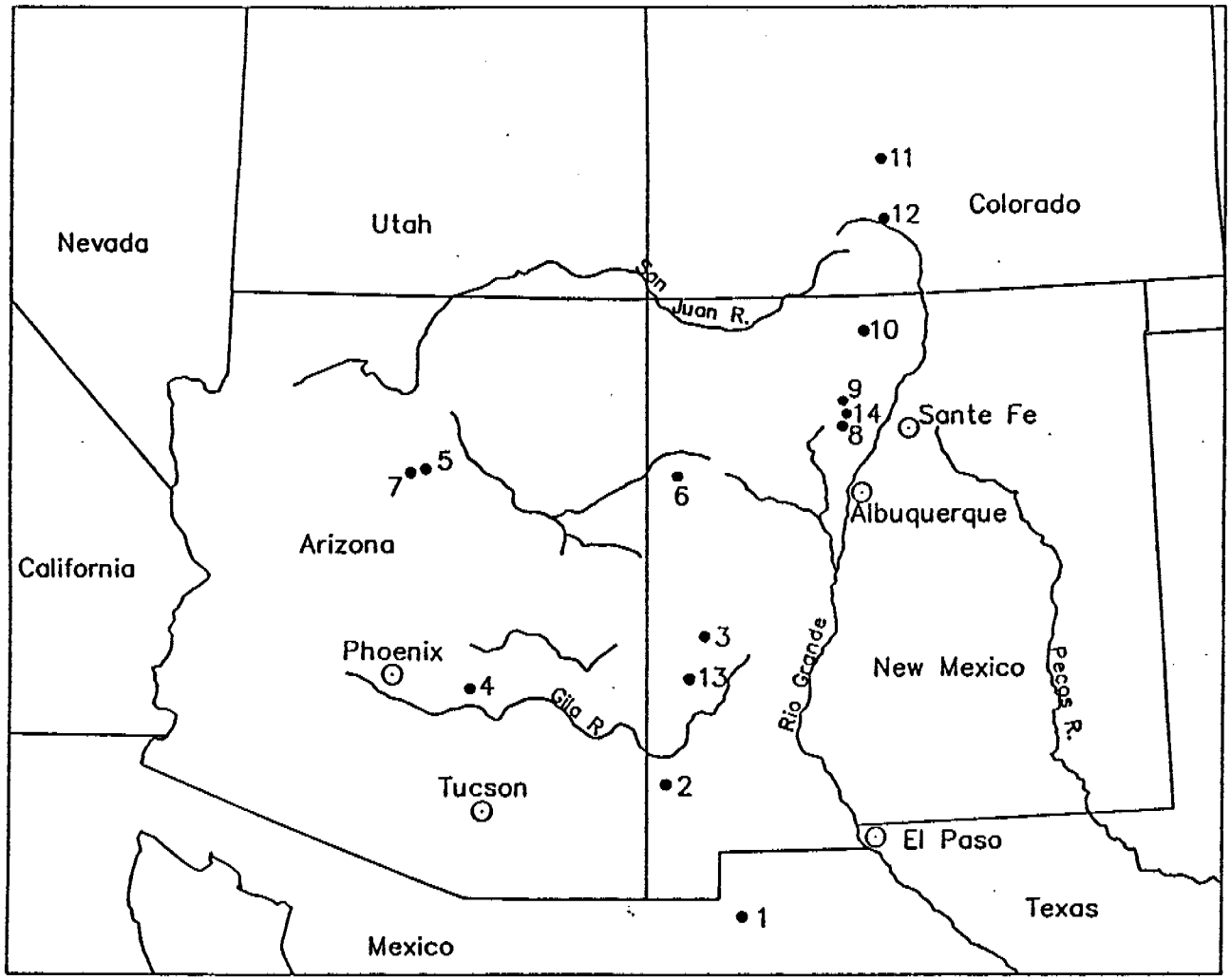
This letter details the results of the obsidian sourcing of 11 artifacts you submitted to the Obsidian Hydration Laboratory at Eastern New Mexico University.

INTRODUCTION

Geochemical characterization of known and unknown samples was carried out using rapid XRF at the trace elemental level. XRF analysis is a non-destructive, yet powerful and rapid method for determining chemical characterization of materials (Hoffer 1985; Lister 1975). An extensive literature indicates that XRF provides a rapid and economic way of isolating distinct obsidian sources (Jack 1976; Ericson et al. 1976; Stross et al. 1976; Reeves and Ward 1976; Dixon 1976). Rapid XRF can detect the presence of trace elements as infrequent as 10 parts per million. This degree of resolution distinguishes sources that are otherwise similar in major elemental or compound composition. Other investigations of geochemical characterization of obsidians have resulted in similar conclusions (Jack 1976; Ericson et al. 1976; Stross et al. 1976; Reeves and Ward 1976; Dixon 1976; Michels and Tsong 1980). In addition to a fine-grained examination of samples, representative and thorough sampling of source areas is necessary to increase the probability of accurate classification.

