STUDIES OF SMALL PREHISTORIC SITES IN THE GILA BUTTE-SANTAN AREA

by

Jeanne K. Swarthout

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Laurie Blank-Roper

Prepared for U.S. Soil Conservation Service
Roosevelt Water Conservation District Project
Contract No. 53-8A02-9-00C77

Submitted by

Office of Cultural Resource Management
Department of Anthropology
Arizona State University

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1.0 INTRODUCTION TO STUDY

1.1 INTRODUCTION

In 1979 Arizona State University undertook mitigation of impacts to twelve Hohokam sites to be affected by Soil Conservation Service's construction of the Roosevelt Water Conservation District floodway channel. This channel is designed to convey floodwaters originating from Queen Creek to the Gila River, eliminating periodic inundation of the northeast portion of the Gila River Indian Reservation. From the lower reaches of the Queen Creek drainage the channel will carry water southward, skirting the Santan Mountains on their western lower bajada where the channel will make an abrupt turn toward the west, span the alluvial plain for approximately eight miles, and make a final sharp turn south toward the river at the base of Gila Butte (Figure 1.1). Within the final scope of this project right-of-way and associated impact areas, twelve archaeological sites were defined by previous survey (Rice et al. 1979) as needing further data recovery before construction. These sites are described in this report.

In this introductory chapter are sections outlining the project, the research goals of the project, and the general methodologies applied in the field and laboratory situations. The second chapter contains a summary of the present environment of the study area. The third chapter discusses each of the twelve prehistoric sites, while the fourth and fifth chapters summarize ceramic and lithic analyses, respectively. Palynological analysis is covered in the sixth chapter, while faunal analysis is described in the seventh. The eighth chapter contains a description of the very limited burial remains from this project. General summaries and conclusions are presented in the ninth chapter. Appendix I characterizes shell remains for the project, while Appendix II tabulates pollen remains.

1.2 RESEARCH GOALS

In an early test phase of the RWCD project area (then known as the Queen Creek Floodway Project) Danny Brooks and R. Gwinn Vivian addressed the problem of Hohokam cultural adaptation to the environment of the Gila River Valley (Brooks and Vivian 1978:105). They tested a model developed by Vorsila Bohrer (1970) that postulates that the prehistoric Hohokam subsistence system was analogous to that of the historic Pima. Although the results of their test were to some degree inconclusive, they suggest several interesting avenues for future research. Among those that

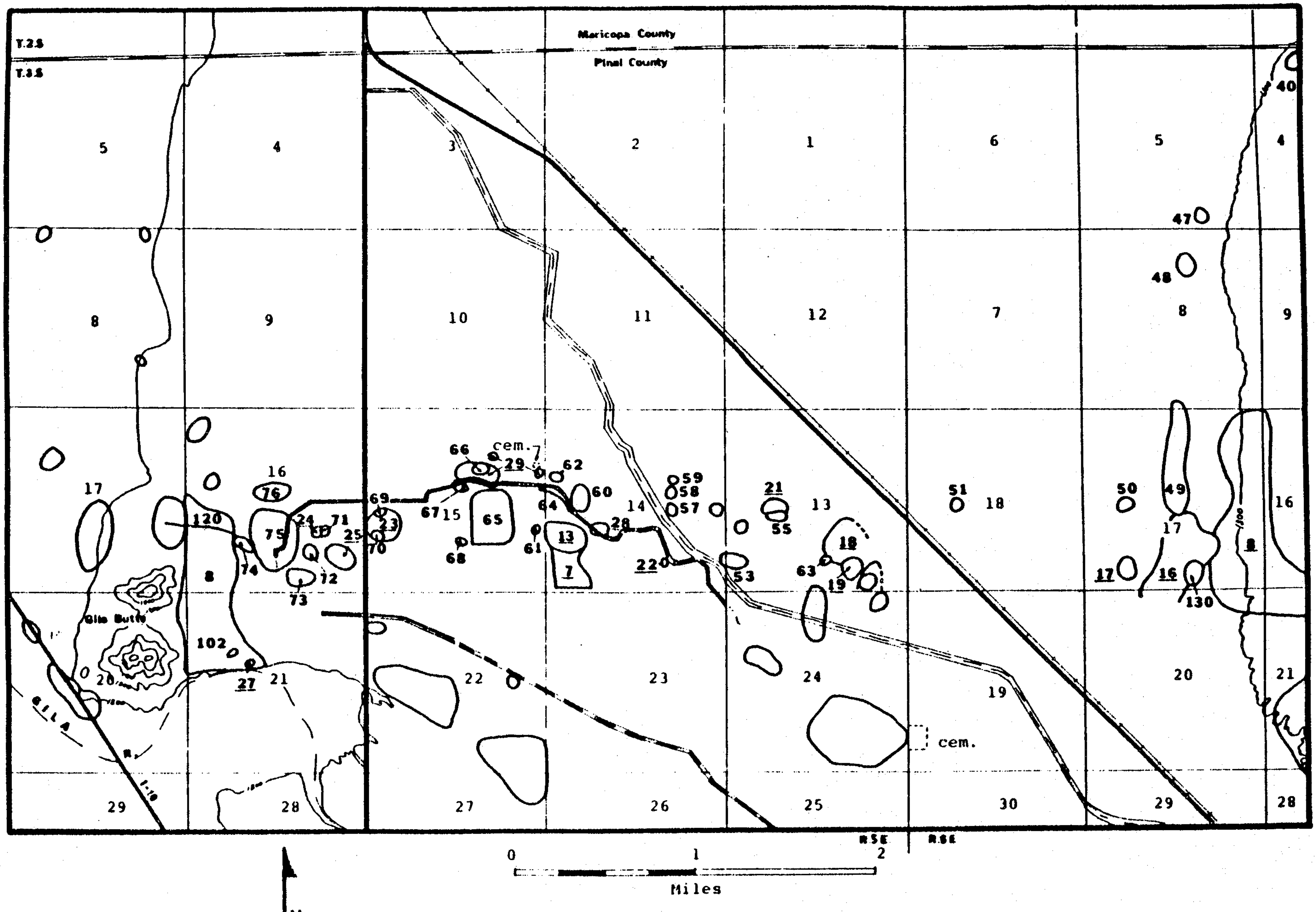


Fig. 1.1. Map showing study area and site locations. All site numbers are prefixed by AZ U;13:___. The Arizona State University numbers are underlined, University of Arizona are not.

are relevant to the mitigation phase work are the more intensive work at AZ U:13:39 (ASU), which is a major prehistoric canal site, and at the rock alignments and rock piles on the Santan bajada at AZ U:13:8 (ASU). In addition, they emphasize the need for functional distinctions between project sites.

The major foci of field and laboratory research in the test phase conducted by Arizona State University were: the interpretation of archaeological features within the RWCD project boundaries with emphasis on the canal site at AZ U:13:39 (ASU) and the bajada site at AZ U:13:8 (ASU), the development of a classification scheme for sites, and the integration of RWCD archaeological data with regional Hohokam research (Rice et al. 1979). A plan for the continuation of research in accordance with the suggestion contained within the test phase final report (Rice et al. 1979) was submitted in the research proposal for the RWCD mitigation phase.

The goals of the research proposal are those of this study. These include: testing the validity of the site classification scheme derived during the test phase (Rice, et al. 1979) and testing previous hypotheses concerning the function and temporal spans of specific archaeological features.

1.3 DATA ACQUISITION METHODS

A wide variety of techniques, including mapping, surface collection, backhoe trenching, hand excavation, and aerial photography, have been used to recover the information presented in this volume. These techniques, and the manner in which they have been employed, were chosen to provide the data necessary to meet the above goals and to provide documentation that meets professional standards. This section provides a review of these techniques used to recover the RWCD archaeological data.

1.3.1 Surface Collection

Surface collections were conducted at all sites to be investigated for RWCD. At many of these sites, areas of high artifact density predicted the location of subsurface trash deposits, proving the utility of the technique. In addition, surface collections proved invaluable to this project because surface material constituted the principal remains at many sites due to poor soil development and deflation.

As there exist no universal rules for defining site boundaries, these were defined in the field based on previous fieldwork (Rice et al. 1979), on-site examination, and practicality of right-of-way constraints. Datum was established using the 1978 test program data from which a grid was extended by use of theodolite or transit. Grid was consistently aligned with magnetic north. During collection, units that contained the major classes of artifacts, such as lithics, sherd, and shell, were recorded on sketch maps. These maps also included information on vegetation and disturbances. The sketch maps served as field and lab references and as checks for final mapping procedures.

As surface collection progressed, topographic mapping was undertaken. The combination of the topographic map with computer-generated surface-distribution maps illustrated general trends of distributions in order to facilitate field decisions regarding locations of subsurface deposits.

1.3.2 Trenches

At sites where previous testing (Rice et al. 1979; Brooks and Vivian 1976; Greenleaf and Vivian 1971) suggested the possibility of subsurface remains, trenches were excavated using a backhoe or wheel trencher. In each trench, at least one sidewall was profiled; in the event of cultural features, all walls with such features were profiled. The destructive aspect of trenching was minimized by the use of monitoring all trench activity. One hundred shovels of fill from each trench were screened to provide a sample of disturbed subsurface material. Trench locations were selected by stratified random sampling, which provided coverage of site areas, and by judgmental additional trenches to cut mounds not falling within that sample. At least a soil and a pollen sample were taken from every natural or cultural stratum.

1.3.3 Hand Excavation

Hand excavation was used extensively in RWCD mitigation activities. Excavation unit locations were chosen by several methods, including placement directly from the trench wall where a cultural feature was noted, judgmental placement to excavate and identify cultural features, and by stratified random sample designed to disperse test units throughout the site. For the stratified random sample, a site area was divided into blocks from which unit locations were randomly chosen.

All test units were excavated to the sterile desert hardpan. Shovels and trowels were used for soil removal. Levels were generally 10 cm arbitrary levels unless cultural strata could be defined and utilized. All dirt was screened through 1/4 inch mesh hardware cloth. At each level, pollen and soil samples were taken for soil analysis and for micro- and macrobotanical analyses.

1.3.4 Other Procedures

Human or animal bone recovered during RWCD was primarily from the surface, with the exception of subsurface material from AZ U:13:28. Bone was placed in bags according to provenience.

In order to obtain reliable dates, an archaeologist must choose carbon 14 samples from undisturbed context. Although bits of charcoal were noted frequently in RWCD excavations, few samples met the contextual criterion. Datable carbon was wrapped in foil to avoid contamination. Other charcoal specimens were retained for species identification.

1.3.5 Laboratory Strategies

Lithic and ceramic artifacts from surface collection and excavation were numerous enough to necessitate a sampling of artifacts for analysis. For surface collections, the requirements of mapping surface artifact densities and the need to obtain an adequate sample of artifacts from each site governed the choice of sampling strategies for lithics and sherds. For density mapping purposes, an even distribution of data points across the site surface is preferred. This even distribution of analytical sample units would also ensure that a variety of cultural contexts were sampled for other laboratory purposes. At sites where sherds and lithics were abundant on the surface, a smaller percent of collection units were analyzed than at sites with few artifacts. Thus, sampling was designed to be proportionate to the size of the population. Where sampling for analysis was required, a stratified, unaligned, random sampling strategy was used.

The subsurface material was sampeld on a site-by-site basis. At sites from which few subsurface artifacts were recovered, all excavated materials were analyzed. At sites with extensive subsurface remains, analysis units were selected from both random test units and judgmental units. Units were selected to provide maximum spatial coverage of both the site and features within the site. Other artifact classes, such as bone and shell, were not plentiful; all bone was examined, and shell was analyzed when it occurred in analytical units selected for lithic and ceramic observations. Pollen samples were submitted for analysis on the basis of context and association, while flotation samples were submitted only when from contexts where carbonation of vegetal material appeared to have taken place.

2.0 ENVIRONMENT OF STUDY AREA

2.1 INTRODUCTION

Archaeologists generally agree that the Middle Gila River Valley, in which the RWCD project is located, and its immediately adjacent areas have supported sedentary human occupation for at least 1,000 and perhaps 1,300 years (Gladwin et al. 1937; Haury 1976; Doelle 1976; Doyel 1974; Wilcox and Schenck 1977; Rice et al. 1979). The following is a brief description of the study area, which has provided a home for many people for so long. Plates 2.1 and 2.2 illustrate this environment. The description includes a summary of geological, floral, faunal, and wate resource settings. Finally, there is a brief observational summary of the current effects of wind erosion on this environment. All of these discussions are brief; the environment has been well presented in previous archaeological volumes, including those listed above.

It should be emphasized that the boundaries of this discussion have been drawn for reasons of practicality and are somewhat arbitrary. Neither the Hohokam, historic Piman, or modern Piman cultural systems operated or are presently operating solely within these geographic confines. The Pima clearly interact and have interacted in the past with neighboring groups, and there is evidence that suggests that Southwestern prehistory will be understood only in a context perhaps as large as the entire American Southwest (Kelley and Abbott 1966; Wiegand, Harbottle, and Sayre 1977).

2.2 GEOLOGY

Southern Arizona is part of the Basin and Range province, which is characterized by many small mountain chains separated by broad alluvial valleys. In addition to the nearby Santan Mountains, the RWCD project area is flanked by the Sacaton Mountains to the south, the Sierra Estrellas to the West, and the Salt River Mountains to the distant northwest. In the past as today, the mountains provided hunting areas for local residents, and they provided raw materials to the Hohokam and perhaps to the early Pima and have held mystical or religious significance for both groups.

The Santan Mountains are composed of "pre-Cambrian granite and schist cut by younger granite rocks and flanked locally by lavas" in which both olivine basalt and latice might be found (Darton 1925:266). Some of the granite,

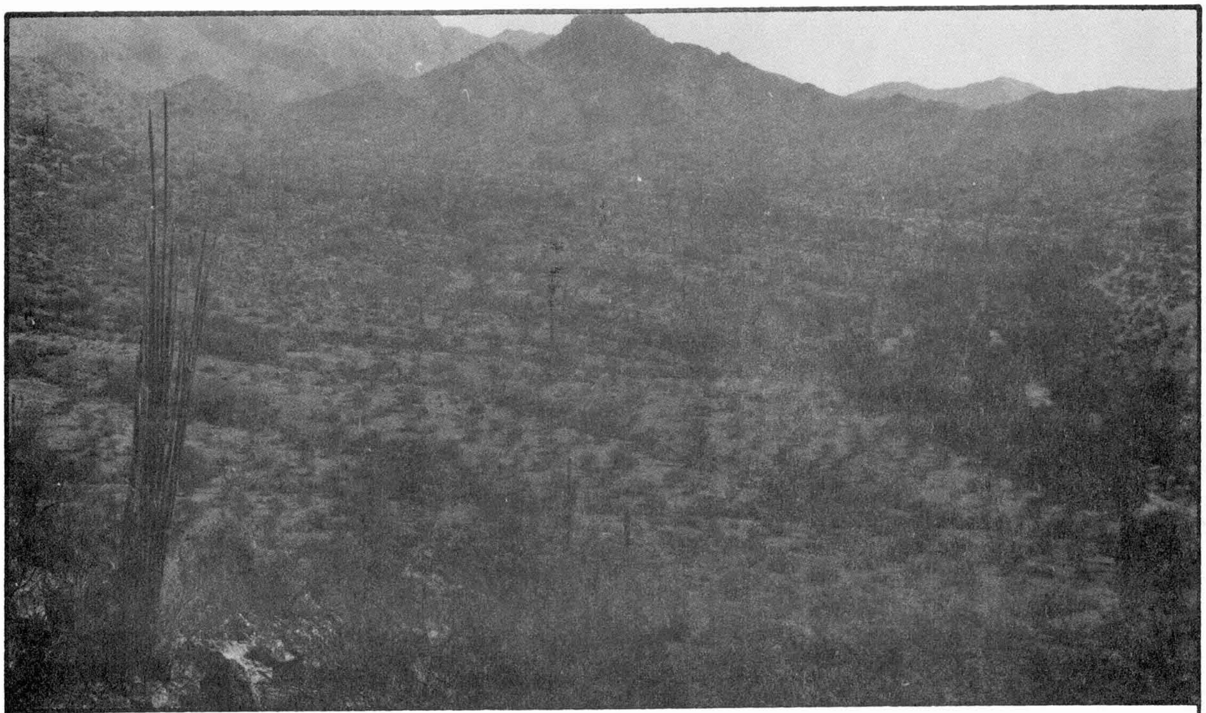


Plate 2.1. Environment of the study area showing bajada and desert riparian vegetation

Plate 2.2. Close-up of typical site vegetation

fine-grain basalt, and perhaps vesicular basalt and pumice that was found on RWCD archeaeological sites may have originated in these mountains. Volcanic tuff, also found on project sites, is known to occur in the Mineral Butte area (Wilson, Moore, and Cooper 1969), which is part of the Santan Mountain Mineral Butte and Cholla Mountain group (Wilson, Moore, and Cooper 1969:4). It should be noted here that a large proportion of the lithic materials at the Hohokan sites were produced as river cobbles and would have originated in the eastern regions through which the Gila travels. These may have been obtained from the riverbed or from old river channels.

Other minerals known to have been important to both historic and prehistoric peoples are scattered throughout the area. At Gila Butte can be found granite, quartz, and micaceous schist. The schist was used extensively in Hohokam pottery as a temper; it pulverizes easily and is readily available in pieces that erode from the butte or can be mined from exposed surfaces. Micaceous schist is also known to occur at Pima Butte to the northwest and in the Sierra Estrella Mountains (Wilson, Moore, and Cooper 1969). Several clays are available in the river plain for use in ceramic production. Hematite, used as a paint for ceramics by the Hohokam and as a ceramic and body paint by the early Pimas (Russell 1908:160), is reported by Wilson, Moore, and Cooper (1969:21) to occur in the Sierra Estrella Mountains.

Russell (1908:256) mentions that places in the Santan Mountains where burials or petroglyphs occur were at one time regarded with respect by the Pimas. Ezell (1961:78) reports that the large petroglyph described by Russell (1908:25) was a Piman trail shrine. The Pimas were paying tribute to an ancient monument rather than having engraved the stone themselves. Shrines have not been forgotten by the Pima today. Recently, George Kyyiten, a Piman crew member, told us of a Piman shrine in the vicinity of Gila Butte. Petroglyphs, presumed to be of Hohokam origin, can be seen both on Gila Butte and in the Santans; their significance is as yet unknown.

Perhaps the most important geological resources occurring in the study area, though, are the soils themselves. In the project area, the topographic slope is extremely gentle, making it often difficult to differentiate between the floodplain and the first and second terraces. There are four soil associations in the study area, only one of which is not suitable for agricultural use. Along the Gila River and the adjacent terrace, soils consist of deep sandy loam of recent alluvial origin. These soils are extremely well suited to agriculture and are extensively used for such at this time. Where the first and second terraces adjoin, the soils are limey and sandy in nature and are of old alluvial plain origin. The remainder of the second terrace is composed of deep sandy clay loam with high contents of salt and alkalai. This soil has poor agricultural potential. Soils on the bajada of the Santan Mountains are gravelly, limey soils of old alluvial fans. It has been demonstrated (Hartman 1973:6) that these last soils are adequate to sustain agriculture.

2.3 FLORA

The floral environment of the project has three components: the riparian, creosote-bursage, and paloverde-saguaro communities. The Gila River floodplain has been an important focus of the riparian community in the past. According to Bohrer (1971:13), the early historic riparian community probably was made up of mesquite, cottonwood, willow, narrowleaf saltbush, catclaw, ash, and hackberry. Several of these species may have been important resources prehistorically. For example, mesquite was undoubtedly a major food resource as well as useful for firewood, while cottonwood and willow can be important for basketry.

The first and second terraces sustain the creosote-bursage community. Species here include, obviously, dense stands of creosote and bursage. Scattered mesquite and ironwood are found near the bajadas of the Santans and near Gila Butte. While few species in this community provided major foodstuffs prehistorically, the community is significant in that it supports a large variety and high density of fauna.

The paloverde-saguaro community is found on the bajadas of the Santan Mountains and Gila Butte. Many species of cactus, ironwood, catclaw, mesquite, and lycium are found here. Many of these appear to have functioned as major food sources prehistorically. Notably, the community may also have been an important source of firewood.

2.4 FAUNA

From both the archaeological record and historic accounts it is esablished that a great many species of animals, now gone, once occupied the Middle Gila region. The drying of the Gila destroyed miles of riverine, marshland, and grassland habitat and its occupants, while the dense settlement of the area and intensive hunting have impacted the desert and mountain fauna. The aboriginal populations may have affected the wild animal populations too; this cannot be adequately documented.

From the prehistoric faunal remains identified from the Snaketown site (McKusick 1976; Olsen 1976; Minckley 1976), a large variety of water-associated species may be assumed to have been present throughout the year seasonally, in the Middle Gila. These include: geese (at least three species), ducks (at least five species), heron (1), marsh birds and Icterids (meadowlarks, orioles, and blackbirds) (6), fish (6), the badger, and a species of turtle. Perhaps many of these were also available in the area of Escalante Ruin near Florence but were utilized to a lesser degree, being represented only by the same turtle species found at Snaketown and unidentified fish vertebrae (Doyel 1974). With the exception of the meadowlarks, yellow-headed redwing blackbirds, and hooded orioles, which may be seen today near irrigated fields and livestock tanks (McKusick 1976, personal observation 1979-1980), water-associated animals are today absent from the Middle Gila.

Animals that are reported as important food sources in ethnographic accounts (Russell 1908; Hackenberg 1974) were also common at both Snaketown (Greene and Mathews 1976) and at Escalante Ruin and nearby sites (Doyel 1974). Lagamorpha, both Sylvilagus and Lepus (jackrabbits and cottontails) were the most common individuals but supplied a much smaller proportion of the usable meat than did the less common but larger Artiodactyls (Greene and Mathews 1976:367), which included Dama Odocoileus hemionus (the mule deer) and Dama virginianus couesi (Coues white tail deer). In addition to these, Russell (1908:80-83) lists as important Pima game: beaver, antelope, ground squirrels (at least six species), Gambel's quail, mountain sheep, and gopher, among others. Hunting large game took place in the nearby mountains where deer, antelope, and mountain sheep could be obtained (Russell 1908; Hackenburg 1974). The smaller animals, especially the jackrabbits, cottontails, and Gambel's quail, could be obtained in the valley, where they are common even today. During the winter, the brushy vegetation that grows in the abandoned fields and alongside irrigation ditches serves as a temporary stopping point for numerous species of migratory birds. The dense vegetation of garden and canal borders provides cover to rabbits, quail, and other small mammals that may have served to supplement the food supply during historic and prehistoric times.

During the course of fieldwork a variety of wildlife was seen. These included: coyotes, several species of snakes, both poisonous and nonpoisonous, a kangaroo rat, at least three species of hawks, and the burrowing owl. The burrowing owl, which makes its residence in the soft sand dunes, also liked to dig a home into the trash mounds at archaeological sites at RWCD just as they did in places at Snaketown (Haulry 1976).

2.5 WATER RESOURCES

The Gila River, which is presently dry in this region due to upstream dams, is one of the Southwest's major rivers. It begins to the east in the mountains of New Mexico as a fast-moving stream, but in the project area it flows in a broad, meandering channel on its way westward, where it joins the Colorado and empties into the Gulf of California. The Gila River before its damming was perhaps the most important feature to the residents of the Middle Gila River Valley. It furnished water for irrigation and domestic use, supported a lush "greenbelt" through the desert where riparian vegetation flourished, and was the home of a variety of animals--fish, birds, reptiles, amphibians, and mammals--that lived in, on, or near the water.

By all Spanish accounts, the Gila River, also known in the earliest accounts as the Rio Grande, was a reliable water source from which large supplies of fish could be caught. The Spanish were in search of promising areas for new settlement in the frontiers of their territory through which they could become established and make the land profitable for the Spanish Empire. For this reason they kept relatively detailed notes on the productivity of the land and its possibilities for improvement. The area from near Gila Bend eastward to the confluence of the San Pedro, excluding the region that was systematically bypassed when the travelers journeyed due east from Gila Bend through the Sierra Estrellas, was a lush area. Of the Gila Bend area, Mange, in Karns (1954), writes:

> Here there are fertile lands, but the Indians plant only the low lands of the river. The river carries sufficient water to justify digging ditches for irrigation, in the event a mission should be established.

There are no early reports that might suggest the volume of water the river may have carried, but, in the summer of 1889, just west of Buckeye the river had ". . . a well-defined channel with hard, sloping banks lined with cottonwoods and bushes. The water was clear, was five or six feet deep, and contained many fish" (Ross 1923:67). According to Castetter and Bell (1942:13), the volume of the Gila decreases steadily in the 150-200 miles of its course. This suggests that the volume of flow may have been greater in the Gila Butte-Santan region, which is upstream from Buckeye. Since the Buckeye statement was made during the years in which the river flow is said to have been diminished by upstream diversion, the Gila River in the RWCD area during earlier times must have been of sizable proportions.

It is likely that even though the flow of the Gila was originally quite sufficient for the development of extensive irrigation networks, it was never, except in flood seasons, a raging torrent. This is evident from a second-hand account of the river near the junction of the Salt and Gila rivers in the late 1840s:

> The bed of the Gila, opposite the village, is said to be dry, the whole water being drawn off by the zequias of the Pimas for irrigation; but the ditches are larger than is necessary for this purpose, and the water which is not used returns to the bed of the river with little apparent diminution of its volume. (Emory 1951)

If the village referred to in this account is accurately located, it would be downstream from several other large Pima villages and may have been one of the last to receive water in a substantial irrigation network. Despite this situation, the water supply appears ample.

These conditions were altered to the extreme by the Anglo settlers' upstream diversion of water in the mid-1800s. The turn-of-the-century drought probably contributed to the decrease in river volume. It is likely that it was the conditions during these dry years that prompted Castetter and Bell (1942:39) to report that the Gila failed about once every five years. The Gila appears to have been a dependable water source until the coming of the Anglo settlers and, although it was known to have flooded and destroyed canals and crops, it probably never failed.

After the Gila became essentially dry, significant changes occurred in its banks and channel. In his description of the Lower Gila in 1923, Ross writes:

> At the present time the Gila River in the lower portion of its course is depositing rather than eroding. The definite channel described by the pioneer visitors to the region has disappeared. Instead there are shifting channels with crumbling banks of barren silt forming linked patterns on the flood plain, which change with every flood. (p. 94)

Bryan reported in 1925 that silt was filling the Gila River channel. In addition to the impact on riverine fauna and flora that accompanied these changes, the disappearance of the river would have had the effect of lowering the local water table, thereby altering the environment in a band of unspecified width throughout the valley (Hastings and Turner 1965:41).

Additional water sources are rainwater runoff from the Santan Mountains and well water. In his 1976 work on the Hohokam, Haury (1976:152) describes the aquiferous properties of the local soils that transport water from the Queen Creek dainage and holds this water at a fairly shallow depth. He states that the availability of shallow groundwater in the Snaketown area may have been a key factor in the establishment of a Pima village there in the late 1970s and that a well of about 3 m deep was in use by the Pimas. One of the old Pima wells was put into service for the 1934-1935 Snaketown archaeological camp. That the Hohokam also made use of this water source was confirmed by the discovery of several ancient wells at Snaketown, but at present we cannot estimate the importance of well water for Middle Gila Hohokam. Writing in 1923, Ross (1923:17-18) reports that many shallow wells were in use by the Pima at the time but that these were close to the river. Differing from the Hohokam situation, this occurred at a time when the Gila was almost entirely dry due to upstream use of the water and long-term drought; these wells appear to have been an attempt to tap the remnant waters of the river area.

Russell (1908:88-89) describes features of the base of the Santan Mountains that might be termed "waffle gardens"--small rectangular rock enclosures that serve to retain soil and moisture for agricultural purposes. He suggests that these were the work of the Hohokam, as none of his Piman informants could remember a time when they were in use. Also noted is a canal that is near the gardens, but from his statements it cannot be determined if this canal could have supplied water to the fields. Even if the canal carried water to the hillside gardens, it seems unlikely that the source of the water would have been the river, given the local topographic circumstances. Work for the RWCD project has confirmed Russell's statements: on the Santan bajada, probably just north of the area described by Russell, were rock piles and partial rock alignments that appear rectangular in shape and produce evidence of agriculture in the form of corn and cotton pollen grains. These features were associated with Hohokam ceramics that spanned the Colonial to Classic time periods. Hence, as has been suggested by many, the Hohokam were able to harness the runoff waters from the mountainsides and put them to use.

2.6 WIND EROSION

Severe deflation was evident throught the nonbajada zones of the RWCD project area. It is suggested here that this severe erosion is a recent phenomenon and is proceeding at a relatively rapid rate. The Hohokam sites and the earliest Piman site had all suffered extreme deflation. At sites where partial dunes remained intact, erosion appears to be continuing; artifacts tumble down sand dunes onto the hardpan surface below as the sand blows from beneath them. The giant saguaro cacti show evidence of the deflation process, too. Of the few that remain on the terraces, most are exposed at the root zones and several have recently fallen. Although rates of movement for the sand dunes and sandy surfaces are unknown at present, given the velocity of the winds in the area and the unconsolidated nature of these deposits, erosion probably is rapid. If the process is indeed rapid, it must also be recent, since Hohokam sites, abandoned by the end of the fifteenth century, are not completely eroded and several saguaros remain standing. These sites would not be expected to remain intact, nor would cactus persist if rapid erosion had begun at an early time. The onset of the deflation process probably can be set between the end of the nineteenth century and the early twentieth century.

It may be assumed that the stability of the soil in this region, as in any other, depends on the presence of a vegetative covering. If vegetation is reduced or destroyed, the soil is then subject to wind and water erosion. In 1925, Kirk Bryan noted that there were many sand dunes in the Gila River floodplain and that these commonly were fixed in position by clumps of mesquite (Bryan 1925:107). Before this time, there had been widespread cutting of mesquite to supply Anglo settlements, and it is likely that this caused many dunes to become unstable and to begin rapid movement. Destruction of riparian vegetation also occurred when the Gila was reduced by upstream irrigation and damming, which also had the effect of lowering the local water table. In addition, soil may have been lost when historic farms were abandoned. Modern plowing would disrupt existing vegetation cover and unplanted soils might be a ready mark for deflation if weeds were slow to cover the area. It is unlikely that the prehistoric abandonment of fields would have caused widespread deflation, since ancient agricultural techniques, as they are understood today, did not substantially loosen the soil by plowing or tilling. The lowering of the Gila, the widespread cutting of mesquite, and the plowing and abandonment of large portions of reservation farmlands all occurred between the late 1800s and the early 1900s. In the near future, erosion may strip the land of its remaining soil and vegetation; the archaeological sites may be reduced to mere piles of artifacts on the desert hardpan.

3.0 SITE DESCRIPTIONS

3.1 INTRODUCTION

This chapter provides detailed descriptions of the twelve sites on which mitigation was performed during the Roosevelt Water Conservation District program. The discussion addresses each site in numerical order, beginning with AZ U:13:8 and ending with AZ U:10:16. For each site, there is a brief discussion of the site setting, the field methodology used for data recovery, a description of the findings, including stratigraphy and features, and a detailing of artifactual material and patterning where appropriate. When data are sufficient, questions of chronology and site function are also explored.

3.2 AZ U:13:8 (ASU)

AZ U:13:8 (ASU) is a large site located on the western slope of the Santan Mountains. It consists of a series of rock features and alignments postulated to be part of a dry farming system. Typable ceramics indicate intermittent use of the site from the Gila Butte phase to the Classic Soho phase. No features indicating a permanent habitation were noted. The site is located in T 35, R 6 E, east 1/2 of Section 17. The site extends far beyond the boundaries of the recorded description below.

3.2.1. Methodology

Because of the size of the site (ca. 3/4 mi by 200 to 900 m), two 300 m by 300 m sample areas were designated as shown in Figure 3.1. In these sample units, an intensive surface survey was conducted with crew member spacing of 5 m. At this time, all artifacts were collected and maps were prepared showing artifact locations and rock features. Table 3.1 summarizes the artifacts collected (all ceramics), while Figures 3.2 and 3.3 show artifact locations in Quads 1 and 2, respectively.

Following this, five test units were selected to permit testing of rock features. These are described in the following section.

3.2.2 Description

AZ U:13:8 is a large site; the full extent has never been recorded. It contains a variety of rock features,

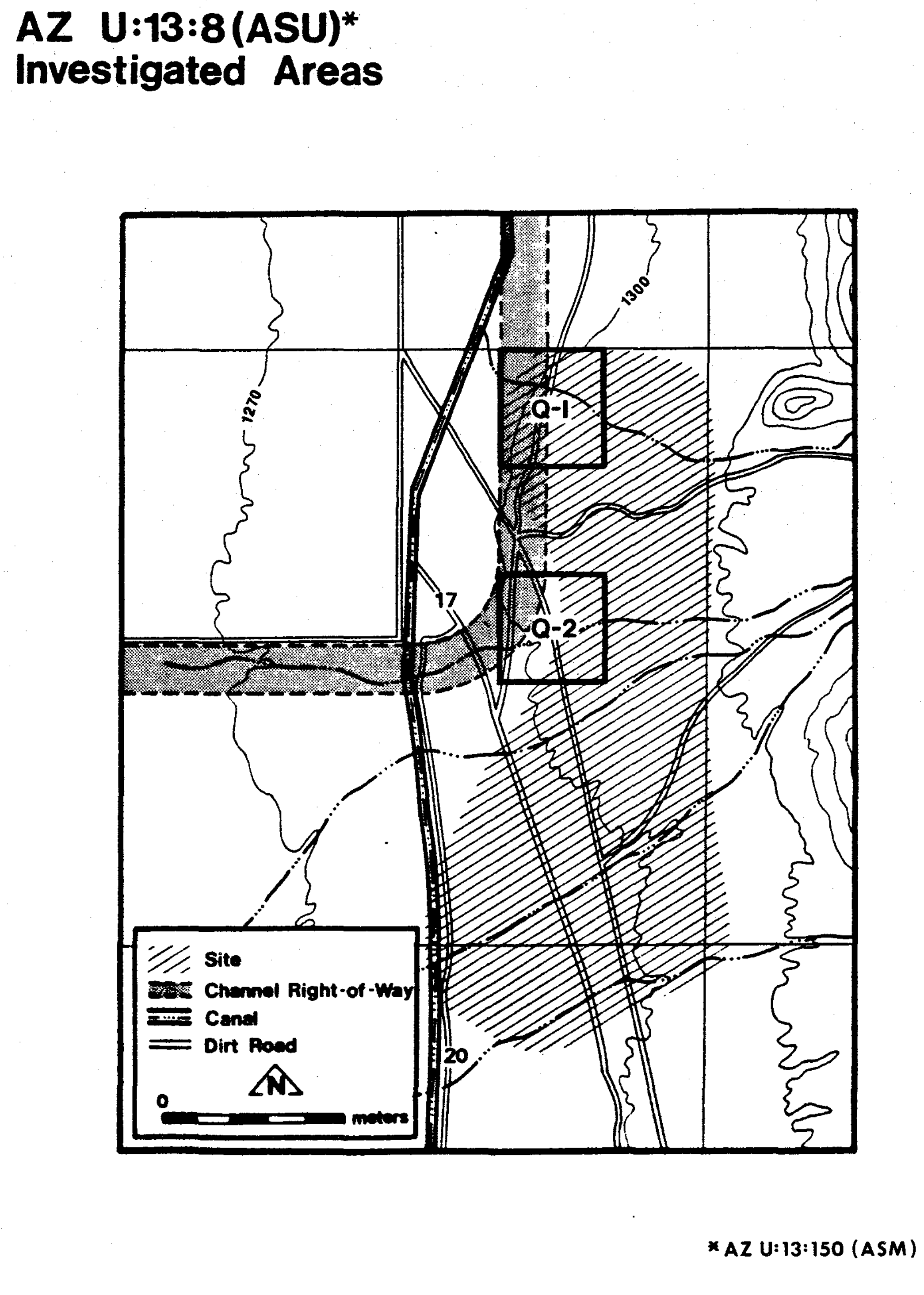


Figure 3.1. Map of AZ U:13:8 (ASU) showing sample unit locations

Table 3.1. Ceramic analysis for AZ U:13:8 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	186	100.00
Plain wares	73	39.25
Hohokam or Pima red wares	6	3.22
Red-on-buff wares or buff wares	107	57.53
Polychrome wares	0	0.00
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0.00
Gila Butte Red-on-buff	13	36.11
Santa Cruz Red-on-buff	8	22.22
Sacaton Red-on-buff	2	5.56
Casa Grande Red-on-buff	12	33.33
Tonto Polychrome	0	0.00
Gila Polychrome	0	0.00
Lower Colorado Gray ware	1	2.78

AZ U:13:8(ASU)*
Quad 1

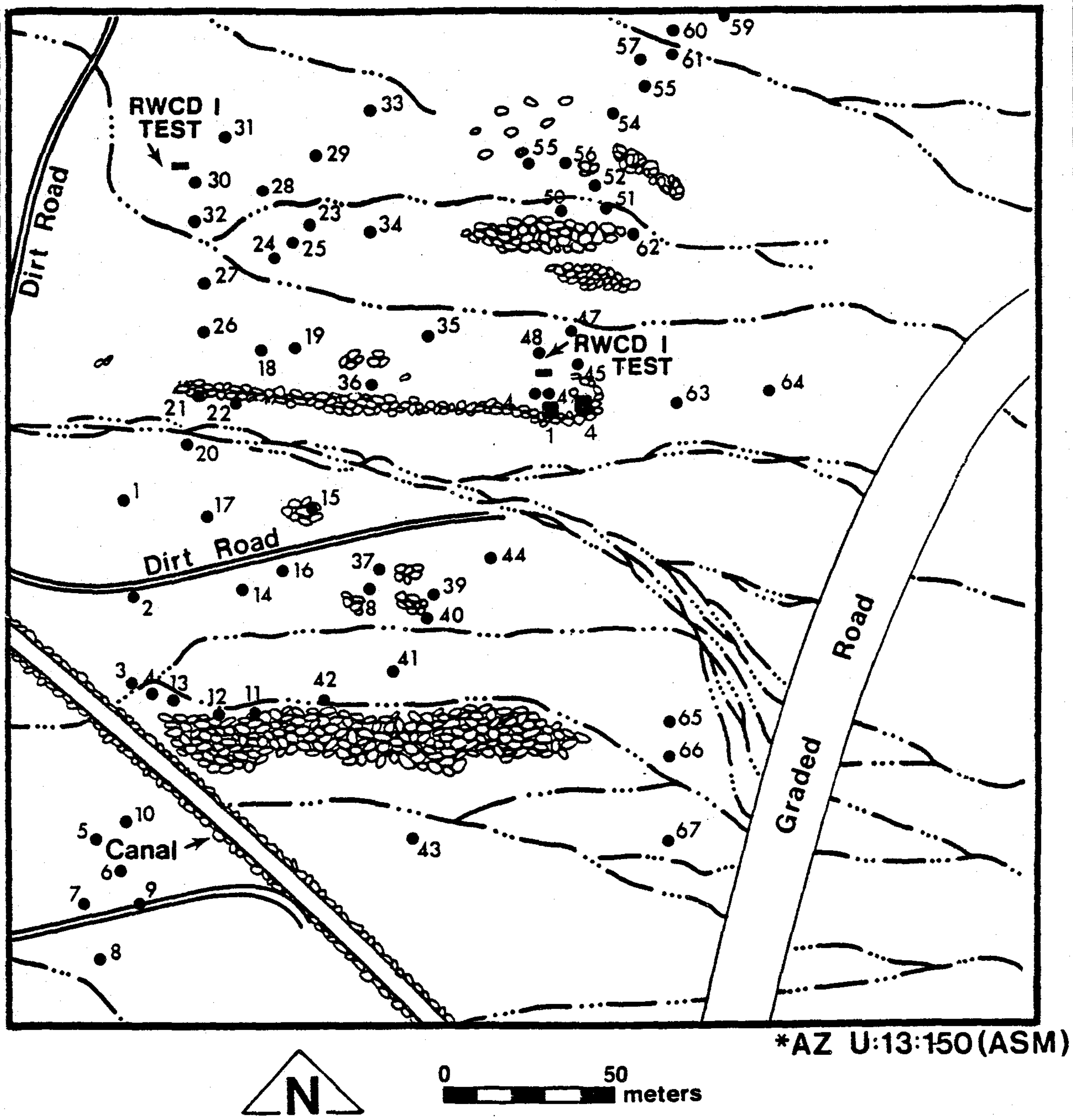


Figure 3.2. Overlay map, Quad 1, AZ U:13:8 (ASU) showing artifact locations

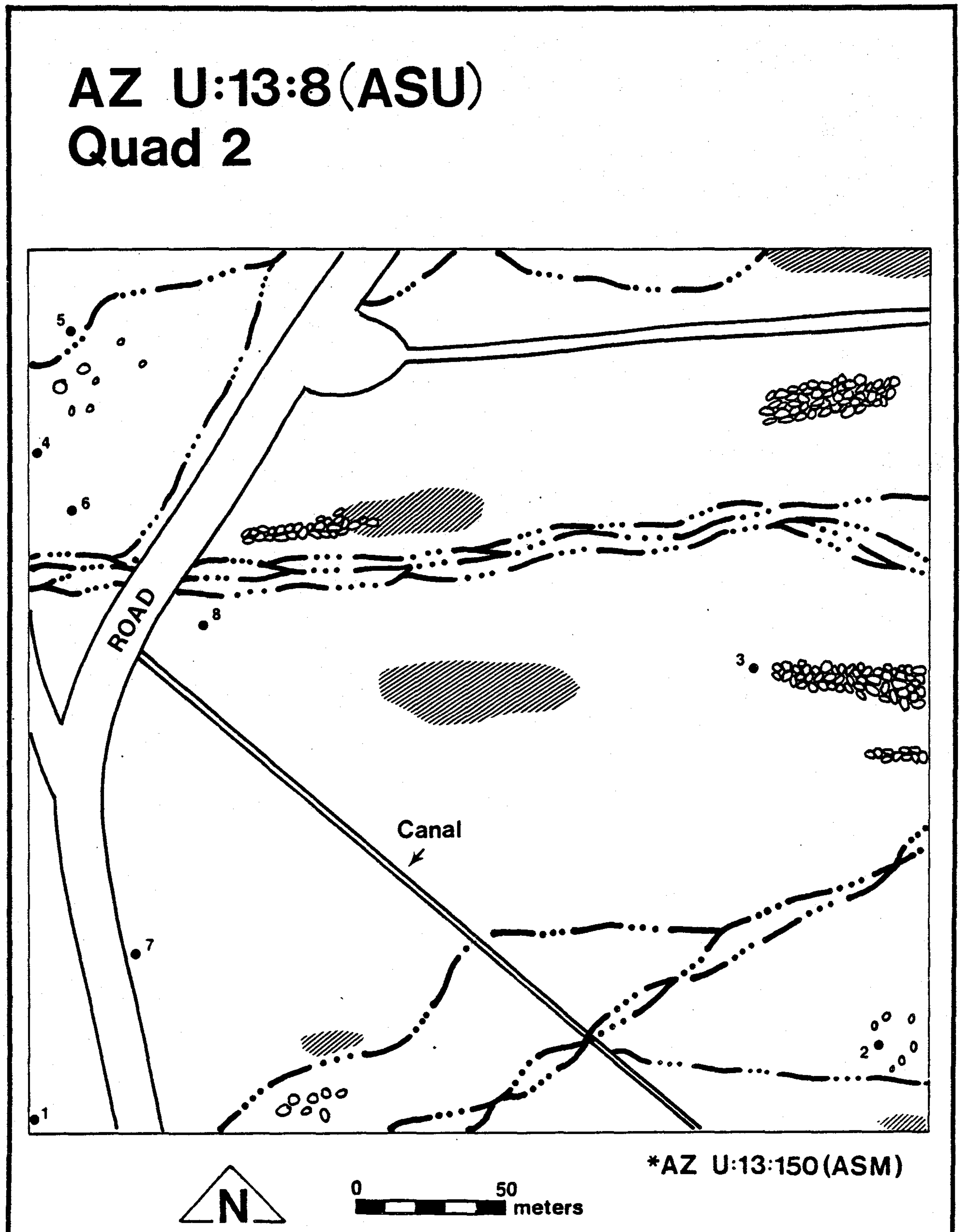


Figure 3.3. Overlay map, Quad 2, AZ U:13:8 (ASU) showing artifact locations

including rock piles and alignments. It is characterized by a low density of artifactual material, primarily ceramics. The few ceramics identifiable as to type indicate an occupation of the site from as early as the Gila Butte phase, A.D. 500 to 700 (Haury 1976) until the Classic period.

The site was initially recorded by Wood (1972) but was not investigated until the Queen Creek Floodway Project (Brooks and Vivian 1976). At that time, the site was traced along the Santan bajada for about one-half mile. Arizona State Museum gridded the portion of the site within the project right-of-way (Fig. 3.1), mapped features, and collected artifacts within that area. ASM's 100% collection yielded 375 sherds of Gila Butte Red-on-Buff, Santa Cruz Red-on-Buff, Sacaton Red-on-Buff, Casa Grande Red-on-Buff, Pima Red, and Gila Plain. A hammerstone and a few flakes were also recovered. The museum excavated two test units, one in a rock pile feature and the other in a rock cluster where charcoal flecking was noted. Table 3.2 summarizes archaeological activities on RWCD, both testing and mitigation phases.

During the RWCD test phase, Arizona State University performed mapping, intensive survey of a limited area, and excavations in a rock pile and in a rock alignment (Rice et al. 1979). Two hundred six artifacts were recovered from a 129 m^2 area. Of interest was the recovery of a single corn pollen grain from a soil sample within the rock alignment, indicating that the feature may have been associated with past agricultural activities. Because of the question regarding possible agricultural use of the site area, the mitigation phase on this site was designed to provide data to test hypotheses about such practices. Specifically, test implications were developed to determine if the area had been used for floodwater farming of domesticates, for the enhancement of natural flora, or if the phenomena were natural features (Rice and Blank-Roper 1979:17-18). Figure 3.4 summarizes these test implications.

Finally, the five test units excavated into features are described below.

Test Unit 1, profiled in Figure 3.5, was 1 m x 2 m and located within a partial rock rectangle hypothesized to be a garden plot. The rock feature measured 20 m on its longest side and 8 m in width. A test unit was dug within this same feature during the test phase of RWCD and was the unit from which a single corn pollen grain was extracted (Rice et al. 1979:166). Excavations were made in the rock border and within the fill entrapped in the area. Pollen samples were taken both from the rock area and from the fill. The soil was a sandy silt with cobbles that changed at 45 cm

Table 3.2. Summary of field and laboratory investigations at AZ U:13:8 (ASU)

Category or Activity	Amount
Total site area:	At least 805 m north to south and varying between 200 m and 900 m east to west (from Brooks and Vivian 1976)
RWCD Project, mitigation phase:	
Area collected	180,000 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	No lithics recovered
Ceramic density	0.001 sherd/m^2
Lithic density	0
RWCD Project, test phase:	
Area collected	45,000 m^2
Artifact density	0.005 artifact/m^2

	Cultural Features	Domestic Pollen
Floodwater Farming	+	+
Enhancement of Natural Resources	+	–
Natural Features	–	–

Figure 3.4. Implications for the test of the function of features at AZ U:13:8 (ASU)

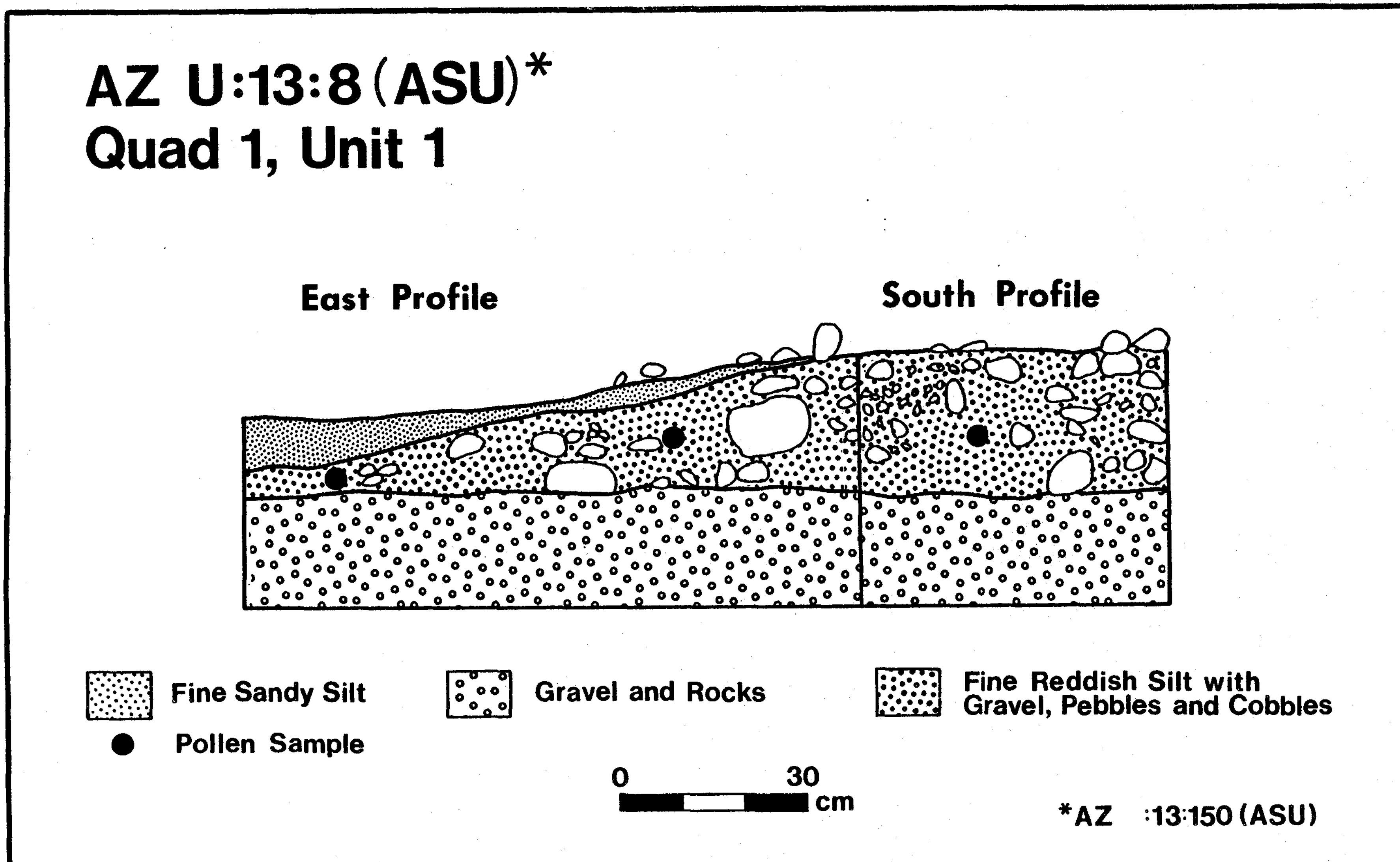


Figure 3.5. Profile of east and south walls of Quad 1, Unit 1, AZ U:13:8 (ASU)

below datum to sandy silt with cobbles and gravels. The unit was excavated to 55 cm below datum, and no artifacts were encountered. Field notes indicate that despite the heavy rock and gravel concentration, grass roots were encountered to a depth of 45 cm.

