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The Archaeology of Owl Canyon and Stoddard Valley, Mojave Desert, California

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RUSSELL L. KALDENBERG
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FORWARD

This publication contains two separate archaeological mitigation reports on sites in the Mojave Desert. The sites which the authors carefully excavated and evaluated, were damaged by off highway vehicles. Archaeologists employed by the Bureau of Land Management felt that the damage was so severe as to violate the integrity of the involved sites and that there was no feasible method of protecting the site from vehicular damage; therefore, Cornerstone Research was contracted to mitigate the impacts to the sites.

Both the Stoddard Valley and Owl Canyon sites represent interesting milestones in the archaeology of the Mojave Desert. The Stoddard Valley rock rings are the only ones to be systematically excavated in the Upper Mojave desert region. Cornerstone presents convincing evidence that these rings were most probably either domestic structured foundations or food processing stations in proximity to a major water-carrying wash.

The Owl Canyon site, north of Barstow, is a habitation site some 2000 years old. The site is one of only a few occupational sites known from the region of the desert and fills a void about our knowledge of the Mojave desert archaeology which is slowly being investigated as the result of BLM generated studies and systematic reports contracted so ably by Mr. Walt Cassidy of the U.S. Army at Ft. Irwin.

Russell L. Kaldenberg, General Editor
Cultural Resource Program Manager
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Owl Canyon from the South.

Geological structure near the Owl Canyon campground.

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Petroglyphs from the Inscription Canyon area, north of Barstow, Ca.

DISCUSSION OF THE PREHISTORY AND EARLY HISTORY OF THE MOJAVE DESERT REGION

Culture history of the western Mojave Desert region has traditionally been segmented into five periods on the basis of approximate temporal parameters and presence of various artifact classes. A cultural/historical reconstruction is particularistic in that through time, each group, culture, and area had its own unique details of development and change. The following table depicts relative temporal placement of these periods, approximate dates for their duration, and references to projectile point series characteristic of the periods.

PERIOD 1 - COBBLE-BASED TOOL HORIZON

The Cobble-based Tool Horizon is the earliest, most ill-defined, and most controversial period in New World prehistory. It is characterized by informal flaked tool assemblages with elements identified by some as scrapers and choppers. No associated projectile points, milling equipment, or ceramics occur in sites designated for this period. As yet, determinations concerning absolute age of these assemblages are inconclusive. Proponents have attributed such assemblages to Pleistocene occupations, some as old as 200,000 B.P. The period is thought to end with the introduction of formally flaked stone projectile points sometime near the end of the Pleistocene, 18,000-10,000 B.P.

A number of notable examples of these early assemblages are of relevance to this discussion. The Calico Early man site near Yermo, California, is claimed to represent one of the earliest occupations in the New World. Continuing analysis of the Calico site and supposedly contemporaneous lithic traditions along the shoreline of Pleistocene Lake Manix (Coyote and Troy dry lakes), as defined by Ruth D. Simpson, may well provide verification for a Period 1 occupation (Simpson 1952, 1956, 1962, 1972; Schuiling 1979). Geomorphological examination of the Calico site, supported by uranium-thorium isotope dating techniques, has recently dated one level at roughly 200,000 years before the present (Bischoff et al. 1981:576-582). However, numerous questions remain unanswered and there is no concensus among experts as to the true antiquity of the Calico finds.

Claims have also been made for a Period 1 occupation based on an assemblage found along the shore of Pleistocene Lake Manly in Death Valley (Clements and Clements 1953; Clements 1954). These researchers argue that occupation here occurred during the Tioga substage of the Wisconsin glaciation. In a later study of this region, however, Wallace (1977) indicates that he does not feel these materials are the result of human modification:

PREHISTORIC CULTURAL PERIODS
FOR THE WESTERN MOJAVE DESERT

Approximate Dates of Duration	Temporal Period Designation	Cultural Traits
100-300 B.P.	Period 5 Ethnohistoric Horizon	Euro-American artifacts (glass, metal)
300-1200 B.P.	Period 4 Ceramic Horizon	Locally manufactured ceramics Desert series projectile points Cottonwood series projectile points
1200-6000 B.P.	Period 3 Milling Horizon	Milling tools Rosegate series projectile points (Rose Spring/Eastgate) Inception of bow and arrow Elko series projectile points Gatecliff series projectile points Humboldt series projectile points Large side-notched projectile points Pinto series projectile points
6000-15,000 B.P.	Period 2 Projectile Point Horizon	Use of atlatl and dart Lake Mojave series projectile points Silver Lake series projectile points Fluted series projectile points (Clovis) Lanceolate series projectile points (San Dieguito)
15,000 B.P.-Unknown	Period 1 Cobble-based Tool Horizon	Crude flaked lithic "tools"

> Some of the chipped stones do call to mind simple tools such as scrapers and choppers. But they lack any consistence of form or workmanship, and so appear to be products of natural forces rather than human handiwork. Natural agencies for flaking stone are many and varied and can and frequently do produce fairly convincing "tools" (1977:111).

While a number of claimed Cobble-based Tool Horizon assemblages have been attributed to natural stone breakage, others have been identified that are clearly and widely accepted as produced by human workmanship. In these cases, skepticism is aimed more at absolute dating of the materials than their morphological integrity.

One of the more widely accepted bodies of evidence for Period 1 occupation has been obtained by Emma Lou Davis from her investigations at China Lake. Here, Davis identified a number of assemblages believed to represent Period 1 occupation, beginning with a Core Tool Tradition (45,000 to 25,000 B.P.), followed by the Late Wisconsin Culture I (25,000 to 20,000 B.P.), Late Wisconsin Culture II (20,000 to 15,000 B.P.), and Proto-Clovis Culture (15,000 to 13,000 B.P.). Artifacts characteristic of the three earliest periods include chopping tools, spokeshaves, scraping tools, ovate knives, borers and cutters (bifacial and flaked), and proto-Clovis materials with additional new technologies of bifacial thinning, incipient fluting (and basal thinning), and more discrete artifactual forms (Davis et al. 1978:Figures 8-10). Davis' proposed reconstruction is based on the presence within the sample of a number of distinctive tool kits and on the degree of weathering, morphology of the tools, technology, and choice of materials (1978:33). It is evident that these materials are not as well dated as later assemblages with absolute dates.

Another candidate for the Cobble-based Tool Horizon is the so-called Malpais Tradition, first identified by Rogers (1929, 1939). The assemblages consist of crude stone tools often found at or near parent lithic source zones and also in association with trails, cairns, and cleared areas in the desert pavement known as "sleeping" or "house" circles. The estimated age of this occupation was originally set at 4,000 B.P. by Rogers (1939:Plate 21); however, a revised possibility of 8,000 B.P. was admitted prior to his death (Warren 1966:18).

Since 1939 authors have treated the "Malpais Industry" in a variety of ways. Some are reluctant to consider this data an early, separate assemblage predating the use of projectiles (Bennyhoff 1958:Figure 1; Wallace 1962:174; Bettinger and Taylor 1974). Others, however, believe there is evidence of Malpais traditions and stone tool assemblages throughout the American Southwest, including the Trans-Pecos region in Texas (Ezell

1981:personal communication), the Sierra Pinacate in northwestern Sonora, Mexico (Hayden 1976), and numerous localities throughout the Colorado and Mojave deserts (Rogers 1939:Map 1). Geochronologic methods employed by Hayden suggest that for the Pinacate region, artifacts are associated with an early, possibly localized altithermal climatic condition dated to roughly 16,000 to 18,000 years B.C. (or 17,900 to 19,900 B.P.) (Hayden 1976:286, Figure 9).

Some evidence obviously exists for a Period 1 occupation. However, it is apparent that this evidence is relatively rare and considered inconclusive by many researchers. This is due to a number of factors, including informality of the assemblages, lack of clearly stratified subsurface deposits, and paucity of absolute dates and associations.

PERIOD 2 - PROJECTILE POINT HORIZON

This period is marked by the introduction of formal flaked stone projectile point forms and the absence of milling equipment and ceramics. The period begins at or near the end of the Pleistocene and continues until the introduction of milling technology at approximately 7000-5000 B.P. While documentation and understanding of this period is less than that for later periods, Period 2 represents the earliest firmly accepted occupation in the Mojave Desert region.

The Projectile Point Horizon is characterized by a number of relatively discrete traditions defined primarily by variation in projectile point styles and associations with various physiographic features, such as extinct lakes and waterways. Depending on location and economic interpretation of the researchers, Period 2 materials have been named Playa Industry (Rogers 1939), San Dieguito Complex (Rogers et al. 1966), Lake Mojave Complex (Wallace 1962), Lake Mojave Pattern as part of a larger Western Lithic Co-Tradition (Davis, Brott and Weide 1969; Davis 1978), Western Pluvial Lakes Tradition (Bedwell 1970, 1973; Hester 1973), Lake Mojave-Pinto Tradition (Tuohy 1974), Haskomat and San Dieguito (Warren and Ranere 1968), Nevares Springs Culture (Wallace 1977), and Mojave Period (Bettinger and Taylor 1974). Also included are fluted projectile point traditions, such as Clovis.

Environmental conditions during Period 2 were substantially different from those of today. Throughout the Great Basin, and the northern Mojave Desert in particular, more moist and cool conditions prevailed, bringing larger amounts of surface water to drainages and basins throughout the region. Flora and fauna were also more verdant and diverse, making the region more productive and inviting for human populations. Interpretation of how the peoples of this period exploited their environment--generalized hunting versus lacustrine adaptations--remains in great debate. Four traditions are briefly discussed below--fluted projectile point tradition, San Dieguito tradition, Lake Mojave/Silver Lake tradition, and Haskomat tradition.

The fluted projectile point tradition is the earliest absolutely dated tradition in the New World. Fluted points have been found in direct association with extinct Pleistocene fauna, and several radiocarbon dates confirm this tradition's antiquity to at least 10,000 years B.P. (Jennings 1964). Generally, fluted projectile points are considered to have originated at approximately 12,000 B.P. (Hester 1973:123). Evidence for the tradition has been identified at various localities throughout the western Great Basin, most in western and southern Nevada and southeastern California (Hester 1973:123). In the western Mojave Desert portion, fluted points have been reported at Searles Lake and Little Lake (Warren and Ranere 1968:1), Owens Lake (Amsden 1937; Bryan 1965; Campbell 1949; Davis 1963; Walters 1970), Panamint Valley (Davis 1970), Death Valley (Hunt 1960), Pilot Knob Valley (Amsden 1937), Lake Mojave (Amsden 1937; Davis and Shutler 1969; Rogers 1939; Simpson 1947), and Bow Willow Wash (Eckhardt and Hatley 1982). They are also common in the Mojave Desert as a whole (Amsden 1935; Brott 1966; Davis and Shutler 1969; B.H. McCown 1954). Unfortunately, many of the materials occur in surface contexts without associated datable material or stratigraphic relationships, thus making it difficult to further assess cultural and temporal placement.

The Lake Mojave/Silver Lake Tradition was first identified by Campbell and Campbell (1937) from an assemblage recovered along the shores of Lake Mojave. The assemblage is characterized by ". . . numerous side and turtle-backed scrapers, retouched flakes, large knives, mostly broken, leaf-shaped projectile points, drills, and the projectile point which has been styled the Silver Lake Type . . ." (Campbell and Campbell 1937:33). The tradition is most notable for two particularly distinctive projectile point styles--Lake Mojave and Silver Lake projectile points. The typical Lake Mojave point has a long, tapering stem with a slight shoulder just below the center of its vertical axis (Amsden 1937:80). It is diamond shaped and is closely associated with the Silver Lake style (Campbell 1936), which has a more definite shoulder and less tapered stem. Percussive production techniques predominate, but pressure retouch has been noted on thinner items, such as crescentics and points (Barbieri 1937:101). A primarily hunting economy has been inferred from the artifacts (Amsden 1937:90-91), but Amsden also noted that fishing and seed gathering are alternate emphases (1937:92).

The Lake Mojave/Silver Lake Tradition has been identified throughout the California desert area at China Lake (Davis 1973, 1975), in Panamint Valley (Davis 1970), within the Little Lake-Owens Valley area (Bryan 1965; Davis 1964; Harrington 1957;

Riddell and Riddell 1956; Walters 1970), in Death Valley (Hunt 1960; Wallace 1958), and throughout the Mojave Desert (Campbell and Campbell 1935, 1937; Davis 1962; Donnan 1964; Rogers 1939; Simpson 1960; Smith 1963; True, Sterud and Davis 1966). Again, this tradition is not well dated in absolute terms, primarily because most finds are surficial and lack datable contexts.

The San Dieguito Tradition was first defined by Malcolm Rogers. His concept of this tradition was refined several times. In his initial chronological sequence for interior southern California deserts, Rogers designated San Dieguito/Playa as the more advanced lithic industry following Malpais (1939:74). He defined two phases of the San Dieguito/Playa industry, which he viewed as a hunting economy penetrating the desert from the Pacific littoral or the Great Basin (1939:71). In later years, the sequence was changed to represent three development phases of the same complex, San Dieguito I, II, and III (Haury et al. 1950:193, 1958:3). Rogers' differentiation and chronological placement of the various phases were based on typological study of surface artifacts, degree of chemical alteration on the lithic material, and geographical location of sites in relation to relict water sources (Rogers et al. 1966:61, 63). With ensuing years, the San Dieguito complex was further defined, and a fourth phase present in Baja California was added (Rogers et al. 1966:100).

According to Rogers, these San Dieguito materials constituted "a cohesive pattern which is unique because of its simplicity, age, and great territorial distribution" (1958:8). Regional variations of this pattern were identified as four aspects: southeastern, southwestern, central, and western (Rogers et al. 1966:24-25).

A limited number of radiocarbon dates are available for the San Dieguito tradition. For coastal manifestations, Kaldenberg (1976) obtained dates for what he believes to be San Dieguito materials that are in excess of 8000 years B.P. Other dates (Warren 1967:179; Warren and True 1961:260) suggest a temporal range from at least 10,000 B.P. to perhaps as late as 4000 B.P. for desert areas.

The Haskomat Tradition has also been identified as a Period 2 occupation in the Mojave Desert. Warren and Ranere (1968) analyzed the artifacts from Lake Mojave and outlined what they felt were significant variations in the assemblages. Three distinct cultural expressions were recognized: fluted points, San Dieguito, and Haskomat. It was noted by Warren that:

> Some forms of artifacts appear to be shared by the Haskomat and San Dieguito complexes. However, the stone flaking technologies appear to differ. The Haskomat projectile points, for example, were most often executed by well-controlled direct percussion with

collateral flaking at right angle to the margin followed by delicate pressure flaking at the margins. This results in straight lateral margins and thin lenticular cross sections. San Dieguito points, on the other hand, were made by a relatively crude percussion technology resulting in deep negative bulbs of percussion with step fractures producing irregular edges and surfaces. Edges are also often flat and crushed as if supported on an anvil (Warren, Knack and von Till Warren 1980:32).

Although Haskomat and San Dieguito traditions are both represented at Lake Mojave, Warren and Ranere (1968) note that the San Dieguito Tradition appears to be more characteristic of the Mojave Desert and that Haskomat may be primarily a northwestern Great Basin phenomena.

A number of basic research problems are particularly important for Period 2. Most basic is the need for explication of the temporal range of the various traditions. Absolute dates and assemblages in reliable stratigraphic contexts are quite limited. Many of the current interpretations have been generated through study of assemblages in surface contexts, particularly those around dry lakeshores where superposition may be a problem. Another difficulty is that of determining relationships between various traditions--Do these traditions indicate different cultural groups or are they expressions of different functional modes of the same culture?

An area of interest in recent years has been adaptation of Period 2 cultures to various environmental conditions. Questions have involved how much such cultures relied on big game hunting and/or exploitation of lacustrine environments. Many gaps certainly exist in current knowledge regarding this relatively early occupation that require examination of a far larger resource base than has been examined thus far.

PERIOD 3 - MILLING HORIZON

This period begins with the introduction of milling technology and ends with the introduction of locally made ceramics. Within this period is considerable variation in terms of temporal span and stylistic traits, particularly for projectile points. Sufficient information is available to permit intra-period differentiation and refined interpretations as a number of stratified and well-dated sites have been investigated. On the other hand, considerable confusion and differences of opinion are reflected in the literature in addressing particular problems.

The environment for this period is marked by broad climatic fluctuations which would also have affected vegetation and game supplies. These conditions must have imposed adaptive strategies which limited population and required frequent migrations to seasonally available resources (Rogers 1939:56-57; Wallace 1962:175; Davis 1970:120-121).

It is notable that several authors have suggested a cultural hiatus or abandonment of the Mojave Desert during the initial portion of this period (Wallace 1962:175; Hall and Barker 1975:44). The idea of abandonment during this time (ca. 5,950 to 7,950 B.P.) stems in part from Antevs' concept of a climatic altithermal during which conditions were thought to be more arid than today (Antevs 1955). Although it is presently conceded that such conditions may have occurred on a large scale, the effect on localized populations may have been nonexistent (Bettinger and Taylor 1974:14; Hall and Barker 1975:55-56; Elston 1976). The supposed hiatus may be simply reflective of a subsistence shift or material culture "transitional stage" (Davis et al. 1978:15).

Traditions identified during this period in the western Mojave Desert are most easily discussed as two basic groups--locally developing traditions and southwestern traditions. Southwestern traditions are characterized by various elements, such as painted ceramics and grooved axes, indicative of contact with or presence of groups of the Hohokam or Anasazi traditions. Locally, cultural development probably proceeded from terminal Period 2 traditions in transition to more complex cultural orders. Evidence of this local development is seen in change from larger to smaller projectile forms in Period 3 and more notable homogeneity in material assemblages increasing over time. Period 3 local traditions have come to be termed Desert Culture.

Jennings' general concept of the Desert Culture is a widespread, uniform "culture" with no significant change between 4,950 to 9,950 B.P. (Jennings 1964:50). Swanson (1966:144-145) suggests that changes occurred in the environment causing one-time big game hunters to be more reliant on plant foods, thus creating the "Desert Culture" (cf. Warren and Ranere 1968; Ranere 1970). Regardless of the cause of inception, it would appear that similarities in material culture became rather widespread during Period 3 in the desert west, including:

> . . . basketry, netting, fur cloth, woven sandles, the spear thrower, hardwood dart points, stone tools preferrably of basalt and quartzite in the early stages (with a shift toward obsidian and other glassy materials later), flat milling stone, many specialized stone tools, scrapers, choppers, pulping planes of crude appearance, digging stick, curved wooden clubs, fire drill and hearth, tubular pipes, and imported shells from California for ornaments (Jennings 1964:85).

The Milling Horizon in the southern Great Basin is commonly divided into two phases, "Pinto-Gypsum" and "Amargosa," each of which is characterized by distinctive projectile point styles (cf. Bettinger and Taylor 1974). For further discussion of projectile point series and relationships, see Bettinger and Taylor (1974) and Hall and Barker (1975).

A variety of labels have been applied to differing traditions within Period 3. Regardless of labeling, there is a definite series of projectile point styles that occur, although many have been relabeled and reclassified through the years by various researchers. Basic series include Pinto, Gypsum or Elko contracting stem, Elko, Rose Spring, and Eastgate series.

The Pinto series is characteristic of earlier manifestations of Period 3 occupation and has been identified throughout the western Great Basin. A subsistence pattern consisting of both hunting and gathering has been suggested (Wallace 1978:31) and an apparent association between Pinto sites and relict or intermittent water sources has frequently been noted (Campbell and Campbell 1935; Cowan and Wallof 1974; Donnan 1964; Harrington 1957; Mortland 1974). According to Bettinger and Taylor (1974), the Pinto series is characteristic of a period between approximately 5950 B.P. and 3150 B.P.

Elko series projectile points (including Gypsum Cave points) are characteristic of a period ranging between approximately 3150 and 1350 B.P. (Bettinger and Taylor 1974:14). As defined by Heizer and Baumhoff (1961), the two major types of Elko points are a corner-notched and an eared point. Elko points also include most projectile points known as Amargosa (Bettinger and Taylor 1974:18). The Gypsum Cave point defined by Harrington (1933) at Gypsum Cave, Nevada, was noted by Rogers 1939:47) to occur in San Bernardino County and has been reclassified as Elko contracting stem (Clewlow 1967; Thomas 1971). Bettinger and Taylor state that Smith et al. (1957) report Elko eared and Elko corner-notched points with Gypsum Cave points in Newberry Cave (Bettinger and Taylor 1974:18). Point types now known as Elko eared and corner-notched were defined by Rogers as occurring in the north-central part of the Mojave Desert as representative of the Amargosa pattern (1939:61-60).

Elko series projectile points were replaced by the Rose Spring/Eastgate series some time between 1450 to 1350 B.P. Rose Spring series points are smaller than Elko points and range from convex- to concave-sided implements. Bases are straight or convex. These points have been divided into six separate types: Rose Spring side-notched, Rose Spring corner-notched, Rose Spring contracting stem, an aberrant form with a rounded stem, an aberrant single-shouldered form, and a general unclassified category (Lanning 1963:252).

The Rose Spring/Eastgate series is interpreted as representing a shift from atlatl to bow and arrow (Lanning 1963:268). On this basis, Hester (1973:34) proposes the Rose Spring/Eastgate complex, which he sets apart from the preceding temporal period. Heizer and Baumhoff (1961) and O'Connell (1967) suggested that this series developed out of the larger Elko points; others view this as a continuation of the earlier period with changes primarily in projectile point size (Warren and Crabtree 1978:19). These points are restricted to the more northern portion of interior southern California, having been found in Owens Valley, Panamint Basin, Death Valley, and at Little Lake (Hester 1973:127; Bettinger and Taylor 1974:19).

Introduction of bow and arrow with attendant changes in projectile types may warrant distinction in local material-cultural chronologies. However, this does not necessarily indicate a significant change in ethnicity or tradition.

Toward the end of Period 3, there is definite evidence of the presence and influence of southwestern traditions in the Mojave Desert region. The most notable evidence is found at turquoise mining areas near Halloran Springs (Eisen 1898; Rogers 1939). Interest in prehistoric mining activities spurred the San Francisco Call newspaper to organize an exploratory expedition in 1898 led by archaeologist Gustav Eisen (Pogue 1915:46). Prehistoric quarrying activities also resulted in Malcolm Rogers' first studies in the Mojave Sink region (1929). More recent studies of cultural affiliations and quarrying techniques have been conducted by Leonard and Drover (1979).

The Halloran Springs mining region is an area approximately eight to fourteen miles long and three miles wide with evidence of extensive use (Rogers 1929:2-3). The work of Sigleo (1975:459) and ceramics recovered by Rogers (1929) suggest an Amargosa II or Basketmaker III age for the onset of mining at Halloran Springs. Although Rogers recognized no Mojave (Yuman) ceramics, he is equivocal regarding cultural affiliations of the miners. A definite link is seen between Halloran Springs materials and true Southwest traditions.

Turquoise beads recovered from room fill of a Gila Butte Phase house (A.D. 500-700) at the Hohokam site of Snaketown in south-central Arizona are determined to be of Halloran Springs origin (Sigleo 1975). Further evidence of possible Hohokam contact is suggested by finely finished three-quarter-groove stone axes (see Rogers 1939:Plate II, 3). Inspection of coil and scrape gray wares, however, suggests a Virgin-Kayenta relationship (Rogers 1939:65; Leonard and Drover 1978), which indicates possible Anasazi exploitation.

Rogers' belief that Amargosa phases were influenced by, or were part of, cultural traditions (Basketmaker) in the Southwest seems to be borne out. It may be accurate to include the eastern half of the Mojave Desert from approximately 2,950 B.P. until ethnohistoric times as part of the greater southwest (cf. Wiley 1966:180; Kroeber 1920, 1923). Pottery and domesticated plants were eventually added to similar Californian (Amargosan) and Arizonan (Cochise) cultural assemblages. Intrusion of domesticated plants into the Mojave and Colorado deserts was met with varying success (see Forbes 1963 and Lawton and Bean 1968). Although King and Casebier suggest the introduction of horticulture as early as Amargosa I times in the Mojave Desert (1976:29), supportive physical evidence remains to be found.

At its inception, Period 3 occupation is considered to represent adaptation to post-Pleistocene conditions and extinction of many species of megafauna. Increased variation in the assemblages is believed to represent increased use of plant resources and small game, with increasing diversity reflecting local specializations. The variation and length of time involved for Period 3 has led to a number of different and sometimes conflicting interpretations. Toward the end of Period 3 the introduction of the bow and arrow and influences from the Southwest culture area are seen as major sources of culture change. Complexities of the archaeological record for Period 3 constitute one of the more challenging research areas in the northwestern Mojave Desert.

PERIOD 4 - CERAMIC HORIZON

This cultural period begins with introduction of locally made ceramics and ends with historic contact and introduction of Euro-American elements into Native American assemblages. Dates for inception of this period vary between authors, but tend to cluster around 1000 B.P. New projectile point styles also tend to associate with Period 4 occupation.

Notably, Desert side-notched (Baumhoff and Byrne 1959) and Cottonwood (Lanning 1963) series points occur in Period 4. Although appearance of these projectile types is commonly equated with expansion of Shoshonean groups, Rogers (1939:Plate 18) distinguishes between Early Desert Mojave (Cottonwood), Late Desert Mojave (Desert side-notched), and Paiute-Shoshonean (side-notched variant) projectile forms.

The Cottonwood series was initially defined by Lanning (1963) as including "triangular" and "leaf-shaped" varieties; Heizer and Clewlow (1968) later added a "bi-pointed" form. Desert side-notched points are of four varieties--General, Sierra, Redding, and Delta (Baumhoff and Bryne 1959)--and are regarded as evidence for a developing bow/arrow technology. Both series (and any variety) can occur in mutual association within prehistoric and historic sites. Desert side-notched points were introduced circa 850-750 B.P. and Cottonwood points circa 650 B.P. (Bettinger and Taylor 1974; Clewlow 1967; Clewlow, Heizer, and Berger 1970; Elston and Davis 1972; Hester and Heizer 1973).

Locally made ceramics, usually described as characteristic of the onset of the Late Prehistoric Period, probably appeared earlier than A.D. 1000. Southwestern ceramics were introduced during the latter portion of Period 3. Three or possibly four separate ceramic wares were manufactured in eastern California by at least A.D. 800, and these technologies eventually became the historic pottery of the southern Paiute, riverine Yuman, and coastal Yuman groups.

Owens Valley Brown Ware (Riddell 1951) and Southern Paiute Utility Ware (Stewart 1942; Baldwin 1950) are the ceramic technologies of the Paiute of the southern Great Basin. They comprise two separate wares, but the latter may not have actually been produced in California (cf. Riddell 1951:22). Owens Valley Brown Ware extends from Las Vegas westward to Bishop, California, and beyond, where it is apparently inspiration for late ceramics among the Plains Miwok and Yokut peoples of the southeastern Central Valley (Heizer and Elsasser 1953). Owens Valley Brown Ware has a wide geographic distribution, but may not have been produced much further south than Death Valley.

Lower Colorado River Buff Ware has been described as being distributed mainly along the Colorado River (also Colorado Desert) between Hoover Dam and the Sea of Cortez beginning about A.D. 800 and having probable affiliations with Pioneer Phase (pre-A.D. 700) Hohokam culture (Schroeder 1958). This ceramic sequence culminates with riverine Yuman groups, at least one series of which (Parker Red-on-Buff) developed into historical Mojave ceramics (Kroeber and Harner 1954). Pottery of this ware may have been manufactured as far west as the present towns of Barstow and Indio, California, and as far east as Gila Bend, Arizona. Temporal treatment of singular types is difficult because of a lack of chronologically comparable riverine sites.

Tizon Brown Ware, originally named by Colton and Hargrave (1937) from specimens recovered during survey in northwestern Arizona, was subsequently described in detail by Dobyns and Euler (1958). Tizon Brown Ware was reported as having a temporal range from A.D. 700 to 1,890 and being produced by:

> . . . upland Arizona Yuman Indians, principally the Walapai, and their direct ancestors of the Cerbat Branch (Patayan). At least one type, Tizon Wiped, was a variation produced by the Havasupai (Dobyns and Euler 1958:Ware 15).

These wares have been reported throughout the Far Southwest (Euler 1959; McCown 1959; May 1973, 1978; Meighan 1959, 1974;

Rogers 1945) and possibly represent the earliest diffusion of locally made ceramics in the western Mojave Desert region. Mojave Brown Ware series (May 1978) was identified by Rogers near the shores of Cronese Dry Lake and elsewhere throughout the Mojave River area. These ceramics correspond to Periods 4 and 5, roughly 1200 to 200 years before the present (A.D. 750-1750).

An apparent increase in the total record of occupation--particularly in habitation sites--led Wallace (1962:178) to infer a larger population during Period 4. Population increase and experimentation with agriculture may indicate climatic differences during the last millenium, a possibility which should certainly be explored more fully.

While it is widely believed that Shoshonean speakers (Southern Paiute) made their first appearance from the north during Period 4, local antiquity of the Shoshonean language family in southern California has been questioned (Broadbent 1976; Hall 1976; Koerper 1979). Ethnicity of Period 4 archaeological materials in the Mojave Desert region has been a major concern to local prehistorians (Rogers 1945; Schroeder 1957) and poses major problems in current research.

Period 4 ends with the contact and impact of Euro-American culture. This, of course, did not occur all at once. Rather, impact and acculturation was a sometimes early and dramatic and sometimes slow and ineffectual process, with some groups persisting until the latter portion of the nineteenth century.

PERIOD 5 - ETHNOHISTORIC HORIZON

Ethnographic knowledge is not extensive for the western Mojave Desert region. Aboriginal population in this area was small, and early ethnographic accounts provide little specific information. In historic times sightings of Native Americans along the Mojave Trail were rare. Knack summarizes these sightings and attributes their rarity to low population and avoidance (1980). Since detailed ethnographic accounts are lacking, it is difficult to assess the latest Native American occupation in the region. Several studies have attempted to identify what groups were present (Warren, Knack and von Till Warren 1980; Stickle et al. 1980), but no definitive conclusions have been made.

Possible recent occupants include the Chemehuevi, Vanyume, Serrano, Kawaiisu, and Koso. The Mojave were probably influential due to their expeditions along the Mojave Trail. Ethnographic accounts for these groups are provided in Kroeber 1925, Kelly 1934, Steward 1938; and Laird 1976.

Regardless of who occupied the region, it is reasonable to assume that subsistence and other activities generating material remains were similar throughout the Mojave Desert region. Basically, there was a limited water supply, a marginal and depressed biological resource base, and low population. The prevailing pattern was one of each family pursuing subsistence activities independently for a substantial portion of each year. During this time they would range over a widespread area extracting necessary food resources. Steward indicates that limited food supplies would have prevented all inhabitants of any given area from living in a single large village for any significant length of time. Groups would congregate periodically, however, for such activities as pine nut gathering or rabbit drives (1938:72-73).

Early European contact with indigenous American populations in the Mojave Desert region began in A.D. 1540. Spanish explorer Hernando de Alarcón in a party of small boats sailed up the Colorado River some distance beyond the Colorado-Gila confluence at the head of the Colorado Delta (Federal Writers Project 1939:63b). Although this contact was distant from the current study zone, it no doubt had an impact on the indigenous population throughout the Mojave as exploration continued.

Again in 1540, Melchior Díaz marched from Sonora toward the Colorado in search of Alarcón (Steere 1952). In the early 1600s Juan de Oñate marched downstream along the Colorado River, reaching the Gulf of California on January 25, 1605 (Norris and Carrico 1978:15). Although accounts of the Colorado region were superlative, the Spanish government turned its attention elsewhere and the Colorado River and the vast lands to the California coast went unexplored for the next 170 years.

An expedition from Tucson to the area of present-day Yuma and surrounding regions was conducted in 1771, led by Father Francisco Garcés (Pourade 1960). This effort, coupled with the foundation of Mission San Diego de Alcalá two years earlier, solidified the Spanish government's commitment to colonization of Alta California. Between 1772 and 1776 the Anza/Sonora route was established, allowing transportation and trade between the California missions and the Arizona/Sonora region (Lindsay 1973; Pourade 1960).

The first recorded expedition to enter the Mojave Desert region was that of Garcés in 1775-1776. Moving northward along the Colorado, Garcés reached the area of Needles and headed westward with the aid of native Mojave guides (King and Casebier 1976:283-284; Bard 1973:38). Traveling a path forged and frequently used by Mojave traders and raiders between Paiute Valley and the California coastal plain (Norris and Carrico 1978:22), Garcés moved from watering hole to watering hole to sustain his pack animals, wagons, and mounted men. The trail led Garcés through the Providence Mountains to Soda Springs and beyond the Cady Mountains to the southern slopes of the Calico Mountains.

There is no real mention of the Barstow area beyond these several brief passages:

> Mar. 16. Having gone four leagues I came to where there was good grass, large cottonwoods, cranes and crows of the kind there is at San Gabriel. Mar. 17. At the passage of the river the mule mired down and wetted all that he was carrying, and for this did I tarry there. This day I dispatched one Jamajab (mojave) and Sebastian, that they should seek the inhabited rancherias . . . This day came five Jamajab Indians who were returning from San Gabriel from their commerce, and very content to have seen the padres . . . Mar. 18. Sebastian returned without mishap, praising the kind reception that had been given them by the Indians whom they had seen; and thereupon I went five leagues southwest up the river, and arrived at a rancheria of some forty souls of the same Beneme nation . . . (Coues 1900).

Coues in his note places Garcés somewhere between Grapevine (latter-day Barstow) and Cottonwood, which is probably around Helendale.

By the year 1781, a native insurrection near Yuma and further southward effectively closed (for a time) the Anza/Sonora trail to most travelers. More northerly routes from New Mexico to the California frontier were sought. Eventually the Old Spanish Trail became the major trade route. The exact location and course are much in question (Hafen and Hafen 1954; Casebier 1975; Warren and Roske 1978), but there is no debate that the trail (or trails) became a busy commercial route between 1830 and 1848, used by merchants, emigrants, trappers, and thieves (Edwards 1969; Casebier 1975). The first American emigrants came over the trail in 1841 (Bard 1973:43).

When war between the United States and Mexico broke out, the Mojave Desert remained largely uncharted and little understood by Europeans. The Old Spanish Trail served as an emigrant trail, commercial road, and marauder's escape route. Natives still controlled the land; nature prevailed; permanent settlements and extended land use were several years and another culture removed from the sunset of the Mexican period in 1846 (Norris and Carrico 1978:29).

The American period (1846 onward) brought thousands of emigrants into California, and their influence on the Mojave Desert region was profoundly different from that which prevailed in the preceding Spanish and Mexican periods. American efforts became focused on extracting and exploiting available desert resources, pushing indigenous people further to the side. With grazing animals destroying their food sources, settlers and emigrants claiming their springs and streams, and land being stripped from under them, the native populations reacted violently. By the late 1850s, a strong military presence was required to protect American interests from Indian hostilities. Fort Mojave was established during this period, as well as outposts at Camp Sugar Loaf (near Barstow) in 1858, Camp Cady in 1860, and other localities along well-traveled routes.

Once protection was reasonably assured, the way was open to civilian growth. Suppliers established outposts to serve the needs of travelers. Miners began to operate in previously unexplored areas, settlements and ranches started to form, and transport and trade were greatly increased. Railway surveys conducted earlier (1853-1860) laid the groundwork for a large network of rail lines which, beginning in 1876 and flourishing through the early 1930s, played a major role in development of industrial mining throughout the Mojave region.

During the late 1800s and early 1900s, a great deal of prospecting occurred throughout the Mojave Desert. Claims were laid for extraction of both metallic and nonmetallic ores. Discovery of borax in Death Valley came in the 1880s, bringing transport of large amounts of ore by mule team and wagon along the Old Borax Trail. This trail wound from Saratoga Spring to Cave Spring in Avawatz Pass, passed Bicycle Lake, and went through Garlic Spring on the way to processing plants in the Barstow-Daggett area. Many ephemeral mining settlements were to come and go with the economic tide.

Set against the prevailing pattern of Euro-American culture and influence, native populations of the Mojave Desert left their lands and were forced into set-aside government reservations and cultural obscurity as the nation rapidly moved into the twentieth century.

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Photograph of Rainbow Basin near Owl Canyon, north of Barstow, California.

ARCHAEOLOGICAL INVESTIGATIONS OF THE SIDEWINDER WELL QUARRY WORKSHOP AND OF THE STODDARD VALLEY STONE RING FORMATIONS, SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

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ABSTRACT

In conjunction with a twenty-year plan by the Bureau of Land Management to monitor effects of ORV impacts to sites in the Stoddard Valley area, Cornerstone Research conducted excavation and mapping exercises at three cultural resource sites in this area. Research included one test excavation unit within 4-SBr-562; an overall site map, individual feature maps, and three excavation units at 4-SBr-2288; and an overview of previously reported cultural materials at 4-SBr-3559.

Located on a wide alluvial fan immediately east of I-15, 4-SBr-562 is a large quarry of chalcedony cores and flakes. The site has been impacted from a variety of sources, including highway construction, ORV activities, and modern quarrying. The two-by two-meter test unit was excavated to fifty centimeters and recovered over 600 chalcedony flakes, cores, and debitage, but no refined tool forms. These test results suggest that the site is an exhausted aboriginal quarry resource. Cornerstone Research recommends that the site area be protected from adverse impacts by installing a fence. However, if land use priorities continue to impact the site, information should be recovered to include horizontal and vertical material distributions and additional analytical data relating to intrasite variability.

Cultural resource 4-SBr-2288 is approximately three kilometers to the northeast on a steep bench above a large wash. Impacts have occurred to the site from ORV activities, primarily along the eastern margin. The mapping exercises conducted at this site documented twenty rock feature configurations, including circular features, stacked rock cairns, and various alignment formations. Excavations of three rock features revealed small subsurface pebble concentrations beneath two features (possibly associated with ceremonial activities), but no additional cultural materials. Cultural and temporal affiliation of these features is unknown. The features are most likely related to ceremonial practices, although utilitarian uses for several features cannot be discounted based on pollen research results and ethnographic analogy. Cornerstone Research recommends that a carefully controlled monitoring plan be implemented by the BLM at this site to assess negative impacts occurring to the cultural features. If these disturbances noticeably increase, an impact mitigation plan should be designed to stabilize the balance between popular land use interests and resource conservation.

4-SBr-3559, located about 0.7 kilometer southeast of 4-SBr-2288 and west of the same large wash, was recorded as a rhyolite quarry and workshop area. However, following experimentation and several inspections of the site by Cornerstone Research and BLM personnel, it was determined that these reportedly cultural artifacts are natural in form. Lithic material specimens collected from the field for additional examination are retained for inspection by interested researchers.

Photograph of an aboriginal stacked-stone formation in Baja California. While this feature bears only a slight resemblance to the size of the Stoddard Valley stone formations, it could give an indication of similarities in function. Photo courtesy of Rose Tyson, San Diego Museum of Man.

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The scope of research necessary to complete this project demanded team work and assistance from numerous individuals. Investigation of the sites required initial support and sponsorship by the Bureau of Land Management. Notably, thanks is extended to Russell Kaldenberg of the Riverside District BLM Office for inaugurating the long-term impact monitoring plan and to Mark Sutton of the Barstow BLM Office for his patience and interest in compiling the information regarding rock ring features.

Invaluable palynological research was provided by Dr. Richard Hevly of Northern Arizona University, Flagstaff. Although limited to a sample series from only one rock ring feature, Hevly's findings have potential to greatly assist in accurate determination of rock ring functions. This research was supported by a detailed ethnobiological overview and hypothetical subsistence model compiled by Fran Buck of Cornerstone Research.

Analysis of the recovered flaked lithic materials also required assistance from several differing fields of research. Rod Reiner, a San Diego-based stoneknapper, assisted greatly in this research and is continuing to supply Cornerstone Research with extensive data on flaked lithic technologies and replicative studies. Computer analysis provided by Doug Neeper was an absolute necessity to synthesize the volume of data generated by the recovered materials.

As with most projects, however, in-field and office staff formed the backbone of this investigation. For their extraordinary efforts, I wish to especially thank Nancy Hatley for her high-caliber editorial expertise and unique interest in generating a complete, correct, and readable manuscript. Graditude is also extended to Joe Vogel for providing the extensive graphic documentation for this report. In addition, Bill Eckhardt was of great assistance in generating useful discussion and avenues of research. Any omissions or errors in this document are the sole responsibility of the Principal Investigator.

SECTION I

INTRODUCTION

PROJECT DESCRIPTION

In an effort to lessen the effects of current impacts to several sites within the Stoddard Valley area, the Bureau of Land Management is designing a long-term study plan for these cultural resources and contracted with Cornerstone Research to conduct test excavation and mapping exercises at these culturally related sites. Specifically, Cornerstone Research was contracted to place a two- by two-meter test excavation unit within 4-SBr-562, to produce an overall site map with detailed individual feature maps and excavate three test excavation units at 4-SBr-2288 (d,e), and to produce a site map of 4-SBr-3559 and recover geological specimens from the site materials.

Fieldwork was conducted during two field exercises, the first from January 21 to January 29, 1981, and the second from February 11 to February 15, 1981. A total of over 350 work hours was expended during this fieldwork.

Stoddard Valley is located fifteen kilometers south of Barstow and thirty kilometers north of Lucerne Valley on BLM-administered lands in San Bernardino County, California (Figure 1). The current study area is in the northern portion of Stoddard Valley south of the city of Barstow (Figure 2). The Barstow S.E. Quadrangle of the 7.5-minute series of U.S.G.S. maps shows the relative positions of the cultural sites under investigation (Figure 3).

4-SBr-562 is located immediately east of Interstate 15 near the Sidewinder Road exit (see Figure 3). It is situated on a large alluvial fan with a slight slope toward the south. Small converging drainages cut through the site area. The site was recorded as a large quarry site containing chalcedony cores, flakes, cobbles, and a few tool-type artifacts. Mark Q. Sutton reported the site as larger than 20,000 square meters with a possibility for subsurface materials (1980:26).

SBr-562 is currently being impacted by highway construction to the west, off-road vehicle activity throughout the area, past mining and quarrying activities to the east, and some erosion from the drainages within the site itself. The current project, one two- by two-meter test unit excavation, was intended to determine the extent of any subsurface deposit at this site.

Cultural resource 4-SBr-2288 (d,e) is approximately three kilometers northeast of the Sidewinder Road exit from Interstate 15 on a steep bench above a large wash which drains to the north (see Figure 3). The primary features of the site are rock rings

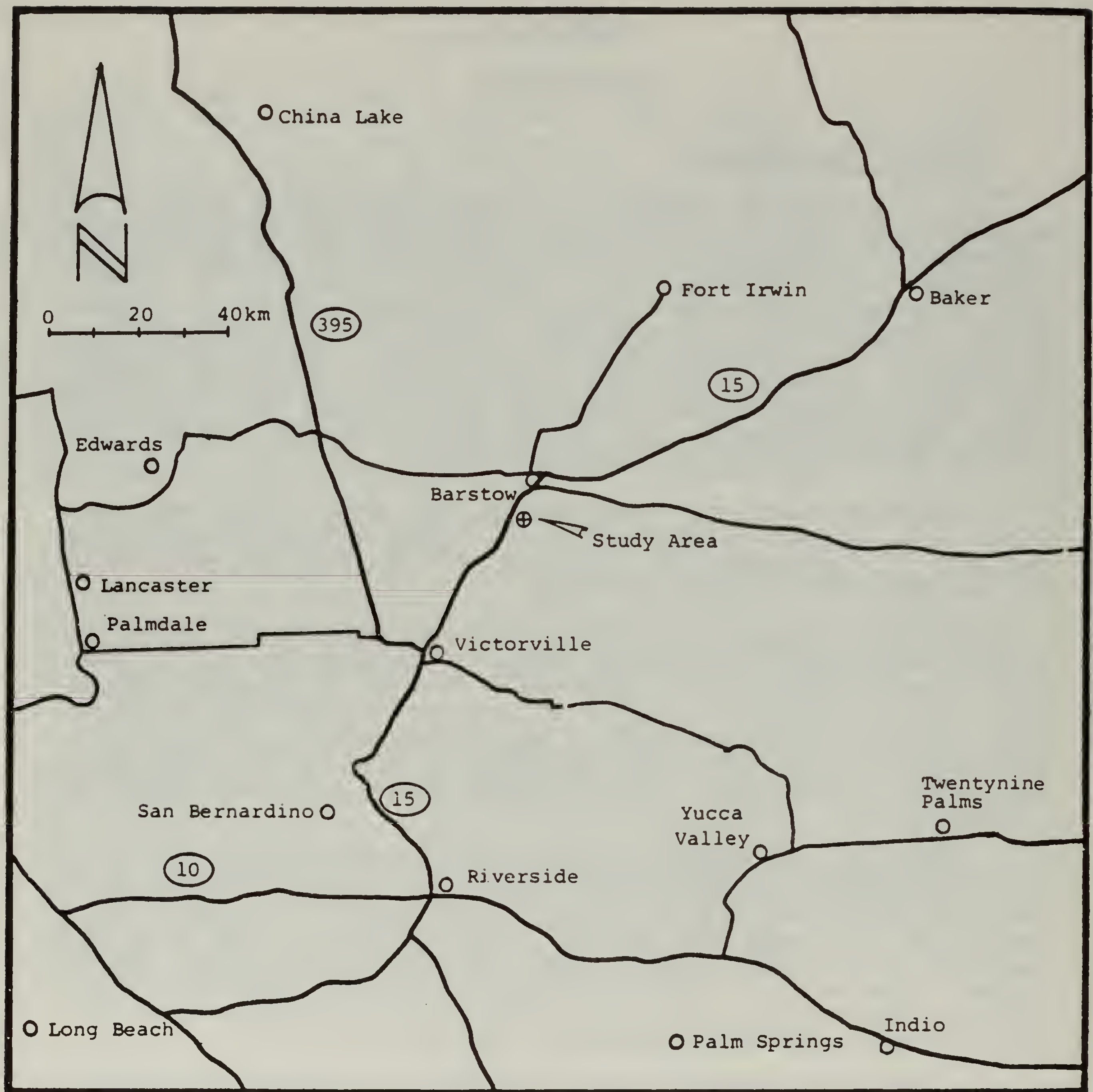

Figure 1
The study area is shown on this map in relation to nearby towns and highways.

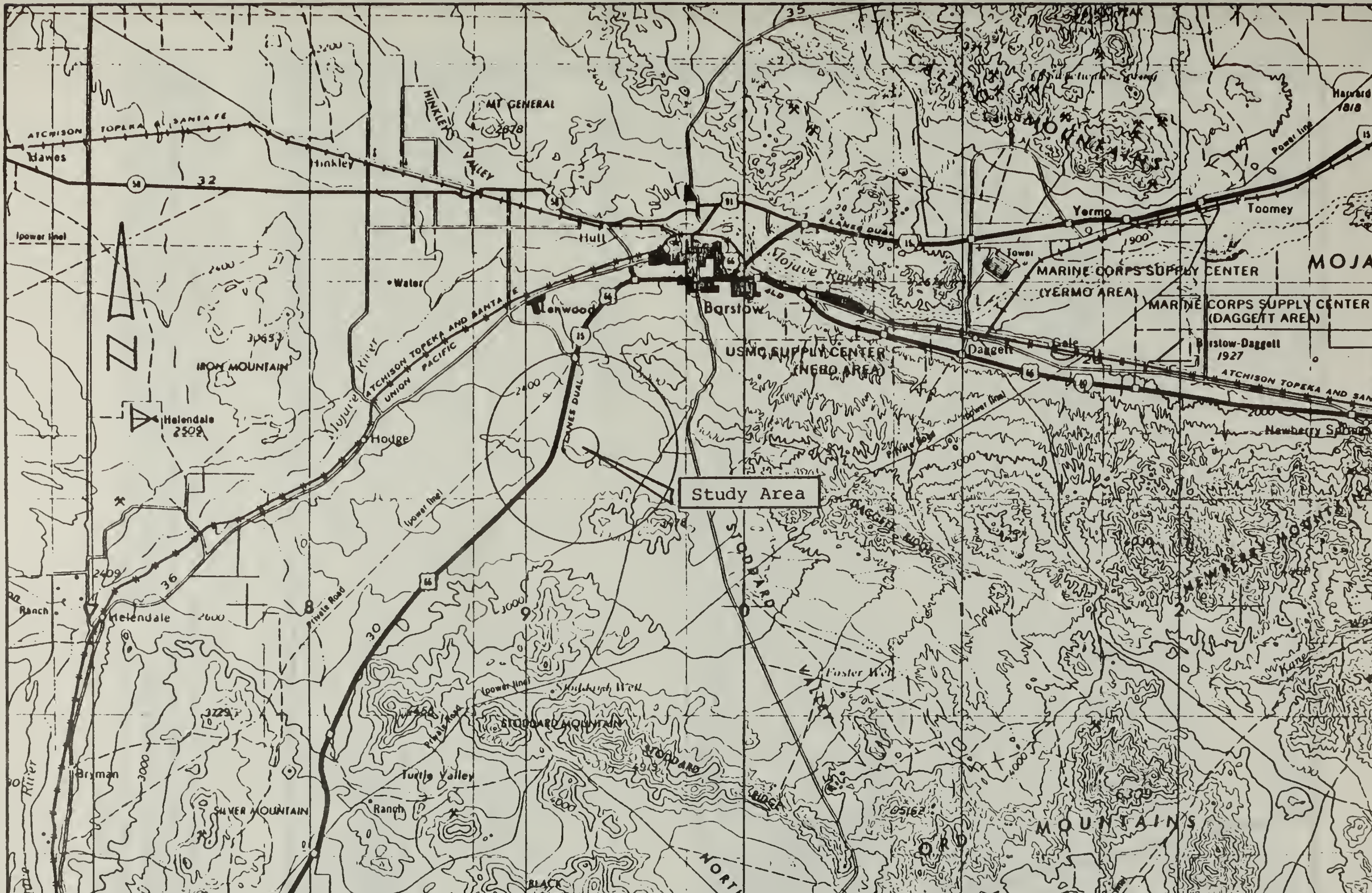

Figure 2

This figure shows the location of the study area relative to the surrounding physiographic setting. The map is based on a portion of the U.S.G.S. San Bernardino, California 1:250,000 series of topographic maps.

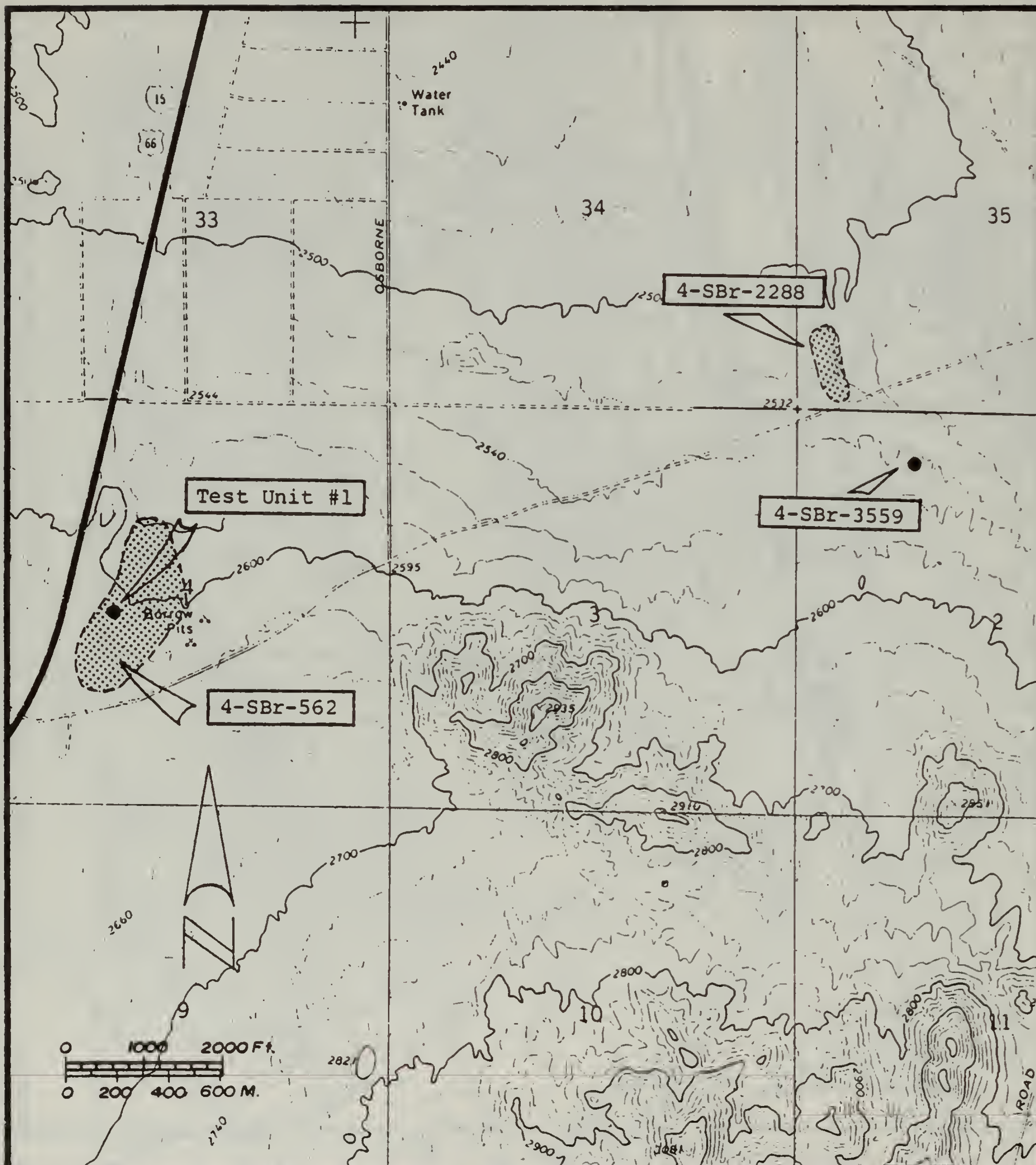

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Figure 3

Illustrated on this figure are the cultural resources investigated during the current project in relation to the surrounding environmental setting. The map is based on a portion of the Barstow SE Quadrangle of the U.S.G.S. 7.5-minute series of topographic maps.

and cairns incorporated into a desert pavement surface. Sutton also reported several lithic workshop areas of chalcedony, quartz, and rhyolite on the site (1980:29).