Source areas shown in Figure 1 were characterized by ENMU-OHL prior to this project. In all instances, those samples submitted for XRF characterization were selected because they are considered to be macroscopically representative of a particular geologic deposit or flow. Further, no source was characterized with fewer than five samples. Many sources were sampled more extensively because of their macroscopic variability and their spatial and/or temporal extent.

Several other investigators have attempted to define obsidian sources in the New Mexico region. Some of these are more successful than others, and some provide data that cannot be easily compared to the results of this report. Most of these research endeavors are programmed along the methodology outlined by Ward (1974). But all have flaws that limit their usefulness. For example, the sourcing research reported by Newman and Neilsen (1985) uses only one example from a source and examines the chemical composition of obsidian for 10 elements. They note that two of these elements (Sr and K) are poor contributors to source discrimination. Tripolar graphs, chi-square analysis, and cluster analysis are the analytical techniques used to



1. Cave Creek, Northern Old Mexico
2. Mule Creek, Southwest N.M.
3. Red Hill, Western N.M.
4. Superior, Southeastern Arizona
5. San Francisco Mts., Northcentral Arizona
6. Grants Ridge, Northwest N.M.
7. Government Mt., Northeast Arizona
8. Jemez Mts., Northcentral N.M.
9. Polvadera Peak, Northern N.M.
10. San Antonio Mt., Northern N.M.
11. Cochetopa, Central CO.
12. Beaver Creek, Southcentral CO.
13. Ewe Canyon, Southwest N.M.
14. Cerro del Medio, Northern N.M.

Figure 1

assign artifacts to particular sources. While useful in several ways, this research is hindered primarily by the fact that the variability within a source is not described.

METHODS

X-Ray Fluorescence Analysis. The obsidian artifacts submitted for sourcing were subsampled and sent to the New Mexico Bureau of Mines and Mineral Resources where x-ray fluorescence (XRF) analysis was done by Mr. Chris McKee. The samples were powdered prior to XRF analysis to homogenize them and their concomitant XRF values. In addition, powdering provides a relatively uniform target area for x-rays. Consequently this procedure minimizes any variation caused by geochemical changes in the hydrated zone and the underlying material, as well as differences in x-ray values caused by subtle variations in the geometry of the target areas.

Discriminant Function Analysis. Rather than attempting to compare the geochemistry of known and unknown samples using frequencies of a few "key" elements or a few of the major chemical compounds, comparisons were accomplished using a multivariate statistic, discriminant function analysis. It is capable of classifying unknown observations into known populations considering all known variables and their range of variation within and between groups, in this case, source areas of obsidian. Statistical analyses of XRF data were conducted with the statistical software SYSTAT (Version 5.0; Wilkinson 1990).

An excellent discussion of the different ways to "fingerprint" obsidian to particular sources is found in Hughes (1986). He notes that ternary diagrams (which depict the relative frequency of three elements of a group of samples) often cannot clearly distinguish sources with overlapping plots. These diagrams also are complicated by "the fact that specimens from the same source will not plot in the same location on the graph if different measurement units are employed" (Hughes 1986:53). Multivariate techniques, specifically discriminant analysis procedures, have long been used to more clearly determine sources for lithic materials (cf. Ericson 1981; Ward 1974; Nelson and Holmes 1979; Luedtke 1979). While also noting in detail the statistical assumptions of discriminant analysis, Hughes summarizes the strengths of using this procedure:

> Discriminant analysis, then, accomplishes two objectives: first, it describes or identifies groups of objects on the basis of distinctive combinations of discriminating variables; and second, it predicts group membership or classifies ungrouped cases into one or another of the groups in the sampling universe on the basis of mathematical equations derived from known groups. Thus, the descriptive aspect of discriminant analysis simply derives allocation rules to characterize the differences between obsidian sources on the basis of major, minor, trace, or rare earth elements. Once this step has been accomplished, discriminant analysis can be employed to classify cases of unknown origin (these are usually obsidian artifacts) on the basis of allocation rules derived from the analysis of known obsidian sources [1986:56-57].

Discriminant function analysis uses either the discriminant variable scores or the canonical discriminant functions to predict the source to which a particular sample most likely belongs. In multivariate space, this procedure compares the

unknown sample's position to each source group's centroid to determine the source most similar to the unknown sample. In this case, classification of known sources by discriminant function analysis resulted in a 99% correct solution. Seventeen variables were selected for the analysis. They are V, Zn, Mo, Nb, Th, Rb, Zr, Y, Sr, TiO_2, Fe_2O_3-T, MgO, CaO, Al_2O_3, Na_2O, K_2O, and MnO.

RESULTS

Results of the XRF and discriminant function analysis are interpreted as indicating that the obsidian artifacts derives from a source that is not within the database of sources used by ENMU-OHL. Although the 11 artifacts were classified as deriving from either the Jemez or Cerro del Medio sources, examination of the Mahalanobis distance (D^2) for the artifacts indicate that none of the classifications are very good. Hughes (1986) discusses ways of using D^2 to identify correctly classified artifacts. The D^2 range for the Cerro del Medio source is 1.625-4.392, the mean is 2.816, and the standard deviation is 0.9. As Table 1 illustrates none of the D^2s for the artifacts are within acceptable limits. The D^2 range for the Jemez source is 2.648-5.129, the mean is 3.531, and the standard deviation is 0.8. Again, as illustrated in Table 1, none of the artifacts classified as Jemez have an acceptable D^2.