Test Unit 2 (Fig. 3.6) was the excavation of a rock pile near Unit 1. The rock pile was approximately 1.8 m north to south and 2 m east to west. About one-half of this feature was removed in the 1 m x 2 m unit. Gravels, large cobbles, pebbles, and a small amount of fine silt composed the rock pile. No artifacts were recovered. Rock pile features were not isolated but were noted to occur in groups and resembled those recorded by Doelle (1976:104-107) in a location ". . . which includes the sloping land that is transitional between the first and second terraces [of the Gila River]" (p. 104) in the Conoco Florence Project area.

Test Unit 3 was excavated by shovel scraping in order to determine if the low rock pile of 20 cm height was associated with a subsurface feature. A well-defined contact separated the rock pile from the bajada surface, and it was concluded that these features were not associated with subsurface features of any sort. No artifacts were encountered.

Test Unit 4 (Fig. 3.7) was a 1 m x 1 m excavation within the same partial rock rectangle as Unit 1. Noticeably fewer cobbles occurred in this unit than in Unit 1, and the fill of Unit 4 was predominantly composed of gravels and silt. Again, no artifacts were recovered.

Test Unit 5 (Fig. 3.8) was a 4 m trench excavated east to west across a rock ridge aligned north to south. The ridge stood approximately 40 cm above the ground surface. Artifacts were not found.

3.2.3 Intrasite Patterning

The ceramic assemblage from AZ U:13:8 was somewhat aberrant among project sites in three ways: (1) a high percentage of red-on-buff or buff wares were present, (2) the bowl/jar ratio was skewed highly toward jars, and (3) ceramic types indicated a longer period of site usage.

Table 3.1 shows the frequency of various wares on AZ U:13:8. Only AZ U:13:39 and 23 have comparable percentages of buff and red-on-buff wares. The ceramic assemblage on this site and Raab's (1976) findings in the Slate Mountains suggest that decorated ceramics may have been used in wild

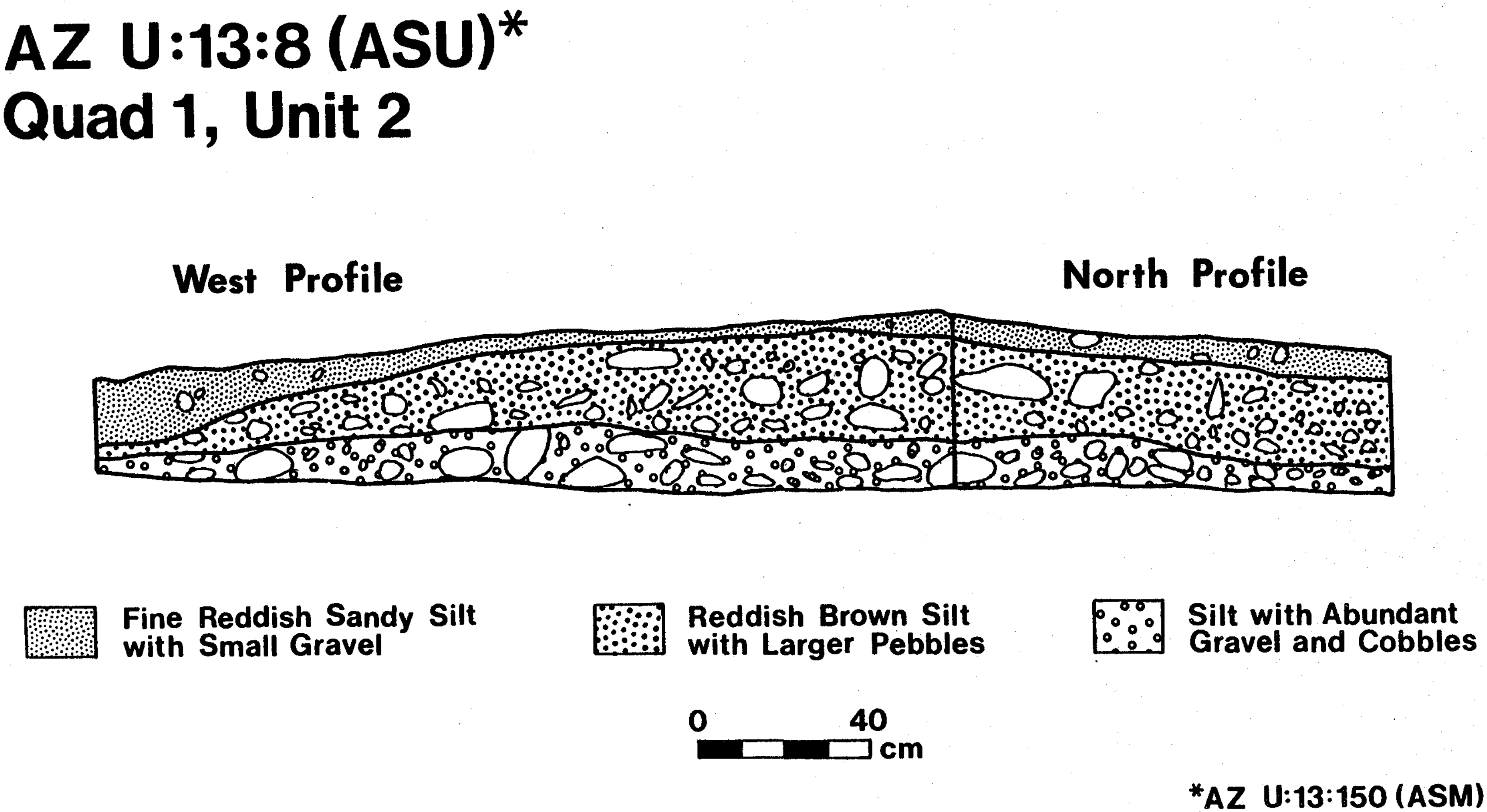


Figure 3.6. Profile of north and west walls of Quad 1, Unit 2, AZ U:13:8 (ASU)

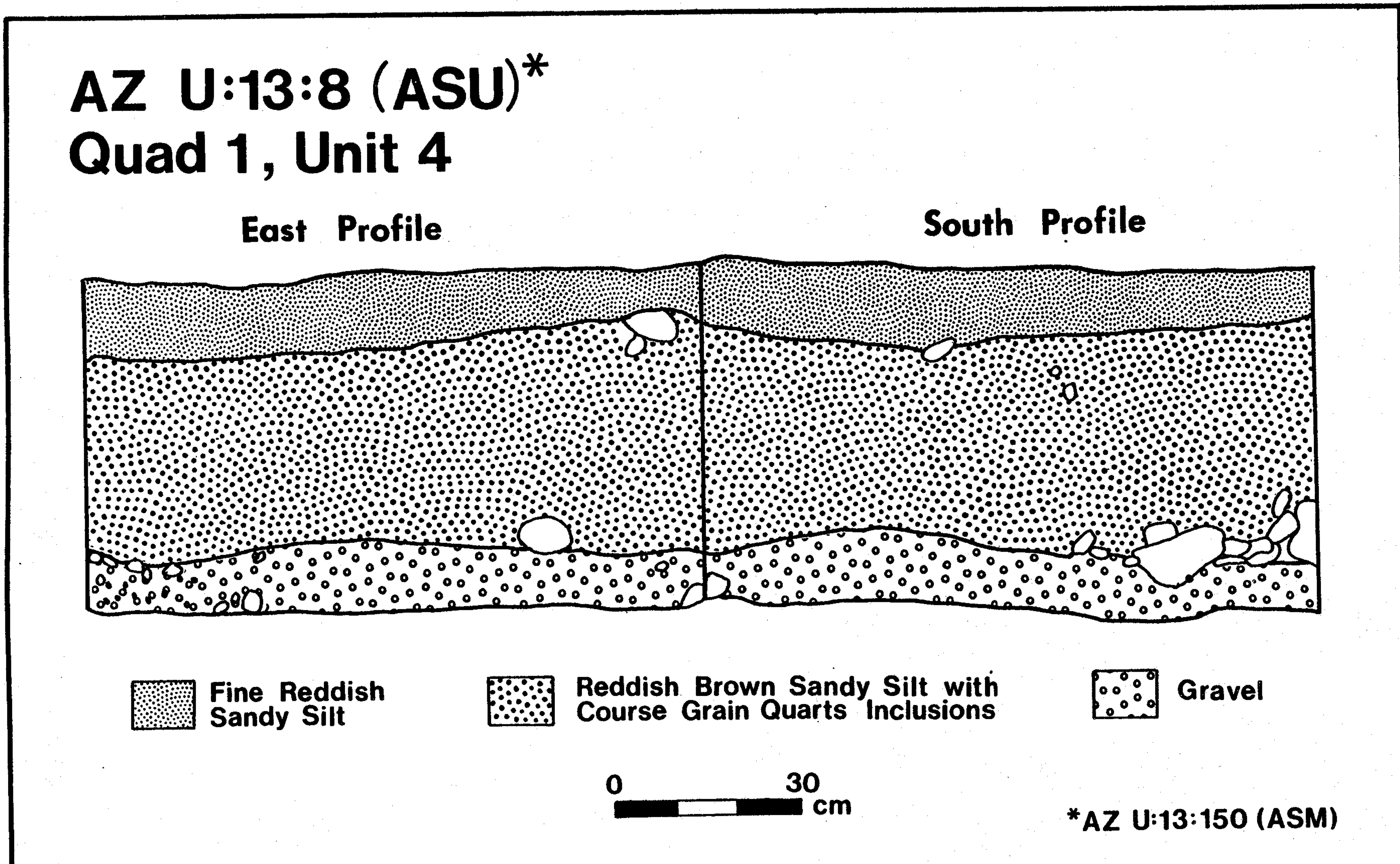


Figure 3.7. Profile of north wall of Quad 1, Unit 4, AZ U:13:8 (ASU)

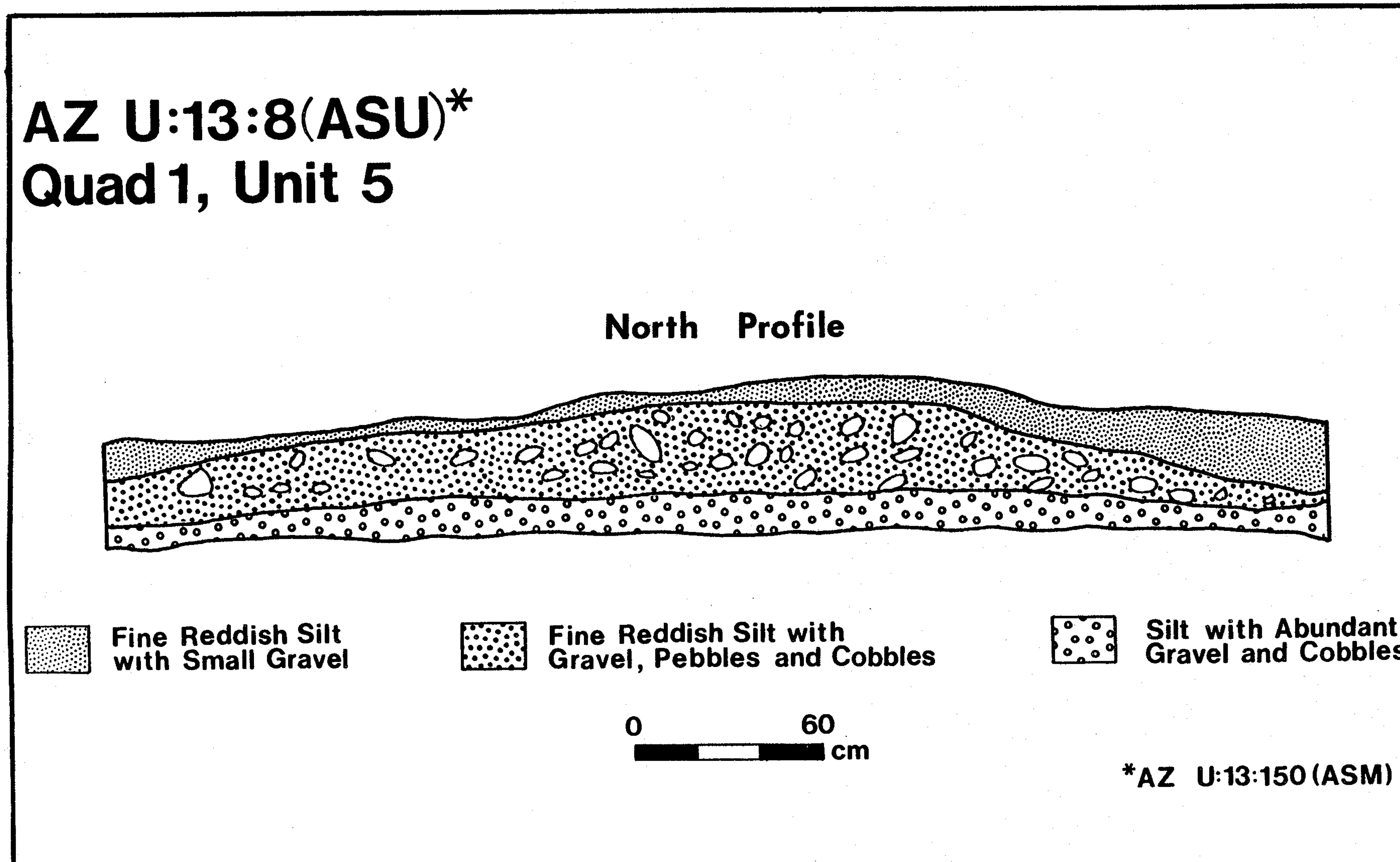


Figure 3.8. Profile of east and south walls of Quad 1, Unit 5, AZ U:13:8 (ASU)

food collection and in agricultural pursuits prehistorically. Raab (1976) found red-on-brown ceramics in much greater abundance than other wares within the wild resource collection area of his study than within habitation sites on the nearby floodplain. However, in Doelle's Conoco project study, findings are in contradiction to this pattern; Doelle's results may not be comparable due to different methods of estimating abundance of ceramics.

At AZ U:13:8, jar sherds far outnumber bowl sherds (83.33% and 8.06%, respectively). As outlined in the fourth chapter, the bowl/jar ratio is one criterion used in assigning a functional classification to sites. A cluster analysis for bowl/jar ratios grouped this site with suspected limited activity sites AZ U:13:23, 29 (locus 148), and 40. Jars predominate in all ware categories and occur in almost equal percentages in plain and buff wares.

Of the 107 buffware sherds, 37 retained enough paint to be identifiable. Table 3.3 summarizes the frequencies of typable ceramics. This range of types was manufactured during the time span A.D. 550 to 1400 (Haury 1976). Casa Grande Red-on-buff, relatively rare on sites located in the bajadas, may reflect the use of the area by occupants of nearby Soho Phase sites.

Examination of ceramic technical attributes for intrasite patterning provided limited information. Amongst decorated wares, there is a high frequency of sherds of pink-white background and thin red-purple paint in the northwest quadrat of the site, while the northeast and southwest quadrats contain a number of sherds of the same background lacking paint. These concentrations may indicate pot drops that cannot be isolated with other techniques. The patterning of technical attributes of plain wares has a slightly different distribution, concentrating in the southwest quadrat of the site. Plainware sherds are more numerous here. Overall among plain wares, silver mica temper and crushed quartz and silver mica temper are most common. Smudging of vessel interiors is rare but may reflect the high number of jars to bowls on this site.

In addition to this general examination for patterning, ceramics from rock alignments/piles were compared to those from areas in between. As would be expected because of the differences in areal extent involved, both plain and decorated sherds were far more frequent in occurrence outside of alignments and piles. No significant distribution of technical attributes was noted from alignment areas as compared to areas in between. Interestingly, if these alignments and rock piles reflect prehistoric agricultural activity, one would expect the density of sherds in

Table 3.3. Red-on-buff ceramics from AZ U:13:8 (ASU)

Ceramic Type	No. of Sherds
Gila Butte Red-on-Buff	13
Santa Cruz Red-on-Buff	8
Sacaton Red-on-Buff	2
Casa Grande Red-on-Buff	14

alignments to be lower than in the surrounding use area. However, the opposite is true here, with sherds associated with alignments more than expected at a level of significance of 0.05 (df = 1). This leads to the tentative suggestion that these alignments on AZ U:13:8 may actually postdate the prehistoric occupation of the site.

No lithics were recovered during intensive surface survey of Quads 1 and 2. The Arizona State Museum work at the site recovered a diorite hammerstone and one chert and four diorite flakes (Brooks and Vivian 1976:7). Lithic activities at the site appear to have been quite limited, as was found by Doelle in the rock pile area of the Conoco Project, where few lithics were found.

3.3 AZ U:13:13 (ASU)

AZ U:13:13 (ASU) is a possible habitation site with a mound dating perhaps as early as the Sacaton phase. Main site use appears to have taken place during the Soho phase of the Classic period. No subsurface features were recorded at this stie; functional site designation is based on artifact assemblages. The site is located in a relatively undisturbed portion of the Gila River floodplain in T 35, R 5 E, SW 1/4 of NW 1/4 of Section 14. It is located in an area of sandy soil on what is most likely a slight natural knoll; backhoe trenching prior to this project did not recover evidence of cultural deposition in the mound itself. The dominant vegetation in the area is saltbush; saguaro and hedgehog cacti are also present. The undergrowth has been burned off recently, as evidenced by the black ash overlying major portions of the site.

3.3.1 Methodology

Investigations at this site took the form of surface collection, as previous trenching activities had indicated no subsurface remains. Initially a 64 m square area was gridded in 4 m units. This area was totally collected. The grid was then extended by 10 m off the northeast corner of the original grid in order to include a concentration of lithic material. Figure 3.9 shows the site topography.

Description

AZ U:13:13 was originally recorded by B. Rosenberg in 1976. In the same year, it was relocated by J. Antieau (1977), who recorded it as a single component, nonmidden site. In the fall of 1978, ASU tested the site and surface

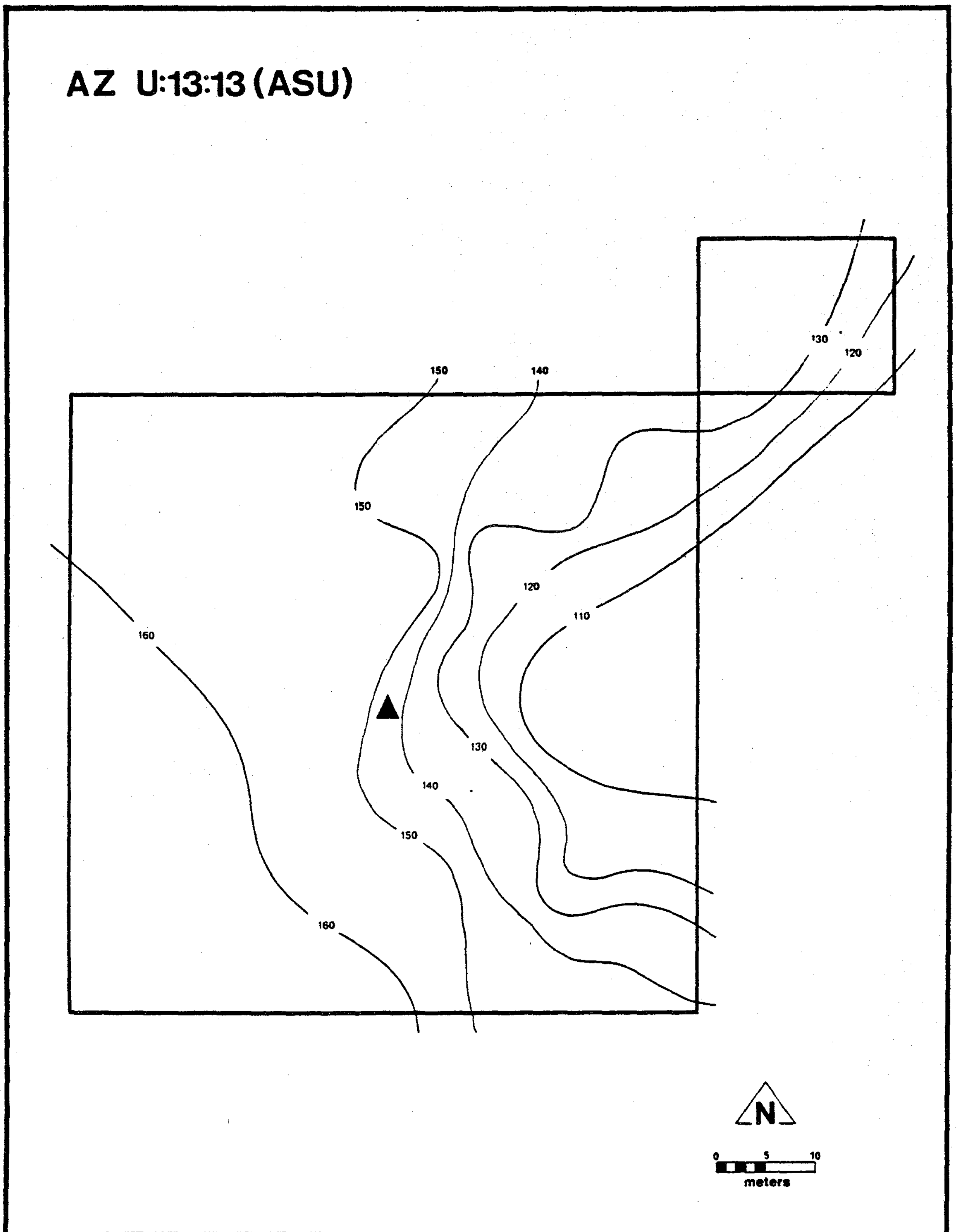


Figure 3.9. Map of AZ U:13:13 (ASU)

collected portions of it. Seven systematically placed backhoe trenches were used to examine subsurface remains on the site. Many collection units in the test phase were judgmentally positioned to sample high ceramic densities, so no comparison can be made between density estimates for the separate test and mitigation phases on this site.

Table 3.4 outlines the extent of archaeological investigations at the site, while Table 3.5 summarizes the ceramic analysis. Table 3.6 overviews the lithic analysis; Table 3.7, the technological analysis.

3.3.2. Intrasite Patterning

The ceramic collection from AZ U:13:13 indicates a probable late Sacaton to Soho occupation of the site based on the presence of Sacaton Red-on-buff and Casa Grande Red-on-buff. Because of the predominance of the latter, most of the occupation may have taken place in the Soho phase. The cluster analysis performed on bowl/jar ratios places this site with suspected habitation sites. Ceramics from the site were mapped according to Symap shown in Figure 3.10. Three ceramic clusters appear on the map. A comparison of technical attributes showed no significant distribution between these three clusters. However, an examination of the distribution of wares indicates an interesting pattern. Cluster 3 contains 2.5 times more plain ware and decorated buff ware than Cluster 2, but red ware occurs much more frequently (1.5 times more) in Cluster 2. This would seem to indicate a differential use of site space with some specific task associated with Cluster 2. The distribution in Cluster 1 is not unusual except to suggest that the site extends farther south than the grid system does.

The Symap of lithic distributions is shown in Figure 3.11. Analysis of technical attributes of lithics did not produce significant patterns. It should be noted that lithic clusters are frequently based on a single large lithic artifact, since Symaps are based on gram weights rather than numbers of items.

3.4 AZ U:13:23 (ASU) (ASU:13:69-ASM)

AZ U:13:23 (ASU) is a probable Soho phase limited-activity site. Unusual ceramic attributes led original investigators to conclude that the site was a locus of prehistoric ceramic production activity. The site is on the first terrace of the Gila River in T 3 S, R 5 E, NW 1/4 of SW 1/4 of Section 15. A historic habitation, AZ U:13:70

Table 3.4. Summary of field and laboratory investigations at AZ U:13:13 (ASU)

Category or Activity	Amount
Total site area:	4,496 m^2
RWCD Project, mitigation phase:	
Area collected	4,496 m^2
Percent area analyzed for ceramics	44.84%
Percent area analyzed for lithics	50.4%
Ceramic density	0.5 sherd/m^2
Lithic density	0.75 g/m^2
RWCD Project, test phase:	
Area collected	232 m^2
Ceramic density	4.37 g/m^2
Lithic density	0.14 item/m^2

Table 3.5. Ceramic analysis for AZ U:13:13 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	1,005	100.0
Plain wares	533	53.03
Hohokam Red wares	160	15.92
Red-on-buff wares or buff wares	311	30.95
Polychrome wares	1	0.10
RWCD Project, test phase		
Total ceramics, by weight	1,013.4 g	100.0
Plain wares	452.8 g	44.68
Hohokam Red wares	426.2 g	42.06
Red-on-buff wares	134.4 g	13.26
Polychrome wares	0	0
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	1	1.28
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	15	19.23
Casa Grande Red-on-buff	60	76.92
Tonto Polychrome	0	0
Gila Polychrome	1	1.28
Verde Gray	1	1.28

Table 3.6. Functional analysis of lithic artifacts from AZ U:13:13 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	18	54.55
Bifacial nibbling wear on edges	0	0
Polishing wear on edges	0	0
Hammerstones	8	24.24
Metates	1	3.03
Manos	5	15.15
Polishing stones	0	0
Others (gravers, drills, punches, worn projectile points, & misc.)	1	3.03
Total number of tools	33	
Raw material type		
Total lithic weight	3,034 g	
Basalt	1,495 g	49.27
Chert	9 g	0.30
Quartz	7 g	0.23
Quartzite	15 g	0.49
Micaceous schist	18 g	0.59
Obsidian	0 g	0
Rhyolite	127 g	4.18
Granite	693 g	22.84
Andesite	7 g	0.23
Sandstone	0 g	0
Felcite	16 g	0.53
Pumice	70 g	2.31
Others	577 g	19.02

Table 3.7. Technological analysis from AZ U:13:13 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	10	3.47
Secondary flakes	60	20.83
Tertiary flakes	165	57.29
Shatter	44	15.28
Cores	7	2.43
Ground stone	2	0.69
Total items	288	

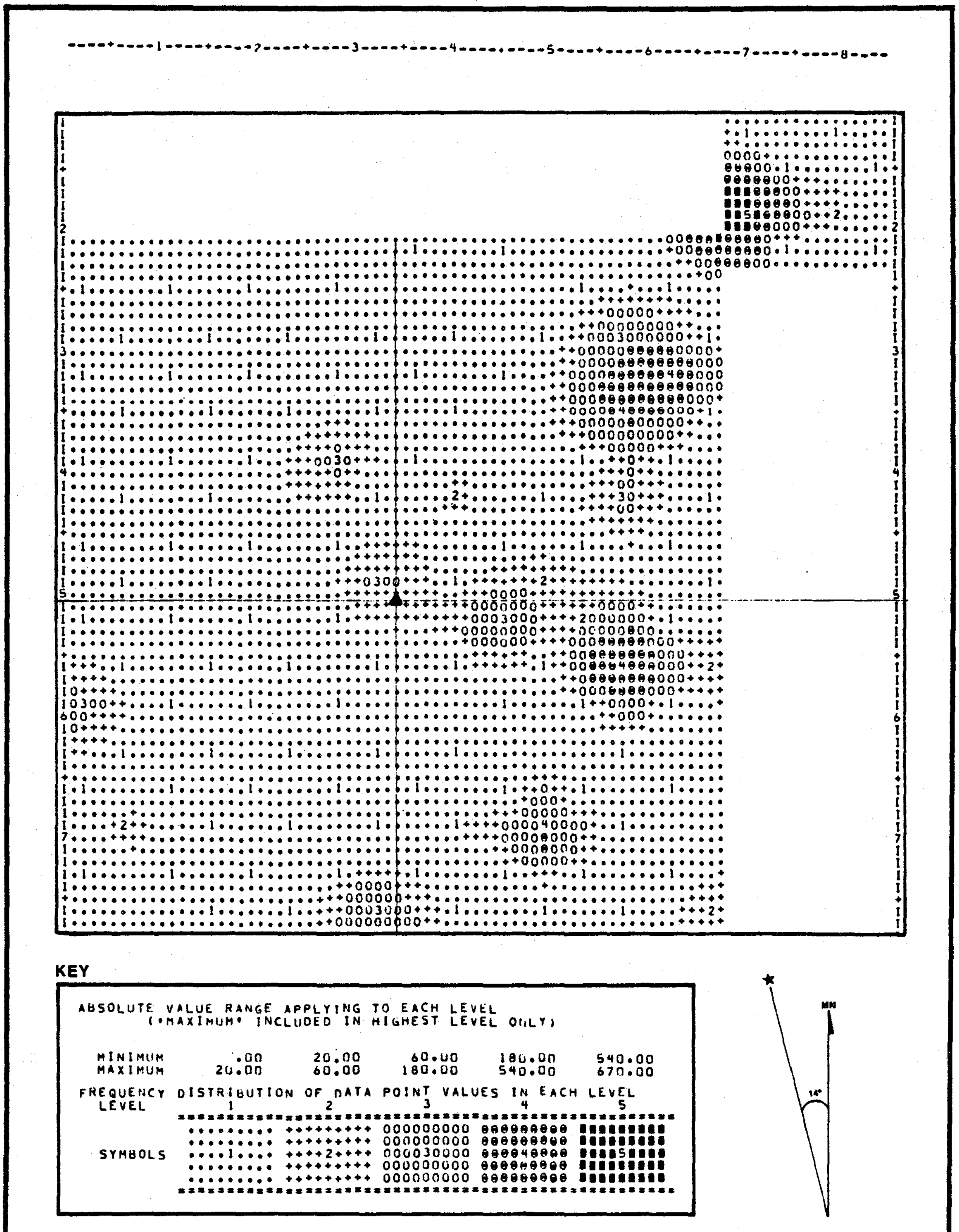
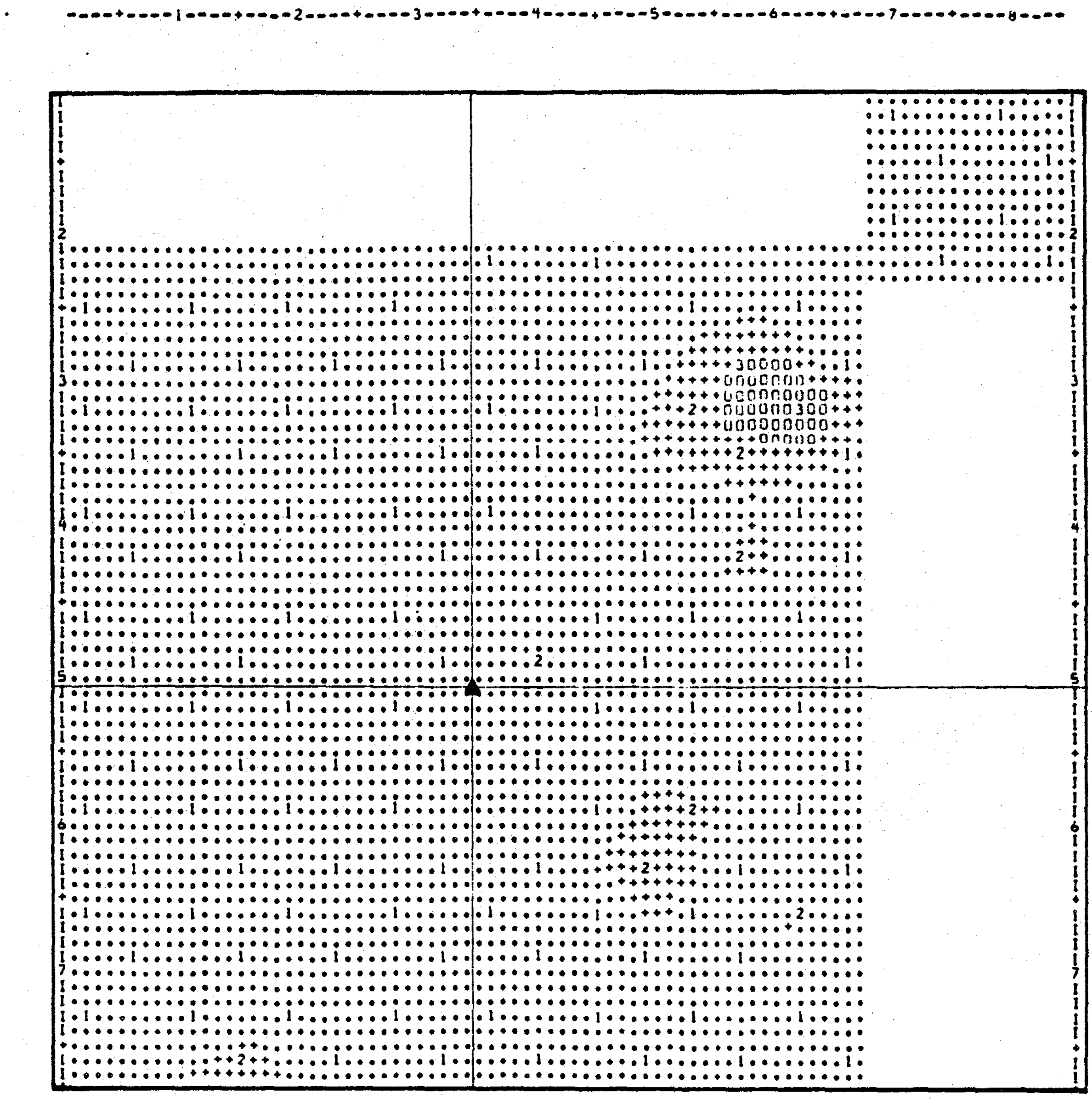


Figure 3.10. Symap representation of surface ceramic distribution, AZ U:13:13 (ASU)



KEY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	.00	24.00	72.00
MAXIMUM	24.00	72.00	159.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

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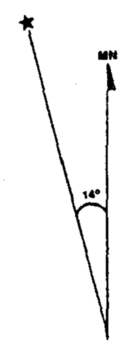


Figure 3.11. Symap representation of surface lithic distribution, AZ U:13:13 (ASU)

(ASU), is located 150 m to the south. AZ U:13:23 is situated in a slightly eroded basin surrounded by low sand mounds about 50 cm in height. Vegetation consists of sparse salt bush, grasses, and cacti. Large burned roots located during excavation indicate that the site once supported more extensive vegetative cover. A dirt road crosses the site from northwest to southeast and probably is associated with AZ U:13:70.

3.4.1 Methodology

For this project, an area measuring 24 m square was completely surface collected using a grid 4 m on a side. The site was then divided into sixteen 6 m x 6 m blocks, and a single 1 m x 1 m unit was randomly selected for excavation in each block. All units were excavated to a sterile base of mixed silt and caliche. Few artifacts were recovered from these tests, and in no instances were the artifacts deeper than 5 cm below ground surface. When artifacts occurred in the first 5 cm of soil, all cases occurred in tests in sand mounds. No cultural features were noted in the tests or surface collection procedures.

3.4.2 Description

AZ U:13:23 was originally located by Wood (1972) and given its ASM designation. Antieau (1977) later combined this site with a nearby historic component and gave it the ASU site number. He described the prehistoric component as being partially deflated and listed plain wares, Classic red wares, Sacaton and Casa Grande Red-on-buff, basalt flakes, large cobbles, grinding stones, and schist as making up the artifact assemblage. In 1978, ASU tested the site (Rice et al. 1979) by defining a 20 m square area and collecting 5% of the surface material in this area. Most of the 1,146 artifacts recovered in this collection were obtained from a judgmental unit placed in the site center, an area of maximum artifact density. This site center is now interpreted as a deflated trash mound. However, a test excavation placed here in 1978 (Rice et al. 1979:199) revealed no significant subsurface deposits.

Table 3.8 summarizes the extent of archaeological investigations for both the testing and mitigation phases of RWCD. Table 3.9 briefly describes the ceramic analyses from both phases. From the sample of ceramics obtained during the mitigation of the site impacts, only 33 could be typed; all are Tonto Polychrome. Functional analysis of lithic artifacts produced only two tools, both showing evidence of unifacial nibbling on edges. Table 3.10 overviews raw

Table 3.8. Summary of field and laboratory investigations at AZ U:13:23 (ASU)

Category or Activity	Amount
Total site area:	576 m^2
RWCD Project, mitigation phase:	
Area collected	576 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	100.0%
Ceramic density	0.28 sherd/m^2
Lithic density	1.23 g/m^2
RWCD Project, test phase:	
Area collected	20 m^2
Ceramic density	29.11 g/m^2
Lithic density	0.15 item/m^2

Table 3.9. Ceramic analysis for AZ U:13:23 (ASU)

Category	Raw Count	Percent of Total
<u>RWCD Project, mitigation phase</u>		
Total ceramics, by count	159	
Plain wares	62	38.99
Hohokam Red wares	0	0
Red-on-buff wares or buff wares	97	61.01
Polychrome wares	0	0
<u>RWCD Project, test phase</u>		
Total ceramics, by weight	595.4 g	
Plain wares	213.4 g	35.84
Hohokam Red wares	0 g	0
Red-on-buff wares	382.0 g	64.16
Polychrome wares	0 g	0

Table 3.10. Raw material analysis from AZ U:13:23 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	710	
Basalt	277	39.01
Chert	14	1.97
Quartz	0	0
Quartzite	6	0.84
Micaceous schist	409	57.61
Obsidian	0	0
Rhyolite	0	0
Granite	0	0
Andesite	2	0.28
Sandstone	0	0
Felcite	0	0
Pumice	0	0
Others	2	0.28

material distribution of recovered lithic materials, while Table 3.11 outlines the results of technological analysis.

3.4.3 Ceramics Across the Site

The collections from the mitigation phase were used to produce a symap of ceramic distribution, shown in Figure 3.12. The area of heaviest concentration seen here coincides with the high-density area reported by Rice et al. (1979). The ceramics, while heaviest in this area, are still few in number. As shown in Table 3.9, 159 sherds were recovered from this site, the majority being Hohokam Buff wares. The predominance of buff ware is atypical of Hohokam sites but is comparable to results obtained on this stie by Rice et al. (1979).

Sherds recovered from this site demonstrated an unusual characteristic; they appeared to have spalled apart. This spalling had reduced the sherds to apparently one-half original thickness. Although the cause of spalling has not been determined, it may be due to improper firing or exposure to extremely high-temperature post firing. The conditon of the sherds is not common to other RWCD sites.

Polished red wares were not recovered from this site, although they were noted by Antieau (1977). These may have occurred outside the currently defined site boundaries, or they may have been associated with the Pima site nearby. Of the buffware sherds on which designs were visible, 100% were classified as Casa Grande Red-on-buff. This is consistent with the analysis results of RWCDI. The site, then, is tentatively assigned to the Soho phase on the basis of ceramics. The fact that Casa Grande Red-on-buff on this site is not clearly associated with Classic period red wares is unusual; the lack of red wares is unexplained.

Because of small sample size, little can be said regarding technological attributes of ceramics, particularly among plain wares. There do not appear to be significant distributions of temper variation, paint type, or other attributes horizontally. Insufficient samples of vertical distribution were obtained for meaningful comment. The bowl/jar ratio was calculated to be 6.60 for this site but may be unreliable due to spalling of sherds.

3.4.4 Lithics

A relatively small amount of lithic material was collected from AZ U:13:23. Most of the material is schist (409 g of a total 710 g) and basalt (277 g). The distribution is

Table 3.11. Technological analysis from AZ U:13:23 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	0	0
Secondary flakes	11	78.57
Tertiary flakes	1	7.14
Shatter	1	7.14
Cores	1	7.14
Ground stone	0	0
Total items	14	

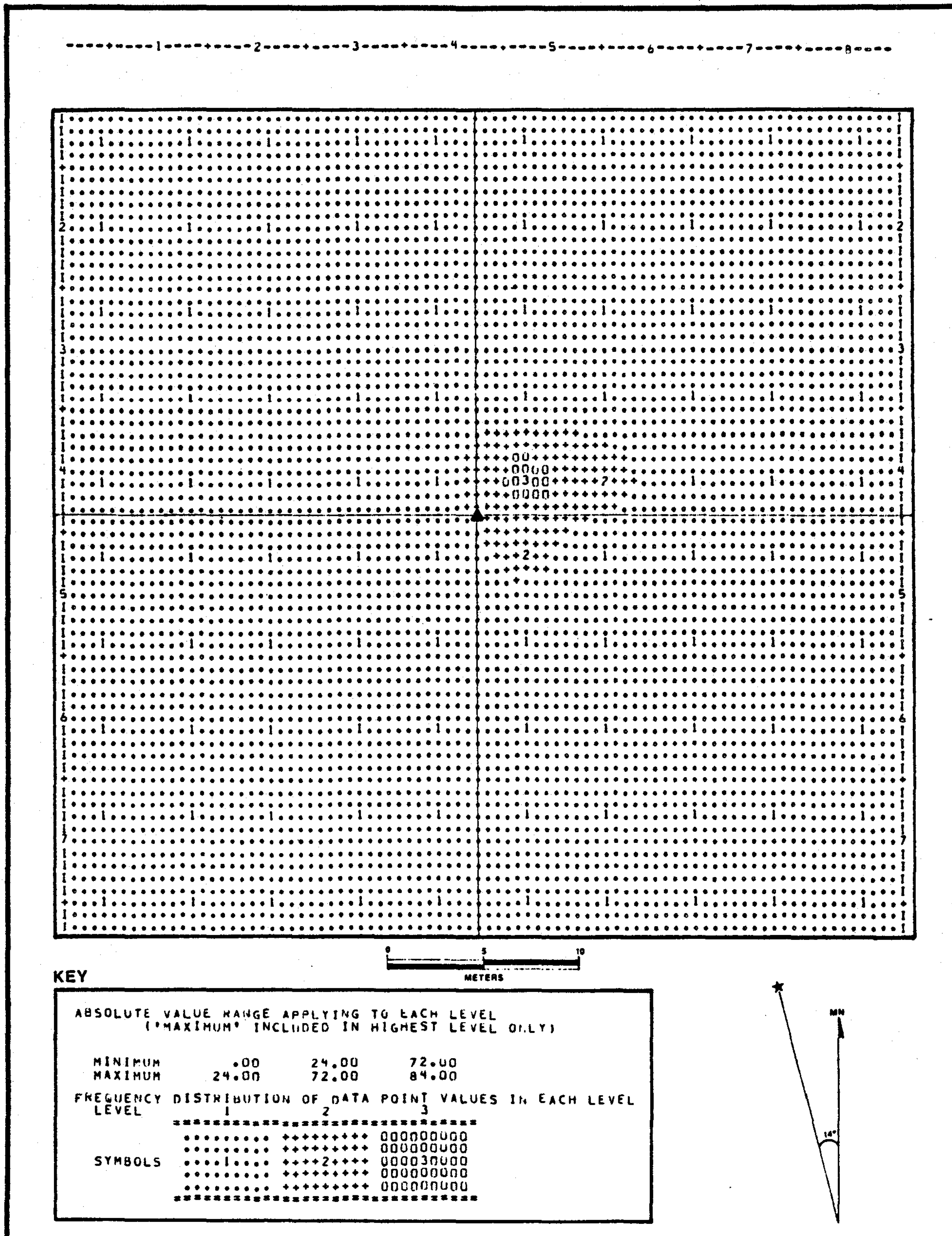


Figure 3.12. Symap representation of surface ceramic distribution by number of sherds, AZ U:13:23 (ASU)

shown in Figure 3.13. While low sample size does not permit reliable functional or technological interpretation, the distribution shown here is primarily of secondary flaking debris. One gets a superficial impression of a group of men sitting in a semicircle, shooting the breeze as they performed some desultory chipping activity.

3.5 U:13:24 (ASU)

AZ U:13:24 (ASU) is the most complex prehistoric site excavated as part of the RWCD II program. This site is a habitation site dating from the Sacaton phase, at the earliest. The site occupation may extend partially through the Classic period. One complete structure was located on the site, but there were suggestions of two possible structures beyond this. The site showed evidence of considerable deflation; apparently cultural remains had undergone extensive damage. Suggestions of several damaged extramural features were also noted; most of these are thermal in nature. The artifact collection from AZ U:13:24 shows more diversity than other RWCD II sites.

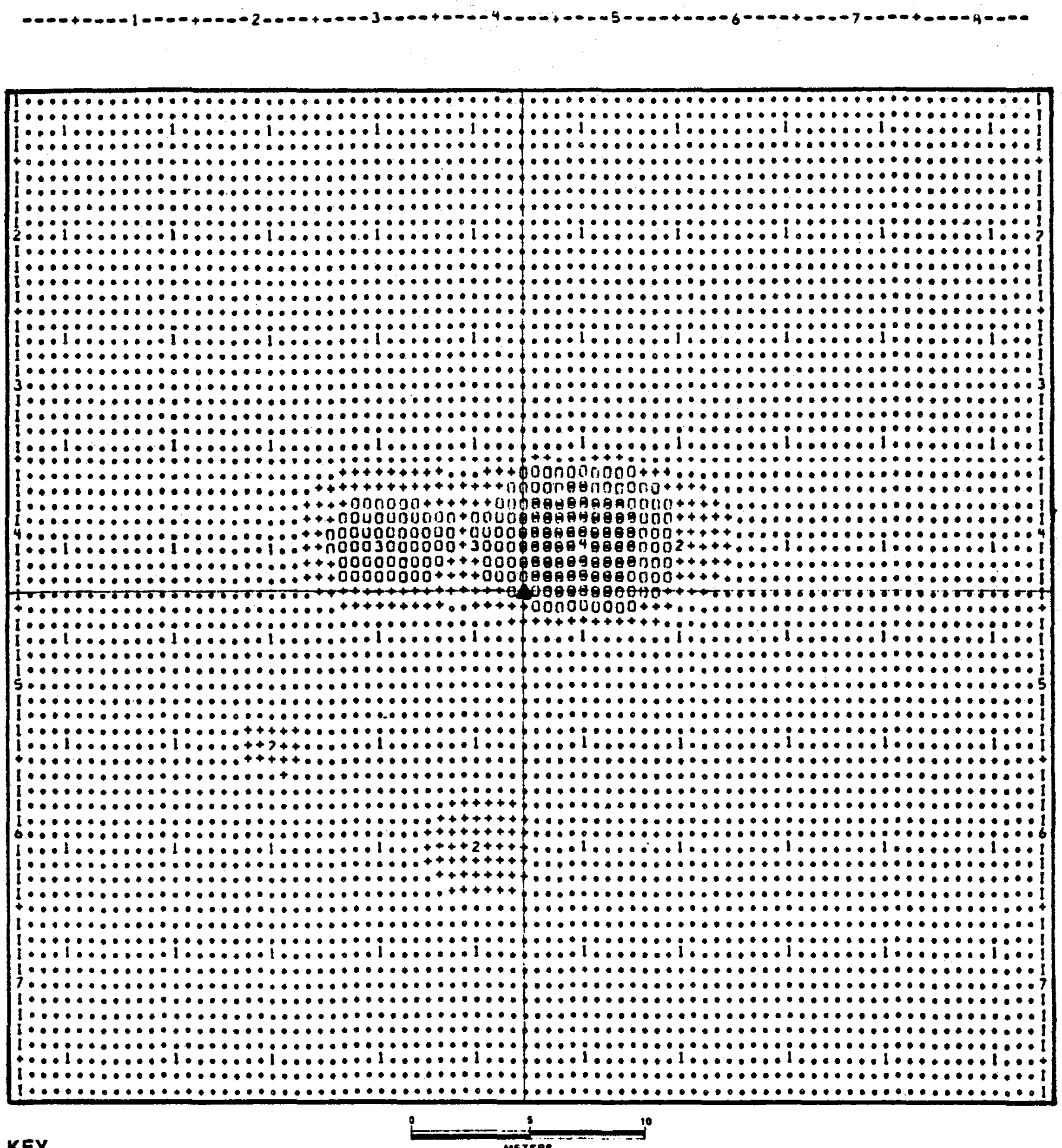
AZ U:13:24 (ASU) is located in T 3 S, R 5 E, Section 16, in the center of the SE 1/4. The site is covered with saltbush, wolfberry, and hedgehog. The site lies on a badly deflated remnant sand surface. Deflation has most severely affected the eastern portion of the site.

3.5.1 Methodology

Initially, the entire surface of AZ U:13:24 was gridded in 2 m squares and a 100% surface collection was undertaken. A distribution of artifact density was noted at that time. Artifacts tended to be located at the deflated bases of mounds, while flat areas were virtually devoid of cultural material. Thirteen trenches were then placed judgmentally across the site. For test unit placement, the site was divided into sixteen quads and two 1.5 m x 1.5 m test units were randomly chosen for excavation. Additional units were placed as necessary. Features revealed in trenches and tests were hand excavated. Several areas of the site were stripped in an attempt to locate additional features.