The most prominent current impacts to this site have resulted from off-road vehicle and associated camping activities. Due to the off-road vehicle tracks along the steep eastern bank of the site and the several drainages throughout the area, erosion is also occurring on the site. The primary tasks of the current investigation--detailed mapping and subsurface excavation--were intended to secure accurate, detailed data showing the present status of the archaeological site. These data will be used in conjunction with an ongoing Bureau of Land Management twenty-year monitoring program which is intended to measure the effects of present land usage and provide a management tool to aid in decision-making regarding potential amendments to current and future use of this area.

4-SBr-3559 is located approximately 0.7 kilometer southeast of SBr-2288 and west of the same large drainage (see Figure 3). When recorded, the site was described as a rhyolite quarry and workshop area (Leonard 1979). This area is also being impacted by surrounding off-road vehicle activities and erosion. The current project was to produce an overall site map of the cultural and physical features and to secure geological specimens of the lithic material from the parent source. These specimens were to be compared to lithic materials at other cultural sites, primarily SBr-2288.

ENVIRONMENTAL SETTING

The portion of Stoddard Valley which contains the current study sites is the outflow for water runoff from the Stoddard and Ord mountains and Daggett Ridge. This drainage area runs northwest, eventually reaching the Mojave River approximately ten kilometers from the present study area. Currently, none of the drainages in Stoddard Valley have any surface water flow, except occasional sheet wash and flash flooding during heavy seasonal rains, although it is possible that the drainages along SBr-2288 could be ancient fossil stream beds formed after the termination of the last major glaciation, that of the Pluvial Wisconsin glacial retreat. Antevs (1952) states that the highest level of precipitation would have occurred just after the last great pluvial; this would make the possibility of surface water flow in Stoddard Valley much more tenable some 9,000 years ago.

The Stoddard Valley region contains typical floral and faunal representatives of a creosote scrub plant community. The most common floral species found in the study area is creosote; other prominent species include saltbush, sagebrush, Mormon tea, buckwheat, and various cacti (see Appendix C).

Other than a few jackrabbits, small birds, and lizards, few faunal species were observed during the current study. Species reported by biological studies in the general area include desert tortoise, ground squirrel, coyote, kangaroo rat, cottontail rabbit, and several varieties of lizards, rattlesnakes, hawks, and other birds (Campbell 1978).

In his 1976 study, King suggests that pinyon-juniper and juniper woodlands were once present in the highlands near Lucerne Valley (just south of Stoddard Valley) from about 12,100 to 7,800 years B.P. This would indicate a higher precipitation rate and a cooler and moister climate than now exists. King futher suggests, based on palynological research, ". . . the possibility of an arboreal resurgence between 5,800 and 3,690 B.P." (1976:188). The possibility of juniper berries and pinyon nuts for a food source would have notably increased the attractiveness of the area during aboriginal times. Fauna during this time period would also have been quite different from the present, creating a more plentiful food resource base for aboriginal exploitation.

Geologically, the Stoddard Valley area is a portion of the Mojave Block, described by Dibblee as a granitoid batholith (1960:111). Several reported faults exist in the region, including the San Andreas fault, running southeast to northwest in the San Bernardino Mountains; the Garlock fault, running northeast across the upper Mojave Desert; the Lenwood fault, which runs along the northeast side of Stoddard Valley; and the Helendale fault, which cuts through Lucerne Valley and the Granite Mountains (Dibblee 1960:111-112, 115). Dibblee also suggests that these faults act as barriers to underground water movement. This latter condition may have provided auxiliary water resources to the area by way of springs and seeps.

The Stoddard Valley floor is Recent- to Pleistocene-age alluvial fans cut by streams and larger drainages. On the southwest side of the valley--north of Stoddard Mountain and Stoddard Ridge--are older folded, faulted, and dissected alluvial fan deposits locally cemented together by caliche.

Stoddard Mountain is an intrusive complex of quartz monzonite porphyry, latite porphyry, and porphyritic felsite of Mesozoic age. Stoddard Ridge is an older formation of Jurassic and/or Triassic metavolcanic rocks. The Ord Mountains to the southeast are made of the oldest complex of undivided Precambrian granitic rocks, Mesozoic basic intrusive rock, and outcroppings of Jurassic and/or Triassic metavolcanic rocks. To the northeast lies Daggett Ridge, which is composed of middle Miocene nonmarine sedimentary rocks. The study area itself is situated on alluvial fans which make up most of the Stoddard Valley geological setting.

SECTION II

PREVIOUS FIELDWORK

The general region around the current project area has been reviewed by several archaeological and anthropological researchers, including Rogers et al. (1966), Harrington (n.d.:field notes, San Bernardino County Museum), and Smith (n.d.:field notes, San Bernardino County Museum). These studies, as well as numerous others throughout the southern California deserts, have resulted in continuing development and refinement of prehistoric cultural chronologies for the area.

More recent fieldwork has included informal investigations by the San Bernardino County Museum and the Mojave River Valley Museum Association and studies by Caltrans in 1977 and 1979, the Desert Research Institute (Fowler et al. 1978), Greenwood and Associates (Greenwood and McIntyre 1979), Archaeological Research, Inc. (Coombs 1979), and the Bureau of Land Management (Kaldenberg 1977; Sutton 1980). Sutton's report presents a summary of these projects in relation to Stoddard Valley sites (1980:10-12). The following discusses previous work at the sites currently under investigation.

Site 4-SBr-562, referred to as the "Sidewinder Off-ramp Quarry Site," was originally recorded in 1972 by Robert Reynolds from the San Bernardino County Museum during an examination of this portion of Stoddard Valley. The site was later visited and reviewed by Henry James from the Mojave River Valley Museum Association in 1979 and by Mark Sutton from the Bureau of Land Management in 1980. Sutton describes this site as follows:

> . . . a single, very extensive scatter of chalcedony cores, flakes, smashed cobbles, hammerstones, and choppers. There does not appear to be any midden, although there may be subsurface materials. The surface area of the site may be in excess of 20,000 square meters. The southern portions of the site have been severely impacted or destroyed by the construction of Sidewinder Off-ramp (I-15). The remaining portion of the site continues to suffer impacts from ORV use and erosion (1980:26).

Cultural resource 4-SBr-2288 was recorded by Gordon Stickler from the Mojave River Valley Museum Association in 1972. It was later reexamined and documented by Russell Kaldenberg from the BLM in 1977 and Mark Sutton in 1980. In 1977 Kaldenberg recommended rerouting a proposed off-road vehicle race track to avoid additional impacts to the site. Review of the results from these investigations indicates minor discrepancies regarding the current registration number for this site, although the area of the present study is designated SBr-2288, loci d and e. Sutton (1980) describes the site as consisting of at least ten to fifteen rock rings, cairns, and lithic workshops (chalcedony, quartz, rhyolite), with a secondary locus separated by a wide sandy wash. The investigation conducted by Cornerstone Research was centered on the primary loci which contain the rock ring features.

Site 4-SBr-3559 was documented and recorded by Joanne Leonard during a 1979 Bureau of Land Management survey of Stoddard Valley. At that time, the site was described as a rhyolite quarry and workshop area with distinctive dark phenocrysts in the lithic material. During a site review by Cornerstone personnel and the BLM Contracting Officer's Authorized Representative (C.O.A.R.), questions arose regarding identification of the rhyolite materials as culturally modified or naturally fractured. See Section III for additional discussion of this consideration.

SECTION III

DATA RECOVERY METHODS AND TECHNIQUES

4-SBr-562

On January 21, 1981, Cornerstone Research began work at SBr-562 by examining the site area for a suitable location for the required two- by two-meter test unit. The general location for the unit was negotiated with the BLM C.O.A.R. Due to the extent of the site, time was expended locating an area containing several elements or features representative of the overall site. Considerations included site density, artifact types and materials, current site disturbance, and expected excavation and backfill disturbance.

Once the optimum position for the unit was decided upon, the southwest corner (horizontal datum) of the test unit was established and a series of six reference bearings were taken to triangulate this location from known prominences shown on the U.S.G.S. 7.5-minute Barstow S.E. Quadrangle map. The test unit area was subdivided into sixteen equal parts, each fifty by fifty centimeters in size, to facilitate a finer-gradient system of retrieval for the surface collection (see Figure 4). Prior to mapping and removal of the surface artifacts, all nonartifactual, medium to large granite and chalcedony nodules were plotted and removed and a photograph was taken of the unit surface.

Mapping and collection of the surface artifacts proceeded systematically from the southwest quarter of the southwest quadrangle. In order to attempt future reconstruction of this high-density accumulation of artifactual materials, the top of each artifact was numbered to read facing north. To minimize additional damage to multifaceted flaked lithic artifacts or those with delicate edges, these items were separately wrapped in toweling for transport to the Cornerstone laboratory in San Diego.

Following plotting and collection of the surface artifacts, a contour map at one-centimeter intervals was made of the test unit area using the southeast corner as the vertical datum. The unit area sloped toward the northwest corner, with that corner six centimeters below the vertical datum.

Since the first ten to twenty centimeters were expected to contain the largest amount of subsurface artifacts, excavation proceeded according to the following pattern to maximize detailed information recovery: 0-5, 5-10, 10-15, 15-20, 20-30, 30-40, and 40-50 centimeters. Levels were manually excavated and cultural materials recovered by one-meter-square quarters, following the natural surface contour. Artifacts recovered in situ were

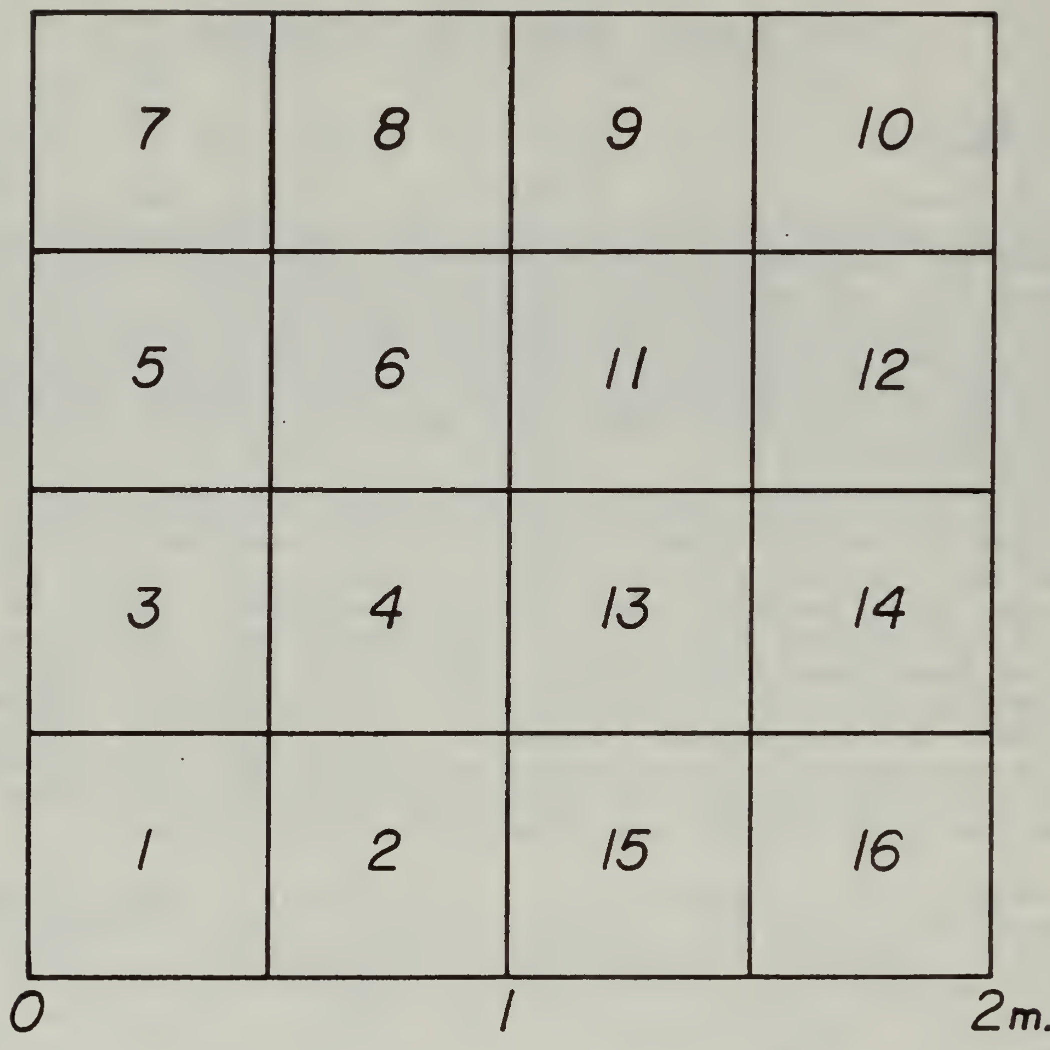


Figure 4

This illustration shows the subdivision of the two- by two-meter test unit at SBr-562 into 50- by 50-centimeter study segments. This plan was implemented to further the accuracy of data retrieval.

plotted and numbered consecutively in the same manner as the surface artifacts, and soils removed from each level were screened through one-eighth-inch screen to recover any additional cultural materials (see the results section for a detailed discussion of recovered artifacts). Soils were screened onto ground cloths to protect the site as much as possible from excavation-related impacts; however, various impacts were experienced as a result of this limited subsurface investigation.

A total of nine person-days was expended excavating the test unit. During this time period, a barbed wire fence was placed around the unit area as protection for off-road vehicle operators. Stratigraphic profiles were drawn of the north and west sidewalls, and a column sample was removed from the midpoint along the east wall of the unit. The test unit was then backfilled.

Ongoing research into the lithic technology of archaeological materials such as those recovered during the test excavation at SBr-562 is currently being conducted by Cornerstone Research. This research has generated a preliminary set of terminologies and observation forms to aid in describing lithic artifacts (see Appendix A). Specific characteristics observed include the following: striking platform and fabricator contact area size and condition, type of evident platform preparation and distal termination, direction of the mass form, percentage of cortex, polar reference and termination codes for previous flake removals on the dorsal face, type of dissection, and presence or absence of compression rings, fissures, bulb of applied force, eraillure and meniscus lens (flake, natural cracks, and patination or oxidation (see Appendix A for definitions of terms). Although still in a preliminary stage of development, these observations are designed to provide data relating to the lithic technology used to produce the artifact and to the possible function or use of the artifact. In an effort to further the development of this research, and to thoroughly describe each artifact, the cultural resources located during the current test excavation were examined using this method. With the aid of a TRS-80 computer, the mean, standard deviation, and population of the various characteristics were also calculated.

A complete set of level records, photographs, and photograph records, as well as the sidewall profile drawings, was compiled during this excavation and is currently curated at the Cornerstone laboratory.

4-SBr-2288 (d,e)

Mapping Program

The contour mapping program at SBr-2288 began on January 21,

1981. The first aspect of this program involved locating existing rock rings and alignments and other cultural materials and relating these to the previous field records and to Sutton's report (1980). The field team determined that lighting conditions greatly influence which features are visible at various times of the day; therefore, the area was reviewed several times over a two-day period and features to be mapped were flagged and numbered. A data chip was also placed at the center of each feature to aid in future monitoring of individual features. A data chip is a rectangular piece of polycarbonate with a hole drilled in one end. A seven-inch nail is set through the hole, which secures the data chip in place for future reference. Pertinent information (i.e., project name, site or feature number, date, and recorder's initials) is inscribed on the chip. Placement of these date chips will minimize continuous searching of the area for features during the monitoring program. Comparison of these features with the previous field records showed that many of the features directly correspond to those depicted on the rough sketch map in the site records, others are considered new finds, and some shown on the records map were not relocated during this detailed search (see the results section for a detailed discussion of the mapped features).

The contour map of SBr-2288 was prepared at a horizontal scale of 1 cm = 5 m, with a vertical contour increment of fifty centimeters. The flatter areas were contoured at twenty-five-centimeter increments (see Figure 6). A transit, alidade, plane table, and stadia rod were used to produce this map. Details on the map include general topography, prominent arroyos and drainages, off-road vehicle tracks, and precise locations of the twenty features located. The contour map was completed on January 29, 1981, and a complete photographic essay of the site area and individual features was also completed.

Detailed mapping of the twenty features, which include rock rings, alignments, and cairns, began on January 28, 1981. A Forest Service chalking device was used to clearly mark each rock considered an element of the feature. Each feature was mapped at a scale of 1 cm = 20 cm. To establish correct orientation and perspective of the feature drawing, string was placed over the feature on true north-south and east-west axes. The maps include the sizes and positions of each rock element and notations regarding amount of visible surface discoloration, feature disturbance, and degree of embedment. The detailed maps required sixteen person-days to complete.

Feature Test Excavations

Features 1, 19, and 20 were manually excavated following completion of the detailed feature drawings. Excavation of these three features began on February 11, 1981, and was completed on February 15, 1981.

Feature 1 is described as a deflated cairn. A two- by two-meter unit was placed over the feature, but to maximize subsurface exposure, only the northwest and southeast quads were excavated, leaving the northeast and southwest quads unexcavated (Photographs 1-2). Prior to excavation, the rock elements on the surface of the two quads were numbered and plotted to be replaced following excavation. Standard archaeological excavation tools were used (i.e., trowel, pick mattock, whisk broom, shovel) and soil was screened through one-quarter-inch mesh. The two quads were excavated in ten-centimeter levels, following the natural surface contour, to a depth of fifty centimeters. Profile drawings were made of all exposed walls, photographs were taken, the unit was backfilled, and the original feature rocks were replaced on the surface of the unit.

Feature 19 is a rock ring with an opening facing east. As with Feature 1, the surface rocks were plotted, numbered, and removed prior to manual excavation (Photographs 3-4). Surface and subsurface soil samples were also collected from a variety of positions, both within and outside this feature, for palynological examination (see Appendix B for detailed discussion).

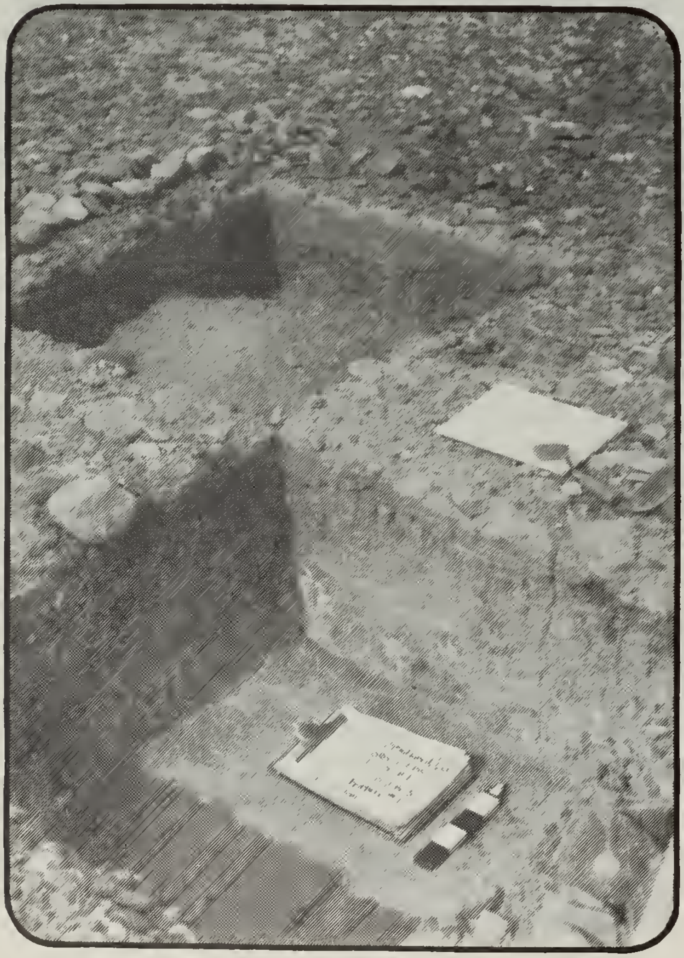
An entire two- by two-meter unit was excavated by alternating quads at this feature, proceeding in ten-centimeter levels to fifty centimeters and processing through one-quarter-inch mesh screen. Following the excavation, sidewall profiles were drawn of all exposed walls, the unit was backfilled, and the original surface rocks were replaced.

The third excavated feature was Feature 20, also a rock alignment or ring. This feature was selected for excavation due to shape, size, and physiographic setting. The latter consideration was especially important as its position is such that destruction from off-road vehicle activity is more likely than other features. Excavation was therefore considered a data salvage effort for this feature. In order to encompass the primary rock ring area, a 150-centimeter by 150-centimeter unit was manually excavated. Excavation proceeded to fifty centimeters in ten-centimeter levels, following the natural ground contour, soils were processed through one-quarter-inch mesh screen, profiles were drawn of all the sidewalls, and the unit was backfilled.

<u>4-SBr-3559</u>

The current project at SBr-3559 was scheduled to produce an overall contour map of the site area, including locations of reported rhyolite quarries, and to secure geological specimens of the lithic material for comparison with materials at SBr-2288. During several inspections of the site area, the lithic outcrops were closely examined by the Principal Investigator and the

Photograph 1. This view of the Feature 1 excavation at SBr-2288 is toward the southeast. The stones along the southeast one- by one-meter unit are feature elements which were removed prior to the excavation. Note the impacts to the surrounding pavement from the excavation and backfill.



Photograph 2. This view of the two one- by one-meter units excavated at Feature 1 is toward the northwest. The arrow scale is in five-centimeter increments, and the maximum depth in the photograph is fifty centimeters. See Figure 29 for stratigraphic details of the sidewall profiles.

Photograph 3. This photograph is of Feature 19 at SBr-2288 prior to excavation--note the roughly oval configuration. The circular marks on the stones were produced by a Forest Service chalking device and delineate elements of the feature. See Figure 30 for a view of the feature in relation to placement of the subsequent two- by two-meter unit.

Photograph 4. This view of the Feature 19 area is toward the southeast. Team members Mike Lerch and Joe Vogel are shown documenting the stone element positions prior to excavation. Note the depressions caused by removal of these stones.

Bureau of Land Management field representative. Although the multifaceted talus debris retains block, angular, and often curved surfaces, the classic indicators of human modification, such as striking platforms, impact points, compression rings, and bulbs of applied force, are absent. Numerous in situ boulders exhibit multidirectional hairline cracks throughout their matrix; however, chemical etching and weathering is believed to cause the exfoliation or spalling effect which creates an illusion of human modification. Therefore, following these on-site inspections and minimal experimentation, it was concluded that these reportedly cultural artifacts are natural in form. Specimens of the lithic material were removed from the field for additional examination, but the originally scheduled site map was not prepared at the discretion of the BLM C.O.A.R.

Similar materials were observed at site SBr-2288, especially associated with outcrops in the steep embankment along the eastern margin. Following the inspection of the materials at SBr-3559, the similar materials at SBr-2288 were also determined to be natural and were not included on the site contour map. Examples of these naturally degenerated rhyolite lithic materials are currently curated at the Cornerstone Research laboratory for review by interested investigators.

SECTION IV

INVESTIGATION RESULTS AND DISCUSSION

4-SBr-562

Cornerstone Research undertook a limited subsurface test at SBr-562 to gain an understanding of the nature of the deposit in terms of depth, range of material constituents, depositional structure, and disturbance. One test unit (two by two meters) was positioned within this extensive cultural deposit and excavated to a depth of fifty centimeters. The investigation was not intended to represent a sample in terms of overall site variability and content, but rather to generate information on what to anticipate during any future large-scale subsurface exploration. Information of this caliber will present the Bureau of Land Management with a tool for further cultural resource management decisions. Refer to Section III for specific details regarding data recovery methods and techniques used during this subsurface test.

To examine the characteristics of flaked lithic specimens in terms of patterning within the recovered assemblage, a detailed series of observations was performed (see Appendix A). These observation variables were formulated by Cornerstone Research based on work by Don Crabtree (1972) and experimental studies conducted by Cornerstone and Rod Reiner, a San Diego-based stone-knapper. To assist in handling the large amount of data gleaned from the investigation, many of the variables in Appendix A were processed by a TRS-80 computer to collate the analytical information and summarize statistically relevant data. Table 1 and the following discussion represent a synopsis of these findings.

The entire assemblage of flaked lithic materials recovered from the test unit are flakes or cores. The lithic material is exclusively chalcedony, of which the majority is opaque with some specimens of translucent chalcedony material. No formal tool forms, such as projectile points, scrapers, or hammerstones, were observed within the materials recovered.

Generally, flaking waste is divided into two subclasses, flakes (formal) and debitage. The subclass flake includes any flaked lithic non-tool that has one positive bulb of percussion, a striking platform, and a point of percussion. Debitage, sometimes termed "shatter," includes all flaked lithic non-tools that are angular in configuration and lack one or more of the attributes listed above and the attributes identifying a flaked lithic tool or core. Human-produced flakes are relatively easy to identify, while debitage can be difficult to identify due to its irregular morphology.

A core is a nucleus from which flakes are derived and is characterized by one or more negative flake scars and one or more striking platforms. Cores generally have an angular, blocky configuration and such dagnostic attributes as localized step fractures.

Flaked lithic materials were predominantly located within zero to twenty centimeters; below that point, cultural materials were encountered only sporadically. This condition is likely attributable to rodent activity or possibly an unknown degree of mixing due to aboriginal extraction techniques, whereby the raw lithic nodules of chalcedony are essentially "mined," probably with digging sticks. Table 1 and Figure 4 show the distributions between surface and subsurface materials by one-meter-square quadrangles. Figure 5 is a generalized representation of the depositional structure at SBr-562, including geological matrix and incorporated cultural materials.

Within the flake category, formal characteristics observed include the presence of observable platform preparation on 0.8 percent of the flakes, a bulb of applied force on 90.8 percent, compression rings on 22.0 percent, and a range of 0-52 percent of cortex remaining on the flakes (with a mean of 21.1 percent). When present, the flakes retain consistently light surface discoloration, including iron oxidation on 15.1 percent of the flakes, manganese oxidation on 1.6 percent, and patination on 91.8 percent of the specimens. Surface discoloration has been used as a relative dating technique by some investigators, although reliability of such observations is subject to debate.

The mass direction forms for these flake specimens are predominantly Code 9 (right lateral) at 17.1 percent and Code 1 (central) at 16.7 percent; the remaining mass direction forms are represented at relatively homogeneous but lower frequencies. Mass direction considerations are relatively novel to lithic technology research and appear to be more applicable to reconstructive studies within tool manufacturing/refinement localities and habitation sites rather than this highly mixed quarry site.

A review of Table 1 shows relatively homogeneous distributions within the measurement attributes. The diverse populations between surface and subsurface within both artifact classes is probably a result of settling rates between the differing size and weights of the artifacts when subjected to weathering processes as the churned soils eroded through time.

Flaked lithic cores recovered from the test unit were also represented throughout zero to twenty centimeters, with few occurrences below that point. Amorphous cores are 65.2 percent of the overall core assemblage, 33.3 percent have multidirectional reduction indicators, and only 1.5 percent have alternate or sinuous flaking patterns. These patterning distributions

Table 1
SYNOPSIS OF FLAKES AND CORES
RECOVERED FROM SBr-562 TEST EXCAVATION UNIT #1*

Attribute	Quad 1-4		Quad 5-8		Quad 9-12		Quad 13-16		Total Quads	
	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface
Flakes										
Population	57	146	39	78	28	46	44	52	168	322
Mean length (mm)	39.8	32.0	36.1	32.8	42.4	25.7	36.9	27.3	39.1	30.5
Mean width (mm)	30.9	29.0	32.1	29.0	34.9	24.6	29.7	25.4	31.8	27.8
Mean thickness (mm)	12.1	9.4	16.1	9.6	12.4	6.8	10.8	8.0	12.9	8.8
Mean weight (gm)	17.4	10.8	19.2	10.5	24.1	5.7	17.8	8.9	20.0	9.7
Cores										
Population	13	5	17	8	12	3	5	3	47	19
Mean length (mm)	65.6	75.0	72.7	73.0	64.9	67.3	70.1	81.3	68.6	73.9
Mean width (mm)	49.1	49.8	51.2	54.9	48.4	46.3	51.0	65.3	50.8	53.8
Mean thickness (mm)	27.9	33.4	36.9	37.5	30.5	30.6	35.4	33.7	32.7	34.7
Mean weight (gm)	98.6	97.5	119.5	121.2	85.2	101.3	100.2	192.8	106.5	128.2

*In addition to the above-listed materials, 71 chalcedony debitage specimens were recovered during the test excavation.

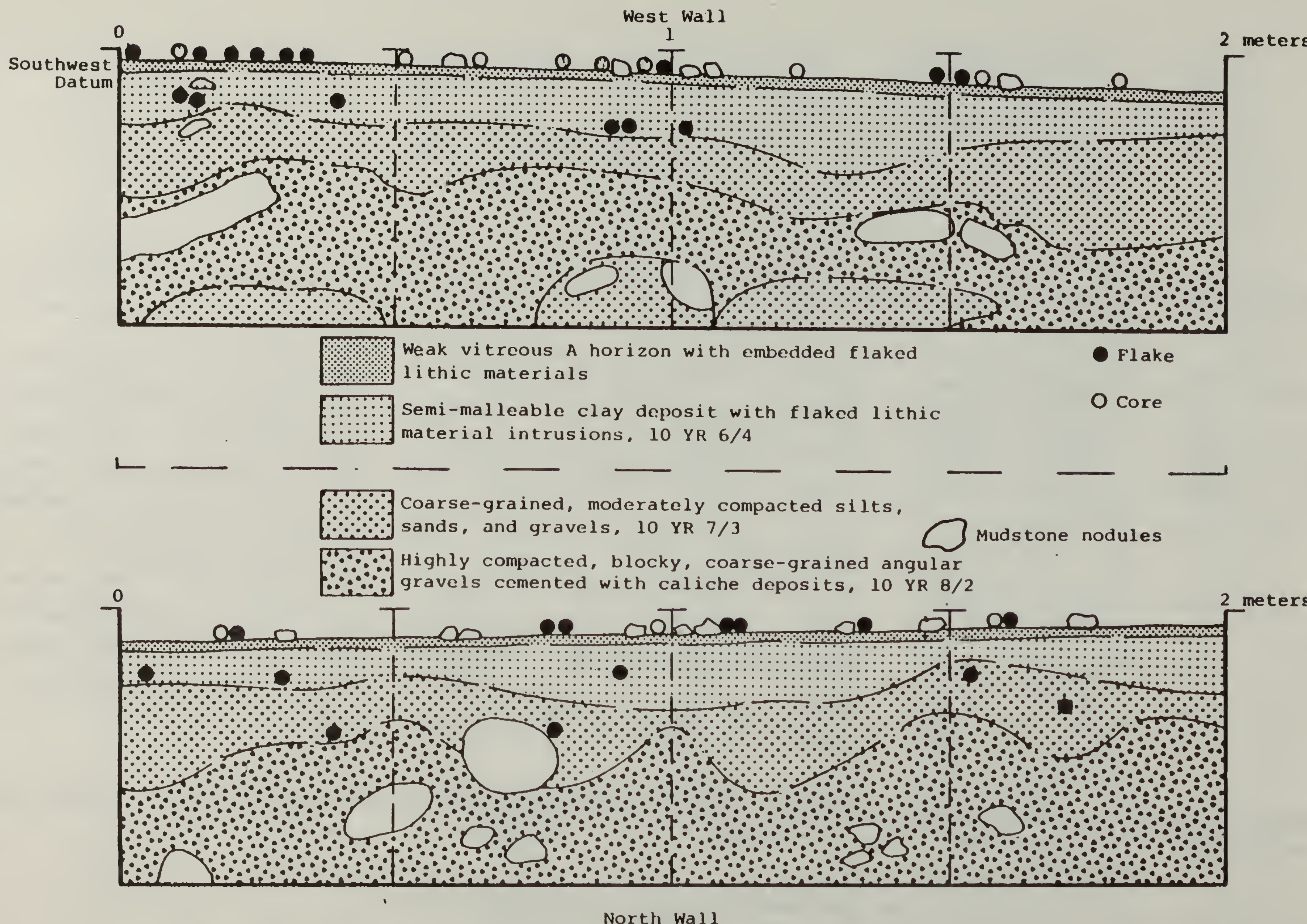


Figure 5

This stratigraphic profile portrays the west and north walls of the SBr-562 test excavation. Note subsurface flaked lithic artifacts and decomposing mudstone inclusions (non-stippled areas).

indicate that the primary function of SBr-562 was extractive and that most subsequent refined tool manufacture was conducted at other locations in the region. This observation is further supported by the absence of refined tool forms or broken tool specimens (due to end shock) of primary or secondary stage reduction sequences at the site.

A review of Table 1 shows the cores to be quite small, with an average diameter of 5.2 centimeters throughout the core assemblage. This factor reflects expended core reduction. The occurrence of natural cracks within 55.3 percent of the specimens may have a bearing on this level of reduction. These factors (i.e., natural cracks and level of reduction) are interpreted as indicative of base lithic material depletion caused by a long-term exploitation strategy, whereas even marginal quality material was diminished to extract flawless work pieces to be later fashioned into various serviceable tool forms.

Remaining cortex on the cores ranges from 4 to 45.5 percent, with a mean of 24.8 percent, also indicating a fine degree of core reduction. Iron oxidation is light on 75.2 percent of the cores, while light manganese discoloration is present on 51.1 percent. Light patination is also present on 95.5 percent of the core specimens.

Figure 5 shows the flaked lithic materials as generally homogenous through twenty centimeters of depth. This factor plus currently low amounts of available raw material (i.e., chalcedony nodules with cortex rind) reflects large-scale aboriginal "mining" or quarrying for raw material to the extent of exhausting available lithic resources at this location in aboriginal times. No additional culturally related items, such as bone, ceramics, or other materials, were observed at this site during the general site overview or the subsurface exploration, and no items considered temporally or culturally diagnostic were recovered or observed during this information retrieval program.

4-SBr-2288 (d,e)

The portions of SBr-2288 studied during this investigation (loci d and e) are comprised of various rock features over an area approximately 285 by 130 meters (Figure 6). the site is situated on a high, relatively flat mesa, which drops abruptly on the east to a wide, prominent wash system and slopes gradually downhill toward the west, south, and north. Several small intermittent drainages dissect the mesa along the western and northern extremities.

Most of the site area is a dense, well-developed desert pavement which is mixed due to disturbance in some areas, with extensive rock discoloration, including dark manganese

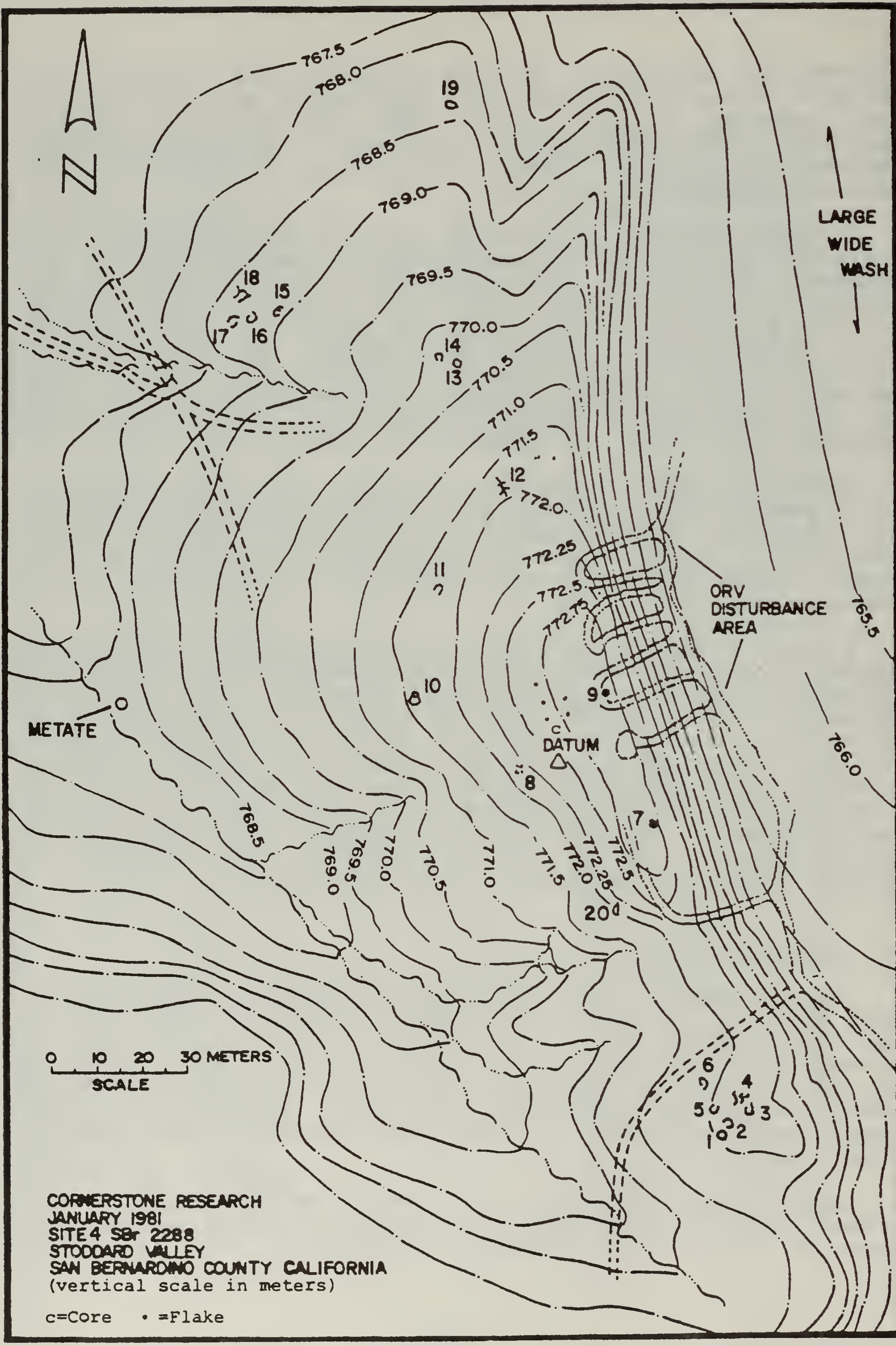


Figure 6

This plane table map of SBr-2288 illustrates the locations of stone features investigated during the project.

discoloration on the uppersides of the stones and iron oxide staining on the undersides. Recent investigations have suggested that discoloration such as this may be associated with micro-organic transformation versus oxidation staining (Dorn 1982).

Vegetation in the site area is typical of a creosote bush scrub plant community. However, vegetation coverage is sparse within the desert pavement area and more prevalent in the drainages and along the peripheries of the pavement systems.

Impacts to the site have primarily occurred through off-road vehicle activities. As seen in Figure 6, several prominent vehicular tracks dissect the area, primarily from the wash to the east. These impacts are caused by vehicles climbing the steep embankment, circling within the site on the flat mesa, and retreating down the embankment to repeat the process. Vehicle tracks also occur to a lesser extent elsewhere within the site. These activities, as well as other types of impacts such as on-foot traffic, have disrupted elements within many of the stone features, as evidenced by irregular feature patterns and overturned rocks with iron oxidation visible on the uppersides. Such displacements create additional difficulties with location and identification of numerous culturally related features.

During investigation of SBr-2288, twenty rock features were identified. As discussed previously, these features often blend into the surrounding desert pavement and were difficult to identify during different times of day. Some of these features had been noted during previous work in the area (San Bernardino County Museum 1979:site records) and some had not been previously located, as discussed earlier. Configurations of the features vary and include circles, semi-circles, alignments, ovals, cairns, and combinations of these forms. Circular features are the predominant type. Although most of the stone elements within the features are embedded in the surrounding pavement, many of the features have been disturbed, as evidenced by dislocated stones and dispersed configurations. The identified features occur as isolated elements within the site and as groups of contiguous features.

Very few prehistoric cultural artifacts were located on the site. Many lithic scatters previously recorded as cultural in origin were closely examined during the current investigation and determined to be natural. However, several formal flakes, a core, and a metate were observed on the site (see Figure 6).

Figures 7-26 illustrate in detail the twenty features located during this investigation of SBr-2288. Included with each illustration is a brief description clarifying various aspects of each feature.

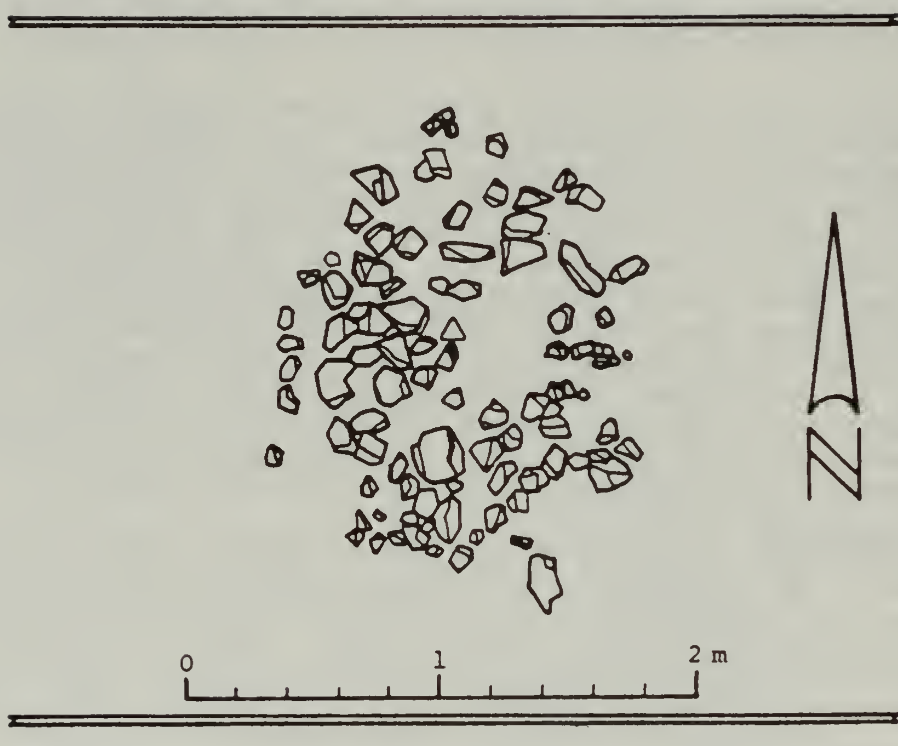


Figure 7

Feature 1 is a deflated cairn encompassing an area 180x160 centimeters and including approximately 85 stone elements. The elements range in size from 20 centimeters in diameter to as small as 5 centimeters; most are about 10 centimeters. Approximately half of the stones exhibit an iron oxidation stain on the uppersides, indicating overturned rock elements. Most of the stone elements were embedded in the desert pavement surface. One-half of this feature (alternate one- by one-meter quadrants) was excavated during this investigation.

FEATURE 2

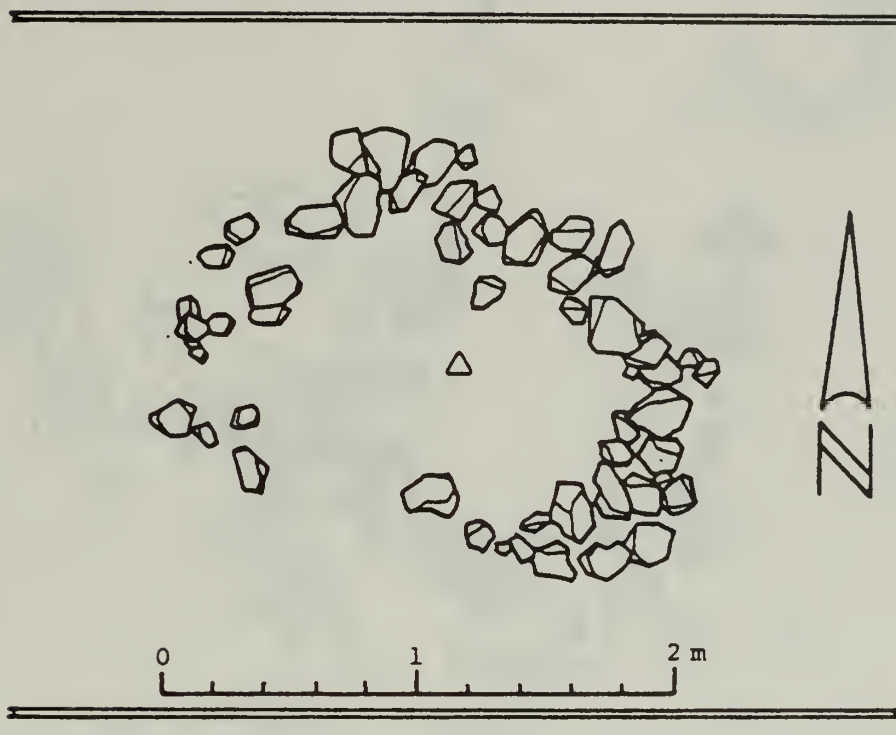


Figure 8

Feature 2 is an oval rock alignment, 2.0x1.2 meters in size, with a 50-centimeter opening toward the southwest. Approximately two-thirds of the 55 rock elements average 20 centimeters in diameter; the rest are smaller, averaging 5 centimeters in diameter. Most of the rocks are embedded or semi-embedded and very few have iron oxidation visible on the upperside. Little obvious disturbance has occurred to this feature.

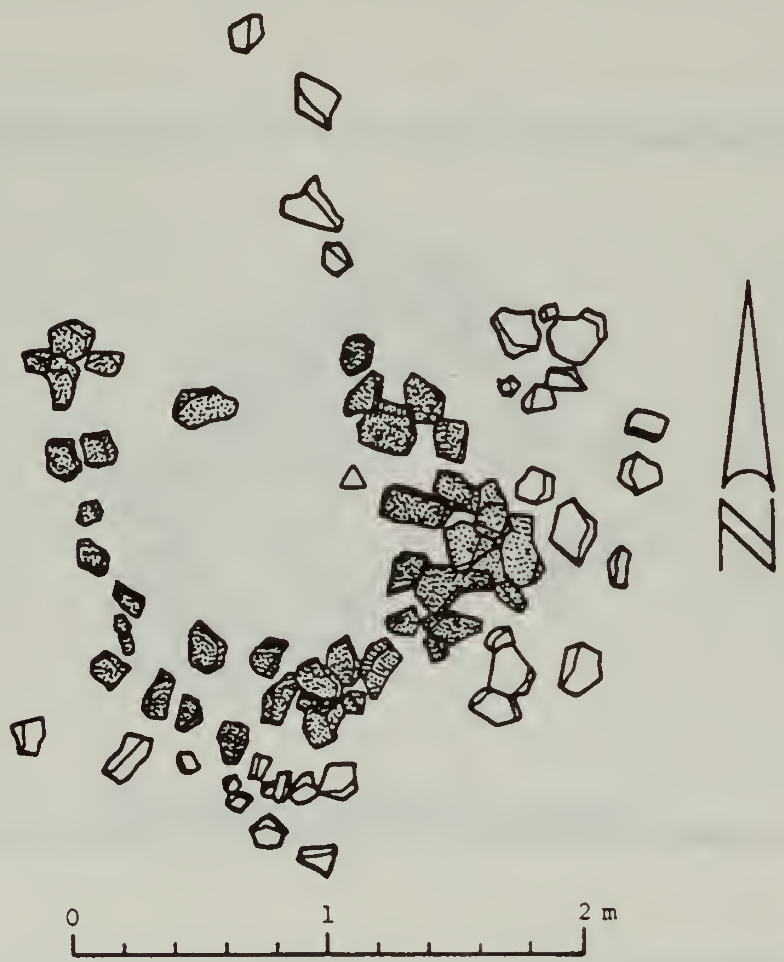


Figure 9

Feature 3 is a highly disturbed alignment which was probably circular in form. It consists of approximately 80 rock elements ranging from 5 to 20 centimeters in diameter and extends over an area 3.2x2.6 meters. Most of the stones are semi-embedded with few not embedded, and about 15 stones scattered throughout the configuration have iron oxidation visible on the upperside. This latter factor, in conjunction with the disrupted nature of the configuration, indicates a high amount of disturbance to the feature. However, a roughly circular form is visible. In addition, several groups of rocks in the southern and eastern portions indicate that the feature may have had a stacked aspect; an opening to the north is also possible. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

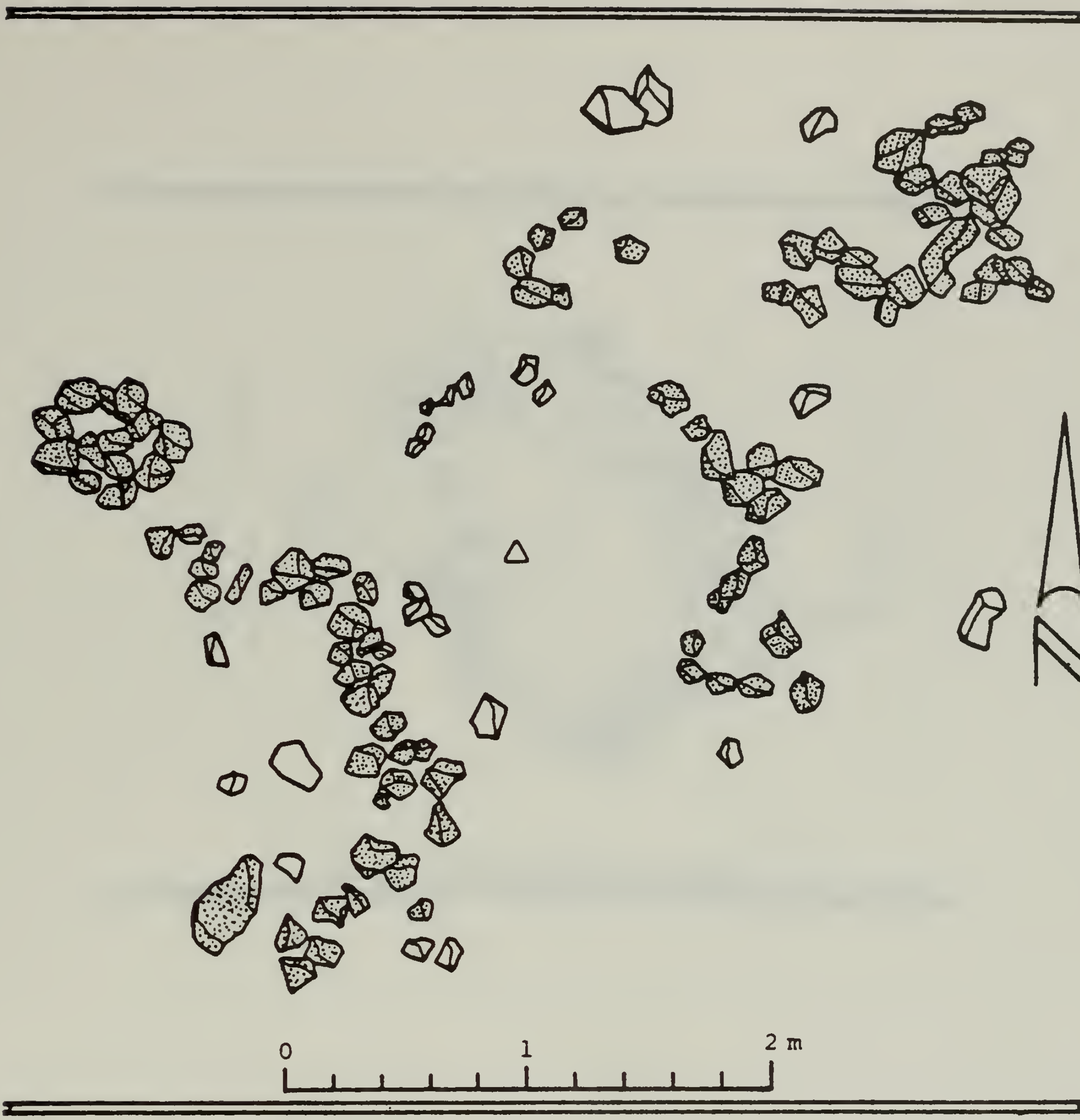


Figure 10

Feature 4 is a possibly structural configuration of uncertain identification. A moderate amount of disturbance has obscured much of the original form, although several semi-circular forms and rock clusters are still visible. About 125 stone elements make up the feature, most of which are small- and medium-size rocks ranging from 5 to 20 centiemters in diameter over an area 4x4 meters in size. About one-fourth of the rocks, scattered throughout the feature area, have iron oxidation on the upperside, and the rocks are generally partially embedded in the desert pavement. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

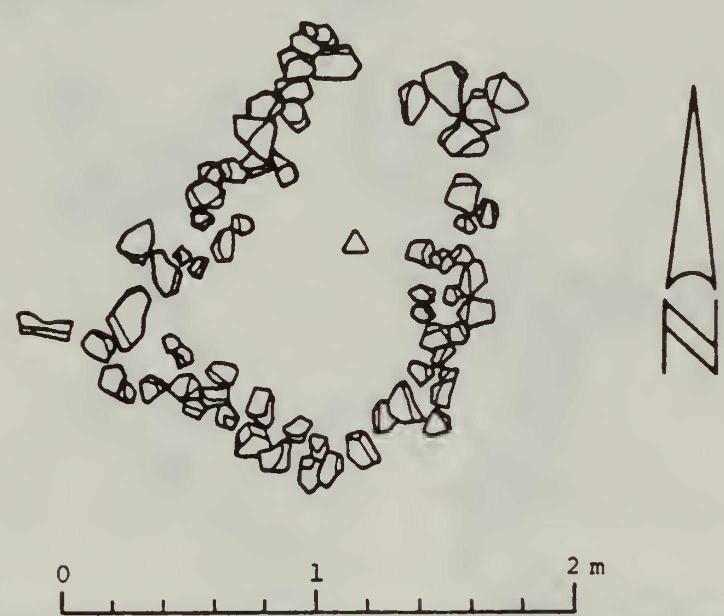


Figure 11

Feature 5 is an oval-shaped rock ring, 1.6x1.4 meters in size, consisting of about 60 rock elements. The average stone size is 5 to 10 centimeters long with a few larger rocks. A 20-centimeter opening faces toward the north, and approximately 8 stones have iron oxidation on the upper surface, indicating moderate previous impacts.