A number of factors could be affecting the classification results. It may be that the obsidian source these artifacts derive from is not within the database of known sources used by ENMU-OHL. Or, it may be that the sources within our database do reflect the variability of the Jemez and Cerro del Medio sources accurately. In either case, it is clear that the artifacts cannot be sourced accurately with the present data.

If you have any questions, please do not hesitate to contact me at (505) 562-2254. I have also enclosed your obsidian artifacts. As we discussed with you prior to the analysis, some of the artifacts were small and had to be sacrificed for XRF analysis. These artifacts are: LA 68188, FS-5-110; LA 68188, FS-23-103; LA 68188, FS-30-1; LA 68188, FS-5-118; LA 68188, FS-5-82; LA 71167, FS-61; and LA 58971, FS-8a-51. The XRF data for these artifacts is on file at ENMU-OHL; if you should need it please let us know.

Sincerely,

John Montgomery

John L. Montgomery, Ph.D.
Co-Director, Obsidian Hydration Laboratory

Table 1. Mahalanobis Distances for the Artifacts

Artifact Number	Proposed Source	Mahalanobis Distance
IO 18, FS-726	Jemez	7.729
LA 68188, FS-0-255	Jemez	12.195
LA 68188, FS-0-1608	Cerro del Medio	7.211
LA 68188, FS-5-82	Cerro del Medio	8.211
LA 68188, FS-5-110	Jemez	7.953
LA 68188, FS-5-118	Cerro del Medio	5.695
LA 68188, FS-23-103	Jemez	8.914
LA 68188, FS-30-1	Jemez	6.925
LA 58971, FS-1-69	Cerro del Medio	6.147
LA 58971, FS-8a-51	Jemez	7.812
LA 71167, FS-61	Jemez	7.255

Dixon, J.E.
1976 Obsidian Characterization Studies in the Mediterranean and the Near East. In *Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives*, edited by R.E. Taylor, pp. 288-333. Noyes Press, New Jersey.

Ericson, J.E.
1981 Exchange and Production Systems in California Prehistory: The Results of Hydration Dating and Chemical Characterization of Obsidian Sources. *British Archaeological Reports, International Series* 110.

Ericson, J.E., T.A. Hagan, and C.W. Chesterman
1976 Prehistoric Obsidian in California II: Geologic and Geographic Aspects. In *Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives*, edited by R.E. Taylor, pp. 218-239. Noyes Press, New Jersey.

Hoffer, J.M.
1985 Chemical Analysis of Archaeological Samples by Energy Dispersive X-Ray Fluorescence. Ms. in possess of author.

Hughes, R.E.
1986 Diachronic Variability in Obsidian Procurement Patterns in Northeastern California and Southcentral Oregon. *University of California Publications in Anthropology* 17.

Jack, R.N.
1976 Prehistoric Obsidian in California I: Geochemical Aspects. In *Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives*, edited by R.E. Taylor, pp. 183-217. Noyes Press, New Jersey.

Lister, D.B.
1975 Application of Energy Dispersive X-Ray Fluorescence. *Instrument Society of America* AID 75437:143-151.

Luedtke, B.E.
1979 The Identification of Sources of Chert Artifacts. *American Antiquity* 44(4):744-757.

Michels, J.W., and I.S.T. Tsong
1980 Obsidian Hydration Dating: A Coming of Age. In *Advances in Archaeological Method and Theory*, vol. 3, edited by M.B. Schiffer, pp. 405-444. Academic Press, New York.

Nelson, F.W., and R.D. Holmes
1979 Trace Element Analysis of Obsidian Sources and Artifacts from Western Utah. *Antiquities Section Selected Papers* 15. Utah State Historical Society, Salt Lake City.

Newman, J.R., and R.L. Neilsen
1985 Initial Notes on the X-Ray Fluorescence Sourcing of Northern New Mexico Obsidians. *Journal of Field Archaeology* 12(3):377-383.

Reeves, R.D., and G.K. Ward
1976 Characterization Studies of New Zealand Obsidians: Toward a Regional Prehistory. In *Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives*, edited by R.E. Taylor, pp. 259-287. Noyes Press, New Jersey.

Stross, F.H., T.R. Hester, R.F. Heizer, and R.N. Jack
1976 Chemical and Archaeological Studies of Mesoamerican Obsidian. In *Advances in Obsidian Glass Studies: Archaeological and Geochemical Perspectives*, edited by R.E. Taylor, pp. 240-258. Noyes Press, New Jersey.

Ward, G.K.
1974 Comparison of Source and Artifact Characterization Data Using a Generalized Distance Measure. *American Antiquity* 39(3):473-477.

Wilkinson, L.
1990 *SYSTAT: The System for Statistics.* Systat, Inc., Evanston, IL.