3.5.2 Stratigraphy

The stratigraphy of AZ U:13:24 is obscured by the amount of erosional activity on the site, the presence of vague coaking features, and wall melt in apparent structure areas. In general, the uppermost 20 cm of site



KEY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

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MAXIMUM	20.00	60.00	180.00	410.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

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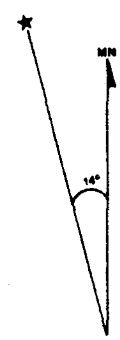


Figure 3.13. Symap representation of surface lithic distribution by weight, AZ U:13:23 (ASU)

fill consists of a moderately compact red-brown silt. Beneath this lies a 10 to 15 cm thick compact silt slightly redder than the above stratum. The next 30 cm is a caliche and clay-caliche mix under which is a basal caliche layer.

3.5.3 Description

AZ U:13:24, shown in Figure 3.14, was originally recorded by Antieau in 1972. He noted basalt and chert flakes, metate fragments, and incised Sacaton and plainware sherds. Site size was noted to be 40 m north-south and 70 m east-west. Rice et al. (1979) note U:13:24 to be a Sacaton phase site during the RWCD I program. The site was defined as a large and a small locus. A surface collection of 1.6% was made, producing 844 artifacts. This collection yielded an artifact density ranging from less than 1 artifact/m^2 to 199 artifacts/m^2. Ninety-eight and eight-tenths percent of the collected ceramics are plainware, primarily Gila Plain. Some sherds are redslipped, probably either Gila or Salt Red. Lithics from the surface are mainly basalt flakes with some cores present. Two probable habitation areas are described for the site, although others may be present.

3.5.3.1 Area A

This area, as shown in Figure 3.14, contains Structure A, the only clearly defined architectural unit on any of the RWCD II sites. Structure A is shown in Plates 3.1 and 3.2 and Figures 3.15 and 3.16.

Period: Sacaton phased, based on rare sherds in fill.

Size: 4.95 m east-west, 3.25 m north-south.

Floor 1 (upper floor): floor remnants patchy; slight evidence for plastered, prepared surface.

Floor 2 (lower floor): as above.

Wall construction is shown in Plate 3.2 and Figure 3.16. There are two hearths, both apparently associated with the latest floor. Hearth 1 is centrally located in the structure. It measures 31 cm north-south and 29 cm east-west. The feature is of deep, circular construction. It is lined with orange clay. Feature fill is loose ash containing burned bones and sherds. Hearth 2, adjacent to and just south of Hearth 1, is of the same construction and fill. It is 14 cm deep and measures 26 cm east-west and 28 cm north-south. Four extramural features are associated with Area A, although the exact terms of this association are unknown. These are as follows:

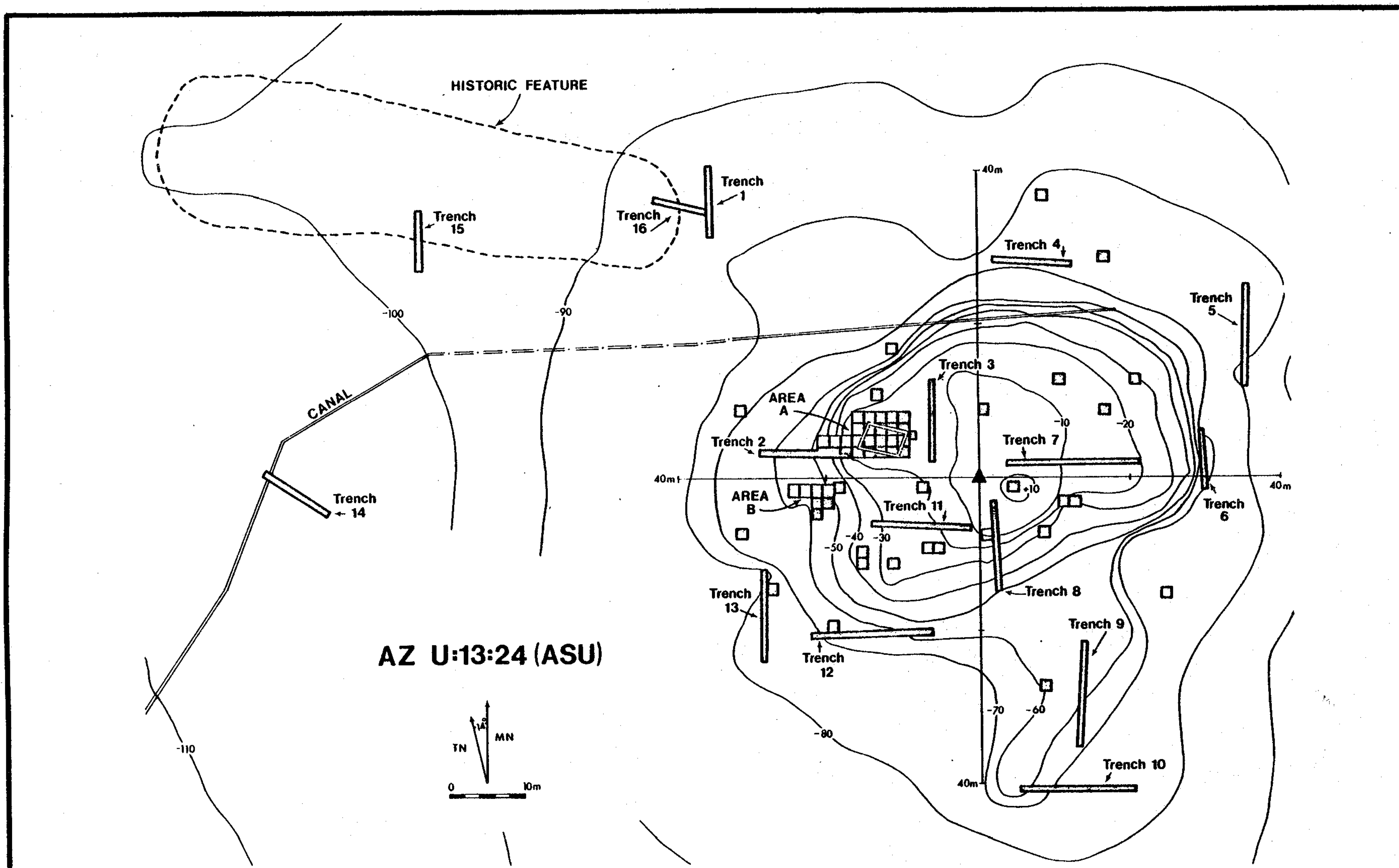


Figure 3.14. Map of AZ U:13:24 (ASU) showing topography and feature locations

Plate 3.1. Structure A, AZ U:13:24 (ASU), showing floor and wall construction (hearth unexcavated)

Plate 3.2. Close-up of plaster wall construction, Structure A, AZ U:13:24 (ASU)

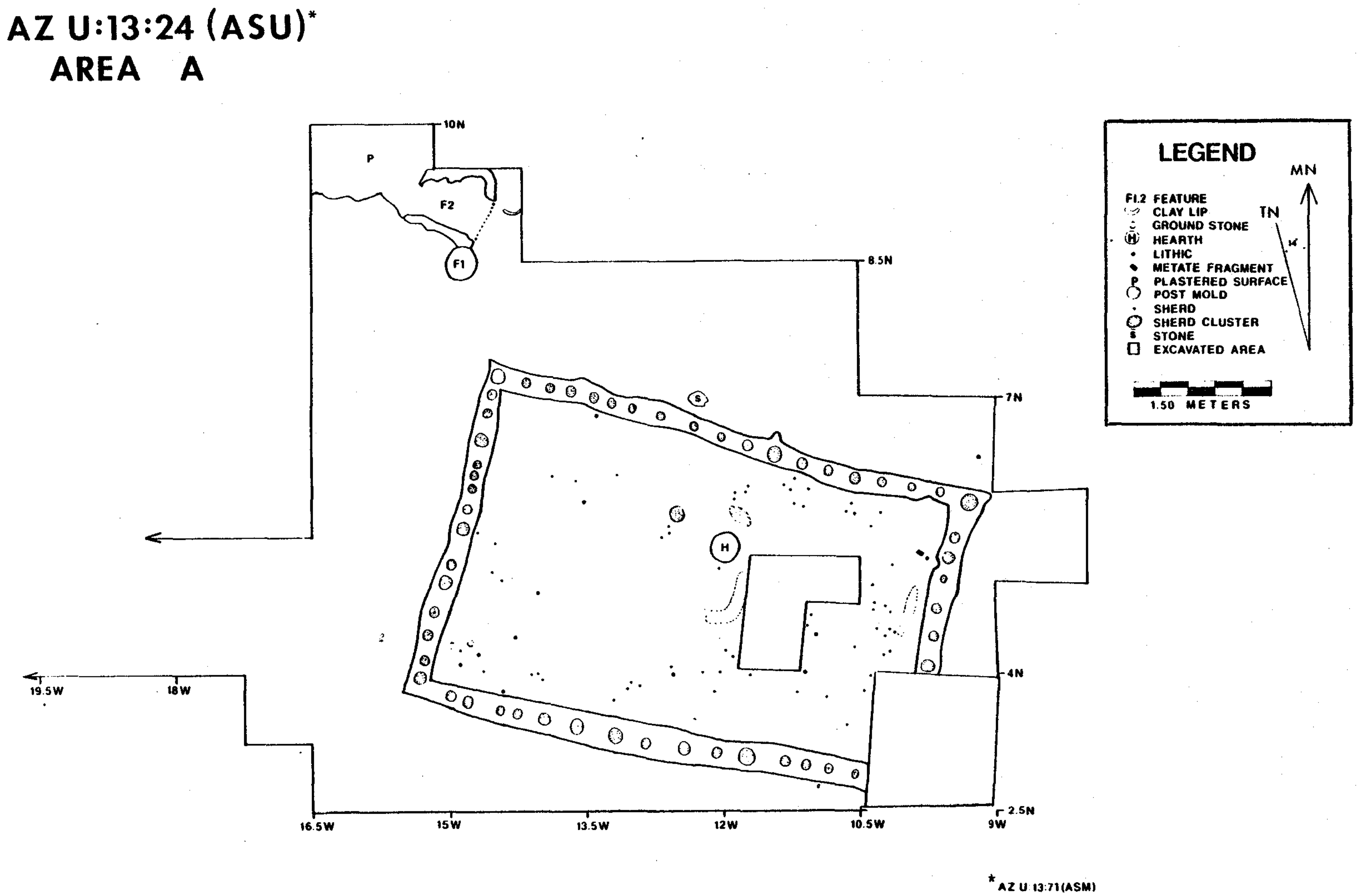


Figure 3.15. Map of Structure A, AZ U:13:24 (ASU) showing artifact distribution and floor and wall characteristics

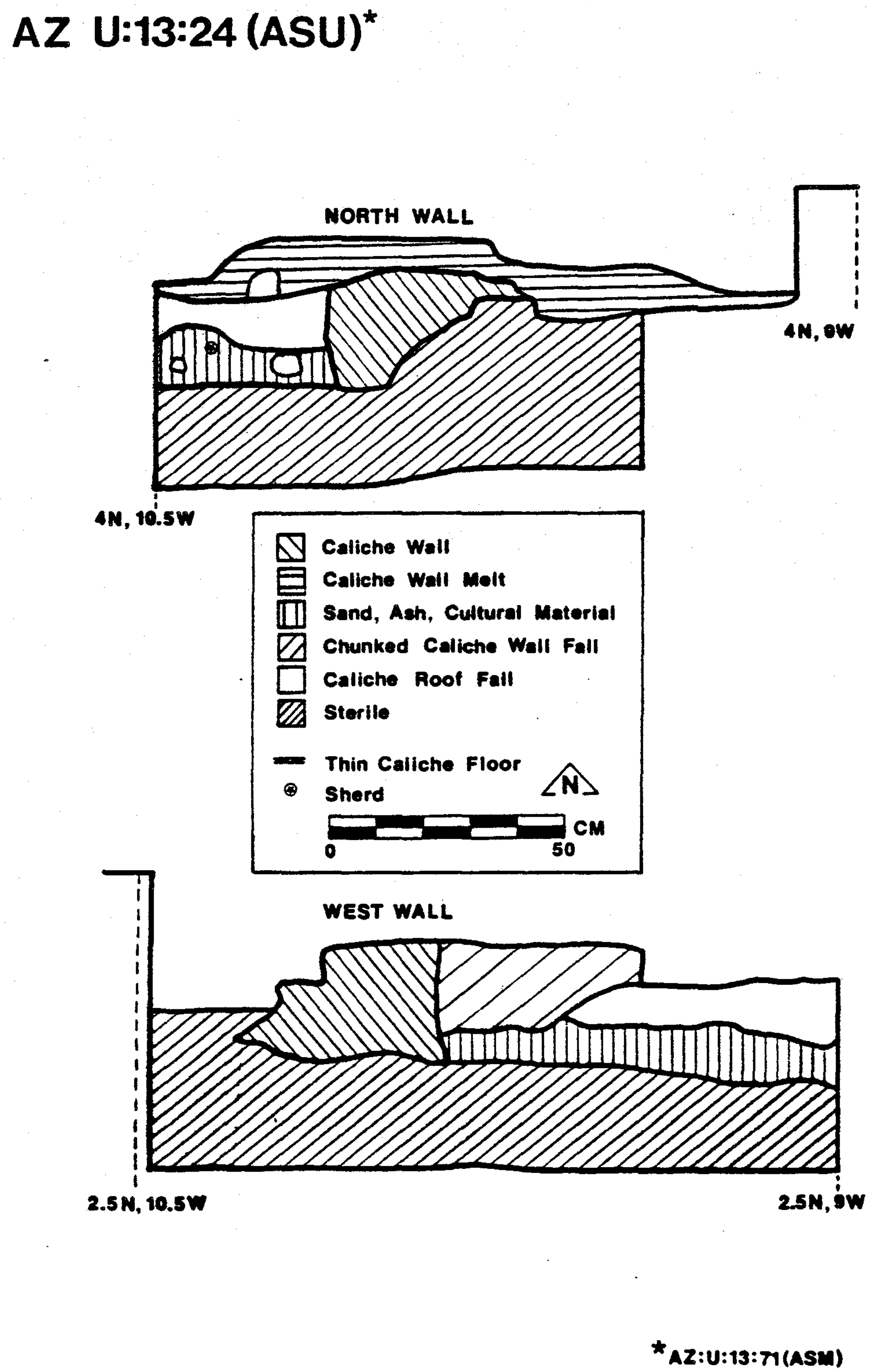


Figure 3.16. Profiles of north and west walls of Structure A, AZ U:13:24 (ASU)

Feature 1: 8.5 N, 15.25 W. This is a pit feature filled with sandy silt containing some ash and charcoal. The feature is 20 cm north-south, 30 cm east-west, and 5 cm deep. A chopper and a number of plainware sherds were recovered from the fill. Feature function is unknown.

Feature 2: 8.5 N, 15.25 W. This pit underlies Feature 1. It measures 80 cm north-south, 56 cm east-west, and has no depth measurement given. The pit walls are plastered with caliche. The pit interior is divided into two compartments by an east-west oriented wall. The feature is filled with ashy red-brown silt containing moderate charcoal flecking.

Feature 3: 9.5 N, 16.5 W. This feature is probably the remains of a brush ramada. It consists of patches of a plastered surface and a probable associated posthole. Features 1 and 2, described above, may be dug into this surface. The surface is 3 mm in thickness, probably indicating extensive erosion. The plaster has been placed over soft sandy fill. The posthole is 5 cm deep and 11 cm in diameter.

Feature 4: This feature is most likely the location of a chipping activity locus associated with Structure A. Its dimensions are unavailable. It consists of a medium concentration of debitage in an area filled with light brown ashy soil flecked with charcoal. The fill indicates that the original function assigned to this feature--chipping station--may not be accurate. The fill would seem to indicate a thermal function.

3.5.3.2 Area B

Located about 6 m southeast of Structure A is a second habitation area. The habitation function is assigned to the area, although no clear evidence of a structure was recovered. The assignment is based on the extensive and ubiquitous presence of wall melt and roof fall in the excavated area. In a number of units investigated in Area B, small patches of probable floor surface were also noted. A total of seven possible postholes were also documented. Two features are noted in Area B, though the relationship of these to a structure in the area is unclear; it cannot be stated whether these are extramural or intramural features.

Feature 1: 3.5 S, 22 W. This feature is oval in shape. It measures 58 cm north-south, 36 cm east-west, and 3 cm deep. It is filled with dark red-brown silt containing flecks of charcoal.

Feature 2: This feature is thermal in nature. It is oval, measuring 47 cm north-south, 36 cm east-west, and is 6 cm in depth. Feature fill is burned red-brown soil containing large amounts of ash and charcoal.

3.5.4 Artifacts

3.5.4.1 Ceramics

Typable ceramics from AZ U:13:24 are predominantly from the Sacaton phase. The surface ceramic distribution is shown in Figure 3.17. Here it can be noted that the midden-like densities of ceramics on the Symap are primarily located away from the single positively identified structure. While density at the structure is slightly higher than average, it does not come near densities in the three other concentrations. This may indicate that trash was hauled from the structure and placed in allocated trash areas. If hauling of trash is supposed, then the distribution of trash should indicate the presence of other structures on the site. Heavy concentrations of red ware and decorated ware are present in the southeast and northeast corners of the site, perhaps indicating the presence of structures in those areas.

In examining red wares from the site, it was noted that a full range of smudging, polishing, and mica tempering combinations are present. Absent are unsmudged, unpolished sherds with gold mica temper, unsmudged, polished sherds with gold mica temper, and unpolished, smudged sherds with gold mica temper. The emphasis, then, is on silver mica as a tempering agent. Red ware attributes decrease in frequency with depth, as do raw sherd counts. Thus, no vertical distribution is noted. Unsmudged red wares tend to concentrate in the southwest quadrant of the site, while smudged wares are noticeably denser in the northwest quadrant. This horizontal distribution may result from a number of conditions, including the spatial arrangement of cooking features or the spatial arrangement of potters among others.

Attribute analysis of decorated and buff ware ceramics focused on paste color and paint characteristics. Overall, no vertical change in attributes is noted; all attributes decline in frequency with depth, as do raw sherd counts. No notable concentrations are found in analysis other than trends discussed previously. There is, however, a strong consistency across the site in attributes present. Out of fifteen possible paint-and-paste combinations, only three combinations make up ca. 74% of the sample. These combinations are a pink-white paste with thin red paint, pink-white

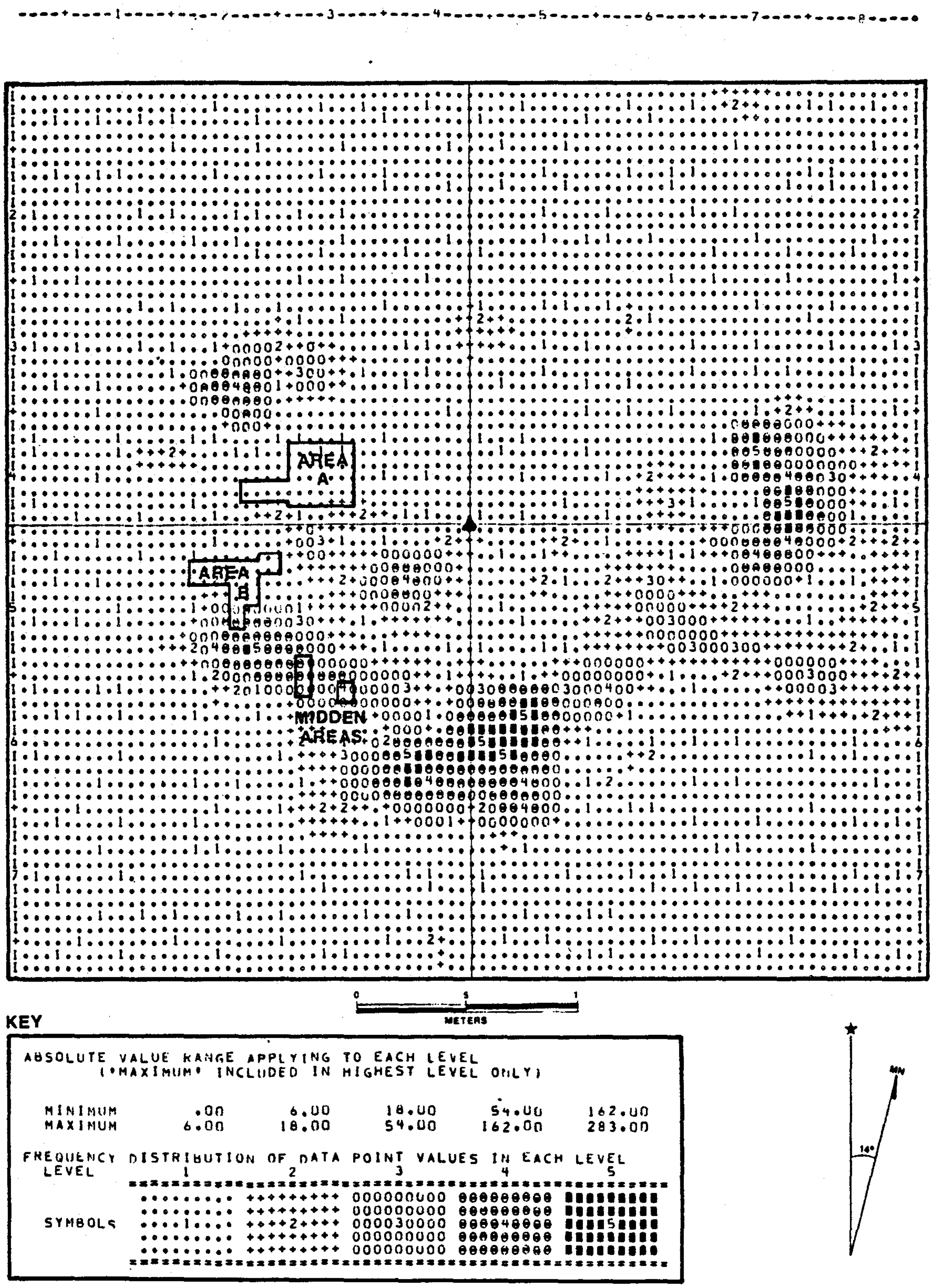


Figure 3.17. Symap representation of surface ceramic distribution by number of sherds, AZ U:13:24 (ASU)

paste with no paint, and unmottled orange paste with no paint. The narrow range of attributes present on AZ U:13:24 may indicate that buff wares, particularly undecorated types, were being produced on or near the site.

As in other ware categories, plain wares show no significant changes with increased depth. Overall, smudging is relatively uncommon in plain wares from this site, making up less than 18% of the sample. Unsmudged sand-tempered sherds are concentrated in the southwest quadrant of the site. Unsmudged sherds tempered with gold mica are also common in this quadrant and are absent in all other areas of the site. On the other hand, unsmudged sherds tempered with silver mica are absent in this southwest quadrant but make up over 95% of the sherds present in the northwest quadrant. These patterns of plain ware distribution, coupled with red ware and decorated ware distributions, indicate a complex set of highly patterned spatial arrangements in the Sacaton to Classic period Hohokam community pattern.

3.5.4.2 Lithics

Most notable in the lithic assemblage are the following points. Basalt as a raw material is quite common on AZ U:13:24. The high frequency of basalt sets this site apart from others in raw material cluster analysis. The popularity of basalt on the only site to positively exhibit a permanent dwelling on RWCD II may result from one of two factors. First, basalt may have been used as building material for permanent habitations. Second, and perhaps more likely, basalt was needed in large amounts for preparation of grinding tools, an increased number of which may have been needed during sedentary use of a site. It should be noted here that original investigators felt that the availability of basalt to occupants of AZ U:13:24 was not significantly different than at other sites on the project (RWCD II field notes).

Examination of lithic material related to Structure A indicates that stone tool manufacture or use took place in or nearby the structure. A considerable amount of chipping debris was included in the roof fall, suggesting that stone tool production also took place on the roof. On the structure floor itself, completed stone tools are isolated, leading to the suggestion that tool storage or use took place inside the structure.

The lithic symap of surface distribution is shown in Figure 3.18. It can be seen that lithics, like ceramics, tend to be located in midden deposits in the southeast and northwest site quadrants.

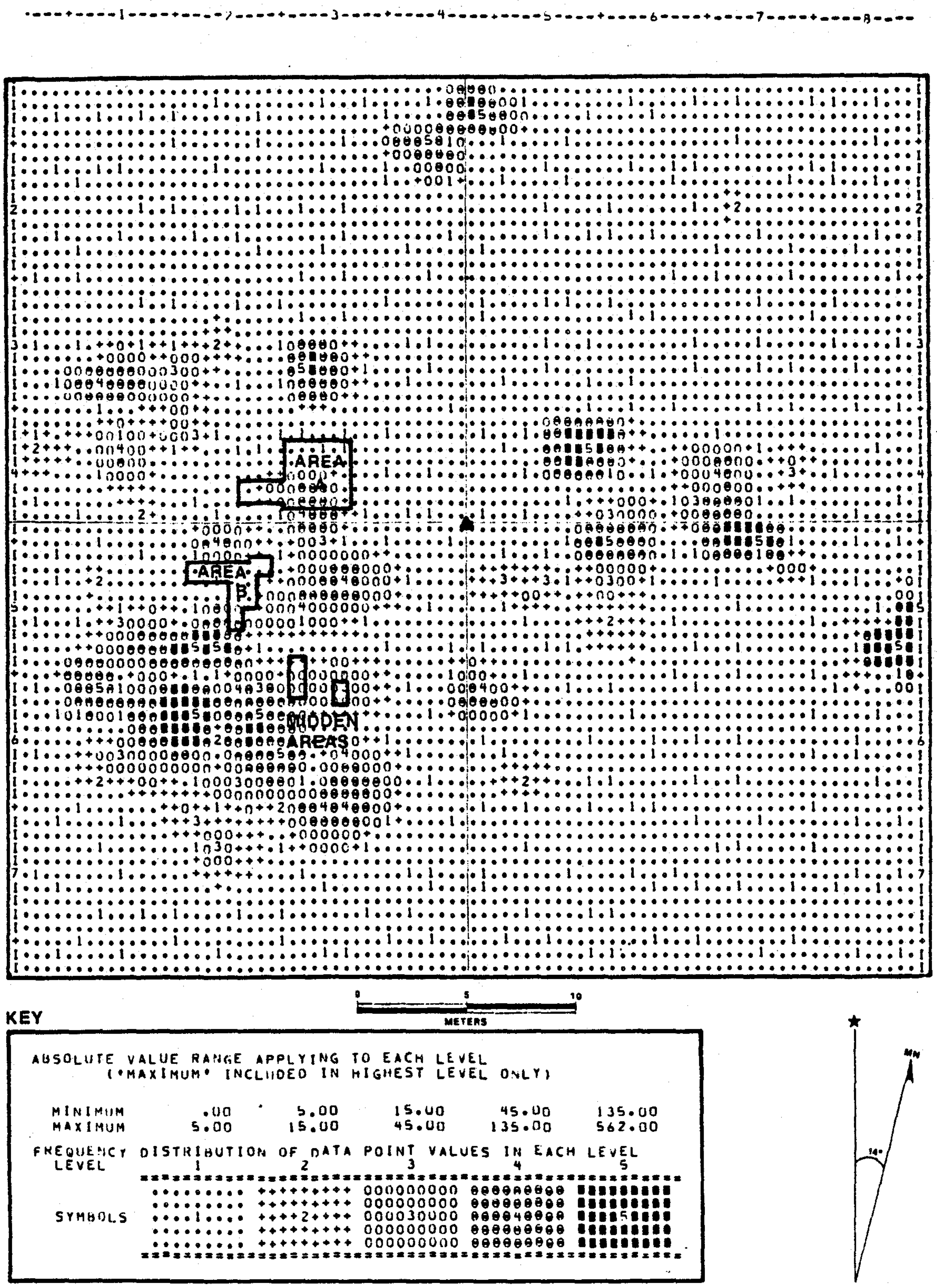


Figure 3.18. Symap representation of surface lithic distribution by weight, AZ U:13:24 (ASU)

A number of exotic items are present in the chipped stone assemblage from AZ U:13:24. Obsidian is present, but quantity or raw counts are not currently available on the frequency. A single turquoise bead and a hematite ball are also present.

3.5.4.3. Others

A brief analysis of the surface distribution of human bone (mostly apparently burned) suggests that a cremation area might once have been present. The area of bone concentration centers on 16 S, 16 E and is about 10 m^2.

3.6 AZ U:13:28 (ASU) (AZ U:13:60-ASM) PREHISTORIC COMPONENTS

AZ U:13:28 (ASU) is a Soho phase site dated on the basis of ceramic types and supported by a single carbon 14 date. Although no permanent features were noted, it is classed as a habitation on the basis of the artifct assemblage and extensive trash deposits. The site is in T 3 S, R 5 E, N 1/2 of SW 1/4 of Section 14. AZ U:13:28, estimated to cover ca. 1,500 m^2, occurs in an area with vegetation characterized by saltbush, creosote, and occasional saguaro. Portions of the site have been severely deflated, causing several saguaros to topple from lack of sufficient soil depth. Although deflation is present at this site, as it is throughout the project area, much of the mounding present has been created by meander channels and blow sand deposited around vegetation. At the southern edge of the site, bordering a modern canal, is a historic Pima habitation, designated as a locus of AZ U:13:28.

3.6.1 Methodology

At the initiation of the mitigation program, AZ U:13:28 was considered to be a site containing three prehistoric loci, A, B, and C (see Fig. 3.19). Each was thought to be associated with one or a series of low mounds. After field work was well underway, this assumption of spatially discrete loci was judged incorrect. As a reasult of the initial assumption, original field researchers felt that partitioning of the site into three loci had created ". . . some spatial gaps in our coverage, particularly between areas B and C." At the easternmost locus, A, the RWCD test program data were used to establish a 60 m north-south by 58 m east-west grid aligned by magnetic north. Grid units were 4 m on a side. On Locus A, six trenches were excavated before initiation of surface collection, resulting in large

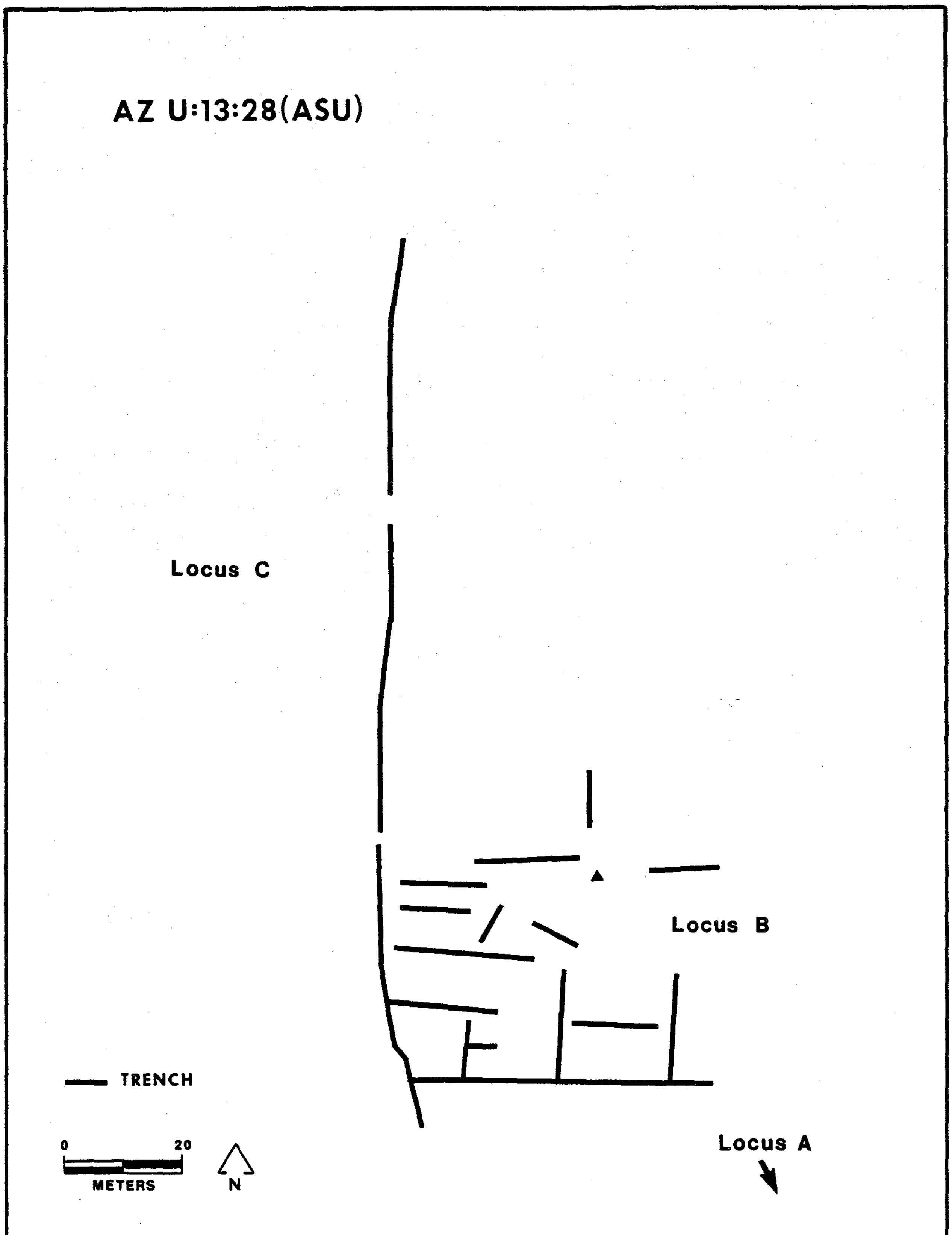


Figure 3.19. Map of AZ U:13:28 (ASU) showing the three prehistoric loci

gaps in surface artifact distribution. These six trenches, shown in Figure 3.19, resulted in backdirt being placed on areas of high artifact densities; these areas were then inaccessible to controlled surface collectors. As a result, the surface distribution of artifacts is meaningless. After 100% surface collection, excluding backdirt areas, 24 test units were excavated, 20 of which appear to be randomly placed. It should be noted that only five trenches appear on the map; field notes indicate that the sixth fell outside the site boundary. Locus B was designed as 174 m north-south and 40 m east-west in order to provide coverage of the very long, narrow mound littered with cultural material. Thirty-three test units were excavated; field notes do not indicate which units are random or judgmental. Apparently the entire surface area was collected. It is also unclear how many trenches were used to explore subsurface cultural and natural stratigraphy. Locus C was staked as a 40 m x 40 m locus, although notes conflict on the amount of area gridded. Field notes indicate that surface collection took place before gridding; given the level of provenience recording of surface collection field specimens, this seems highly unlikely. Grid units are 4 m on a side. There is no indication of what percentage of the surface was collected. It is interesting to note that the field director states that a 20 m x 20 m area was designated as Locus C. There is also a crude map of artifact distribution indicating that 688 m^2 was surface collected and that this is roughly 50% of the entire grid system. No final maps are available for Locus C, and extant field notes do not resolve this question. No trenches appear to have been used on this site, and records for only four test units, each 1.5 m^2, are present in the field records. There are no maps indicating topography, trenches, or test units.

3.6.2 Description

Wood (1972) first described this entire site as a Gila Butte through Civano phase occupation, with three or more trash mounds covering about 12 acres. It is located beyond the second terrace of the Gila River and about 2.8 km (1.7 mi.) from the river. Brooks and Vivian (1976:13) identified the site as only a Classic period occupation after finding Casa Grande Red-on-buff, polished and smudged red wares, Gila Plain, and Tonto and Gila Polychromes on the surface. RWCD mitigation program analysis supports the latter conclusion. Arizona State Museum noted an absence of cultural features in three backhoe trenches excavated in the project right-of-way through the northern portion of the site. During the RWCD test program, field workers investigated a 40 m x 40 m portion of the site (Rice et al. 1979), which now falls in Locus A. During testing, a 2% sample of this area produced 361 artifacts similar to those noted by Brooks and Vivian (1976) and Rice et al. 1979:196). On the basis of the test program, Rice et al. (1979) suggest that the site may be a habitation. Table 3.12 summarizes test and mitigation program findings at AZ U:13:28.

Although the trenches at AZ U:13:28 included only two noted featues, the many profiles provide an interesting cross section through a geological deposit unique to the sites excavated during RWCD. Through examination of areal photographs, it was determined that the massive mound area of Locus B was a gravel bar caused by an ancient river meander. This feature was noted in Trench 3 where the upper level of the profile is an unconsolidated light tan sand with small gravels that vary in depth from 20 cm to 50 cm below the surface. Below is a compacted sand stratum of medium to coarse structure with varying amounts of gravel. Depth of this second stratum is quite variable. The third stratum is similar to the second but contains variable amounts of caliche. Calcareous deposits varied from poorly developed to nearly pure in isolated pockets.

Caliche development in the site area appears to be partially hindered by vegetation on the surface. Further, the irregularity of the caliche stratum does not appear to be produced by cultural activity. The irregular intrusion of the compacted sand and gravel soil into the very dense caliche stratum appears to be a result of erosional processes that have not been further investigated here.

The trenches in Locus A were also cut through mounds but did not contain either gravelly deposits or irregularities in the caliche stratum. In these trenches, a light tan sandy soil overlays a more compacted red clay sand with caliche inclusions. Some areas of the site contained lower levels of light and dark banded clays. The mound formation process in this area appears to be one of dune formation and erosion of land surfaces by wind. In the west end of trench III appeared a trash pit measuring ca. 10 m north-south by 8 m east-west after excavation. Fill consisted of fine, light gray unconsolidated sand. The fill contained a large amount of artifactual material. Also in trench III, at the east end, was a thick, black ashy lens. Excavation of this lens demonstrated this to be a regularly shaped ash pit devoid of fill artifacts.

Test units were excavated at all loci of AZ U:13:28 to further test for subsurface features and to sample the trash pit and ash pit at Locus A. The trash pit appears to have been dug into the prehistoric use surface and filled with trash; the trash may have eventually overflowed the pit. The pit showed no internal stratigraphy, and no differences

Table 3.12. Summary of field and laboratory investigations at AZ U:13:28 (ASU)

Category or Activity	Amount
Total site area:	
RWCD Project, mitigation phase:	
Area collected	11,440 m^2
Percent area analyzed for ceramics	22.7%
Percent area analyzed for lithics	22.9%
Ceramic density	1.06 sherds/m^2
Lithic density	3.01 g/m^2
RWCD Project, test phase:	
Area collected	40 m^2
Ceramic density	26.98 g/m^2
Lithic density	1.08 items/m^2

in ceramic types or percentages were noted in the various levels. Flotation samples yielded no carbonized remains. Pollen analysis of 10 samples showed relatively high percentages of Cheno-AMs, moderate amounts of pine, and two occurrences each of maize and mesquite.

Test units in Locus B indicate shallow trash deposits in the area of heavy surface concentration of artifacts. Fill of the tests consisted of soft sand including cultural material and occasional charcoal flecking. Test pit results have been interpreted by original investigators as indication that an undefinable series of trash sites had been excavated into the hard-packed clay-caliche stratum. In instances where pit outlines were discernible, these tended to be extremely irregular and difficult to trace. These manifestations appear to be the bases of trash pits, the upper levels of which are deflated. Two samples of possible pit fill were examined for macrobiotic remains. Both samples, from 16 S 12 E, produced a cheno-AM seed. Pollen studies of one sample from the same provenience noted small amounts of cheno-AMs and a single pine pollen.

Limited excavations, consisting of four test units, were conducted at Locus C. These yielded plain ware, Classic period red ware, Casa Grande Red-on-buff sherds, and lithics. No features were encountered with the exception of a possible female adult cremation eroding out of the surface. This cremation is described in Chapter 8 of this report.

In the following discussion of artifact distributions from AZ U:13:28, the text is taken from notes made by the original investigator(s). Four major artifact concentrations are noted for the site; two are at Locus A, with B and C each representing one. It seems that in all four cases, high densities of sherds and lithics overlap. These densities are shown in Figures 3.20 and 3.21. At other RWCD sites, similar surface distributions have been interpreted by original investigators as remains of middens or trash pits. The excavations at this site also revealed a high correlation between surface and subsurface artifact concentrations.

Table 3.13 briefly describes ceramic analysis for AZ U:13:28. Preliminary sorting of surface sherds demonstrated a high degree of similarity between assemblages from the three loci. Although the percentages of ceramic types vary from locus to locus, Classic period materials were distributed throughout the area. It was then assumed that the loci were occupied contemporaneously, and the site was analyzed as a single unit. Obviously, for this analysis investigators had to assume that a ceramic phase represented contemporaneity, a dangerous assumption, at best.

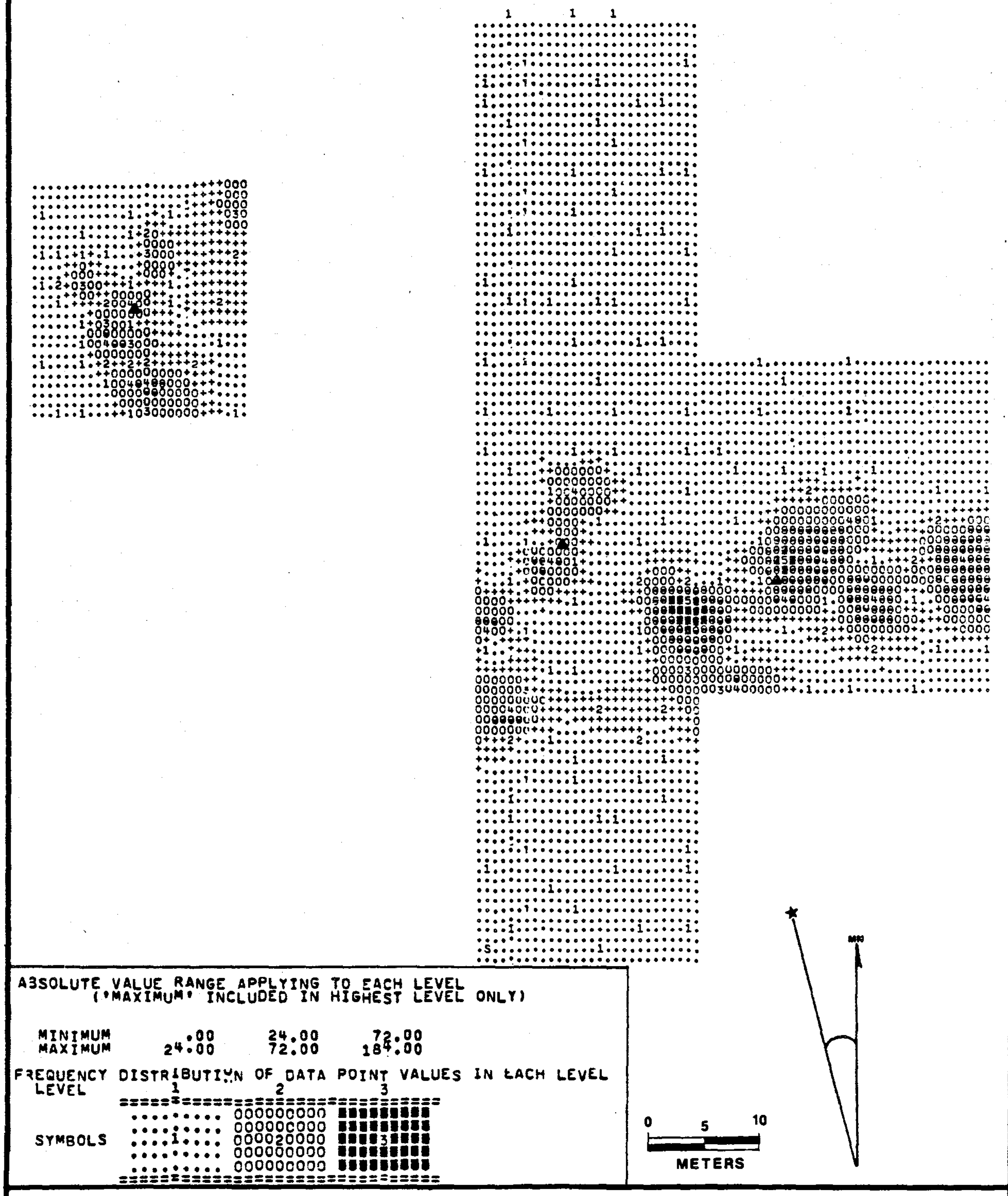


Figure 3.20. Symap representation of surface ceramic distribution by weight of sherds, AZ U:13:28 (ASU)

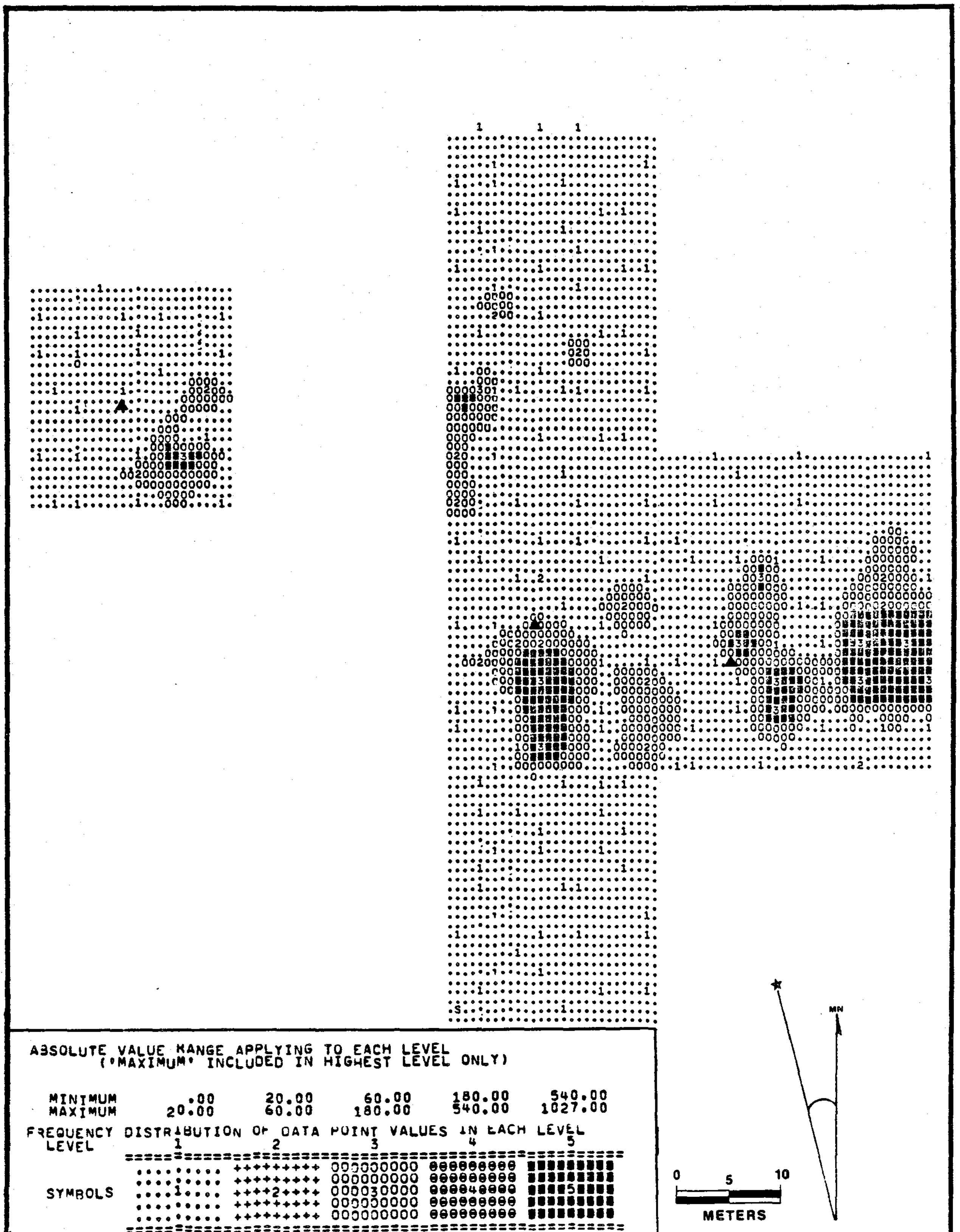


Figure 3.21. Symap representation of surface lithic distribution by weight, AZ U:13:28 (ASU)

Table 3.13. Ceramic analysis for AZ U:13:28 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	2,773	
Plain wares	1,310	47.24
Hohokam Red wares	702	25.31
Red-on-buff wares or buff wares	749	27.23
Polychrome wares	6	0.22
RWCD Project, test phase		
Total ceramics, by weight	1,079.4 g	
Plain wares	647.7 g	60.00
Hohokam Red wares	144.8 g	13.41
Red-on-buff wares	286.9 g	26.58
Polychrome wares	0	0
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	3	3.19
Santa Cruz Red-on-buff	1	1.06
Sacaton Red-on-buff	1	1.06
Casa Grande Red-on-buff	89	94.68
Tonto Polychrome	0	0
Gila Polychrome	0	0

For the purpose of comparison, the surface material from AZ U:13:28 was utilized in the cluster analyses designed to differentiate project sites on a functional basis. It was earlier stated that surface and subsurface materials from the site appear to have been derived from the same population of artifacts. Thus, surface materials should yield an accurate picture of the site. It should be noted that the assumption that the surface and subsurface materials are from the same population seems to be based more on presence/absence of ceramic types than on identical or similar percentages of these types.

Despite the inability to locate structural features at AZ U:13:28, the site morphology, which includes dense concentrations of artifacts, an overall high density of cultural material, subsurface trash pits, and a regularly shaped ash pit, strongly suggests that this site is a permanent habitation. The analyses of the surface material support this hypothesis.

The bowl/jar ratios obtained for each locus as well as for the site as a whole are high and compare favorably with that obtained from the known habitation at AZ U:13:24 (ASU). The ratios from each locus are as follows: A, 31.69; B, 43.56; C, 39.66. For the entire site, the ratio is 36.52, resulting from the identification of 649 bowls and 1,777 jars.

The results of the temper analysis for both plain wares and Classic period red wares indicates some patterning. The plain ware at AZ U:13:28 was tempered most often with sand, as is common at many other RWCD II sites. Phyllite also is present as a temper and may indicate trade in ceramic vessels rather than acquisition of the raw material. A large variety of other tempers are present; the same variety of tempers is true of red wares.