FEATURE 6

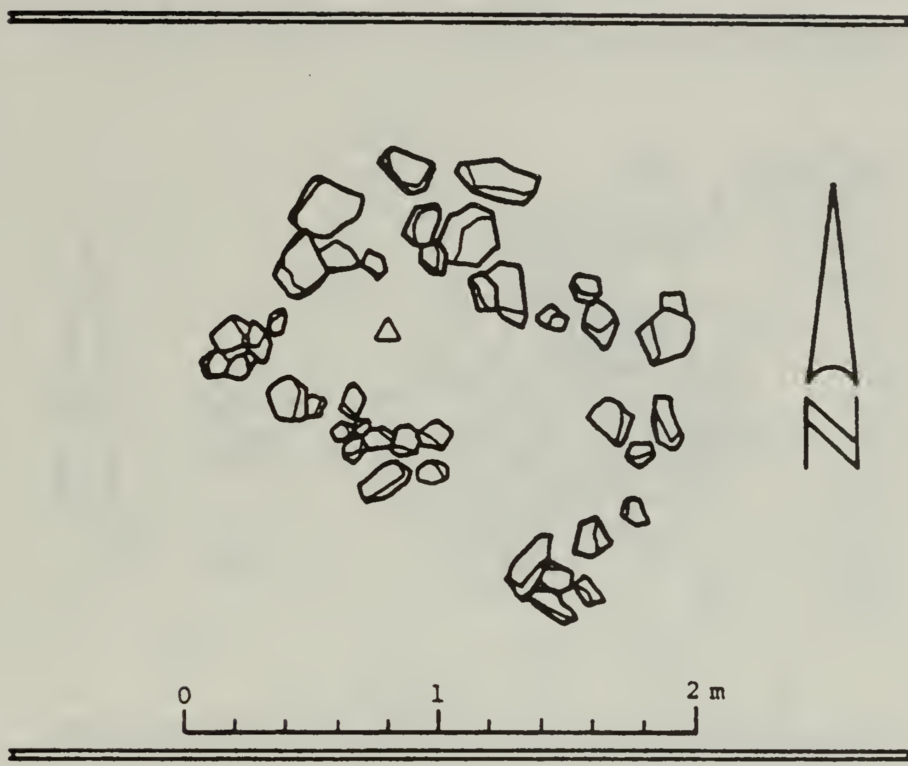


Figure 12

Feature 6 is very disrupted, although probably oval in original shape. About 45 rock elements make up the feature, covering an area 2.2x1.8 meters. Rock sizes vary greatly, ranging from 20 centimeters long to less than 5 centimeters. About 15 stones have iron oxidation on the upper surface; most of the rocks are only slightly embedded in the desert pavement.

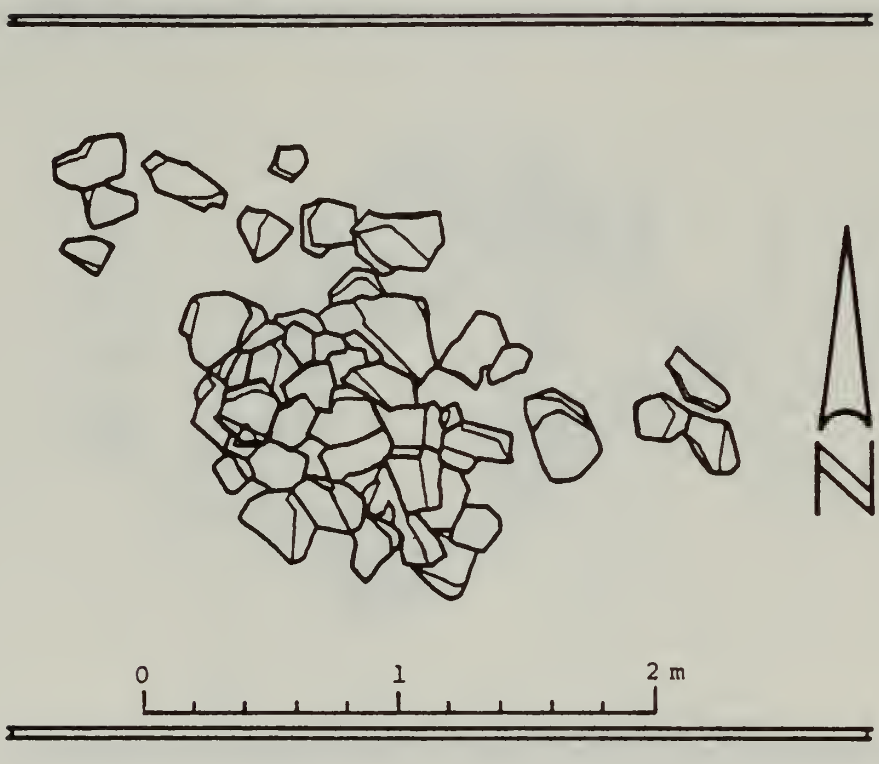


Figure 13

Feature 7 is a rock cairn of about 60 stone elements. The major concentration is approximately 1.4 meters in diameter and 0.25 meter high. Several outlying stones occur just outside this stone concentration. Most of the stones are 25 centimeters in size and very few are embedded. About 10 of the visible rock elements have iron oxidation on the surface. No prehistoric or historic artifacts were observed in association with this feature.

FEATURE 8

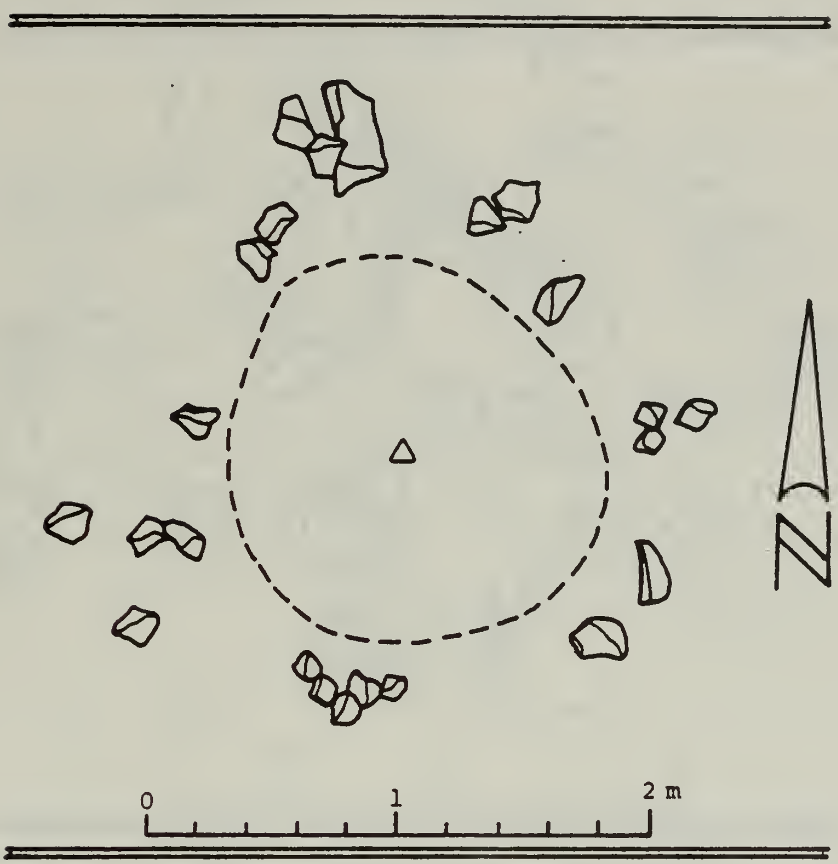


Figure 14

Feature 8 is a swept clearing with only embedded, sorted, small gravels remaining in the affected area. Overall dimensions, as outlined by the dashed line, are 1.4x1.6 meters.

FEATURE 9

Figure 15

Feature 9 appears to be a collapsed rock cairn over an area 3.0x1.6 meters in size and is composed of approximately 40 rock elements. Rock sizes vary greatly--about one-third are 5 to 10 centimeters in size, another third are 20 to 25 centimeters, and the remaining range from 30 to 40 centimeters. Most of the rocks are not embedded and do not display any iron oxide staining. Disturbance in the area includes a prominent off-road vehicle track 10 meters north of this feature.

FEATURE 10

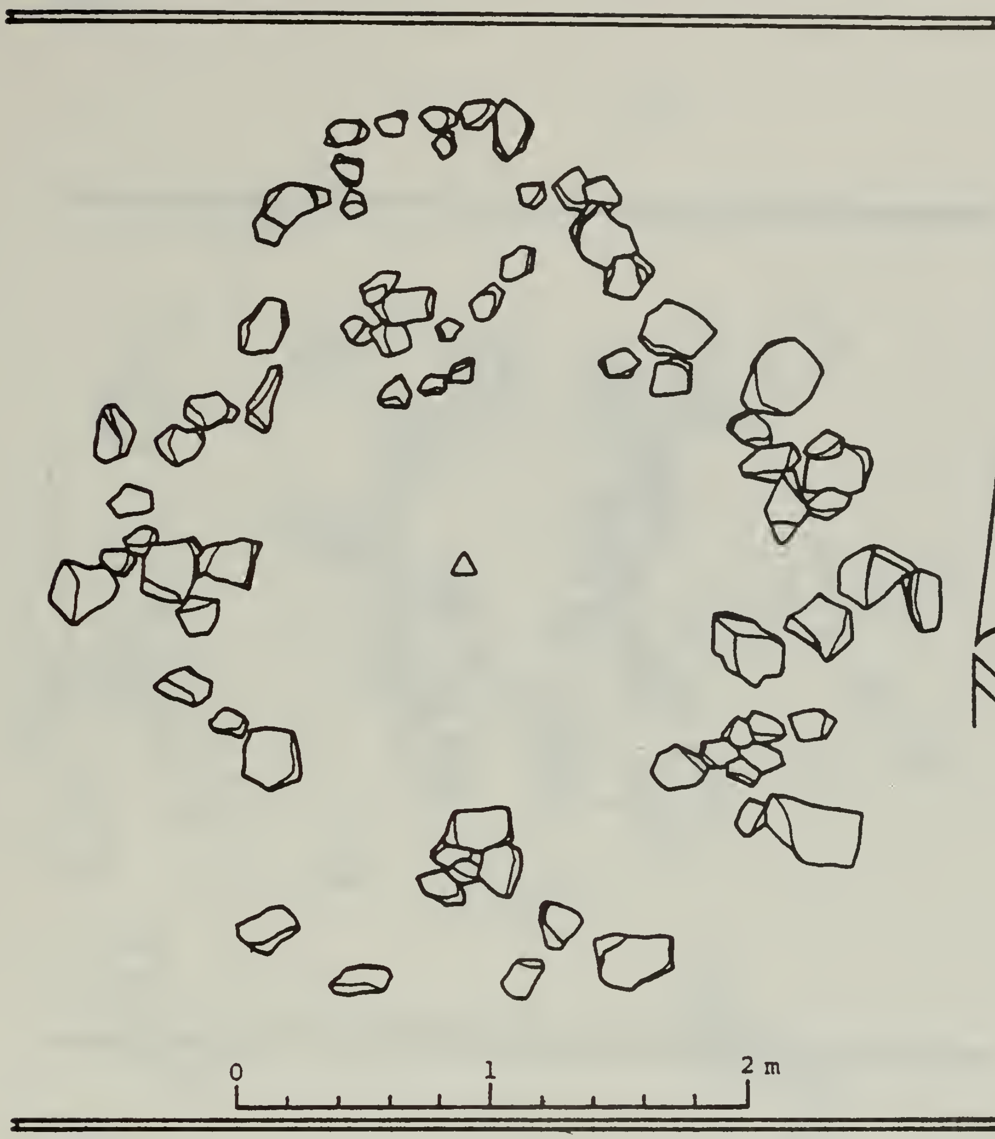


Figure 16

Feature 10 is a slightly dispersed circular configuration of approximately 75 rock elements over an area 3.3x3.2 meters. The rocks are medium to small in size (20 and 10 centimeters in diameter). Most of the rocks surround a central cleared area of small, homogeneous gravels. Several potential openings in the ring are also evident, although the dispersed nature of the ring may have created these openings. The number of rocks associated with this ring may also indicate a once stacked rock feature. A 60x60-centimeter area north of the primary ring appears to be a connected circular feature. A few of the stones in this northern aspect have iron oxidation on the uppersides; none of the other rock elements have this staining visible on the surface. Most of the rocks are embedded in the pavement.

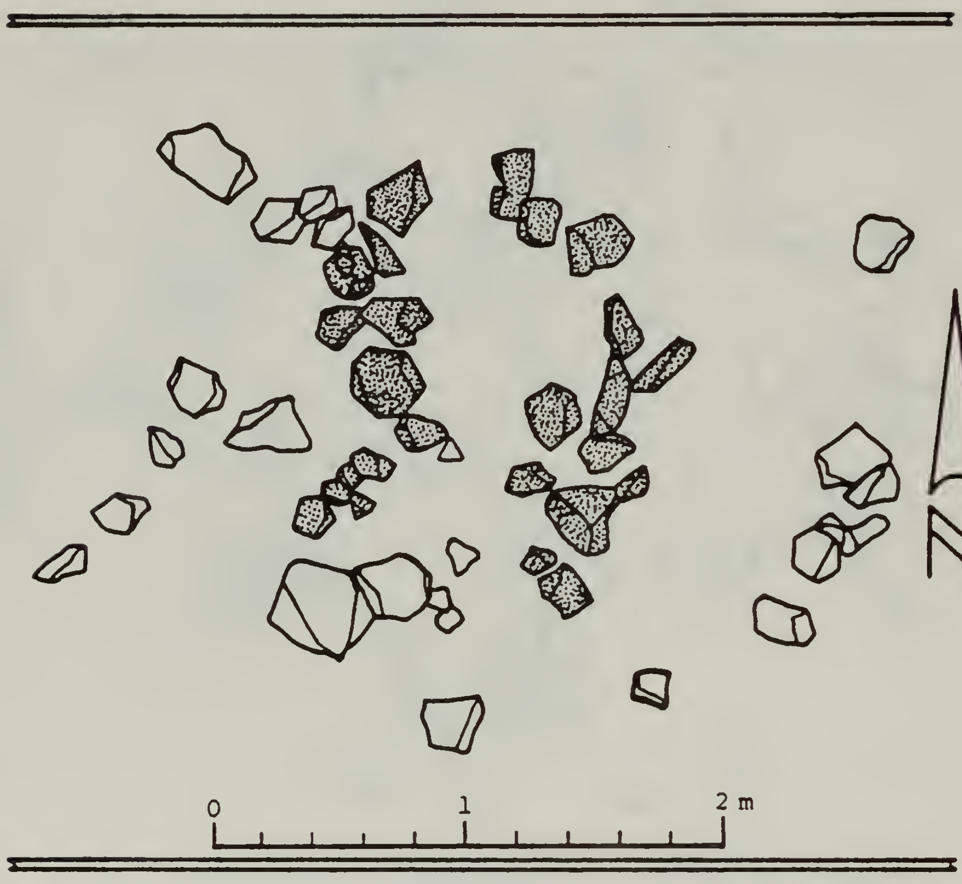


Figure 17

Feature 11 is a very disrupted configuration over a 2.4x3.2-meter area. Approximately 55 stone elements are included in the feature, ranging from small, 5-centimeter stones to large stones up to 40 centimeters in size. Over half of the stones are well embedded in the desert pavement, and some erosional impacts have occurred to the feature. Although highly disrupted, a roughly circular form is visible. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

Figure 18

Feature 12 is a loosely associated rock configuration composed of approximately 40 stone elements over an area 5.3x3.4 meters. Eleven of these stones are in an alignment along a 330° bearing through the central portion of the feature. Most of the rocks are embedded or semi-embedded in the desert pavement, and disruption to the feature has obscured much of its original form. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

FEATURE 13

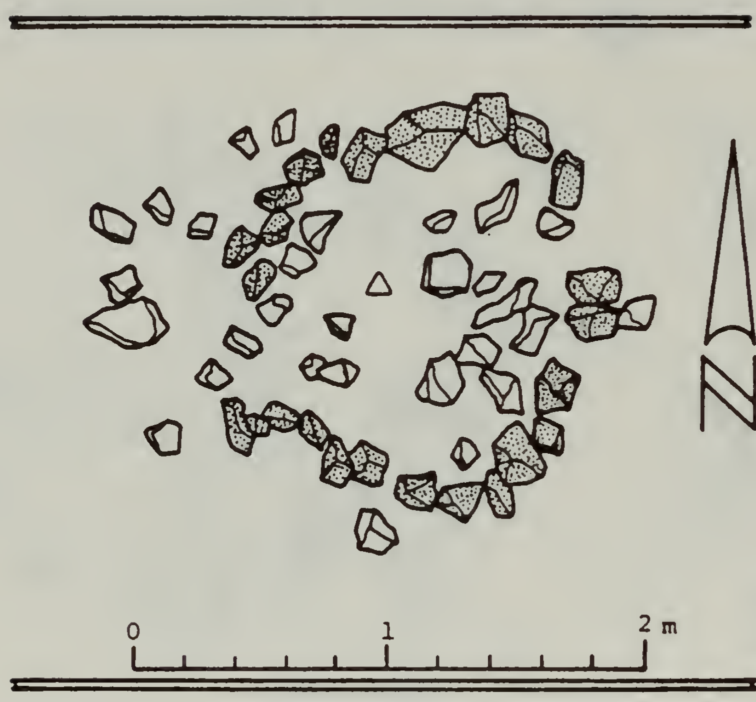


Figure 19

Feature 13 is a circular feature of about 50 rocks over an area 2.1x1.6 meters. The stone elements are very uniform in size--approximately 15 to 20 centimeters in diameter. They are semi-embedded in the desert pavement and only two stones have visible iron oxidation on the surface. Although slightly dispersed, the circular form of the configuration is still highly visible, and many of the rocks may have once been stacked. An off-road vehicle track runs through a portion of this feature. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

FEATURE 14

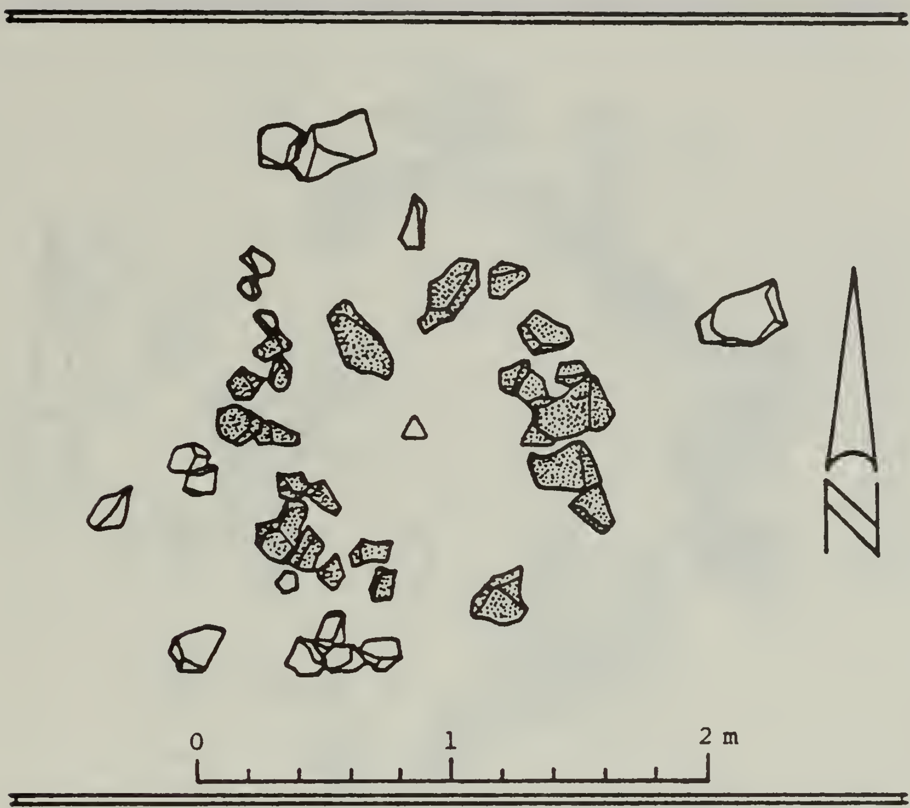


Figure 20

Feature 14 is a circular feature of approximately 40 rock elements. The primary configuration is 1.6x1.6 meters in size, but several larger outlying stones also occur in possible association. The rock sizes range from 10 centimeters to 30 centimeters in overall dimensions. Only 1 rock was observed with surface iron oxidation, and all of the stones are firmly embedded in the desert pavement. The feature is slightly dispersed. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

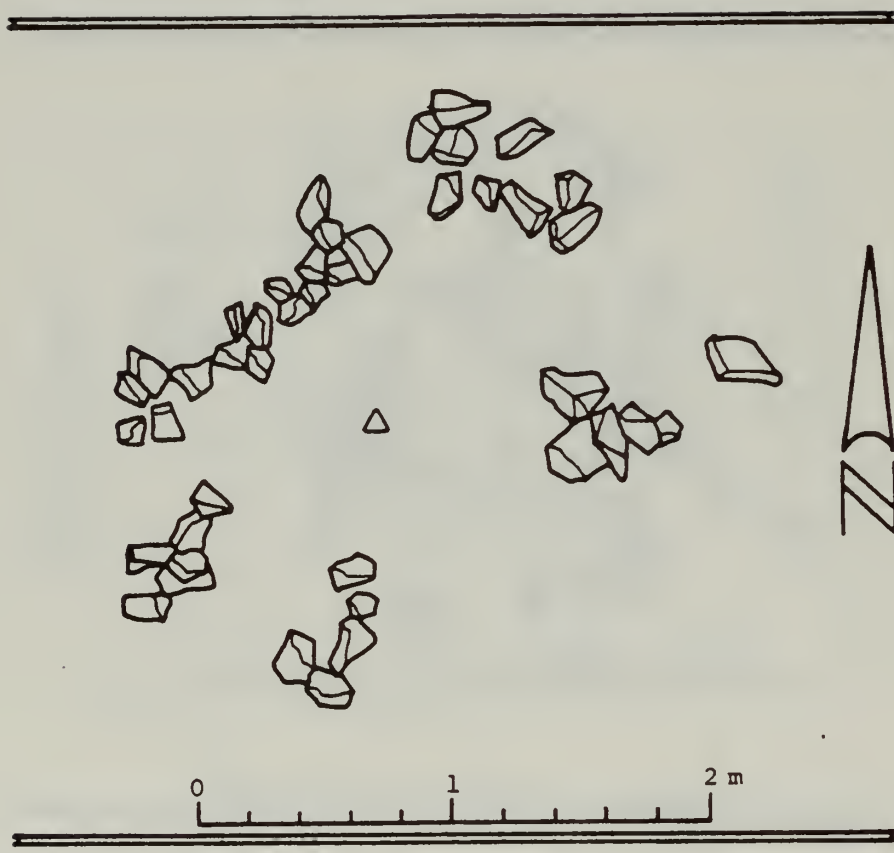


Figure 21

Feature 15 is a semi-circular configuration of approximately 45 stone elements in an area 2.4x1.6 meters. The stones are medium in size, averaging about 15 centimeters long, with a few smaller rocks. Although the configuration is slightly dispersed, a wide opening is evident toward the southeast. Only 2 stones have iron oxide staining visible on the surface. The stones are semi-embedded, and the feature has sustained a low amount of impact.

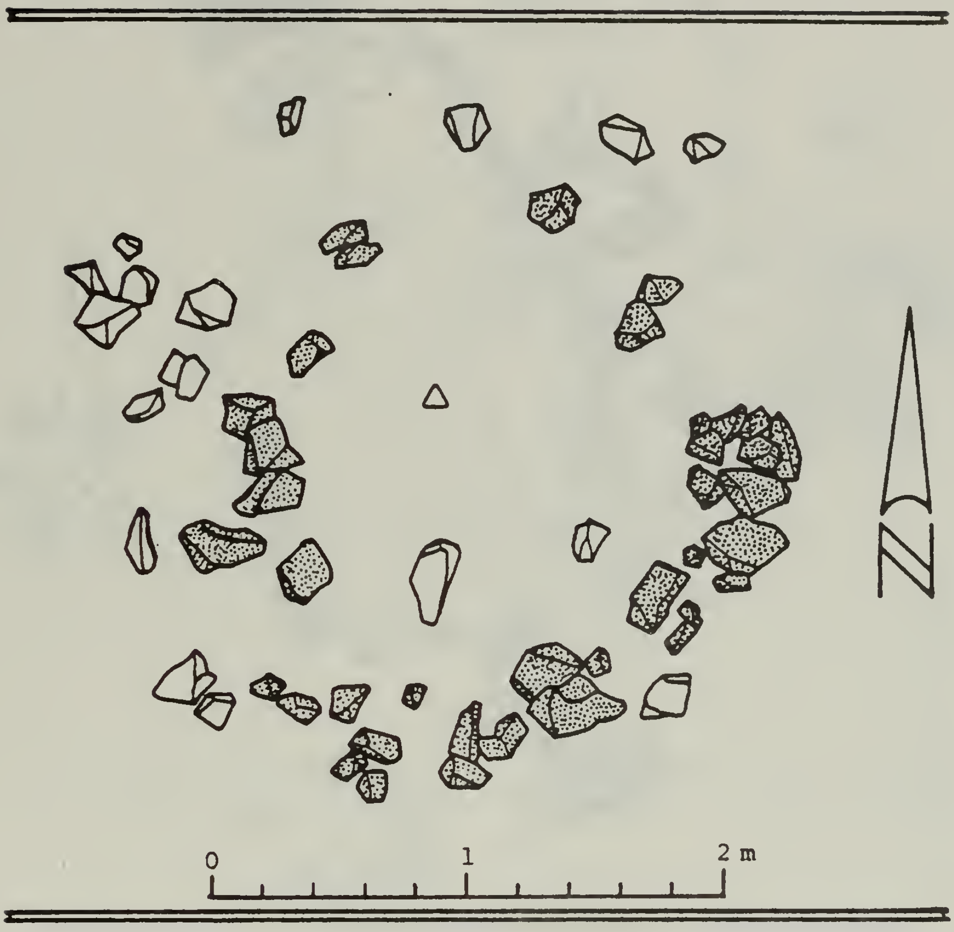


Figure 22

Feature 16 is a circular configuration, 2.7 meters in diameter, of about 60 stone elements. The rock sizes vary from 5 to approximately 30 centimeters; the predominant size averages 15 centimeters. The rocks have been only slightly dispersed and the circular form is still very pronounced. Most of the stones are semi-embedded in the desert pavement, with a few in a stacked formation. Only 1 rock was observed with iron oxidation on the upperside. Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation.

FEATURE 17

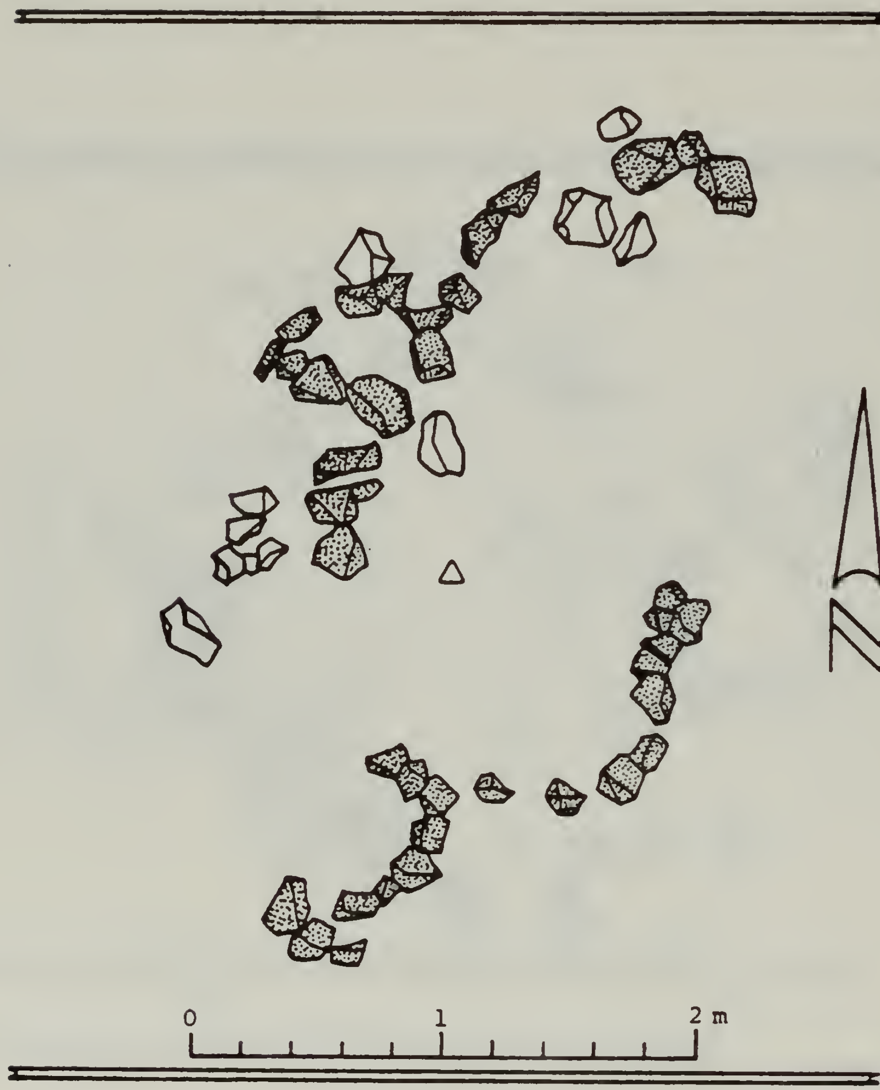


Figure 23

Feature 17 is an irregularly shaped rock alignment consisting of several aspects. Two semi-circles of approximately 10 elements each are visible in the southeastern portion of the feature. These features are 80 and 120 centimeters across, share a central wall, and open toward the northwest. The rocks are very uniform in size--about 15 to 20 centimeters in diameter. Approximately 30 rocks form another configuration northwest of the semi-circles. The form of this aspect is loose, but may be a dispersed alignment or semi-circle opening toward the southeast. A small (40 centimeters in diameter) circular feature is also visible within this alignment. The rocks in the northern aspect are of varying sizes, ranging from 5 to 30 centimeters in diameter, and extend over a 2.8-meter linear area. Most of the rock elements of Feature 17 are semi-embedded and none have visible iron oxidation on the surface. The dispersed nature indicates a moderate amount of disturbance to the original formation.

FEATURE 18

Figure 24

Feature 18 is a diverse series of alignments of uncertain identification, very similar in form to Feature 4. Disturbance has also obscured much of this feature, although several linear and semi-circular forms and rock clusters are visible. Approximately 90 stone elements make up the feature, which encompasses an area 5x5 meters. The stones vary in size, ranging from 10 to 25 centimeters in diameter. Most of the stones are embedded or semi-embedded in the desert pavement, and despite the obvious disturbance to this feature, only 1 stone was observed with iron oxide staining on the upperside. Stippling indicates primary constituents; remaining stones are potentially associated elements subject to interpretation.

FEATURE 19

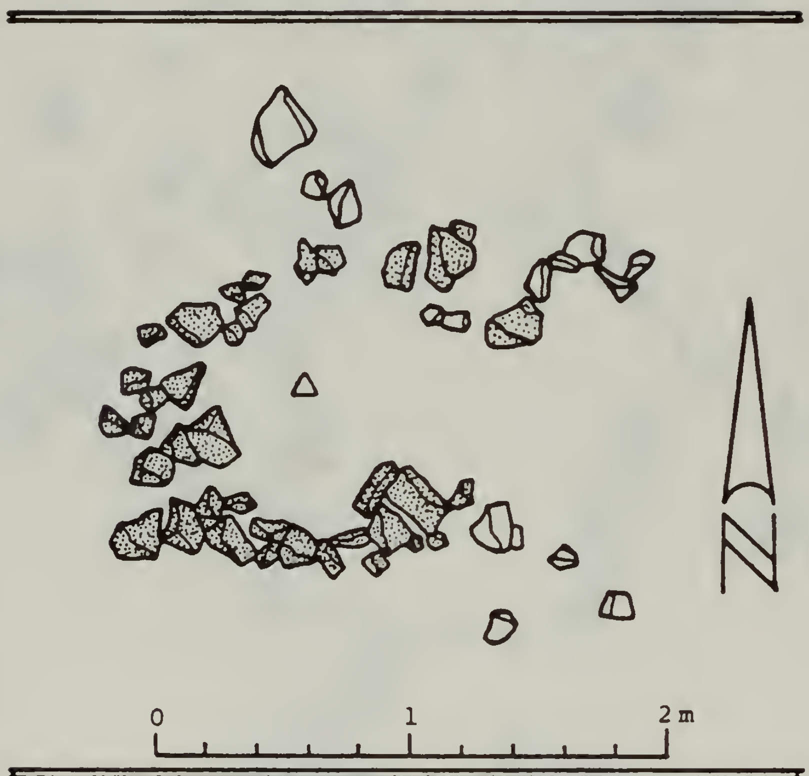


Figure 25

Feature 19 is a roughly oval form of 53 rock elements over an area 1.5x2.0 meters. The rocks vary in size, but average about 15 centimeters in diameter. The ring has been only slightly dispersed and the form is still clearly visible with a probable opening 50 centimeters wide toward the east. The rocks are all semi-embedded in the pavement and none have visible iron oxidation on the surface. This feature was manually excavated during the current investigation, and pollen research was also accomplished (see Appendix B). Stippling indicates primary feature constituents; remaining stones are potentially associated elements subject to interpretation (see Photograph 3).

FEATURE 20

Figure 26

Feature 20 is a semi-circular formation, although the dispersed nature of several of the stones indicates a possibly original circular form. Approximately 40 stone elements make up this feature; the sizes vary from about 5 to 60 centimeters, with an average size of 20 centimeters in diameter. Only a third of the rocks have iron oxidation visible on the surface. Most of the rocks were well embedded in the desert pavement; several of the stones along the northwestern "opening" of the circle were not embedded and are evidently disturbed from their original position. A 1.5x1.5-meter unit was excavated in the primary feature concentration during this investigation. Stippling indicates main feature constituents; remaining stones are potentially associated elements subject to interpretation.

The following literature review is presented to assist the reader in understanding the hypothetical uses of highly variable stone feature configurations and to formulate a foundation from which to interpret the potential functions of the stone features associated with SBr-2288. Generally, stone ring features have been classified into two primary categories, those for utilitarian purposes (i.e., house rings and food processing stations) and those for ceremonial use (i.e., associated with vision quests and communicating with the supernatural). Within each of these primary categories, a wide range of configurations have been reported by numerous authors and will be further described below. Figure 27 illustrates several different feature configurations observed at desert archaeological sites.

Stone ring features are a widely distributed phenomenon in the American Southwest, as well as many other locations throughout the world. Pioneer archaeologist Malcolm J. Rogers recorded large numbers of stone ring features in the Colorado and Mojave deserts. A review of Rogers' field observations in the San Diego Museum of Man reveals various feature configurations which were thought to be associated with differing temporal and cultural affiliations, including San Dieguito, Yuman, Chemehuevi, and Paiute Indians. Rogers believed that the stone ring features were primarily used for habitation purposes and that differing configurations represented cultural and temporally sensitive diagnostic elements, thereby enabling various cultural affiliation assignments. Factors such as presence or absence of boulder rims, maximum diameter, entryway orientation (when present), form (i.e., circular, oval, rectangular, single- or multiple-course stacking, etc.), occurrence of associated artifactual materials, and individual find locations versus multiple feature configurations assisted in determining cultural associations. With reference to Rogers' field notes, the aforementioned factors will be examined below with occasionally interjected observations by other authors.

The presence or absence of boulder rims relates to a basic scraped area that is clear of rocks and large pebbles. Very early cultural sites produce ". . . many cleared circles in desert pavement but very few boulder rimmed circles" (Rogers n.d.: Museum of Man notes, C-48). Begole notes that the Malpais cultural group also formed cleared circular features, which were probably brush covered and were for sleeping purposes (1981).

The later Yuman II peoples also constructed rudimentary houses which did not require rock ring formations and were noted by Rogers as being ". . . House pits present in the dunes, defined only by fire darkened depression surrounded by a few cobbles and concentrations of archaeological debris" (Rogers n.d.:Museum of Man notes, C-10). The primary difference here is the much larger amounts of cultural materials relative to the San Dieguito period.

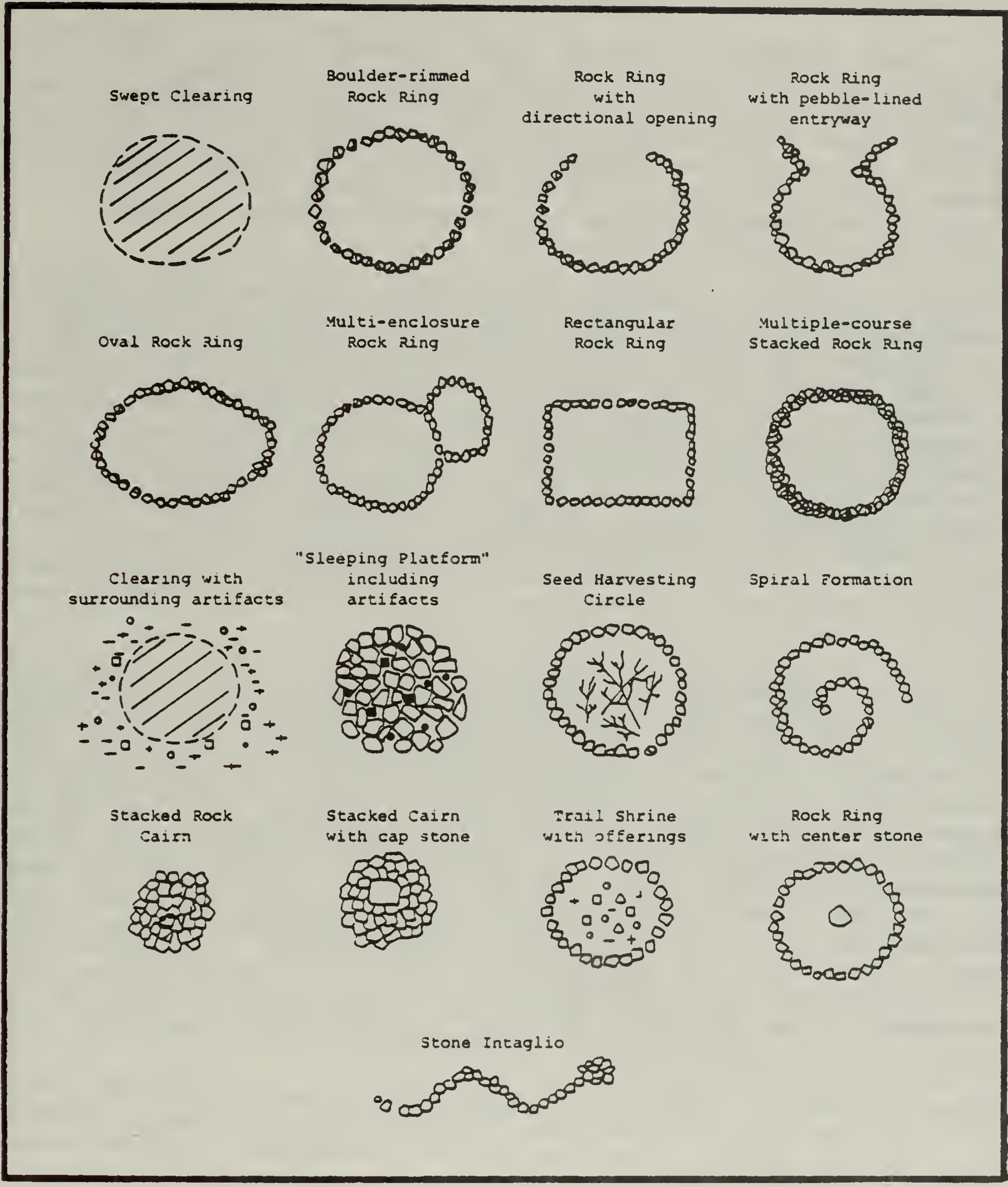


Figure 27

Various rock ring configurations noted at numerous localities in the southwestern deserts are illustrated above. See Rogers et al. (1966) for additional stone feature forms.

In another portion of the Colorado Desert, Rogers notes:

> Most sleeping circles are rimless in the major portion of the area, but as the higher mesa country is approached . . . where larger stones were attainable, the circles have boulder rims, two rectangular, boulder rimmed clearings were recorded. . . . As usual in all areas where workable stone is absent there are no flaking or implements around the cleared circles (Rogers n.d.:Museum of Man notes, C-4).

Questions arise regarding the actual cultural and temporal affiliation of the "higher mesa country." However, more importantly, the phenomenon of positive versus negative occurrence of flaked lithic tools or waste flakage in association with the features presents itself. Numerous notations regarding the paucity or abundance of artifactual material in association with stone ring features have been documented. This is an important factor with regard to a utilitarian versus ceremonial differentiation for these features. Rogers relates this consideration further: ". . . at M-117 on mesa on both sides of the wash are many . . . cleared circles some of which are boulder rimmed. Very few have any flaking associated with them" (n.d.:Museum of Man notes, M-117).

In other localities, the opposite occurs. William Wallace has noted large amounts of flaked lithic materials associated with stone ring features while studying cultural sites in the Death Valley area (1981:personal communication). This anomaly may represent subsequent post-abandonment land use activities in the area of the features. These various combinations are further illustrated at Denning Spring: "Some boulder rimmed . . . house sites present on mesa above the spring. . . . The east and west mesas have the stone circles and no quarry working on them. The middle mesa carries the blade and scraper industry and no stone circles" (Rogers n.d.:Museum of Man notes, M-38). The information above illustrates that utilitarian house forms will be accompanied by cultural detritus, while other "stone ring features" may have non-habitation purposes.

The migratory or sedentary characteristics of the individual bands is an important factor which would affect material constituents. Julian Hayden supports Rogers' "sleeping circles" viewpoint, but concludes that the term is generic and often used for convenience. Hayden further states that stone circles in the Sierra Pinacate area were swept clean in the interior and sometimes dug down to compact silt or clay substrata and possibly compacted (1981:personal communication). This phenomenon may represent another utilitarian function for stone ring features, that of plant processing.

In his 1976 progress report of archaeological investigations in the Anza-Borrego Desert State Park, Robert Begole states, "The possibility does arise that some sites with well constructed stone circles could have been used for the collecting and harvesting of seeds" (Begole 1976:17). His opinion is primarily based on reports of Australian aborigines' use of "food harvesting circles" presented by Norman Tinsdale:

> . . . women working with their children pull up the plants and pile them in large heaps on a piece of firm ground swept clean of all dirt and debris. The heap may be from 6 to 10 feet across. The heap is surrounded with a ring of stones or of logs. Where women of two or more families are working together, several such rings may be formed, either partly joined or a little distance apart. Within a day or so the drying of the plants . . . ripens the capsules and causes them to release their seeds. The plants are shaken and thrown aside leaving the dust and the wakati (seed) within the enclosure. This follows the processes of winnowing and preparation of the cleaned seed (Tinsdale 1974:95).

An additional ethnographic illustration of stone ring formations used for plant resource procurement was obtained while performing field research in the biological sciences through Utah State University. Jack Reveal had the opportunity to conduct botanical studies for the Indian Service in the Pine Nut Hills near Gardnerville, Nevada. This 1939-40 study documented the complete process of pinyon nut gathering by Washo Indians. In this process, green pine cones were collected with long hooked willow sticks, with which the pine cones were pulled from the trees and placed in burden baskets, then portaged to another locality and piled into boulder-rimmed circles. In time the pine cones would dry and open, releasing the edible pinyon nuts. Reveal noted that if this procedure took too long, the features were set ablaze to quicken the pinyon nut extraction process. He added that the numerous rock rings in the area were family owned and were reused over many years. Reveal compiled a complete photographic series of these processes and believes the rock ring features would still be present today in the area (Reveal 1981:personal communication).

In addition, potential exists that Rogers' often-reported "winter beds" were indeed used for plant drying. An example of these features, attributed to the Chemehuevi Indians, was documented in the Turquoise Mountains in California:

> These beds which are found in caves and rock shelters all over the north half of the Mojave Desert are built of layers of local fibrous plants, yucca, bunch grass, broom, etc., laid down over some springy brush.

The ends are held down with a ring of boulders which also forms a circular enclosure (Rogers n.d.:Museum of Man notes, M-21).

The large numbers of these features noted by Rogers may represent family or individual drying bins or perhaps dry plant thrashing floors, where the sticks and stems would be thrashed and then removed. The seeds or leaves would then be swept up and further processed, probably using the winnowing technique.

Although still conjectural at this point, the contention is further supported by Rogers' description of sleeping feature configurations very different from those proposed above as plant processing features: "Many Panamint sleeping platforms of cobbles in the mesquite dunes. In these are often incorporated fragments of metates, manos, and hammerstones" (n.d.:Museum of Man notes, M-98). These latter features were built on the ground, a method considerably more logical and practical than stacked brush bedding material as the ground provides much better insulation during cold weather.

Additional support for the potential for some stone ring features to be associated with plant processing has been presented by Richard Hevly through palynological studies performed in conjunction with this project at Feature 19 (see Appendix B). Hevly notes, "While pollen of Gramineae (grass) varies greatly from sample to sample, a significantly higher proportion of this pollen type is found within the rock circle subsurface sample" (Appendix B:4). Even considering a 15 percent "noise" factor for natural pollen frequencies (Drover 1981:personal communication), this higher Gramineae pollen occurrence is potentially meaningful in terms of usage of this feature. William Wallace warns, however, that differential settling rates of various pollen types could cause anomalies in distribution frequencies within stone ring enclosures (1981:personal communication).

A review of Hevly's palynological report presents additional data regarding pollen distribution frequencies. However, much more research is necessary to clarify natural pollen distribution factors, which will strengthen statements relating to culturally influenced distributions. In conjunction with this interest, more stone ring formations should be studied to investigate questions regarding function. Cornerstone Research has secured additional soil samples for palynological research from an oval stone ring feature (SBr-4153A) in the Helendale area to further this research goal (Hatley 1981).

Numerous observations have been made regarding various configurations and numbers in clusterings of stone ring features. A primary reference source for these data is Malcolm Rogers from his research on desert archaeology. For C-49, Rogers notes, "circular house pits, some with river boulders, on the mesa, a few rectangular clearings, probably mark ramada structures. Some house pits are double with one circle smaller than the other as if it were a vestibule, or store room" (n.d.:Museum of Man notes, C-49). Examples of these and other configurations from desert areas are illustrated in Figure 27. Rogers further notes that at West Well in San Bernardino County are numerous stone ring formations:

> 60 cleared circles in terrace surfaces of which about one-third have boulder rims. . . . Both types are generally grouped in twos, threes, fours and fives. Rimless clearings are smaller than the boulder rimmed ones, and the latter are most often linked together. Those which have openings have them to the south or east. Two rectangular boulder rimmed house circles are present (Rogers n.d.:Museum of Man notes, M-67).

The multiple-feature or linked phenomenon occurs in other widely separated locations, including the Helendale area near the Mojave River where seven closely positioned stone ring features have been recorded. Additional multiple-feature sets have also been noted in the area. Many of the features have openings to the south and east, as recorded by Rogers, but differ by having pebble-lined entryways (Hatley and Buck 1981).

Much further away (approximately 130 miles), in the Anza-Borrego Desert State Park, a number of locations have been recorded as having multiple-feature concentrations up to the number of fourteen (Begole 1981). Rogers noted that such concentrations ". . . often occur in group combinations up to the number of nine. When this is the case, they are in close juxtaposition, some clearings being only three feet apart, and the perimeters of two often merging. These groups could have been constructed by members of a small family, sleeping in the area for a few nights only, a custom often followed by wandering hunting bands" (Rogers et al. 1966:45).

The occurrence of rectangular stone features is considered a rarity: "Fully ninety percent of the clearings are circular; the other ten percent, with the exception of a few rectangular ones, are oval in outline" (Rogers et al. 1966:45). However, they are found at widely separated localities in the Southwest. One rectangular feature was noted approximately one-quarter mile south of the Harris site on the San Dieguito River in San Diego County (Kaldenberg 1975:personal communication). The closest recorded rectangular stone feature to SBr-2288 was reported by Gordon Stricler in 1972 and is located approximately one-quarter mile north of the study area (San Bernardino County Museum site records). This cultural site was not visited during the current investigation.

Early ethnographic observations also provide some insight regarding aboriginal usage of rock ring features. While serving as a missionary in Baja California between 1739 and 1768, Fr. Javier Clavigero noted that he believed such features served as habitation facilities; however, his statements are somewhat vague and he may have simply seen numerous "circular fences" and assumed them to be sleeping structures:

> Each tribe, composed of several consanguineous families, usually lives near some spring, but with only the sky for a roof and the bare ground for a bed. When the sun is too hot, they take shelter under the trees; and on cold nights they retire to the caves in the mountains. Some few build bowers in the shape of hovels for sleeping; others make holes or pits about two feet in depth. But the most usual little abodes are certain circular fences of loose stone piled up, which are five feet in diameter and less than two in height. Within each one of them a family sleeps under the open sky (Clavigero 1971:95).

An interesting note which somewhat contradicts Clavigero's observation was reported by Fr. Jacob Baegert while living with the Pericu Indians (1751-1768) in the southern portion of Baja California:

> The Californians themselves spend their whole life, day and night, in the open air, the sky above them forming their roof, and the hard soil the couch on which they sleep. During winter only, when the wind blows sharp, they construct around them, but only opposite the direction of the wind, a half moon of brushwood, a few spans high, as a protection against the inclemency of the weather (1863:360-361).

Thus far in this discussion, potential utilitarian uses of stone circles have included housing and food processing features. However, other feature possibilities include various ceremonial functions. A well-illustrated example of Seri Indians "vision quest" practices is presented by Bowen:

> The Seri have constructed stone circles as part of the procedure for seeking visions, the primary means of becoming a shaman. . . . The vision seeker constructed a brush hut away from camp where he slept for three nights. During three days he wandered alone in the desert, eating nothing and drinking only the juice from a certain plant. Near evening on the third day he either went to a sacred cave or constructed a circle of stones in which he sat and waited for the vision. He would leave the cave or stone ring before sunrise on

> the next morning whether or not the quest had been successful.
>
> The spirits are thought to live underground, especially inside mountains. To the Seri, mountains are like large houses inhabited by the spirits. The "doors" to these "houses" are often, but not always, caves, and they are shown to the vision seeker by the spirits. If the entrance is not an actual opening in the ground (that is, a cave), a ring of stones, either circular or oval, is constructed to mark the entrance (Bowen 1976:40-41).

Other researchers also attribute ceremonial usage to rock rings and have noted the occurrence of center stones in some features. E.L. Davis considers this to be an "eye" to enable the vision seeker to see into the spirit world (Davis, Brown and Nichols 1980), while Begole refers to the center stone as a "keepout" marker or place holder. The closest known stone ring to the study area with a center stone has been observed in the Fort Irwin area approximately fifty miles northeast of Stoddard Valley (Walker 1981:personal communication). In the Colorado Desert, features attributed to vision quests are occasionally noted to be U-shaped formations, often associated with a nearby unmodified quartz nodule used as a focal point for the vision seeker (von Werlhof 1982:personal communication).

Intaglios are another form of non-circular ceremonial feature. Stone element configurations including spirals, zig-zag alignments, anthropomorphs, zoomorphic designs, and others have been recorded throughout the Southwest and at other locations in the world. Often these features will be very well formed; in other instances, they will appear ill defined in a loose formation. The latter is noted because some stone features that appear as disrupted circles may indeed be intaglio configurations of unknown form and meaning.

Trail shrines are also considered ceremonial features. Rogers recorded a number of these, including C-25 in the Colorado Desert: "There is a small boulder and dirt shrine on the north side of the trail, 7' in diameter. . . . The rim only was of boulders, the inside dirt and small stones" (n.d.:Museum of Man notes, C-25). Other desert trail shrines are known to contain offerings of shell, bone, ceramic sherds, and other items. The phenomenon of placing small stones or pebbles in a concentrated pile frequently occurs in other parts of the world and some attribute this to hunting magic intended to increase the abundance of a specific game resource.

Stacked rock cairns have also been noted to have particular meaning to aboriginal persons. Again a widespread phenomenon, they have been attributed to warning signs to persons approaching encampments or land holdings (Begole 1976). Extensive patterned arrays of stacked rock features have been observed in association with the "Condor Fan" in Panamint Valley (Davis 1980:personal communication) and at Fort Irwin near the Goldstone tracking station boundary (Walker 1981:personal communication). Multiple stacked rock feature arrays may signify important junctions of aboriginal territorial boundaries. Stacked rock cairns vary in size, numbers, and construction, and some are quite large: "One mile north of Drinkwater [Spring?] on a talus slope in the Drinkwater Basin is a Panamint camp with two boulder cairns 10' in diameter and 3' high of unknown significance . . ." (Rogers n.d.:Museum of Man notes, M-73).

As noted above, a wide range of interpretations regarding cultural affiliation and functions of stone rings and other configurations have been proffered by many investigators. The stone features at Stoddard Valley, SBr-2288, include many of those forms previously discussed. A review of the individual detailed drawings (Figures 7-26) shows a highly diverse stone feature assemblage, including cairns, a swept clearing, circles, semicircles, an alignment, and other amorphous configurations.

To gain a better understanding of the structure and possible uses of the stone circles at SBr-2288, three features (1, 19, and 20) were subjected to subsurface investigations. Feature 1 was excavated in ten-centimeter levels to a maximum depth of fifty centimeters. The unit was excavated in alternate one- by one-meter units to provide a better opportunity to examine any structural variations presented in the profile exposures. Figure 28 and Photographs 1 and 2 show the method by which the excavation proceeded. No subsurface cultural materials were located as a result of that excavation. Of importance, however, is the geomorphic situation of the feature elements. The feature is considered a deflated cairn which had become embedded in the desert pavement. The stratigraphic profile (Figure 29) indicates the stone elements positioned atop the cambic clay horizon, with a vitreous A horizon developed around the stone elements. Discussions with geomorphologist Roy Shlemon indicate that such a condition would take a considerable time to occur (perhaps many thousands of years); however, a precise age determination would require much in-depth research beyond the scope of this current investigation (1981:personal communication).

Feature 19 was approached in a similar format, with alternate one- by one-meter units being excavated (southeast and northwest quads). The remaining units (southwest and northeast quads) were then excavated upon completion of a stratigraphic profile series and after recovery of pollen soil samples. The unit was excavated to a depth of fifty centimeters. The alternate excavation plan allowed a better opportunity to gain subsurface structural information through stratigraphic profile analysis. Photograph 3 shows the stone ring prior to excavation, and Photographs 4-8 show various information recovery procedures exercised during this investigation. The plan view drawing

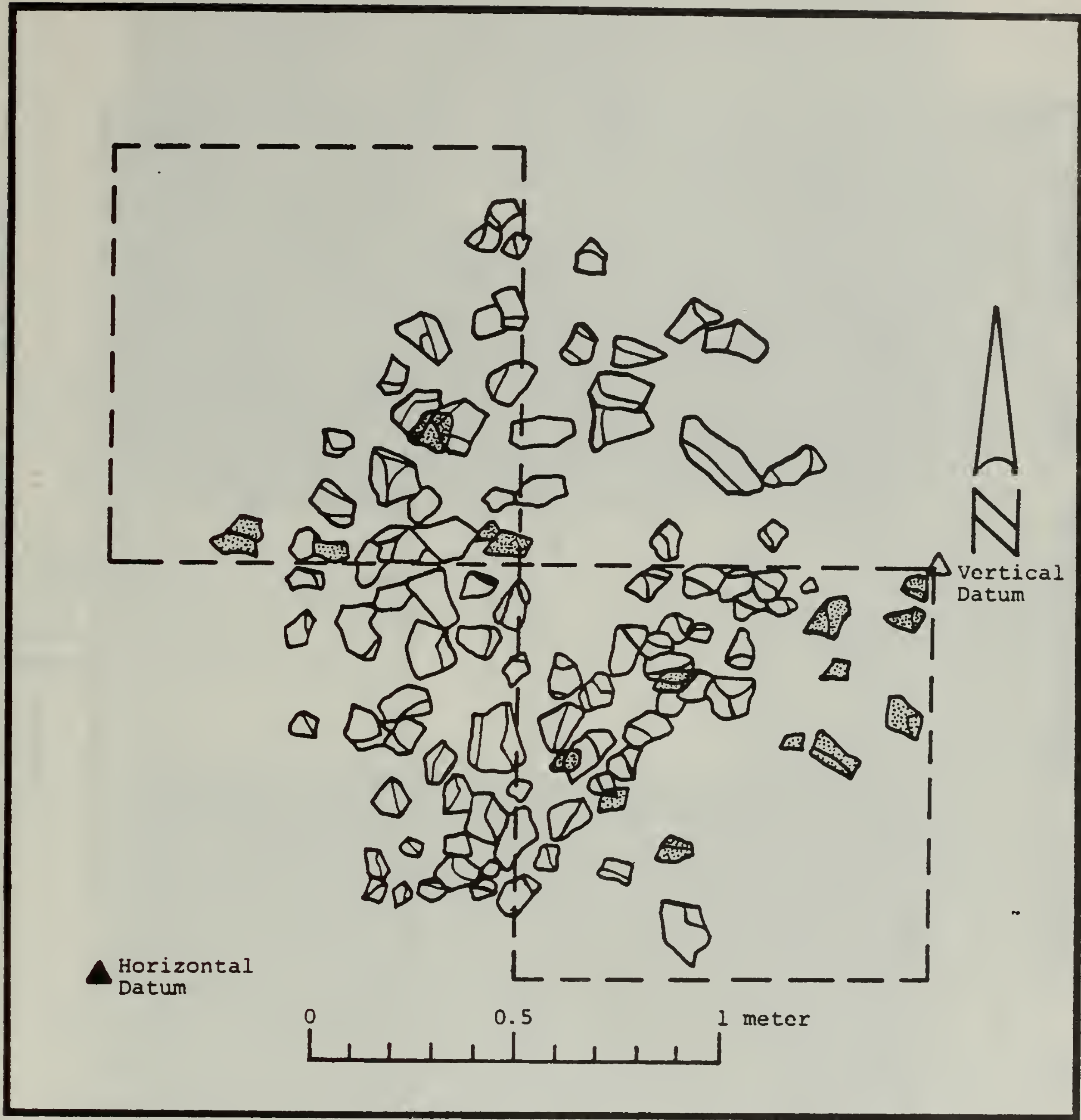


Figure 28

This illustration of Feature 1--a deflated rock cairn--indicates the placement of the two one- by one-meter units excavated in relation to feature elements. Maximum depth of both units was 50 centimeters, and the stippling indicates subsurface stone elements located during the excavation. No additional subsurface artifactual materials were recovered.

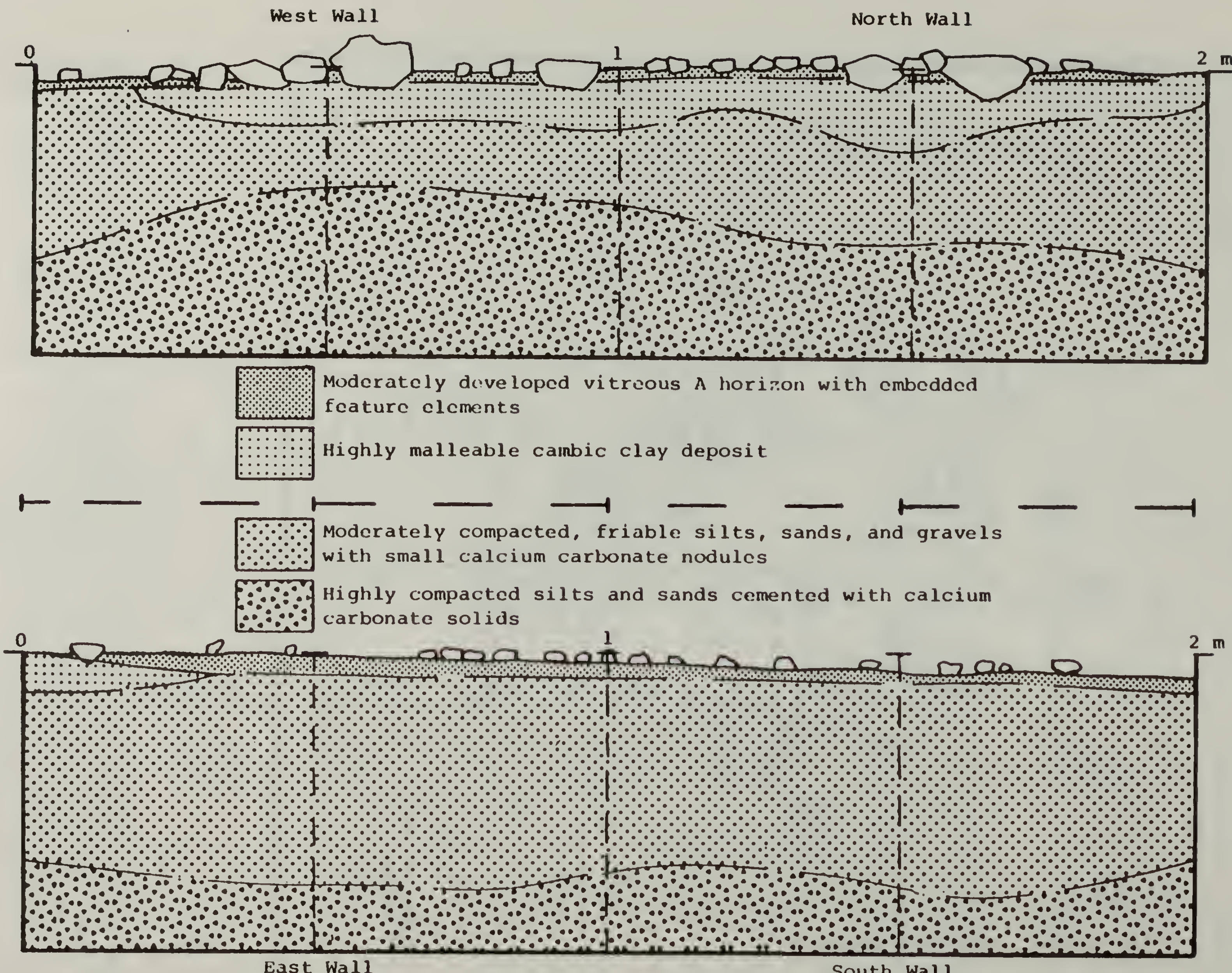
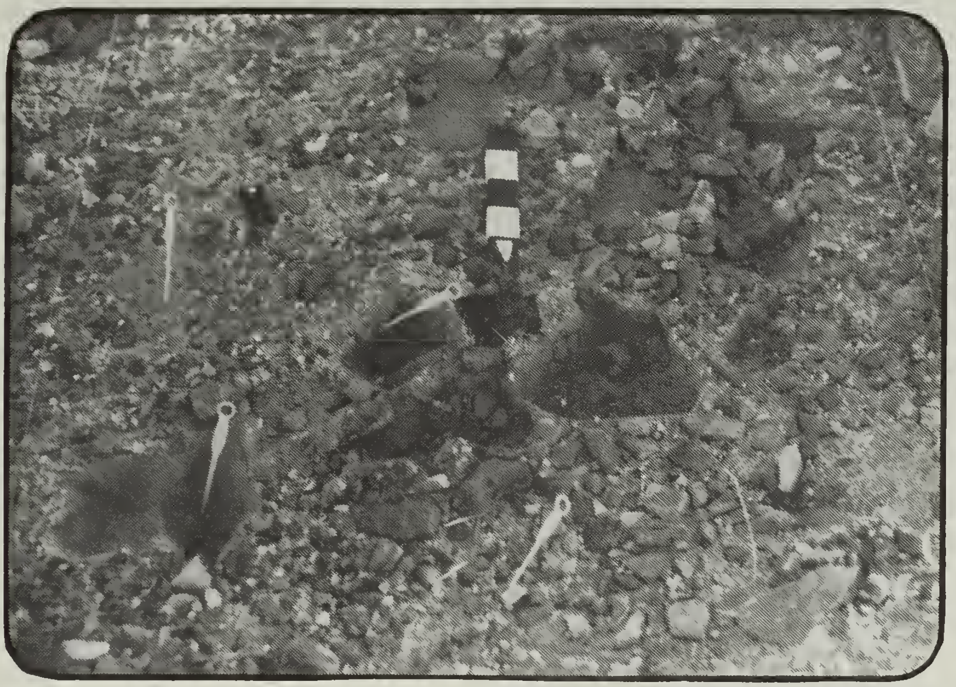


Figure 29

The above stratigraphic profiles illustrate the four sidewalls of the southeast one- by one-meter unit excavated at Feature 1, SBr-2288

Photograph 5. In this photograph, Joe Vogel is pointing with his trowel to the pebble elements associated with Feature 19. These were located subsurface in the southeast one- by one-meter quad. Additional subsurface stones are shown in the foreground; no other cultural materials were located during the excavation (see Figure 30).



Photograph 6. This view is of the northwest quad of Feature 19 facing south. The pointers indicate positions of pollen samples, including interior and exterior samples, a sample from the bottom of a stone element impression, and a sample from a stone impression windrow (next to the north arrow). Refer to Appendix B for details of the pollen sample extraction plan.

Photograph 7. In this photograph of the Feature 19 excavation, Field Supervisor M. Jay Hatley is shown extracting a subsurface pollen sample from the east wall of the northwest one- by one-meter quad. Note the feature stones which were removed during the excavation.

Photograph 8. This photograph is a close-up view of a pollen soil sample extraction from beneath the cambic clay deposit at Feature 19.

(Figure 30) indicates the positions of surface and subsurface stone elements associated with the feature. Note the small pebble concentration in the northwest corner of the southeast quad (Figure 30 and Photograph 5). This occurrence is similar to the subsurface pebble concentration located in Feature 20 and could represent a variance of the ceremonial custom of pebble offerings, such as with trail shrines as noted in the previous discussion.

The stone elements of Feature 19 are embedded into the mixed desert pavement and rest upon the cambic clay formation (Figure 31). A well-developed vitreous A horizon encompasses the feature elements, which points toward greater antiquity. Again, the specific time period involved with this feature is not as yet known. No additional cultural materials were observed as a result of the subsurface exploration.

As previously discussed, a contemporary systematic sampling plan was developed to recover soils for palynological analysis and to examine the pollen record from Feature 19 (Photographs 6-8). The plan was suggested by Dr. Richard Hevly of Northern Arizona University and worked well to allow evaluation of the recent pollen record in relation to the fossil pollen record within and without the stone ring feature (see Appendix B).

Feature 20 is a semi-circular formation having a potentially spiral aspect. A 1.5- by 1.5-meter unit was placed over the predominant feature elements and excavated to a depth of fifty centimeters. Figure 32 shows the positions of surface and subsurface stone elements. Note the subsurface concentration of small pebbles. This phenomenon is similar to that observed in Feature 19 and may represent a ceremonial function.

Stratigraphic profiles were also compiled for this feature (Figure 33 and Photograph 9) to assist in establishing the level of stone element incorporation into the mixed desert pavement. No additional cultural materials were located in Feature 20 as a result of the investigation. All units were backfilled and limited restoration was conducted prior to departing the site area.

The paucity of surface artifactual materials at SBr-2288 and the absence of subsurface artifacts point toward activities other than utilitarian usage. This is further supported by ethnographic observations and archaeological data which suggest that food resource processing or utilitarian features are usually represented by formal, multiple-course stacked rock structures and multiple "room" enclosures, feature types not reported during the current investigation at SBr-2288. An exception to this generalization are U-shaped or semi-circular features with multiple-course stacked rock aspects which are believed to represent "back rests" associated with vision quests. Similar features are represented at SBr-2288 (see Features 3 and 13, Figures 9 and 19).

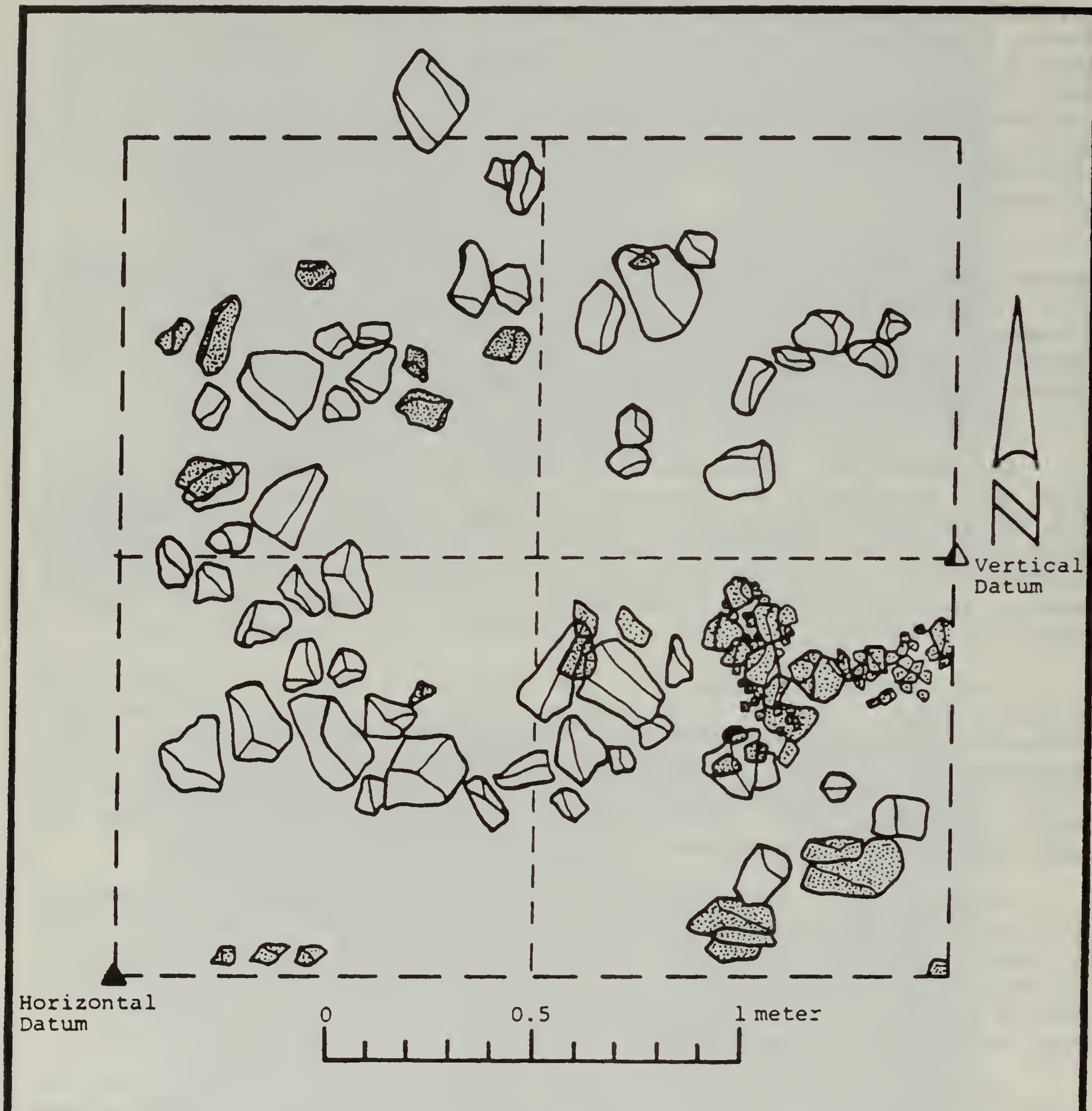


Figure 30

This plan view shows the stone elements associated with Feature 19. The dashed line outlines the excavation area, and the stippled stones indicate subsurface feature elements. Note the subsurface pebble elements in the southeast portion of the configuration.

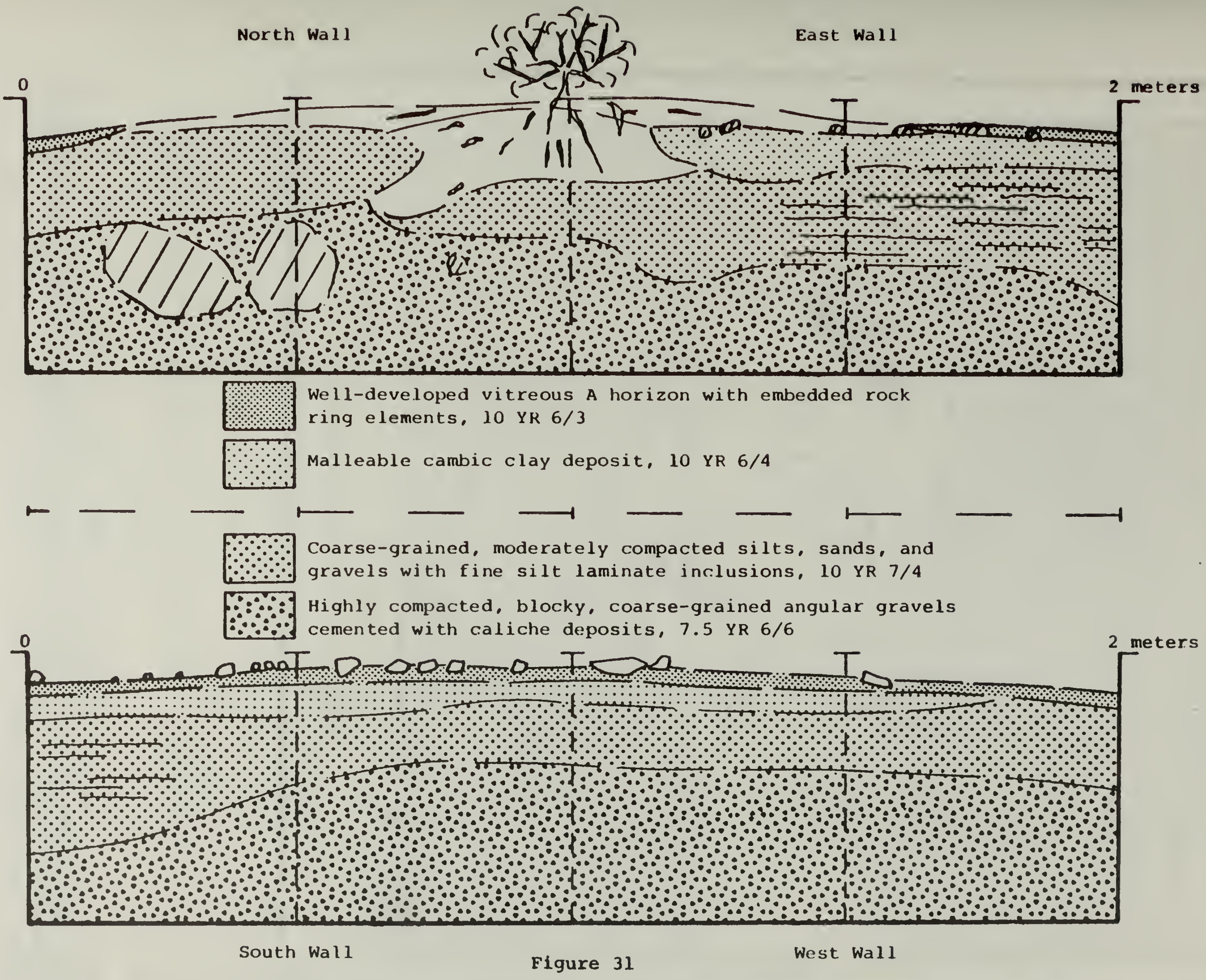


Figure 31

This stratigraphic profile represents the southeast quarter of the Feature 19 excavation. An aeolian fine-grained sand deposit has developed in association with the creosote bush at the northeast corner. Also shown are decomposing granite boulders in the lower stratum.

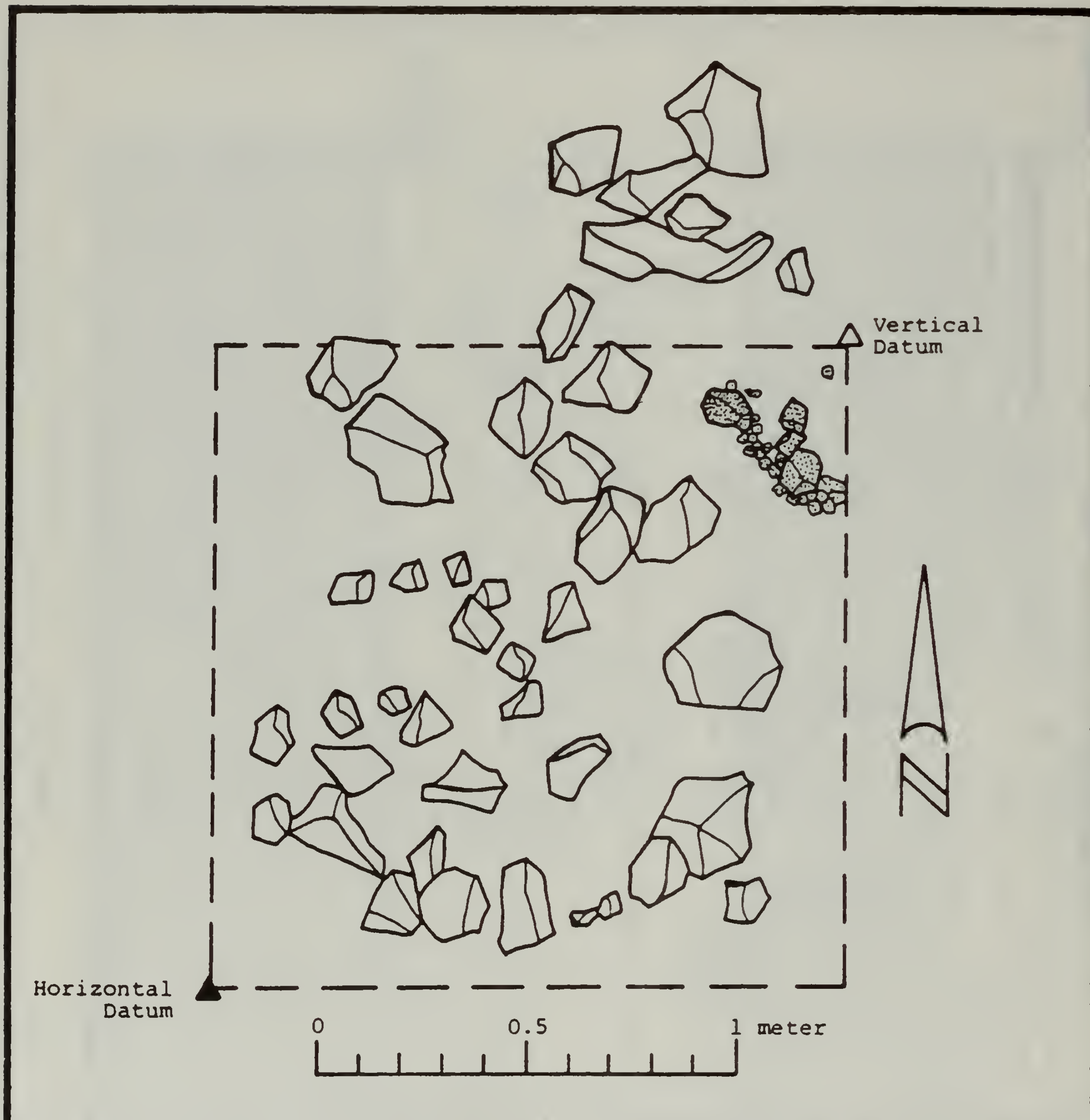


Figure 32

This plan view of Feature 20 shows the placement of the 1.5- by 1.5-meter unit in relation to the feature elements. Stippling indicates subsurface stone elements located during the excavation. Note the small pebble clustering in the northeast corner.

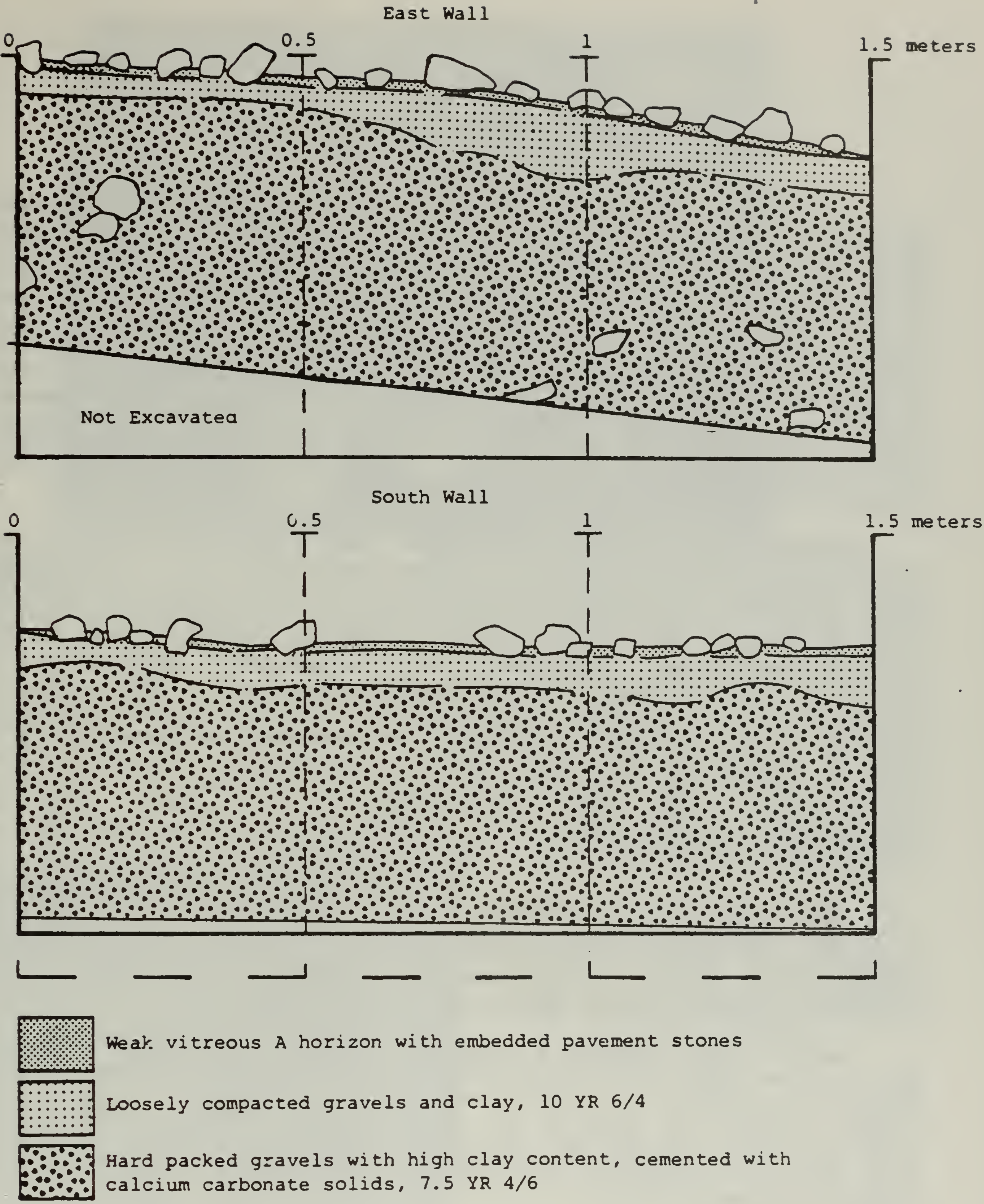


Figure 33

The above stratigraphic profiles illustrate the east and south sidewalls of the 1.5- by 1.5-meter unit excavated at Feature 20.

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

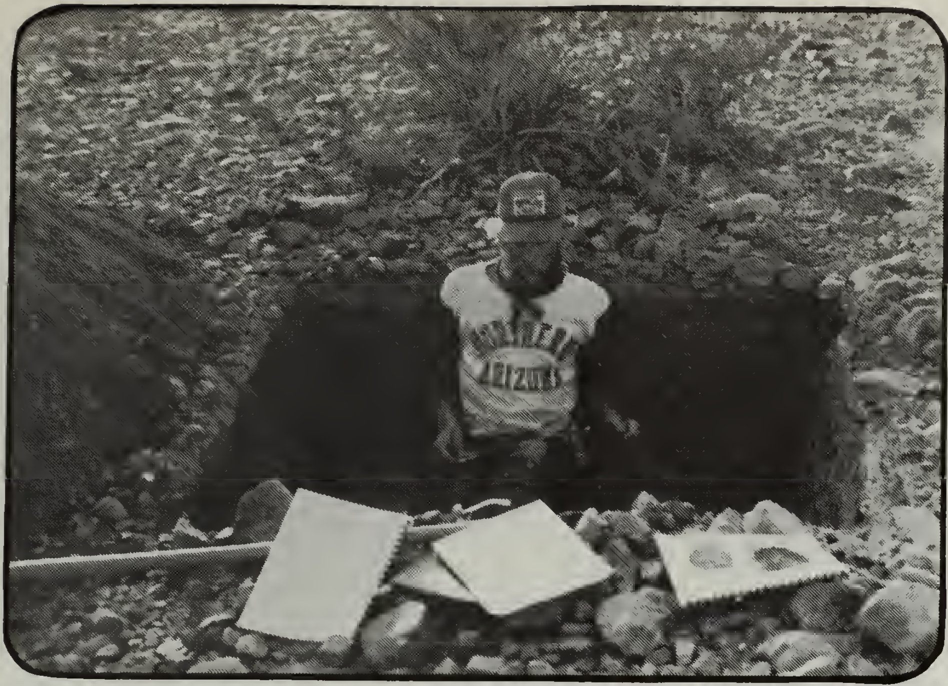
As noted in the preceding discussion, 4-SBr-562 is a very extensive deposit of flaked lithic material covering a large surface area and an unknown subsurface area. The subsurface test unit exhibited a relatively homogeneous distribution of materials which could reflect disturbances caused by a mixing effect associated with aboriginal quarrying activity. Cultural and temporal affiliation could not be established at this time. The current lack of raw lithic resources suggests that the site represents an expended quarry workshop. Potential exists for deeper subsurface deposits of flaked lithic materials within the site. Areas of specialized tool manufacturing may also occur in discrete locations within the site; however, such areas were not observed during the current investigation.

Cornerstone Research recommends that the site be protected from adverse impacts by way of fence construction. In the event that land use priorities continue to negatively affect this cultural resource, Cornerstone recommends that information be recovered to include the horizontal and vertical extent of the material distributions, locations of any "diagnostic" materials, and additional data relating to intrasite variability. This level of research may be accomplished with a program including detailed mapping and a systematic posthole test series, accompanied by a limited subsurface test unit series. Information gained in this fashion would clarify questions regarding cultural and temporal affiliation. Also, the areal extent of the deposit could be established, thereby allowing more effective resource management decisions.

The flaked lithic materials recovered during this investigation are undergoing additional analysis as a part of continuing research of flaked lithic technologies. These materials are scheduled to be forwarded to the San Bernardino County Museum for permanent curation upon completion of this project.

4-SBr-2288 presents a much more complex management problem due to the wide distribution of associated features (e.g., not easily protected) and the nature of the resources (stone features) which can readily be disrupted by off-road vehicular activity. The latter is especially true for features which are only partially embedded as opposed to those well set into the desert pavement matrix.

Figure 6 and Photograph 10 attest to the current level of impacts which have occurred at SBr-2288. Fortunately, the heaviest impacts (i.e., total destruction zones) have been limited to the "hill climb" area. However, general disruption has occurred



<u>Photograph 9</u>. This photograph illustrates Joe Vogel preparing a stratigraphic profile drawing of the east wall of Feature 20 at SBr-2288. See Figure 33 for details of this profile.

<u>Photograph 10</u>. This view was taken at the mid-point of SBr-2288 looking northward. The photograph is of the steep escarpment along the eastern boundary of the site (see Figure 6). Several tracks caused by off-road vehicles--the major type of impact to the site--are visible.

over much of the area. In some instances, simply walking over this loosely formed pavement surface dislodges many stones and causes a general impact.

The construction of various stone ring configurations is a very ancient tradition surviving to recent times. Rogers' contention that various size and shape factors allow cultural affiliation determinations was probably judgemental and would require many thousands of observations to provide a statistically reliable framework to allow such assignments. A review of the introductory discussion of the prehistory and early history of the Mojave Desert region in the front of this document provides a general framework from which to estimate cultural affiliation for the resources examined during this investigation. No datable material or temporally diagnostic artifacts were recovered during the study. Without such items, affiliation assignment is tenuous; however, a rough estimate could place the subject resources in a Period 2 or 3 time frame.

Considering that a number of the stone ring formations may have been used for seed procurement activities, an ethnobotanical overview was prepared (Appendix C). A review of this information presents numerous plants located in the region which have been known to provide food resources used by aboriginal peoples. Although conjectural at this time, the potential of plant processing use for some of the features at SBr-2288 is presented as a tenable proposition, subject to verification through further analytical research. Review of Figure 2 shows Sbr-2288 to be centrally located between two major ecological zones, that of the Mojave River riparian habitat and the highland resources provided by Daggett and Stoddard ridges. If SBr-2288 were used as an ecotone exploitation base camp, residual evidence in the form of high frequencies of pollens from these zones should be evident within other rock rings if used as floral processing features.

The vision quest prospect is also very plausible and could likely be further supported by way of exercising the null hypothesis research method and further examining the ethnographic and archaeologic record relating to this phenomenon. However, no single use can be assigned overall to these features (such as "sleeping circles").

In summary, Cornerstone Research submits that the stone features at SBr-2288 most likely relate to ceremonial practices of unknown purpose or origin, although other utilitarian uses cannot be ruled out at this time. Cornerstone recommends that administrative discretion be exercised to further promote protection and conservation of these significant cultural resources. A monitoring plan should be implemented to field check SBr-2288 at a minimum of two-year intervals to assess the level of negative impacts to the desert pavement and culturally related features. If the

Basketry and pottery of the Piautes of Death Valley on display at the National Park Service Visitor Center, Furnace Creek, California.

level of impacts increases due to pronounced off-road vehicle activities, an impact mitigation plan should be designed to stabilize the balance between popular land use interests and resource conservation. Further, due to the difficulty in identification of these features, Cornerstone recommends that members of the original recording personnel recheck the area in the presence of BLM personnel and this project's Principal Investigator to ensure complete documentation of other not so readily discernible features.

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ARCHAEOLOGICAL INVESTIGATIONS AT THE OWL CANYON SITE, RAINBOW BASIN, SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

U.S. Department of the Interior
Bureau of Land Management
California Desert District
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Contract No. CA-060-CT1-6

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August 1982

Photograph of the Black Mountains to the east of Owl Canyon, In this vicinity fine quality chalcedonies and quartz's are found.

Inscription Canyon, northeast of Owl Canyon, contains some of the outstanding examples of rock art in the Mojave Desert.

ABSTRACT

Under contract with the U.S. Department of the Interior, Bureau of Land Management (BLM), Cornerstone Research undertook the preparation, performance, and documentation of a program designed to mitigate adverse impacts to archaeological site 4-SBr-3801. Known as the Owl Canyon site, SBr-3801 is located on BLM-administered lands in the Mud Hills, approximately ten miles north of Barstow, California. The results of these efforts are presented in this report.

On the basis of previous fieldwork conducted by BLM (Sutton 1981), prefield record searches, and site visitations, a research design was prepared to guide the cultural inventory program for SBr-3801 (Eckhardt and Cook 1981). Fieldwork was conducted in three phases between February and April 1981, consisting of intensive surface survey, notation, and site mapping (Phase I), preliminary surface and subsurface sampling (Phase II), and a refined surface and subsurface sampling effort (Phase III). A catalog was prepared and analysis conducted between June and December 1981. Report preparation was initiated in August 1981.

As a result of this research, interpretations arising from previous fieldwork (Sutton 1981) were partially validated, and zones within the site area where subsurface materials in good context are apparent were identified. Site SBr-3801 contains a record of seasonal occupation for a fairly distinctive period of roughly 2,000 years before the present. Diverse resource procurement mechanisms and maintenance activities of small-group social structures may be interpreted in greater detail through continued research at this locale. The site has provided new information for the meager record of the Owl Canyon area in particular and is likely to contain additional data useful in more fully developing understanding of resource exploitation and social patterning among early California peoples inhabiting the northwestern Mojave Desert region.

The combined efforts of previous research (Sutton 1981) and the current study cannot be said to fully mitigate the adverse impacts of current or future land use in the Owl Canyon area. The site is presently being impacted by off-road vehicle and recreational camping uses, and as populations expand in the Los Angeles Basin and in southern California in general, usage will definitely increase. Casual artifact collection and increased erosion will expand in proportion as well. This land use may reduce or destroy the remaining heritage and scientific values of site SBr-3801, unless afforded appropriate consideration in future BLM management plans.

SECTION I

INTRODUCTION

The Owl Canyon site (4-SBr-3801) lies at the head of Owl Canyon in the Mud Hills of San Bernardino County, California. This region is in the Mojave Desert of southern California, roughly ten miles north of Barstow, eighty miles east of Mojave, and 137 miles west of Needles, California (Figure 1). Cornerstone Research conducted a cultural resource inventory and mitigation program for site SBr-3801 under the auspice of the U.S. Department of the Interior, Bureau of Land Management, with funding and program supervision provided by the California Desert District and Barstow Area offices, BLM. Requirements and consideration for the conduct of this project are specified in contract no. CA-060-CT1-6, with modifications.

Previous fieldwork had been conducted at SBr-3801 by the Bureau of Land Management in December of 1979 (Sutton 1979:site form). Emergency salvage efforts to recover a disabled four-wheel-drive vehicle from the steep ravines at the head of Owl Canyon threatened to severely impact the southerly portion of the site, which necessitated immediate action to mitigate the impacts of the vehicle removal (Sutton 1981:1). It was evident at that time that particular areas of the site had suffered major disturbance from off-road vehicle use in the past and that these impacts were continuing (Sutton 1981:8). Sutton describes SBr-3801 as:

> . . . a small habitation site located on top of a small sandy ridge . . . about 400 meters long running roughly north-south and . . . surrounded on three sides by canyons several hundred feet deep which form the uppermost portion of Owl Canyon (Sutton 1981:7).

It was reported that exposed materials were predominantly confined to two loci, measuring roughly 120 by 40 meters (locus A) and 15 by 15 meters (locus B) in size. Data collection for this previous fieldwork was confined entirely to the southernmost portions of locus A, where the objective was to mitigate the impacts to the site that would have occurred by the removal of the abandoned, disabled vehicle (Sutton 1981:12).

A diverse artifact assemblage was recovered during this earlier fieldwork, including seventy-nine stone tools (whole and fragmentary), a single Olivella biplicata shell bead, two sandstone pendant fragments, two potsherds, 5,593 lithic flakes, and 1,468 osteological specimens (Sutton 1981:15, Appendix I). Manos, metates, hammerstones, chopper-like tools, apparent scrapers, projectile points, and small bifaces make up the stone tool category. In addition, numerous quartzite cobble fragments

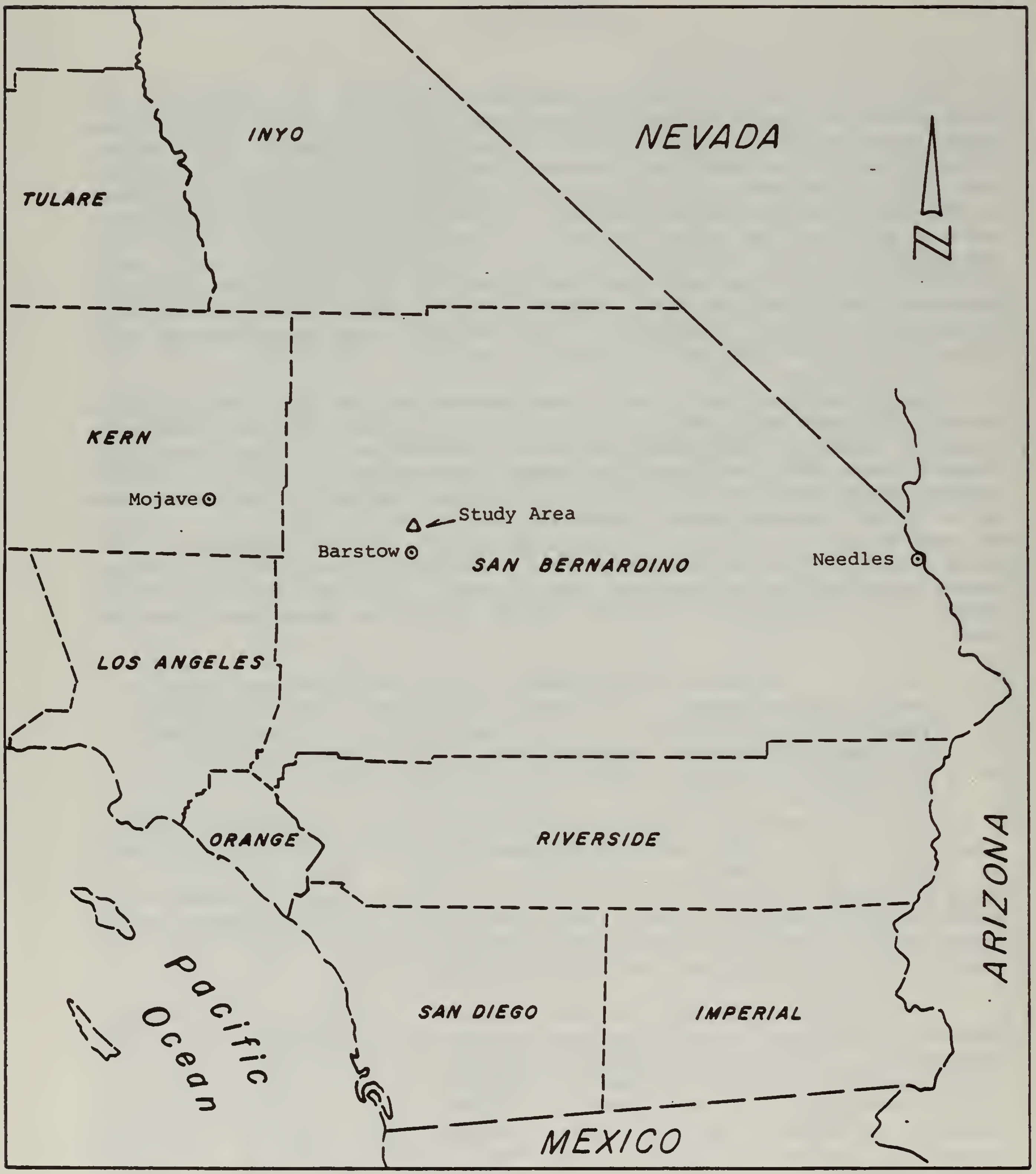


Figure 1

This map of southern California illustrates the approximate location of the Owl Canyon area within the County of San Bernardino.

and a great deal of fire-affected rock--mainly quartz monzonite and sandstone--were observed (Sutton 1981:8). Time-sensitive artifacts, one radiocarbon date, and obsidian hydration measurements suggest site occupation (or occupations) between 3000 and 550 years before present (ca. 1240 B.C.-A.D. 1500).

As reported, the previous field effort and analysis of SBr-3801 was considered by BLM as mitigation of the predicted adverse impacts arising from the disabled vehicle recovery, but was insufficiently directed to mitigate the continuing potential adverse impacts resulting from ongoing recreational and off-roadway vehicular use (solicitation no. CA-060-RFP1-4). For this purpose, a contract was awarded to Cornerstone Research on December 15, 1980, detailing both specific objectives and definite field and analytic techniques to be used to achieve the prime objective.

Contract requirements were outlined in detail. Briefly summarized, these are as follows:

1. Conduct a surface collection of at least 25 percent of the site, using statistical sampling techniques (to be proposed by contractor) with sample unit sizes no greater than ten meters square, all artifactual material within each sample to be collected except unmodified fire-affected rock, which is to be quantified by weight and material.

2. Conduct surface scrapes in unspecified number of surface collection sample units, sifting all loose sand and soil through one-eighth-inch mesh screen and curating the resulting artifact assemblage separate from that recovered in the sample's surface collection.

3. Excavate a minimum of ten test units (each with an area of two square meters), one to be located astride a soil hummock and locations for the remainder to be determined between the contractor and the BLM.

4. Excavation is to proceed in arbitrary ten-centimeter levels (unless cultural levels can be distinguished) and features or artifacts observed in situ are to be recorded and mapped, while sands and soils removed from the sample unit are to be sifted through one-eighth-inch mesh screen, from which all observed cultural material is to be recovered.

5. Prepare a soil profile record for each sample test unit excavated.

6. Collect all appropriate carbon, faunal, pollen, and floral samples or specimens for submission to appropriate laboratories and specialists.

7. Analyze all time-sensitive specimens in the assemblage, including carbons (radiometric techniques), obsidian (hydration and sourcing techniques), projectile points (Great Basin typologies), and flaked and ground stone (morphological/functional techniques), to determine the most probable temporal span of occupation and associated cultural horizons.

8. Prepare a map of the site (scale not to exceed 1 in = 20 ft) to include the total sample unit universe, location of all in situ surface artifacts and recognizable cultural features, and sample test excavation units.

9. Construct a photographic record of the general progress of the project to document developments, completed sample test excavation units, and any other features or items deemed appropriate.

10. Produce a descriptive and analytical report of all work undertaken in the course of the project (following BLM Manual 8111 format for Class 3 studies) and include appropriate maps, diagrams, charts, and photographs.

Accepting these requirements, Cornerstone Research proposed a program designed to synthesize and compare the results of testing and analysis of site SBr-3801 with other similar resources in the surrounding region. Guided by development of a prefield research design, and with the integration of ancillary data and previous project results, identification and discussion of perceived patterns and relevant cultural processes attributable to site SBr-3801 was developed. The results of this process are the focus of the current presentation.

SECTION II

BACKGROUND INFORMATION

During the past two decades, a significant number of cultural researchers have increasingly focused their interests on the history and prehistory of the California desert. Beyond an examination of how the most recent populations (ca. A.D. 1600 to the present) used and survived in this arid zone, studies have shown that evidence exists to document human activity patterns occurring in this region as early as 11,500 years before the present (Rogers 1929, 1939; Campbell and Campbell 1935, 1937, 1940; Davis 1963; Davis, Brott and Weide 1969; Davis et al. 1978). Earlier patterns of human prehistory in this area have also been suggested from research in several widely spread localities (Carter 1957; Wormington 1957; Simpson 1972; Childers 1977; Singer 1979; Childers and Minshall 1980; Davis, Brown and Nichols 1980), patterns which may represent the presence of man in the New World as early as 200,000 years ago.

Ethnographic research and results of numerous investigative archaeological studies offer considerable information regarding the most recent historic and prehistoric Native American populations. Broad overviews, including discussions of California desert cultures, have been prepared (Kroeber 1925; Heizer and Whipple 1957; Hester 1973; Heizer 1978), but a full digest of all (or even most) data currently available for this region has yet to be compiled. On the other hand, recent studies by the U.S. Department of the Interior, Bureau of Land Management, present a rather extensive mosaic of the Native American and early Euro-American cultural spectra for large portions of the California desert (King and Casebier 1976; Brooks, Wilson and Brooks 1979; Norris and Carrico 1978; Coombs 1978, 1979; Norwood and Bull 1980; Davis, Brown and Nichols 1980; Warren, Knack and von Till Warren 1980; Stickel and Weinman-Roberts 1979). These patterns and interpretations, of course, remain to be evaluated in terms of the ethnographic and archaeological record.