Lithic analysis for RWCD II is summarized in Tables 3.14, 3.15, and 3.16. According to the cluster analysis using percentages of raw materials, AZ U:13:28 is similar to the majority of the RWCD II sites, as it contains a high percentage of basalt, a fair amount of unclassified materials, and a scattering of most other lithic materials recorded for the project. Only sandstone and pumice are not at the site; however, it is one of the few sites that contains obsidian, a possible exotic material. Of 124.4 g of shell recovered from the site, 54.7 g came from the surface. This shell is not present in the analyzed shell material--it is not known if it represents worked or natural shell. Other exotic materials are small amounts of steatite and turquoise.

Table 3.14. Functional analysis of lithic artifacts from AZ U:13:28 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	79	48.76
Bifacial nibbling wear on edges	15	9.26
Polishing wear on edges	19	11.73
Hammerstones	29	17.90
Metates	5	3.09
Manos	7	4.32
Polishing stones	0	0
Others (gravers, drills, punches, worn projectile points, & misc.)	8	4.94
Total number of tools	162	

Table 3.15. Raw material analysis from AZ U:13:28 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	7,883	
Basalt	3,899	49.46
Chert	601	7.62
Quartz	36	0.46
Quartzite	838	10.63
Micaceous schist	554	7.03
Obsidian	4	0.05
Rhyolite	528	6.7
Granite	555	7.04
Andesite	143	1.81
Sandstone	0	0
Felcite	75	0.95
Pumice	0	0
Others	650	8.24

Table 3.16. Technological analysis from AZ U:13:28 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	49	7.77
Secondary flakes	189	29.95
Tertiary flakes	333	52.77
Shatter	33	5.23
Cores	19	3.01
Ground stone	8	1.27
Total items	631	

In the cluster analysis of functional lithic variables, this site was grouped with AZ U:13:29 (150), a suspected limited-activity site, and AZ U:13:36, a possible habitation. These sites are characterized by a high percentage of unifacially nibbled flakes, moderate percentages of bifacially nibbled flakes, polished edges, hammerstones, and manos. Tools are infrequent on the site surface but occur more commonly in subsurface tests of the trash pit at Locus A. Technologically, the site is represented by a low frequency of primary flakes and shatter with increasingly greater percentages of secondary and tertiary flakes.

3.6.3 Intrasite patterning

Partially because of data recovery strategies, intrasite patterning at AZ U:13:28 is difficult to assess. The following trends are noted at Locus A. Red wares occur twice as often as expected in the southwest quadrant of the site. The distribution of decorated and plain wares is stable. Unsmudged, sand-tempered plain-ware sherds are concentrated in the western half of the trash pit, while unsmudged plain ware with quartz temper also occurs in concentration in the northwest segment of the feature. Among decorated and buff wares, sherds with dense purple paint are common in the southwest corner of the trash pit; buff wares predominate in the northern half of the feature. This suggests patterned refuse disposal, possibly resulting from patterned habitation use around the feature. In horizontal and surface examination at Locus B, no significant differences were noted in the attributes of ceramic technology. All ceramic material is concentrated in the southwest quadrant of the mound, both in surface and subsurface distribution. However, a high frequency of red-ware sherds is noted in the northeast quadrant; such concentrations of red ware are often noted on RWCD sites. There is also a slight predominance of painted sherds in the southwest quadrant. The distribution of lithics by weight appears to be skewed by large chunks of material located at the center of the locus, near datum.

Far less recovery was undertaken at Locus C than at A and B. However, patterns of artifact and technological distribution can still be noted. Generally, there is little overlap in the distribution of ceramics and lithics across the site; in the central southern portion, the two artifact classes do overlap. Among plain wares, quartz tempering is concentrated in the southeast quadrant of the site, while silver mica is concentrated in the northwest; this may be related to use or manufacturing patterns.

A Soho phase date has been assigned to the site on the basis of ceramics. Two carbon 14 dates were obtained for this site. Sample A-2259, from a trash pit at Locus B, dated betweeen A.D. 1030 and 1330. The other sample, from a trash pit in Locus A, dated between A.D. 100 and 400, which does not agree with ceramics from other areas of the site. Interestingly, this small feature was not directly associated with any cultural material. If the data are accurate, it may indicate an early, ephemeral use of the area.

3.7 AZ U:13:29 (ASU)

AZ U:13:29 (ASU) is a multicomponent site with three documented prehistoric loci and two historic loci. Most site occupation prehistorically is concentrated in the Classic period, based on ceramic typology. The three prehistoric loci are all interpreted as limited-activity areas; artifact densities are light, and trash deposits generally are lacking. The site is located in an area of remnant land surfaces that appear as mounds. These are interspersed with deflated areas. Sparse grasses and saltbush cover the mounds, while the exposed hardpan is barren. Locus 148 is found in T 3 S, R 5 E, SW 1/4 of NE 1/4 of Section 15; Locus 150 in the SE 1/4 of the NE 1/4 of Section 15; and Locus 151 in the SE 1/4 of the SE 1/4 of the same section.

3.7.1 Methodology

Field methodology varied from locus to locus. In Locus 148, shown in Figure 3.22 in relation to other loci, the 1978 test stage data were used to locate a 40 m x 40 m grid aligned to magnetic north. The entire site surface was then collected in 4 m square units. After dividing the area on the basis of topography, three test units were excavated in nondeflated areas and one in a deflation. Further, a unit was tested in each of the four quadrants and an additional nonrandom unit was excavated in the southwest quadrant to further examine the undeflated segment of the site.

In Locus 150, field methodology included expansion of the test program grid to 72 m north-south and 60 m east-west to include additional surface indications of the site. A light scatter of lithic material was noted outside this new, arbitrary site boundary. A total surface collection was performed using 6 m square units. The site was then divided, as in Locus 148, on the basis of deflation or absence of it. Three units were excavated in undeflated areas, while two were undertaken in the deflated zone, as shown in Figure 3.23.

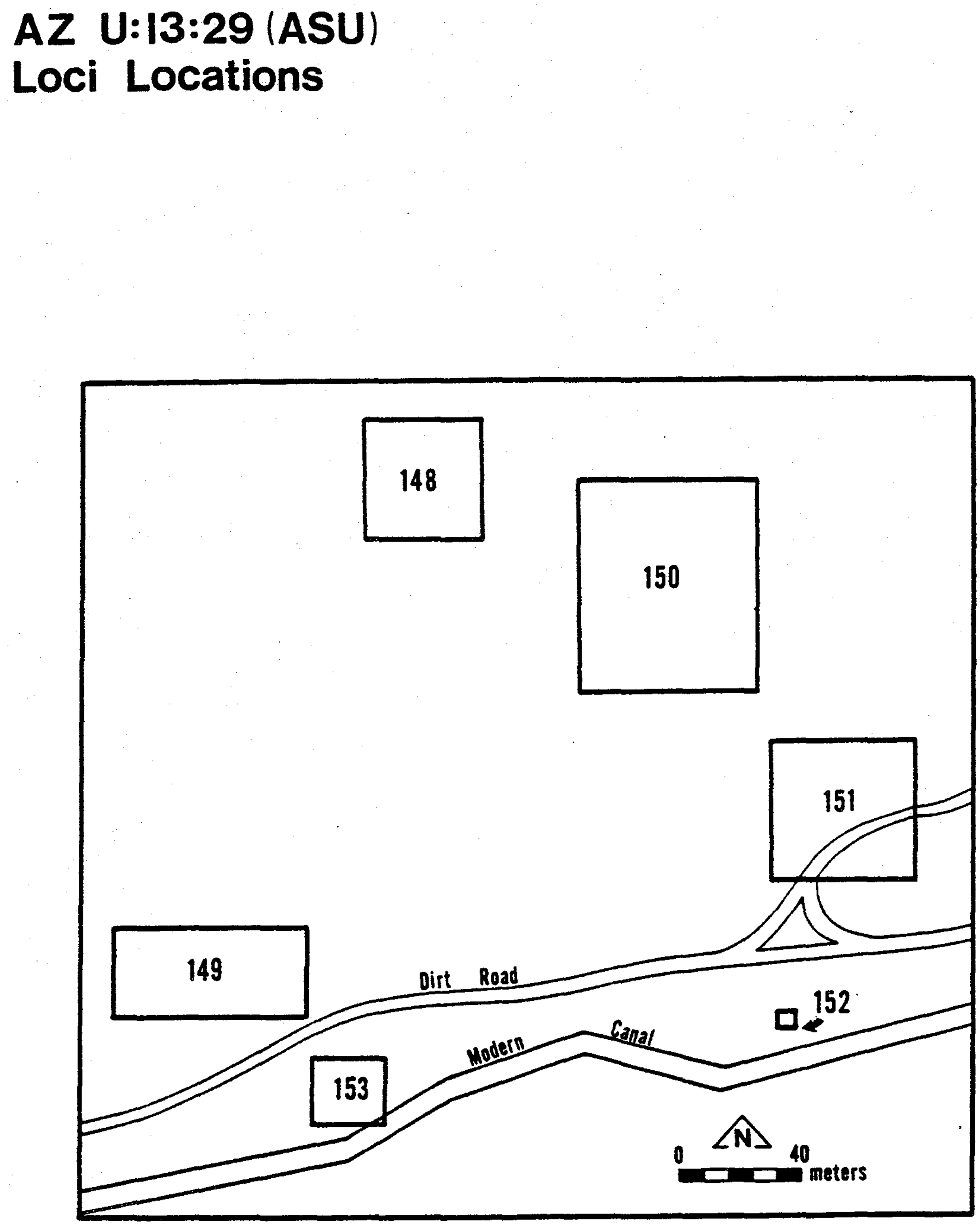


Figure 3.22. Map of AZ U:13:29 (ASU) showing historic and prehistoric (148, 150, 151) loci locations

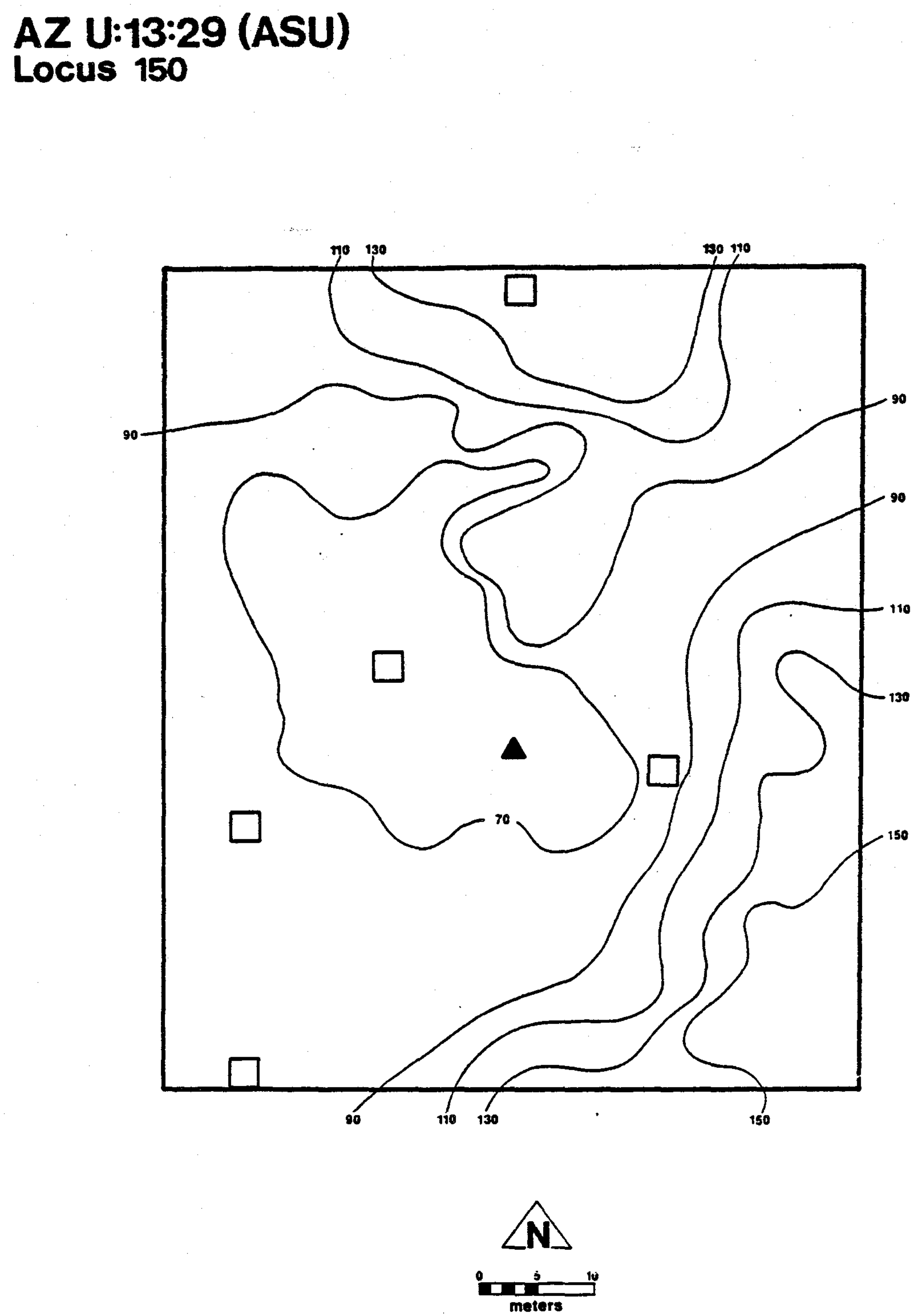


Figure 3.23. Topography and test unit location map of Locus 150, AZ U:13:29 (ASU)

The same procedure was followed in Locus 151, yielding eight test units. These are shown in Figure 3.24.

3.7.2 <u>Description</u>

AZ U:13:29, Locus 148, is a light lithic and sherd scatter that was defined as a locus by Antieau (1977). For a brief overview of loci designations and descriptions, the reader is referred to Rice et al. (1979). The site was included within AZ U:13:66 (ASM) by Wood (1972). In 1978, RWCD test program crews defined the site area as 40 m x 40 m and collected 20% of this area. Collection resulted in 77 artifacts, which were mostly basalt and andesite flakes but included some sherds and bone (Rice et al. 1979). All test units were excavated to hardpan, revealing a stratigraphy similar to that at nearby sites. The upper stratum is light tan unconsolidated sand that lies over a more compact stratum of the same material. Beneath this is a very compact base of red sand with caliche nodule inclusions. Only two lithics, a tertiary flake and a sandstone cobble from which flakes have been detached, and two sherds were recovered during excavation. The sandstone cobble was removed from a unit included in a surface lithic cluster on the eastern part of the site that lacked surface cobbles but contained all four manos.

This site is similar to nearby AZ U:13:29, Locus 150, in its low ceramic density (0.03 sherd per square meter) and in the predominance of sandstone manos. Table 3.17 outlines the extent of field work at Locus 148. Table 3.18 characterizes ceramic types on the site locus, while 3.19 characterizes lithic artifacts. Table 3.20 summarizes raw lithic materials, and Table 3.21 does the same for lithic technological attributes.

A Symap of ceramic distribution has not been included here due to the low frequency of ceramics at this location. A Symap of lithic distribution by weight is shown in Figure 3.25; the two maps combined indicate that areas of high ceramic density occur in areas of high lithic density.

An examination of the two major lithic clusters, 4 and 5 on the Symap, indicates a resemblance to clusters at AZ U:13:29, Locus 150. The westernmost cluster consists of large chunks of material with more than 93% of the cluster made up of hammerstones (or fragments), cobbles, or odd pieces. The eastern cluster on Locus 148 is similar to the northeast cluster at Locus 150. All of the four manos were recovered from this cluster, and a single graver was found in association with these; this pattern is reinforced at Locus 150.

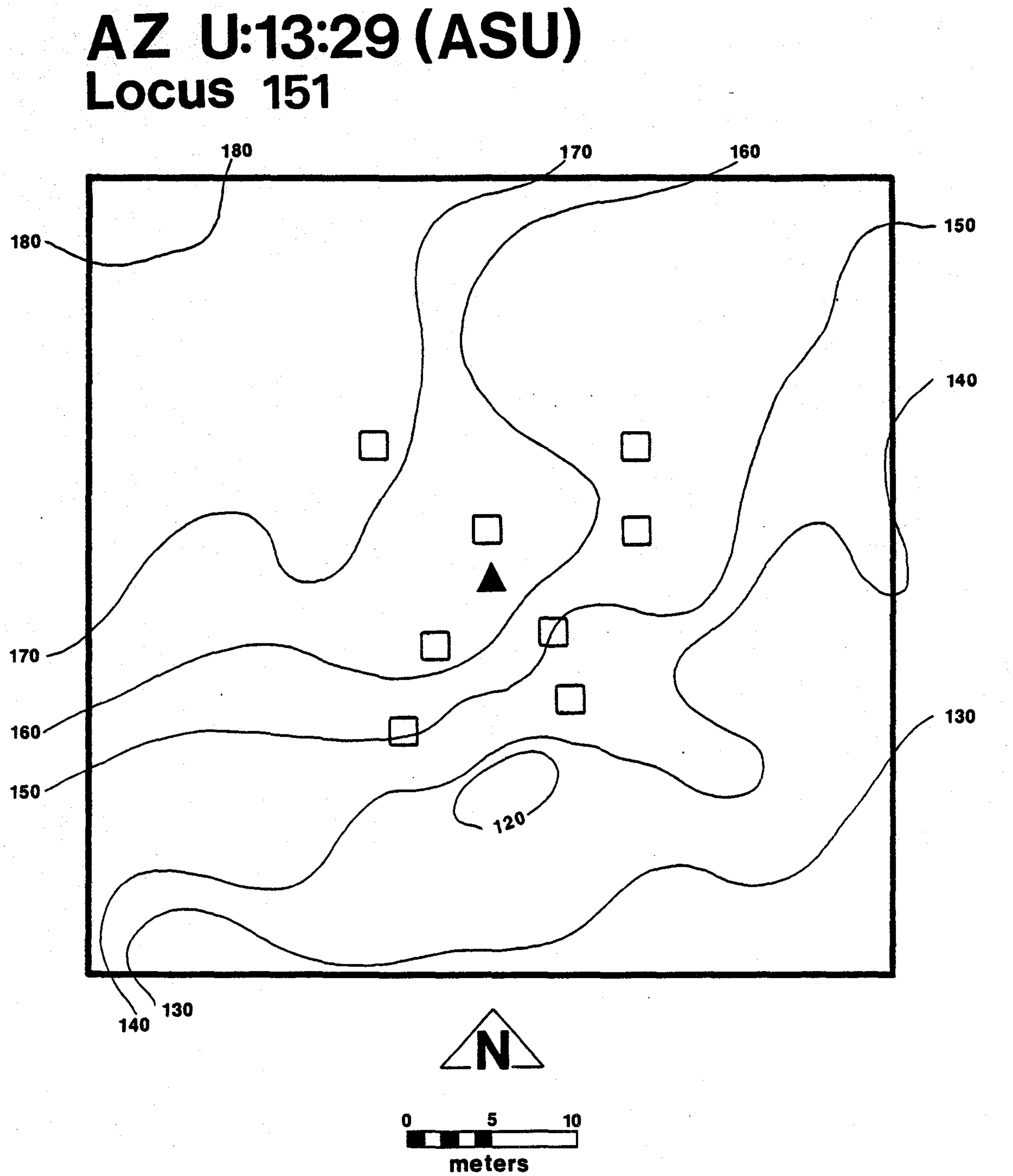


Figure 3.24. Topography and test unit location map of Locus 151, AZ U:13:29 (ASU)

Table 3.17. Summary of field and laboratory investigations at AZ U:13:29, Locus 148 (ASU)

Category or Activity	Amount
Total site area:	1,600 m^2
RWCD Project, mitigation phase:	
Area collected	1,600 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	100.0%
Ceramic density	0.03 sherd/m^2
Lithic density	1.29 g/m^2
RWCD Project, test phase:	
Area collected	300 m^2
Ceramic density	0.31 g/m^2
Lithic density	0.15 item/m^2

Table 3.18. Ceramic analysis for AZ U:13:29, Locus 148 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	47	
Plain wares	23	48.94
Hohokam Red wares	3	6.38
Red-on-buff wares or buff wares	21	44.68
Polychrome wares	0	0
RWCD Project, test phase		
Total ceramics, by weight	93.4 g	
Plain wares	86.2 g	92.29
Hohokam Red wares	0	0
Red-on-buff wares	7.2 g	7.7
Polychrome wares	0	0
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	0	0
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	0	0
Casa Grande Red-on-buff	1	100.0
Tonto Polychrome	0	0
Gila Polychrome	0	0

Table 3.19. Functional analysis of lithic artifacts from AZ U:13:29, Locus 148 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	5	35.71
Bifacial nibbling wear on edges	1	7.14
Polishing wear on edges	0	0
Hammerstones	3	21.43
Metates	0	0
Manos	4	28.57
Polishing stones	0	0
Others (gravers, drills, punches, worn projectile points, & misc.)	1	7.14
Total number of tools	14	

Table 3.20. Raw material analysis from AZ U:13:28, Locus 148 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	2,067	
Basalt	513	24.82
Chert	27	1.31
Quartz	1	0.05
Quartzite	790	38.22
Micaceous schist	46	2.22
Obsidian	0	0
Rhyolite	30	1.45
Granite	0	0
Andesite	51	2.47
Sandstone	442	21.38
Felcite	0	0
Pumice	0	0
Others	167	8.08

Table 3.21. Technological analysis from AZ U:13:28, Locus 148 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	4	3.70
Secondary flakes	33	30.55
Tertiary flakes	59	54.63
Shatter	8	7.41
Cores	1	0.93
Ground stone	3	2.78
Total items	108	

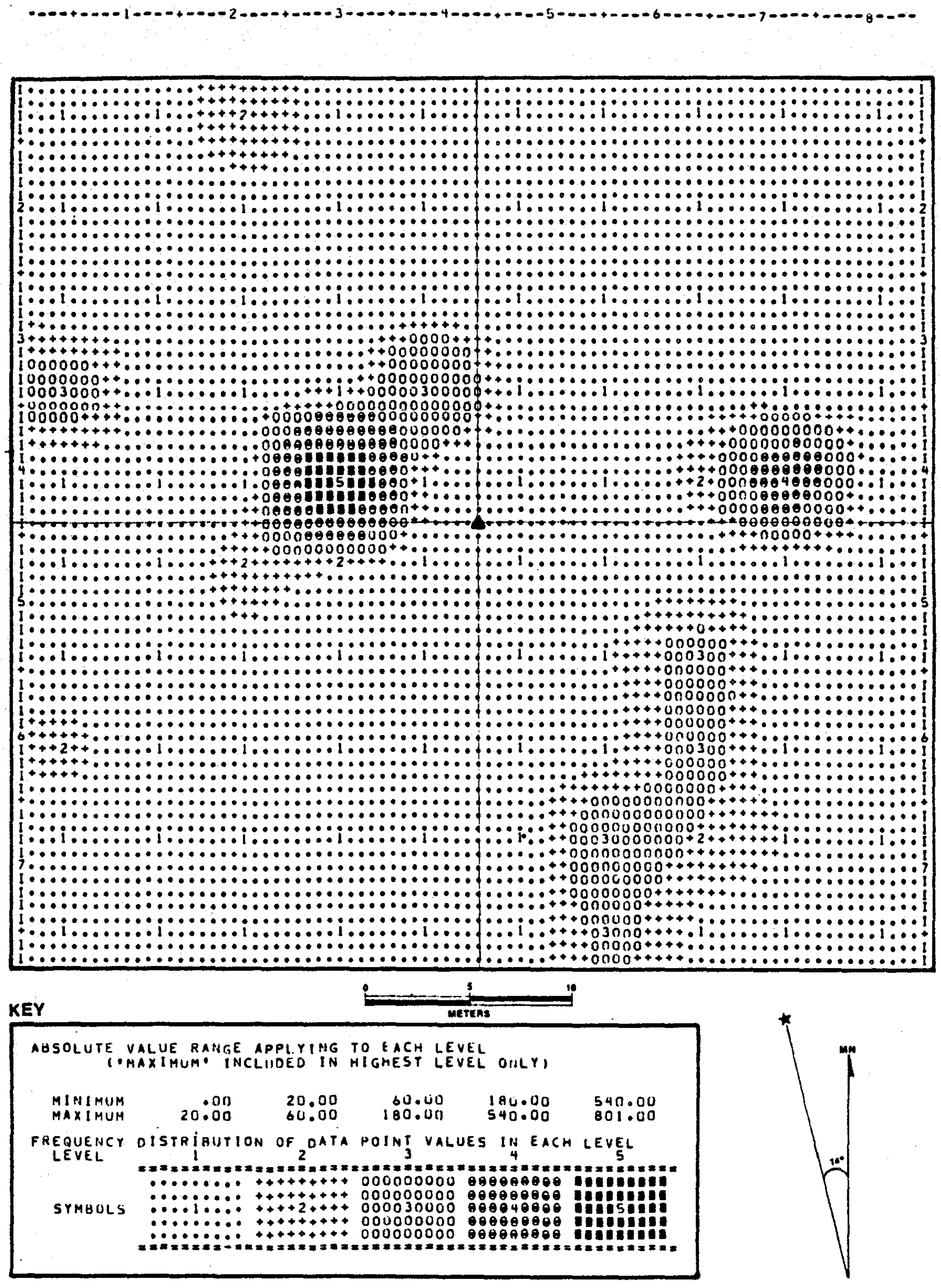


Figure 3.25. Symap representation of surface lithic distribution by weight, AZ U:13:24 (ASU)

The cluster analysis of surface raw materials (see Chapter 5) placed AZ U:13:29, Locus 148, in a group by itself. This is due to the presence of high percentages of quartzite and sandstone. These are based on weights of material; the quartzite is present as one large piece, while the sandstone class is composed of the four manos discussed previously. In technological analysis, Locus 148 is grouped with AZ U:13:29, Locus 150 and Locus 151, AZ U:13:13, AZ U:13:24, and AZ U:13:28 based on a fairly low percentage of primary flakes and a high percentage of tertiary flakes. Secondary flakes fall in the midrange. There is also a small number of shatter pieces.

The frequency of sherds at this locus is quite low; as a result, little analysis could be performed. However, in the area of highest lithic density, there is a high frequency of decorated sherds as opposed to red ware and plain ware (18 decorated, 0 red, 4 plain). The ratio on other sections of the locus is roughly 1 decorated to 1 red ware to 5.5 plain ware.

The only ceramic cluster analysis for which sufficient data were available was the bowl/jar study. Forty-three sherds were identifiable as either bowls or jars; three as bowls and 40 as jars, which produced a ratio of 7.50. The cluster analysis placed this site in Group 3, which includes sites AZ U:13:8, AZ U:13:40, and AZ U:13:23. The synchronous use of lithics and ceramics here is suggested by the similarity of their surface distributions. The three red-ware sherds and the single buff-ware sherd, which was identifiable as a Casa Grande Red-on-buff, may indicate a Classic period use for this site, but the ceramic count is considered too low for certainty. No exotic materials were recovered from the site, but a single bead was found on the surface.

3.7.3 Description, Locus 150

Locus 150 of AZ U:13:29 is an artifact scatter of moderate size in which lithics predominate. Wood (1972) included Locus 150 in AZ U:15:66 (ASM). During the testing program, field personnel from ASU defined the site boundaries as 45 m x 45 m. Thirty percent of this surface area was collected. A 1 m x 1 m test unit was also excavated (Rice et al. 1979). A total of 131 artifacts were recovered, only a few of which were plainware sherds (see Table 3.22). No subsurface artifacts or features were noted in the test, which was excavated to a depth of 60 cm. On the basis of these findings, Rice et al. (1979:225) suggest that Locus 150 may have been a tool-manufacturing area.

Table 3.22. Summary of field and laboratory investigations at AZ U:13:29, Locus 150 (ASU)

Category or Activity	Amount
Total site area:	4,320 m^2
RWCD Project, mitigation phase:	
Area collected	4,320 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	100.0%
Ceramic density	0.004 sherd/m^2
Lithic density	0.96 g/m^2
RWCD Project, test phase:	
Area collected	575 m^2
Ceramic density	0.08 g/m^2
Lithic density	0.17 item/m^2

The stratigraphy of this locus is similar to others in the area. It is composed of a light tan sand that becomes increasingly compact with depth until a red-brown silt hardpan containing caliche is encountered. Only three artifacts were recovered from the excavation unit.

Table 3.23 overviews the ceramic analysis of material recovered from Locus 150. This locus has the lowest ceramic density on the project, 0.004 per square meter. Figure 3.26 is the Symap of ceramic materials from this site. While sherds were too few to allow comment, it is interesting to note that ceramic and lithic distributions do not overlap on this locus. This leads to the suggestion that ceramics and lithics might have been deposited at different periods of the site use.

Tables 3.24 and 3.25 summarize the lithic functional and material type analyses from the testing program. Table 3.26 characterizes the lithic technological analysis. A cluster analysis of raw-material types from Locus 150 placed it with the majority of sites (Chapter 5), including AZ U:13:13, AZ U:13:24, AZ U:13:36, AZ U:13:28, and AZ U:13:29, Locus 151. A few differences are noted, though, when raw-material classes are compared across these sites: Locus 150 has a lower incidence of schist, a higher frequency of chert, and a considerably higher frequency of sandstone. All of the utilized sandstone from Locus 150 was classed as whole or partial manos. However, four of the nine manos (or fragments) recovered were of other materials. Where manos are compared to chipped stone classes on the basis of weight, they can be expected to dominate the assemblage. Sandstone manos are also relatively common at Locus 148, perhaps indicating use of the area for processing of specific plant resources.

Using the functional categories of lithic data from Locus 150, it is most similar to AZ U:13:28 and AZ U:13:36. Locus 150 contained a high percentage (66%) of unifacially nibbled flakes. Tertiary flakes dominate the assemblage, followed by secondary flakes, shatter, and primary flakes, indicating emphasis on finishing objects.

Figure 3.27 shows the distribution of the lithic material by weight. The distribution is concentrated at the base of a low rise in the northeast portion of the site. The surface distribution of artifacts on sand ridges, sloping sides of these ridges, and adjacent deflated areas and the apparent lack of cultural material within ridges indicates that occupation of the site occurred on or above the present-day surface of the ridges. These ridges may be remnant land surface around which severe wind erosion has created blowout areas. The artifacts recovered from

Table 3.23. Ceramic analysis for AZ U:13:29, Locus 150 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	21	
Plain wares	15	71.43
Hohokam Red wares	1	4.76
Red-on-buff wares or buff wares	5	23.81
Polychrome wares	0	0
RWCD Project, test phase		
Total ceramics, by weight	45.4 g	
Plain wares	28.3 g	62.33
Hohokam Red wares	8.4 g	18.50
Red-on-buff wares	8.7 g	19.16
Polychrome wares	0	0
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	0	0
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	0	0
Casa Grande Red-on-buff	0	0
Tonto Polychrome	0	0
Gila Polychrome	0	0

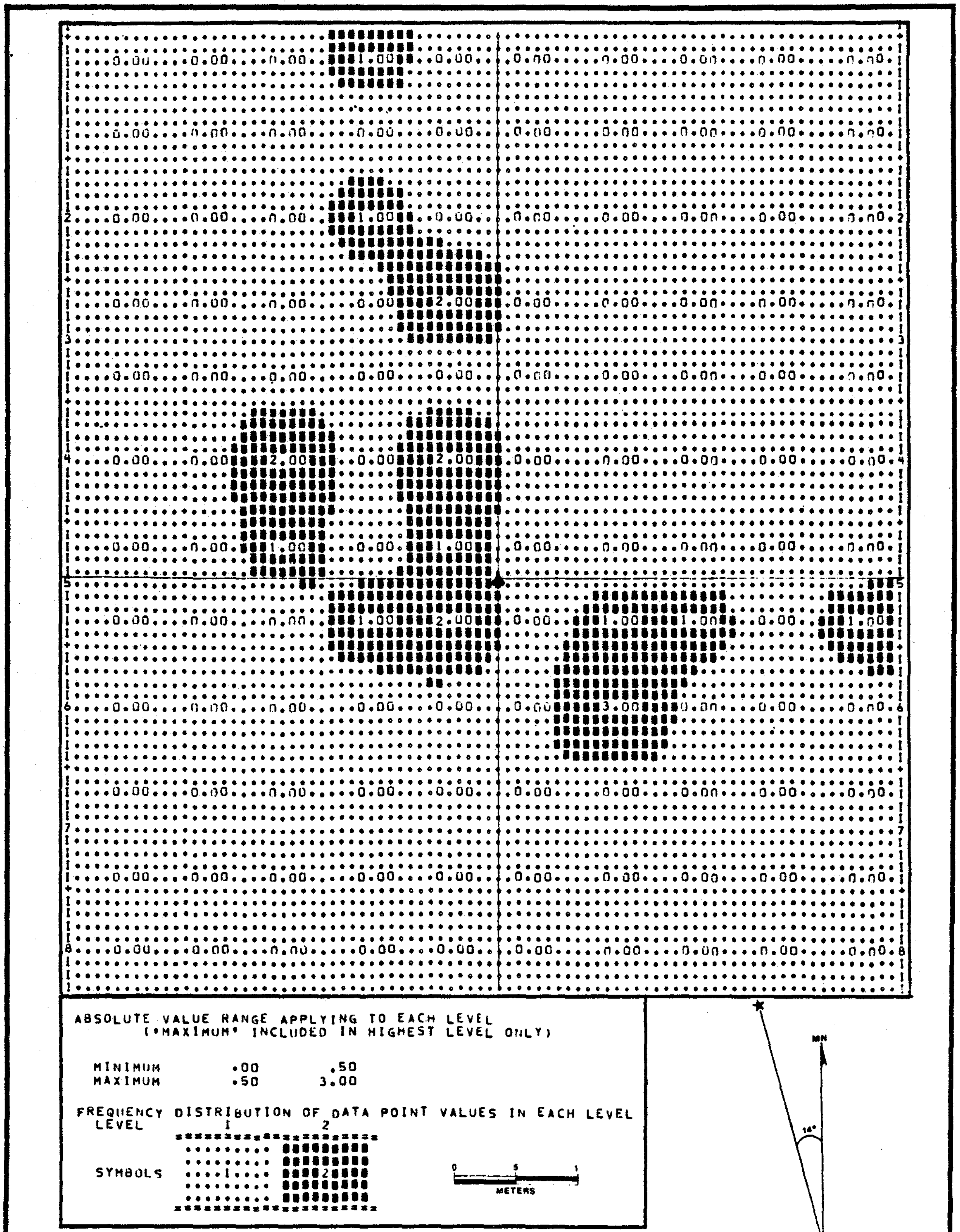


Figure 3.26. Symap representation of surface ceramic distribution, AZ U:13:29, Locus 150 (ASU)

Table 3.24. Functional analysis of lithic artifacts from AZ U:13:29, Locus 150 (ASU), mitigation phase

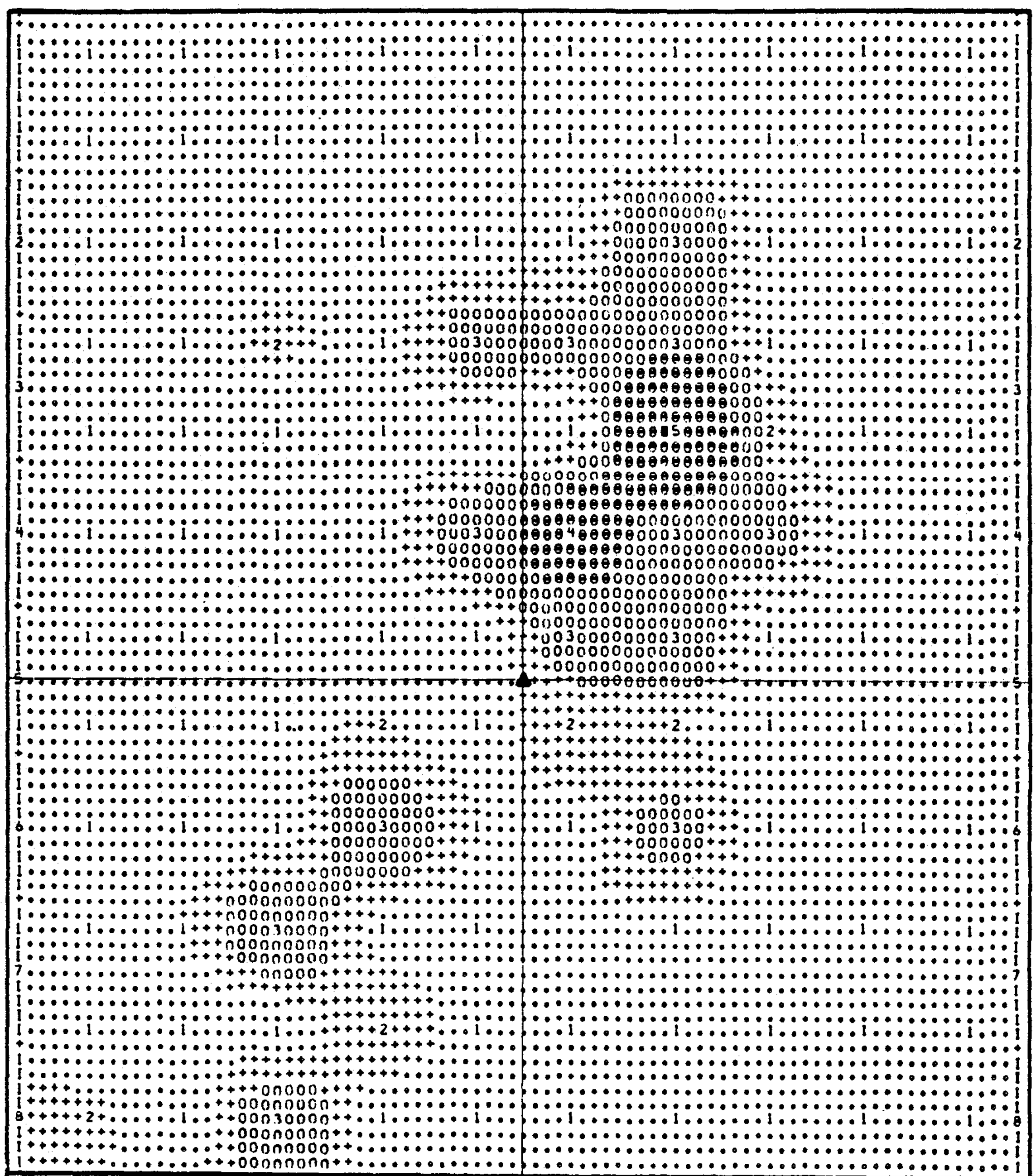
Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	39	66.01
Bifacial nibbling wear on edges	3	5.08
Polishing wear on edges	5	8.47
Hammerstones	2	3.39
Metates	0	0
Manos	9	15.25
Polishing stones	0	0
Others (gravers, drills, punches, worn projectile points, & misc.)	1	1.69
Total number of tools		

Table 3.25. Raw material analysis from AZ U:13:28, Locus 150 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	4,153	
Basalt	1,367	32.96
Chert	329	7.92
Quartz	62	1.49
Quartzite	200	4.81
Micaceous schist	42	1.01
Obsidian	0	0
Rhyolite	123	2.96
Granite	189	4.55
Andesite	326	7.85
Sandstone	811	19.53
Felcite	10	0.02
Pumice	0	0
Others	703	16.93

Table 3.26. Technological analysis from AZ U:13:28, Locus 150 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	16	5.35
Secondary flakes	99	33.11
Tertiary flakes	129	43.14
Shatter	29	9.70
Cores	16	5.35
Ground stone	10	3.34
Total items	299	



ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	.00	30.00	90.00	270.00	810.00
MAXIMUM	30.00	90.00	270.00	810.00	817.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

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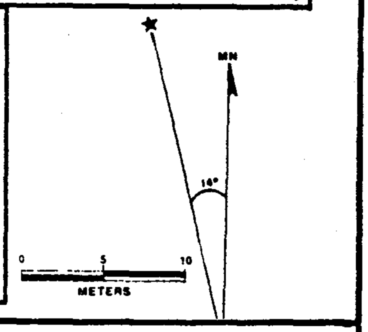


Figure 3.27. Symap representation of surface lithic distribution by weight, AZ U:13:29, Locus 150 (ASU)

blowouts were originally deposited at the ridge level. Artifacts appear to have been displaced both laterally and vertically during this process, altering original associations.

The two high-density areas seen in Figure 3.27 are referred to as the northeast and southwest groups. The southwest group contains 5 of the 16 cores recovered from the locus; one utilized flake was noted in this group. The northeast group is made up of 11 cores, a graver, and 7 manos.

Dating of Locus 150 is dependent on a few typable sherds, which may not have been deposited during the same occupation of the site. However, the locus is tentatively assigned to the Classic period.

3.7.4 Description, Locus 151

AZ U:13:29, Locus 151, is a light sherd and lithic scatter that was defined as a locus of AZ U:13:29 by Antieau (1977). The stratigraphy of the site is similar to others in the area. The upper stratum is a light red to tan sandy silt that becomes more compact with depth. Anywhere from 16 cm to 28 cm below present ground surface, a hard-packed red-tan sand with a large amount of caliche inclusions is encountered. There is very sparse cultural material in the upper 10 cm, after which it drops out.

Table 3.27 outlines the extent of field activity at Locus 151 in both the testing and mitigation phases. Ceramic analysis is summarized in Table 3.28. The locus has a relatively high frequency of polychrome, indicating that the site may postdate A.D. 1350. Cluster analysis of vessel function attributes indicates that the site groups best with known habitations. It also groups with sites where sand temper predominates the assemblages. The Symap of ceramic distribution by weight shows one major concentration of sherds (Fig. 3.28), which overlaps the lithic distribution but does not contain it. Analysis of temper distribution across the site revealed no significant differences, not surprising in light of the restriction in ceramic distribution over the locus. Likewise, distributional examination of ware categories does not provide evidence of patterning.

Lithic analysis is summarized in Tables 3.29, 3.30, and 3.31. In the Symap (Figure 3.29) of lithic distribution by weight, two clusters are apparent. The smaller eastern cluster is determined by the presence of three large hammerstones. In terms of technological attributes, the lithics from Locus 151 are closely associated with those from AZ

Table 3.27. Summary of field and laboratory investigations at AZ U:13:29, Locus 151 (ASU)

Category or Activity	Amount
Total site area:	2,304 m^2
RWCD Project, mitigation phase:	
Area collected	2,304 m^2
Percent area analyzed for ceramics	49.6%
Percent area analyzed for lithics	48.0%
Ceramic density	0.52 sherd/m^2
Lithic density	0.82 g/m^2
RWCD Project, test phase:	
Area collected	64 m^2
Ceramic density	15.91 g/m^2
Lithic density	not available

Table 3.28. Ceramic analysis for AZ U:13:29, Locus 151 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	601	
Plain wares	396	65.89
Hohokam Red wares	66	10.98
Red-on-buff wares or buff wares	63	10.48
Polychrome wares	76	12.64
RWCD Project, test phase		
Total ceramics, by weight	1,018.1 g	
Plain wares	373.6 g	36.69
Hohokam Red wares	324.9 g	31.91
Red-on-buff wares	69.8 g	6.85
Polychrome wares	249.8 g	24.53
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	0	0
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	0	0
Casa Grande Red-on-buff	2	1.96
Tonto Polychrome	3	2.94
Gila Polychrome	93	91.18
Pinto Polychrome	4	3.92

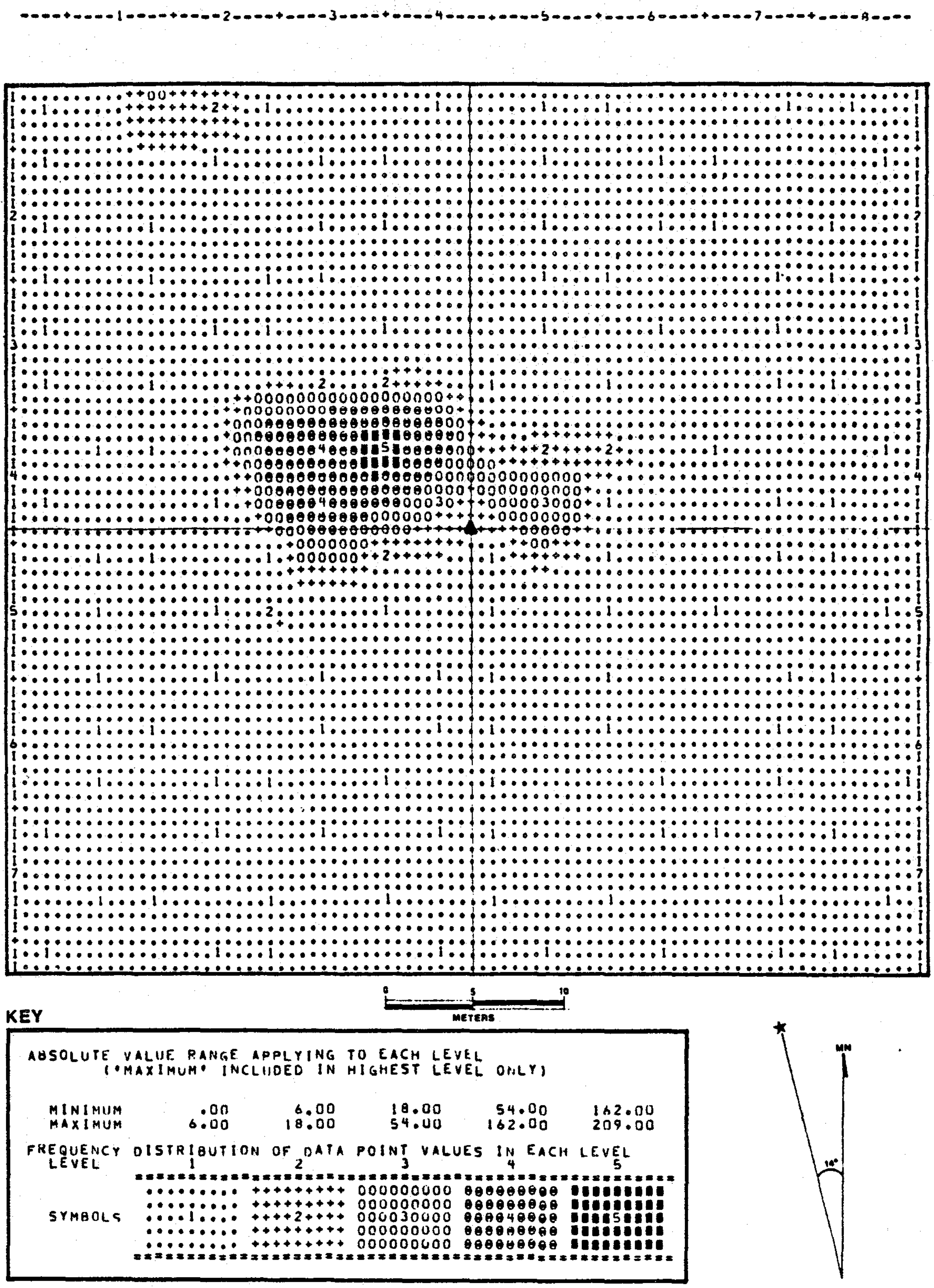


Figure 3.28. Symap representation of surface ceramic distribution, AZ U:13:29, Locus 151 (ASU)

Table 3.29. Functional analysis of lithic artifacts from AZ U:13:29, Locus 151 (ASU), mitigation phase

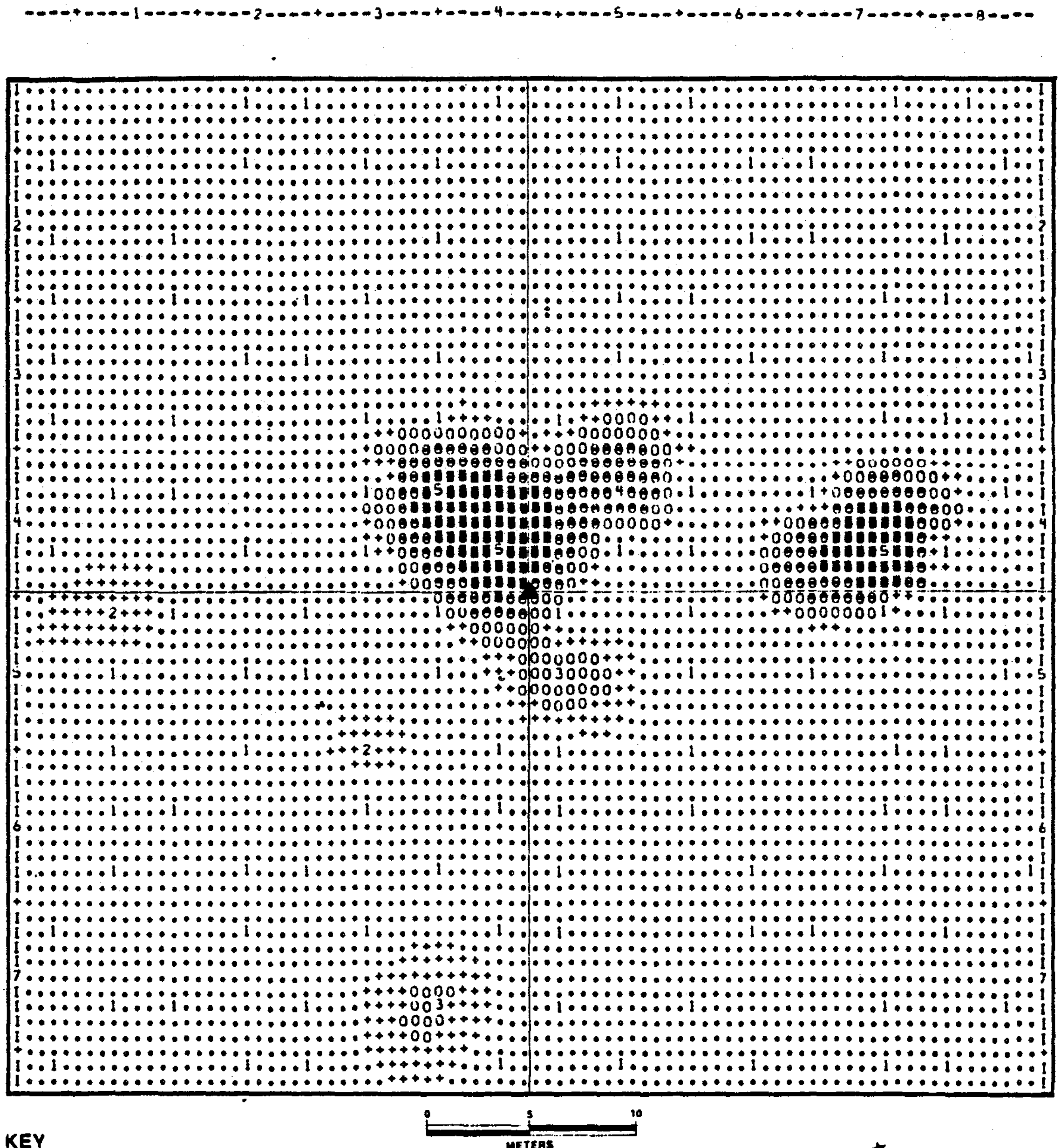
Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	5	41.67
Bifacial nibbling wear on edges	1	8.33
Polishing wear on edges	0	0
Hammerstones	5	41.67
Metates	0	0
Manos	1	8.33
Polishing stones	0	0
Total number of tools	12	

Table 3.30. Raw material analysis from AZ U:13:28, Locus 151 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	911	
Basalt	482	52.91
Chert	3	0.33
Quartz	0	0
Quartzite	46	5.05
Micaceous schist	0	0
Obsidian	0	0
Rhyolite	0	0
Granite	27	2.96
Andesite	0	0
Sandstone	0	0
Felcite	1	0.11
Pumice	0	0
Others	352	38.64

Table 3.31. Technological analysis from AZ U:13:28, Locus 151 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	3	5.77
Secondary flakes	16	30.77
Tertiary flakes	29	55.77
Shatter	0	0
Cores	3	5.77
Ground stone	1	1.92
Total items	52	



KEY

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL
('MAXIMUM' INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	.00	5.00	15.00	45.00	135.00
MAXIMUM	5.00	15.00	45.00	135.00	280.00

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	1	2	3	4	5
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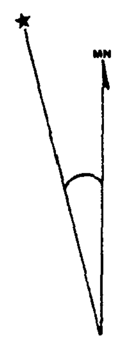

Figure 3.29. Symap representation of surface lithic distribution by weight, AZ U:13:29, Locus 151 (ASU)

U:13:13, AZ U:13:24, AZ U:13:28, AZ U:13:29 (Loci 148 and 150), AZ U:13:36, and AZ U:13:39. These sites share a high frequency of unifacially nibbled flakes. Cluster analysis of raw material attributes places the locus with sites where basalt dominates the assemblages but many other material types are present in small amounts.