Cultural research and resource assessment have not been extensive in the Owl Canyon region. Several project-specific archaeological surveys have been conducted within several miles of site SBr-3801 (Kaldenberg 1978; Reynolds 1979; Sutton 1978) that suggest the region has been only sparingly used by prehistoric peoples (Sutton 1981:7). In-depth site examinations are even fewer in number (Leonard 1980; Sutton 1981), and details of local cultural patterns must be constructed from the work of cultural research undertaken throughout the northwestern Mojave Desert (Rogers 1929, 1939; Heizer 1946; Davis 1963; Smith 1963; Simpson 1964; Kowta 1969; Kaldenberg 1978; Turner 1978; Drover 1979; Rector, Swenson and Wilke 1979).

The focus of archaeological study and research in this region has long been the ecological adaptive responses of prehistoric populations to what many have termed a harsh environment (Kroeber 1925:583-585; Meighan 1959:49; Wallace 1962:172; Hester 1973:1). This has led to a notable reliance on interpretations of past environments and their change over time and resulted in a wide array of anthropologically oriented endeavors which delve into the subsistence patterns, settlement systems, and ecological adaptations of the cultures under study.

In the following subsections details of the environmental setting and previous fieldwork pertaining to the Owl Canyon resources are considered. This matrix of existing information forms the most reasonable point of departure in development of perceptions of how indigenous populations might have used and occupied this region. Furthermore, such review focuses attention on regional domains of research and identifies specific problems to be addressed by investigation of the resources at hand.

ENVIRONMENTAL SETTING

The Owl Canyon site (SBr-3801) is situated in the western Mojave Desert, a region characterized by scant precipitation, high summer temperatures, and cold, dry winters. This zone is topographically typical of the western Great Basin in that generally north-south-trending mountain ranges separate intervening basins which often contain dry lake beds. Superior Dry Lake lies a little over twenty kilometers (twelve miles) north of the site, while Coyote and Harper dry lakes lie approximately twenty kilometers (twelve miles) to the east and west, respectively. The most important permanent source of water for the region today is the Mojave River, which lies approximately sixteen kilometers (ten miles) to the south (Figure 2).

The site is located in a hilly region known as the Mud Hills, an area of highly varied Miocene and Mesozoic rocks uplifted, tilted, and extremely eroded into steep-sloping ridges and deep-cut canyons and fans (Figure 3). Elevations in the Owl Canyon area range from 854 meters (2,800 feet) to 1,291 meters (4,235 feet) above mean sea level (MSL). Site SBr-3801 occupies a steep, sand-covered, south-sloping ridge near the head of Owl Canyon at an elevation of 1,165 meters (3,820 feet) MSL. A northwest-trending fault is located to the east of the site. There are currently no known active springs for the Mud Hills area.

Geological formations in the immediate vicinity of SBr-3801 include a bedrock of Mesozoic granitic rocks, quartz monzonite to granite (Jennings, Burnett and Troxel 1978), and adjacent Pickhandle, Jackhammer, and Barstow formations (Dibblee 1968) of Miocene tuffs, breccias, shale, sandstone, fanglomerate, and stream-

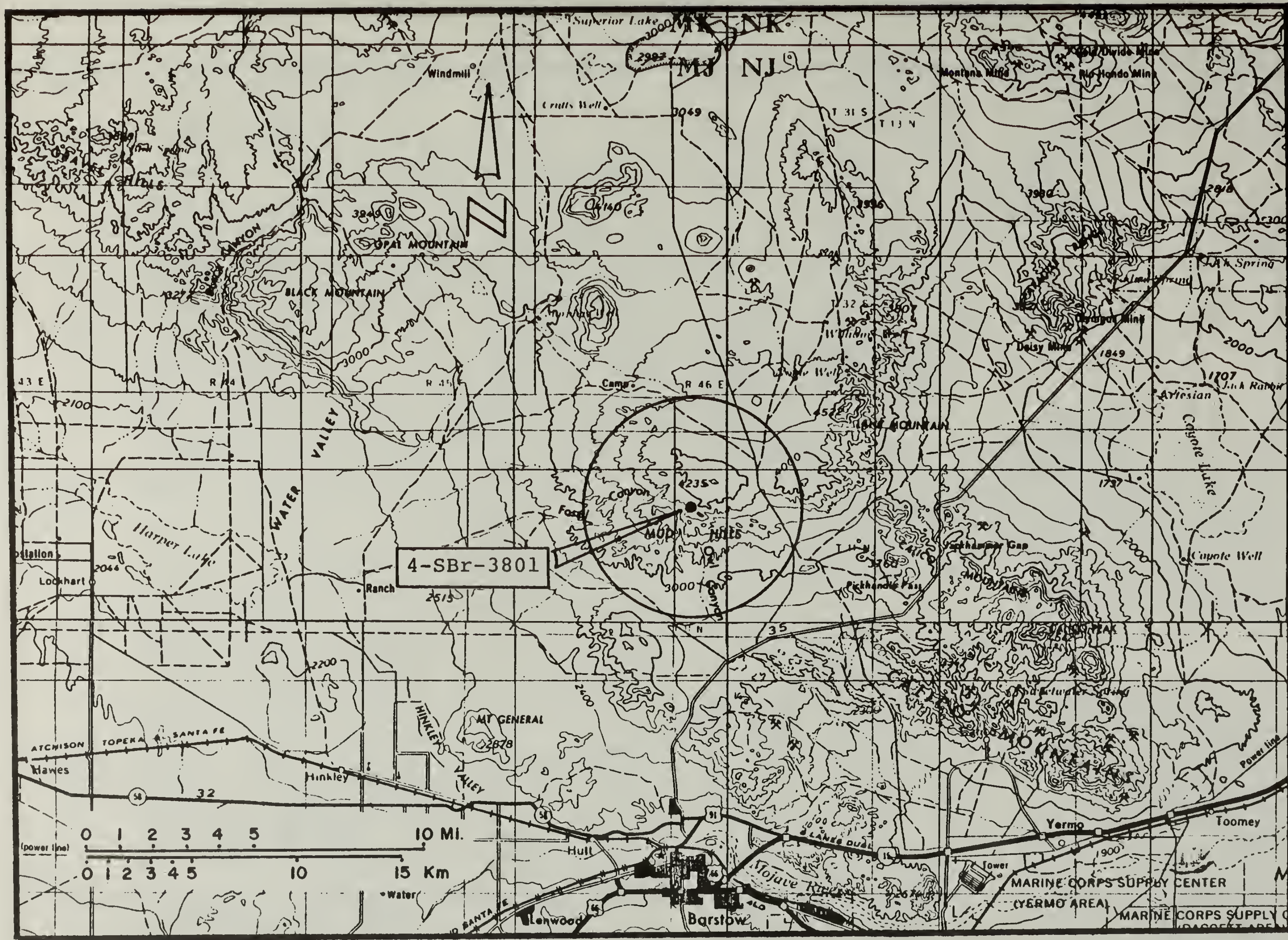


Figure 2

Portions of Trona and San Bernardino two-degree U.S.G.S. topographic maps depicting the regional physiography of the Owl Canyon area, including Harper, Superior, and Coyote dry lakes, the Calico Mountains, and a short length of the Mojave River.

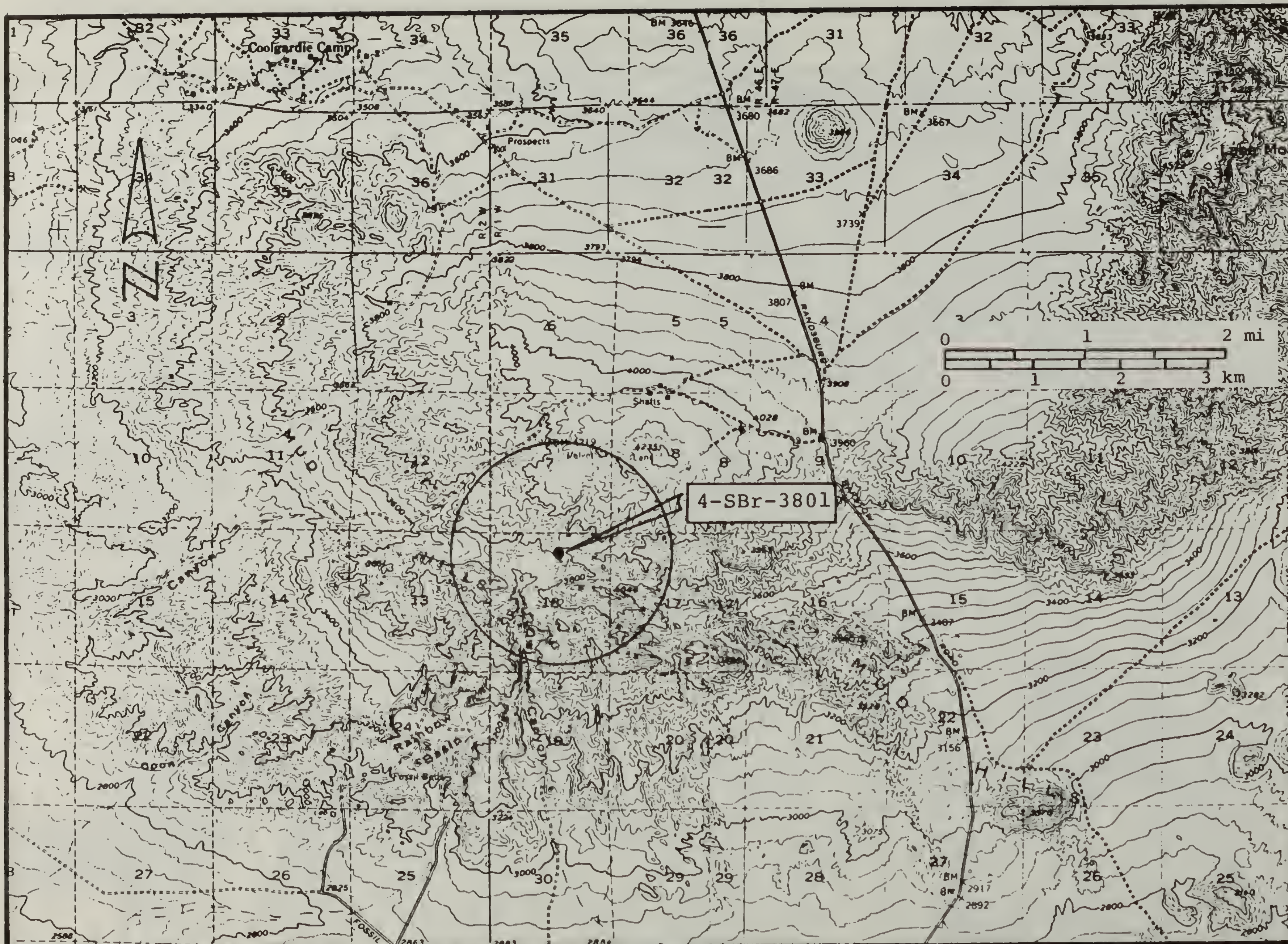


Figure 3

Portions of Opal Mountain and Lane Mountain 15-minute U.S.G.S. topographic quadrangles, depicting the project location in relation to the Mud Hills region.

laid conglomerates. Other rocks in the adjacent area include Pliocene volcanic rhyolites and andesites. With the exception of quartzite cobbles in the Jackhammer Formation, lithic resources suitable for flake stone tool technology are not available in the immediate vicinity of the site. However, vast areas of the Mojave Desert contain such material as chert, chalcedony, and vitreous volcanic clasts suitable for exploitation.

The biotic environment of the site area is typical of California high deserts. Plant communities involved produce a variety of edible and otherwise exploitable resources useful to indigenous human populations. The region encompasses three major plant communities: desert wash, creosote bush scrub, and Joshua tree woodland communities. These have previously been introduced for discussion by Sutton (1981:4).

Within site SBr-3801, a mini-dune ecosystem is prevalent. On-site vegetation consists of big galleta grass (*Hilaria rigida*), squaw tea (*Ephedra nevadensis*), Indian rice grass (*Oryzopsis hymenoides*), creosote (*Larrea divaricata*), burro bush (*Ambrosia dumosa*), saltbush (*Atriplex lentiformis*), and Joshua tree (*Yucca brevifolia*). This plant community supports a variety of fauna (see Sutton 1981:Appendix II). Mammals consist primarily of small rodents, jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and coyote (*Canis latrans*). A wide variety of reptiles occurs, including snakes, lizards, and the desert tortoise (*Gopherus agassizi*). Avifauna include various raptors, such as the red-tailed hawk, and passerines.

It is generally accepted that after the close of the Wisconsin pluvial, a cooler, moister climate prevailed in the Mojave Desert until about 8,000 B.P. This cool, moist period, Antevs' Anathermal, gave way over the next 2,000 years to a warmer, drier climate much like the present, bringing about the retreat of desert woodlands and the advance of desert scrub. These climatic changes affected not only the character and distribution of the vegetation, but the faunal and human populations as well.

In recent years studies of woodrat middens have provided additional indicators of the late Pleistocene and early Holocene climate of the Mojave Desert in the vicinity of the Owl Canyon study area. Radiocarbon data from four woodrat middens situated at elevations ranging from 972 meters to 1,219 meters in Lucerne Valley, about seventy kilometers south of the study area, led King (1976) to conclude that extensive stands of pinyon-juniper woodlands (*Pinus monophylla-Juniperus osteosperma*) existed in the western California Mojave Desert in areas of presently intense rainshadow as recently as 11,850 B.P. Xerophilous shrubs such as *Juniperus osteosperma* apparently persisted as late as 7800 B.P.; *Juniperus california* woodlands may have persisted at higher elevations until recent times (King 1976). Also in Lucerne Valley at an elevation of 1,006 meters, King and Taylor (1981) investigated a fifth midden which yielded radiocarbon dates that supported data from the first four.

King's (1976) studies also suggest that the presence of essentially creosote bush desert flora below 1,097 meters from 5880 to 1610 B.P. (and Present) in Lucerne Valley indicates that a strong shift in precipitation, climate, and vegetation occurred between 7800 and 5800 B.P. and may have continued through to recent times. The vegetation in the study area may have undergone a similar change.

The importance of pinyon-juniper woodland resources to historic and prehistoric native people is well documented. The apparent climatic shift between 7800 and 5800 B.P., which brought about the retreat of the pinyon-juniper woodlands, without doubt would have impacted native populations by greatly reducing available subsistence resources, including water. Since 5800 B.P., small and perhaps brief fluctuations in climate would result in change in the composition and density of the extant flora. A period of slightly increased precipitation and slightly cooler temperatures could increase annual plant populations, increase stands of perennial grasses, and add to the density of shrubs and trees in water courses. Conversely, periods of reduced rainfall and warmer temperatures would depress annual vegetation, reduce perennial grasses, and thin out riparian trees and shrubs. Such increases and decreases in plant resources and dependent fauna could probably take place without much effect on native people. They could undoubtedly adapt to such changes in resource availability, providing source-specific water did not fail to meet their needs.

Within the current environmental regime, both plant and animal resources tend not to occur in large concentrations, but occur over widespread areas. This circumstance limits the size of the population that could have been supported. Nonetheless, if a group did not exceed the carrying capacity of a given area, the desert environment would have produced necessary survival resources.

PREVIOUS RESEARCH

Within the immediate area of the Owl Canyon site, there has been no comprehensive work beyond the survey level of investigation. There are a number of regional data recovery efforts that have either been completed or are in progress in the Fort Irwin area, which lies approximately twenty-one kilometers (sixteen miles) north of Owl Canyon. To the south, site SBr-189 near Hinkley on the Mojave River was recently investigated by Leonard (1980). Some of this newly available data will be useful in interpretation of the Owl Canyon materials.

As previously mentioned, the Bureau of Land Management undertook a data recovery effort at the Owl Canyon site in 1979. Sutton (1981:1-2) summarizes the discovery of the site and circumstances of the data recovery effort in the following manner:

> . . . The Owl Canyon site was originally discovered on November 29, 1979, by Mike DeKeyrel (Barstow B.L.M. Soil Conservationist) on public land under BLM administration. The site was visited and officially recorded by the author on December 4, 1979. Site number CA-SBr-3801 was later assigned by the State Archaeological Survey regional clearinghouse at the San Bernardino County Museum.
>
> It was evident that the site had suffered major disturbance from off-road vehicle (ORV) use within the last year and that these impacts were continuing. The site was revisited by the author and Faye West on December 7, 1979, to obtain additional photographs. During that visit, it was discovered that a 4-wheel drive vehicle had been driven off the southern end of the site. At that time, removal of the vehicle would have necessitated using the flat area on top of the ridge (center of the site) as a base of operations for necessary recovery equipment. Tow trucks would have had to drag the vehicle up the ridge and across the site. The fact that conventional methods of removing the vehicle would have severly disrupted the site, and that removal was expected at any moment, necessitated immediate action to mitigate the impacts of the vehicle removal.
>
> Prior to fieldwork, a number of archaeologists were taken to the site and asked for opinions regarding potential action. These archaeologists, included Russell Kaldenberg, William Olsen, Eric Ritter, Francis Berg, Donald Lipp, and Ruth Musser. The Barstow Area Manager for BLM, Gail Givens, also visited the site. Opinions varied regarding the potential impacts to the site from the removal of the vehicle and of the urgency of action.
>
> Native American imput was solicited from Darrel Duro, a member of the Serrano Tribe (San Manuel Reservation) who visited the site. He raised no objections from a Native American standpoint regarding data recovery. The State Office of Historic Preservation was contacted by telephone and informed of the situation. A preliminary statement of potential research questions was drafted and commented upon by several archaeologists prior to fieldwork. The final decision to conduct fieldwork was made December 17, 1979, with work commencing December 18, 1979. The fieldwork was conducted on December 18-21 under the direction of the author (Sutton 1981:1-2).

The Bureau of Land Management recovery program consisted almost entirely of a surface collection effort. No excavation units were completed, although several surface scrapes were performed, with positive results. Provided below is the description of field methods used for the project; Figure 4 presents the site area and zone of examination as presented by Sutton:

> . . . Materials not directly in the area of projected impact were not collected. All efforts on the site were confined to that portion of the site which was to be impacted.
>
> Two primary data collection methods were used. The area of projected impact was completely surface collected in a systematic manner. Several of the surface collected units were then carefully "surface scraped" and passed through an 1/8 inch mesh screen. All recovered material was washed and catalogued, and is curated at the San Bernardino County Museum in Redlands.
>
> <u>Surface Collection</u>
>
> A 10 meter square grid was superimposed over the site. The grid was established so that the primary axis would be parallel and perpendicular to the axis of the ridge. This resulted in the long axis of the grid being 28° west of magnetic north. . . .
>
> After the preliminary datum was established, several primary baselines were shot in by transit and staked. Several of the unit corners not on the primary baselines were established by tape measurements. A permanent datum consisting of a nail in concrete was later placed just to the west of the main site area. . . . A central point on the site was arbitrarily chosen and each of the 10 meter units was then numbered east or west and north or south.
>
> After the area of projected impact had been defined on the site, that portion was completely gridded and staked. The 10 meter square grid was further subdivided into five meter squares. All of the units collected, a total of 20, were five meter squares. Each of the five meter square collection units was numbered by quarter. For example: 1S-2E, NW¼. . . . A total of 500 square meters was surface collected.
>
> Each unit was systematically inspected and all cultural material, including fire affected rock, was collected and bagged. Identifiable tools (i.e., manos, projectile points, etc.) were mapped and recorded in situ. Concentrations of fire affected rock, ash and burned areas also were mapped. . . . Some of the units contained considerable loose medium to coarse sand. Those units were inspected by moving the loose sand (sometimes to a depth of 3-20 centimeters) around

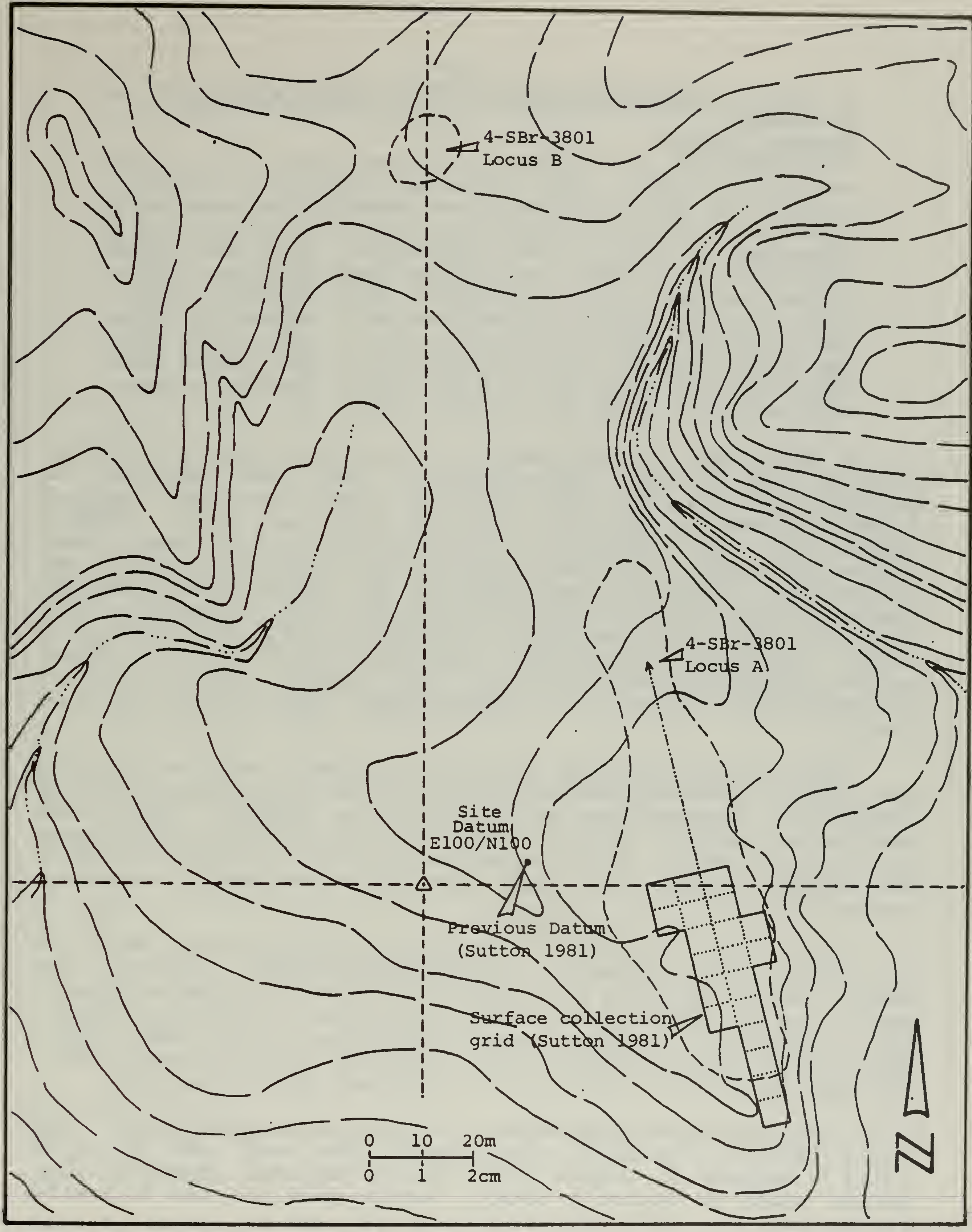


Figure 4

Represented here are graphic details of site 4-SBr-3801 as first reported by Sutton (1981), showing the relative locations of Locus A and Locus B and the conformity, location, and orientation of the previous study's surface collection grid system (after Sutton 1981: Figure 4).

by hand so that concealed cultural materials could be recovered.

Surface Scrapes

Three of the surface collected units . . . were surfaced scraped. This technique involved surface collecting the unit first and then passing the loose soil a 1/8 inch screen to recover the cultural material not recovered in the surface collection. Only the loose soil (3-10 cm. deep) was scraped and screened and no further excavation was conducted. The material recovered by the surface scrapes was kept separately from the surface collection material. . . . After the soil had been screened (within the unit) it was spread back over the unit as close to the original surface contour as possible (Sutton 1981:12-13, 15).

A relatively large assemblage of cultural materials was recovered from the BLM investigation. These are described in Sutton's 1981 report. The flake/debitage assemblage contains 5,593 specimens, which are listed as relatively small (average weight 0.63 gram), ranging in size from 0.1 to 9.14 grams. Most of the flakes are chalcedony (5,576); the remaining include obsidian (8), basalt (8), and rhyolite (1). Seven cores were recovered, two of which are quartzite and five chalcedony. The flaked lithic tool assemblage consists primarily of bifacial tools, including twenty-three projectile points, six bifacial cutting tools, one "mescal knife," two "chopper-like" tools, two "scraper-like" tools, two hammerstones, and three retouched flakes.

The milling assemblage includes ten manos, only one of which is complete. These are composed of plutonic rock, quartzite, and sandstone. At least two were recorded as shaped. Twenty-four metates and metate fragments were also recovered, including three complete specimens. It was noted in Sutton's report that most of the milling surfaces are flat. One basin specimen of sandstone occurred.

Other finds include an *Olivella biplicata* shell bead, an unmodified gypsum crystal, a sandstone pendant fragment, two ceramic sherds (Pyramid grey ware), and 1,468 osteological specimens. The projectile point assemblage contains several classifiable specimens, including Rose Spring contracting stem (one), Rose Spring corner notched (one), Humboldt basal notched (one), Saratoga Springs or Cottonwood (three), and Elko eared (one).

Time-sensitive artifacts, a single radiocarbon date, and eight obsidian hydration measurements have been used to infer dates of occupation (Table 1 depicts the proposed range of occupation based on Sutton's data). Sutton provides the following discussion:

Table 1
CHRONOLOGICAL DETERMINATIONS FOR 4-SBr-3801
RESULTING FROM PREVIOUS INVESTIGATION (Sutton 1981)

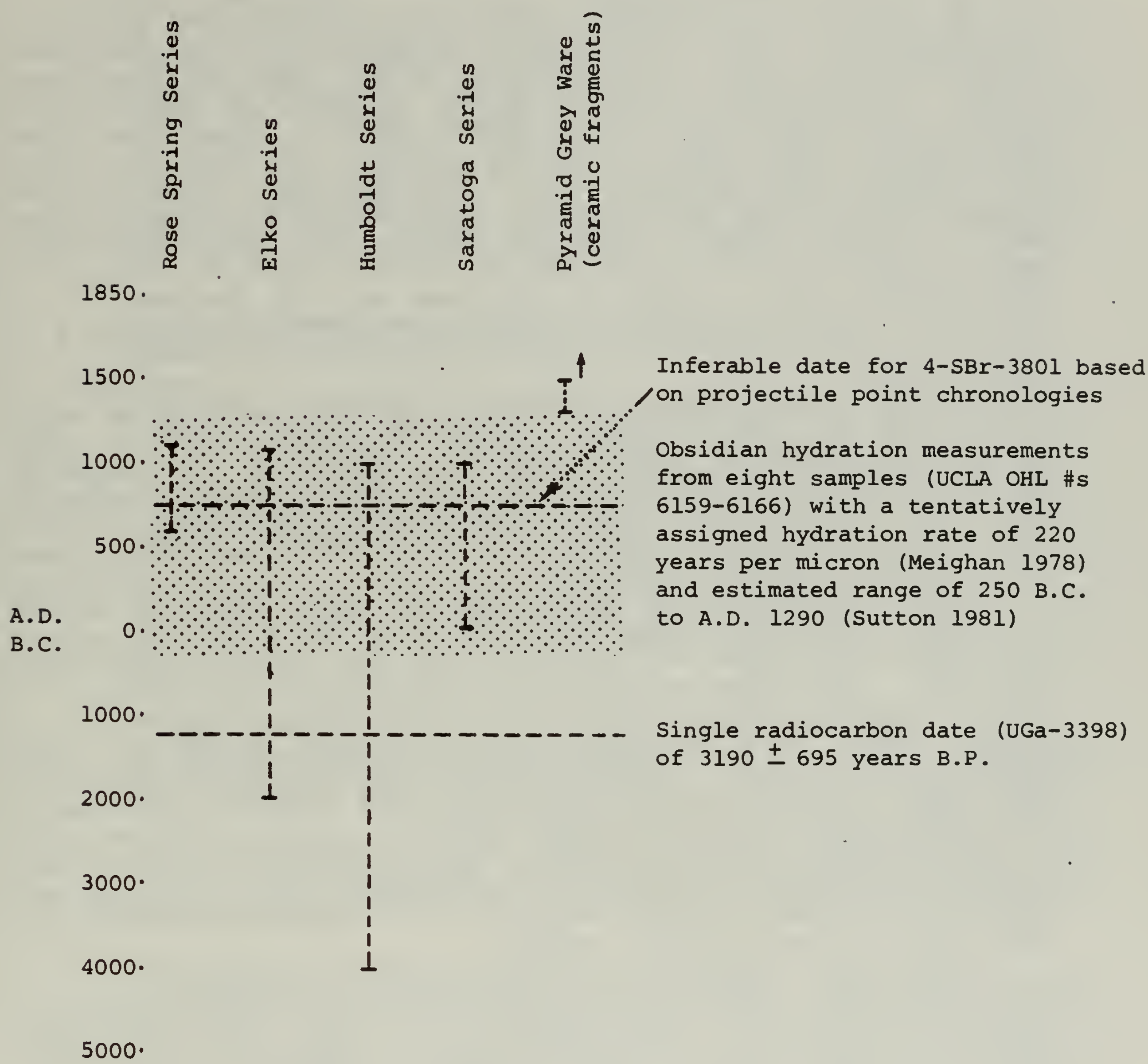


Table based on Heizer and Hester (1978) after Rector, Swenson and Wilke (1979:15)

*Range for Saratoga Spring Series after Wallace (1977)

Range for Pyramid Grey Ware after King and Casebier (1976)

One radiocarbon date of 3190 ± 695 B.P. (1240 B.C.) (UGa-3398) has been obtained from a hearth area in 3S-2E, NW¼ probably near the original bottom of the original deposit. The large error factor is probably the result of a small sample.

A number of temporally sensitive artifacts were also recovered. The Rose Spring projectile points date roughly to A.D. 600 to A.D. 1100 (Heizer and Hester 1978). The Elko Eared points appear to date from 2000 B.C. to A.D. 1080 (Heizer and Hester 1978). The Humboldt point would date to roughly 4000 B.C. to 1000 B.C. (Heizer and Hester 1978). The Saratoga Spring points date to the Death Valley 3 period (A.D. 1-A.D. 1000) (Wallace 1977). Wallace notes that Saratoga Spring points co-occur with Rose Spring and Elko in the Death Valley area. Such is the case at Owl Canyon. The shell bead is not particularly sensitive but the ceramics would date to A.D. 1300-1500 (King and Casebier 1976).

A series of obsidian hydration readings were obtained and the samples were sourced by x-ray florescence spectrographic analysis at U.C. Berkeley. . . . The readings range in micron value from 3.0 to 10.1. While this would seem to indicate time depth of occupation, it is impossible to compute firm absolute dates on the basis of these readings.

Some progress has been made in this area as Meighan (1978) tentatively assigned a hydration rate of 220 years per micron to obsidian from the Malibu site (LAn-264). Meighans calculations were based on 60 obsidian readings compared with two radiocarbon measurements. While this suggested hydration rate is quite preliminary, it is a useful starting point. Based on this rate, the Owl Canyon materials would range in age from 2200 years old to 660 years old.

The samples from Owl Canyon are all from the surface although some of them were probably buried until recently. Surface samples appear to hydrate more rapidly and so give inflated readings.

The source indicates that all but one of the samples come from the Coso/Pilot Knob areas. Pilot Knob, located southeast of Ridgecrest, is a newly reported obsidian source but is so chemically similar to the Coso materials to be almost indistinguishable (Tom Jackson, personal communication 1980). This could have implications in the discussions of trade patterns of materials identified from Coso may actually have come from Pilot Knob. One piece of obsidian was tentatively identified as having originated at Bodie Hills near Bridgeport, California (Sutton 1981:38, 40).

SECTION III

RESEARCH DESIGN

The primary goal of this research is to provide sensible, reliable information concerning the morphology and content of SBr-3801 as it relates to prehistoric culture patterns of the southwestern Great Basin in general and the Mojave Desert and surrounding environments in particular. Achievement of this goal must be measured by both the degree to which new information gathered from this research is directed at the notable vacuums in this region's prehistoric cultural research data base and by the degree to which this effort is documented and shared with other interested researchers and the general public.

PREFIELD INVENTORY AND PROGRAM ADJUSTMENTS

Subsequent to award of contract, and preceding implementation of the research strategy, several visits to site SBr-3801 were conducted to secure a greater understanding of the available inventory and to guide development of program design. The first of these visits was conducted on December 16, 1980, by representatives of Cornerstone Research. Access routes to the site area were determined at this time and several localities were selected for location of the field station (encampment). A brief survey of the resource noted various flaked stone material types, milling stone fragments, fire-affected rock, and recent recreational disturbances.

A second visit to this resource was conducted on January 8, 1981, by representatives of Cornerstone and the U.S. Department of Interior, Bureau of Land Management. This visit was undertaken to reidentify the location of the permanent datum used in the previous research effort (Sutton 1981:13) and to establish the boundary of the resource as understood by BLM personnel. On the basis of this information, research strategy and program design were initiated.

In reviewing the available data, it became apparent that not enough was known of the resource's distribution and that stratification of the site into several zones of focus could not be supported by current information. The dimensions of the resource and, in particular, its areal extent were also called into question.

Because of the critical problem of site delineation, investigation was focused on refining knowledge of the site in terms of size, volume, and boundaries. While previous examination (Sutton 1981) had generally defined these variables, more information was needed to direct research efforts and to assess the relative importance of the resource.

A third trip to SBr-3801 was initiated on February 3, 1981, to more accurately delineate the site. A field team of three persons, directed by William T. Eckhardt of Cornerstone Research, set out to establish a transect map of the surface of this resource to dispel uncertainties regarding size, extent, and distribution of surface cultural resources. A total of sixty-six hours were expended in this prefield mapping exercise (Figure 5), considered project Phase I.

Most notably, the extent of this resource site was found to be a little more than twice the size originally estimated by BLM. Roughly 12,950 square meters were observed to contain evidence of surface debris or to be so closely associated as to require their inclusion within the site's perimeter. As a result of the mapping effort, three distinct strata were defined on the basis of presence or absence of cultural surface debris. These are discussed in detail in subsections to follow.

The increase in surface area of site SBr-3801 had an impact on the research and mitigation program solicited by BLM and proposed by Cornerstone Research. The original volume of intensive surface collection investigation was designated at 25 percent of the known surface area, or roughly 1,500 square meters. To achieve parity with original plans, a 25 percent surface collection of the total area of the resource would have required an inspection of 3,238 square meters of surface area. This represents a significant variance from the terms of the awarded contract. Several alternatives were devised to manage this variance, each of which required adjustment to the agreed upon scope of services or augmentation of the original contract budget. These are more fully discussed in the justification of problem selection (presented below).

OBJECTIVES AND ASSUMPTIONS

Several objectives were used to guide and focus the design and direction of the present research. Fundamentally, archaeological research is oriented toward: 1) learning the nature of the remains under study and the manner of their deposition, 2) reconstructing the nature and development of the social aggregate and behaviors that produced the remains, and 3) discovery of the processes and factors affecting human development. The core objective was to identify, recover, analyze, and document the cultural record presented at site SBr-3801 and to use these data to evaluate hypotheses directed toward achievement of these fundamental aims.

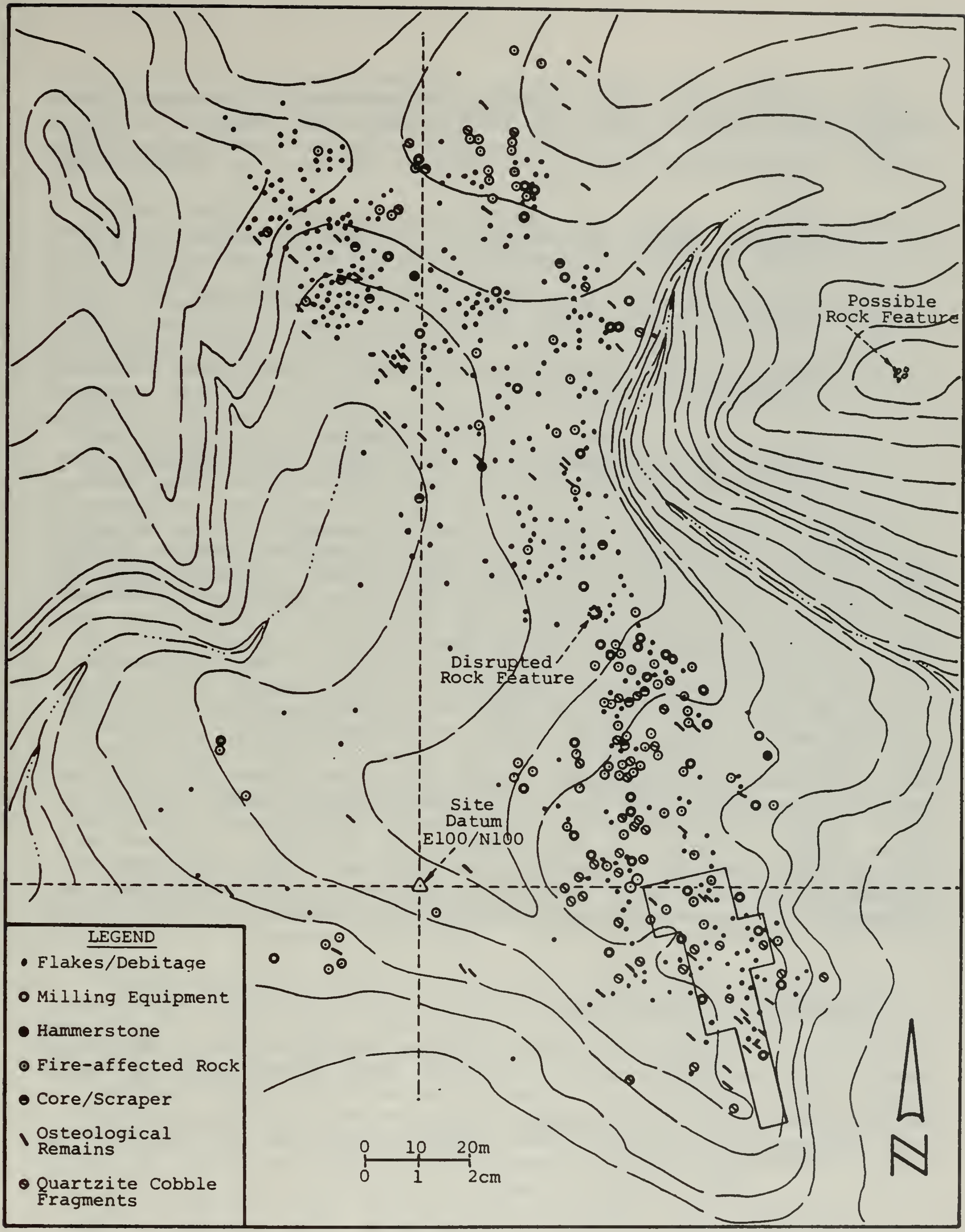


Figure 5

This figure is redrafted from a transect survey sketch map prepared during prefield inventory of resource site 4-SBr-3801. The outlined area encloses the study zone examined previously by BLM (Sutton 1981)

An outline of lower echelon objectives is necessary to achieve stated aims. These are as follows (after Weide 1973:5):

1) Discover the range of resource variability within the site

2) Identify zones of greater or lesser activity by past human occupants of the site

3) Determine the kinds of activities performed by past human occupants of the site

4) Recognize and elaborate patterns of past human use and occupation of the site

5) Formulate and assess the environmental or cultural variables, or combination of variables, that present the most reasonable explanation for occupation of the site.

To reach these objectives, it is necessary to rely on several basic assumptions. First, it must be assumed that in periods of past human activity in this region (and in occupation of this site in particular), man's behavior was a patterned response to physical and cultural needs and that this relationship was significantly affected by environmental factors outside his control. Second, it is assumed that the economy of resource extraction was an important determinant of land use patterns practiced by indigenous populations in this zone (Weide 1973:6) and that this system was well developed into a network of trade, industry, and seasonal transhumance at the time of historic contact. Third, it is assumed that the cultural system responsible for the deposits at site SBr-3801 is an identifiable portion of that broad social continuum which gave rise to the protohistoric cultures first recorded in this region by historic accounts and ethnographic records. Finally, it is assumed that the pattern, purpose, and association of the deposits at this site may be determined or known through a sample investigation of less than the total assemblage presented.

THEORETICAL ORIENTATIONS

There are a number of components to the theoretical approach behind this research, each requiring some elucidation at this point. Proper theoretical orientation is a device that serves to narrow the research to a manageable scope and facilitate its pursuit (Kowta 1976:6) and is here applied to method of data recovery and theoretical propositions.

A probabilistic sampling technique is used in this program to direct the recovery of cultural data. In probability sampling, the samples are drawn to conform to rigorous mathematical theory. The effects of explicit or implicit human bias are minimized, and the theoretical limits of reliability may be calculated to estimate how closely the values derived from the sampled units approximate the parameters of the entire population (Redman 1975:149).

The field strategy requested by BLM for the implementation of this research design is a controlled sample collection program, involving three separate dimensions or proveniences (surface, surface scrape, and subsurface), which must minimally total 25.3 percent (Section F.2, Contract No. CA-060-CT1-6) of the previously defined site area (Sutton 1981:7-10, Figure 4). After considering these matters, and in light of elements of known information relating to this resource site and underscored by the research design program, a two-stage, stratified, random interval sampling program has been developed.

In addition to theoretical orientations which guide the collection and analysis of data pertaining to the specific resource in question, certain theoretical propositions are used here to initiate construction of a body of theory which, assuming proper validation, may eventually be used to constitute an explanation for the resource at hand. These propositions may be said to be more or less useful to the degree that they:

a. Refer to abstract rather than concrete phenomena.
b. Relate otherwise discrete phenomena in previously unsuspected ways.
c. Encompass more phenomena in more economic fashion.
d. Generate additional propositions through logical deduction or permit a larger variety of predictions (Kowta 1976:8-9).

Proposition 1. The basic unit of behavior inferable from an archaeological context is the activity, which may be defined as the interaction between at least one energy source and one cultural element (Schiffer 1972:157).

Proposition 2. Units of activity (and their elements) represented in an archaeological context may be grouped as activity sets consisting of all activities repetitively performed within a specific unit of space (Struever 1968:135), commonly termed a locus (Binford 1964).

Proposition 3. Activity sets represented in an archaeological context may be grouped by activity structure, which is defined as all activities and activity sets participated in by an aggregate of cultural elements, termed a social unit.

Proposition 4. The aggregate of activity structures presented in an archaeological context represents a portion (or portions) of the prevailing socio-cultural system, which may be explained by: 1) an understanding of the nature of observed activities, activity sets, and structures by which the socio-cultural system is maintained; 2) determination of the independent environmental variable or variables with which the socio-cultural system must interact; and 3) the presentation of those factors or combination of factors responsible for observable temporal differences which reflect socio-cultural evolution over time.

JUSTIFICATION OF PROBLEM SELECTION

Research and investigation, for whatever intention (e.g., mitigation of adverse impacts to cultural resources), requires focus, and focus demands selection. This relationship affects an exclusion in consideration of some data for certain others; the researcher is guided by this and, hence, may be called to justify it. The current project is required to fulfill the intent and scope of services requested by BLM (Solicitation No. CA-060-RFP1-4) to the ceiling that contracted funds will allow (Contract No. CA-060-CT1-6), neither of which may herein be judged. It is the manner and efficiency of using the available resources--both cultural and financial--that are to be questioned here.

The existing record for resource site SBr-3801 is comprised of test investigation results (Sutton 1981) and field notes from brief reconnaissance (referred to elsewhere in this design) (see Figures 5 and 7). Analysis of the data and physical evidence derived from previous test investigation indicates that the resource may be characterized as a limited activity site, roughly 6,000 square meters in size, used as a base camp for local resource exploitation (Sutton 1981:38-42, Figure 4). It is evident that the site has suffered major disturbance from off-road vehicle activities and that these impacts are continuing (Sutton 1981:1).

Consideration of the documentation from the Phase I reconnaissance of the resource suggests that estimates of site dimension were inaccurate (Figures 5 and 7; cf. Sutton 1981:Figure 4). Delimited by surface cultural content, site SBr-3801 is more than twice the size of the original measure, covering roughly 12,950 square meters. In addition, off-road vehicle disturbance of the resource was noted to be localized to existing trails and one broad area used as a turn pole in an informal hill-climb arrangement (Figure 6). Areas remaining undisturbed by frequent vehicle damage include a broad zone in the vicinity of Sutton's locus B, exhibiting a mantle of surface cultural debris, and an area surrounding Sutton's locus A, where thinly scattered cultural materials were observed (Sutton 1981:7-10).

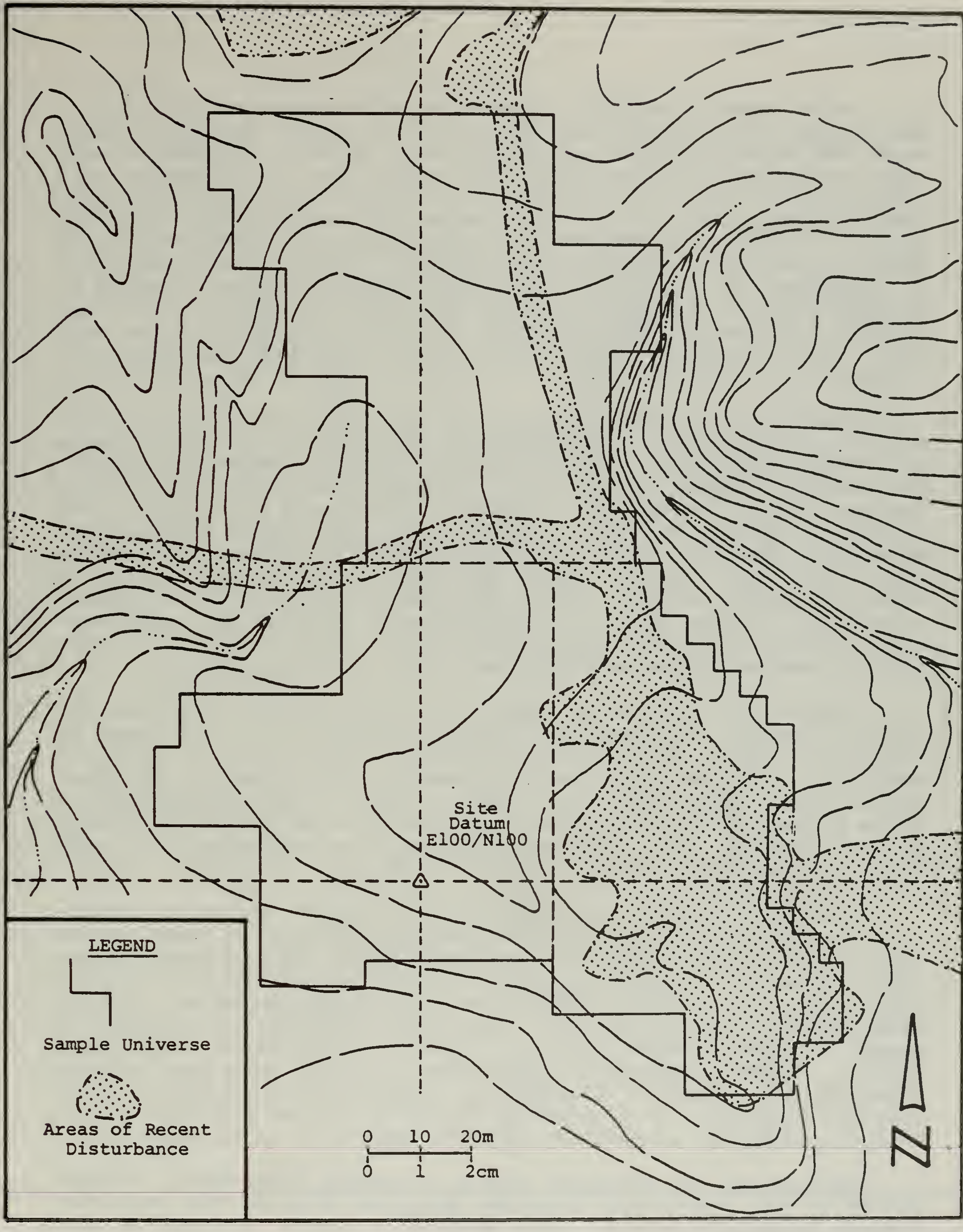


Figure 6

Illustrated are the several zones of surface cultural debris, areas observably disturbed by off-road vehicle activities, and boundaries of selected strata for resource site 4-SBr-3801. Total area encompassed within this universe is 12,950 square meters. Justification for selection of the boundaries between strata is discussed in the text.

These details were all considered and weighed in arriving at the appropriate combinations for choice of sample universe dimension and stratification and sample unit size. The sample unit size employed in the previous study was a ten- by ten-meter grid cell (Sutton 1981:13). However, the unit analysis was a one-quarter grid cell, or five- by five-meter unit (Sutton 1981:Figure 4). Using grid cell sample units measuring five meters on a side, the sampling universe selected for the current examination is comprised of 518 sample units with several distinct strata of varying populations as recognized by on-site inspection and review of previous fieldwork (Figure 7). Establishment of the several strata, however, deserves more thorough justification (see Figures 5, 6, and 7).

Prefield inventory (Phase I) disclosed that within the site's perimeter, notable variation was observed in 1) presence or absence of artifacts, 2) degree of recent, frequent vehicular and erosional disturbance, and 3) integrity of microphysiographic features (i.e., hummocks). Stratum A represents the greater area around the previously designated locus B and the northernmost aspect of locus A (Sutton 1981:Figure 4). Prefield inventory identified this stratum as an estimated 4,950 square meters in size, exhibiting widespread cultural debris (Figure 5), a limited amount of surface vehicular disturbance (Figure 6), and relatively stabilized, although potentially deflating, dune sands over compacted, cemented sands and clays.

Stratum B contains an equal or greater amount of surface cultural debris compared to Stratum A (Figure 5), but also an intensive degree of surface disruption from frequent vehicular activity. This activity has accelerated the degree of erosional disturbance, which has, in select areas, reduced the surface sands to zero and left compact, concreted sands and clays exposed to the surface. The size of Stratum B is estimated at 3,700 square meters (see Figures 5 and 6).

Stratum C consists of roughly 4,300 square meters of physiographically similar, yet archaeologically distinct, area, which was not previously identified per se (Sutton 1981). Nonetheless, this statum--or the area confined within it--is viewed as having potential for intact subsurface cultural deposits (Sutton 1980:personal communication). Cultural debris on the surface is scant in this stratum (Figure 5), although present in limited degree. Recent vehicular disturbance in this area was neither observed nor reported (Figure 6), suggesting the potential for greater integrity of microphysiographic features and the likelihood of preserved subsurface cultural deposits, if present.

Because of the resource site's increased dimensions, modification of the previously proposed sampling program was required. Several alternatives were considered in a search to find the most feasible and economic method of redirection. Briefly, each

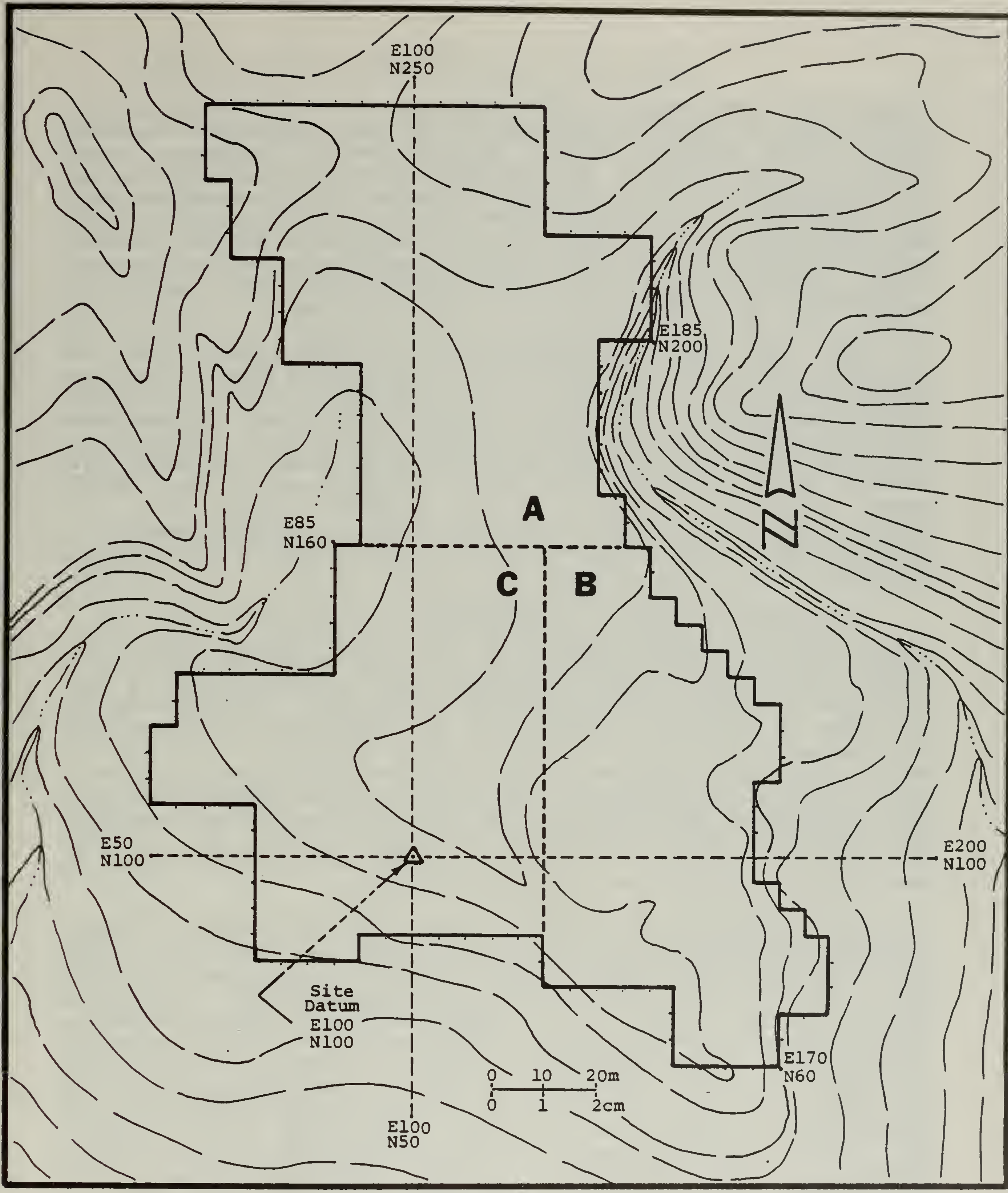


Figure 7

Sample universe for resource site 4-SBr-3801, as determined by previous research (Sutton 1981) and site inspection conducted for the current project. The universe includes roughly 12,950 square meters, stratified into three areas on the basis of observable surface materials (Stratum A), heavily disturbed zones (Stratum B), and potential for previously untested subsurface discovery (Stratum C).

alternative considers a sample universe size of 12,950 square meters, with a variance in size of surface collection samples ranging from 13.5 percent, 15 percent, and 18.7 percent to 25 percent of the universe. To complete a sample surface collection of 25 percent of the current site universe (3,238 square meters), all other phases of data retrieval (i.e., surface scrapes, test unit excavation) and analyses (e.g., statistical program, ancillary studies, lithic analysis) would need to be omitted or severely reduced unless additional funding (in close parallel to the increase in sample universe) could be secured.

The two closest variants to this ideal percentage (as originally requested), 18.7 and 15 percent, are equally cumbersome, requiring a 61 percent or 30 percent increase in surface area inspection, respectively. Neither of these intermediate sampling percentages could be initiated without major adjustments to the scope of services or total contract price. Even a 13.5 percent sample of the current site universe results in an additional 250 square meters of surface collection sample area, although this is more easily managed with less drastic alteration to the project's scope and with no need to reconsider or redress funding.

Cornerstone Research recommended the implementation of a 13.5 percent controlled sample surface collection (1,750 square meters) in conjunction with test unit excavations (20 square meters) and surface scrape programs (375 square meters) to replace the previously proposed sampling program. Adjustments to the scope of services included only the dismantlement of the computer-aided statistical analysis program originally proposed and resulted in a net increase in real surface inspection (2 percent) with no reduction in maximum data yield. It was possible to conduct statistical manipulations of both quantitative and qualitative variables with calculators, graduated tables, and comparative tabular formats to aid in synthesis and interpretation of results at various stages during investigation.

The second phase of field study in the current project addressed three basic questions concerning the integrity, content, and context of the cultural record presented at site SBr-3801. Thirty-eight surface collection sample units (950 square meters), three surface scrape sample units (75 square meters), and four test excavation units (8.5 square meters) were selected in controlled, random fashion. Analysis focused on the distribution of artifacts in selected and sampled units in relation to variables of modern historic disturbances, geomorphological and physiographic impacts, and patterned prehistoric spatial behavior. In the third phase, with the largest sample held in reserve, an attempt was made to justify, refocus, and restratify the universe to allow for the maximum data yield in terms of testing questions of prehistoric cultural and social behaviors.

PROCEDURES FOR EVALUATION OF SITE STRUCTURE

Discussions in this subsection have been derived from basic questions concerning SBr-3801 with regard to recent adverse impacts, deposition and context of observed cultural debris, and recognizable behavioral patterns of the culture group or groups responsible for this resource's situation and accompanying cultural assemblage. Three alternative explanations to account for observed variations in site integrity, physiographic characteristics, and distribution of surface cultural debris are considered and their implications drawn to distinguish the particular variables--either quantitative or qualitative in kind--which are expected to accompany each alternative. Analytic techniques are then suggested whose applications are meant to test the validity of each statement. In this fashion, the more probable alternative (or alternatives) for the distribution of cultural debris within and between the several strata may be more closely scrutinized. The goal is to determine the most reasonable explanations for the observed variations in presence and condition of the total cultural deposit.

Alternative 1. Recent historic impacts to site SBr-3801 have had a significant effect on the condition and deposition of cultural debris and may account for observed variation in spatial distribution of cultural elements throughout the site.

Alternative 2. Variation in physiography or geomorphology within site SBr-3801 has had a significant effect on the condition and deposition of cultural debris and may account for observed variation in spatial distribution of cultural elements throughout the site.

Alternative 3. The patterned human behaviors of prehistoric occupants of site SBr-3801 have had a significant effect on the condition and deposition of cultural debris and may account for observed variation in spatial distribution of cultural elements throughout the site.

The first alternative is implied in the physical record of resource site SBr-3801, predominantly in qualitative terms. Berms have developed in turn zones along established trails and pathways, completely denuding surface sands and vegetation in some areas. Numerous discarded parts from both two- and four-wheeled vehicles litter portions of the site and surrounding regions, attesting to off-road vehicle use. These recent historic impacts disrupt and disturb depositional patterns resulting from the prehistoric activities performed at this site. The distribution of artifacts in areas of recent historic impacts is implicitly more representative of those recent behaviors than of the behaviors responsible for the initial deposit. Artifactual debris should cluster in distribution varying with aggradation and degradation of surface sands attributable to recent disturbance and, apart from zones of vegetation-stabilized deposits, indications of subsurface deposits should show no evidence of primary deposition and be irregular to principles of stratification.

Five qualitative variables are derived from the implications of the first alternative: 1) berms, 2) turn zones, 3) trails, 4) pathways, and 5) denudations. Berms are defined as aggradations of soils and sands in the approximate path of the arc of gravitational pull arising from the banking (turn) of a moving vehicle. Turn zones are those portions of trails and pathways where traffic shifts direction. Application of a turn results in a degradation of sands within the track and accompanying aggradation along the berm. Trails and pathways are distinguished by their degree of utility; trails are defined by evidence of frequent use, whereas pathways need only show evidence of a single occurrence. Denudations are cases of severe degradation of the surface that result in the exposure of substrates comprised of compacted sands and clays.

The second alternative implies that physiographic or geomorphologic features within the site have a significant effect on the condition, deposition, and distribution of cultural elements at site SBr-3801. If that is the case, then numerous physiographic and geomorphic figures come into play, all of which are essentially quantitative. Consideration is extended here to variables of percentage and type of vegetative cover, presence/absence of crotavina (rodent burrows), degrees of soil compaction, volumetric estimates of loose, surface sands, ranges in soil color (Munsell color code), and variations in soil grain size. These quantitative variables combine to define the qualitative terms used to describe the physiography or geomorphology of a given area, such as "stable," "unstable," "eroding," "preserved," and so forth.

The third alternative implies that the condition, deposition, and variation in spatial distribution at SBr-3801 result from patterned human behavior. This implies that the cultural elements and their distribution may be used to "reconstruct"--or reasonably infer--some unspecified portion of the activity patterns practiced by those responsible for the resulting cultural deposit. Variables such as "activity," "units of activity" and "activity sets," "activity structure," and "socio-cultural system" must be considered in some detail. Variables related to these concepts may be quantifiable, but only through strict definition and rigorous attention to detail. Acceptance of Alternative 3 as a reasonable explanation will mean the rejection or diminution of the first two alternatives to the extent that an analyzable record in good context may be found.

SECTION IV

METHODS AND TECHNIQUES

The research program implemented in the current study involved several distinct stages and required detailed consideration of both field and laboratory strategies prior to initiation of the project. Before commencement of the fieldwork phases of this project, two preliminary visits were made to site SBr-3801, one on December 16, 1980, and the second on January 9, 1981. The purpose of the first visit was to locate existing roads into the site area and secure a camp site for the pending project. The January visit was a preliminary site reconnaissance to establish and refine knowledge of the site boundaries.

FIELDWORK

Phase I fieldwork was initiated on February 3, 1981, and concluded on February 5, 1981, requiring sixty-six person-hours by a three-person crew. As discussed in the research design, the purpose of Phase I was to clarify site dimensions and distributions of surface cultural materials by producing a field map of the site (see Figure 5). Using an existing BLM datum, ten-meter-wide, north-south control transects were established over the area. Crew members walked close-increment, east-west parallel transects within these control areas, noting all cultural materials observable on the surface of the site. A transit and stadia rod were used to plot locations of materials, and general observations were made regarding prominent physiographic features. A location for a permanent datum to be used for the duration of the current project was selected at this time.

The documentation and resulting map from the Phase I reconnaissance suggested a three-stratum stratification for the site (see Figure 7) based on the following criteria: 1) presence or absence of artifacts, 2) degree of recent, frequent vehicular and erosional disturbance, and 3) integrity of microphysiographic features. Stratum A was delineated on the basis of observable surface materials and limited surface disturbance, Stratum B because of heavily disturbed zones, and Stratum C as an area of potential subsurface deposition. Development of these strata is detailed in Section III.

The sampling universe (entire site area comprised of three strata) was divided into 518 sample units, each five by five meters in size, from which the subsequent sample units were selected. Choosing sample units from the three strata involved random selection of one sample unit from each stratum and application of standard intervals which, when added in succession to the randomly chosen sample frames, ensured dispersed sampling coverage. Standard intervals were derived by dividing the sample population of each stratum by the number of sample units representing the desired sampling percentage. Units sampled during Phases II and III are illustrated in Figure 8.

Stratum C was not sampled in the grid cell manner for the surface collection program. Prefield inventory showed that few surface elements were present in this stratum (see Figure 5) and that expectations of subsurface cultural deposits--if present--would most likely not be mirrored in the surface distribution. However, Stratum C was sampled in a controlled random fashion with regard to surface scrapes and test unit excavations.

Phase II, intended to implement the controlled sample program and test Phase I findings concerning observations on site disturbance and distribution, was undertaken from March 5 to March 16, 1981, with a total of 298 expended person-hours by a crew of three to five people. Prior to fieldwork, a new datum was established and baselines were oriented from true north in perpendicular axes. Positions of the various sample units were determined from the new datum. The Phase II field study consisted of inspection, mapping, and collection of thirty-eight surface collection sample grids (950 square meters), three surface scrape sample units (75 square meters), and four test excavation units (8.5 square meters) (Table 2). Sample units drawn for the Phase II program are presented in Figures 9-11. Following are details of the various sampling methods employed during the project (see Appendix A for standard documentation forms).

<u>Surface Collection Grid</u>. Surface collection grids--five- by five-meter areas--were collected by two-person crews and mapped at a scale of 2 cm = 1 m on metric graph paper. A photograph was taken of each grid prior to collection and markers were placed at one-meter intervals around the perimeter to aid in surface plotting. Cultural materials noted within each grid were identified, plotted, collected, and placed in a plastic bag identified for each unit. Fire-affected rocks were bagged separately because of potential damage to smaller, more fragile artifacts. Primary vegetation and disturbances such as off-road vehicle tracks or rodent activity were also plotted on the sketch map. Uniform coding was used by crew members to simplify later interpretation of the grid and collected materials.

<u>Surface Scrape</u>. Surface scrape units consisted of five- by five-meter grids divided into four 6.25-meter-square quadrants for ease in fieldwork implementation. Loose surface sand from each quadrant was scraped down to a compact layer with a whisk broom, transferred to twenty-five-cubic-centimeter boxes, and screened through one-eighth-inch mesh. Cultural materials were retrieved, bagged, and marked appropriately. A twelve-centimeter-square box of screened sand was collected from each

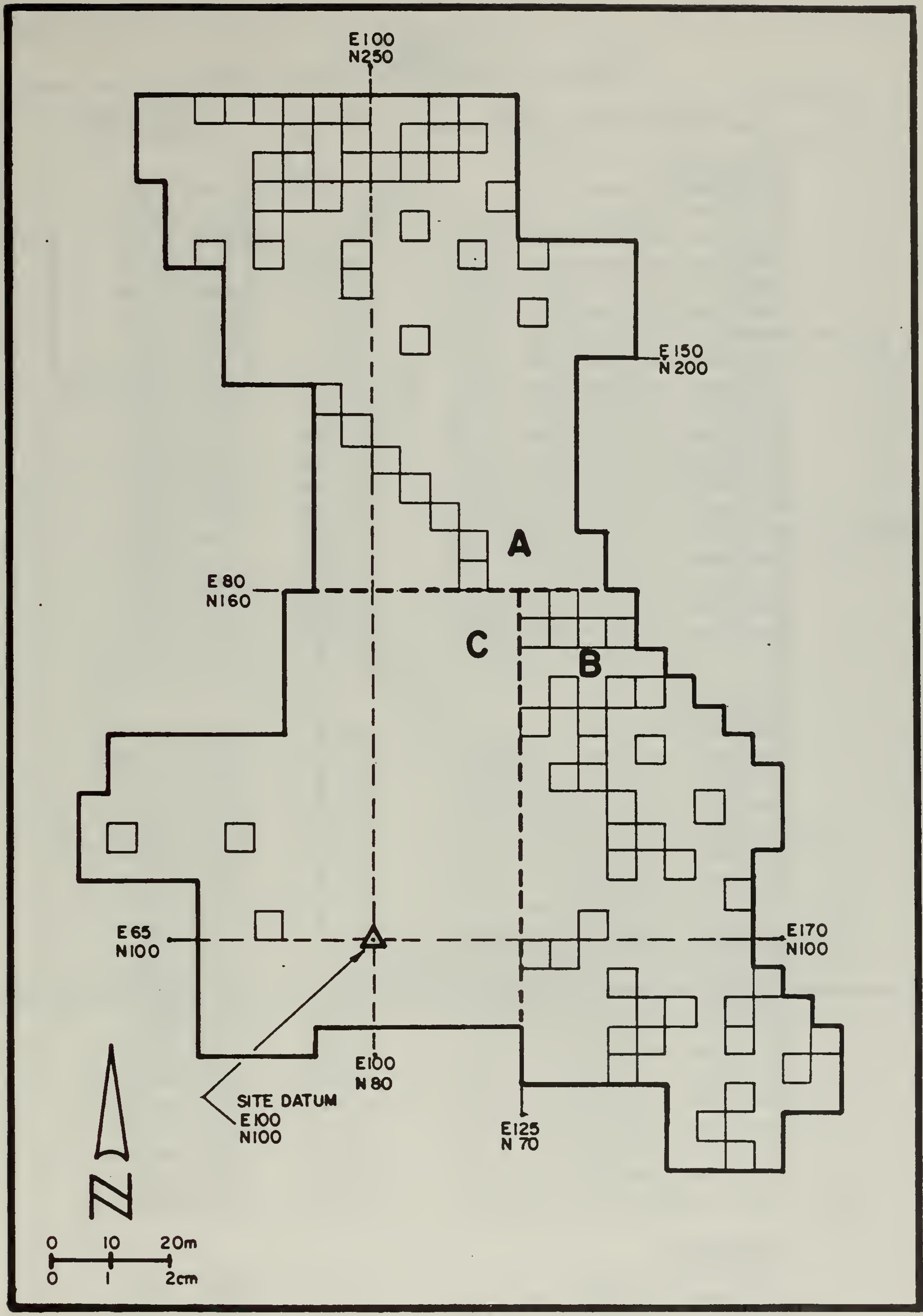


Figure 8

Sample units examined during Phases II and III of the current investigation. Figures and tables to follow present unit coordinates and phase-by-phase breakout.

Table 2
PHASE II FIELDWORK SAMPLE UNITS

Sample Unit Type	Grid	Coordinates
STRATUM A		
Surface scrape	A-174	110E/170N
Surface collection grid	A-4	075E/240N
Surface collection grid	A-19	085E/230N
Surface collection grid	A-24	110E/235N
Surface collection grid	A-31	080E/230N
Surface collection grid	A-34	095E/230N
Surface collection grid	A-44	085E/225N
Surface collection grid	A-55	080E/220N
Surface collection grid	A-74	115E/215N
Surface collection grid	A-84	095E/110N
Surface collection grid	A-104	125E/205N
Surface collection grid	A-114	105E/200N
Surface collection grid	A-134	090E/190N
Surface collection grid	A-144	095E/185N
Surface collection grid	A-154	100E/180N
Surface collection grid	A-164	105E/175N
Surface collection grid	A-174	110E/170N
Surface collection grid	A-184	115E/165N
Surface collection grid	A-194	115E/160N
Test excavation unit IV	A-31	082E/231N
STRATUM B		
Surface scrape	B-86	125E/095N
Surface collection grid	B-7	135E/150N
Surface collection grid	B-17	140E/140N
Surface collection grid	B-20	125E/135N
Surface collection grid	B-37	135E/125N
Surface collection grid	B-47	140E/120N
Surface collection grid	B-57	145E/115N
Surface collection grid	B-67	150E/110N
Surface collection grid	B-77	160E/100N
Surface collection grid	B-86	125E/095N
Surface collection grid	B-87	130E/095N
Surface collection grid	B-97	140E/090N
Surface collection grid	B-107	145E/085N
Surface collection grid	B-117	145E/080N
Surface collection grid	B-120	160E/080N
Surface collection grid	B-127	140E/075N
Surface collection grid	B-137	160E/070N
Surface collection grid	B-147	160E/060N
Test excavation unit I	B-97	140E/090N
Test excavation unit II	B-120	160E/080N
STRATUM C		
Surface scrape	C-127	080E/100N
Surface collection grid	C-85	055E/115N
Surface collection grid	C-89	075E/115N
Surface collection grid	C-127	080E/100N
Test excavation unit III	C-85	055E/115N

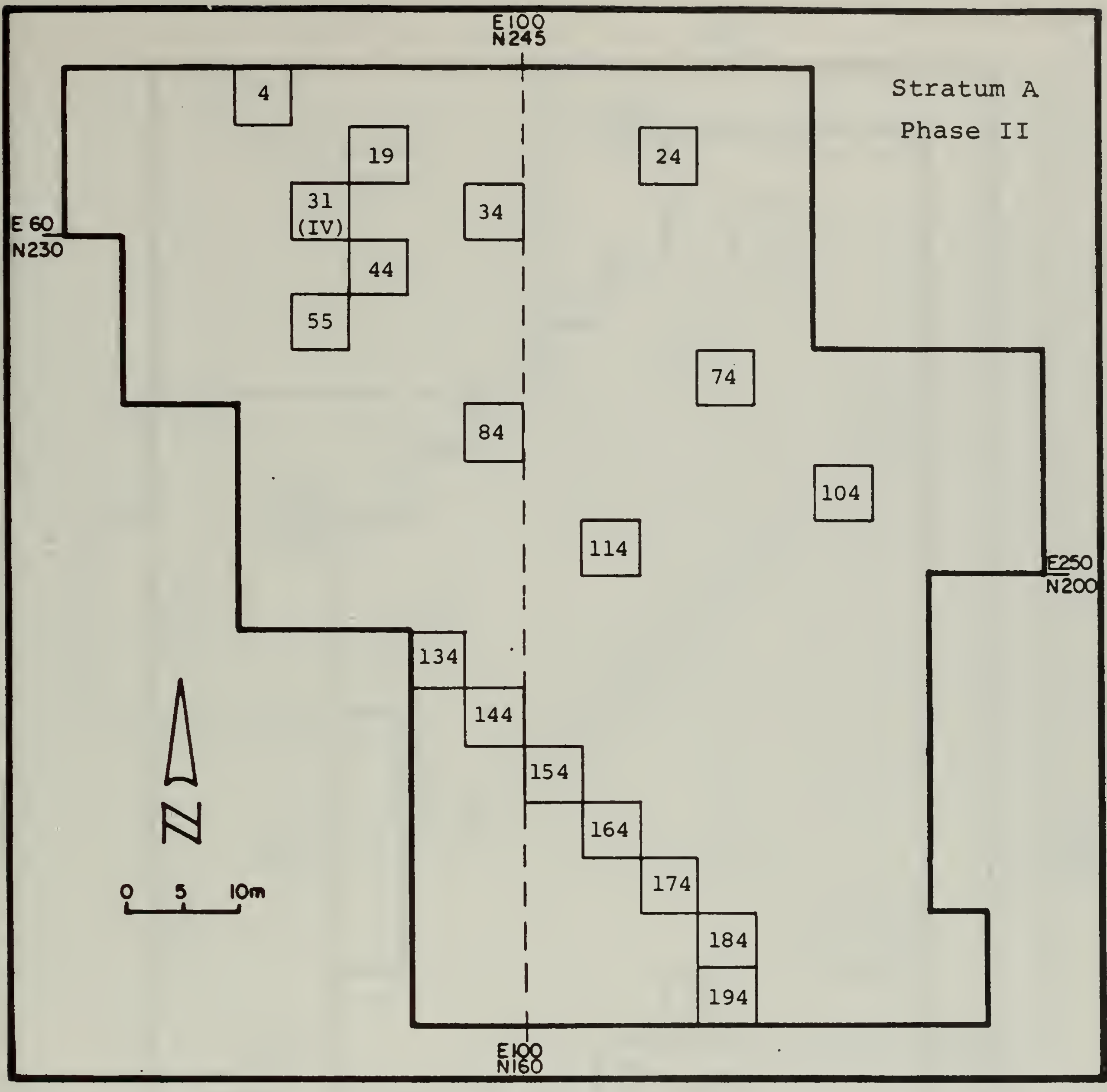


Figure 9

Surface collection grids examined in Stratum A during Phase II. Roman numerals indicate test excavation unit within that grid. Grid A-174 was also surface scraped.

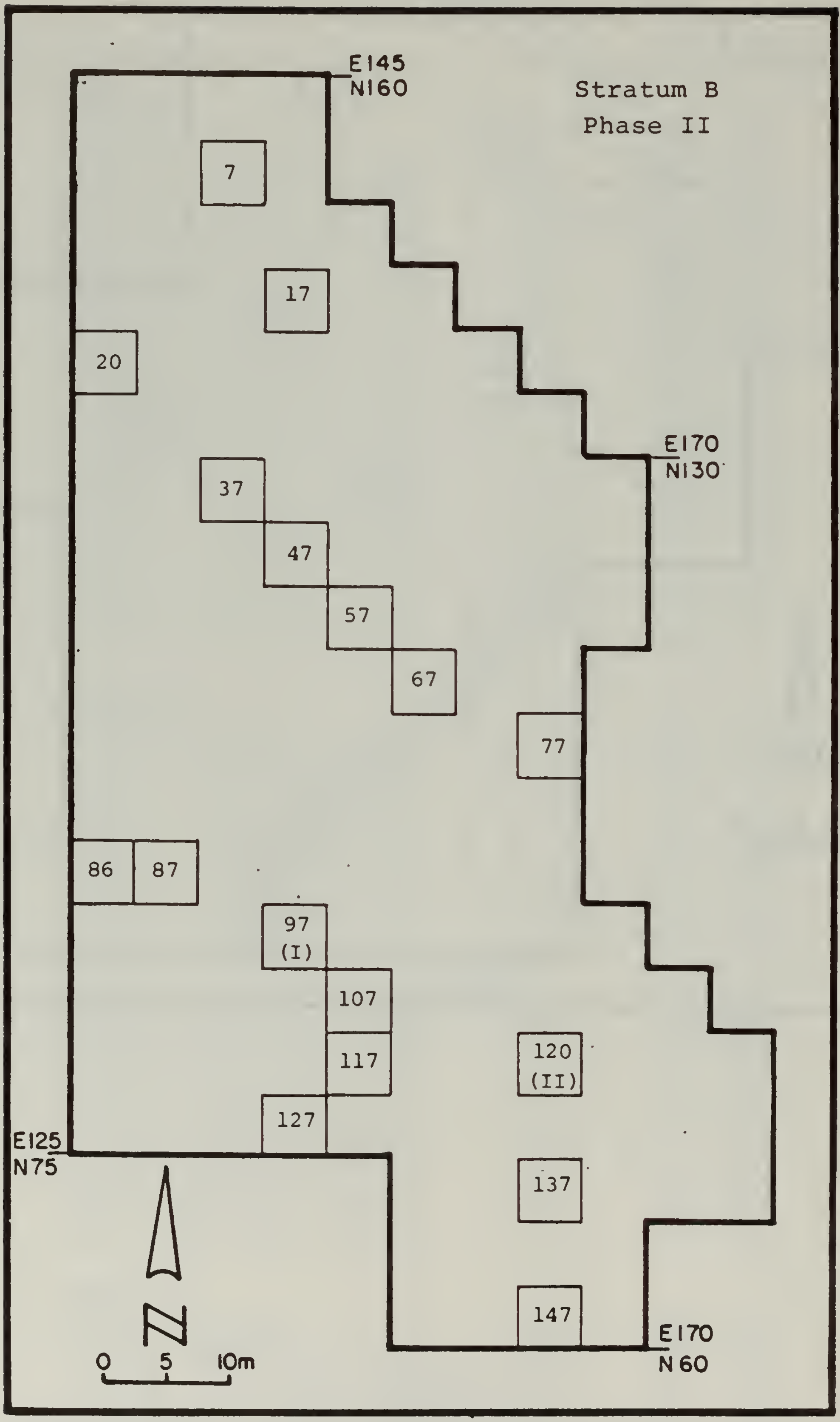


Figure 10

Surface collection grids examined in Stratum B during Phase II. Roman numerals indicate test excavation unit within that grid. Grid B-86 was also surface scraped.

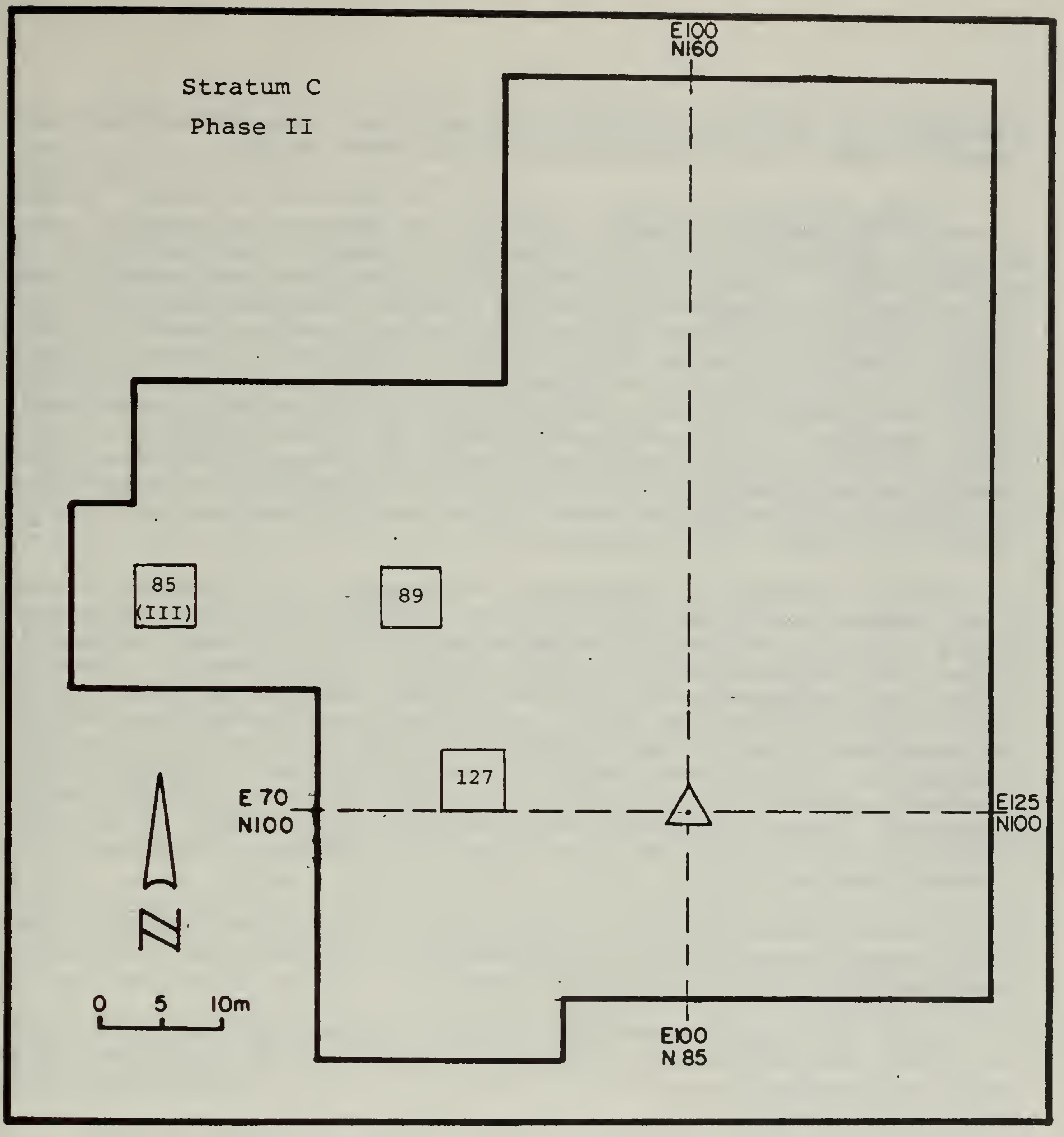


Figure 11

Surface collection grids examined in Stratum C during Phase II. Roman numerals indicate test excavation unit within that grid. Grid C-127 was also surface scraped.

quadrant for further laboratory processing, and photographs were taken of field work activities and completed units.

Test Excavation Unit. Each test excavation unit, except where noted below, measured two square meters in surface area. Specific configurations of individual units varied depending on physiographic features and expected subsurface deposition (see individual unit discussions below). After triangulating the test unit position (southwest corner), markers were placed at one-meter intervals around the perimeter of the unit to aid in plotting in situ artifacts and features. With only one exception, excavation proceeded in arbitrary levels following natural surface contours. Units were excavated in ten-centimeter levels with implements such as trowel, whisk broom, and shovel. With exception of specific units noted below, subsurface excavation techniques and equipment were those standard for archaeological investigations.

In an effort to determine volumetric differences between site areas, soil was measured by twenty-five-cubic-centimeter boxes and then screened through one-eighth-inch mesh. All cultural materials were recovered, bagged, and labeled appropriately, and archaeological excavation plot sheets and level sheets were completed for each level. A fifteen-cubic-centimeter box of screened soil was retrieved from each level for later evaluation. A sidewall profile was drawn of each unit, the unit was photographed, and a column of soil was collected at five-centimeter intervals from a sidewall for analysis. The units were backfilled and, as close as possible, the area was returned to its natural state.

Unit I measured one by two meters and was excavated in ten-centimeter levels to fifty centimeters. The unit was placed in a sand hummock located within Stratum B.

Unit II measured one-half by four meters and was also excavated in ten-centimeter increments to thirty centimeters. This unit was located in an area of heavy off-road vehicle disturbance within Stratum B.

Unit III was a stratigraphic profile test trench, one-half by five meters in size, designed to yield a sidewall profile and soil sample. As subsurface depths were measured from a vertical datum and did not follow surface contours, the southwest portion of the trench was excavated to 37 centimeters and the southeast portion to 180 centimeters, bringing the floor of the unit to a generally leveled contour. Soils were excavated with a shovel and processed through one-eighth-inch screen to a depth of thirty-five centimeters; soils below this level were sample screened.

Unit IV was an L-shaped unit measuring one-half meter wide and two and one-half and two meters long along the east-west and north-south axes. The unit was excavated in ten-centimeter increments to fifty centimeters.

To provide a properly oriented (i.e., true north) baseline for the current fieldwork, it was necessary to abandon Sutton's (1981) datum--set for a baseline of 28 degrees west of true north--and reestablish an accurate control point and baseline. A posthole test was excavated during Phase II at the selected datum point located in Stratum C to provide a suitable point to permanently secure the datum and to prevent the loss of possible subsurface cultural material from placement of the datum. The posthole was excavated at ten-centimeter levels and extracted soils were screened through one-eighth-inch mesh. Diameter of the hole was sixteen centimeters. The test was discontinued at fifty-three centimeters due to a lack of cultural material and was filled with cement to secure the permanent data chip.

Phase III was intended to validate earlier findings from Phases I and II and recover as much data as possible within the parameters of contract requirements. Phase II resulted in only a limited yield from surface scrapes, and evidence of cultural deposition (if any) in Stratum C could not be identified. Therefore, time and energy were conserved and the surface scrape sample unit type was eliminated and substituted with additional surface collection grids. Also, all Phase III fieldwork was focused in Strata A and B, and several of the test excavation units were reduced in overall size to maximize data yield within the existing contract constraints. Based on the previous fieldwork results and project requirements and subsequent adjustments, thirty-six surface collection grids (900 square meters) and eight test excavation units (12 square meters) were completed during Phase III (Table 3, Figures 12 and 13). Fieldwork began on April 2 and concluded on April 8, 1981, requiring 293 person-hours by four to six people in two-person crews. All fieldwork methods, except where noted below, were as described above for Phase II. Specific unit configurations, depths, and additional tests are outlined below.

Unit V measured one-half by four meters and was excavated in ten-centimeter increments to fifty centimeters. Unit VI was an L-shaped unit, measuring one-half meter wide by two and two and one-half meters long. The unit was excavated in ten-centimeter increments to seventy centimeters. Unit VII was one-half by four meters in size and was excavated in ten-centimeter levels to forty centimeters.

Unit VIII was also L-shaped, measuring one-half meter wide and two and two and one-half meters long. It was excavated in the following increments: 0-5, 5-10, 10-20, and 20-30 centimeters. Additional subsurface testing included a 0-30

Table 3
PHASE III FIELDWORK SAMPLE UNITS

Sample Unit Type	Grid	Coordinates
STRATUM A		
Surface collection grid	A-3	070E/240N
Surface collection grid	A-5	080E/240N
Surface collection grid	A-6	085E/240N
Surface collection grid	A-7	090E/240N
Surface collection grid	A-11	110E/240N
Surface collection grid	A-21	095E/235N
Surface collection grid	A-23	105E/235N
Surface collection grid	A-25	115E/235N
Surface collection grid	A-32	085E/230N
Surface collection grid	A-35	100E/230N
Surface collection grid	A-36	105E/230N
Surface collection grid	A-43	080E/225N
Surface collection grid	A-51	120E/225N
Surface collection grid	A-60	105E/220N
Surface collection grid	A-65	070E/115N
Surface collection grid	A-67	080E/215N
Surface collection grid	A-70	095E/215N
Surface collection grid	A-76	125E/215N
Test excavation unit V	A-8	095E/242N
Test excavation unit VI	A-45	091E/228N
Test excavation unit VII	A-37	110E/230N
STRATUM B		
Surface collection grid	B-2	130E/155N
Surface collection grid	B-5	125E/130N
Surface collection grid	B-6	130E/150N
Surface collection grid	B-8	140E/150N
Surface collection grid	B-15	130E/140N
Surface collection grid	B-18	140E/100N
Surface collection grid	B-22	135E/135N
Surface collection grid	B-29	135E/130N
Surface collection grid	B-31	145E/130N
Surface collection grid	B-36	130E/125N
Surface collection grid	B-56	140E/115N
Surface collection grid	B-80	135E/100N
Surface collection grid	B-102	165E/090N
Surface collection grid	B-108	150E/280N
Surface collection grid	B-116	140E/080N
Surface collection grid	B-123	175E/080N
Surface collection grid	B-133	170E/075N
Surface collection grid	B-142	155E/065N
Test excavation unit VIII	B-109, B-110	159.5E/085.5N
Test excavation unit IX	B-50	156E/123N
Test excavation unit X	B-18	148E/140N
Test excavation unit XI	B-6	132E/151N
Test excavation unit XII	B-65	140.5E/113N

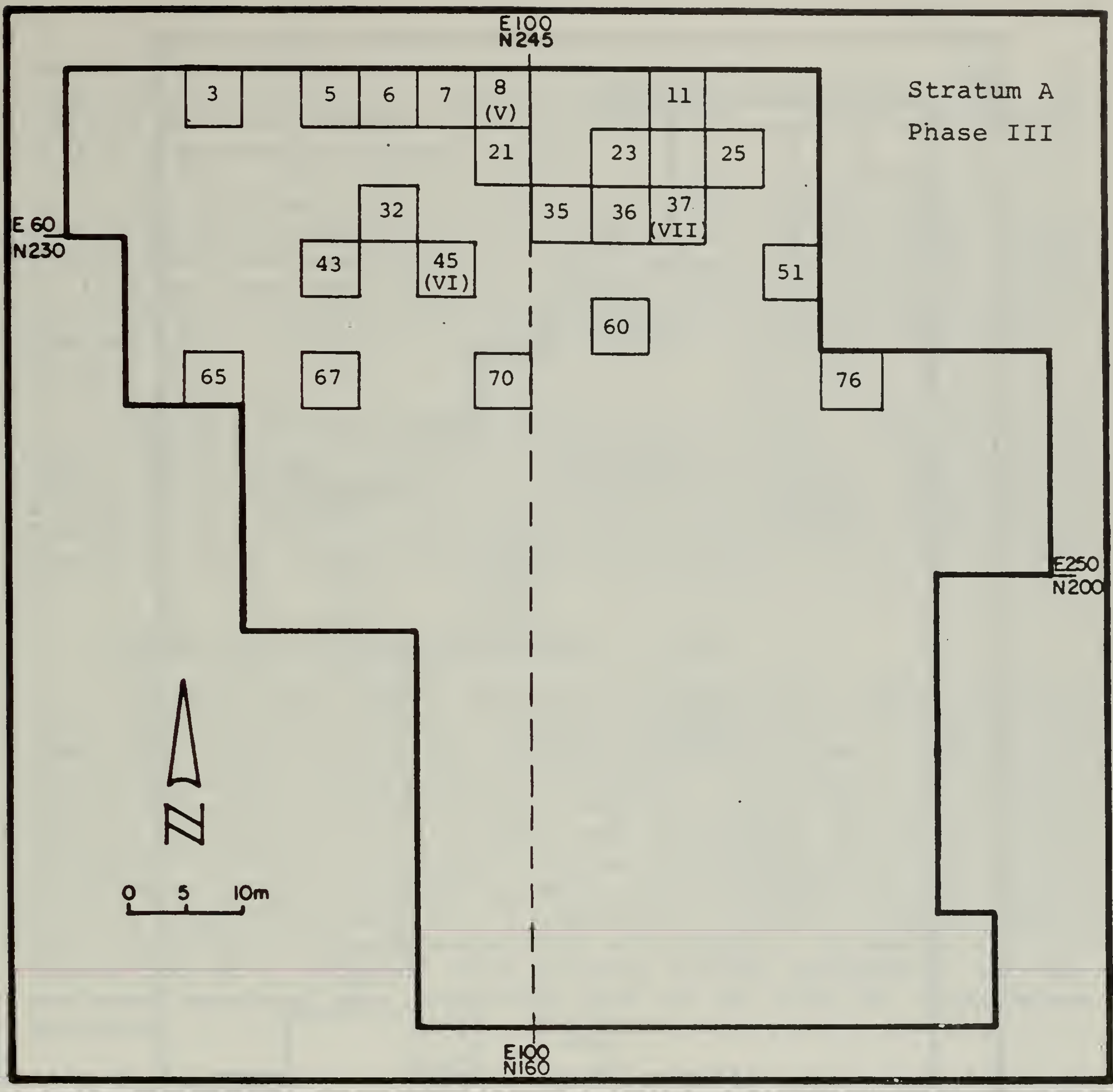


Figure 12

Surface collection grids examined in Stratum A during Phase III. Roman numerals indicate test excavation unit within that grid.

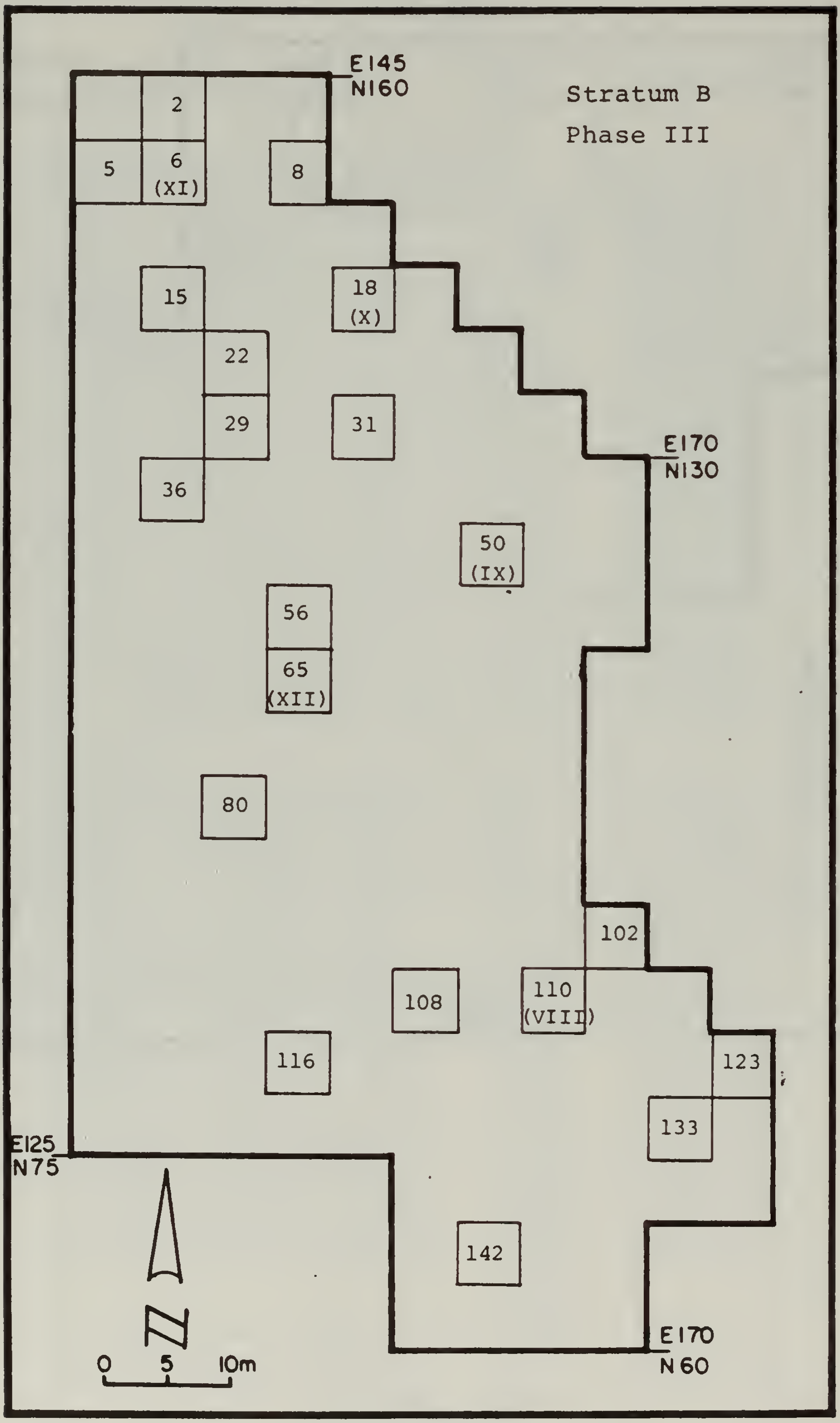


Figure 13

Surface collection grids examined in Stratum B during Phase III. Roman numerals indicate test excavation unit within that grid.

centimeters, fifty-centimeter-square sample removed along the west wall for a charcoal sample and a one-half by one meter area in the northwest corner excavated from 30 to 150 centimeters within a portion of a sand hummock.

Unit IX measured one-half by two meters and was excavated in the following increments: 0-5, 5-10, 10-20, 20-30, 30-40, 40-50, 50-60, and 60-90 centimeters. Unit X was one-half by two meters in size and was excavated in ten-centimeter increments to thirty centimeters. A fifty- by fifty-centimeter portion (west end) of the unit was completed in ten-centimeter levels to fifty centimeters.

Unit XI, measuring one-half by two meters, was excavated over a portion of a potential fire hearth. The unit was excavated in two levels, from 0-5 and 5-20 centimeters. The central one-half- by one-meter area was then excavated from 20-30 centimeters. Unit XII, also one-half by two meters, was excavated from 0-5, 5-10, 10-20, and 20-100 centimeters.

CATALOGING AND CLASSIFICATION

Following the field effort, all cultural materials were taken to the Cornerstone Research laboratory for stabilization, cataloging, and analysis. Stabilization involved washing the materials (when appropriate) and marking each artifact or artifact group with the site number, unit of collection, and catalog number. A classification scheme was applied to assign materials to general classes. Catalog cards were used to record a variety of descriptive information for each class of material (see Appendix A). Basic descriptive information included weight, dimensions, and various class-specific attributes. A master catalog consisting of a tally of each catalog number assignment and associated material was generated and is on file at Cornerstone Research.

The approach to classification entailed assignment of materials to very general yet well-defined classes and subclasses. At that point, further classes were not created and materials were analyzed in terms of attributes relevant to that class. In contrast with application of a hierarchical typological system, attribute analysis permits a great deal of flexibility and organizes data in such a way that imaginative comparisons can be made between attributes and classes and between attributes and contextual associations.

The first step of classification entailed assignment of materials to one of two classes--artifact or ecofact. An artifact is considered any object to which people have added one or more artificial attributes in accordance with their technological customs. Thus, an artifact is any object that has been altered either through use (e.g., unflaked hammerstone) or through manufacture (projectile point). The class "ecofact" includes any material or residue associated with an archaeological context that does not have evidence of manufacture or use. In essence, ecofact refers to all natural objects that may have importance by virtue of association with a cultural resource, such as bone, shell, seeds, pollen, natural stone, and fire-affected rock.

The second classification step involved assignment of artifacts and ecofacts to classes according to general composition--organic or inorganic. This distinction is based on the assumption that different technological processes are necessary to modify or use items of different composition. Following this step, all ecofacts were further classed according to the standards of the biological and geological sciences (i.e., by rock type, genera, and species).

The third step in classification involved classing each artifact according to the technological process(s) applied to form and/or modify them. These basic processes include flaking and grinding. During the fourth step, artifacts were classed as a tool or non-tool. This step, of course, is inferential and assumes that patterns of attribute occurrence related to form and edge damage can be recognized. Although more detailed attribute analysis is necessary to separate "informal" tools from non-tools, this step sets up materials for more careful examination during later analysis.

At the fifth step of classification tools and non-tools were assigned to tool and non-tool subclasses. The five-step general classification scheme is depicted in Figure 14. Definitions for flaked lithic and groundstone subclasses are provided below.

<u>Flake</u>. Flakes are any flaked lithic non-tool that has one positive bulb of "percussion" and a striking platform.

<u>Shatter/Debitage</u>. This class includes all rock specimens that lack a bulb of percussion and/or striking platform, yet appear to have been generated through the application of flaking technology. Partial flakes are included in this class.

<u>Core</u>. A core is characterized by one or more negative flake scars and one or more positive striking platforms.

<u>Biface/Projectile Point</u>. This is a combined class that includes all bifacially flaked lithic specimens that are roughly ovoid or triangular in shape. A projectile point is a specialized form of biface that is considered a finished tool and is symmetrically triangular in shape, roughly lenticular in cross section, and less than ten grams in weight.

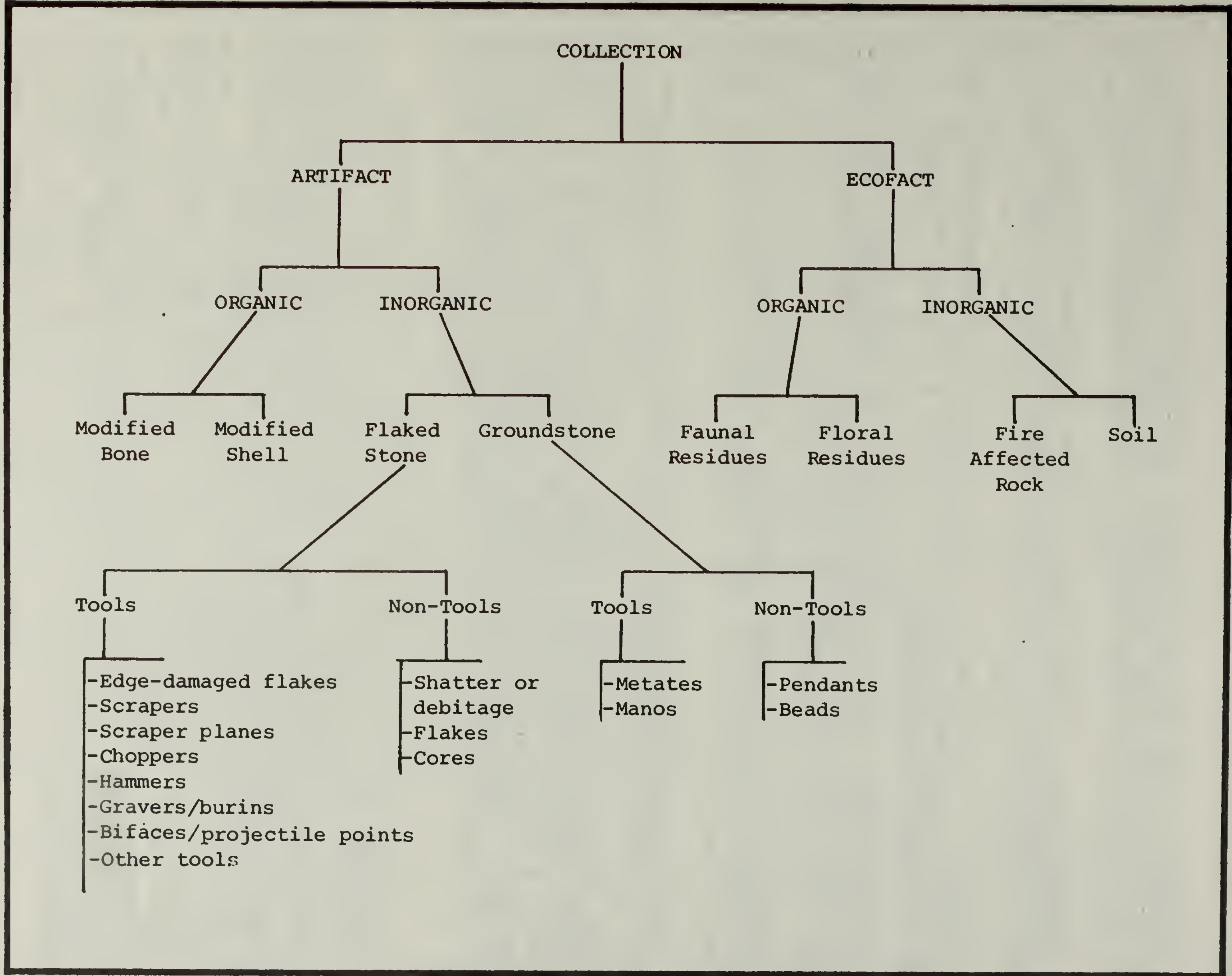


Figure 14

Hierarchy of general classification system

Edge-damaged Flake. This class includes all non-retouched flakes that have one or more edge damage attributes suggesting use.

Scraper. This class includes all flake- or split cobble-based specimens that have systematic unifacial retouch, at least one planate face, and edge damage attributes suggestive of use.

Scraper Plane. This class includes all those specimens that have characteristics of a scraper in addition to wear on the planate surface.

Chopper. This class is comprised of all systematically retouched tool specimens that have bifacial step flaking as the dominant form of edge damage.

Graver/Burin. This class includes all specimens that have one or more points or features with edge damage suggestive of intense use (i.e., compressed microsteps).

Hammer. All specimens, retouched or unretouched, that have edge of surface crushing as the dominant form of edge damage are classed as hammers.

Other Flaked Lithic Tools. This class includes all specimens not classifiable above.

Groundstone. Two basic classes of groundstone tools (both portable) were recognized for the current study--manos and metates. A mano is a cobble-based, hand-held tool with evidence of use wear on at least one flat to convex working face. A metate is a portable to semi-portable milling platform with at least one flat to concave working face showing evidence of use wear.

ANALYSIS

Cataloging and the first stages of analysis occur concurrently when basic descriptive data is observed and recorded. This section provides a description of the methods that were applied to analyze the materials on a class-by-class basis.