3.8 AZ U:13:35 (ASU) (AZ U:13:59-ASM)

AZ U:13:35 was at one time identified as a Classic period sherd area. The site was not relocated, despite two intensive survey efforts. Apparently it was located in T 3 S, R 5 E, SW 1/4 of NE 1/4 of Section 14 on the first terrace of the Gila River. Vegetation at one time consisted of saltbush, creosote, bursage, and grasses.

3.8.1 Methodology

Despite two intensive survey efforts during RWCD II, this site could not be relocated. A very few artifacts were noted in the general site vicinity, but density was comparable to that over the whole project area. It is probable that the site was destroyed through previous collections by archaeologists and by vehicle traffic on the road that bisected the site (Rice et al. 1979:205).

3.8.2. Description

Wood (1972) describes this site as a Hohokam sherd area dating to the Classic period. Antieau (1977) reported a sherd scatter 100 m in diameter in the vicinity of this site that was reported to contain Classic period red-on-buff and red wares. During RWCD I, a sherd and lithic scatter of the same size was located and partially collected (Rice et al. 1979:52). A 5% sample of the surface area yielded 70 artifacts, which included a "number of plainwares, a Classic period red-on-buff sherd, and 12 lithics . . ." (Rice et al. 1979:205). Further, a 3 m x 3 m cluster of sherds was noted in the southeastern portion of the defined site area.

3.9 AZ U:13:36 (ASU) (AZ U:13:57-ASM)

AZ U:13:36 (ASU) appears to be a large trash deposit associated with a permanent Soho phase habitation. No features were found during investigation, but variation and frequencies in the artifact association as well as the extent of trash deposition indicate a degree of occupational permanence. AZ U:13:36 (ASU) is located on the edge of the second terrace 3.5 miles (5.6 km) north of the Gila River in an area scheduled for soil disposal. A segment of this site may have been previously destroyed by construction activities associated with an adjacent modern canal. The erosional pattern typical of the area characterizes the site; remnant surface patches are found next to deflated areas. The site is in T 3 S, R 5 E, NW 1/4 of SW 1/4 of Section 14.

3.9.1 Methodology

Site boundaries were defined during the mitigation program as 60 m north-south and 90 m east-west. The surface collection was initiated as a 100% collection, but as time ran short, it was altered to a checkerboard pattern, resulting in a much lower percentage (7%). Collection units were 6 m square. Field activities for the mitigation and testing programs are overviewed in Table 3.32. Two units from each site quadrant were randomly chosen for excavation (only seven were actually used). In addition, several units were placed judgmentally in undeflated portions of the site to test further for features. Figure 3.30 shows site topography and unit placement.

3.9.2 Description

AZ U:13:36 was first recorded by Wood (1972) and described then as a partially destroyed large Sacaton-Civano phase sherd area with structures. Rice et al. (1979) concluded that this site corresponds with Antieau's (1977) field number 155 after extensive survey in the area yielded only one site. Antieau's description does not fit well with the site as currently known. During 1978, test program personnel defined the site area as 60 m in diameter and collected 10% of this surface area. A total of 503 artifacts were recovered, 490 of which were sherds. Of these sherds, 93 were identified as Sedentary period red-on-buff, though only Classic period red-on-buff sherds were noted during the mitigation program. Rice et al. (1979:50, 199) suggest that the site may be either an intensively reoccupied seasonal camp or a small habitation. In the mitigation program field work, a moderately dense scatter of artifacts was encountered in deflated areas, and artifacts were recovered in low mounds. No features were identified.

Distributional studies indicate a heavy concentration of sherds and lithics in the northwest portion of the site. This corresponds to the probable midden area reported by Rice et al. (1979). Other concentrations of lithic materials are simply a few large pieces of material scattered

Table 3.32. Summary of field and laboratory investigations at AZ U:13:36 (ASU)

Category or Activity	Amount
Total site area:	4,800 m^2
RWCD Project, mitigation phase:	
Area collected	2,556 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	100.0%
Ceramic density	0.31 sherd/m^2
Lithic density	2.17 g/m^2
RWCD Project, test phase:	
Area collected	375 m^2
Ceramic density	4.97 g/m^2
Lithic density	0.09 item/m^2

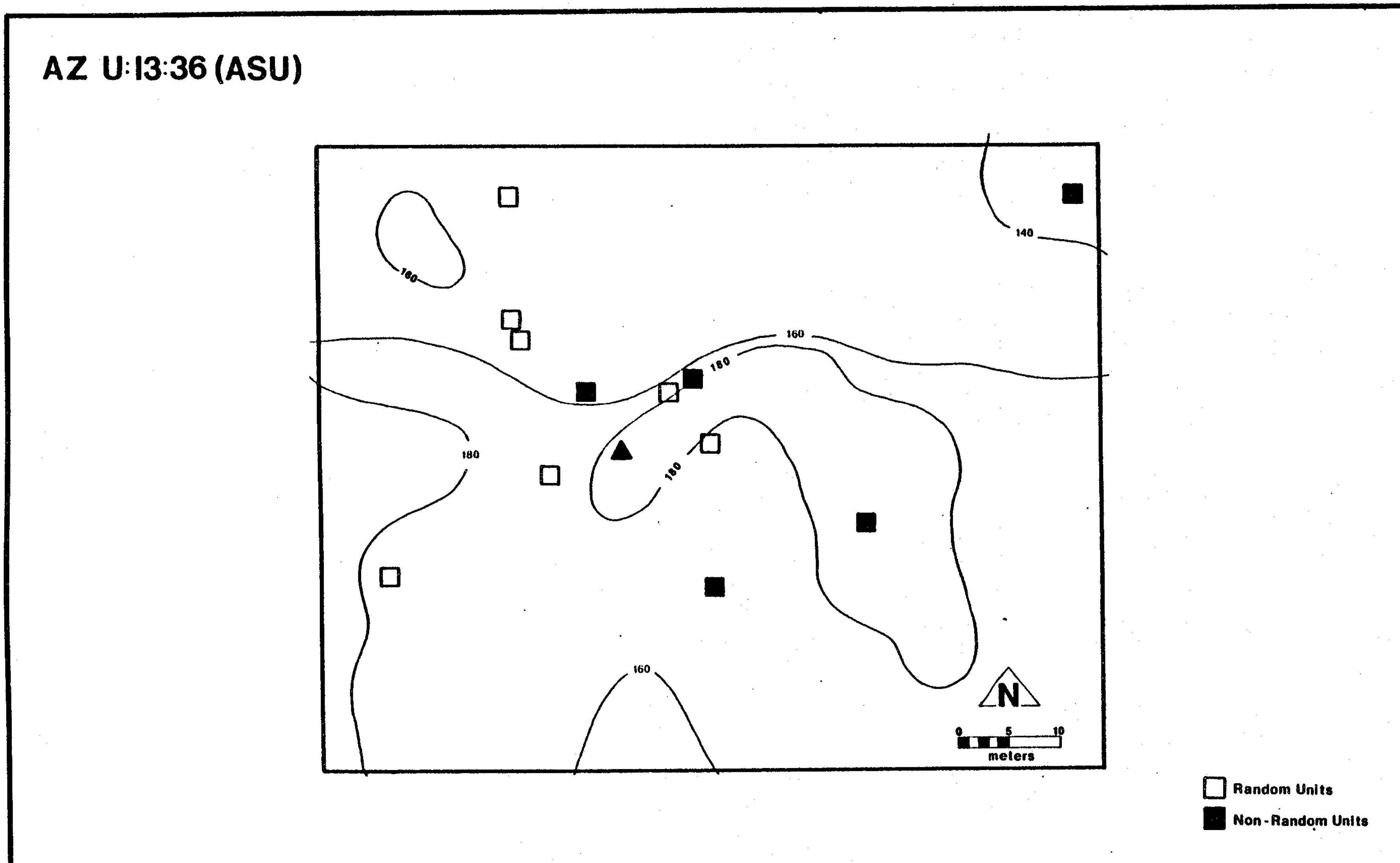

Figure 3.30. Map of AZ U:13:36

over the site. In addition, low-density artifact scatters are found to occur throughout the deflated portions of the site.

Lithic analysis recorded 35 tools. All lithic material came from the surface collections. Functional lithic analysis is overviewed in Table 3.33. No unusual functional types or distributions were noted. Raw material analysis, Table 3.34, revealed patterns similar to most other project sites; a high percentage of basalt is present, and many other locally occurring materials are present in low frequency. Schist is slightly more common at this site than many others, but the difference is too slight to lend itself to explanation.

Lithic technological analysis, shown in Table 3.35, characterizes this site as having a high ratio of secondary flakes as compared to primary or tertiary flakes or shatter. This characteristic is unique for sites on this project. A similar ratio of chipping debris on the site was obtained by Rice et al. (1979). Given that functional analysis of ceramics places this site with known habitations, the high frequency of secondary debris is unexpected and cannot be adequately explained given current data. This surface ratio of chipping debris holds for excavated material also. In all aspects, lithic material from the subsurface mirrors surface patterns.

Ceramic analysis from AZ U:13:36 is summarized in Table 3.36. From the defined site area, 789 sherds were collected from roughly 50% of the area. Of these 544 (69.2%) are plain ware, 97 (12.3%) red ware, and 148 (18.8%) buff ware. A cluster analysis performed on ceramic types places this site with others considered to be Classic period occupations. All buff-ware sherds that could be typed (17) were classified as Casa Grande Red-on-buff.

Seven hundred thirty-nine sherds could be identified as to function; 122 were classed as bowls, and 617 as jars. This yields a bowl/jar index of 19.77. Based on this index, cluster analysis grouped this site with others considered habitations.

The plain-ware and red-ware temper analysis for AZ U:13:36 indicates that micaceous schist temper dominates the assemblage. The high frequency of schist temper combined with the relatively common occurrence (17.6%) of schist among lithic material may suggest that ceramics with this temper may have been produced on the site.

When surface and subsurface ceramic patterns are compared, no significant differences are noted except in sheer

Table 3.33. Functional analysis of lithic artifacts from AZ U:13:36 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	16	45.71
Bifacial nibbling wear on edges	3	8.57
Polishing wear on edges	4	11.43
Hammerstones	3	8.57
Metates	0	0
Manos	6	17.14
Polishing stones	0	0
Others (gravers, drills, punches, worn projectile points, & misc.)	3	8.57
Total number of tools	35	

Table 3.34. Raw material analysis from AZ U:13:36, mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	5,550	
Basalt	2,206	39.75
Chert	10	0.18
Quartz	54	0.97
Quartzite	180	3.24
Micaceous schist	977	17.60
Obsidian	0	0
Rhyolite	34	0.61
Granite	5	0.09
Andesite	53	0.95
Sandstone	875	15.77
Felcite	27	0.49
Pumice	0	0
Others	1,129	20.34

Table 3.35. Technological analysis from AZ U:13:36, mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	17	4.84
Secondary flakes	125	35.61
Tertiary flakes	99	28.20
Shatter	99	28.20
Cores	6	1.71
Ground stone	5	1.42
Total items	351	

Table 3.36. Ceramic analysis for AZ U:13:36 (ASU)

Category	Raw Count	Percent of Total
<u>RWCD Project, mitigation phase</u>		
Total ceramics, by count	789	
Plain wares	544	69.95
Hohokam Red wares	97	12.29
Red-on-buff wares or buff wares	148	18.76
Polychrome wares	0	0
<u>RWCD Project, test phase</u>		
Total ceramics, by weight	1,863.0 g	
Plain wares	1,066.7 g	57.26
Hohokam Red wares	355.0 g	19.06
Red-on-buff wares	441.3 g	23.69
Polychrome wares	0	0
<u>Traditional types, mitigation phase</u>		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	0	0
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	0	0
Casa Grande Red-on-buff	17	100.0
Tonto Polychrome	0	0
Gila Polychrome	0	0

numbers. It is possible to state that both collections came from the same population. A distributional analysis of ceramic types and technological ceramic attributes was performed for this site, but no patterns were noted. Patterns could not be noted, probably for two reasons: (1) collection units were large, and (2) most of the area defined as site contained no or minimal artifacts.

The only exotic material to be found at this site is 8.7 g of shell. Of this, 2.0 g were found on the surface, the remainder from excavation. No further information is available on this shell.

3.10 AZ U:13:39 (ASU) (AZ U:13:120-ASM)

Just northeast of Gila Butte, the RWCD right-of-way crosses two series of stratified canals that attest to a long history of Hohokam irrigation in the area. The canals date from the Gila Butte to Soho phases. These irrigation channels were found to run roughly east-west in the project vicinity. Relative dating through ceramic typology indicates that the southern channels were constructed and used earliest, drawing water from the Gila River at an unknown location southeast of excavations. Originating at the Gila, the two channel systems are most likely one and the same up to 1,000 m southeast of the site, at which point they diverge. It is possible that the northern canal group postdates rather than coincides with the last use of the southern group.

Evidence of the ancient channels is visible on the surface as roughly parallel ridges that are remnants of backdirt accumulation from canal construction, modification, and channel clearing. The somewhat heavier vegetation along the channels resulting from the moisture-retaining characteristics of the canal fill make it possible to trace both canal series in aerial photographs 400 m east of the site and 1,070 m to the west. It was not possible to trace either canal series farther west of the site than is illustrated in Haury (1976:122), as the area north of Gila Butte is severely deflated. This leaves unanswered the question of whether these channels are related to canals at Snaketown. The canals are in T 3 S, R 5 E, NW 1/4 of SW 1/4 of Section 16.

3.10.1 Previous Work

The first archaeological description of this canal site is given by Haury (Gladwin et al. 1937:56). He notes that the known prehistoric canal north and east of Gila Butte may be connected to the canal systems excavated and described at

Snaketown. This suggestion was again stated by Haury (1976:122) based on his 1964-1965 work at Snaketown. Greenleaf and Vivian conducted tests in the area of AZ U:13:39 during the early 1970s (Greenleaf and Vivian 1971). In Test Trench D they located a canal of 60 cm depth and 2 m width that showed at least three depositional episodes. Later, Brooks and Vivian described two, and possibly three, canals in Test Trench E located near the western limits of the project right-of-way (Brooks and Vivian 1976:29). The earliest of the three canals, tentatively identified in profile, may date to the Snaketown phase.

In 1978, the site again underwent investigation. ASU conducted the testing program examination of the site (Rice et al. 1979). The testing program consisted of a 7% surface collection and the placement of 10 backhoe trenches each 8 m long. The surface collection produced 2,726 artifacts, summarized in Table 3.37. In trench profiles, a shallow canal with laminated fill was identified. The profiles also suggested that the elevated area of the site may be a remnant land surface created by erosion. Questions were raised in the ASU test program report concerning the Arizona State Museum interpretation of Stratum G as a Pioneer period canal. Therefore, RWCD mitigation work was directed toward relocation of the upper canal noted in previous studies, examination of the site stratigraphy to determine if other canals or cultural features are present, and the study of the origins of the sand ridge deposit on the site. These goals were pursued through surface collection, trenching, test unit excavation, and limited excavation of canal features.

3.10.2 Methodology

At the initiation of field work, an artifact scatter of density comparable to a large permanent habitation was noted. Using the previous season's data stake, a 72 m east-west and 82 m north-south grid was established for surface collection. The right-of-way boundaries and an arbitrary north point served as site limits as the artifact scatter continued east, north, and west of the grid. Mapping and trenching exceeded these collection area limits. The entire gridded surface was then collected using 2 m x 2 m units. A series of test units were randomly selected for excavation, resulting in twenty-two 1.5 m x 1.5 m units and two 2 m x 2 m units.

Twenty-six backhoe trenches were excavated using a judgmental placement scheme, shown in Figures 3.31 and 3.32. The northern trenches were used primarily to examine the subsurface beneath a vegetation line first noted in aerial

Table 3.37. Summary of field and laboratory investigations at AZ U:13:39 (ASU)

Category or Activity	Amount
Total site area:	5,904 m^2
RWCD Project, mitigation phase:	
Area collected	5,904 m^2
Percent area analyzed for ceramics	23.7%
Percent area analyzed for lithics	24.5%
Ceramic density	3.00 sherds/m^2
Lithic density	4.72 g/m^2
RWCD Project, test phase:	
Area collected	600 m^2
Ceramic density	13.01 g/m^2
Lithic density	0.08 item/m^2

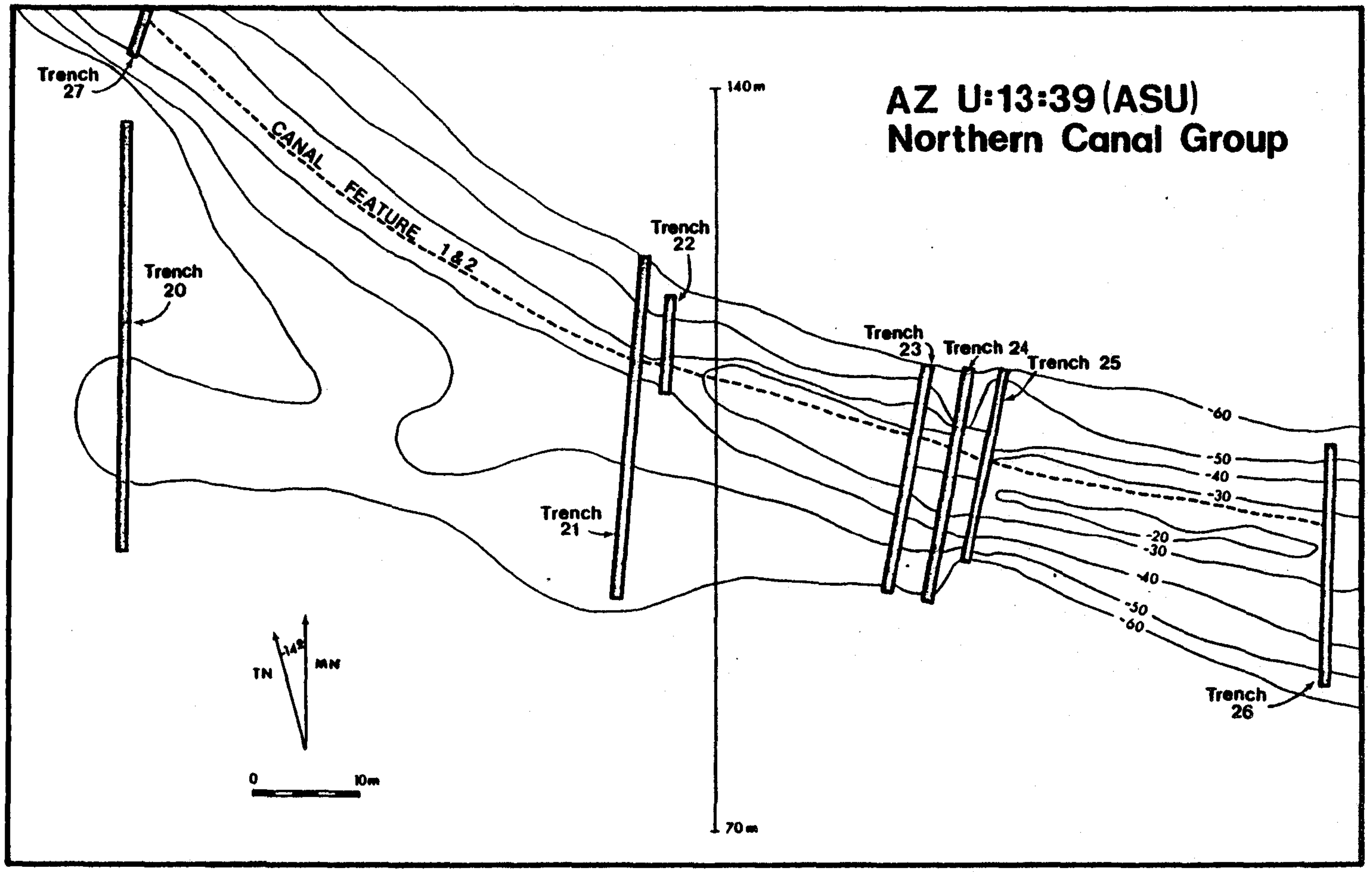

Figure 3.31. Map of the northern canal group and trench placement, AZ U:13:39 (ASU)

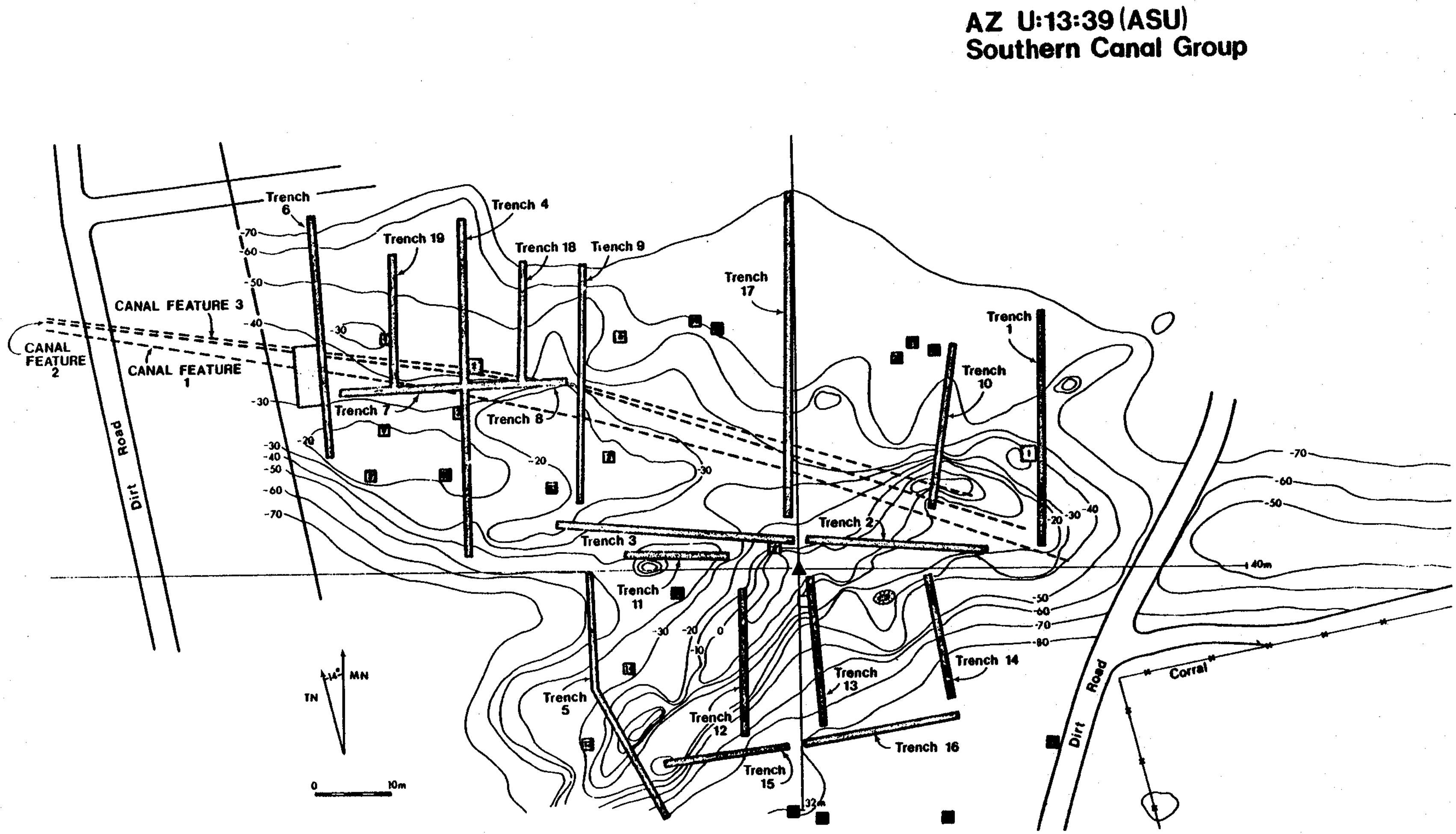

Figure 3.32. Map of the southern canal group and trench placement, AZ U:13:39 (ASU)

photographs. It was here that the northern canal sequence is located. At the end of the field season, a single hand-dug trench was used here to confirm the orientation of this canal sequence. Six trenches were placed in the sand ridge area, revealing three possible cultural episodes, including a tentatively identified Pioneer canal.

Excavation strategies were designed to define and expose the canals in their original dimensions. In the north group, balk walls between three of the test trenches were excavated to expose one canal in each of the balks, i.e., Balk 24-25 exposed Feature 1a and b; Balk 23-24, Feature 2ab. On the southern portion of the site, excavations were begun in a 3 m x 4 m test unit off Trench 6. To help define canal relationships, the excavations were stepped; this method was used efficiently at Snaketown and seemed practical here.

There is considerable difficulty with feature visibility in the natural deposits in this region. Haury reports ". . . several months' exposure to the elements led to identification of the Pioneer Period canal" (Haury 1976:125).

3.10.3 Surface Collection Results

Artifacts from 25% of the surface collection units were analyzed; the distributions of ceramics and lithics were plotted by Symap, Figures 3.33 and 3.34. As can be seen in these figures, artifact density is highest in the northern portion of the grid area, which corresponds to either side of the southern canal paths (the northern canal area was not surface collected). These deposits of material most likely are the result of activities associated with canal construction, subsequent cleaning, and secondary use of the canal banks as an activity area. The somewhat heavier artifact concentration on the north side of the channels may be due to the greater deflation of mounds on this side.

The surface material from this site differs noticeably from that of other project sites. All cluster analyses performed on artifact assemblages and technological attributes identified AZ U:13:39 as least similar to other sites. For three of these analyses, the site was grouped alone; in the fourth, it was classified with one other site that, due to low sample size, probably should not have been used in the cluster process. Unfortunately, AZ U:13:39 cannot be directly compared to the small canal site AZ U:13:41, since this site lacks a certainly associated artifact assemblage. It is also important to note that AZ U:13:39 is one of the longest lived sites at RWCD II, second only to AZ U:13:38 on the Santan bajada.

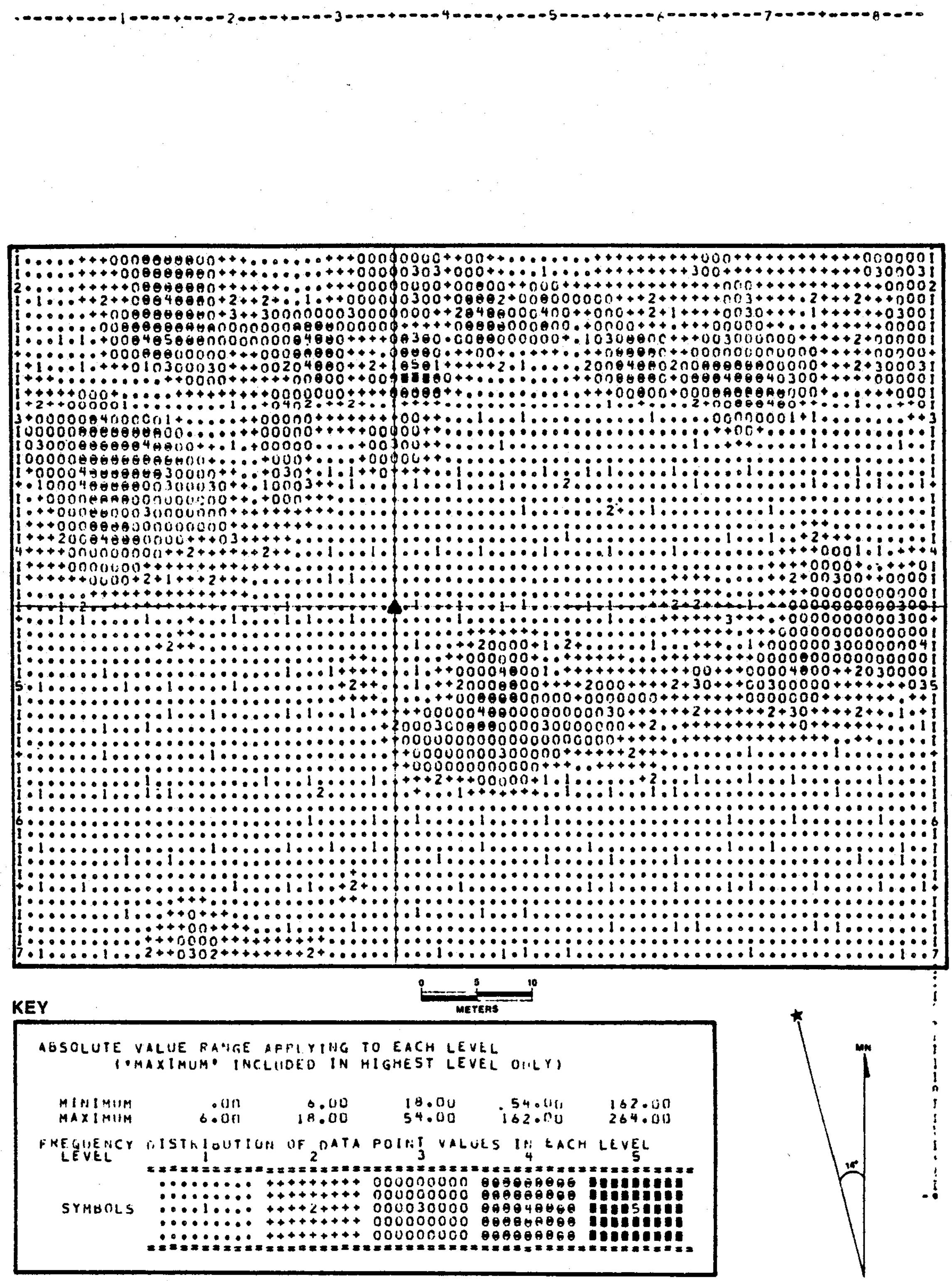

Figure 3.33. Symap representation of surface ceramic distribution, AZ U:13:39 (ASU), southern canal group

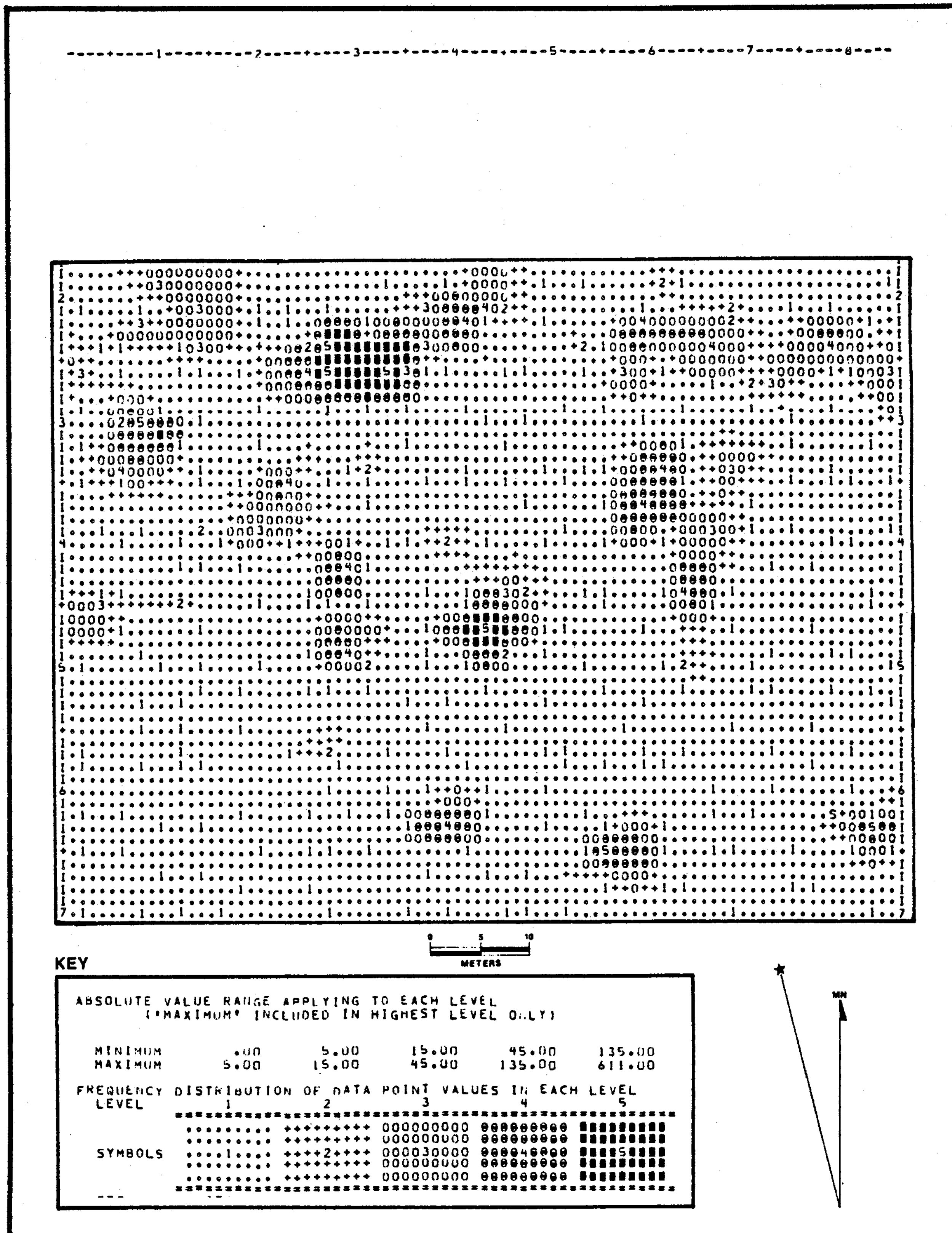

Figure 3.34. Symap representation of surface lithic distribution, AZ U:13:39 (ASU), southern canal group

An unusual characteristic of AZ U:13:39 is the high percentage of Hohokam Red-on-buff or buff-ware sherds present on the site (see Table 3.38). This high percentage is unusual not only for project sites but for Hohokam sites in general. Of the project sites, only AZ U:13:23 approaches this high buff-ware percentage (61.01%), and this site may have been a ceramic production area; a case can be made that AZ U:13:39 may have been a locus for ceramic production of Hohokam buff wares.

At this site there is also a high ratio of bowls to jars. One thousand sixty-eight bowls and 1,464 jars from the site surface produced a ratio of 72.95, much higher than for other project sites. It is hypothesized that this ratio is directly related to specialized activities that may have taken place at this site.

In the cluster analysis of functional lithic variables, AZ U:13:39 was grouped alone on the basis of high percentages of grinding tools and polished edges and a low percentage of unifacial nibbling; a high degree of tool diversity characterized the site lithic assemblage (see Tables 3.39 and 3.40). Technologically, the site is differentiated on the basis of a high percentage of shatter and ground stone.

Finally, the cluster analysis performed on percentages of raw material (Table 3.41) grouped AZ U:13:39 with AZ U:13:23 on the basis of high weight counts of micaceous schist. Most of the schist at AZ U:13:23 occurs as a single large piece, so its entry here may be inappropriate. Thus, it seems reasonable to assume that the raw material assemblage of AZ U:13:39 is not distinctive among RWCD project sites.

3.10.4 Test Unit Results

The test unit excavations add little information concerning the nature of the canals after trend data have been interpreted. Features other than canals were not located by test units. A comparison of units located directly in canal sediments or in canal banks to those units outside of the canal area show a marked difference in artifact density per cubic meter, as shown in Table 3.42.

Table 3.38. Ceramic analysis for AZ U:13:39 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	4,206	
Plain wares	1,293	30.74
Hohokam Red wares	7	0.17
Red-on-buff wares or buff wares	2,904	69.04
Polychrome wares	2	0.04
RWCD Project, test phase		
Total ceramics, by weight	7,807.0 g	
Plain wares	2,888.4 g	36.99
Hohokam Red wares	165.6 g	2.12
Red-on-buff wares	4,748.1 g	60.81
Polychrome wares	5.3 g	0.07
Traditional types, mitigation phase		
Snaketown Red-on-buff	0	0
Gila Butte Red-on-buff	0	0
Santa Cruz Red-on-buff	0	0
Sacaton Red-on-buff	0	0
Casa Grande Red-on-buff	0	0
Tonto Polychrome	0	0
Gila Polychrome	0	0

Table 3.39. Functional analysis of lithic artifacts from AZ U:13:39 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone artifacts		
Unifacial nibbling wear on edges	13	26.00
Bifacial nibbling wear on edges	1	2.00
Polishing wear on edges	8	16.00
Hammerstones	7	14.00
Metates	10	20.00
Manos	15	10.00
Polishing stones	2	4.00
Others (gravers, drills, punches, worn projectile points, & misc.)	4	8.00
Total number of tools	50	

Table 3.40. Technological analysis from AZ U:13:39, mitigation phase

Category	Raw Counts	Percent of Total
Primary flakes	5	2.45
Secondary flakes	40	19.61
Tertiary flakes	166	32.35
Shatter	66	32.35
Cores	2	0.98
Ground stone	25	12.24
Total items	204	

Table 3.41. Raw material analysis from AZ U:13:39, (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	6,834	
Basalt	2,011	29.43
Chert	26	0.38
Quartz	33	0.489
Quartzite	176	2.57
Micaceous schist	3,522	51.54
Obsidian	1	0.01
Rhyolite	230	3.37
Granite	299	4.37
Andesite	108	1.58
Sandstone	37	0.54
Felcite	105	1.54
Pumice	0	0
Others	311	4.55

Table 3.42. Number of ceramics and grams of lithics per cubic meter of fill in samples of test units within and outside canal features

Category	Canal Area (3 units)	Outside Canal Area (5 units)
Number of ceramics per cubic meter		
Mean	307.5	19.8
Standard deviation	368.0	15.6
Lithics in grams per cubic meter		
Mean	1,412.5	51.1
Standard deviation	1,259.6	78.6

3.10.5 Trenching Results

A total of 646.8 m of trench walls were profiled at AZ U:13:39. The profiles reveal both an interesting natural stratigraphy and canal sequences. Since this site is situated on the first, rather than the second, river terrace, as are other project sites, the trenches here reveal a lower portion of the natural stratigraphy not visible in other areas. The upper soil is a light tan unconsolidated gray sandy silt that overlies a compacted tan silty sand with a light caliche development. Below this level, the strata are variable, as several soils are noted appearing throughout the area. Among these soils are several clay types, including a dense, subangular reddish clay, a dark brown clay, and a fine white clay. Below the clay deposits is a very fine beige silt.

3.10.6 North Canal Results

The northern canals are visible in trenches 21, 22, 23, 24, 25, 26, and 27. Two distinct canals have been identified: the upper canal, labeled Feature 1, and the lower, Feature 2. The group is shown in Plate 3.3.

3.10.6.1 Feature 1

In the upper canal, three filling episodes are noted based on clearly laminated horizons of sands and silts. The uppermost is termed a, the middle b, and the lowest c. Only Features 1ab and c were clearly identified during excavation. All of the silting episodes are of similar widths, ranging from 3.5 m wide at the top to 1.0 m across at the base. Feature c has a central channel that is ca. 130 cm below present surface. The base of Feature 1ab lies 70 cm below the surface. The fill of 1ab is distinct in that its light gray-brown laminated sands and silts were bedded and contained some artifactual material. The variation in soil deposits within and between canal episodes is uncertain in origin, although the variation may be due to canal modification upstream; for example, changes of intake location or Gila River course changes. A total of 54 sherds were recovered from Feature 1 from the excavation of balks. These are listed below.

Feature	Trench 23-24	Trench 24-25
1a	13 plain	14 plain
	9 buff	12 buff
1ab	-	2 plain
		1 buff
1c		2 plain
		1 buff

Plate 3.3. Southern canal group (top of photo) and northern canal group (bottom of photo) of AZ U:13:39 (ASU).

Plate 3.4. Feature 1 of the southern canal group, AZ U:13:39 (ASU), showing the presence of a small channel at the base

Twelve of the buffware sherds from Balk 24-25 retained design elements that allowed typing. A single Casa Grande Red-on-buff sherd was found at 35 cm in depth on what may have been a canal bank. Eight Sacaton Red-on-buff sherds were found in canal fill, five associated with Feature 1a. In addition, one Santa Cruz Red-on-buff and two Sacaton Red-on-buff sherds were recovered from Feature 1a between Trenches 23 and 24.

3.10.6.2 Feature 2

The lower canal, Feature 2, is 170-180 cm below present surface and is excavated into the natural packed silt of light color. It has a channel 1.5 m wide. It has been suggested that such a narrow channel could be useful in reducing evaporation when water is being transported long distances (Wilcox, personal communication). It was possible to note two major redigging episodes within this feature. The lowest, Feature 2a, is about 30 cm deep and has a compacted sand and clay fill flecked with charcoal. Above Feature 2a is feature 2, the second phase of canal use. Fill here consists of reddish brown coarse angular clay flecked with caliche. The upper banks of this canal series were difficult to define due to the similarity of natural and cultural soils. The apparent best guide to the bank presence is a slight difference in texture and compactness between features and surrounding soils.

Between 20 and 53 cm below surface was noted the remains of a campfire, apparently dug slightly into the canal fill. Fire remains consisted of several large pieces of charcol in an ashy matrix also containing an orange burned soil. The fire area measures 56 cm from north to south and 70 cm east-west. The feature was not C-14 dated due to its highly questionable assocition with the canal.

The southern edge and base of Feature 2a were exposed as a very fine grayish silt. Clay lenses, generally absent from the upper fill, were seen to line the base of the channel and follow the channel cut up the side walls. In the middle portion of Feature 2b appears some slumping of the gray silt from the canal wall into the channel. In this area, larger sand particles make up the fill, apparently due to water velocity slowing in the slump region.

Only nine sherds were associated with northern canal Feature 2, all from the upper channel 2a. Four of these are buff ware, the remainder plain ware. One decorated sherd, Casa Grande Red-on-buff, was found in Feature 2a hill.

3.10.6.3. Chronology--Northern Canals

The only means presently available for the chronological placement of these canals is through associated ceramics. Problems peculiar to dating canal features on this basis include: (1) sherds from early periods can readily enter canal fill, and (2) redigging and cleaning activities tend to mix old and young deposits. Also, sherd numbers are extremely low for adequate temporal placement here. As the older sherds could have been included in younger canal fill, the youngest ceramics, Casa Grande Red-on-buff, could be used to date canal use. This type occurs as deep as Feature 2a, indicating that this feature and those above it were in use perhaps as early as A.D. 1180. Since the lowermost feature, 2b, contained no ceramics in the excavated area, it cannot be dated except by stratigraphic position.

3.10.7 Southern Canal Results

The southern canal group (Plate 3.3) is more complex than the northern roup. Three major canals are present, all differing in size, shape, and fill type.

3.10.7.1. Feature 1

Feature 1, shown in Plate 3.4, is the uppermost canal. It is a wide, shallow channel that is directly above the other two channels in the western portion of the site. As one moves toward the east, Feature 1 diverges from the others, moving southward. The feature measures 3 m in width and 50 cm in depth at maximum. The channel fill is distinct and consists of alternating laminations of gray sandy silt and sandy clay. Feature 1 seems to show only one major episode of use, as indicated by stratigraphy, but of interest is the presence of a double channel at the canal base. This may be the result of natural channel erosion, as it seems to wander across the canal base.

3.10.7.2 Feature 2

The fill of Feature 2 is in sharp contrast to that of Feature 3, into which it intrudes. Feature 2 is filled with light gray bedded sand and silts. The feature measures 3.5 m at the top and 1.0 m at the base. It is approximately 1.2 m below the surface at maximum. There appear to be two periods of use that are separated by 35 cm of fill, perhaps indicating an abandonment of several years before reuse. Both episodes of use contain numerous fill artifacts. Sherds make up the majority, but shell, lithics, and ground stone are also present.

3.10.7.3. Feature 3

Feature 3 is the largest and deepest channel in the southern canal group, measuring 10 to 14 m across the top and 2.5 to 3.5 m wide at the base. Depth is approximately 1.5 m. Even after several months of exposure, the sides of this canal were extremely difficult to identify in trench profiles. However, the central channel was easily noted in profile, indicated by a red-brown blocky clay fill that intrudes into natural gray silt. Where the natural soil is clay, the canal was difficult to identify, but presence-absence of artifactual material was used to define boundaries.

Feature 3 may have had two major episodes of use, but a fine distinction in fill noted in profile could not be found in hand excavation; thus, the two episodes remain a hypothesis. An interesting aspect of Feature 3 is the presence of a small central channel 30 cm wide and deep. The small channel is filled with red-brown clay mixed with coarse sand and dark brown silt. The channel appears sporadically and may represent a redigging or channel-clearing event. It is also possible that this small channel is the remains of an earlier canal destroyed by construction of Feature 3.

3.10.7.4. Chronology

The following discussion is based on the decorated ceramics recovered from canal excavation. At the bottom of the canal sequence, the bottom level of Feature 3, Snaketown phase ceramics were recovered. According to the Hohokam chronology established by Haury (1976), this type was produced between A.D. 300 and 500. As no other types were found in the lowest levels of Feature 3, the channel may date no later than the Snaketown phase. This phase assignment corresponds to that given by ASM (Brooks and Vivian 1976) for Deposit G, the lower canal found during that work. The level above the lowest level contained two Snaketown and two Gila Butte sherds, dated A.D. 500 to 700. On the basis of datable sherds, then, Feature 3 may have first been dug in the Snaketown phase and seen continued use until the Gila Butte phase.

Seven Gila Butte, 17 Santa Cruz, and 7 Sacaton sherds were noted at the base of Feature 2. Subsequent levels produced predominantly Santa Cruz sherds. Two interpretations can be made of this ceramic association. The first is that Feature 2 was in use from the Gila Butte phase, A.D. 500-700, through the Santa Cruz, A.D. 700-900, and into the Sacaton phase, A.D. 900-1100. This interpretation assumes that the high percentage of Santa Cruz ceramics signifies a major epoch of canal use. The second interpretation assumes that the frequency of sherds deposited corresponds either to the number of ceramic types being produced at a given time or to more frequent use of the canal as a dumping area during a specific period. Thus, it is possible that the production of ceramics increased at nearby sites during the Santa Cruz phase or more trash deposition at the canals took place. However, in the upper portion of Feature 2, ceramic types remain the same but Sacaton Red-on-buff sherds have the greatest frequency. Given this sequence, the lower portion of Feature 2 was most likely used from the late Santa Cruz phase into the Sacaton phase, while the upper portion dates to the Sacaton phase.

Although the fill of Feature 1 contains Snaketown, Gila Butte, Santa Cruz, and Sacaton phase ceramics, only the latter were found on the canal wall. Assuming the first three types are a result of wash off of banks, the feature is assigned to the Sacaton phase. Its use may have extended into the Classic period; however, because of the lack of Classic period surface material, this seems doubtful.

The canal sequences at AZ U:13:39 indicate use of irrigation in this area by the Hohokam at least as early as the Gila Butte phase, A.D. 500. This sequence begins in the southern canal grouping and shows extensive modificaiton through time. The life-span of the southern canals corresponds closely to the occupation period of the Gila Butte site (AZ U:13:8-ASM) and that of the main portion of Snaketown (AZ U:13:1-ASU & ASM). It should be noted that the southern canal route appears to have been abandoned at roughly the same period given for the abandonment of both of the above sites, circa A.D. 1100. The northern canal group appears to have been in use at the end of the Sacaton phase and into the Soho phase. It is hypothesized that the abandonment of the southern canal group and the excavation of a new canal line to the north may have been the result of a settlement pattern shift in this portion of the Gila River Valley at the end of the Sedentary period.