Flaked Lithic Artifacts. Three classes of flaked lithic artifacts were recognized--flaking waste, cores, and flaked lithic tools. All of these have at least one attribute in common, composition. For this analysis a general rock type typology was applied to the materials. Definitions for these types are provided below.

Rhyolite: With a relatively light-colored groundmass, rhyolite occurs locally in such colors as green, grey, red-brown, purple, and tan. In porphyritic varieties, the phenocrysts are quartz and feldspar. Nonporphyritic varieties may be difficult to distinguish from andesite, as they may display similar colors.

Andesite: Intermediate in color between rhyolite and basalt, porphyritic varieties have no quartz phenocrysts. Nonporphyritic varieties tend to have a sugary texture and mottled appearance.

Basalt: This stone is relatively dark in color, with black and grey being common. Basalts may have a greenish tinge and there may be phenocrysts of a green mineral, olivine, in the groundmass.

Felsite: This is a catchall term used to designate any volcanic rock which is not readily identifiable. Chemically, felsite ranges from rhyolite to andesite, but the term has come to focus on any groundmass of rather fine-textured, green to greenish brown, volcanic material which has a high quality of conchoidal fracture. Some felsites are very fine grained with a waxy to vitreous luster not unlike that of chalcedony. Other felsites lack such luster, but still retain a conchoidal fracture. Felsite as classed here does not occur in porphyritic varieties.

Quartzite: This metamorphic rock is distinguished by a sugary texture, commonly a vitreous luster, and a less well-developed fracture than many other rock types exploited by prehistoric peoples. Quartzite essentially consists of cemented grains of quartz and can be distinguished from sandstone in that when quartzite is fractured, the fracture passes through the constituent grains. Quartzites are tough and dense, frequently found in cobble float or beds, and may be white, grey, tan, red, brown, and black in color.

Chalcedony: This category includes specimens which might otherwise be known as agate, jasper, chapanite, and chert and is recognized by its fine-grained texture, waxy to vitreous luster, and quality of conchoidal fracture. Chalcedony is a noncrystalline variety of quartz for which color is a nondiagnostic attribute. Chalcedonies reported from local prehistoric resource sites vary in size, shape, and color, ranging from translucent, white, pink, red, brown, and tan to innumerable combinations of some or all of the spectrum. All petrified woods, for convenience, are also included in this type.

Obsidian: This natural glass has the highest quality of conchoidal fracture among those listed and is distinguished by its dark grey to greyish blue and black color, as well as its vitreous luster. Obsidian may occur with or without phenocrysts and is the chemical equivalent of rhyolite.

Flaking Waste. This class of material was cataloged by unit of collection. Preliminary analysis involved the recording of count, weight, and rock type. Flaking waste was then sorted into two further subclasses--technical flakes and shatter. Technical flakes were analyzed individually in order to derive insights into flaking techniques. Technical flake analysis included obtaining dimensions and individual weight and recording variation in five technically related attributes: mass form, nature of the termination (type), orientation of flake scars on the dorsal face, condition of the platform, and nature of platform preparation (see Appendix A).

Core. Weight, dimensions, and composition (rock type) were recorded for all cores. Specific core observations were made regarding patterning and number of flake removals. Patterning was assessed in terms of six categories: 1-amorphous, 2-sinuous or crested, 3-serrated or denticulated, 4-unidirectional, 5-bidirectional, and 6-multidirectional. Observations regarding patterning aid in determination of how flakes were being removed from the standpoint of planning flake removals and orienting the platform for flake removal.

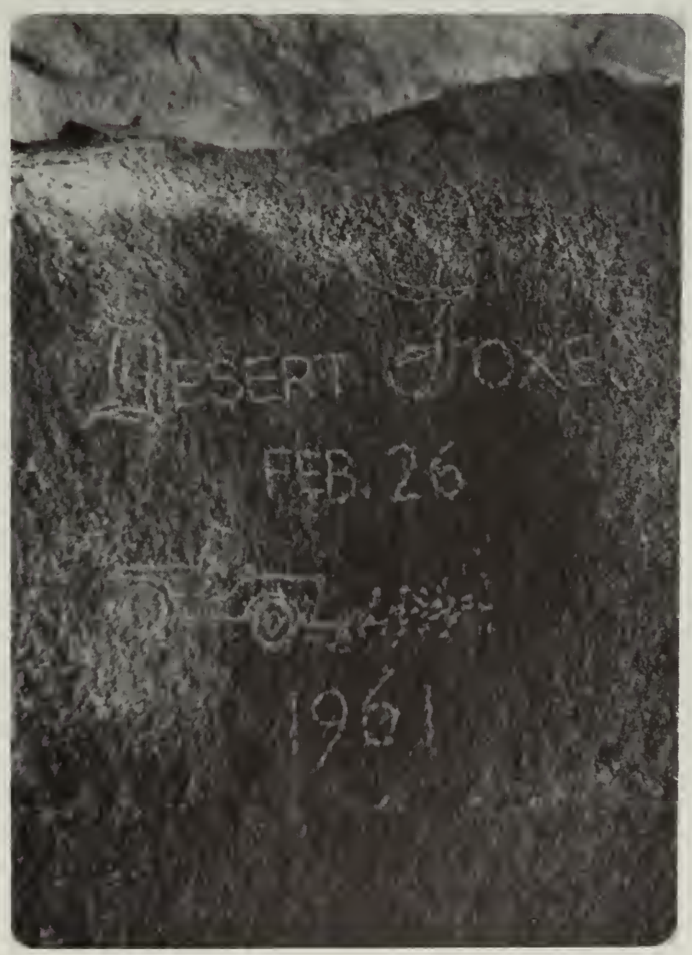
A count of flake removals was made in order to assess the formality of the core. It is assumed that a specimen with only one or two flake removals may represent testing of the raw material rather than use--the greater the number of flake removals, the more likely that the material was considered desirable and was actually exploited.

Flaked and Groundstone Tools. As with cores, lithic tools were weighed and dimensions obtained. These were also assigned to appropriate subclasses. Descriptive information concerning various aspects of each artifact was then entered on the catalog card.

Miscellaneous Artifacts. Weights, counts, and dimensions were obtained for all these miscellaneous materials and descriptive information was recorded as appropriate to the item being cataloged. Miscellaneous artifacts include all artifacts that cannot be classed as either flaked or groundstone artifacts. In this examination, this class is comprised only of ceramic shards.

Fire-affected Rock. A special study of fire-affected rock was performed in order to derive insights into their function. Counts, weights, and information on composition were obtained. Based on the assumption that differential effects will occur in a reducing and oxidizing atmosphere, the specimens were analyzed to determine whether thermal impact occurred in an oxidizing atmosphere, characteristic of a hearth structure, or a reducing atmosphere, characteristic of a subsurface roasting pit structure. This determination was made on the basis of the appearance of the internal structure of the fire-affected rock. Rock fired in an oxidizing atmosphere tends to be internally reddened, while rock fired in a reducing atmosphere tends to be internally blackened. Determinations were made by breaking and examining the interior of the fire-affected rock.

Faunal Material. All faunal remains were counted, weighed, and prepared for specialized analysis during the cataloging process. The analysis was designed to determine the species being exploited, their relative frequencies, butchering and cooking techniques, and, if possible, season of occupation. The materials were submitted to Dr. Lois Lippold for specialized analysis. The results of her study and a description of methods applied are included in a following section.



SECTION V

FINDINGS AND RESULTS

Examination of site SBr-3801 presented an opportunity to test and assess the value of this archaeological site while performing a data recovery program meant to mitigate ongoing direct impacts resulting from recreational usage of the Mud Hills region. Ultimately, fieldwork performed here included mapping and surface collection of seventy-four sample grids (1,850 square meters), screening and artifact recovery from three surface scrapes (75 square meters), and excavation and documentation of twelve test excavation units (20.5 square meters). Materials and information recovered from these efforts were stabilized and then subjected to analysis, the findings and results of which are reported below.

As discussed in preceding sections of this report (Sections III and IV), the current study was conducted in three phases. This procedure was used to allow continuing refinement in the process of analysis and to focus inspection toward areas where cultural materials were most likely to occur in good context. Data assembled in each phase were assessed individually and in combination as fieldwork proceeded and were subjected to reconsideration and interpretation during the analysis process. In order to provide the reader with an immediate and detailed reference of these data, findings from all field aspects are presented in table form. Tables 4, 5, and 6 are descriptive summaries of all basic information gathered from surface collection grids (including data from the surface scrape program), and Tables 7 through 18 summarize results of test unit excavations. These findings are discussed below and returned to again in Section VI.

SITE STRUCTURE

Site SBr-3801 occurs in a sandy matrix of consolidated and unconsolidated dune sands overlying Mesozoic granitic rocks. Cultural residues are found atop and within the dune sand strata to depths exceeding sixty centimeters (see Appendix D). Erosive activity (e.g., blowouts, off-road vehicle use) appears to have an influence on the pattern of concentration of surface cultural materials in some portions of the site, as evidenced by the greater frequency of surface materials in zones where erosion is most notable. As these sandy soils deflate, artifacts and other cultural debris are swept away along the newly forming surface. Most such deflated areas tend to be associated with heavy off-road vehicle disturbance. Natural disturbance includes shifting dune sands, rodent and insect burrowing, and root growth.

Table 4
SURFACE COLLECTION GRID SUMMARIES - STRATUM A

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid A-3 070E/240N Phase III	*Hilaria rigida* *Ephedra nevadensis* *Oryzopsis hymenoides* 2 unidentified species	No sample taken	2 edge-damaged flakes 1 quartzite cobble fragment	Rodent activity
Grid A-4 075E/240N Phase II	*Hilaria rigida* *Ephedra nevadensis* *Larrea divaricata*	10 YR 6/4	5 flakes	Rodent activity
Grid A-5 080E/240N Phase III	*Hilaria rigida* *Ephedra nevadensis* 2 unidentified species	No sample taken	5 flakes 1 quartzite cobble fragment	Rodent activity
Grid A-6 085E/240N Phase III	*Hilaria rigida* 1 unidentified species	No sample taken	None	Calcite root cast fragment
Grid A-7 090E/240N Phase III	*Hilaria rigida* *Franseria dumosa* 1 unidentified species	No sample taken	None	
Grid A-11 110E/240N Phase III	*Hilaria rigida* *Oryzopsis hymenoides* 3 unidentified species	No sample taken	None	ORV road
Grid A-19 085E/230N Phase II	*Hilaria rigida* *Yucca brevifolia* *Oryzopsis hymenoides*	10 YR 5/3	12 flakes 2 fire-affected rocks 2 faunal fragments	Rodent activity
Grid A-21 095E/235N Phase III	*Franseria dumosa* *Oryzopsis hymenoides*	No sample taken	1 fire-affected rock	Calcite root cast fragment

Table 4
SURFACE COLLECTION GRID SUMMARIES - STRATUM A
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid A-23 105E/235N Phase III	_Hilaria rigida_ _Ephedra nevadensis_ _Oryzopsis hymenoides_ 1 unidentified species	No sample taken	2 flakes 1 possible metate fragment 3 fire-affected rocks	ORV road
Grid A-24 110E/235N Phase II	_Hilaria rigida_	10 YR 6/4	7 flakes 1 retouched flake	ORV road, calcite deposits
Grid A-25 115E/135N Phase III	_Hilaria rigida_ _Oryzopsis hymenoides_ _Yucca brevifolia_	No sample taken	1 flake 3 faunal fragments	Calcite root cast fragment
Grid A-31 080E/230N Phase II	_Hilaria rigida_	10 YR 6/3	22 flakes 1 projectile point base 1 fire-affected rock 7 faunal fragments	Calcite root cast fragment, 1 burnt rodent tooth, location of test unit IV
Grid A-32 085E/230N Phase III	_Hilaria rigida_ _Yucca brevifolia_ 1 unidentified species	No sample taken	1 quartzite fire-affected rock fragment	
Grid-A-34 095E/230N Phase II	_Hilaria rigida_ 3 unidentified species	10 YR 6/3	3 flakes	Rodent activity
Grid A-35 100E/230N Phase III	_Hilaria rigida_ _Oryzopsis hymenoides_ 1 unidentified species	No sample taken	4 flakes	
Grid A-36 105E/230N Phase III	_Ephedra nevadensis_ _Oryzopsis hymenoides_ 2 unidentified species	No sample taken	8 flakes 1 milling feature	2 calcite root cast fragments, ORV road

Table 4
SURFACE COLLECTION GRID SUMMARIES - STRATUM A
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid A-43 080E/225N Phase III	*Hilaria rigida* *Ephedra nevadensis* 1 unidentified species	No sample taken	1 flake	2 calcite root cast fragments
Grid A-44 085E/225N Phase II	*Hilaria rigida* *Franseria dumosa*	10 YR 5/3	27 flakes 2 cobble fragments 4 faunal fragments	Rodent activity
Grid A-51 120E/225N Phase III	*Hilaria rigida* *Ephedra nevadensis* *Yucca brevifolia* 3 unidentified species	No sample taken	None	
Grid A-54 080E/220N Phase II	*Hilaria rigida* *Ephedra nevadensis* 1 unidentified species	10 YR 6/3	20 flakes 2 faunal fragments	Rodent activity
Grid A-60 105E/220N Phase III	*Hilaria rigida* 3 unidentified species	No sample taken	2 flakes	
Grid A-65 070E/115N Phase III	*Franseria dumosa* *Larrea divaricata* *Ephedra nevadensis*	No sample taken	None	
Grid A-67 080E/215N Phase III	*Hilaria rigida* 1 unidentified species	No sample taken	4 flakes 1 cobble fragment	2 calcite root cast fragments
Grid A-70 090E/215N Phase III	*Hilaria rigida* 2 unidentified species	No sample taken	None	South-trending slope

Table 4
SURFACE COLLECTION GRID SUMMARIES - STRATUM A
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid A-74 115E/215N Phase II	Hilaria rigida Oryzopsis hymenoides	10 YR 6/4	7 flakes 2 faunal fragments	ORV trail
Grid A-76 125E/215N Phase III	Hilaria rigida Ephedra nevadensis 4 unidentified species	No sample taken	1 flake	
Grid A-84 095E/110N Phase II	Hilaria rigida Oryzopsis hymenoides 1 unidentified species	10 YR 6/4	4 flakes	
Grid A-104 125E/205N Phase II	Hilaria rigida Ephedra nevadensis 2 unidentified species	10 YR 6/4	4 flakes 3 faunal fragments	
Grid A-114 105E/200N Phase II	Hilaria rigida Ephedra nevadensis Franseria dumosa 1 unidentified species	10 YR 6/4	4 flakes 1 biface fragment 1 faunal fragment	
Grid A-134 090E/190N Phase II	Hilaria rigida	10 YR 6/3	3 flakes	10 calcite root cast fragments
Grid A-144 095E/185N Phase II	Hilaria rigida Oryzopsis hymenoides Franseria dumosa 3 unidentified species	10 YR 6/4	1 faunal fragment	2 target glider fragments, 1 piece of iron
Grid A-154 100E/180N Phase II	Oryzopsis hymenoides 3 unidentified species	10 YR 6/3	2 flakes	9 calcite root cast fragments

Table 4
SURFACE COLLECTION GRID SUMMARIES - STRATUM A
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid A-164 105E/175N Phase II	Hilaria rigida Ephedra nevadensis Franseria hymenoides Yucca brevifolia 4 unidentified species	No sample taken	2 flakes 1 edge-damaged flake	5 calcite root cast fragments
Grid A-174 110E/170N Phase II	Ephedra nevadensis Larrea divaricata 3 unidentified species	10 YR 6/4	5 flakes 1 faunal fragment 1 faunal fragment* 22 flakes*	Calcite root cast fragments, 5 rodent holes, location of surface scrape
Grid A-184 115E/165N Phase II	Hilaria rigida Ephedra nevadensis 3 unidentified species	10 YR 6/3	24 flakes 2 fire-affected rocks 1 faunal fragment	ORV road
Grid A-194 115E/160N Phase II	Hilaria rigida Oryzopsis hymenoides 2 unidentified species	10 YR 6/4	5 flakes 1 edge-damaged flake 1 faunal fragment	Caliche

*Materials recovered in surface scrape program

Table 5
SURFACE COLLECTION GRID SUMMARIES - STRATUM B

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid B-2 130E/155N Phase III	Hilaria rigida Ephedra nevadensis	No sample taken	1 flake 1 quartzite cobble fragment	ORV road in northeast corner
Grid B-5 125E/130N Phase III	Hilaria rigida Oryzopsis hymenoides Ephedra nevadensis Franseria dumosa	No sample taken	None	Rodent activity
Grid B-6 130E/150N Phase III	Hilaria rigida Oryzopsis hymenoides Ephedra nevadensis Franseria dumosa	No sample taken	4 metates	7 calcite root cast fragments, location of test unit XI in southern part of historic fire hearth
Grid B-7 135E/150N Phase II	Area denuded of vegetation by ORV activity	10 YR 6/4	31 flakes 1 edge-damaged flake 5 fire-affected rocks 1 cobble fragment	ORV trail
Grid B-8 140E/150N Phase III	Hilaria rigida Yucca brevifolia 1 unidentified species	No sample taken	1 flake 2 fire-affected rocks	ORV trail west of grid
Grid B-15 130E/140N Phase III	Oryzopsis hymenoides Franseria dumosa 1 unidentified species	No sample taken	1 fire-affected rock	5^{o} southwest-trending slope
Grid B-17 140E/140N Phase II	Area denuded of vegetation by ORV activity	10 YR 5/4	24 flakes 1 mano fragment 11 fire-affected rocks 2 cobbles	Grid within ORV roadway
Grid B-18 140E/100N Phase III	Area denuded of vegetation by ORV activity	No sample taken	2 flakes 1 faunal fragment	Dunes on west side of grid, location of test unit X

Table 5
SURFACE COLLECTION GRID SUMMARIES - STRATUM B
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid B-20, 27 125E/135N Phase II	*Hilaria rigida* *Franseria dumosa* *Ephedra nevadensis*	10 YR 6/4	None	
Grid B-22 135E/135N Phase III	*Hilaria rigida*	No sample taken	6 flakes 7 fire-affected rocks 1 mano fragment	Some granite rock, south-trending slope
Grid B-29 135E/130N Phase III	*Hilaria rigida*	No sample taken	8 flakes 9 fire-affected rocks 3 metate fragments 2 quartzite cobble fragments	Granite rocks throughout grid area
Grid B-31 145E/130N Phase III	Area denuded of vegetation by ORV activity	No sample taken	11 flakes 1 edge-damaged flake 2 cobble fragments	Granite rocks throughout grid area, ORV road
Grid B-36 130E/125N Phase III	*Hilaria rigida* *Atriplex lentiformis*	No sample taken	None	West-trending slope
Grid B-37 135E/125N Phase II	*Oryzopsis hymenoides* 2 unidentified species	7.5 YR 6/6	23 flakes 4 fire-affected rocks	ORV trail
Grid B-47 140E/120N Phase II	Area denuded of vegetation by ORV activity	7.5 YR 6/6	15 flakes 15 fire-affected rocks 3 cobbles 1 groundstone fragment	
Grid B-56 140E/115N Phase III	Area denuded of vegetation by ORV activity	No sample taken	2 quartzite cobble fragments 3 fire-affected rocks	Granite rocks scattered throughout grid, south-trending slope

Table 5
SURFACE COLLECTION GRID SUMMARIES - STRATUM B
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid B-57 145E/115N Phase II	Area denuded of vegetation by ORV activity	7.5 YR 6/6	14 flakes 6 fire-affected rocks	
Grid B-67 150E/110N Phase II	Area denuded of vegetation by ORV activity	7.5 YR 5/6	4 flakes 1 edge-damaged flake 3 fire-affected rocks 1 faunal fragment	
Grid B-77 160E/100N Phase II	Area denuded of vegetation by ORV activity	7.5 YR 6/4	3 flakes 1 fire-affected rock 2 faunal fragments	
Grid B-80 135E/100N Phase III	_Hilaria rigida_ _Yucca brevifolia_	No sample taken	10 flakes 1 edge-damaged flake 1 mano fragment 1 cobble fragment 1 fire-affected rock	Dune area, granite rocks scattered throughout grid
Grid B-86 125E/095N Phase II	_Oryzopsis hymenoides_ _Larrea divaricata_ 2 unidentified species	10 YR 6/4	8 flakes 1 core 6 fire-affected rocks 1 quartz cobble 8 flakes* 16 faunal fragments*	ORV trail, location of surface scrape
Grid B-87 130E/095N Phase II	_Oryzopsis hymenoides_ _Ephedra nevadensis_ _Yucca brevifolia_ 2 unidentified species	10 YR 5/4	4 fire-affected rocks	2 ORV trails dissect grid
Grid B-97 140E/090N Phase II	_Franseria dumosa_ _Larrea divaricata_ 1 unidentified species	10 YR 6/4	6 flakes 3 fire-affected rocks 20 faunal fragments	ORV trail, charcoal, location of test unit I

Table 5
SURFACE COLLECTION GRID SUMMARIES - STRATUM B
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid B-102 165E/090N Phase III	Area denuded of vegetation by ORV activity	No sample taken	18 flakes 3 faunal fragments	
Grid B-107 145E/085N Phase II	Ephedra nevadensis Larrea divaricata 1 unidentified species	10 YR 6/4	29 flakes 1 metate fragment 5 faunal fragments	Charcoal, hummock
Grid B-108 150E/280N Phase III	Area denuded of vegetation by ORV activity	No sample taken	58 flakes 2 fire-affected rocks 1 drill/awl 6 faunal fragments	
Grid B-116 140E/080N Phase III	Hilaria rigida	No sample taken	37 flakes 1 fire-affected rock 1 faunal fragment	
Grid B-117 145E/080N Phase II	Area denuded of vegetation by ORV activity	10 YR 6/4	77 flakes 1 potsherd 1 quartzite cobble 8 faunal fragments	
Grid B-120 160E/080N Phase II	Area denuded of vegetation by ORV activity	10 YR 5/4	33 flakes 1 metate 9 fire-affected rocks 9 faunal fragments	Location of test unit II
Grid B-123 175E/080N Phase III	Area denuded of vegetation by ORV activity	No sample taken	None	Granite rocks, east-trending slope
Grid B-127 140E/075N Phase II	Oryzopsis hymenoides Franseria dumosa 1 unidentified species	No sample taken	12 flakes 2 fire-affected rocks 6 faunal fragments	

Table 5
SURFACE COLLECTION GRID SUMMARIES - STRATUM B
(continued)

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid B-133 170E/075N Phase III	Area denuded of vegetation by ORV activity	No sample taken	None	Granite rocks throughout grid, east-trending slope
Grid B-137 160E/170N Phase II	Area denuded of vegetation by ORV activity	10 YR 6/4	6 flakes 1 groundstone 4 faunal fragments	Hummock, ORV trail
Grid B-142 155E/065N Phase III	_Larrea divaricata_	No sample taken	Historic trash 1 fire-affected rock	Small dune in southwest portion of grid
Grid B-147 160E/060N Phase II	_Larrea divaricata_ 1 unidentified species	10 YR 6/4	1 flake 2 faunal fragments	Hummock in northeast corner

*Materials recovered in surface scrape program.

Table 6
SURFACE COLLECTION GRID SUMMARIES - STRATUM C

Collection Grid/ Coordinates/ Phase	Floral Species	Soil Color (Munsell)	Cultural Material	Comments
Grid C-85 055E/115N Phase II	*Hilaria rigida* *Yucca brevifolia* 1 unidentified species	10 YR 6/4	1 faunal fragment	Numerous calcite root cast fragments on surface, location of test unit III
Grid C-89 075E/115N Phase II	*Hilaria rigida* *Ephedra nevadensis* *Franseria dumosa* 1 unidentified species	10 YR 6/4	None	Grid slopes toward south
Grid C-127 080E/100N Phase II	*Hilaria rigida* *Oryzopsis hymenoides* 2 unidentified species	10 YR 6/4	None	Location of surface scrape

Table 7
TEST EXCAVATION UNIT SUMMARY
Unit I, Grid B-97 (140E/090N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Wet, lightly packed sand	10 YR 6/3	13 flaking waste 3 faunal fragments 1 aluminum foil 1 glass shard	Excavation area is creosote hummock, completely surrounded by denuded sands, heavily traveled by motorcycles
10-20 cm	Wet, lightly packed sand in east half, west wall also wet but with some very dry, loose sands as well	10 YR 6/3	4 flaking waste 3 faunal fragments 1 fire-affected rock	Roots and rodent hole in west wall
20-30 cm	Wet and dry sands, loosely packed	10 YR 6/3	4 flaking waste 1 edge-damaged flake 10 faunal fragments 2 fire-affected rocks	Numerous small charcoal bits throughout level
30-40 cm	Wet sands easily removed, dry sands slightly compact, particularly around charcoal lens	10 YR 4/2	8 flaking waste 1 metate fragment 28 faunal fragments 1 quartzite cobble fragment	Cobble fragments and small random charcoal bits throughout level
40-50 cm	Same as previous level	10 YR 4/2	10 flaking waste 31 faunal fragments 1 fire-affected rock 1 quartzite cobble fragment	Quartzite cobble is half of cobble located in 30-40 cm level

Table 8
TEST EXCAVATION UNIT SUMMARY
Unit II, Grid B-120 (160E/080N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Sandy soil, compacts easily, moist soil at 4 cm	10 YR 6/6	70 flaking waste 1 hammerstone fragment 1 fire-affected rock 23 faunal fragments	Numerous creosote roots in this level
10-20 cm	Moist compact sands, high in silt content	10 YR 5/6	9 flaking waste 7 faunal fragments	Bedrock outcrop in southern quarter of unit
20-30 cm	Loose damp sand and gravel	10 YR 5/6	None	

Table 9
TEST EXCAVATION UNIT SUMMARY
Unit III, Grid C-85 (055E/115N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Loose, blown, dry sands to 1.7 cm	10 YR 7/4	None	Rodent activity apparent
10-20 cm	Very moist sand with fine sands, silts, and small gravel	10 YR 7/3	None	
20-30 cm	Finer sands and gravel, dry and much more compact	No sample taken	None	Roots and calcite root casts throughout level

Table 10
TEST EXCAVATION UNIT SUMMARY
Unit IV, Grid A-31 (082E/231N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Dry sand with frequent clasts to 3 cm, then becomes moist	10 YR 6/3	94 flaking waste 19 faunal fragments 1 edge-damaged flake 1 biface preform 1 metate fragment 7 fire-affected rocks	Charcoal sample taken from possible fire hearth area, several burnt osteological specimens, 2 apparently from large mammal
10-20 cm	Loosely compacted, moist, medium-grained sand	10 YR 5/3	71 flaking waste 21 faunal fragments 15 fire-affected rocks	Possible deflated fire hearth, charcoal flecks and <u>Hilaria rigida</u> roots throughout level
20-30 cm	Moist, medium- to fine-grained aeolian sand	10 YR 5/3	72 flaking waste 50 faunal fragments 16 fire-affected rocks	Charcoal noted throughout level, sample collected, still encountering <u>Hilaria rigida</u> roots
30-40 cm	Moist, medium- to fine-grained sand, becoming dry in patches	10 YR 5/3	38 flaking waste 37 faunal fragments 1 biface fragment 1 fire-affected rock	Majority of flakes recovered from screen are micro-flakes, charcoal sample taken
40-50 cm	Damp and somewhat compacted sands with areas of drier, sandier soil	10 YR 6/4	15 flaking waste 31 faunal fragments 1 metate fragment	Numerous roots in level, extensive ant bed/tunnel along north wall, charcoal sample taken

Table 11
TEST EXCAVATION UNIT SUMMARY
Unit V, Grid A-8 (095E/242N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Fine- to medium-grained sands and silts, dry to 8 cm then damp, black streaks in soil (possible charcoal but most probably humus from roots)	10 YR 6/3	3 flaking waste	Calcified material, some roots encountered
10-20 cm	Loose, moist, sandy aeolian silt	10 YR 5/4	7 flaking waste 1 edge-damaged flake 1 faunal fragment	
20-30 cm	Moist, fine- to medium-grained sand	10 YR 5/4	7 flaking waste 1 metate fragment 2 fire-affected rocks 6 faunal fragments	1 burnt bone fragment, numerous large root cast fragments throughout level
30-40 cm	Moist, fine- to medium-grained sand	10 YR 5/6	5 flaking waste 3 faunal fragments 1 possible metate fragment	3 calcite root cast fragments, ash and charcoal traces
40-50 cm	Very moist, fine- to medium-grained sand in west end of unit, north side of segment 4 more compact and much drier	10 YR 6/6	5 flaking waste 5 faunal fragments	1 burnt tooth

Table 12
TEST EXCAVATION UNIT SUMMARY
Unit VI, Grid A-45 (091E/228N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Loose arkosic sand with some silt, becoming moist toward bottom of level, limited granitic rocks present	10 YR 6/3	14 flaking waste 4 metate fragments	Extensive quantity of roots throughout level, probable insect burrows below 10 cm, metate fragments recovered from surface
10-20 cm	Slightly moister sand, still very loose and same texture	10 YR 5/3	28 flaking waste 1 retouched flake 13 faunal fragments 1 unifacial mano 1 fire-affected rock	Charcoal traces throughout level, dead Joshua tree in section 2, roots throughout level
20-30 cm	Soil slightly moister, otherwise same texture	10 YR 5/3	26 flaking waste 1 faunal fragment 1 potsherd	Dead Joshua tree still present at 30-cm level, few roots
30-40 cm	Moist, loose, fine-grained sand	10 YR 5/3	47 flaking waste 46 faunal fragments	Osteological fragments include tooth, one vertebrae, and several fragments with condyles
40-50 cm	Moist, fine- to medium-grained sand	10 YR 5/4	25 flaking waste 1 faunal fragment	Some root disturbance, charcoal traces
50-60 cm	Moist, loose, fine- to medium-grained sand	10 YR 6/4	27 flaking waste 14 faunal fragments	1 rodent burrow
60-70 cm	Loose, fine-grained sands	No sample taken	8 flaking waste 1 faunal fragment	Roots, rodent burrow

Table 13
TEST EXCAVATION UNIT SUMMARY
Unit VII, Grid A-37 (110E/230N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Loose, dry sands to 3 cm, becoming damp with some gravels	10 YR 5/4	91 flaking waste 5 faunal fragments 1 projectile point fragment 2 possible metate fragments 26 fire-affected rocks	_Hilaria rigida_ on surface, ORV road borders east side of unit, rabbit scat
10-20 cm	Moist, fine-grained sands with some gravel	10 YR 5/4	33 flaking waste 5 faunal fragments	_Hilaria rigida_ roots throughout level
20-30 cm	Moist, firm sands	10 YR 5/4	16 flaking waste 37 faunal fragments 1 fire-affected rock	Some rodent disturbance, charcoal stains light to moderate throughout level with heavy concentration in section 1
30-40 cm	Moist, fine-grained sands with some granite chunks	10 YR 6/6	8 flaking waste 1 faunal fragment	_Hilaria rigida_ roots running vertically and _Yucca brevifolia_ roots running horizontally throughout level.

Table 14
TEST EXCAVATION UNIT SUMMARY
Unit VIII, Grid B-109, B-110 (159.5E/085.5N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-5 cm	Loose blown dune sands	10 YR 6/3	(0-10 cm inclusive) 167 flaking waste 80 faunal fragments 1 edge-damaged flake 1 projectile point tip 1 metate fragment 1 glass shard 1 sheet target fragment 9 fire-affected rocks	Strong winds and other erosional disturbances, heavy ORV use, possible pothunting, 40 osteological fragments (including several burnt, several mandibles with teeth, teeth), charcoal sample collected, metate fragment recovered from surface
5-10 cm	Moist, compact sands	10 YR 6/3		Roots throughout level, decomposing granite, 40 osteological fragments (including several mandibles with teeth, individual teeth, one long bone)
10-20 cm	Firmly compacted sands with clay	10 YR 6/3	64 flaking waste 20 faunal fragments 5 fire-affected rocks	Roots throughout level, decomposing granite, several osteological fragments (including mandibles with teeth, indivdual teeth, one burnt fragment)
20-30 cm	Fine-grained, compacted sands and gravel with clay	No sample taken	6 flaking waste	Roots throughout level
30-150cm	Well-compacted sands with clay and caliche layers	No sample taken	None	Test probe in portions of sections 2 and 3
0-30 cm	Well-compacted sands with clay and caliche	10 YR 5/2	9 flaking waste 6 faunal fragments	Test probe along west wall of section 2, bulk sample from charcoal sand area

Table 15
TEST EXCAVATION UNIT SUMMARY
Unit IX, Grid B-50 (156E/123N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-5 cm	Loose, dry, fine- to coarse-grained sands, becoming moist at 5 cm	7.5 YR 5/6	(0-10 cm inclusive) 4 flaking waste 1 edge-damaged flake	Heavy ORV disturbance, Larrea divaricata in unit
5-10 cm	Moist, fine- to medium-grained sands	No sample taken		1 fire-affected rock in west sidewall, 2 charcoal pieces collected
10-20 cm	Fine- to coarse-grained sands, loose in southern portion, compact in northern portion	No sample taken	1 flaking waste 1 cigarette filter	Roots throughout level, 20+ charcoal pieces
20-30 cm	Fine- to medium-grained sands, dry on south side, becoming moist on north side	No sample taken	5 flaking waste 5 faunal fragments 1 fire-affected rock	
30-40 cm	Medium-compacted dry sands with random moist areas throughout level	No sample taken	4 flaking waste 1 metate 4 fire-affected rocks	15-20 charcoal pieces, some rodent burrowing activity, Larrea divaricata roots
40-50 cm	Dry, medium-compacted sands	No sample taken	None	Some Larrea divaricata roots
50-60 cm	Dry, medium-compacted sands with fine gravels	No sample taken	4 flaking waste 42 faunal fragments	Light charcoal throughout level
60-90 cm	Dry, medium-compacted sands with fine gravels	No sample taken	9 flaking waste 127 faunal fragments	Possible burrowing activity, 4 charcoal pieces

Table 16
TEST EXCAVATION UNIT SUMMARY
Unit X, Grid B-18 (148E/140N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-10 cm	Loosely compacted, fine- to medium-grained sands (sub-angular edge rounding)	No sample taken	12 flaking waste 1 faunal fragment 1 edge-damaged flake 4 fire-affected rocks	ORV disturbance
10-20 cm	Moist, medium- to hard-compacted sands with clay	No sample taken	1 flaking waste 1 fire-affected rock	Calcite root cast fragments
20-30 cm	Slightly drier, medium-compacted sands	No sample taken	None	Some roots
30-40 cm	Slightly drier, medium-compacted sands	No sample taken	None	Some roots
40-50 cm	Slightly drier, medium-compacted sands	No sample taken	None	Some roots

Table 17
TEST EXCAVATION UNIT SUMMARY
Unit XI, Grid B-6 (132E/151N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-5 cm	Loose, wind-blown sands	No sample taken	1 flaking waste 2 metates (1 fragment)	Large granite stones embedded in sand at surface, charcoal staining and modern/historic(?) fire ring (some elements with milling/pecking evidence)
5-20 cm	Wet sands and dry, crusty, compacted clays	No sample taken	None	1 rodent burrow, roots throughout level, calcite root cast fragments
20-30 cm	Moist, loosely compacted sands with areas of well-compacted sands	No sample taken	None	Calcite root cast fragments throughout level, *Yucca brevifolia* and other smaller roots

Table 18
TEST EXCAVATION UNIT SUMMARY
Unit XII, Grid B-65 (140.5E/113N)

Level	Soil Description	Soil Color (Munsell)	Cultural Material	Comments
0-5 cm	Loose sands becoming compact	10 YR 3/2	7 flaking waste 1 faunal fragment 1 ovate biface 1 aluminum pop top 1 glass shard 1 fire-affected rock	ORV activity, wind erosion, rodent burrows present, charcoal residue throughout level
5-10 cm	Hard-compacted sands	10 YR 3/2	2 flaking waste	Rodent burrows present, charcoal sand sample collected
10-20 cm	Moist sands	10 YR 3/3	None	Roots throughout level, rodent burrows evident

The substrate varies from decomposed granitic bedrock to cemented, compact sands. Soils tend to have a yellow-red tint throughout the site, predominantly in the 10 YR color range (Munsell color:1975). There are no areas of darkly stained midden in the classic sense; however, lenses of charcoal-bearing soils are dispersed between layers of relatively light-colored sands. Perhaps the best record of subsurface conditions at the site may be viewed in test unit sidewall profiles from throughout the several strata.

In Stratum A (Figures 15-19) test excavations revealed fine- to medium-grained sands and silts, loosely consolidated and with some gravels, to roughly twenty centimeters in depth. Roots, calcarious root casts, and both insect and rodent activity were noted with high frequency. Below this level sands are consistently more moist and somewhat compacted, with areas and pockets of drier, clayey soils. Texture was relatively constant throughout each unit, and limited disturbance of subsurface biotic activity continued throughout all recorded depths.

Loose, dry sands were reported for the surface of all surface collection grids in this stratum and were noted for the four test excavation units as well. Soil color is not strong in any of the recorded samples, and the red tinge frequently associated with strongly developed buried soils is absent. However, this is probably more related to the mini-dune ecosystem rather than to any absence of buried, older surfaces. While no culturally defined strata could be identified during the test unit excavation process, positive results from all four test units were generally constant to depths of forty centimeters. Test unit VI resulted in positive cultural findings to a depth in excess of sixty centimeters. For the total recovery program, the greater assemblage of subsurface remains came from test excavations in this stratum, although the test unit sample size was not largest in Stratum A. These points are returned to below and again in Section VI.

Stratum B test unit excavations (Figures 20-26) comprise the largest number of subsurface observations in this examination, with seven test units placed throughout the stratum. As with Stratum A, loose, dry sands were noted on the surface to depths of only two to five centimeters, below which slightly more compacted and noticeably moister sands and gravels were recognized. From the surface collection sample grids and test unit data, it is evident that soil structure is more coarse and grainy in this stratum, and a broad substrate of densely compacted, cemented sands, gravels, and clays was also reported. Bedrock granitic rock was noted in test unit II at a depth of ten to twenty centimeters. For both recovery methods, sandy areas were reported to mimic the basic color range seen in Stratum A--a light yellowish brown in the 10 YR series. On the other hand, compacted sands

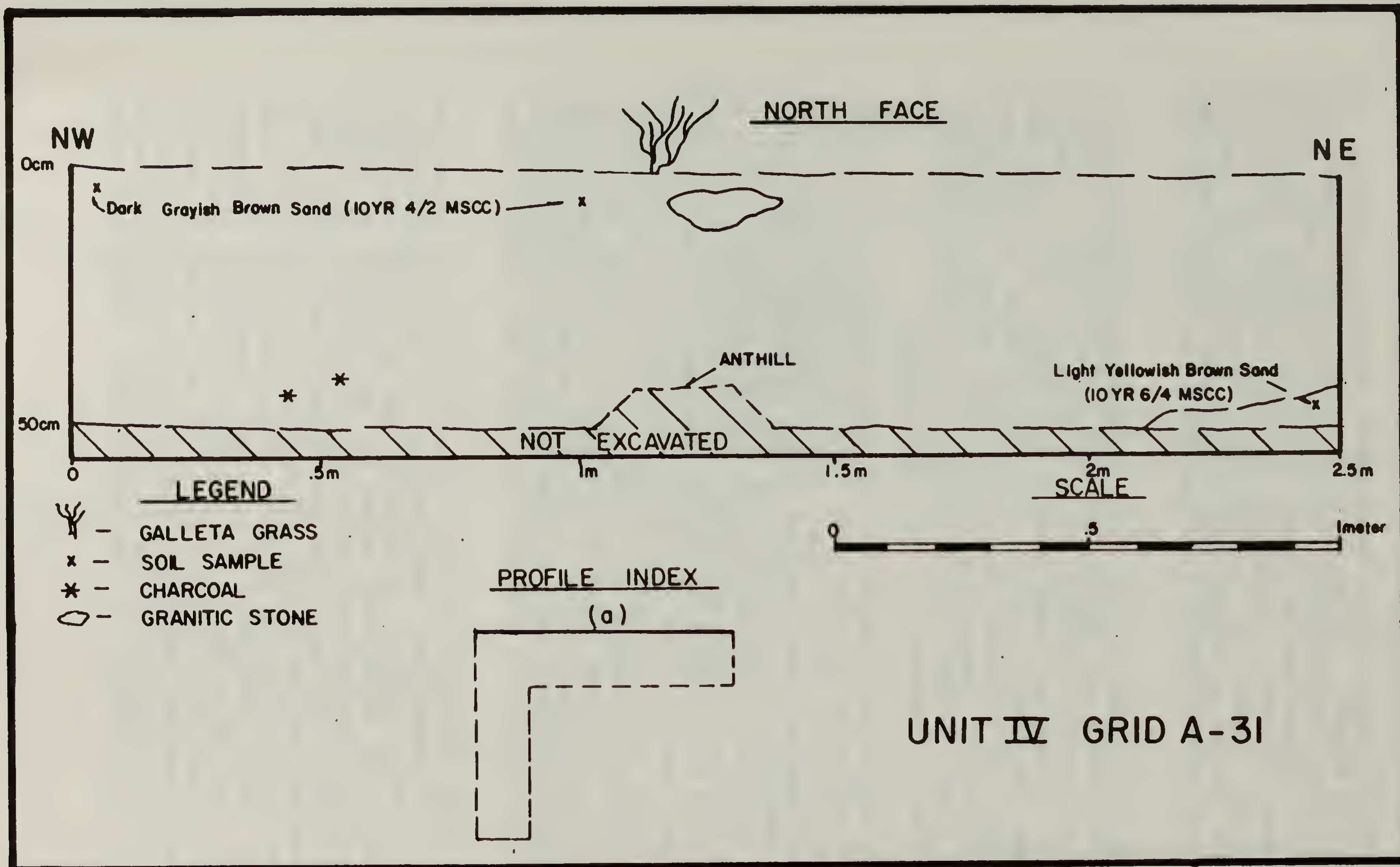


Figure 15

Test excavation unit IV sidewall profile, north face.

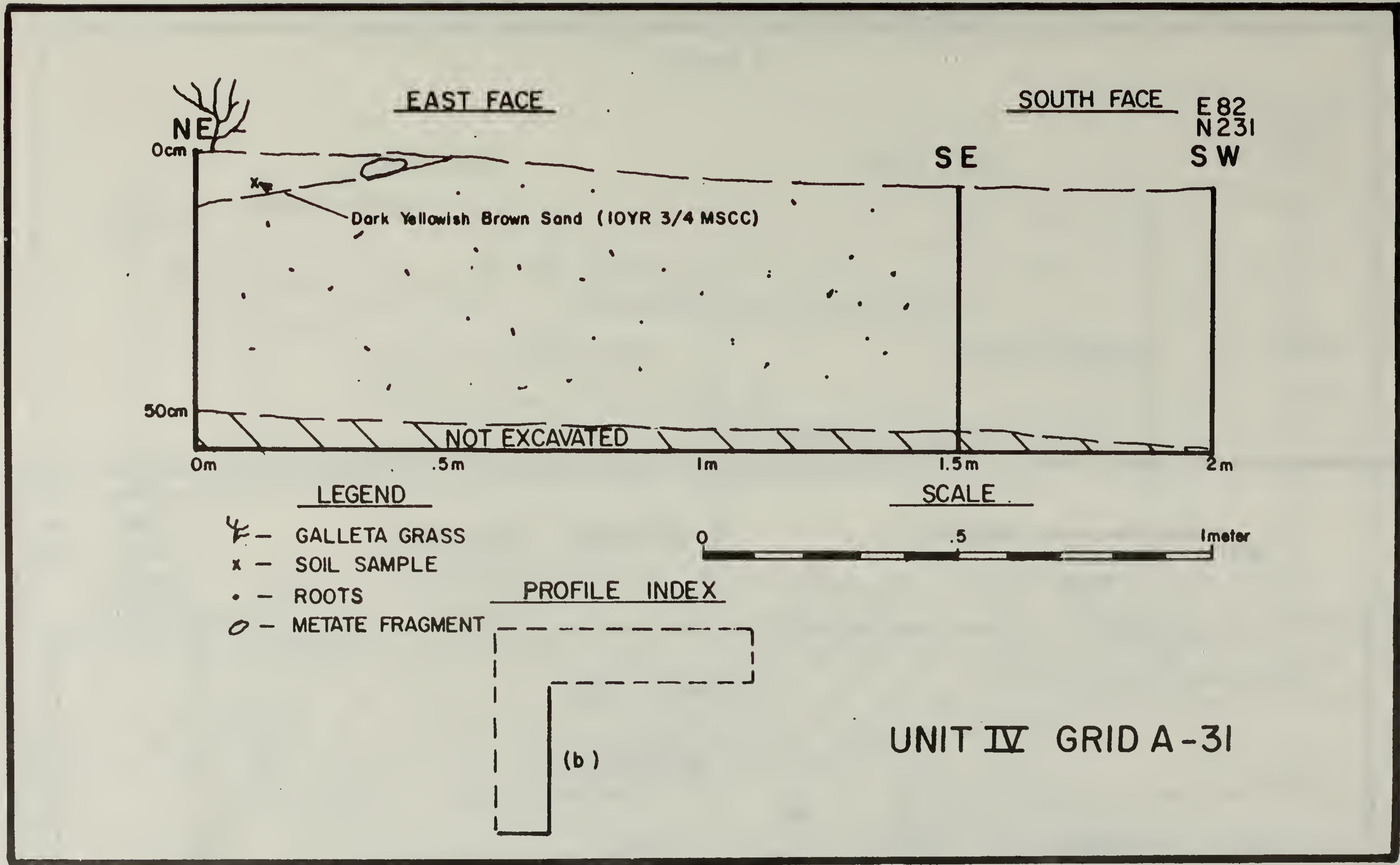


Figure 16

Test excavation unit IV sidewall profile, east and south faces.

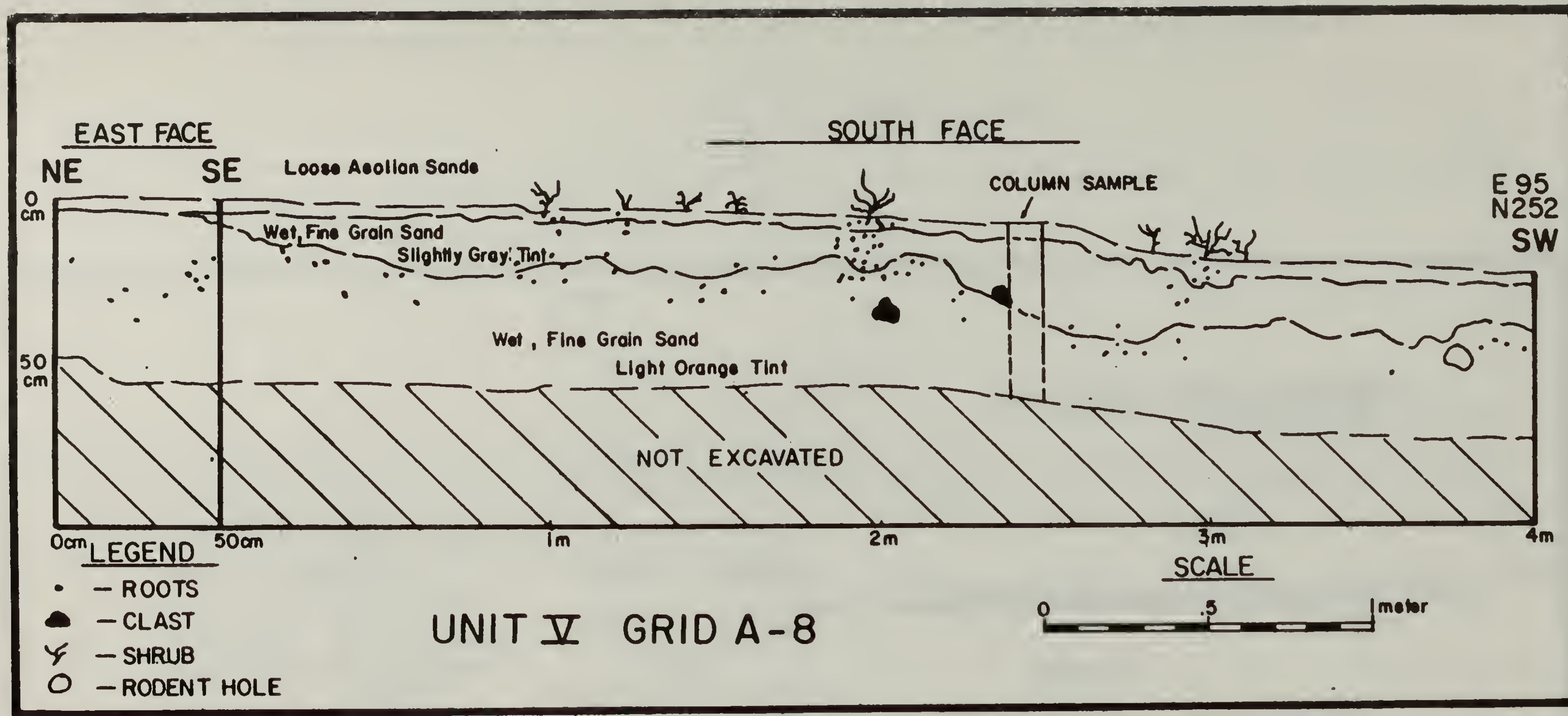


Figure 17

Test excavation unit V sidewall profile.

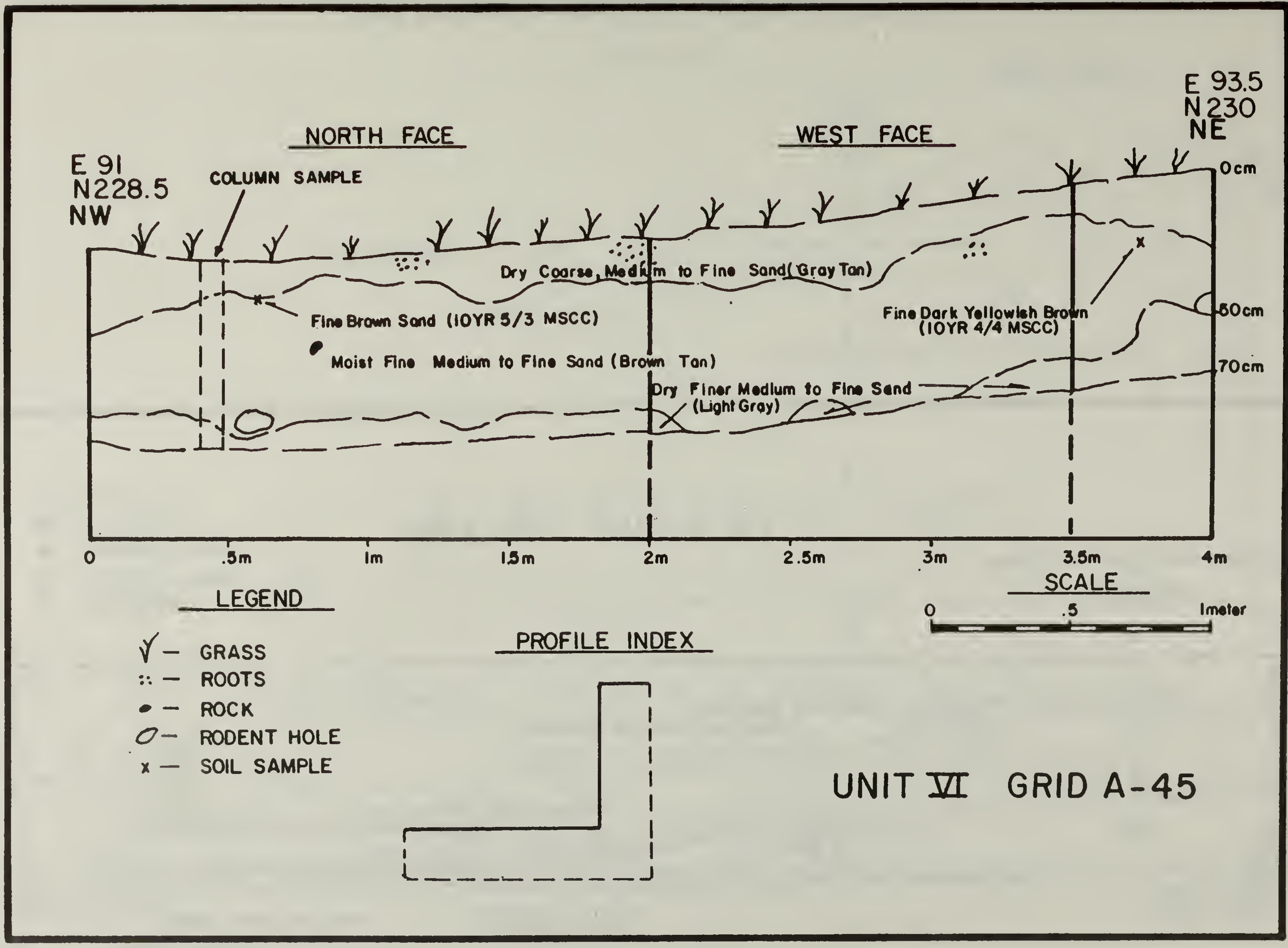


Figure 18

Test excavation unit VI sidewall profile.