3.10.7.5 Relation to Snaketown Canals

In his extensive reports, Dr. Emil Haury (Gladwin et al. 1937; Haury 1976) suggests two possible upstream courses for the Snaketown canals. One would have taken water from the Gila River at the southwest base of Gila Butte, Diversion Point 1 (Figure 8.3, Haury 1976:122). From here water would flow directly to Snaketown. The other route supposes that the stub of ancient canals east of Gila Butte, AZ U:13:39 (ASU), connected to the Snaketown system and drew water from the southeast at Diversion Point 2 (Figure 8.3, Haury 1976:122). By this route water would travel about 10 miles (16.1 km) from the Gila River to the Snaketown fields.

A canal of this length was considered by Haury (Gladwin et al. 1937:52) to be short in comparison to other Hohokam canals in the Salt and Gila River Valleys.

The cultural implications of either route are several. If water was being passed from the eastern side of Gila Butte through the AZ U:13:39 canals to Snaketown, then both the Snaketown occupants and those at the Gila Butte site (AZ U:13:8-ASM) shared the water. In this case management, construction, and cleaning of the canal system would be the concern of both villages, posing interesting questions about the social and political relationship of these sites (see, for instance, Upham and Rice 1980; Upham et al. 1980). If water were drawn from Diverison Point 1 on the west side of Gila Butte, these matters would be less pressing; each village could act independently to manage its own irrigation system. Unfortunately, Dr. Haury was unable to pinpoint the source of the Snaketown canals and we were unable to determine if the path of the AZ U:13:39 canals proceeds past Gila Butte. According to Dr. Haury (1976:123), contour configurations are such that a canal could be built that would carry water from AZ U:13:39 north of Gila Butte and onto the upper terrace at Snaketown. In fact, there are several similarities between the Snaketown canals and the southern canal series at AZ U:13:39 that tend to support the theory that they are a single system.

The following arguments consider the similarities of the dominant ceramic types found within the major canal features of Snaketown and Gila Butte and, to a lesser degree, the shape of canal features. It is assumed here that the ceramic types place a particular canal use episode in time; the problems with this dating technique have been addressed above.

Two major canals excavated at AZ U:13:39--Features 2 and 3 of the southern group--appear to have been utilized during the same phases as Canals 1 and 2 at Snaketown. Feature 3 is the oldest of the canals at AZ U:13:39, dating as early as the Snaketown phase (see above). At Snaketown, the oldest canal is sometimes referred to as the Pioneer period canal or as Canal 1. No single phase is given by Haury for the use of the canal, as ceramics from all the Pioneer period phases--Vahki, Estrella, Sweetwater, and Snaketown--were recovered. In the upper portions of the canal, Colonial and Sedentary period sherds were also encountered. It may be inferred from Haury's writing that he believes this lower canal to represent an irrigation channel that was utilized prior to and including the Snaketown Phase (Haury 1976:134). The Pioneer period canal at Snaketown is extremely large; although its upper portion has been eroded, its maximum width is given as 6.5 m and its shape described as wide and shallow. Feature 3 at AZ U:13:39 was also an extremely wide feature, measuring approximately 10-14 m across. Although wide, it could not be described as shallow, but it also appears to be uneroded, as is Canal 1 at Snaketown. Hence, a very broad irrigation ditch was used at least as early as the Snaketown phase at AZ U:13:39, and another was in use as late as the Snaketown phase at Snaketown. Canal 2, the next youngest canal at Snaketown, exhibited at least six reuse episodes, which are said to have been utilized probably from the Gila Butte phase through the Santa Cruz phase of the Colonial period (Haury 1976:139). The dating of both the oldest (a) and the two youngest (c and f) silting episodes are based on logic and on some conjecture, as no ceramic samples were recovered from these. The middle filling sequence, Channels b, c, and d, contain predominantly Santa Cruz phase ceramics, although a fair percentage of Sacaton Red-on-buff sherds were located in Silt Unit c. Although Haury states that the use of Canal 2f was "most likely Santa Cruz Phase . . ." (Haury 1976:139), the appearance of Sacaton ceramics in 2c presents the possibility that canal use may have continued into the Sacaton phase.

Figure 8.22(a) in Haury (1976:133) indicates the maximum width of Snaketown Canal 2 as approximately 1.5 m, considerably smaller than the older Snaketown Canal 1 or Feature 3 at AZ U:13:39. The use of Feature 2 at AZ U:13:39 has been placed in both the Santa Cruz and the Sacaton phases (see above). Unlike the Snaketown Canal 2, only two use episodes could be seen in Feature 2 at AZ U:13:39. The maximum width of the laminated fill in this feature as seen in Figure 3.32 of this report is 2.1 m. Its channel is rather rounded and constricted in shape, similar to that shown in Figure 8.22(e) in Haury (1976:133) for Snaketown Canal 2, which apparently is a profile of the canal at a point at which the youngest channel (f) has obliterated most or all of the evidence of the earlier channels. Therefore, at Snaketown an irrigation channel that is similar in width and shape to the Santa Cruz-Sacaton phase canal identified at AZ U:13:39 was in use perhaps as early as Gila Butte phase and possibly as late as the Sacaton phase. At both sites these later canals are considerably different in size and shape from the earlier canal features.

No attempt has been made here to correlate any of the remaining canals from either site. The shape of Feature 1 does not coincide closely with that of Canal 3 at Snaketown, although both date to the Santa Cruz-Sacaton phases. The northern canal series at AZ U:13:39 has been dated on the basis of only a few ceramics to the early Classic period, while Canals 4 and 5 at Snaketown are tenuously dated as Late classic, Civano phase.

3.11 AZ U:13:40 (ASU)

AZ U:13:40 (ASU) is a limited-activity site of uncertain age. No mounds or features were recorded during excavation. Because of similarities in the ceramic assemblage to AZ U:13:23, it is tentatively identified as a ceramic production site. No lithic material was recovered from the site. AZ U:13:40 is located on the western base of the bajadas leading to the Santan Mountains. It is in T 3 S, R 6 E, NW 1/4 of NW 1/4 of Section 4.

3.11.1 Methodology

The site was relocated during RWCD II by virtue of the still visible test unit and stake remaining from ASU testing. Three additional units were selected for excavation; each was placed where a sherd was found on the surface. At 8 to 10 cm in depth in all units, sterile bajada soil was encountered. No further work was conducted. In all, 37 sherds were recovered.

3.11.2 Description

AZ U:13:40, a small sherd scatter, was first recorded by Wood (1972) as a large Hohokam sherd area dating from the Sacaton to Civano phases. During the RWCD testing program, the site was described as 20 m in diameter, and a complete surface collection was made in a 400 m^2 area (Rice et al. 1979:57, 200). At this time, 925 sherds were recovered, all but 12 from a single 10 x 10 m area. One test unit that was excavated revealed very shallow soil deposits, and the suggestion was made that the cultural material was surficial in nature. Field investigations are summarized in Table 3.43.

3.11.3 Intrasite Patterning

No intrasite pattern searches were conducted for this site because of the paucity of artifacts. Ceramic analysis is summarized in Table 3.44. Traditional types could not be identified.

The lack of lithic material at this site is unique to the project. From earlier descriptions of this site, the site may have characteristics in common with the hypothesized ceramic production locus of AZ U:13:23 (ASU). These characteristics include: (1) a dense accumulation of sherds, (2) a high percenage of a single ceramic type or ware, and (3) relative absence of lithic material. It might be

Table 3.43. Summary of field and laboratory investigations at AZ U:13:40 (ASU)

Category or Activity	Amount
Total site area:	314 m^2
RWCD Project, mitigation phase:	
Area collected	Only remaining isolated sherds collected from site location
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	No lithics recovered
Ceramic density	-
Lithic density	-
RWCD Project, test phase:	
Area collected	400 m^2
Ceramic density	12.49 g/m^2
Lithic density	No lithics recovered

Table 3.44. Ceramic analysis for AZ U:13:40 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	37	100.00
Plain wares	34	91.89
Hohokam Red wares	0	0
Red-on-buff wares or buff wares	3	8.11
Polychrome wares	0	0
RWCD Project, test phase		
Total ceramics, by count	925	100.00
Plain wares	921	99.57
Hohokam Red wares	0	0
Red-on-buff wares	4	0.43
Polychrome wares	0	0

hypothesized that if a site were the location of ceramic production, a particular type being produced here would dominate the assemblage, while small percentages of other types were brought to the site as eating and drinking vessels. Rice et al. (1979:154) show that of 1,996 g of plain-ware ceramics recovered from the site, 98% are sand tempered. The only other site approaching this temper distribution of tempering material in plain-ware ceramics is AZ U:13:23.

The site has been characterized previously as ". . . a pile of sherds, apparently from several different vessels" (Rafferty, personal communication). It is possible, then, that this site represents a pot bust of a number of vessels in transport.

3.12 AZ U:13:41 (ASU) (AZ U:13:64-ASM)

AZ U:13:41 is a small canal segment that cannot be dated due to a lack of clearly associated artifacts. The site, in T 3 S, R 5 E, NW 1/4 of SW 1/4 of Section 14 and SE 1/4 of NE 1/4 of Section 15, is in a vegetation zone characterized by saltbush and mesquite.

3.12.1 Methodology

The canal site was relocated by the eroded ASM backhoe trench placement. No surface collections were made. Test trenches were cut across the canal in two places.

3.12.2 Description

This canal segment parallels a nearby modern canal. On the ground, it is visible as two parallel lines of vegetation centering a narrow depression. Arizona State Museum first recorded and tested the feature (Brooks and Vivian 1976). Researchers were able to trace the canal on the ground a distance of 1,750 m. ASM's trench ". . . revealed the presence of a shallow canal 1.9 meters in maximum width cut into local alluvial soil . . ." (Brooks and Vivian 1976:16). The fill was a homogeneous gray sand. The mitigation work by ASU confirms these findings.

The canal was encountered 10 cm below the modern surface and, at maximum, is only 40 cm in depth (see Figure 3.35). It is possible that recent surface erosion is responsible for the shallowness of the feature. The canal was excavated into the original ground surface of sandy clay soil. Within this stratum, a small amount of plastic was

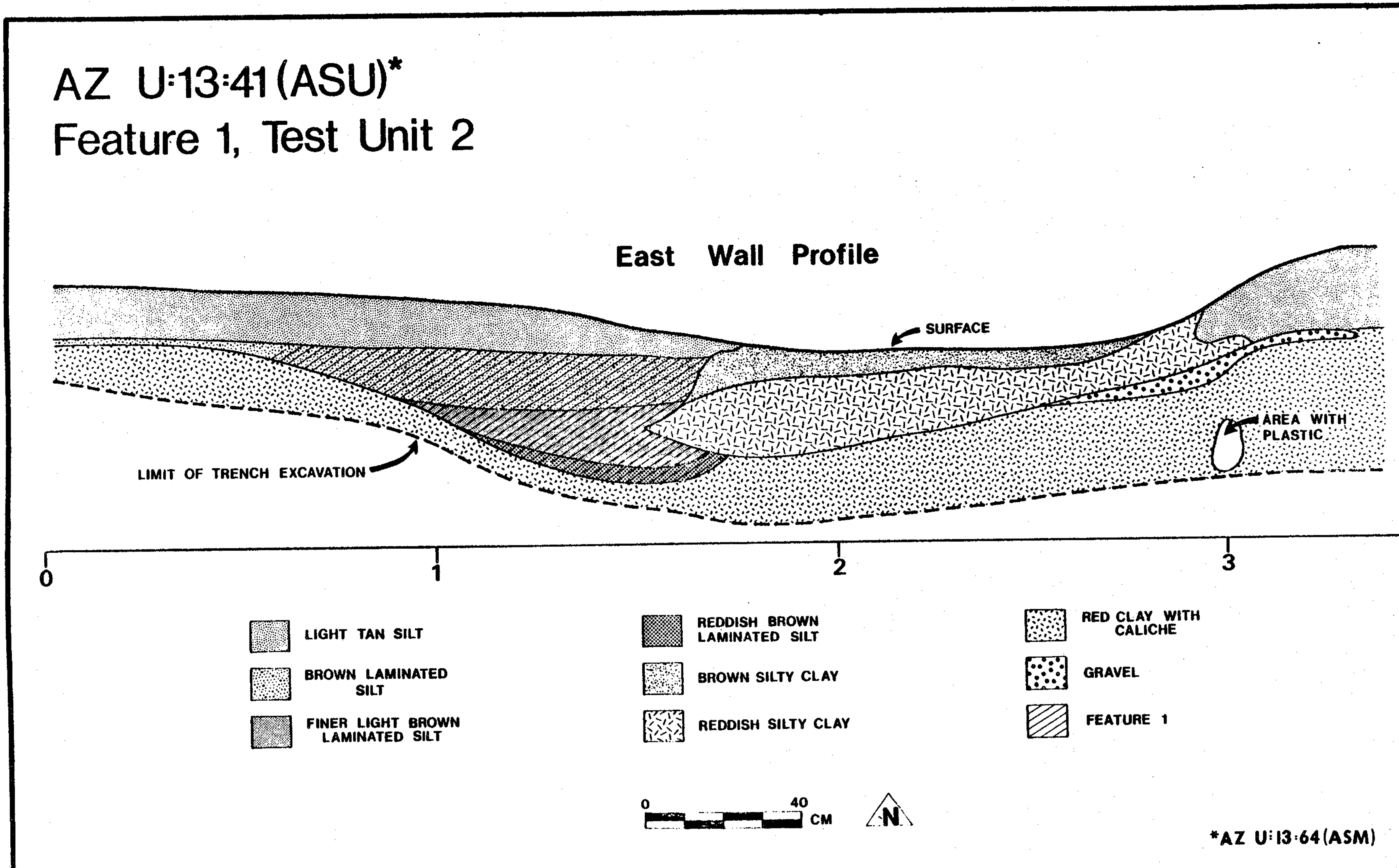

Figure 3.35. East wall profile at minor canal segment, AZ U:13:41 (ASU)

recorded at 35 cm below the surface in Trench 2. It is unclear if the plastic predates or coincides with the building of the canal. Root disturbance was noted in the canal but could not account for the position of the plastic.

Canal fill was a brown to reddish brown silty clay in which laminations could be seen in the profile of Trench 2. Three grades of laminations appeared in the profile: the upper layer of more coarse brown laminations, which contained some fine gravel; the lighter brown middle laminations, which were finer than those above and contained some sand particles; and the lower, most finely laminated, soils, which were reddish brown silts lacking inclusions. At the south end of the canal in Trench 2 a layer of small gravels underlay soil that had slumped into the feature. This probably occurred before the final use of the canal, since it intrudes at the middle of the lamination sequence. Unfortunately, the white plastic was the only cultural material to be found at either test trench. Pollen samples were taken in each trench but were not processed.

Pima and Hohokam sherds have been noted in the area but cannot be clearly associated with the site. There is a linear distribution of nearly prehistoric (Classic period) and historic sites. This distribution may have been determined by the presence of this canal. If that is the case, the site may have been a part of a local irrigation system at some point in the last 700 years.

3.13 AZ U:10:16 (ASU)

AZ U:10:16 (ASU) is located in T 2 S, R 3 E, NE 1/4 of NE 1/4 of Section 25. The site is a Classic period occupation and may be a permanent habitation. It is located in a flat area close to the original channel of Queen Creek. A similar sherd and lithic scatter, AZ U:10:15 (ASU), is located within 1/4 mile of the site. The site area is characterized by shallow soil deposition and vegetation consisting of creosote bush, mesquite, and grasses. Recent disturbance in the form of trash dumping and vehicle tracks are visible in the site area, as shown in Figure 3.36. A number of archaeologists have visited the site in the past, and their collection and testing activities have also affected the site.

3.13.1 Methodology

During the RWCD I testing phase (Rice et al. 1979), a 60 m x 60 m area was staked and a 5.0% surface collection was performed, producing 49 artifacts; these are summarized

AZ U:10:16 (ASU)

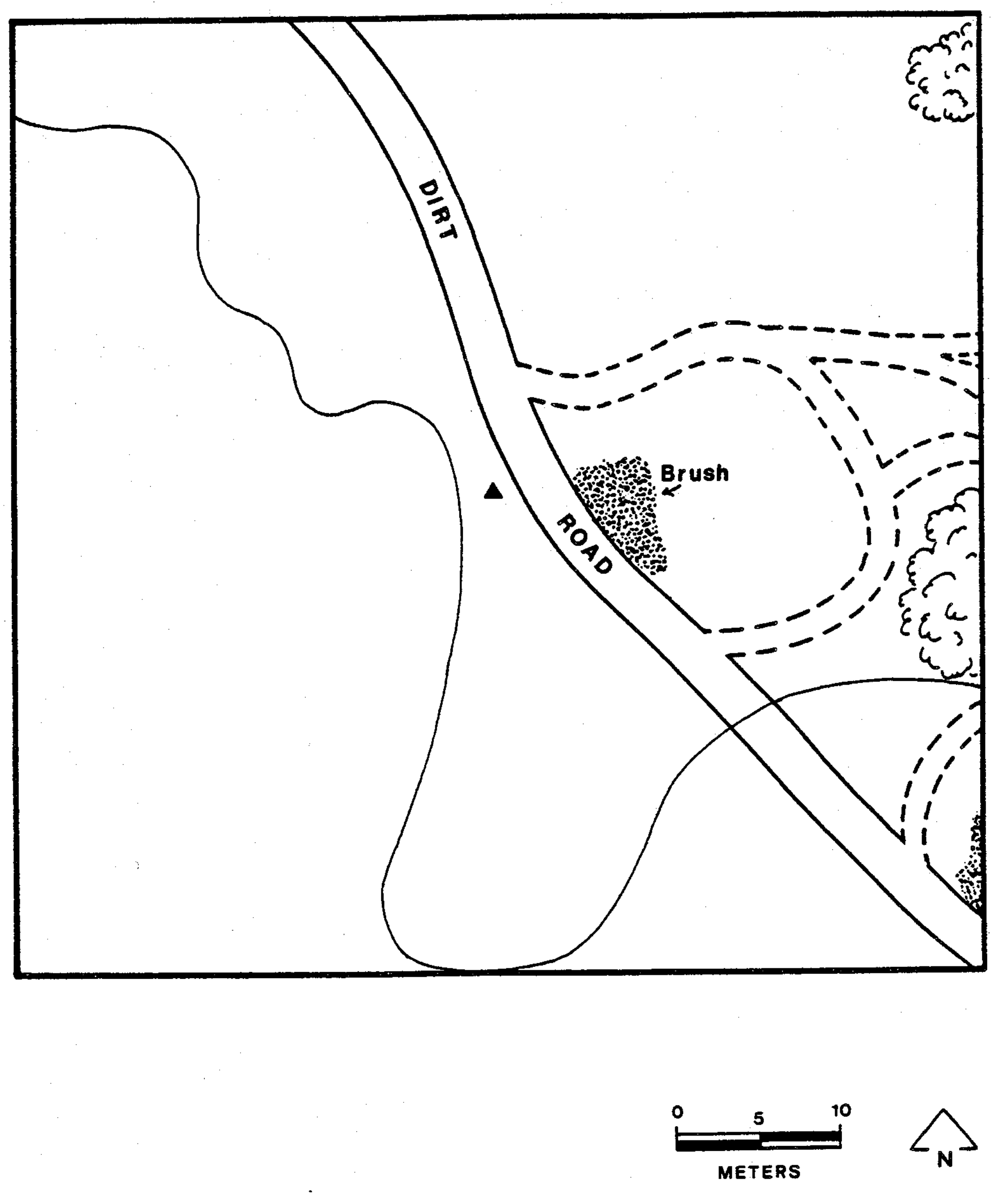

Figure 3.36. Map of topographic character of AZ U:10:16 (ASU)

in Table 3.45. Two 1 m x 1 m test units revealed no major subsurface deposits and indicated that the site consisted of surficial remains.

Based on the RWCD I findings, the RWCD II mitigation of site impacts was confined to a 100% surface collection of a 60 m x 60 m area using 6 m x 6 m units. Only 2 lithics and 175 sherds were recovered using this procedure. The low density of lithic material did not permit distributional analysis. The units from which artifacts were recovered are shown in Figure 3.36. All of the material from the site was analyzed, and resulting classifications are summarized in Tables 3.46, 3.47, 3.48, and 3.49.

3.13.2. Description

Rodgers (1975) reported that this site was first recorded by Ruppé in 1966. Rodgers described the site as a 75 m north-south by 65 m east-west artifact scatter that contains some Classic period red ware and Sacaton Red-on-buff ceramics. Rosenberg (1976) noted the site and referred to it as a possible small habitation site with dimensions similar to those given by Rodgers (1975). She noted that three concentrations of artifacts were present. An undated sketch map located in the ASU site files depicts three components of the site and is accompanied by a list of items collected from the components. Thirteen of the collected sherds from one area were reported as Mexican imported glazed red sherds that had been turned on a potter's wheel. A second area yielded seven Sacaton Red-on-buff sherds. Overall, the site produced 16 Salt Red, 16 Gila Plain, 4 polished brown ware, and 1 red-on-buff sherds. Lithics are reported but not described. Some previous test pits were noted.

No dates were obtained from this site. The ceramic analysis and previous field work indicate a fair percentage of red ware, indicating a possible Classic period occupation of the site.

3.13.3 Intrasite Patterning

Too few lithics were recovered from AZ U:10:16 for distributional analysis. Those recovered consisted solely of basalt and sandstone. The ceramics from the mitigation and previous field work reveal that a fair percentage of red ware was present at the site, seeming to indicate a Classic period occupation of the site. No buff-ware ceramics retained design elements; therefore, no more specific data can be assigned. The cluster analysis performed on the

Table 3.45. Summary of field and laboratory investigations at AZ U:10:16 (ASU)

Category or Activity	Amount
Total site area:	3,600 m^2
RWCD Project, mitigation phase:	
Area collected	3,600 m^2
Percent area analyzed for ceramics	100.0%
Percent area analyzed for lithics	100.0%
Ceramic density	0.05 sherd/m^2
Lithic density	0.04 g/m^2
RWCD Project, test phase:	
Area collected	168 m^2
Ceramic density	1.29 g/m^2
Lithic density	0.02 items/m^2

Table 3.46. Ceramic analysis for AZ U:10:16 (ASU)

Category	Raw Count	Percent of Total
RWCD Project, mitigation phase		
Total ceramics, by count	175	
Plain wares	112	64.00
Hohokam Red wares	46	26.28
Red-on-buff wares or buff wares	17	9.71
Polychrome wares	0	0
RWCD Project, test phase		
Total ceramics, by weight	217.0 g	
Plain wares	190.8 g	87.93
Hohokam Red wares	16.2 g	7.46
Red-on-buff wares	10.0 g	4.61
Polychrome wares	0	0

Table 3.47. Functional analysis of lithic artifacts from AZ U:10:16 (ASU), mitigation phase

Category	Raw Count	Percent of Total
Chipped stone		
Unifacial nibbling wear on edges	1	50.0
Hammerstone	1	50.0
Total number	2	100.0

Table 3.48. Raw material analysis of lithic artifacts from AZ U:10:16 (ASU), mitigation phase

Raw Material Type	Raw Weight (grams)	Percent of Total
Total lithic weight	144	100.00
Basalt	130	90.28
Sandstone	14	9.72

Table 3.49. Technological analysis of lithic artifacts from AZ U:10:16 (ASU), mitigation phase

Category	Raw Counts	Percent of Total
Secondary flakes	3	42.86
Tertiary flakes	3	42.86
Core	1	14.28
Total items	7	100.00

percentages of ceramic types from project sites grouped site AZ U:10:16 with AZ U:10:13, AZ U:10:28, AZ U:10:24, AZ U:10:36, and AZ U:10:29 (Locus 151) on the basis of this criterion.

Given the artifact inventory and the disturbed nature of this site, few behavioral interpretations can be offered. The site has been interpreted previously by Rosenberg (1976) as a possible habitation and by Rice et al. (1979) as a possible camp or work area. The bowl/jar ratio shows a high proportion of bowls, considered typical of a habitation area (see Chapter 4). However, the location of this site, away from a permanent water source, would be atypical of Hohokam habitation sites. Further, no midden area was located during the 1978 or 1979 field work. The lack of exotic material is a third criterion that supports the temporary use interpretation of this site.

4.0 CERAMICS

4.1 INTRODUCTION

Archaeologists have long recognized that ceramic design styles, material, methods of production, and the forms that patterns create vary through time and across space and that certain attributes of a ceramic assemblage are dictated by functional requirements. These characteristics have proved useful in studies of exchange systems, social organization, chronology, and intrasite and intersite functional variability. A researcher who attempts to utilize ceramics to these or other ends must select attributes that are relevant for the analysis at hand. Yet, archaeologists have been unable to single out attributes or changes in attributes that correlate on a one-to-one basis with unique aspects of a cultural system or changes within a cultural system. For example, ceramic design styles tend to change through time, but it is unclear what precipitates these changes. Suggested catalysts to design style change include changes in social organization, influence from external contacts, corresponding changes made for functional purposes, or even a capricious shift in public taste. An effort has been made in the RWCD II ceramic study to isolate temporal, functional, and spatial dimensions and to identify the effects of their overlap. In addition, raw data have been provided for descriptive and comparative purposes.

4.2 METHOD

Since all but a few RWCD II sites were severely eroded and consisted only of surface deposits of artifacts, it was decided to compare sites on the basis of their surface collections. The original investigators believed that surface collections were adequate for intersite comparison, since the surface ceramics at sites with substantial subsurface deposits appeared to be similar to the material recovered during excavation. More detailed discussions of intrasite variation in ceramic assemblages are found in Chapter 3.

At sites that produced relatively few ceramics, entire assemblages were analyzed. These included AZ U:13:23, AZ U:13:29 (148), AZ U:13:29 (150), AZ U:13:36, and AZ U:10:16 (ASU). At the sites of AZ U:13:24, AZ U:13:39, AZ U:13:28, AZ U:13:29 (151), and AZ U:13:35, a stratified random sample of not less than 22.7% was taken by partitioning the surface collection units into blocks and choosing units for analysis from these. The distributions of these sample units are represented by the data points on the SYMAP graphics in

Chapter 3; each point represents the center of a collection square from which the ceramics were analyzed.

The analysis separated ceramics into four major categories: Hohokam buff wares, which included both painted and unpainted sherds; plain wares; red wares; and polychromes. In addition to these, the less frequent trade ceramics were noted. For each major ware, several attributes were recorded. An effort was made to determine if each sherd had been part of a bowl or a jar, temper was identified, presence or absence of smudging was recorded, and presence or absence of polishing on either surface was recorded for the red wares.

All the buff wares from the chosen samples that exhibited adequate design were typed according to the descriptions of Hohokam ceramics provided by Haury (1945, 1976). Assistance in typing was provided by Dr. A. E. Dittert.

4.3 CHRONOLOGY

Listings of the number of sherds of traditional ceramic types may be found in the tables following the descriptions of each site in Chapter 3. Table 4.1 summarizes the phases in which each site might be placed, on the basis of these types. All sites with the exception of AZ U:13:39 (ASU) and AZ U:13:8 (ASU)--the canal site and the bajada site, respectively--probably were occupied for a relatively short time, so they would fall within one phase designation. These designations were made for the Preclassic sites under the assumption that the predominance of a ceramic type indicates that a site was occupied during the phase associated with that type and that a conglomerate of types such as those seen on the surface at AZ U:13:8 (ASU) implies that the site's use spans several phases.

The assignment of sites to the phases of the Classic period, the Soho and Civano phases, has traditionally been accomplished by consideration of the frequency of Classic period ceramics at a site: Casa Grande Red-on-buff, Gila Red, Salt Red, and Pinto, Gila, and Tonto Polychromes. Although this procedure is to some extent based on empirical finds (Schroeder 1940; Haury 1945), major assumptions are made about the geographic spread of ceramics through time and about functional aspects of sites and ceramics.

Haury has defined the Soho phase on the basis of Casa Grande Red-on-buff, Gila Red (both smudged and unsmudged), and Gila Plain. He has defined Civano phase sites as containing Casa Grande Red-on-buff, Gila Red, Salt Red, Gila Plain, and either Gila or Tonto Polychrome. Casa Grande

Table 4.1. Chronological placement of RWCD II sites

Site No.	Location	Phase Designation(s)
AZ U:13:8	surface	Gila Butte, Santa Cruz, possibly Sacaton, Soho
AZ U:13:13	surface	late Sacaton-Soho?
AZ U:13:23	surface	Soho
AZ U:13:24	surface and subsurface	Sacaton-Classic period?
AZ U:13:28	surface and subsurface	Soho
AZ U:13:29 (locus 148)	surface	?
AZ U:13:29 (locus 151)	surface	late Soho-early Civano?
AZ U:13:29 (locus 150)	surface	?
AZ U:13:35	surface	Classic
AZ U:13:36	surface and subsurface	Soho
AZ U:13:39	from south canal features	Snaketown, Gila Butte, Santa Cruz, Sacaton
AZ U:13:40	surface	--
AZ U:13:41	surface	?
AZ U:10:16	surface	?

Red-on-buff is considered by Haury to decrease through time, while Salt Red becomes more abundant at the expense of Gila Red. The first entrance date of Gila or Tonto Polychrome into either the Salt or the Gila river valleys is uncertain, but Haury (1976) places the occupation of the small Classic period sites near Snaketown in the Civano phase between A.D. 1350 and A.D. 1400, based on the presence of a total of 35 polychrome sherds from the three sites. Archaeomagnetic dates confirm that one of these sites, AZ U:13:22, dates to this time interval (Haury 1976:331).

In his discussion of the Casa Grande area, Hayden (1957:178-184) concurs with Haury's portrayal of changes in ceramic assemblages. At University Indian Ruin near Tucson, polychromes accounted for about 4.1% of the sherds, which is comparable to the frequencies of polychromes recovered in a study by Schroeder (1940) from Classic period trash mounds in the Salt River Valley. Gila Polychrome was not found in the University Indian Ruin rooms of the Tanque Verde phase, the Tucson area equivalent of the Soho phase, supporting Haury's date for this type. Hayden uses A.D. 1300-1400 as dates for Gila Polychrome. Casa Grande Red-on-buff is not mentioned in the University Indian Ruin report, and Gila Red is an intrusive or trade item in the Tucson area and occurs there only in small percentages.

In terms of quantified and calendrically dated Classic period ceramics, perhaps the best documented sites are those of the Escalante Ruin group (Doyel 1974). Through extensive use of archaeomagnetic dating, Doyel is able to show that Casa Grande Red-on-buff enjoyed its greatest popularity in the period A.D. 1180-1300, thereby narrowing the Soho phase to a 120-year time span. Table 4.2 shows the relative abundance of Casa Grande Red-on-buff and other ceramic types in the archaeomagnetically dated Sacaton, Soho, and Civano phase contexts. Perhaps due to the influx of polychromes, there is a decrease in Casa Grande Red-on-buff in the Civano phase. The greatest abundance of Gila and Tonto polychromes is seen in the later context; Doyel argues that the Salado wares entered the area at about A.D. 1350. (Beginning dates of the Salado Polychromes in the Hohokam area have yet to be agreed upon; see Wilcox and Shenk 1977:62, 63.) Doyel did not find Salt Red in abundance in the Civano phase site of AZ U:15:3 (ASM). In fact, only a few sherds and possibly one vessel of this type were encountered, which suggests that Salt Red may not have been uniformly distributed throughout the Hohokam area during the Civano phase, and therefore it may not be a reliable phase indicator.

With the above information, it is now possible to assess the chronological placement of the RWCD Classic period sites. Doyel's date of A.D. 1180-1300 is independently

Table 4.2. Ceramic frequencies from the Escalante Ruin group (after Doyel 1974)

ASM Site No.	Total Sherds	Phase	% Gila Plain	% Gila Red	% Casa Grand Red-on-buff	% Other red-on-buff	Unidentified red wares, buff wares, misc.	% Polychrome
AZ U:15:23	1,337	Sacaton	89.38	0.22	0.00	5.98	4.41	0.00
AZ U:15:22	1,914	Soho	78.60	10.40	2.50	0.00	8.50	0.00
AZ U:15:27	4,143	Soho	62.21	16.43	10.81	0.00	6.71	3.91
AZ U:15:32 (rooms)	1,167	Soho	73.61	15.17	5.83	0.00	5.14	0.00
AZ U:15:32 (plazas)	3,767	Soho	80.17	7.35	7.91	0.00	4.43	0.00
AZ U:15:32 (trenches & mounds)	5,869	Soho	76.21	10.88	8.04	0.00	4.84	0.00
AZ U:15:3	16,767	Civano	81.20	4.30	0.50	0.00	4.00	10.00

confirmed by the archaeomagnetic and carbon 14 dates from AZ U:13:24 (ASU), where Casa Grande Red-on-buff constituted nearly the entire assemblage of identifiable buff wares.

Two sites at which the buff-ware assemblage consists entirely of Casa Grande Red-on-buff, AZ U:13:23 and AZ U:13:36 (ASU), may also be placed in the Soho phase. Casa Grande Red-on-buff is also frequent at AZ U:13:13 (ASU) and undoubtedly was occupied in the Soho phase, but earlier ceramics indicate that the area may have seen occasional use in earlier times. At AZ U:13:28 (ASU), Casa Grande Red-on-buff is common in both the surface and subsurface collections. Three intrusive sherds of Tanque Verde Red-on-brown, for which an A.D. 1200-1400 date is suggested by Haury (1976:204) and an A.D. 1100-1450 date is suggested by Doyel, were found in the subsurface sample. From these data sizes, AZ U:13:13, AZ U:13:23, AZ U:13:24, AZ U:13:28, and AZ U:13:36 (ASU) may be considered as roughly contemporaneously occupied between A.D. 1180 and A.D. 1300. The presence of Casa Grande Red-on-buff in association with the earlier types at AZ U:13:8 (ASU) indicates that this site was in use at least as late as the Soho phase.

Only from AZ U:13:29 (Locus 151) (ASU) was more than a trace amount of polychrome ceramics recovered. Although the high percentage of polychromes at this site seems unusual for its small size, it is suggested that the site is later than those discussed above and may postdate A.D. 1350, following Doyel (1974). A nearby site, AZ U:13:29 (Locus 151) may be associated with AZ U:13:65 (ASU), which was visited by RWCD I field crews (Rice et al. 1979) and by the author (Blank-Roper); from all surface indications it also appears to date to the Civano phase. Table 4.3 shows the percentage of ceramics that were classified as Casa Grande Red-on-buff from the identifiable red-on-buff sherds in the surface collection analysis samples from the Classic period sites. An attempt was made to roughly estimate the percentage of the entire ceramic assemblage that might have been Casa Grande Red-on-buff. This estimate was obtained by multiplying the percentage of buffware ceramics (which included both identifiable and unidentifiable red-on-buff types) by the percentage of identifiable red-on-buff ceramics that were actually classified as Casa Grande Red-on-buff. It is interesting that the RWCD estimates, although rough, yield much higher percentages of Casa Grande Red-on-buff than the figures given for the Escalante group. The apparent abundance of Casa Grande Red-on-buff within the RWCD area cannot presently be explained.

Table 4.3. Estimate of total proportion of Casa Grande Red-on-buff within the ceramic assemblages at Classic period sites

% of buff wares in total sample assemblage	x	% of Red-on-buff ceramics identifiable as Casa Grande Red-on-buff	=	Estimate of total proportion of Casa Grande Red-on-buff in entire assembage

ASU Site No.	% of Casa Grande in Identifiable Red-on-buff	% of Total Buff Wares at Each Site	Estimate of Total Casa Grande Within Total Assemblage
AZ U:13:13	78.95	30.95	24
AZ U:13:23	100.00	61.01	61
AZ U:13:24	66.67	22.74	15
AZ U:13:28	94.68	27.07	26
AZ U:13:29 (151)	100.00	10.48	10
AZ U:13:36	100.00	18.76	19

4.4 FUNCTIONAL ANALYSIS

This analysis was based on the simple assumption that vessel form is related to vessel function. It was then hypothesized that functional variability in the ceramics among the RWCD sites could be used to distinguish functional variability among sites. This hypothesis is not new; it was used with a great deal of success in studies of Hohokam limited-activity areas by Goodyear (1975), Doelle (1976), and Raab (1976). In general, bowls and jars are considered to be the most common vessel forms found in Hohokam sites. Ethnographic sites (Russell 1908; Fontana et al. 1962) and archaeological context have been used to derive models for the use of these vessel types. In general, jars are considered to have been used for storage, cooking, and the transport of water, while bowls are considered to have been used in serving and for the parching of certain wild seed foods. Worn surfaces and burn marks reveal that plain wares functioned in day-to-day culinary activities, while the uses of painted wares and red wares seem to have been more specialized. For example, Fontana et al. (1962:37, 47) record that the Papagos used small red-painted ceramics jars to store saguaro fruit and syrup (a highly prized commodity), and Raab (1976) found this type in much greater abundance within the Slate Mountains than in a habitation site on the nearby floodplain. Various types and forms of ceramics are also known to accompany Hohokam burials and cremations. Hence, it seems that both vessel form and ceramic ware should be considered during functional analysis. Vessel form will be discussed first.

Two methods may be used to distinguish form from sherds: the body sherds method and the rim sherds method. The body sherds method may yield misleading counts if one vessel form is consistently larger than the other. When sherds are heavily eroded, as were those at several of the RWCD sites, this method may be difficult to employ, since the distinguishing characteristics may be absent. The rim sherd method, while perhaps somewhat more reliable, may prove unproductive at sites with low sherd counts, since rim sherds are usually rare in these instances. On this project, the body sherd determinations were made for all sites and the rim sherd determinations were made for those with larger sherd samples.

4.4.1 Body Sherd Vessel Form Estimates

Table 4.4 gives the counts for bowls and jars by site, the percentage of bowls and jars, and the number of unknown sherds (the latter not included in the percentage calculations). Following Goodyear (1975) and Raab (1976), it was hypothesized that bowls, because they were associated with

Table 4.4. Bowl/jar ratios, number of bowl and jar sherds, and undeterminate sherds from RWCD II sites

ASU Site No.	No. of Bowls	No. of Jars	Bowl/ Jar Ratio	No. of Unde-termined Sherds
AZ U:10:16	37	132	28.03	6
AZ U:13:8	15	155	9.68	16
AZ U:13:13	199	765	26.01	41
AZ U:13:23	7	106	6.06	46
AZ U:13:24	766	2,073	36.95	414
AZ U:13:28	649	1,777	36.52	347
AZ U:13:29 (Locus 148)	3	40	7.50	6
AZ U:13:29 (Locus 150)	1	16	6.25	4
AZ U:13:29 (Locus 151)	106	464	22.84	31
AZ U:13:36	122	617	19.77	50
AZ U:13:39	1,068	1,484	71.97	1,654
AZ U:13:40	1	36	2.78	0

domestic activities, would occur in higher proportions at habitation sites than at limited-activity sites, where jars are thought to have been more prevalent. In order to compare the bowl and jar counts, bowl/jar ratios were calculated. The utility of the ratio as an indicator of site function was strengthened when almost identical ratios were obtained from the known habitation site of AZ U:13:24 (ASU) and from the strongly suspected habitation site of AZ U:13:28 (ASU). In addition, the canal site of AZ U:13:39 (ASU) yielded a ratio that greatly exceeded that of all the other sites (indicating an unusually high proportion of bowls). The bajada site of AZ U:13:8 (ASU) ratio was well below that of the habitation sites, indicating a greater percentage of jars to be present. The simple diagram in Figure 4.1 indicates site groupings when plotted according to the bowl/jar ratio.

The same groupings were obtained when the raw bowl and jar frequencies were entered into a cluster analysis using the CLUSTAN program. The three groupings obtained both by the CLUSTAN program and by the simple graph of the bowl/jar ratios are interpreted as representing three basic functional site types, these differences being supported by excavation findings. Clearly, AZ U:13:39 (ASU), an extensive network of canals, represents a functionally unique site in the RWCD project area. The functional identification for the Group 2 sites, AZ U:13:36, AZ U:13:29 (Locus 151), AZ U:13:28, AZ U:10:16, and AZ U:13:13 (ASU), is made through their association with AZ U:13:2 (ASU), at which dwelling remains were found. This association makes it possible to hypothesize that these sites also were habitations. In a like manner, the association of AZ U:13:4, AZ U:13:23, and AZ U:13:29 (Locus 148) with AZ U:13:8 suggests that these sites also were limited-activity areas. The apparent consistency of the bowl/jar ratio with other independent data indicates that with refinement and further testing the ratio may be a valuable tool for assessing site function.

As none of the hypothesized limited-activity areas yielded sufficient numbers of vessel rims, comparative measures between these sites and the hypothesized habitation sites are not possible. The two methods of estimation can produce different results. These differences probably stem from the physical characteristics of Hohokam vessels themselves. The total surface area of jars from a site probably exceeds the total surface area of bowls, thereby producing more jar body sherds than bowl body sherds. The total rim circumference of bowls at a site probably exceeds that of jar rims, so that more bowl rim sherds are recovered than are jar rim sherds (see Table 4.5, for example).

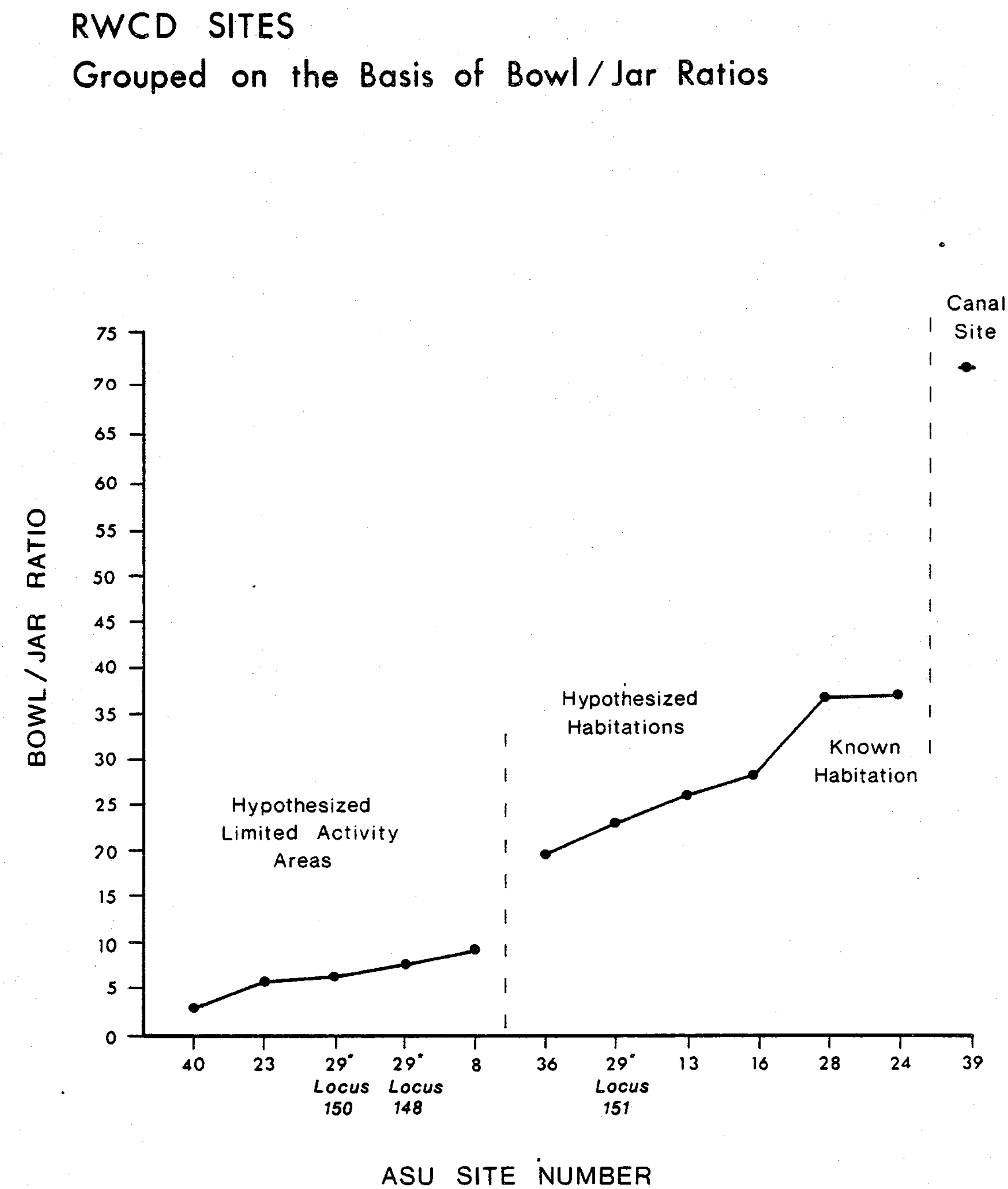

Figure 4.1. RWCD II sites grouped on the basis of bowl/jar ratios

Table 4.5. Comparative listing of numbers of jar and bowl rims from RWCD II sites

ASU Site No.	No. of Bowl Rims	No. of Jar Rims
AZ U:13:13	9	4
AZ U:13:24	25	13
AZ U:13:28	34	34
AZ U:13:36	12	6
AZ U:13:29 (Locus 151)	8	5
AZ U:13:28a	10	8
AZ U:13:28b	4	2
AZ U:13:28c	20	24

4.4.2 Vessel Form and Ceramic Ware

As discussed above, archaeologists have recognized that particular ceramic wares seem to have been utilized for specific purposes. As such, it cannot be assumed that vessel forms were made in equal proportions in plain wares, red wares, and buff wares. The summary statisics in Table 4.6 indicate that bowls and jars were, in fact, unequally produced among the three wares. It is possible, of course, that the differences in these figures result from differences in the sizes of vessels produced in each ware. Although jar sherds predominate in each ware, the percentage of jars is higher in plain wares than in red wares, and it appears that Soho phase buff wares were almost entirely produced in jar form. Haury's figures indicate that jars or jarlike forms (predominantly pitchers) were the most common forms of Casa Grande Red-on-buff, and he states that bowl forms probably were not commonly made (Haury 1945:53, 54). If the numerous bowl forms illustrated in the Snaketown report (Haury 1976) represent the frequency of red-on-buff bowls in the Pre-classic periods, then the proportions of red-on-buff bowls appear to have decreased through time. The interpretation of a ceramic assemblage, then, must depend on the consideration of the interdependence of functional and stylistic attributes and the way in which this interdependence might change through time.

4.5 SMUDGING

Smudging is the intentional blackening of ceramic surfaces produced by burning carbonaceous material in or near newly fired ceramic vessels. This trait was recorded for all plain-ware and red-ware ceramics. Smudging occurs on bowls of these ceramic types but does not occur on the red-on-buff material. Beyond its esthetic value, archaeologists have not understood the function of smudging. It was hoped that the presence or absence of smudging might be related to site function in the RWCD project. However, as will be demonstrated below, the presence of smudged vessels is almost perfectly correlated with the number of bowls at the sites so that the proportion of bowls and jars at a site, rather than smudging, should be considered as indicative of site function.

Red wares were smudged more commonly than were plain wares, but unsmudged vessels predominated at all of the RWCD sites. The highest proportion of smudged plain ware was 19.64% at AZ U:13:24 (ASU), and the highest proportion of smudged red ware was 38.18% found at AZ U:13:28 (ASU). Inspection of the data revealed that the sites with the highest percentages of smudged ceramics were those with the

Table 4.6. Summary statistics of bowl and jar percentages by ceramic ware

Sites	Ware Type	Bowls Mean %	Bowls SD	Jars Mean %	Jars SD
Preclassic site: AZ U:13:39 (ASU)	Plain	39.50		60.50	
	Buff	42.50		57.50	
Soho sites: AZ U:13:13, AZ U:13:24, AZ U:13:28, AZ U:13:36, AZ U:10:16 (ASU)	Plain	23.26	4.75	76.74	4.75
	Red	35.94	4.84	64.06	4.84
	Buff*	9.20	7.10	90.80	7.10
Civano site: AZ U:13:29 (Locus 151) (ASU)	Plain	14.10		85.90	
	Red	9.70		90.30	
	Buff	37.10		62.90	

*Primarily Casa Grande Red-on-buff

highest percentage of bowls. In order to determine whether the number of bowl sherds could accurately predict the number of smudged sherds at a site, the product-moment correlation, r, was calculated using the sum of red-ware and plain-ware smudged sherds and the total number of bowls at each site. When the data were once again examined, it was apparent that the calculations for AZ U:13:39 (ASU) conformed least to the pattern seen in that of the other sites. This calculation yielded $r = 0.784$ and $r^2 = 0.784$, signifying that only about 78% of the variation in smudged sherds could be explained by the presence of bowl sherds. The r statistic was recalculated, this time without the data from AZ U:13:39. A nearly perfect fit of the linear least squares equation was obtained, $r = 0.991$ and $r^2 = 0.982$, indicating that the number of bowl sherds is a reliable predictor of the number of smudged sherds at a site. This is so, even though the proportion of smudged bowls at sites logically could vary independently from the proportion of bowls at sites, and this might be expected if smudged bowls were chosen for some tasks, while unsmudged bowls were chosen for others. However, the above correlation suggests that smudged bowls probably were not related to specific activities--that bowls were simply regarded as bowls, whether smudged or unsmudged.

In further analysis, the number of smudged plain-ware sherds alone was also found to accurately predict numbers of bowl sherds ($r = 0.968$, $r^2 = 0.937$), but the same was not true for smudged red-ware sherds ($r = 0.756$, $r^2 = 0.571$). This is to be expected, since not all sites had red-ware ceramics.

4.6 TEMPER STUDIES

Temper is nonplastic inclusions added to clay to reduce shrinkage in vessel walls during drying, thus preventing cracking (Shepard 1971:25). Many substances may be used as temper: sand, organic materials such as straw or rice hulls, shell, feathers, crushed ceramics, or crushed rock. Archaeologists have found that local potters often choose similar material for temper, so that a particular temper type may become almost a trademark of ceramics from that area, sometimes making it possible to identify the location of manufacture for a ceramic type. In the Hohokam area, temper studies have not yet been sufficiently detailed to assess the variation in temper among the three major wares (plain ware, red ware, and red-on-buff ware), and there certainly has not been adequate study to address the question of location(s) of manufacture for any Hohokam ceramic type. It is known that buff ware was tempered with micaceous schist, rounded or angular quartz pebbles, or other heterogeneous materials (Haury 1976:205). Plain wares were tempered with either sand (Gila Plain, Salt variety) or micaceous schist (Gila Plain, Gila variety), and red wares were tempered with micaceous schist or other materials. It was hoped that this study could determine whether these temper types occurred in the RWCD ceramics or if other temper types might be identified. It was also an opportunity to compile data concerning the relative frequencies of temper types at sites of different ages and different functions for future ceramic spatial distribution studies.

Due to time constraints, sherds were examined under a 10-power hand lens rather than under a microscope. Although several of the temper categories could be easily identified with this method, and some were identifiable with the naked eye, less obvious differences such as those that might occur among sources or sizes in sand tempers could not be recorded. However, the methods employed are believed to have been sufficient for making an initial assessment of the variation in temper found in the ceramics of the RWCD area and to quantify this variation. The results of the study indicate that variation exists within the temper of plain-ware and red-ware ceramics of this area, variation that, if carefully detailed, may perhaps contribute to studies of chronology, exchange systems, and function.

For the red-ware ceramics, four temper categories were established: sand, silver micaceous schist, crushed quartz, and a coppery or gold colored mica. Seven categories were established for the plain wares: sand, silver micaceous schist, crushed quartz, phyllite, gold or coppery colored mica, silver micaceous schist with roughly equal parts of crushed quartz, and silver micaceous schist with roughly equal parts of sandstone.

Souces of mica, micaceous schist, and schistose materials are abundant in the Hohokam region. On the western periphery of the RWCD project area stands Gila Butte, which is composed primarily of micaceous schist and quartz. Pieces of material that erode from the butte frequently contain either the pure micaceous schist, an interfacing of both micaceous schist and quartz, or just pure quartz. Hence, prehistoric potters could have used either the quartz or the schist or a combination of both, as is reflected in temper categories. However, micaceous schist also occurs at Pima Butte, the South Mountains, the Santan Mountains, and probably in many other nearby areas. In addition, free mica can be found in abundance as tiny particles in the wash sands of the Santan Mountains, the sand of the Gila River, and undoubtedly in many other drainages. At present, the author knows of no source for the gold mica. Phyllite is the temper that identified Wingfield Plain ceramics found throughout an extensive portion of the area north of the Salt River. Sherds containing this temper probably represent vessels traded into the RWCD area. Sandstone temper may originate in the Phoenix area in places such as Papago Park or may have been carried downstream in either the Salt or Gila rivers. Sand, of course, can be found throughout the entire project area and the Hohokam region.

The results indicate that in plain wares, sand, micaceous schist/crushed quartz, and micaceous schist alone were the most common tempers and that sand and micaceous schist were the most common tempers in the red wares. As the variation in temper percentages from site to site was considerable, cluster analyses using the CLUSTAN program were run to aid in the search for patterning in the data. It was suggested by Fontana et al. (1962) that temper may be related to vessel function, and it was therefore hypothesized that the variation observed in the temper among the RWCD sites might be related to site function. Separate analyses were undertaken for the plain-ware and red-ware ceramics. Each site constituted a single case, percentages of temper types at each site were utilized in the calculations, and sites with fewer than 30 sherds of a ceramic type were excluded from the analysis. Two- and three-cluster solutions were examined for both ceramic types. The three-cluster solution is shown for the plain wares in Figure 4.2, because three basic site types containing plain wares were assumed to be present: habitation sites, limited-activity areas, and a canal site. The two-cluster solution is used for the red wares, since only hypothesized habitation sites and limited-activity areas contained red wares; only trace amounts of red wares were recovered at the canal site, AZ U:13:39 (ASU).

In the plain-ware analysis, sites are seen <u>not</u> to cluster on the basis of hypothesized function. Cluster 1, in which sand is the most common temper type, contains the canal site and five other sites that are hypothesized to be habitation sites. Cluster 2 contains sites in which crushed quartz/micaceous schist is the most common temper. These sites are AZ U:13:36 (ASU), a hypothesized small habitation site, and AZ U:13:8 (ASU), at which the ceramics contained almost exclusively micaceous schist; this is interesting in light of the fact that an unusually high percentage of raw micaceous schist was recovered from this site.

The red-ware analysis contained only sites hypothesized to be habitations, and these split into two groups: sites at which sand was the most common temper, and those at which micaceous schist was the most common. In the three-cluster solution for the red-ware temper types, two sites fall into each of the clusters: the larger habitation sites,

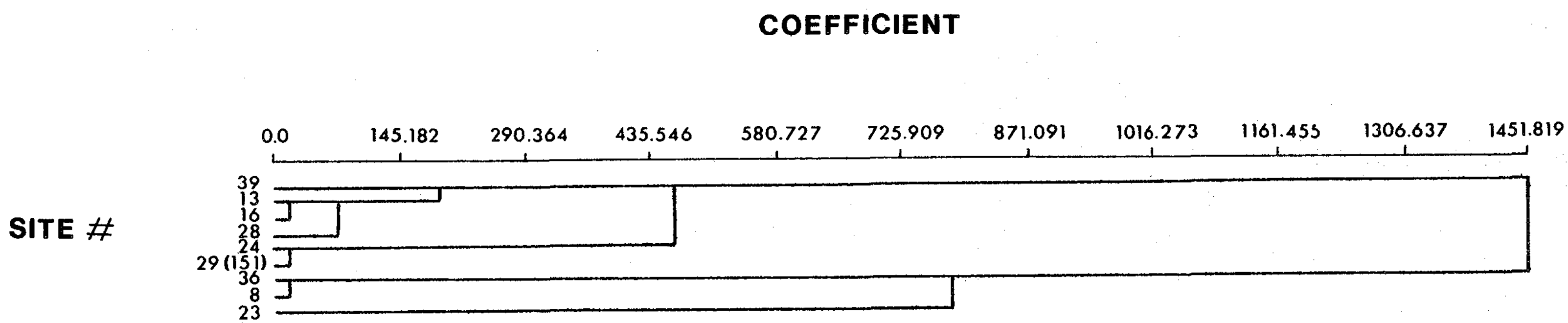

Figure 4.2. Dendrogram of the plain-ware temper analysis

AZ U:13:28 and AZ U:13:24 (ASU), at which sand temper and micaceous schist temper occur in relatively close percentages; the smaller sites, AZ U:13:29 (Locus 151) and AZ U:10:16 (ASU), at which sand predominates; and sites AZ U:13:36 and AZ U:13:13 (ASU), in which micaceous schist predominates. Two possible explanations might be offered for these groupings. The first posits the use of at least two temper types, which are considered interchangeable by potters but either one of which tends to be utilized more frequently than the other by individual potters. As the number of potters increases, the chances that both tempers would be utilized in equal proportions also increases. At the larger sites, then, it would be expected that both types are used in relatively equal proportions. The second possible explanation assumes that pottery with a very limited range of tempers was manufactured at habitation sites but that these types commonly were exchanged with neighbors. If it is assumed that the number of exchanges is positively correlated with the population of settlements (as population increases, exchanges increase), then it is reasonable to expect greater variability in the ceramic wares at the larger or longer-occupied sites than at the smaller sites or at sites occupied for shorter times. Either explanation might account for the greater variability seen in the temper types at the larger sites, or the sites such as AZ U:13:39 (ASU), which was utilized over a period of seven centuries, than at the smaller sites and the sites occupied for short periods. Ceramics at the limited-activity sites may have been brought there from a nearby village so that the composition of the ceramic assemblages represents the variation in ceramic production at the villages. These conjectural remarks emphasize the assumption that the distribution of temper types among the RWCD sites was the result of sets of choices that may be only partially related to site function, vessel function, or change through time. To test further the suggestion that temper might be related to vessel function, chi-square tests were performed. Tau b or Goodman and Kurskal's tau (Blalock 1960:300-302) was used to determine the strength of association when the chi-square statistic proved to be significant. Plain-ware and red-ware ceramics from the surface collections at AZ U:13:28 and AZ U:13:24 and plain wares from the canals at AZ U:13:39 (ASU) were used to test whether there is an association between vessel form and temper. Only the major temper types were included.

Because the results of these tests were not consistent, they are difficult to interpret. In four of the tests--plain wares at three canals at AZ U:13:39 (ASU) and red wares at AZ U:13:28 (ASU)--no association was found between vessel form and temper. In two tests--red wares at AZ U:13:24 and plain wares at AZ U:13:28 (ASU)--a very weak association between the variables was demonstrated, and among the plain wares at AZ U:13:24 (ASU) a very strong association was demonstrated between vessel form and temper type. There may be an association between vessel form and temper type in Hohokam red wares and plain wares, but perhaps other factors such as the sizes of temper particles were also considered by the prehistoric potter.

In addition to the raw data gained during analysis of the Hohokam ceramics from the RWCD II mitigation program, an attempt has been made to investigate the interplay of many behavioral factors that may be manifest in a ceramic assemblage. Traditional ceramic design typologies in combination with limited absolute dates were used to place the occupation of the RWCD sites in time. It was possible to assign approximate dates to some sites, but, perhaps of even greater significance, dates given by Doyel (1974) for the Soho phase (A.D. 1180-1300) have been independently confirmed. In addition, a post A.D. 1300 date for the entrance of Salado polychromes into the Middle Gila area seems to be supported by ceramic data.

Due to the general lack of features at most of the RWCD sites, the functional analysis of artifacts has become important to testing hypotheses of activities at these sites. A bowl/jar ratio was developed based on the assumption that bowls would be more frequent at habitation sites than at limited-activity areas. Some confirmation of this theory was gained when higher ratios were obtained at sites for which there was evidence of occupation than at sites that had produced evidence of dry farming, and by the extremely high ratio obtained at the unique canal site. Cluster analysis was used to group sites on the basis of their bowl and jar percentages. Hypotheses concerning site function for each group were based on the known functions of some of the sites in each group as discovered through nonceramic excavation data.

Vessel forms were shown to be unequally represented in each of the ceramic wares. This implies that attempts to estimate dates based on changes in the percentages of the various Hohokam ceramic wares through time must control for site function. This problem is also compounded by data that indicate that the proportions of vessel forms made in buff wares (and perhaps in other wares) changes through time.

Although smudging occurs only on the interior of Hohokam plain-ware and red-ware bowls, the proportion of smudged vessels at a site logically could vary independently from the proportion of bowls at the site. It has been suggested that this might be expected to occur at functionally different sites if smudged and unsmudged bowls were used for different purposes. However, a least squares regression analysis using the number of plain-ware and red-ware bowl sherds and the number of smudged sherds at each site showed a near-perfect correlation between the variables. It is asserted, then, that smudged bowls do not vary independently from unsmudged bowls and that the two were functionally equivalent.

Temper analysis of plain and buff wares indicates that the temper in the vast majority of these ceramics could be obtained locally but is also available throughout much of the Salt-Gila River valley area. Although it seems likely that these types were local products, more detailed analysis of this subject is needed. Contingency table analysis suggested that the choice of temper may possibly be related to vessel function, but the greater variety of temper types at larger or longer-occupied sites has been hypothesized to be related to either the greater number of potters making choices at these sites or the involvement of the larger sites in a greater number of ceramic exchanges.

This study is a small part in the much-needed detailed analysis of Hohokam ceramics. During analysis it has become clear that a great deal of variability exists in the early Gila Red ware. This quality is also noted by Doyel (1974) in the ceramics of the Escalante Ruin group. The variety in slip cover, degree of polishing, presence of polishing streaks, temper, and fireclouding suggests a great deal of experimentation by potters and perhaps the involvement of many potters. It would be informative to know if Gila Red becomes more consistent through time and how the variability in Gila Red compares with that seen in Salt Red. Lesser variation in Salt Red might suggest that its production was confined to a smaller number of individuals, reflecting on economic organization in different areas.

Little is known about Casa Grande Red-on-buff, which appears technolagically different from its ceramic predecessor, Sacaton Red-on-buff. Perhaps valuable to understanding the Sedentary-Classic transition would be studies that examine the differences in the production and distribution of these two ceramic types. The shift in technology and design that occurred at the end of the Sacaton phase in the Hohokam buff ware may be related to the development of a new economic system and perhaps to new social and political alliances.

In short, Hohokam studies are in need of ceramic analysis from a regional perspective. Studies that place ceramics within the broader Hohokam system will improve understanding of Hohokam ceramics.

5.0 LITHICS

5.1 INTRODUCTION

The RWCD II lithic analysis was developed to complement the analyses performed during the RWCD I test stage (Rice et al. 1979). In the earlier study it was shown that, on the basis of technological and functional attributes of lithic assemblages, site groupings closely corresponded to a distinction between sites with mounds or middens and sites of light-density artifact scatters. It was concluded that these differences could most parsimoniously be interpreted as the distinction between permanent habitations and limited-activity sites (Rice et al. 1979:127). In the present analysis technological and functional data were obtained to test further the site typology as presented by Rice et al. (1979) using the expanded samples obtained during mitigation work. A raw material analysis was added to determine which material types were being selected for use, to investigate the relationship between raw material selection and tool function, and to determine the distribution of nonlocal lithic materials among sites. These analyses were designed to identify broad-scale patternings in the lithic remains at RWCD sites. From the patterns identified in this and the previous study, it will be possible to generate questions concerning the specific types of tasks performed at the RWCD sites.

5.2 METHODS

The sampling strategy used for the lithic materials is the same as that for the ceramics, and at most sites the sampling units were identical to those used in the ceramic study. Given the predominance of surface material, sites were compared on this basis. The percentage of units from surface collections submitted for analysis at each site are listed in Table 5.1. The location of grid units chosen at each site are identified by data points on each lithic Symap in Chapter 3. A total of 44.711 kilograms of lithic materials were examined in this study. Functional and technological attributes and raw material type were recorded for each piece of stone in the samples. For clarity, these analyses will be discussed separately.

5.3 FUNCTIONAL ANALYSIS

The function of a lithic artifact may be investigated through the examination of wear patterns on its surfaces. Wear patterns are produced when a lithic object moves

Table 5.1. Area, percent, and number of collection units from which lithic artifacts were examined at each site (these figures include units for which no artifacts were recovered)

ASU Site No.	Total Area Collected (m^2)	% of Site Surface Area from which Lithics were Examined	No. of Sample Units Examined
AZ U:13:13	4,496	50.4	142
AZ U:13:23	576	100.0	36
AZ U:13:24	6,400	23.6	378
AZ U:13:28	11,440	22.9	164
AZ U:13:29 (Locus 148)	1,600	100.0	100
AZ U:13:29 (Locus 150)	4,320	100.0	120
AZ U:13:29 (Locus 151)	2,304	48.0	276
AZ U:13:36	2,556	100.0	71
AZ U:13:39	5,904	24.5	362
AZ U:10:16	3,600	100.0	100
AZ U:13:40	no lithic artifacts recovered		
AZ U:13:8	no lithic artifacts recovered		
AZ U:13:41	no lithic artifacts recovered		

through or against some medium, causing friction that alters the object and the medium through heat and/or breakage. Several factors, including the direction of movement, the pressure applied during movement, and the physical characteristics of both the tool and the medium being worked, combine to produce rather distinctive patterns of wear. Wear patterns may vary in characteristics, such as the location of wear on a tool or tool edge (i.e., the point of a drill, the edge of a knife, or the upper surfaces of a metate); the characteristics of the wear itself (e.g., striations, crushing, polishing, or the removal of small pieces from the working edge of a stone tool, called nibbling), and the number of surfaces involved in the motion (unifacial or bifacial wear). In addition, certain morphological characteristics of the tool itself may aid in the identification of wear-pattern categories. Examples of these are the shape of the worn edge (convex, concave, straight, denticulate, etc.) and the overall tool shape. Other characteristics, such as weight, edge angle, and others, may also be useful but were not recorded due to time limitations. The attributes used in this analysis are listed in Table 5.2.

All artifacts were examined for wear without the aid of magnification. Each object on which the location of wear that mechanically could have been produced by a single type of action was defined as a tool. Each tool was described by choosing one attribute state from each of the category headings: type of wear, location of wear, shape or worn area, number of sides of wear, and shape of worn object. It was therefore possible for more than one tool to be present on a single object. For example, a bifacial mano was counted as two mano tools, since both sides could not have been used simultaneously. Two different tool types, such as a side scraper and a drill, may also occur on the same object.

The recording procedure generated a tremendous variety of attribute state combinations, which were condensed into 12 general categories (Table 5.3). Through the grouping of observations into the more general categories, some information has been "lost," but this step was necessary for the purposes of intersite comparison because of the small number of recorded tools at most sites.

5.3.1 Functional Results

The frequencies of tools recorded for the surface and subsurface lithic samples at each site may be found in Chapter 3. Unifacial nibbling on flake edges, which indicates the use of flakes for scraping purposes, was the most

Table 5.2. List of functional attributes used in RWCD mitigation phase lithic analysis

Category	Attribute State
Type of wear	Nibbling
	Picking
	Polish
	Striations
	Indeterminant
	Crushing
Location of wear	Edge
	Surface
	Point
	Edge/surface
Shape of worn area	Convex
	Concave
	Concave-convex (denticulate)
	Irregular
	Straight
Side of wear	Unifacial
	Bifacial
	Irrelevant (i.e., on ground stone)
	Faceted (i.e., hammerstones)
Shape of object	Flake
	Core
	Symmetrical biface (i.e., projectile point)
	Asymmetrical biface
	Long cylindrical object (i.e., pestles)
	Mano shaped
	Metate shaped

Table 5.3. Working classification scheme for RWCD II functional lithic analysis (the attribute "shape of worn area" has been discarded; tool categories represent a condensation of several attribute combinations)

Tool Category	Type of Wear	Location of Wear	Side of Wear	Shape of Object
Unifacial nibbling	Nibbling	Edge	Unifacial	Flake
	Nibbling	Edge	Unifacial	Core
Bifacial nibbling	Nibbling	Edge	Bifacial	Flake
	Nibbling	Edge	Bifacial	Core
Graver	Nibbling	Point	Unifacial	Flake
Drill	Nibling	Point	Bifacial	Flake
	Polish	Point	Unifacial	Flake
Punchlike	Pecking	Point	Faceted	Flake
Polished edges	Polish	Edge	Unifacial	Flake
	Polish	Edge	Bifacial	Flake
Wear on projectile point	Nibbling	Edge	Bifacial	Symmetrical biface
Hammerstones	Pecking	Edge	Bifacial	Core
	Pecking	Edge	Bifacial	Flake
	Pecking	Edge	Unifacial	Core
	Pecking	Edge	Unifacial	Flake
Metate	Polish	Surface	Irrelevant	Metate shaped
	Polish	Surface	Irrelevant	Flake*
	Polish	Surface	Irrelevant	Shatter*
Mano	Polish	Surface	Irrelevant	Mano shaped
	Polish	Surface	Irrelevant	Flake†
	Polish	Surface	Irrelevant	Shatter†
Polishing stone	Striations	Surface	Irrelevant	Long cylindrical object

*Wear must appear on a concave surface
†Wear must appear on a convex surface

frequent type of tool, followed by hammerstonelike pieces, grinding implements, unifacial polished edges on flakes, bifacial nibbling on flakes, and smaller percentages of carving, drillng, and polishing tools. A small percentage of wear patterns were recognized for which no interpretation of function could be offered, and these have been grouped in the "other" category.

In order to compare RWCD sites on the basis of the complex functional data obtained in this analysis, the CLUSTAN cluster analysis program was used. With this program, groupings of sites could be obtained on the basis of the similarities in their tool assemblages. Each case consisted of a site, and the percentages of the 12 tool categories were entered for each case. The analysis was restricted to six sites: AZ U:13:24, AZ U:13:13, AZ U:13:28, AZ U:13:39, AZ U:13:36, and AZ U:13:29 (Locus 150); these are sites at which 30 or more tools were recorded. As in all the cluster analyses described in this report, the canal site, AZ U:13:39 (ASU), proved to be the least similar to the others in terms of its artifact assemblage. It appears that the unusually high percentage of grinding tools, polished edges, the low percentage of unifacial nibbling, and a high degree of tool diversity characterize this site. Group 1 and Group 2 are more similar to each other than either group is to Group 3 (Site AZ U:13:39). Both the Group 1 and Group 2 sites display high proportions of unifacially nibbled flake edges and moderate percentages of other tool types. A larger percentage of hammerstones at the Group 2 sites seems to be an important distinction between the two groups. It is interesting that this analysis separated AZ U:13:2, the known habitation site, from AZ U:13:28 (ASU), where evidence for a habitation was noted. It might be expected that the two sites would possess similar functional inventories.

5.4 TECHNOLOGICAL ANALYSIS

Technological analysis is a measure of the stages and methods used in the manufacture of lithic artifacts (Rice et al. 1979:127). These studies are often used to identify the loci of different stages of manufacture and to measure the efficiency of production and use of raw materials, as well as to help identify cultural units. The assumption is often made that the technological aspects of a lithic assemblage are related to site function. In short, different stages of tool manufacture, different methods of tool manufacture, and different tools might be associated with quarry sites, habitation sites, limited-activity areas, etc. With the possible exception of quarry sites where evidence of raw material testing and initial stages of tool production might be noted, little is known about the association of lithic technology and functional site types in the Hohokam area. The attributes recorded for this analysis are listed in Table 5.4.

During the manufacture of a stone tool, flakes are removed from a piece of raw material or core until an item of the proper shape and size is achieved. In the initial stages of core reduction, flakes are removed that still retain cortex, or the weathered outer "skin" of the rock. As work progresses and more flakes are removed, the inner flakes retain less of the cortex material. An assessment of stage of manufacture may therefore be obtained by estimating the percentage of cortex remaining on waste flakes. In this analysis, the stage of manufacture was recorded as primary flakes (50-100% of dorsal surface covered by cortex), secondary flakes (10-50%), and tertiary flakes (0-10%). Also considered in stage of manufacture were the number of flakes previously removed from a piece. These are seen as scars on the dorsal side of flakes.

During the flaking process, pieces of rock will sometimes break off due to imperfections in the material, and these pieces were recorded as shatter. The number of cores was recorded, with a distinction being made between cobble and noncobble cores.

The number of pieces of ground stone were also recorded, as this representsd a distinctive technology from that of flaked stone. Unfortunately, the recording of ground-stone technology as undertaken in this analysis was inconsistent with that of the flaked-stone technology. The variables recorded for the flaked-stone technology were designed to record all stages of manufacture, while the ground-stone technology attributes consisted of recording only the final, well-made tools resulting from this process, such as the manos, metates, etc. Given these data, the location of ground-stone manufacture cannot be identified.

Another problem that may have caused inflated values for ground-stone tools stems from the prehistoric reuse of certain items. During analysis it was recognized that some tools, such as manos, were sometimes used for raw material to produce other tools. As a reasult, flakes were identified that had polished or pecked surfaces resulting from use before flaking occurred. To be consistent, these flakes were classified as ground-stone objects. As many flakes could be generated from a single ground-stone tool, with none of the flakes themselves having been used for grinding, inflated values for this function were generated. This should not affect the RWCD comparative study, since the recording procedures were consistent for all sites.

Table 5.4. List of technological attributes used in RWCD II lithic analysis

Technological Products
Primary flake (1 dorsal scar, 50% or more of cortex)
Secondary flake (2 or more dorsal scars, 10-50% cortex)
Tertiary flake (10% or less cortex)
Shatter
Flaked core
Cobble core (exhibiting only one or two flake scars on water-worn cobble or pebble)
Ground stone

5.4.1 Technological Analysis Results

Cluster analysis was used to order the technological data set. Eight sites contained sufficient observations to be entered as cases: AZ U:13:13, AZ U:13:24, AZ U:13:28, AZ U:13:29 (Locus 148), AZ U:13:29 (Locus 150), AZ U:13:29 (Locus 151), AZ U:13:36, and AZ U:13:39 (ASU). Sites AZ U:13:36 and AZ U:13:39 (ASU), while similar to each other, appear very different from the remaining six sites, which are themselves similar to one another. When the differences are examined in the three-group solution, it is the mean percentage of shatter that seems to differentiate sites AZ U:13:36 and AZ U:13:39 from the others. It is the high mean percentage of ground stone at AZ U:13:39 (ASU) that may have been responsible for its separation from AZ U:13:36 (ASU). One hypothesis that may be offered for the large amounts of shatter may be the production of ground-stone items that must first be pecked or flaked before their final grinding. This hypothesis equates well with the high proportion of ground stone at AZ U:13:39 (ASU) but might not account for the shatter at AZ U:13:36, where the proportion of ground stone is low. A test of this hypothesis is beyond the scope of this report, and hence the differentiation made on the basis of this variable cannot presently be explained.

It was found that the largest numbers of utilized pieces at all sites were flakes that exhibited unifacial nibbling. This suggests that the most common tool was not a well-prepared and carefully finished object, but, rather, a quickly knocked-off flake or waste flake. The waste flakes generated in the production of carefully formed tools such as projectile points and drills would differ greatly from those produced during expedient tool manufacture. Differences might occur in the number of flakes produced, flaking stage (primary, secondary, and tertiary), and in flake size. For example, many small tertiary flakes would be generated in the finishing process of a projectile point, but the production of an expedient tool for scraping might require only that one flake be struck from a core.

5.5 RAW MATERIALS CONCERNS, METHODS, AND ANALYSIS RESULTS

Thirteen raw material types were identified for the purposes of analysis: basalt (all forms), chert (including chalcedony and jasper), quartzite, quartz, micaceous schist, obsidian, rhyolite, granite, andesite, sandstone, pumice, a general category for felcites, and an "other" category that included predominantly metamorphics. The weight of the material in grams was recorded for each sample unit. In an effort to determine which of these materials might be obtained as cobbles in the nearby Gila River, Tom Crocker, a graduate student in geology, and the author (Blank-Roper) walked the river channel. The channel was filled with sand, and only occasional small, predominantly metamorphic, pebbles were found. Judging from the information available in Wilson, Moore, and Cooper (1969), it seems likely that all but sandstone, chert, and obsidian might be obtained from local formations. Sandstone and chert probably could be obtained as cobbles in the Gila River bed, since the river cuts through formations in which these materials might be found. If this estimate is correct, obsidian and turquoise would be the only nonlocal lithic materials recognized at the RWCD sites. At this point it should be noted that during the walk in the Gila River bed a small nodule of obsidian was recovered. This piece contained dendrites of a red material and was quite different from the obsidian recovered in the archaeological sites, which resembled Apache tears nodules.

Once the functional analysis had been completed, it was evident that micaceous schist, although quite definitely transported by humans to RWCD sites, was not used as a raw material for tool production. It has been assumed that the micaceous schist, abundant at several sites, was used in pottery production and for small ground and perforated discs, perhaps used for ornamentation. It was therefore decided that schist should constitute a special category, similar to that of shell, and should be excluded from further lithic analysis. Table 5.5 gives the percentage of schist at each site. Although the Hohokam seem to have obtained most of their lithic raw materials locally, it is suggested that certain nonlocal materials, such as obsidian, turquoise, argellite, asbestos, and gallena, were obtained through trade. In this study it was hypothesized that exotic materials would occur differentially at sites and that habitation sites would contain relatively more of them than would limited-activity areas. The hypothesis was based on the assumption that exotic materials would be brought initially to the habitation areas. These materials might be considered luxury items to be kept at home or to be interred in burials at habitation sites.

A second problem area concerns the relationship of raw material types to tool types. Because lithic materials differ in their physical characteristics, they are best suited for different tasks. For example, because conchoidal fractures can be produced in obsidian, it is excellent for flaking and producing cutting edges. Likewise, the abrasive characteristics of sandstone make it useful for grinding. It is suggested that a relationship can be seen in tool functions and raw material types; these relationships should reflect differences in the characteristics and hardness of the raw materials.

Table 5.5. Percent of micaceous schist at each RWCD site

ASU Site No.	% of Micaceous Schist at Each Site
AZ U:13:13	0.59
AZ U:13:23	57.61
AZ U:13:24	7.54
AZ U:13:28	7.03
AZ U:13:29 (Locus 148)	2.22
AZ U:13:29 (Locus 150)	1.01
AZ U:13:29 (Locus 151)	0
AZ U:13:36	17.60
AZ U:13:39	51.54
AZ U:10:16	0
AZ U:13:8	no lithics recovered
AZ U:13:40	no lithics recovered
AZ U:13:41	no lithics recovered

The only sites from which nonlocal lithic materials were recovered were AZ U:13:24, AZ U:13:28, and AZ U:13:39 (ASU). For surface samples, 1 g of obsidian was recovered at AZ U:13:39, 4 g at AZ U:13:28, and none at AZ U:13:24. Other nonlocal materials included minute amounts of turquoise, coral (one bead), and steatite (1 bead) from AZ U:13:28, and a single turquoise bead and a hematite pigment ball (possibly local) from AZ U:13:24 (ASU). Exotic minerals appear to have been extremely rare at the RWCD sites but do occur at the habitation sites (AZ U:13:24 and AZ U:13:28) and at the canal site, which is associated with the large habitation site at Gila Butte.

When a cluster analysis was performed using all raw material types excluding schist as variables and nine sites--AZ U:13:13, AZ U:13:23, AZ U:13:24, AZ U:13:28, AZ U:13:29 (Locus 148), AZ U:13:29 (Locus 150), AZ U:13:29 (Locus 151), AZ U:13:36, and AZ U:13:39 (ASU)--as cases, somewhat unusual results were obtained. Contrary to other clustering exercises, the canal site of AZ U:13:39 (ASU) did not appear greatly differentiated from the others. Instead, in a three-group solution AZ U:13:39 clustered with AZ U:13:28, AZ U:13:13, AZ U:13:29 (Locus 150), AZ U:13:29 (Locus 151), and AZ U:13:36 (Group 1); sites AZ U:13:23 and AZ U:13:24 formed Group 2; and the hypothesized limited-activity area of AZ U:13:29 (Locus 148) alone formed Group 3. The largest cluster, Group 1, contained sites at which basalt was the predominant material but at which a variety of materials occurred. Group 2 may be somewhat misleading because, even though there were 301 g of lithic material at AZ U:13:23, only 14 individual lithic items were recovered at this site and it should therefore have been omitted from analysis. Nevertheless, site AZ U:13:24 would still constitute an unusual site, as its 67% basalt is above that of the other sites. The most unusual combination of materials is seen at site AZ U:13:29 (Locus 148), where quartz is most common, followed by basalt and sandstrone. This is a unique pattern of raw materials among RWCD sites and most likely is related to functional differences.

AZ U:13:29 (Locus 148) did not contain an adequate number of utilized lithic objects to be included in the cluster analysis of functional attributes. However, of 14 lithic items recorded, 4 were noted to be manos, which amount to approximately 29% of the assemblage of utilized material. This is a higher frequency than that seen at other sites. Three of the four manos are sandstone, suggesting that sandstone may be a preferred material for grinding tools. A high percentage of quartzite at this site has resulted from its presence as a single but heavy hammerstone. This occurrence underscores the possible pitfalls of low sample analyses.

Table 5.6 quantifies in a general way the relationship between tools and raw materials from this project.

5.6 LITHICS AT AZ U:13:24 (ASU)

AZ U:13:24 (ASU) was the only site at which the remains of house floors were identified. As such, the following investigation of lithic distribution was undertaken to determine if lithic manufacturing or lithic use areas could be identified within the site boundaries. To do so, the excavated units at the site were classified in four groups: Area A, which contained the house and adjacent units; Area B, in which remains of a suspected house floor were encountered; the trash pit units; and the remaining units, which were those chosen in a random sample and in which no features were encountered. Comparisons of lithic material distributions have been made between these four groups; next, comparisons of stratigraphic levels of the house in Area A were undertaken.

Table 5.7 is a comparison of various lithic categories between Area A, Area B, the trash pit units, and the random units. Because these locations varied in size, the artifact counts and raw material weights have been adjusted by dividing the figures for each locus by the total square meters of excavated area. Although this method condenses deposits into two, rather than three, dimensions (as would be the case if excavated volume had been considered), it may be argued that, in a site with a single stratigraphic occupation level such as this, this method presents an accurate representation of the nature of deposits. In effect, it is assumed that people work and deposit artifacts on a horizontal plane and that, at a site with a short occupation history, deposits will tend to be dispersed horizontally rather than vertically. The table indicates that the most dense deposits of material are found within the trash pit area, followed by Area A and Area B, respectively. The lowest number of tools and the lowest weight of material per square meter are found in the random units.

It seems likely that most stone working or tool use was performed in or near the house structure(s), assuming that the heavy concentration of material in the trash pit area is a secondary deposit from nearby households. Table 5.7 seems to support this hypothesis, showing that the greatest number and variety of tool types were located in and around the structure in Area A.

Table 5.8 was constructed to compare the distribution of lithic materials within the house in Area A. The roof fall, the fill above the upper floor, and the upper floor

Table 5.6. Listing of tool type by raw material type (includes all materials from surface analysis studies, mitigation phase), in numbers of pieces and percents

Tool Category	Basalt	Chert	Quartz	Quartzite	Micaceous Schist	Other	Obsidian	Rhyolite	Granite	Andesite	Sandstone	Felcite	Total
Unifacial	103	50	4	25	0	19	0	8	3	3	0	10	225
nibbling	45.8	22.2	1.8	1.1	0.0	8.4	0.0	3.6	1.3	1.3	0.0	4.4	
Bifacial	6	6	2	6	0	5	2	0	0	0	0	1	28
nibbling	21.4	21.4	7.1	21.4	0.0	17.9	7.1	0.0	0.0	0.0	0.0	3.6	
Graver	1	2	0	1	0	0	0	0	0	0	0	1	5
	20.0	40.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	
Drill	0	3	0	2	0	0	0	0	0	0	0	0	5
	0.0	60.0	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Punchlike	1	0	0	0	0	0	0	0	0	0	0	0	1
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Polished	17	3	1	12	0	4	1	4	0	0	0	2	44
edges	38.6	6.8	2.3	27.3	0.0	9.1	,.3	9.1	0.0	0.0	0.0	4.5	
Wear on pro-	0	2	0	0	0	0	0	0	0	0	0	0	2
jectile point	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Hammerstones	66	2	0	12	0	5	0	1	1	0	1	3	91
	72.5	2.2	0.0	13.2	0.0	5.5	0.0	1.1	1.1	0.0	1.1	3.3	
Metates	17	0	0	1	0	0	0	0	0	0	0	0	18
	94.4	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Manos	14	0	0	2	0	4	0	2	2	3	14	0	41
	34.1	0.0	0.0	4.9	0.0	9.8	0.0	4.9	4.9	7.3	34.1	0.0	
Polishing	1	1	0	0	1	0	0	0	0	0	0	0	3
stones	33.3	33.3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Others	2*	0	0	0	0	1	0	0	0	3	0	0	6
	33.3	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0	50.0	0.0	0.0	

*Choppers

Table 5.7. Comparison of lithic technology, function, and raw material categories from Area A, Area B, featureless random units, and trash area of AZ U:13:24 (ASU)

AZ U:13:24 (ASU)	Area A	Area B	Featureless Random Units	Trash
Total lithic weight (g/m^2) ..	194	40	10	391
No. of primary flakes/m^2	1.9	1.0	0.5	2.5
No. of secondary flakes/m^2 ..	4.0	2.8	1.1	15.8
No. of tertiary flakes/m^2 ...	4.8	3.0	0.6	4.2
No. of shatter pieces/m^2	2.9	2.4	0.3	19.5
No. of cores/m^2	0.4	0.1	0.1	0.2
No. of ground stones/m^2	0.2	0	0	0.2
No. of tools/m^2	1.9	1.0	0.2	3.2
Tool types:				
Unifacial wear/m^2	0.66	0.76	0.17	1.48
Bifacial wear/m^2	0.07	0	0	0.15
Gravers/m^2	0.09	0	0	0
Drills/m^2	0.02	0	0	0
Hammerstones/m^2	0.26	0.06	0	0.15
Metates/m^2	0.09	0	0	0
Manos/m^2	0.11	0	0	0.44
Polished edges/m^2	0.15	0	0.05	0
Polishing stones/m^2	0.02	0	0	0.30
Bifacial wear on bifaces/m^2	0.02	0	0	0
Punchlike/m^2	0	0	0	0
Others/m^2	0.42	0.06	0	0.59
Raw Materials (nearest gram):				
Basalt, g/m^2	85	24	5	*
Chert, g/m^2	5	4	1	*
Quartz, g/m^2	1	0	0	*
Quartzite, g/m^2	20	5	0	*
Micaeous schist, g/m^2	22	1	0	*
Other, g/m^2	35	5	3	*
Rhyolite, g/m^2	2	1	0	*
Granite, g/m^2	12	0	0	*
Andesite, g/m^2	0	0	0	*
Sandstone, g/m^2	12	0	0	*
Felcite, g/m^2	0	0	0	*
Pumice, g/m^2	0	0	0	*

*Not recorded

Table 5.8. Comparison of lithic distributions between subunits of Area A (lithic categories include technological, functional, and traditional classifications; percentages are computed for each subunit by lithic category)

Lithic Distribution	Inside House					House Exterior	Feature Area N. of Area A
	Above Roof Fall	Roof Fall	Fill Above Floor	Upper Floor	Lower Floor		
Primary flakes	24 15.38	1 2.38	4 16.67	1 12.5	0 0	27 16.77	2 4.25
Secondary flakes	39 25.00	17 40.48	2 8.33	0 0	2 33.33	48 29.81	7 14.89
Tertiary flakes	49 31.41	16 38.09	15 62.50	5 62.50	3 50.00	46 28.57	25 53.19
Shatter	41 26.28	8 19.05	2 8.33	0 0	1 16.67	38 23.60	13 27.66
Cores	3 1.92	0 0	1 4.17	2 25.00	0 0	2 1.24	0 0
Unifacial nibbling	5 38.46	0 0	1 20.0	1 10.0	2 100.0	5 45.45	1 20.0
Bifacial nibbling	0 0	1 25.00	0 0	0 0	0 0	1 9.09	0 0
Gravers	0 0	0 0.	0 0	0 0	0 0	0 0	0 0
Drills	0 0	0 0	0 0	0 0	0 0	1 9.09	0 0
Punchlike	0 0	0 0	0 0	0 0	0 0	0 0	0 0
Polished edges	1	0	0	0	1	2	0
Wear on projectile points	0 0	0 0	0 0	0 0	0 0	0 0	0 0

Table 5.8 (Continued)

Lithic Distribution	Inside House: Above Roof Fall	Inside House: Roof Fall	Inside House: Fill Above Floor	Inside House: Upper Floor	Inside House: Lower Floor	House Exterior	Feature Area N. of Area A
Hammerstones	3 23.08	0 0	1 20.00	3 30.00	0 0	0 0	3 60.00
Metates	0 0	0 0	0 0	1 10.0	0 0	0 0	0 0
Manos	1 7.69	1 25.00	0 0	1 10.00	0 0	0 0	1 20.00
Polishing stones	0 0	0 0	0 0	0 0	0 0	1 9.09	0 0
Other	4 30.77	2 50.00	3* 60.00	4 40.00	0 0	3 27.27	0 0
Total lithic weight (grams)	1405	323	665	1816	65	1076	598
Traditional Classifications							
Choppers	3	0	1	1	0	1	0
Hammerstones	3	0	0	2	0	0	3
Chopper/hammerstones	0	0	1	0	0	0	0
Metates	1	0	0	1	0	0	0
Manos	1†	0	0	1	0	0	1
Projectile points	2	0	1	0	0	0	0
Polishing stones	0	2	0	1	0	0	0
Gurin	0	0	0	0	0	1	0
Anvils	0	0	0	1	0	0	0

*Includes one projectile point without wear. †Fragment.

itself (the best preserved of the two floors) were chosen for this purpose. It was assumed that the materials on the floor represent items deposited during the occupation of the structure, that the roof fall material may represent items that may have been used on top of the roof, and that the fill material probably consists of a jumble of roofing material and possibly artifacts that were deposited once the structure had burned and been abandoned. Interestingly, although the floor contained the least debitage, it displayed the highest number of tools, perhaps signifying that tool use or tool storage occurred within the house. Tool manufacture appears to have occurred on the roof and in the area surrounding the structure. It is not surprising that tool use and manufacture took place outside the structure, since ethnographic evidence and remaining archaeological examples indicate that aboriginal houses were generally dark inside. The size of the Hohokam hearths suggests that these would not have produced sufficient light for most tool use or manufacture.

5.7 ADDITIONAL COMMENTS, SITE AZ U:13:29 (LOCUS 150)

The analyses described in this chapter have not clearly distinguished limited-activity areas from habitation sites. One major cause of this has been that many of the smaller sites, those most likely to have been limited-activity areas, did not produce sufficient lithic remains to be included in a statistical sample. Future studies of the RWCD lithic materials should combine both the RWCD I samples and the RWCD II samples to mitigate this problem.

That the analysis indicated functional variation between sites is suggested by the separation of the canal site, AZ U:13:39 (ASU), from the others in both the functional and technological analyses. These findings repeat those of the ceramic analyses in which the canal site was also identified as distinctive from the others. There are, then, indications that activities that differed markedly from those at other sites were performed at or near the canals.

If the lithic analysis is to be considered as a reliable indication of site function, then a reexamination of the the site AZ U:13:29 (Locus 150) (ASU) is in order. Both the functional and technological analysis grouped this site with sites considered to have been habitation locations, indicating that the assessment of AZ U:13:29 (Locus 150) as a limited-activity area may be incorrect. If a more detailed analysis of remains were to be conducted, the possibility that this site represents a preceramic occupation would have to be carefully considered.

6.0 POLLEN RESULTS

6.1 INTRODUCTION

The pollen analysis of RWCD II prehistoric sites yielded identifiable pollen from the surface of four sites--AZ U:13:8, AZ U:13:23, AZ U:13:24, AZ U:13:29--and from subsurface contexts at AZ U:13:8, AZ U:13:24, and AZ U:13:28, Components A and B. The entire pollen assemblage is tabulated and displayed as Appendix II.

6.2 DISCUSSION OF RESULTS

The palynological analysis of surface samples yielded a reflection of the current environment, for the most part. The surface pollen on AZ U:13:8, however, contains a relatively high frequency of mesquite (*Prosopis* sp.). AZ U:13:8 consists of rock alignments interpreted as check dams for dry farming. The presence of *Prosopis* in the surface pollen may indicate that the alignments were used to retard runoff in order to enhance native species rather than domesticates. The rare presence of domesticates in the surface pollen record probably is a reflection of nearby floodplain farming of modern species. Unfortunately, the subsurface pollen samples from AZ U:13:8 do not support the proposition that the alignments were constructed primarily to increase mesquite production. The subsurface samples from this site are notable for generally high frequencies of hi- and lo-spine Compositae and Cheno-Ams, the presence of cotton and corn pollen, and the marked presence of native economically important species of cactus. Table 6.1 summarizes the pollen types noted in cultural contexts at RWCD II prehistoric sites.

Pollen remains from AZ U:13:24, the only prehistoric site with a known structure, have proved to be the most revealing. Arboreal pollen from all contexts is markedly low. On Floor I, the high density of corn (*Zea mays*) pollen can only indicate storage or preparation in this room, the former being the most likely. Goosefoot (*Chenopodium* sp.) is also quite common and squash (Cucurbitaceae) is present; this may suggest that the structure was a focus of storage of economically important plants. Pollen samples from Hearth I and Floor II are not suggestive of specific use patterns. A single occurrence of corn pollen in Hearth II, scant evidence, may indicate that this feature was used in preparation of that foodstuff. Another possible floor was located during excavation of AZ U:13:24, but no positive identification could be made. In the possible floor area, pollen samples contained a high frequency of *Chenopodium*;

Table 6.1. Summary of pollen identification given by cultural provenience

Pollen	AZ U:13:8			AZ U:13:24					
	Quad 1, Unit 1	Quad 1, Unit 2	Quad 1, Unit 2	Floor I	Hrth. I	Floor II	Hrth. II	Possible Floor	Feature 1
Arboreal pollen									
Juniperus	—	1	2	—	—	—	—	—	—
Pinus edulis	3	9	8	—	—	—	—	—	—
P. ponderosa	2	3	5	—	—	—	—	—	—
Olneya	—	6	1	—	—	—	—	—	—
Larrea	—	13	2	—	—	1	—	—	—
Celtis	—	1	1	—	—	—	—	—	—
Prosopis	—	—	—	—	—	—	—	—	—
Nonarboreal pollen									
Chenopodiaceae	85	136	122	491	190	128	10	348	184
Compositae									
Artemesia-type	—	1	—	—	—	—	—	—	—
Lo-spine	278	196	333	68	25	3	2	29	12
Hi-spine	6	21	51	2	2	—	—	3	2
Liguliflorae	—	—	6	—	—	—	—	—	—
Gramineae	34	33	41	8	8	1	—	14	—
Ephedra N-type	—	—	1	—	—	—	—	—	—
Ephedra T-type	1	2	4	—	—	—	—	—	—
Sacrobatus	1	—	1	—	—	—	—	—	—
Malvaceae	1	—	1	9	—	—	—	1	—
Onagraceae	1	2	5	1	—	—	—	1	—
Nyctoginaceae	10	24	8	—	—	—	—	—	—
Zea mays	—	1	—	38	—	—	1	—	—
Cylindropuntia	—	1	—	—	—	—	—	—	—
Cactaceae	1	1	3	7	—	—	—	—	—
Gossypium	—	—	2	—	—	—	—	—	—
Cucurbita	—	—	—	1	—	—	—	—	—
Plumbaginaceae	—	—	—	—	1	—	—	—	—

Table 6.1 (Continued)

Pollen	AZ U:13:24			AZ U:13:28A						AZ U:13:28B
	Cremation Vessel	Midden L2-3	Midden L4-6	Ash Lense	Ash Pit	Midden L-1	Midden L-2	Midden L-3	Midden L-4	Ash Pit
Arboreal pollen										
Juniperus	—	—	—	—	—	—	—	2	—	—
Pinus edulis	—	—	—	—	—	—	—	—	—	—
P. ponderosa	—	—	—	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	—	—	—	—
Larrea	—	—	—	—	2	—	—	—	—	—
Celtis	—	—	—	—	—	—	—	—	—	—
Prosopis	—	—	—	1	—	—	—	6	11	—
Nonarboreal pollen										
Chenopodiaceae	29	362	529	351	37	450	549	722	518	53
Compositae										
Artemesia-type	—	—	—	—	—	—	—	—	—	—
Lo-spine	2	26	33	164	5	33	24	38	29	11
Hi-spine	1	3	7	56	2	23	16	14	17	7
Liguliflorae	—	—	—	—	—	—	—	—	—	—
Gramineae	—	1	8	21	—	18	7	8	12	3
Ephedra N-type	—	—	—	—	—	—	—	—	—	—
Ephedra T-type	—	—	—	—	—	—	—	—	—	—
Sacrobatus	—	—	1	—	—	—	—	—	—	—
Malvaceae	—	—	—	—	—	—	—	—	—	—
Onagraceae	—	—	—	4	—	2	—	—	3	—
Nyctoginaceae	—	—	—	—	—	2	—	—	—	—
Zea mays	—	1	—	1	—	1	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—	—	—	—
Cactaceae	—	—	—	7	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—	—	—	—
Cucurbita	—	—	—	2	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—	—	—	—

these may be a result of storage activities in a structure or a highly disturbed context such as a trash area. In the identified trash midden on this site, Cheno Ams are quite frequent and increase with depth. *Zea mays* is present in a single pollen grain in the upper level. The presence of Cheno-Ams in high frequency is to be expected in a prehistoric trash midden.

The pollen samples from AZ U:13:28A contain evidence of economically significant plants. The ash lens contains *Zea mays*, *Cucurbita*, and cacti pollen. It also contains high frequencies of *Chenopodium*, both hi- and lo-spine Compositae, and grass (Gramineae) pollen. The first level of the midden contains a single corn pollen. *Chenopodium* is high in frequency throughout the midden levels but tends to increase in frequency with depth. Notable also is the relatively frequent occurrence of mesquite in the lower midden levels.

In four pollen samples taken from a pollen column in the canal on AZ U:13:39, no pollen grains were noted.

7.0 FAUNAL REMAINS

7.1 INTRODUCTION

Faunal material discussed in this report was derived from the surface collection and test excavation of four sites. Two of these have been identified as historic (cf. Pima) sites--i.e., AZ U:13:23 (ASU) and AZ U:13:28 (ASU)--while deposits from the remaining two are prehistoric (Blank-Roper, personal communication). Those are AZ U:13:24 (ASU) and AZ U:13:28A (ASU). Ultimately, faunal material is useful in reconstructing a portion of the total subsistence activities once integral to these communities, and that is an intended goal here. But this cannot always be accomplished with equal facility at different sites due to the functional specificity of certain sites, and various taphonomic factors such as differential bone preservation and intrusive rodent activity. In terms of inferences relating to subsistence, the usefulness of each site is contingent on ferreting out the immediate processes affecting the composition of the assemblage at the site specific level. The purpose of this report is to establish a base line from which subsistence inferences can be made, to identify certain genera representing probable food items, and to explore the limitations of this particular data base.

Most faunal reports attempt to make subsistence interpretations with the available faunal data and treat the more immediate processes mentioned above as tangential issues affecting the accuracy or validity of certain interpretations. This will not be done for a number of reasons, the main one being analytical scale. Valid subsistence inferences necessitate investigation on a regional scale, the comparative examination of a number of faunal assemblages, and a fairly detailed understanding of regional archaeology for the periods being dealt with. Failure to consider each of these issues relegates subsistence interpretation to mere speculation. Analysis will therefore be restricted to topics that can be addressed with the faunal data identified from the project. Some immediate concerns of this report are to document the variety of species recovered, their respective minimum number of individuals (MNIs), and the various types of alterations present in the bone itself.

Analysis of 124 samples from the four sites in the project area yielded a total of 843 bone elements, of which 506 (60%) were identifiable to at least the taxonomic level of order. A composite list of all identified taxa from the samples (Table 7.1) is indicative of a lower Sonoran Desert

Table 7.1. List of vertebrate taxa recovered from RWCD project

OSTEICHTHYES	Bony fish
AMPHIBIA	Amphibians
Salientia	
Bufonidae	
Bufo sp.	Toad, species indet.
REPTILIA	Reptiles
Testudinata	
Testudinidae	
Gopherus agassazi	Desert tortoise
Squamata	
Crotalidae	
Cortalus sp.	Rattlesnake, species indet.
AVES	Birds
Galliformes	
Phasianidae	
Lophortyx gambelii	Gambel's quail
Columbiformes	
Columbidae	
Zenaida macroura	Mourning dove
MAMMALIA	Mammals
Lagomorpha	
Leporidae	
Sylvilagus sp.	Cottontail, species indet.
Sylvilagus amduboni	Desert cottontail
Lepus sp.	Jackrabbit, species indet.
Lepus californicus	Black-tailed jackrabbit
Rodentia	
Sciuridae	Squirrels
Geomyidae	
Thomomys bottae	Pocket gopher
Heteromyidae	
Perognathus sp.	Pocket mouse, species indet.
Dipodomys sp.	Kangaroo rat, species indet.
Dipodomys merriami	Merriam's kangaroo rat
Dipodomys deserti	Desert kangaroo rat
Cricetidae	
Reithrondontomys/ Peromyseus	Harvest/white-footed mouse, species indet.
Sigmodon hispidis	Hispid cotton rat
Neotoma sp.	Wood rat, species indet.
Neotoma albigula	White-throated wood rat
CARNIVORA	
Canidae	
Canis sp.	Coyote/dog
ARTIODACTYLA	Artiodactyles (even-hooved)

fauna in association with an aquatic or riparian habitat. This gross environmental assessment is perfectly expectable given the location of the sites in question (see Figure 1.1). However, each site differs somewhat in terms of its contribution to this overall picture.

7.2 PREHISTORIC SITES

7.2.1. AZ U:13:24 (ASU) and AZ U:13:28A (ASU)

In basic composition both prehistoric assemblages stand in marked contrast to the historic sites and are more similar to one another. The assemblages are shown in Table 7.2. AZ U:13:24 does, however, contain a greater variety of species, including wood, cotton, and kangaroo rats, along with two rattlesnake vertebrae and six fish vertebrae. Each of these prehistoric assemblages contains evidence, albeit meager, of worked bone tools, and the use of certain species as food items.

Faunal material from AZ U:13:24 consisted of 202 bone elements, of which 100 (49.5%) were identifiable to some taxonomic level; this differs somewhat from the 54 (23.6%) identifiable pieces of bone from a total of 229 for AZ U:13:28A. The difference in these figures is mostly related to the greater number of identified rodent remains in AZ U:13:24. While the respective samples are not adequate for meaningful intrasite comparison by level or feature, a consideration of certain species groups allows for some inferences concerning prehistoric subsistence.

At face value it appears that the assemblages represent, in part, by-products of human consumption. As in the historic sites, burnt bone can be used as a gross index of human activity. Of the total 202 bones from AZ U:13:24, 17.8% are burnt, which is relatively close to a corresponding value of 25.3% for the 229 bones from AZ U:13:28A. These figures contrast dramatically to the 1.03% pieces of burnt bone from AZ U:13:28.

The most common species at each of these sites are cottontails and jackrabbits, both in the family Leporidae. The relative frequency (identifiable bone only) of rabbit at AZ U:13:24 is 70% (50% using MNIs) from AZ U:13:28A. High values for Leporids, such as this, correspond with other prehistoric sites in the Sonoran desert and imply that both cottontails and jackrabbits significantly contributed to the meat portion of the diet consumed at these sites. Another line of evidence that supports this inference is

Table 7.2. Bone element frequencies and MNIs (minimum number of individuals) for analytical units within the RWCD project area; information format, x(y)/z, where x = number of bone elements, y = MNI, and z = number of burnt bones

Species	AZ U:13:24 (ASU) House Area							AZ U:13:28A (ASU)			
	Exterior Units	Roof Fall and Upper Strata	Fill Above Floor, and Floor	Trash Pit Area	Miscellaneous Units	Totals: Frequency	Totals: MNI/ Burnt Bone	Habitation Units	Trash Pit Area	Totals: Frequency	Totals: MNI/ Burnt Bone
Osteichthyes			6(1)/0			6	(1)/0				
Bufo sp.											
Gopherus agassizi											
Crotalus spp.		1(1)/1		1(1)/0		2	(1)/1				
Aves--small											
--medium											
--large											
Lophortyx gambelii											
Zenaida macroura									1(1)/0	1	(1)/0
Leporidae	2--/0		3--/1	4--1		9	--/2				
Sylvilagus sp.		5(1)/1	2(1)/0		]	30	(3)/3	1(1)/0	]	16	(2)/6
Sylvilagus auduboni	2(1)/0	2(1)/1	4(1)/0	12(2)/1	3(1)/0]				15(2)/6]		
Lepus spp.		8(1)/2			]	31	(2)/4		6(1)/2]	35	(3)/16
Lepus californicus	2(1)/0	3(1)/1	9(2)/0	5(1)/0	4(1)/1]			3(1)/3	26(3)/11]		
Rodentia--small	1--/0	1--/0				2	--/0				
--medium		3--/0	8--/0	1--/0		12	--/0				
--large											
Sciuridae		1--/0				1	--/0				
Thomomys bottae											
Perognathus sp.											

Table 7.2 (Continued)

Species	AZ U:13:24 (ASU) House Area							AZ U:13:28A (ASU)			
	Exterior Units	Roof Fall and Upper Strata	Fill Above Floor, and Floor	Trash Pit Area	Miscellaneous Units	Totals: Frequency	Totals: MNI/Burnt Bone	Habitation Units	Trash Pit Area	Totals: Frequency	Totals: MNI/Burnt Bone
cf. *Perognathus sp.*											
Dipodomys spp.											
Dipodomys merriami									1(1)/0	1	(1)/0
cf. *D. merriami*											
Dipodomys deserti			1(1)/0	1(1)/0		2	(1)/0				
Reithrodontomys/ Peromyscus											
Sigmodon hispidis		1(1)/1	1(1)/0			2	(1)/1				
Neotoma spp.			2(1)/0			2	(1)/0				
cf. *N. albigula*											
Canidae		1(1)/0				1	(1)/0				
Canis sp.									1(1)/0	1	(1)/0
Artiodactyl--medium											
--large											
Unidentif.--small	9--/3	28--/6	32--/5	15--/8	6--/0	90	--/22	33--/1	75--/27	108	--/28
--medium			1--/0	1--/1		2	--/1	14--/0	10--/1	24	--/1
--med/lg				2--/1	3--/0	5	--/1	26--/0	5--/2	31	--/2
--large		1--/0				1	-/0	12--/5		12	--/5
indeterm.	1--/0	1--/1	2--/0			4	--/1				
Total	17--/3	56--/14	71--/6	42--/12	16--/1	202	--/36	89--/9	140--/49	229	--/58

the frequency of burnt rabbit bone in these prehistoric assemblages. Of the rabbit bone at AZ U:13:24, 12.8% shows evidence of burning, while this figure reaches 43.1% for AZ U:13:28A. None of the rabbit bone recovered from AZ U:13:28 was burnt, not to mention that it constituted only 15.5% of the identifiable bone (12.5% using MNIs).

Other species recovered from these sites, particularly from AZ U:13:24, that may well represent food items are fish, mourning dove, rattlesnake, a squirrel (Sciuridae), and some of the medium-sized rodents. In fact, one cotton rat tibia and a rattlesnake vertebra were heavily burnt, strengthening the possibility of their economic usefulness.

Two canid bones were also represented, one at each site. The fragmentary mid-ventral portion of a mandible from AZ U:13:24, from a small, immature individual, could be classified only to the familial level. The other bone, the proximal third of a metapodial from AZ U:13:28A, was classified as Canis sp. and represents either a coyote or a domestic dog. Because these bones could not be narrowed down below the generic level, and because they exhibited no cultural modification, their value as food items at these sites cannot be discerned.

7.2.2 Artifactual Bone

Upon close examination, three medium/large unidentifiable long bone shaft fragments (probably artiodactyl) exhibited purposeful modification. The one fragment from AZ U:13:24 (specimen #1768) was charred and contained striations from sandstone abrasion. It was probably an awl fragment.

The two fragments from AZ U:13:28A (specimens #631, 686) were both smoothed and polished to some degree. One resembled the tapered end of an awl, while it can only be said of the other that it was once part of a tool.

7.3 DISCUSSION

Both prehistoric sites, and their corresponding faunal assemblages, look promising as indices of the animal component of subsistence. The most prevalent items, and a likely food source, were the cottontails and jackrabbits, which is the general pattern in the Sonoran Desert. The only anomaly is the absence of any artiodactyls, but this may be accounted for in a variety of ways (e.g., sample bias, carnivore preference for chewing on big bone, tool use, etc.). In fact, the small portion of unidentifiable large bone fragments probably represents artiodactyls.

8.0 A HOHOKAM CREMATION FROM AZ U:13:28 (ASU)

8.1 INTRODUCTION

A notable feature distinguishing the prehistoric Hohokam people of the Salt/Gila Valley in south-central Arizona from their neighbors to the north and east is the marked propensity of the Hohokam for cremating their dead. Although this practice serves as a good cultural marker trait, it has hampered skeletal biological research on the Hohokam. While biological studies are impeded by cremation, it is still possible to derive considerable information on cultural practices through analysis of cremated bone (Miller 1980).

This report deals with cremated remains recovered during testing operations at AZ U:13:28 (ASU), a Hohokam site located south of Phoenix, Arizona. The remains reported on here, although sparse, afford some room for interpretation of cultural patterns. The results of the analysis are reported first, followed by a brief discussion of the possible inferences that may be drawn from the material.

8.2 MATERIAL EXAMINED

The cremated human remains consist of a total of 155 bone fragments, with a total weight of 62.7 g. The fragments are generally small, and few are identifiable beyond their gross categorization as either cranial or infracranial. Even this simple classification cannot always be assigned with certainty, several fragments thus being termed "possible cranial." Table 8.1 shows the total weight of all fragments and the separation of cranial from postcranial remains. The "possible cranial" fragments are included in the postcranial category, as assignment of these to the cranial category could not be made.

Inspection of Table 8.1 reveals that cranial fragments, whether or not "possible cranial" fragments are included, are much less common than are postcranial remains. Their mean weight per cranial fragment is also less (see Table 8.2) than the mean weight for postcranial fragments. The mean weight for all fragments combined (0.4045 g/fragment) is also greater than the mean of cranial fragments. This probably is due to the fact that a number of small cranial fragments, along with a few large pieces, were recovered. These small fragments contribute little to the overall weight for the cranial fragments category but do serve to depress the mean weight for that group. In total volume,

Table 8.1. Total weight of bone material from cremation, AZ U:13:28 (ASU)

Bone Material	Weight (grams)
Cranial fragments	8.2
Postcranial fragments	54.5
Total weight	62.7

Table 8.2. Mean weight of cranial and postcranial bone, cremation, AZ U:13:28 (ASU)

Bone Material	No. of Frag- ments	Total Weight (grams)	Mean Weight (gram)
Cranial fragments	26	8.2	0.3153
Postcranial fragments	129	54.5	0.4224
Total	155	62.7	0.4045

the cranial fragments account for 13% of total weight for the recovered material. This figure is slightly below the 16-19% of total skeletal weight generally attributed to the cranium (Trotter et al. 1975). If the 13% figure is accurate (it does not include "possible cranial" fragments), then it appears that the material was not recovered proportionate to actual skeletal weight. That is, the postcranial part of the skeleton is overrepresented. Although preliminary results suggest this, the small size and consequent difficulty of identification of many fragments preclude any conclusive statement in this regard.

An attempt was made to determine sex of the individual, although this effort was hampered because the best skeletal indicator of sex, the pelvic region, was not recovered. Measures of bone thickness, both cranial and postcranial, may be used to determine sex of human remains when other indicators are not available (Gejvall 1970). This procedure, while not as reliable as others, may give some indication of an individual's sex and is better than guess estimates.

Three cranial fragments, the largest available, were selected and measured for thickness with a sliding caliper. A mean thickness of 3.81 cm was determined for the three fragments. This low value suggests that the individual was a female, assuming that the person was an adult. The assumption of adulthood appears valid, based on the degree of sutural development observed in one of the cranial fragments. No accurate age determination, beyond that of adulthood, could be made owing to the lack of age diagnostic criteria in the material recovered.

8.3 DISCUSSION

Miller (1980) has discussed in some detail the types of cultural inferences that may be drawn from cremated material. Of major importance in this regard are the color and degree of calcination observed in the cremated bone. Differences in both of these factors are quite useful for determining the heat of the crematory fire and the placement of the body relative to the fire. Both Wells (1960) and Gejvall (1970) state that prehistoric crematory fires reached at least 800° C. Baby (1954) has demonstrated that organic remains do not achieve complete combustion below that temperature. From the differing degrees of calcination observed in the material recovered, it is inferred that heat varied in different parts of the crematory pit. The differential firing of various bones suggests that the maximum heat of the fire was focused on the central part of the body. The cranial fragments, and some postcranial fragments assumed to be from the lower limbs, exhibit little or no firing. Incomplete combustion of these remains, indicated by blue-gray color, leads to the conclusion that a single fire was used. The chalky-white color of other bone fragments suggests that they were from the torso region, where the fire's maximum temperature apparently was focused.

The incomplete combustion of cranial fragments suggests further that the body was burned in the flesh. It appears that the cremated body was allowed to cool, after which the bones were broken up. The usual Hohokam pattern for disposal of the dead includes postcremation interment in a cremation vessel. Although no pottery was recovered with the body, this may still be the case. No conclusive statement on this matter can be offered at the present time.

8.4 NONHUMAN SKELETAL MATERIAL

A number of nonhuman bones were recovered in the area of the cremated bone. The most prominent species represented is jackrabbit, although other animal species (bovids?) are also represented. A few of the animal bones exhibit some charring, suggesting that they were cooked and consumed. Still other animal remains were unburned and may be of recent origin; their association with the cremated human remains, and with the site area in general, apparently is accidental.

8.5 CONCLUSION

The cremated remains of a single individual were recovered from AZ U:13:28 (ASU). Weighing the remains indicated that the individual was only partially recovered. Measures of bone thickness suggest that the individual was a female, with age judged "adult" on the basis of cranial sutural development. It must be emphasized that these are tentative classifications, based on techniques normally not used for age and sex determination. Differences in color and outer table composition of the burnt bone indicate differential exposure to the crematory fire. The differential degree of burning, and the fact that some cranial fragments show little or no burning, are evidence that the individual was cremated "in the flesh." Due to the small size of the fragments recovered, no metric measurements or discrete cranial traits could be recorded. The small size of the fragments also precluded any analysis of osseous pathologies.

9.0 SUMMARY AND CONCLUSIONS

9.1 INTRODUCTION

Because of the nature of the RWCD II prehistoric sites, few conclusions can be drawn concerning Hohokam settlement and subsistence in south-central Arizona. The RWCD II sites are primarily surface sites, remnants of badly deflated prehistoric occupations. Few sites produced subsurface evidence, and only one site, AZ U:13:24, yielded an architectural feature. These sites certainly testify to the prehistoric use of the Gila Basin by small-scale Hohokam agriculturalists relying on a multiple resource subsistence base. Further statements await further data collection in the basin and comparative treatment of the various data bases.

The following brief discussion focuses on two areas of summary concern. The first area comprises the individual sites investigated on RWCD II. The second is a general project conclusion.

9.2 INDIVIDUAL SITES

Table 9.1 lists the 12 RWCD II sites, the phase designations assigned, and suggested functional use of these sites based on the analytical results of investigation. The phase/period designations are based on ceramics, of which few on any one site are diagnostic.

The field and laboratory observations of AZ U:13:8 are not conclusive. The rock alignments, features, and piles appear to be man-made. An account by Russell (1908) states:

> On the slopes of the Santan hills north of the present Pima village of Santan there are several hundred acres of stony mesa that have been cleared and cultivated. The rocks have been gathered in rows that enclose rectangular areas of but a few square yards in extent. There are about six clumps of creosote bush enclosed in it.

These fields, which were said to be the work of the Hohokam, lie to the south of AZ U:13:8 but do indicate the presence of prehistoric agricultural features in the area. As the abundance of Hohokam ceramics indicates, the Hohokam utilized the area even though the rock features cannot be definitely assigned to a time period. Some of the rock alignments noted on this site probably served to catch runoff from the Santan Mountains. Alignments that crosscut the downhill slope most likely retard flow, while those that

Table 9.1. Summary of the site chronology and function of RWCD II sites

ASU Site No.	Phase/Period Designation	Function
AZ U:13:8	Gila Butte, Santa Cruz, Sacaton(?), Soho(?)	Floodwater agriculture
AZ U:13:13	Late Sacaton-Soho	Habitation(?)
AZ U:13:23	Soho	Limited use (ceramic production)
AZ U:13:24	Sacaton-Classic	Habitation
AZ U:13:28A	Classic	Habitation(?)
AZ U:13:28B	Classic	Habitation(?)
AZ U:13:28C	Soho	Habitation(?)
AZ U:13:29 (Locus 148)	Classic	Limited use--plant processing, tool manufacture
AZ U:13:29 (Locus 150)	Unknown	Limited use--plant processing, tool manufacture
AZ U:13:29 (Locus 151)	Soho-Civano	Limited use--plant processing, tool manufacture
AZ U:13:35	Classic	Limited activity
AZ U:13:36	Classic	Habitation
AZ U:13:39	Gila Butte-Soho	Canal
AZ U:13:40	Unknown	Limited use (ceramic production?)
AZ U:13:41	Unknown	Canal
AZ U:10:16	Classic	Habitation(?)

follow the natural slope may have functioned to channel water runoff. The clusters of small rock piles on AZ U:13:8 also were noted in the Conoco Project area by Doelle (1976: 104-107). He speculates that an increase in surface runoff might be obtained by clearing the soil surface of stones that would be conveniently piled or that the piles may have served ". . . as a mulch to conserve soil moisture, with planting taking place within the rock pile" (Doelle 1976: 104).

Although no architectural features were noted at AZ U:13:13, it is suspected of being a habitation based on the resemblance of the artifactual assemblages recovered here and at the known habitation site, AZ U:13:24. The site has been severely affected by deflation.

AZ U:13:23 is difficult to classify as to function. The lack of features, the extremely low density of lithics, the low diversity of lithic technological characteristics, the lack of exotic goods, the high percentage of buff wares, and the low percentage of bowls suggest that this site was utilized for a highly specialized function. It is suggested that the use of the site for ceramic production would account for the unusual condition of sherds (spalled) recovered here and for other site characteristics. The high-density sherd cluster, previously interpreted as a trash mound, may have served as a disposal pile for improperly fired vessels or as the surface upon which other vessels were fired.

AZ U:13:24 is a habitation site with a known structure. At least one other architectural feature is suspected on the site. The site contains a relatively high frequency of exotic materials and a good variety of faunal species, both indicating a permanent use of the site. In lithic source material for this site, basalt occurs more frequently than on other RWCD II sites. This may result from the use of basalt as building material for permanent dwelling footings or for ground stone tool production. Either of these uses of basalt suggests a sedentary occupation of the site.

AZ U:13:28 is a muiltiple-loci site that meets many criteria to be classified as a habitation site. It contains evidence of significant trash deposits, both on the surface and subsurface. Artifacts were quite abundant at the site, surface density is high, and the artifact assemblage is quite varied and has a high exotic content. In addition, functional and technological lithic analyses showed this site to be most similar to AZ U:13:24. The extensive trash deposits and cremations are features known to exist most often at permanent habitation sites. Flotation, pollen, and faunal analyses indicate that a variety of animal, wild, and domestic resources were utilized at this location.

Three prehistoric activity loci were also noted at AZ U:13:29, all classified as limited-activity areas. This classification is supported by the low incidence of bowl sherds and the low density of the surface material, which lacks an area identifiable as a trash deposit. No exotic goods are known for the site. Plant processing activities on the site are suggested by mano and cobble clusters. Hammerstones and chunks piled up may have been a stockpile of raw materials. No centralized clusters of debitage indicating chipping activities were noted, however. The predominance of manos made from sandstone at these loci may suggest the processing of a single resource.

AZ U:13:36 has been classified as a habitation site, though no structural remains were noted. The large trash deposit here is most likely related to a permanent Soho phase habitation. The functional analysis of lithics and the bowl/jar ratio indicate that the assemblage at this site is similar to other habitation sites on the project. Finally, the quantity of artifacts recovered at the site, as well as the presence of shell, further indicates a permanent dwelling in this location.

AZ U:13:39 is a site containing evidence of complex canal construction and repair. Two canal groups are noted, each group demonstrating evidence of at least two or three construction phases. The cultural material associated with the canal fill, backdirt, and adjacent areas are the remains of a variety of prehistoric activities. It is suggested that these activities might include original canal excavations, subsequent cleaning, the collection and processing of wild plant resources, dumping, and hunting.

It also may have been the location of ceramic manufacturing activities. There has been speculation in the literature concerning the nearby Gila Butte site (AZ U:13:8-ASM, AZ U:13:34-ASU). At Gila Butte, southeast of AZ U:13:39, it has been proposed that the inhabitants were large-scale producers of Hohokam Red-on-buff ceramics (Rice et al. 1979). This proposition is based on the widespread similarity of Hohokam design elements and production techniques and on the assumption that Gila Butte itself is a major source of the micaceous temper so common in these sherds. At AZ U:13:39, two of the three polishing stone artifacts from RWCD II sites were recovered. The extremely high percentage of micaeous schist at this site may be attributable to its use as a temper material; schist does not occur naturally at the canal site.

In comparing the actual canal dates and construction patterns of AZ U:13:39 to those at Snaketown (Haury 1976), the following has been noted. The two oldest canal channels from Snaketown and from the excavations at AZ U:13:39 appear to have been used at the same time periods and are similar in shape; Feature 3 of AZ U:13:39 is similar to Canal 1 at Snaketown, and Feature 2 is similar to Canal 2 at Snaketown. Assuming the canal lines to be separate systems used by the villages at Snaketown and Gila Butte, it is reasonable to believe that as contemporaneous occupations their canal systems would also be contemporaneous. A large-scale flood that could change the river course and perhaps devastate existing canal lines might dictate simultaneous need for the construction of new canals at these sites. Other factors that might provide concurrent impetus at the two villages for construction after the Snaketown phase would be an increased demand for cultivated crops due to trade or population increase through immigration or natural growth. However, the later canals do not appear capable of carrying more water than the older channels; they are, in fact, smaller. Although the above possibilities consider the apparent synchronous use and construction of the canal features, they do not consider their morphological similarities. Without invoking the concept of "canal style," which would associate a canal's shape with a specific time period (i.e., broad, deep canals in the Snaketown phase; rounded and constructed canals later), it is difficult to explain this similarity. Indeed, that Canals 1 and 2 at Snaketown should resemble so closely the two early canals at AZ U:13:39 in shape and periods of use is most parsimoniously explained by the single-system theory. Specifically, a broad canal that flowed from Diversion Point 2, through AZ U:13:39 and north of Gila Butte to Snaketown, was in use at least as early as the Snaketown phase and perhaps into the Gila Butte phase. A second canal was excavated along this same course, probably in the Gila Butte phase, and seems to have been utilized into the Sacaton phase.

Another unusual site is AZ U:13:40, where lithic materials were absent from the artifactual assemblage. The site shares certain characteristics with AZ U:13:23, hypothesized to be a locus of ceramic production. These shared characteristics include a dense, middenlike sherd accumulation, an exceptionally high percentage of a single ceramic type, and a scarcity of lithic materials. This assumes that the high percentage of one ceramic type on a site may indicate its production at the site. It should be noted also that a single temper type, sand, makes up over 98% of the temper classes. The only other RWCD II site where this temper distribution is equaled is AZ U:13:23.

AZ U:13:41 is a small, undated segment of a canal, while AZ U:10:16 is a small surface scatter classed as a possible habitation based on artifactual makeup. Little can be deduced from the limited studies of these sites.

9.3 GENERAL CONCLUSIONS

The results of the RWCD II project demosntrate that the Hohokam occupation of the project area was based on a wide subsistence base composed of both domestic and wild resources. The majority of the sites in the project right-of-way date to the Classic period; those few dating earlier, based on ceramic type dates, tend to be highly specialized sites.

Ceramic chronological investigations tend to confirm Doyel's (1974) dating of the Soho phase at A.D. 1180 to 1300. Further, the analysis supports a post A.D. 1300 entry of Salado Polychromes into the Middle Gila Valley. Ceramic temper studies, while not detailed, also suggest that temper choices in Hohokam wares in the area may be partially related to vessel function. Further, it is noted that the larger the site, the more varied are the temper types on the site. This may be a result of a greater number of potters on a large site or an indication that larger sites are more frequently involved with trade in ceramic containers.

Overall, the project results tend to support the site classification developed by Rice et al. (1979) during earlier phases of RWCD. This classification was based on three criteria: (1) site size, (2) patterns of internal artifact distribution, and (3) presence or absence of mounds, canals, architecture, and rock alignments that produced eight site categories. These site categories were: (1) large sites with mounds, (2) small sites with architecture, (3) small sites with middens, (4) small sites without middens, (5) canals, (6) terrace systems, (7) lithic scatters, and (8) Pima rancherias.

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APPENDIX I

SHELL FROM ROOSEVELT WATER CONSERVATION DISTRICT SITES

Of the 12 investigated RWCD sites, only shell from four sites underwent analysis. Units selected for ceramic analysis from these four sites--AZ U:13:24, AZ U:13:29 (Locus 151), AZ U:13:36, and AZ U:13:39--were used also for shell sampling. On site AZ U:13:24, four pieces of shell were examined; on AZ U:13:29 (Locus 151), a single piece was examined. Two pieces were noted on AZ U:13:36, and at least 49 pieces were noted on AZ U:13:39. There are two problems arising from the distribution of these samples. First, it is difficult to compare shell use on these four sites due to sample sizes. It is also difficult to account for the high frequency of shell on AZ U:13:39 without more adequate sampling measures. The sites from which shell is noted date primarily to the Classic period, with the exception of AZ U:13:39, a major canal site, which may have been occupied as early as the Gila Butte phase.

Table I.1 lists the analyzed shell by provenience unit on each site. Included are species identifications and brief descriptions. All the shell species listed for these four sites are available from the Sea of Cortez. *Laevicardium elatum* is also found along the Pacific Coast (Ferg 1980:371). *Glycymeris gigantea* and *maculatus* are normally difficult to separate from one another except in instances of gross size differences. However, the original shell analysis lists *Glycymeris* species as identifiable; the listing of these species should be considered suspect at best.

Shell from Individual Sites

Shell from each of the four sites will be discussed. It should be noted that analysis notes are brief, containing little detail.

The four analyzed specimens from AZ U:13:24 are all from subsurface contexts. The collection is unusual for RWCD shell because it contains one of the very few examples of unworked shell identified on the project. It also contains the only clearly identified *Laevicardium elatum* artifacts; *Laevicardium elatum* from other sites is either shell-reduction waste or of questionable working.

One piece of shell from the special use site, AZ U:13:29 (Locus 151), is recorded, from the surface. Both shell

Table I.1. Shell analysis

Provenience	Species	Description
	Site No. AZ U:13:24	
Excavation, 12N 20E, level 3	Glycymeris maculatus	Bracelet fragment adjacent to umbo
Excavation, 5.5N 12W, level 4	Laevicardium elatum	Pendant fragment
Excavation, 7N 16.5W, level 3	Olivella dama	Bead
Excavation, 2.5S 22W, level 1	Glycymeris maculatus	No evidence of modification
	Site No. AZ U:13:29 (Locus 151)	
Surface 24S 0W	Laevicardium elatum	Evidence of marginal grinding
	Site No. AZ U:13:36	
Excavation, 0N 8E, level 1	Laevicardium elatum	Shell-reduction waste
Excavation, 0N 8E, level 3	Glycymeris maculatus	Accidental breakage fragment
	Site No. AZ U:13:39	
Surface 2S 3W	Laevicardium elatum	Shell-reduction waste
Surface 4S 46E	Glycymeris maculatus	Bracelet fragment
Surface 6S 36E	Glycymeris gigantea	Bracelet fragment

Table I.1 (Continued)

Provenience	Species	Description
Site No. AZ U:13:39 (continued)		
Surface 6S 38E	Glycymeris maculatus	Bracelent or ring fragment
Surface 8S 44E	Glycymeris gigantea	Bracelet fragment
Surface 10S 4E	Glycymeris maculatus	Ground and abraded fragment
Surface 10S 10E	Laevicardium elatum	Shell-reduction waste
Surface 14S 12E	Laevicardium elatum	Shell-reduction waste
Surface 26S 14W	Glycymeris maculatus	Ring fragment
Surface 30S 18W	Laevicardium elatum	Shell-reduction waste
Surface 2N 40E	Glycymeris maculatus	Ground fragment
Surface 6N 48E	Glycymeris gigantea (2)	Wormholes, 2 bracelet fragments
Surface 6N 8W	Laevicardium elatum	Shell-reduction waste
Surface 10N 18W	Laevicardium elatum	Possibly worked
Surface 10N 28W	Glycymeris maculatus	Bracelet fragment
Surface 22N 8W	Glycymeris maculatus	Bracelet fragment, burned
Surface 24N 8W	Glycymeris maculatus	Bracelet fragment, burned
Surface 26N 2W	Glycymeris gigantea	Unknown

Table I.1 (Continued)

Provenience	Species	Description
	Site No. AZ U:13:39 (continued)	
Surface 30N 0E	Glycymeris maculatus	Unfinished bracelet fragment
Excavation 2N 4W, level 1	Unknown	Unknown
Excavation 26N 42W, level 9	Glycymeris maculatus (7)	6 bracelet fragments, 1 ring
	Laevicardium elatum	Shell-reduction waste
	Glycymeris maculatus	Possibly modified
	Clycymeris maculatus (2)	Bracelet fragments
Excavation 26N 46W, level 2	Glycymeris maculatus (5)	3 ring fragments, 2 bracelet fragments
	Dosinia ponderosa	Possible shell-reduction waste
	Laevicardium elatum	Possible ornament blank
Excavation 30N 52W, level 1	Glycymeris maculatus (2)	2 bracelet fragments
Feature 1, level 1	Unknown	No modification
	Glycymeris maculatus	Bracelet fragment
Feature 2	Glycymeris gigantea	Armlet/bracelet fragment
	Glycymeris maculatus	Bracelet fragment

Table I.1 (Continued)

Provenience	Species	Description
	Site No. AZ U:13:39 (continued)	
Feature 2A	Glycymeris maculatus (2)	Bracelet fragments
	Glycymeris maculatus	Unfinished bracelet fragment
Feature 3	Glycymeris gigantea	Bracelet fragment, wormholes

examples from AZ U:13:36 are from subsurface context in the same test unit. Because of the small numbers of shell here, no comment is made.

Of the 49 shell examples from AZ U:13:39, 20 are from the surface and 8 from features. The surface shell is not concentrated in any single portion of the site. All identified shell artifacts are bracelets/armlets and rings. In the canal features themselves, only Glycymeris species are noted. It is interesting to note that all identified artifacts are of Glycymeris species but no shell-reduction waste of these species was noted. Conversely, Laevicardium elatum occurs only as shell-reduction waste; no artifacts are present on the site. If there is confidence in the sample, it would appear that Laevicardium elatum was being transported to the site for manufacturing, while finished products were taken elsewhere. However, it would seem that Glycymeris species jewelry was brought to the site in completed form after manufacture elsewhere. The author does not believe this is the case; the patterning seen here probably is a result of sampling error and analytical errors in original shell identification procedures.

General Comments on RWCD Shell

Several negative statements, based on the above sample, can be made concerning RWCD shell. There is no evidence of prehistoric etching of shell. Unworked shell is almost unrepresented in the sample. Freshwater shell, to be expected on a canal site of the magnitude of AZ U:13:39, either was not present or went uninvestigated.

Haury et al. (1950) and Ferg (1980:375) have noted a tendency for Hohokam shell found in the Gila drainage and Papagueria to be old or fossil shell, as opposed to fresh. Whether a result of poor analysis or reality, Hohokam shell work from the RWCD sites is noted as fresh except in a few cases. This is an unexpected result, since, during the Classic period when Hohokam shell production was at its height, freshwater shell was in high demand because of its superior workability. Since the four RWCD sites with analyzed shell date primarily to this period of peak shell demand, one would anticipate the shell recovered to be predominantly fossil shell.

Haury (1976:313-314) has presented a typology of shell bracelets based primarily on thickness and width. Thin bracelets generally are found in early phases but do appear later in small numbers. Bracelets of medium thickness are most common in late Colonial and Sedentary phases. Thick, massive bracelets appear in the Sedentary period. While measurements were not taken on RWCD shell bracelets analyzed, it is apparent from some of the notes that thick, massive bracelets were numerous and may dominate the assemblage. Given the late dates of these sites, this type of bracelet should be in the majority of bracelets.

APPENDIX II

POLLEN ANALYSIS OF ROOSEVELT WATER CONSERVATION DISTRICT II SITES

Table II.1 summarizes the results of pollen analysis of all Roosevelt Water Conservation District II prehistoric sites. Discussion of these results can be found in Chapter 6.

Table II.1 Pollen identification, by proveniences

Pollen	AZ U:13:8						
	Quad 1, Plot 1	Quad 1, Plot 10	Quad 1, Plot 30	Quad 1, Plot 30	Quad 1, Plot 31	Quad 1, Plot 31	Quad 1, Plot 37
Arboreal pollen				SURFACE			
Pinus edulis	3	5	—	2	1	1	2
P. ponderosa	8	12	6	10	6	9	3
Total *pinus*	11	17	6	12	7	10	5
Juniperus	3	4	—	—	1	1	1
Celtis	1	2	1	2	—	1	—
Prosopis	2	2	1	3	2	—	3
Cercidium	1	2	—	—	1	—	1
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	2	3	3	6	2	1	4
Nonarboreal pollen							
Chenopodiaceae	47	92	41	97	46	42	87
Compositae							
Artemesia-type	—	—	—	—	—	—	—
Lo-spine	86	178	74	158	113	115	732
Hi-spine	12	40	12	22	11	9	16
Liguliflorae	—	—	—	—	—	—	—
Gramineae	24	46	59	94	16	—	38
Ephedra N-type	—	1	—	—	—	—	1
Ephedra T-type	1	1	—	—	—	1	—
Sacrobatus	—	—	1	2	—	1	—
Malvaceae	1	4	1	3	—	—	1
Onagraceae	—	—	—	—	—	—	—
Nyctoginaceae	1	2	—	—	—	—	1
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	—	—	—	—	—	1	—
Tribulus-type	—	—	—	—	—	1	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	1	1	—	—	—	—	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	1	—	—	—	—	—
Euphorbiaceae	—	—	1	1	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	—	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:8 Quad 1, Plot 37	Quad 2, Plot 27	Quad 2, Plot 27	Quad 2, Plot 27	Quad 2, Plot 27	Quad 2, Plot 53	Quad 2, Plot 53
Arboreal pollen				SURFACE			
Pinus edulis	5	1	3	3	4	5	9
P. ponderosa	7	5	3	6	9	7	12
Total *pinus*	12	6	6	9	13	12	21
Juniperus	—	—	—	4	—	—	2
Celtis	1	1	1	—	—	—	2
Prosopis	—	—	3	3	1	1	1
Cercidium	2	2	1	1	2	—	—
Acacia	—	—	1	1	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	2
Carya	—	—	—	—	—	—	—
Larrea	2	1	2	4	1	4	5
Nonarboreal pollen							
Chenopodiaceae	78	49	35	77	95	42	83
Compositae							
Artemesia-type	—	—	1	2	—	—	—
Lo-spine	237	102	120	226	194	104	197
Hi-spine	16	23	7	22	55	11	29
Liguliflorae	—	—	—	—	—	—	—
Gramineae	—	13	21	45	27	18	46
Ephedra N-type	—	—	—	1	—	—	—
Ephedra T-type	1	—	—	—	2	—	2
Sacrobatus	1	—	—	—	—	2	2
Malvaceae	—	1	—	—	—	1	1
Onagraceae	1	1	—	—	1	—	—
Nyctoginaceae	1	—	1	2	2	2	3
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	1	—	—	—	—	—	—
Tribulus-type	1	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	—	—	—	—	1	—	2
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	1
Cucurbita	—	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)						
	AZ U:13:8					
Pollen	Quad 2, Plot 48	Quad 2, Plot 48	AZ U: 13:23	AZ U: 13:23	AZ U: 13:24	AZ U: 13:24
Arboreal pollen			SURFACE			
Pinus edulis	3	1	6	2	4	4
P. ponderosa	6	3	6	2	14	8
Total pinus	9	4	12	4	18	12
Juniperus	—	1	—	—	—	—
Celtis	—	—	—	—	—	—
Prosopis	3	2	—	—	—	1
Cercidium	3	1	—	—	1	—
Acacia	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—
Olneya	—	—	—	—	—	—
Carya	1	1	—	—	—	—
Larrea	5	4	—	—	2	1
Nonarboreal pollen						
Chenopodiaceae	87	33	320	161	294	145
Compositae						
Artemesia-type	—	—	—	—	—	—
Lo-spine	171	84	25	11	34	23
Hi-spine	37	21	1	1	15	5
Liguliflorae	—	—	—	—	—	—
Gramineae	48	32	2	—	23	5
Ephedra N-type	—	—	—	—	—	—
Ephedra T-type	2	1	—	—	1	1
Sacrobatus	—	—	—	—	—	—
Malvaceae	3	—	—	—	1	1
Onagraceae	—	—	—	—	—	—
Nyctoginaceae	1	—	4	1	2	1
Umbelliferae	—	—	—	—	1	1
Cereus	—	—	—	—	—	—
Zea mays	2	—	—	—	1	—
Tribulus-type	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—
Cactaceae	—	—	—	—	—	—
Mirabilis	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	1
Cucurbita	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U: 13:29	AZ U: 13:29	AZ U:13:8 Qd. 1 Un. 2 Pro-file	AZ U:13:8 Qd. 1 Un. 2 15 cm BD	AZ U:13:8 Qd. 1 Un. 2 20 cm BD	AZ U:13:8 Qd. 1 Un. 2 26 cm BD	AZ U:13:8 Qd. 1 Un. 4 3 cm BD
Arboreal pollen	SURFACE				EXCAVATION		
Pinus edulis	8	9	—	8	—	1	2
P. ponderosa	17	29	—	3	—	—	4
Total *pinus*	25	38	7	11	—	1	6
Juniperus	—	—	1	—	—	—	—
Celtis	—	—	—	—	—	1	1
Prosopis	1	1	—	—	—	—	—
Cercidium	—	—	—	—	—	—	—
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	5	1	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	1	5	9	—	—	4	—
Nonarboreal pollen							
Chenopodiaceae	101	250	73	55	4	4	62
Compositae							
Artemesia-type	—	—	1	—	—	—	—
Lo-spine	16	27	76	86	20	20	95
Hi-spine	26	43	16	3	1	1	15
Liguliflorae	—	—	—	—	—	—	—
Gramineae	7	10	8	14	7	4	13
Ephedra N-type	—	—	—	—	—	—	1
Ephedra T-type	—	—	—	2	—	—	2
Sacrobatus	—	—	—	—	—	—	1
Malvaceae	2	5	—	—	—	—	1
Onagraceae	—	2	—	2	—	—	5
Nyctoginaceae	1	2	3	17	—	4	—
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	—	—	1	—	—	—	—
Tribulus-type	1	—	—	—	—	—	—
Cylindropuntia	—	—	1	—	—	—	—
Cactaceae	2	2	—	1	—	—	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	3	3	—	—	—	—	—
Gossypium	—	—	—	—	—	—	1
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	—	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:8					AZ U:13:24	
	Qd. 1 Un. 4 20 cm BD	Qd. 1 Un. 4 35 cm BD	Qd. 1 Un. 1 26 cm BD	Qd. 1 Un. 1 30 cm BD	Qd. 1 Un. 1 38 cm BD	Floor I	Floor I
Arboreal pollen				EXCAVATION			
Pinus edulis	2	4	—	1	2	—	—
P. ponderosa	1	—	—	2	—	—	—
Total *pinus*	3	4	—	3	2	—	5
Juniperus	1	1	—	1	—	—	—
Celtis	—	—	—	1	—	—	—
Prosopis	—	—	—	1	1	—	—
Cercidium	—	—	—	—	—	—	—
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	1	—	—	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	2	—	—	3	—	—	—
Nonarboreal pollen							
Chenopodiaceae	33	27	18	40	27	8	171
Compositae							
Artemesia-type	—	—	—	—	—	—	—
Lo-spine	123	115	12	122	144	2	19
Hi-spine	6	30	—	2	4	—	1
Liguliflorae	4	2	—	—	—	—	—
Gramineae	16	12	1	19	14	2	—
Ephedra N-type	—	—	—	—	—	—	—
Ephedra T-type	2	—	—	1	—	—	—
Sacrobatus	—	—	—	1	—	—	—
Malvaceae	—	—	—	—	1	—	—
Onagraceae	—	—	—	1	—	—	1
Nyctoginaceae	3	5	4	2	4	—	—
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	—	—	—	—	—	3	6
Tribulus-type	—	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	—	3	—	—	1	—	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	—	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:24						
	Floor I	Floor I	Floor I	Floor I	Floor I	Floor I, Under Stone	Floor I, Under Mano
Arboreal pollen				EXCAVATION			
Pinus edulis	—	—	—	—	—	—	—
P. ponderosa	—	—	—	—	—	—	—
Total pinus	6	—	—	—	5	—	—
Juniperus	—	—	—	—	—	—	—
Celtis	—	—	—	—	—	—	—
Prosopis	—	—	—	—	—	—	—
Cercidium	—	—	—	—	—	—	—
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	—	—	—	—	—	—	—
Nonarboreal pollen							
Chenopodiaceae	159	1	37	16	179	20	—
Compositae							
Artemesia-type	—	—	—	—	—	—	—
Lo-spine	24	—	4	1	9	9	—
Hi-spine	1	—	—	—	—	—	—
Liguliflorae	—	—	—	—	—	—	—
Gramineae	2	—	2	—	1	1	—
Ephedra N-type	—	—	—	—	—	—	—
Ephedra T-type	—	—	—	—	—	—	—
Sacrobatus	—	—	—	—	—	—	—
Malvaceae	5	—	—	—	4	—	—
Onagraceae	—	—	—	—	—	—	—
Nyctoginaceae	—	—	—	—	—	—	—
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	16	—	2	1	7	3	—
Tribulus-type	—	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	1	—	—	—	4	2	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	—	—	—	—	1	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:24 Hrth. I Fill	Hrth. I Plaster	Floor II	Floor II	Floor II	Hrth. II Fill	2.55S 19W Poss. Floor
Arboreal pollen				EXCAVATION			
Pinus edulis	—	—	—	—	—	—	—
P. ponderosa	—	—	—	—	—	—	—
Total *pinus*	1	—	2	—	8	2	—
Juniperus	—	—	—	—	—	—	—
Celtis	—	—	—	—	—	—	—
Prosopis	—	—	—	—	—	—	—
Cercidium	—	—	—	—	—	—	—
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	—	—	—	—	—	—	—
Nonarboreal pollen							
Chenopodiaceae	23	167	26	13	89	10	348
Compositae							
Artemesia-type	—	—	—	—	—	—	—
Lo-spine	1	24	1	—	2	2	29
Hi-spine	1	1	—	—	—	—	3
Liguliflorae	—	—	—	—	—	—	—
Gramineae	—	8	1	—	—	—	14
Ephedra N-type	—	—	—	—	—	—	—
Ephedra T-type	—	—	—	—	—	—	—
Sacrobatus	—	—	—	—	—	—	—
Malvaceae	—	—	—	—	—	—	—
Onagraceae	—	—	—	—	—	—	1
Nyctoginaceae	—	—	—	—	—	—	1
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	—	—	—	—	—	1	—
Tribulus-type	—	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	—	—	—	—	—	—	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	—	—	—	—	—	—	—
Plumbaginaceae	1	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:24 Feature 1	Cremation Vess.	Midden L-2	Midden L-3	Midden L-4	Midden L-5	Midden L-6
<u>Arboreal pollen</u>				<u>EXCAVATION</u>			
<u>Pinus edulis</u>	—	—	—	—	—	—	—
<u>P. ponderosa</u>	—	—	—	—	—	—	—
Total <u>pinus</u>	1	1	1	1	—	1	1
<u>Juniperus</u>	—	—	—	—	—	—	—
<u>Celtis</u>	—	—	—	—	—	—	—
<u>Prosopis</u>	—	—	—	—	—	—	—
<u>Cercidium</u>	—	—	—	—	—	—	—
<u>Acacia</u>	—	—	—	—	—	—	—
<u>Fouquieria</u>	—	—	—	—	—	—	—
<u>Olneya</u>	—	—	—	—	—	—	—
<u>Carya</u>	—	—	—	—	—	—	—
<u>Larrea</u>	—	—	—	—	—	—	—
<u>Nonarboreal pollen</u>							
Chenopodiaceae	184	29	179	183	181	196	172
Compositae							
<u>Artemesia</u>-type	—	—	—	—	—	—	—
Lo-spine	12	2	15	11	12	2	19
Hi-spine	2	1	2	1	4	1	2
Liguliflorae	—	—	—	—	—	—	—
Gramineae	—	—	1	—	3	—	5
<u>Ephedra</u> N-type	—	—	—	—	—	—	—
<u>Ephedra</u> T-type	—	—	—	—	—	—	—
<u>Sacrobatus</u>	—	—	—	—	—	—	1
Malvaceae	—	—	—	—	—	—	—
Onagraceae	—	—	—	—	—	—	—
Nyctoginaceae	—	—	—	—	—	—	—
Umbelliferae	—	—	—	—	—	—	—
<u>Cereus</u>	—	—	—	—	—	—	—
<u>Zea mays</u>	—	—	—	1	—	—	—
<u>Tribulus</u>-type	—	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	—	—	—	—	—	—	—
<u>Mirabilis</u>	—	—	—	—	—	—	—
<u>Gompherna</u>-type	—	—	—	—	—	—	—
<u>Gossypium</u>	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
<u>Cereus</u>-type	—	—	—	—	—	—	—
<u>Cucurbita</u>	—	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)							
	AZ U:13:28A						
Pollen	Ash Lense	Ash Lense	Ash Pit	Mid-den L-1	Mid-den L-1	Mid-den L-2	Mid-den L-2
Arboreal pollen				EXCAVATION			
Pinus edulis	—	—	—	—	—	—	—
P. ponderosa	—	—	—	—	—	—	—
Total pinus	1	—	—	13	9	5	9
Juniperus	—	—	—	—	—	—	—
Celtis	—	—	—	—	—	—	—
Prosopis	1	—	—	—	—	—	—
Cercidium	—	—	—	—	—	—	—
Acacia	—	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—	—
Olneya	—	—	—	—	—	—	—
Carya	—	—	—	—	—	—	—
Larrea	1	1	—	—	—	—	—
Nonarboreal pollen							
Chenopodiaceae	234	117	37	337	113	185	364
Compositae							
Artemesia-type	—	—	—	—	—	—	—
Lo-spine	103	61	5	19	14	6	18
Hi-spine	43	13	2	15	8	2	14
Liguliflorae	—	—	—	—	—	—	—
Gramineae	14	7	—	14	4	2	5
Ephedra N-type	—	—	—	—	—	—	—
Ephedra T-type	—	—	—	—	—	—	—
Sacrobatus	—	—	—	—	—	—	—
Malvaceae	—	—	—	—	—	—	—
Onagraceae	3	1	—	1	1	—	—
Nyctoginaceae	—	—	—	1	1	—	—
Umbelliferae	—	—	—	—	—	—	—
Cereus	—	—	—	—	—	—	—
Zea mays	1	—	—	1	—	—	—
Tribulus-type	—	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—	—
Cactaceae	6	1	—	—	—	—	—
Mirabilis	—	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—	—
Cucurbita	1	1	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—	—

Table II.1 (Continued)

Pollen	AZ U:13:24 Midden L-3	AZ U:13:24 Midden L-3	AZ U:13:24 Midden L-3	AZ U:13:24 Midden L-4	AZ U:13:24 Midden L-4	AZ U:13:28B Ash Pit
Arboreal pollen			EXCAVATION			
Pinus edulis	—	—	—	—	—	—
P. ponderosa	—	—	—	—	—	—
Total pinus	2	3	5	3	5	1
Juniperus	—	1	1	—	—	—
Celtis	—	—	—	—	—	—
Prosopis	3	—	3	2	9	—
Cercidium	—	—	—	—	—	—
Acacia	—	—	—	—	—	—
Fouquieria	—	—	—	—	—	—
Olneya	—	—	—	—	—	—
Carya	—	—	—	—	—	—
Larrea	—	—	—	—	2	—
Nonarboreal pollen						
Chenopodiaceae	177	184	361	174	344	53
Compositae						
Artemesia-type	—	—	—	—	—	—
Lo-spine	11	8	19	8	21	11
Hi-spine	4	3	7	7	10	7
Liguliflorae	—	—	—	—	—	—
Gramineae	3	1	4	6	6	3
Ephedra N-type	—	—	—	—	—	—
Ephedra T-type	—	—	—	—	—	—
Sacrobatus	—	—	—	—	—	—
Malvaceae	—	—	—	—	—	—
Onagraceae	—	—	—	—	3	—
Nyctoginaceae	—	—	—	—	—	—
Umbelliferae	—	—	—	—	—	—
Cereus	—	—	—	—	—	—
Zea mays	—	—	—	—	—	—
Tribulus-type	—	—	—	—	—	—
Cylindropuntia	—	—	—	—	—	—
Cactaceae	—	—	—	—	—	—
Mirabilis	—	—	—	—	—	—
Gompherna-type	—	—	—	—	—	—
Gossypium	—	—	—	—	—	—
Euphorbiaceae	—	—	—	—	—	—
Cereus-type	—	—	—	—	—	—
Cucurbita	—	—	—	—	—	—
Plumbaginaceae	—	—	—	—	—	—