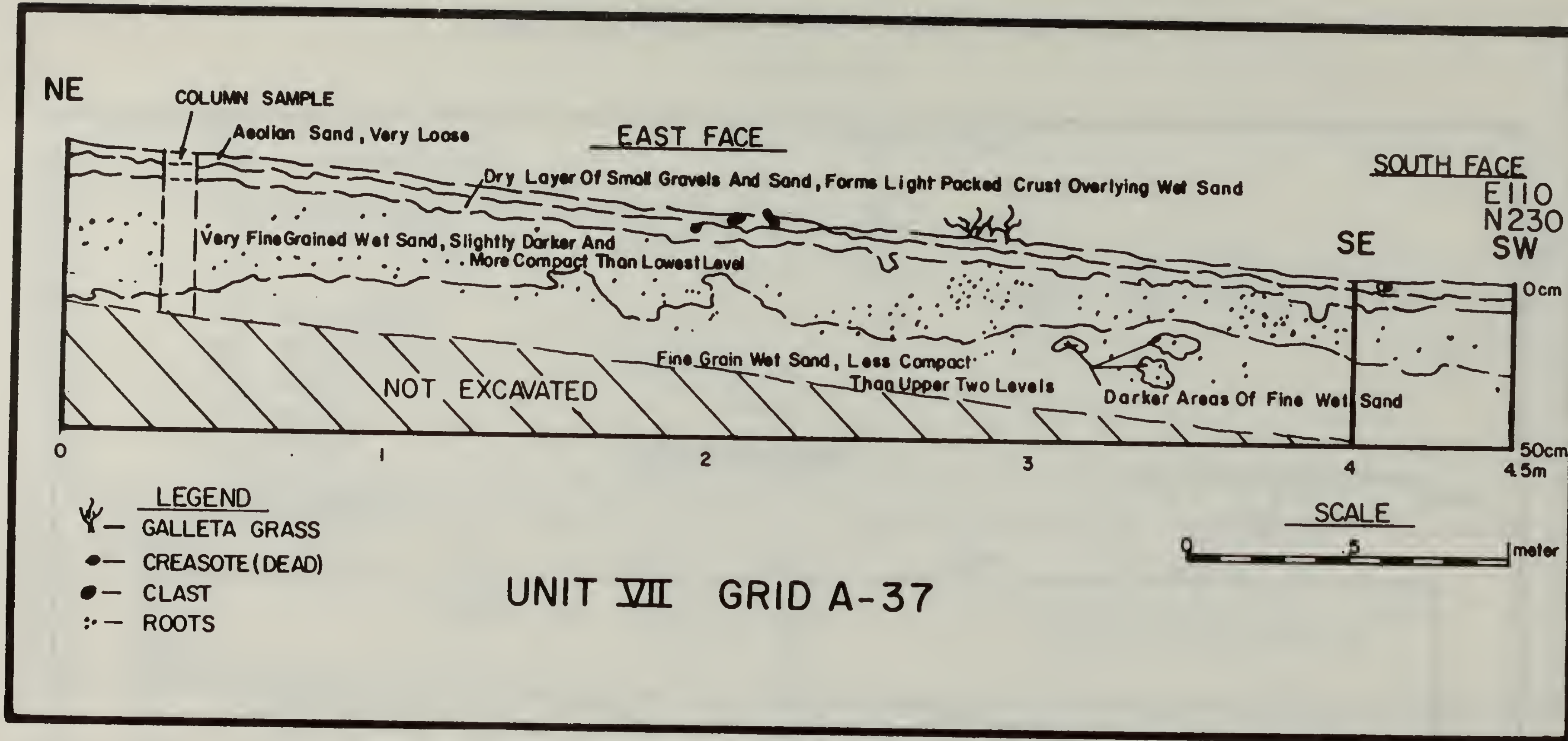


Figure 19

Test excavation unit VII sidewall profile.

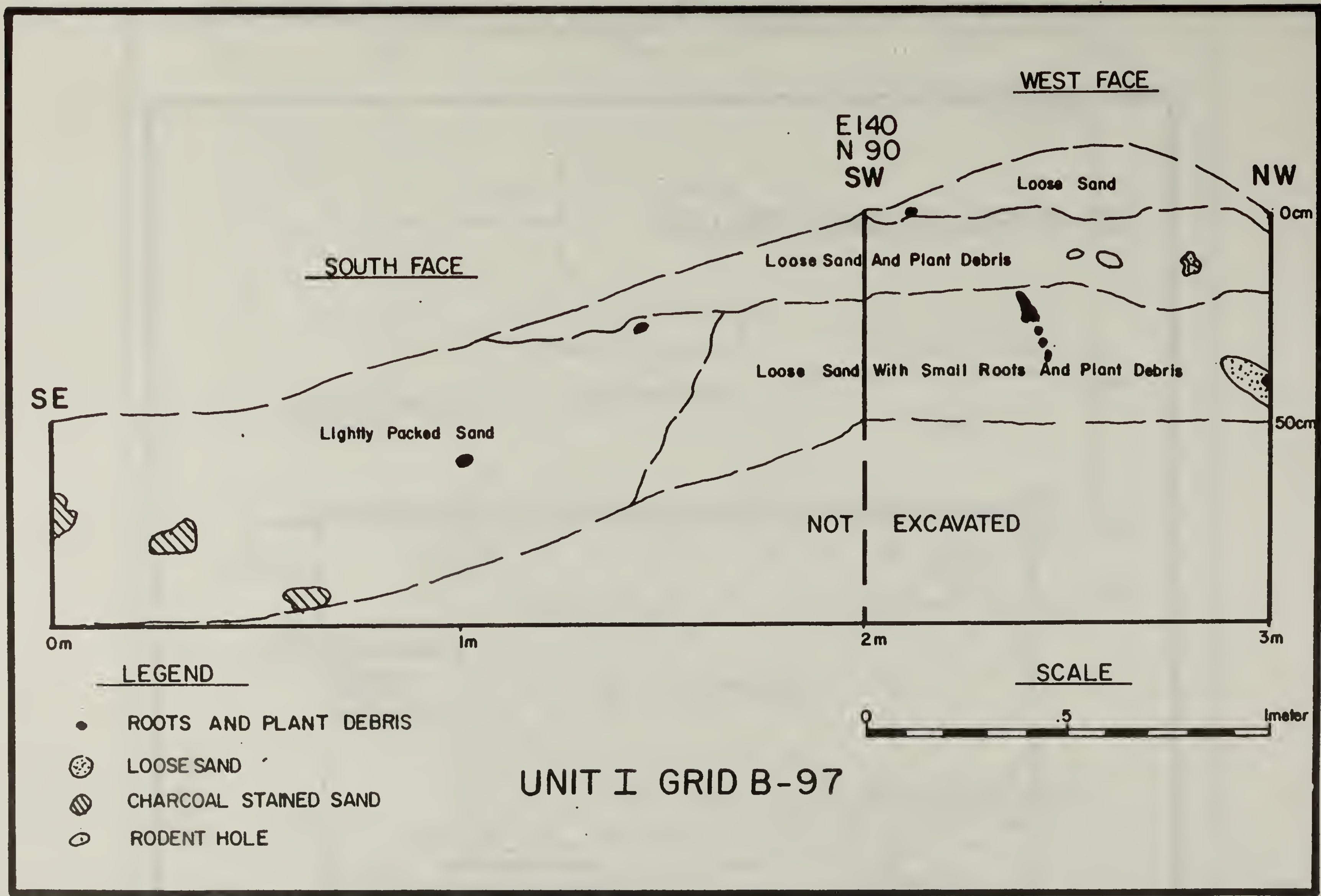


Figure 20

Test excavation unit I sidewall profile.

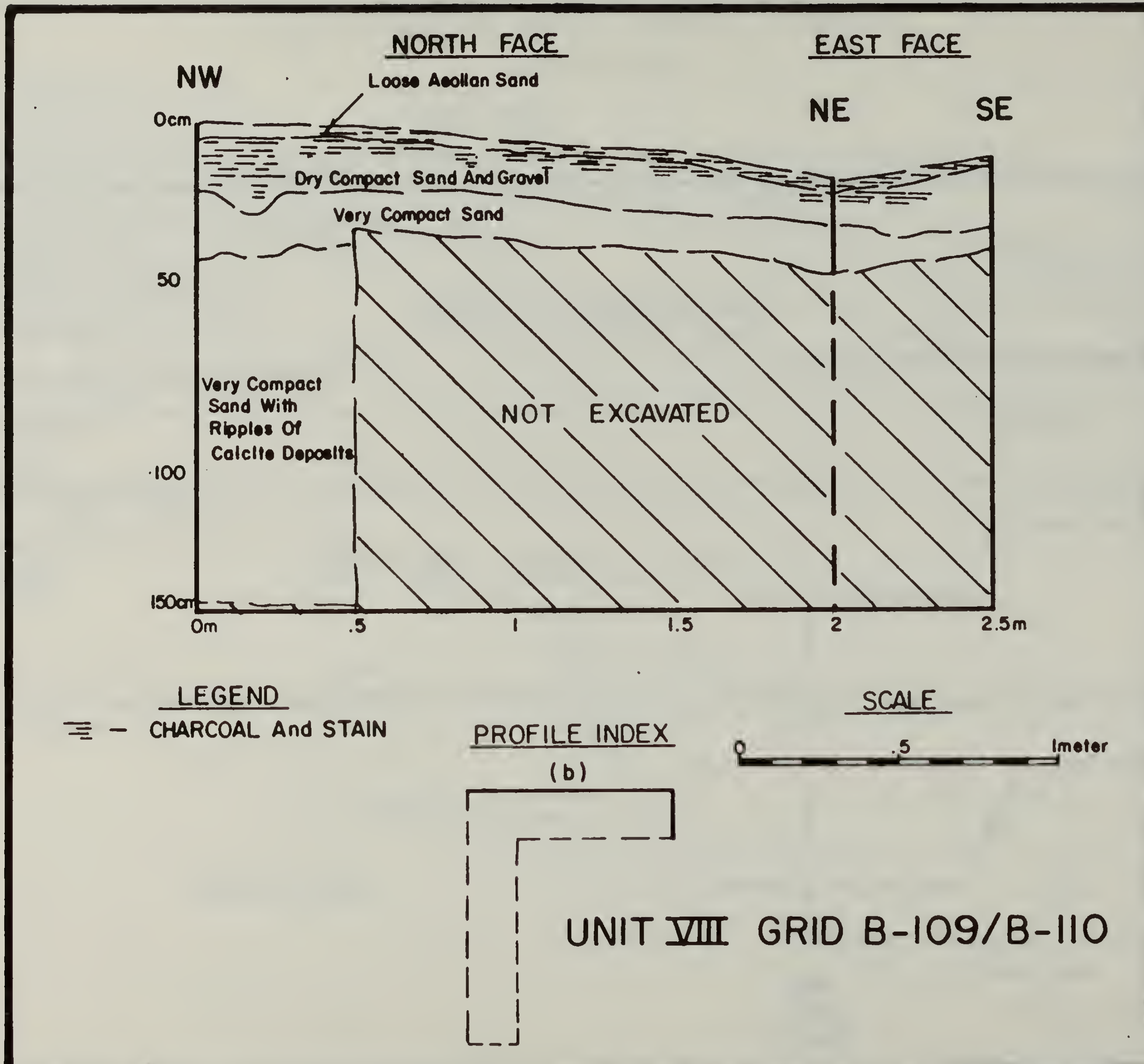


Figure 21

Test excavation unit VIII sidewall profile, north and east faces.

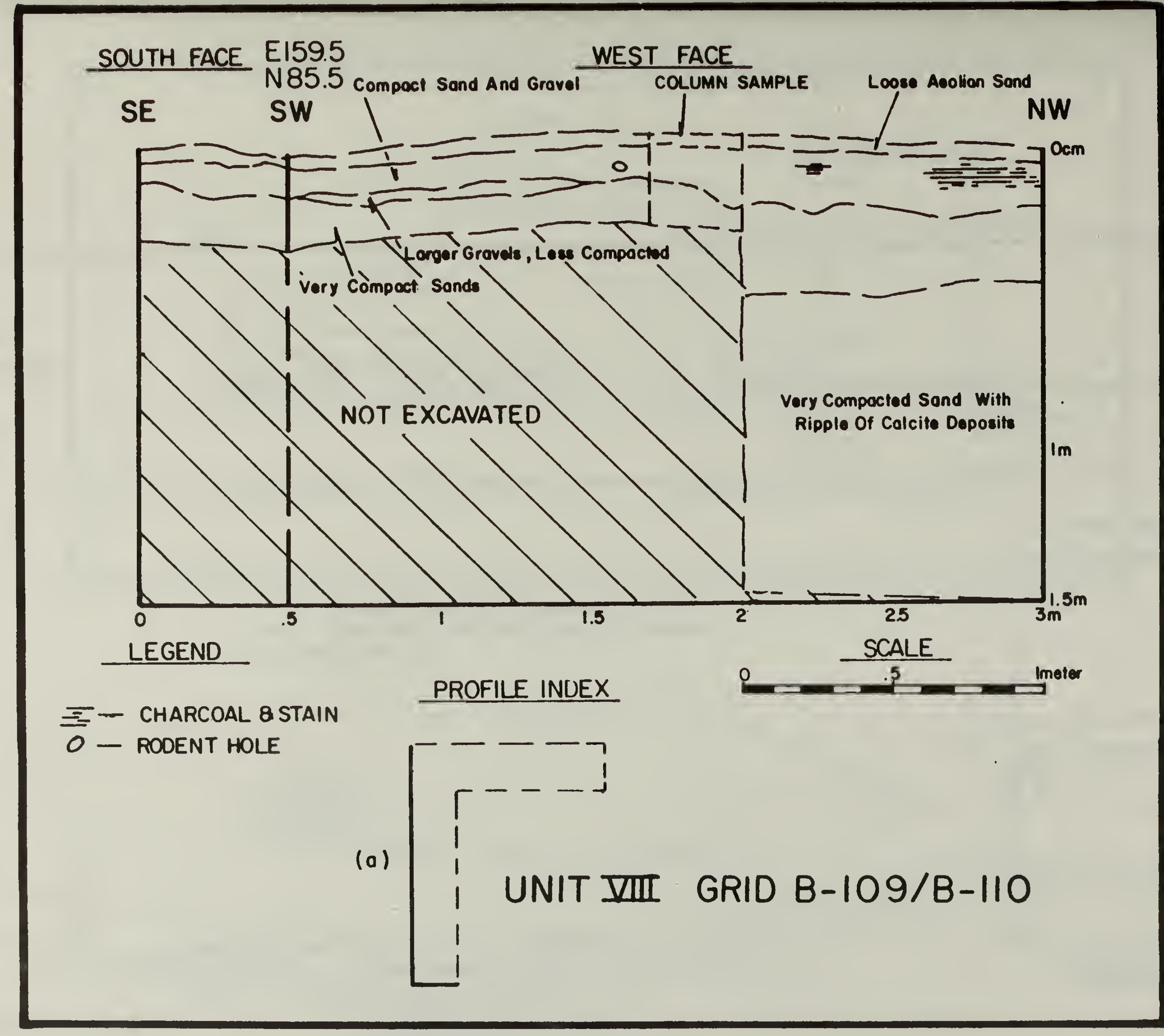


Figure 22

Test excavation unit VIII sidewall profile, south and west faces.

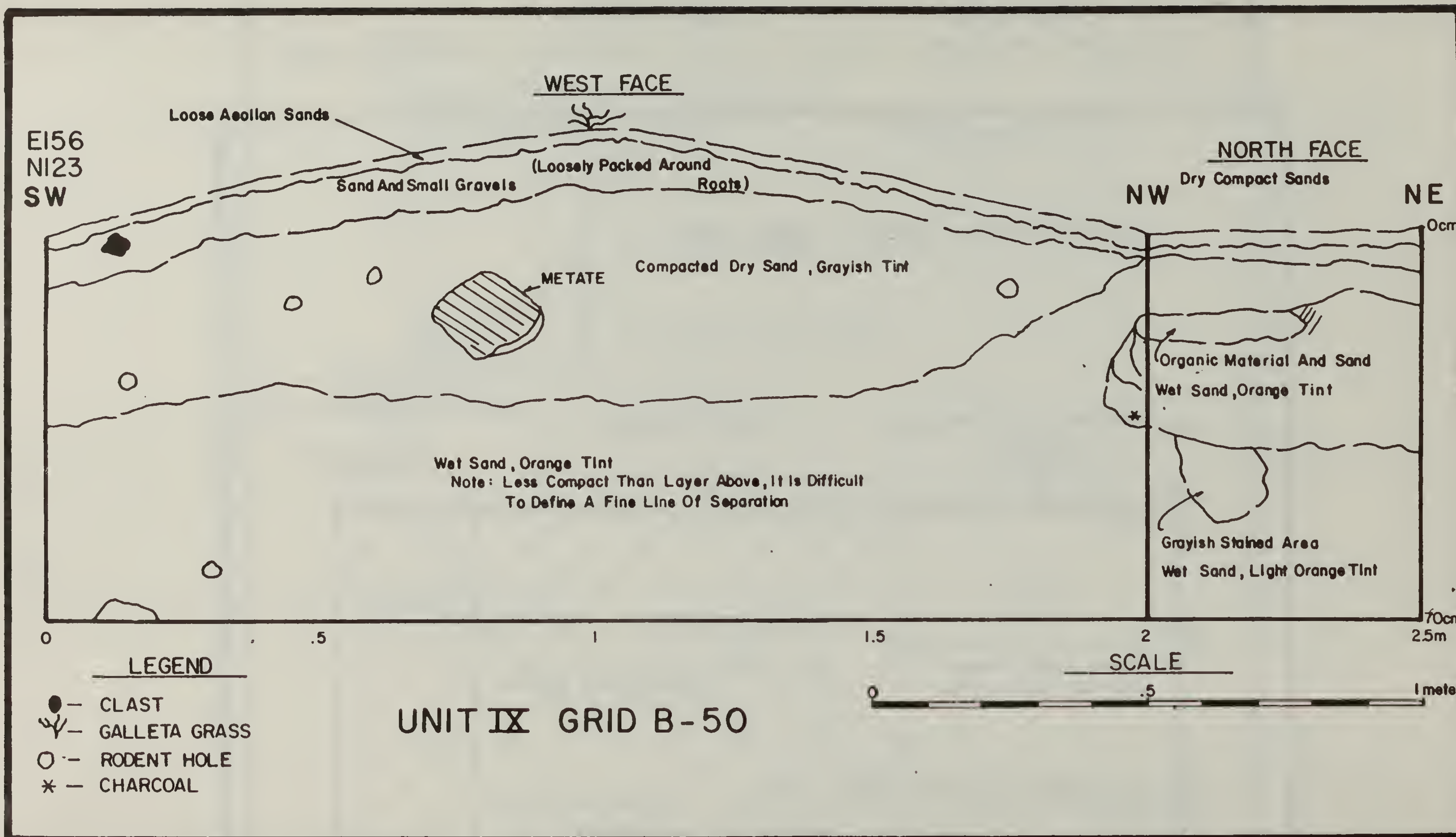


Figure 23

Test excavation unit IX sidewall profile.

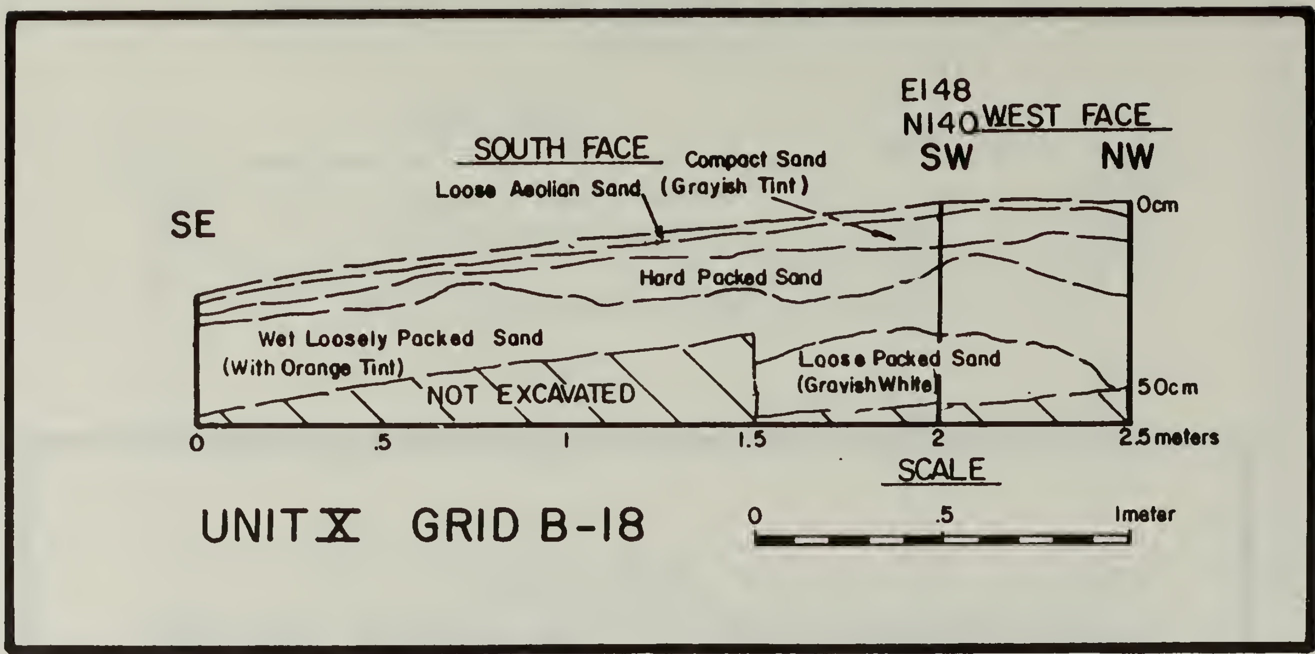


Figure 24

Test excavation unit X sidewall profile.

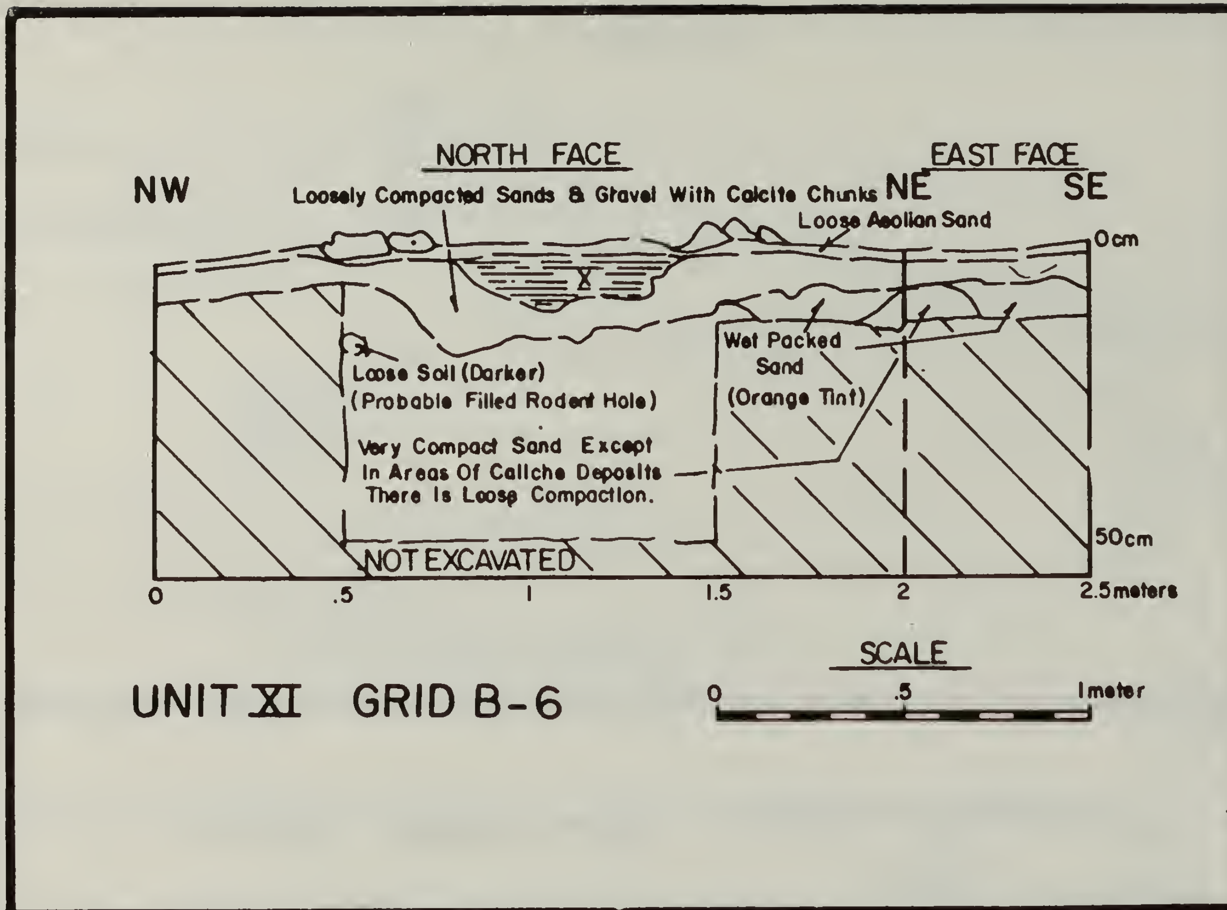


Figure 25

Test excavation unit XI sidewall profile.

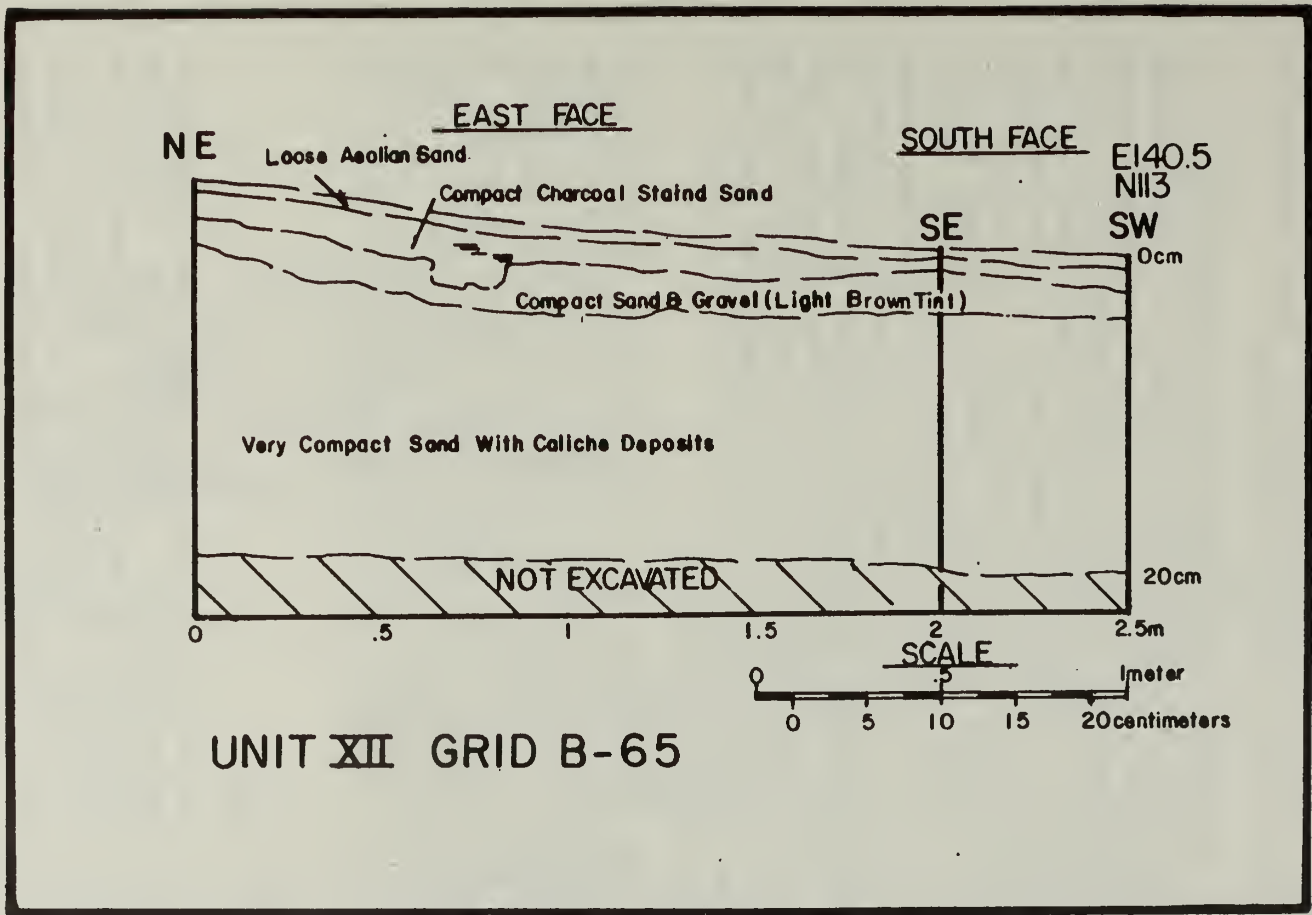


Figure 26

Test excavation unit XII sidewall profile.

examined in Stratum B are slightly more reddened (in the 7.5 YR series), ranging from reddish yellow to strong brown.

On the basis of this evidence, Stratum B appears to be more greatly deflated than either Strata A or C. Exception to this is the buildup of sands trapped in root structures of the creosote bush, which develops a distinctive hummock as adjacent surfaces blow out and deflate. Much of the deflation may be related to natural causes, although this has most certainly been accelerated by the high degree of off-road vehicle disturbance.

Cultural refuse recovered subsurface from Stratum B did not occur with the consistency observed for Stratum A. Test units placed in the southern aspect outside the denuded, deflated zones of off-road vehicle disturbance attained some depth, with positive results ranging from fifty centimeters (test unit I) to thirty centimeters (test unit VIII). Test unit II encountered bedrock at twenty centimeters. At the north end of Stratum B, no cultural debris was recovered below the cemented clayey sands, which were exposed at depths ranging from five to twenty centimeters (test units X, XI, and XII). However, this lens was never encountered in test unit IX, also located in the north of Stratum B, where cultural materials were recovered at depths in excess of sixty centimeters. Through consideration of these findings and those for soil structure noted above, it is evident that Stratum B is relatively more disturbed than A and the likelihood for confidently interpretable cultural data in the southern portions of site SBr-3801 (Stratum B) is not great.

Stratum C was not subjected to the detailed examination shared by Strata A and B. A single test unit (III) was excavated in this stratum (Figure 27) and three surface collection grids were examined. While this stratum contains the deepest deposits of sand in this mini-dune ecosystem, no significant occurrence of cultural residue was recorded. On the other hand, one of the most important findings resulting from this investigation is that subsurface deposits containing relatively abundant cultural refuse in seemingly good context are recognized in portions of Stratum A.

FLAKING WASTE AND CORES

A total of 1,717 specimens of flaking waste was recovered during the current Owl Canyon project. This includes 1,054 from test excavation units, 41 from surface scrapes, 184 from Stratum A surface collections, 438 from the Stratum B surface collections, and none from Stratum C. Distributions of flaking waste recovered from these various collection activities are presented in Tables 19 through 22.

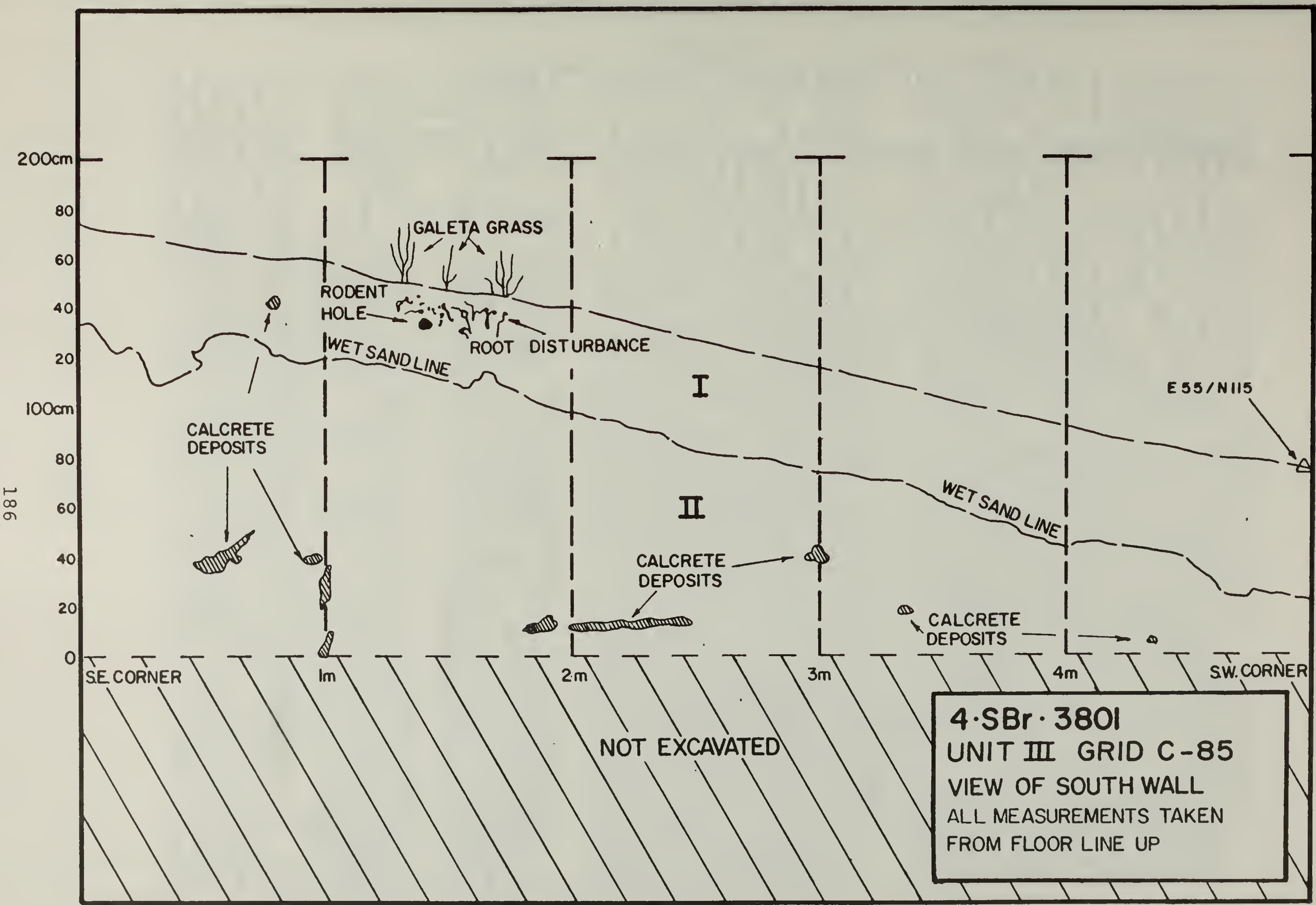


Figure 27

Test excavation unit III sidewall profile.

Comparison of surface collection results between Strata A and B illustrates a number of patterns (Tables 19 and 20). First, there is little variation in rock type. Approximately 85 percent of the flaking waste are chalcedony, with the remaining 15 percent distributed among five other rock types (rhyolite, andesite, quartz, quartzite, and obsidian). However, specimens classed as chalcedony are extremely variable in color, texture, and quality. Included within the term "chalcedony" are what some researchers class as chert, agate, jasper, and opal. This wide variation in chalcedony suggests that several quarry sources were being exploited for lithic material. Possibly a portion of the material was obtained through trade, a supposition further supported by the presence of obsidian in the flake assemblage since there are no known sources in the immediate vicinity of the site. According to trace element studies performed by Sutton (1981), obsidian at the site was derived primarily from a source near Coso Hot Springs.

Comparisons indicate that flaking waste from the southern site region varies from that of the north in absolute size, which may have implications in continuing study of variations in flaked stone tool technologies and modes of manufacture. Consider the following figures. The average weight of flake specimens recovered from Stratum B is 1.2 grams, substantially greater than those from Stratum A (0.8 gram). Also, the average density of flakes per collection grid in Stratum B is 17.5 flakes per positive grid, compared to 7.1 flakes per positive grid in Stratum A. However, Stratum A has a significantly higher ratio of technical to non-technical flakes: 1:3.3 versus 1:10.4 in Stratum B. One would not expect these relationships due to the greater disturbance noted in Stratum B. Smaller specimens would be expected in Stratum B from off-road vehicle breakage.

A relatively low number of flakes was recovered from the surface scrape collections (Table 21). Chalcedony is still the predominant rock type. As indicated by the small average flake weight (0.48 gram), flakes recovered from surface scrapes are relatively small and do not vary in flake weight between strata in any significant number.

Test excavation units yielded the largest assemblage of flaking waste from the various sample unit types (Table 22). Although not presented in Table 22, rock type distribution of these materials is very similar to the collection units discussed above, with practically all the flakes of chalcedony.

Average weight of the combined subsurface flaking waste assemblage is 0.49 gram, a figure remarkably similar to the surface scrape results. Average weight for specimens from Stratum A units is 0.44 gram, compared to 0.57 gram from Stratum B, figures less variable than exhibited in the surface collection assemblage. However, considerable average weight variation is noted

Table 19
FLAKING WASTE FROM SURFACE COLLECTION GRIDS - STRATUM A

Catalog Number	Grid	Total Count	Total Weight (gm)	Total Technical Flakes	Rhyolite	Andesite	Chalcedony	Quartz	Quartzite	Obsidian
01	A-4	5	1.2	1	-	-	4	-	-	1
208	A-5	5	1.8	0	-	-	5	-	-	-
02	A-19	12	12.8	3	1	2	8	1	-	-
216	A-23	2	6.8	0	-	-	2	-	-	-
04	A-24	7	5.8	3	-	-	7	-	-	-
205	A-25	1	1.4	0	-	-	1	-	-	-
158	A-31	22	19.6	1	-	-	20	1	-	1
165	A-34	3	0.8	0	-	-	2	-	1	-
201	A-35	4	24.0	0	-	1	2	-	1	-
211	A-36	8	5.4	1	-	-	8	-	-	-
203	A-43	1	1.0	0	-	-	1	-	-	-
07	A-44	27	15.2	8	-	2	22	2	-	1
10	A-54	20	6.8	10	-	2	15	-	3	-
238	A-60	2	0.6	0	-	-	2	-	-	-
239	A-67	4	1.8	0	-	-	4	-	-	-
12	A-74	7	2.6	2	-	-	7	-	-	-
228	A-76	1	0.8	0	-	-	1	-	-	-
14	A-84	4	1.2	3	-	-	4	-	-	-
15	A-104	4	2.4	1	-	-	3	1	-	-
17	A-114	4	4.2	2	-	-	3	1	-	-
20	A-134	3	2.8	2	-	1	2	-	-	-
21	A-154	2	1.4	1	-	-	2	-	-	-
22	A-164	2	0.4	1	-	-	2	-	-	-
24	A-174	5	2.4	3	-	-	5	-	-	-
26	A-184	24	12.0	14	-	-	21	-	3	-
28	A-194	5	4.4	0	-	-	4	-	1	-
TOTALS		184	139.6	56	1	8	157	6	9	3
Relative frequencies of rock types:					.01	.04	.85	.03	.05	.02

Average flake weight: 0.8 gram
Average flake density for all positive grids: 7.1/5 square meters
Technical flake/non-technical flake ratio: 1:3.3

Table 20
FLAKING WASTE FROM SURFACE COLLECTION GRIDS - STRATUM B

Catalog Number	Grid	Total Count	Total Weight (gm)	Total Technical Flakes	Rhyolite	Andesite	Chalcedony	Quartz	Quartzite	Obsidian
247	B-2	1	2.2	0	-	-	1	-	-	-
31	B-7	31	19.8	6	-	-	30	-	1	-
231	B-8	1	1.0	0	-	-	1	-	-	-
34	B-17	24	8.7	6	-	-	21	2	1	-
232	B-18	2	0.4	0	-	-	2	-	-	-
226	B-22	6	12.4	2	-	-	6	-	-	-
241	B-29	8	66.0	1	1	-	7	-	-	-
223	B-31	11	20.8	0	2	-	9	-	-	-
37	B-37	23	37.0	2	-	-	20	2	1	-
40	B-47	15	46.2	1	1	2	10	2	-	-
43	B-57	14	13.6	1	-	-	12	2	-	-
44	B-67	4	7.2	0	-	-	4	-	-	-
47	B-77	3	4.6	0	-	-	3	-	-	-
220	B-80	10	38.2	0	1	-	8	1	-	-
68	B-86	8	11.6	1	1	2	4	1	-	-
70, 72	B-97	6	12.4	1	-	1	4	-	-	1
229	B-102	18	11.2	2	-	-	18	-	-	-
49	B-107	29	44.0	3	-	-	23	-	7	-
234	B-108	58	38.6	3	3	-	55	-	-	-
244	B-116	37	41.4	3	3	-	31	-	1	1
53	B-117	77	40.2	4	1	2	66	-	8	-
57	B-120	33	35.2	4	-	-	27	3	3	-
61	B-127	12	8.8	1	-	1	10	-	1	-
63	B-137	6	1.8	1	1	1	3	1	-	-
66	B-147	1	0.2	0	-	-	1	-	-	-
TOTALS		438	523.5	42	14	9	376	14	23	2
Relative frequencies of rock types					.03	.02	.86	.03	.05	.01

Average flake weight: 1.2 grams
Average flake density for all positive grids: 17.5/5 square meters
Technical flake/non-technical flake ratio: 1:10.4

Table 21
FLAKING WASTE FROM SURFACE SCRAPES

Catalog Number	Grid	Grid Section	Total Count	Total Weight	Chalcedony	Quartzite	Obsidian
73	A-174	SW¼	2	0.8	2	-	-
75	A-174	SE¼	9	5.6	7	1	1
76	A-174	NE¼	5	5.8	4	1	-
77	A-174	NW¼	6	5.0	5	1	-
78	B-86	SW¼	1	0.2	1	-	-
79	B-86	SE¼	11	0.6	10	1	-
81	B-86	NE¼	7	1.8	7	-	-
--	B-86	NW¼	-	-	-	-	-
TOTALS			41	19.8	36	4	1

Average flake weight: 0.48 gram

Table 22
FLAKING WASTE FROM TEST EXCAVATION UNITS

Test Unit	Grid	Count (Weight in grams) 0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	Totals	Average Weight	Average Flake Density per Unit Level
V	A-8	3 (0.2)	7 (0.4)	7 (0.8)	5 (0.2)	5 (0.2)	--	--	27 (1.8)	0.06	5.4
IV	A-31	94 (30.8)	71 (8.6)	72 (21.8)	38 (5.8)	15 (2.6)	--	--	290 (69.6)	0.24	58.0
VII	A-37	91 (24.4)	33 (101.6)	16 (1.8)	8 (1.2)	--	--	--	148 (129.0)	0.87	37.0
VI	A-45	14 (8.2)	28 (13.0)	26 (9.2)	47 (20.8)	25 (5.0)	27 (18.8)	8 (4.6)	175 (79.6)	0.45	25.0
XI	B-6	1 (1.8)	0	0	--	--	--	--	1 (1.8)	1.80	0.3
X	B-18	12 (7.6)	1 (0.2)	0	0	0	--	--	13 (7.8)	0.60	2.6
IX	B-49	4 (0.6)	1 (0.2)	5 (1.4)	4 (0.2)	0	4 (1.2)	*9 (0.8)	27 (4.4)	0.16	3.9
XII	B-65	9 (15.4)	0	--	--	--	--	--	9 (15.4)	1.70	4.5
I	B-97	13 (13.2)	4 (0.2)	4 (0.8)	8 (1.2)	10 (1.4)	--	--	39 (16.8)	0.43	7.8
VIII	B-109, B-110	167 (91.6)	64 (33.4)	6 (1.6)	**--	--	--	--	237 (126.6)	0.53	33.9
II	B-120	70 (55.2)	9 (3.0)	0	--	--	--	--	79 (58.2)	0.74	26.3
III	C-85	0	0	0	--	--	--	--	0		
TOTALS		478 (249)	218 (160.6)	136 (37.4)	110 (29.4)	55 (9.2)	31 (20.0)	17 (5.4)	1045 (511)		
Average weight:		(0.52)	(0.74)	(0.28)	(0.27)	(0.17)	(0.65)	(0.32)	(0.49)		
Density/m^3:		199.2	90.8	61.8	78.6	45.8	77.5	42.5	121.5		

*60-90 cm
**Test probes: 0-30 cm, 9 (8.2); 30-150 cm, no cultural materials

when compared by unit level. For example, average weights vary from 0.74 gram in the 10-20 centimeter levels to 0.17 in the 40-50 centimeter levels. Average flake weight also varies between units. Of the units that produced statistically meaningful collections (over thirty specimens), average weight ranges from a high of 0.74 in test unit II (Stratum B) to a low of 0.24 in test unit IV (Stratum A).

Density of occurrence, again by unit level, also varies considerably by total volume of soil processed. The highest flake density, 90.8, was recovered from each cubic meter of soil from the 0-10 centimeter levels, compared to lows of 45.8 from the 40-50 centimeter levels and 42.5 from 60-70 centimeters.

Cores are rare in the recovered materials. A single specimen (#163) composed of quartzite was recovered from the surface. This cobble-based core has bifacial flake removal at one end and weighs 1,234 grams. Its dimensions are 13.6x11.1x6.4 cm.

Results of the flaking waste study from the current project are basically congruent with those from the BLM study (Sutton 1981:Appendix III). The flaking waste is reflective of secondary reduction, bifacial thinning, trimming, and pressure flaking. Most of the flakable material was apparently brought to the site in as yet undetermined, preprocessed form.

NON-BIFACIAL FLAKED LITHIC TOOLS

Eighteen non-bifacial flaked lithic tools were recovered during the investigation, as depicted in Table 23. With few exceptions, the assemblage consists of edge-damaged flakes. Retouched tools are rare, and those that do occur have minimal informal retouch.

The edge damage attribute most prevalent is nibbling--typically bifacial in configuration--suggesting that cutting tasks were the cause of the damage. With the exception of a single quartzite hammerstone, composition of the non-bifacial flaked lithic tools is exclusively chalcedony. Distribution of these tools varies very little between Strata A and B. Additionally, due to the low frequency of specimens, no special use areas could be identified from the distribution of this tool class.

BIFACES/PROJECTILE POINTS

Eleven bifaces and projectile points were recovered during this investigation (Table 24). With the exception of specimen #235, all specimens are either broken or fragmented. Specimens #161 and #142 may be classified as Eastgate contracting stem projectile points. Specimen #156 is an example of a Saratoga

Table 23
NON-BIFACIAL FLAKED LITHIC TOOLS

Catalog No.	Stratum	Provenience	Weight (gm)	Length (cm)	Width (cm)	Thickness (cm)	Material	Type
214	A	Grid A-3	1.2	2.3	2.1	0.3	Chalcedony	Edge-damaged flake
213	A	Grid A-3	2.0	2.5	1.3	0.7	Chalcedony	Edge-damaged flake
005	A	Grid A-24	20.8	4.7	3.6	1.3	Chalcedony	Retouched flake
023	A	Grid A-164	3.8	4.2	2.8	0.3	Chalcedony	Edge-damaged flake
030	A	Grid A-194	1.2	2.1	1.1	0.5	Chalcedony	Edge-damaged flake
033	B	Grid B-7	13.0	5.4	3.3	1.1	Chalcedony	Edge-damaged flake
224	B	Grid B-31	1.0	2.4	1.1	0.4	Chalcedony	Edge-damaged flake
045	B	Grid B-67	16.6	5.3	3.4	1.0	Chalcedony	Edge-damaged flake
221	B	Grid B-80	4.8	2.2	2.5	0.9	Chalcedony	Edge-damaged flake
406	--	General surface	486.1	9.7	7.8	4.5	Quartzite	Hammerstone
097	B	Test Unit I, 20-30 cm	2.6	2.8	1.2	0.6	Chalcedony	Edge-damaged flake
114	A	Test Unit IV, 0-10 cm	1.4	1.9	1.3	0.7	Chalcedony	Edge-damaged flake
141	A	Test Unit IV, 30-40 cm	0.4	1.3	1.0	0.4	Chalcedony	Edge-damaged flake
253	A	Test Unit V, 10-20 cm	1.6	2.7	1.6	0.4	Chalcedony	Edge-damaged flake
281	A	Test Unit VI, 10-20 cm	36.6	5.0	4.9	2.1	Chalcedony	Retouched flake
301	B	Test Unit VIII, 5-10 cm	1.4	2.4	1.6	0.5	Chalcedony	Edge-damaged flake
311	B	Test Unit IX, 5-10 cm	7.8	3.7	2.9	0.8	Chalcedony	Edge-damaged flake
322	B	Test Unit X, 0-10 cm	125.2	7.5	8.0	2.6	Chalcedony	Edge-damaged flake

Table 24
BIFACES/PROJECTILE POINTS

Catalog No.	Stratum	Provenience	Weight (gm)	Length (cm)	Width (cm)	Thickness (cm)	Material	Description
161	A	Grid A-31	2.6	(2.0)	2.4	0.5	Chalcedony	Projectile point base, Eastgate contracting stem
019	A	Grid A-114	1.6	(2.4)	(1.1)	(0.6)	Chalcedony	Biface fragment, edge
156	B	Grid B-55	5.6	(3.0)	2.7	0.6	Chalcedony	Projectile point base, possibly Saratoga Springs
157	B	Grid B-98	3.8	(3.2)	(2.4)	0.4	Chalcedony	Projectile point tip
235	B	Grid B-108	5.0	5.1	1.9	0.7	Chalcedony	Drill/awl, complete
162	--	General surface	8.8	(4.9)	(3.4)	0.7	Chalcedony	Biface fragment, leaf-shaped(?)
115	A	Test Unit IV, 0-10 cm	2.2	(2.1)	(1.7)	(0.7)	Chalcedony	Biface preform, base with platform remaining
142	A	Test Unit IV, 30-40 cm	10.0	(3.7)	3.0	0.8	Basalt	Projectile point base, probably Eastgate contracting stem
266	A	Test Unit VII, 0-10 cm	4.0	(1.4)	(1.2)	(0.3)	Chalcedony	Projectile point fragment, edge(?)
295	B	Test Unit VIII, 0-5 cm	5.4	(3.1)	(2.3)	(0.7)	Chalcedony	Projectile point tip
326	B	Test Unit XII, 0-5 cm	25.8	5.6	(3.3)	1.5	Chalcedony	Ovate biface, possible preform

() = Broken specimen dimension

Springs (Cottonwood series) projectile point. These projectile point types were also noted during the earlier BLM investigation (Sutton 1981).

Specimen #235, the only complete artifact in the collection, is an awl or drill produced from a brown jasper (chalcedony) secondary flake. Only the tip has been retouched; the base is unmodified and shows original flake morphology.

GROUNDSTONE

Two classes of milling equipment were recovered during the investigation--manos and metates (Table 25). The mano assemblage is represented by only three specimens, two of which are complete. Specimen #167 is trifacial and was apparently used "edge on" to a considerable extent. The specimen is pecked, one end is battered, and it is made of a well-consolidated sandstone.

Specimen #282 is made of a locally available, irregularly shaped quartzite cobble. This specimen is unifacial and pecked, with evidence of battering along one margin. The battering on both these specimens may be related to animal pulping tasks or hard-seed processing.

Metates are more abundant in the assemblage than manos. Practically all of these specimens are fragments, making detailed attribute analysis impractical. Based on examination of the fragments, the metate assemblage includes only unshaped specimens made primarily of coarse-grained granodiorite or sandstone slabs.

MISCELLANEOUS ARTIFACTS

Two small ceramic sherds are the only specimens from this artifact class recovered during the current study. No bone tools, beads, pendants, or other such items were encountered. Specimen #55 was recovered from the surface in collection grid B-117 and is a rim sherd of brown utility ware weighing 1.4 grams. Specimen #286 was recovered from test excavation unit VI in the 20-30 centimeter level and weighs 0.8 gram. This specimen has an orange slip visible on the interior, and the exterior has exfoliated to reveal a blackened carbon core.

Few details can be discussed regarding the ceramic assemblage at SBr-3801 based on these two small fragments, although it is apparent that ceramics was not an important component in the overall site assemblage. It is most probable that the ceramics were manufactured elsewhere and may have been obtained during trade with peoples to the east.

Table 25
GROUNDSTONE

Catalog No.	Stratum	Provenience	Weight (gm)	Length (cm)	Width (cm)	Thickness (cm)	Description
Manos:							
35	B	Grid B-17	133.6	(5.5)	(6.7)	(2.5)	Unifacial fragment
167	B	Grid B-80	588.6	9.5	7.0	5.7	Trifacial mano, pecked, end-battered, complete
282	A	Test Unit VI, 10-20 cm	838.0	9.1	8.6	5.5	Unifacial, pecked, quartzite, complete
Metates:							
217	A	Grid A-23	284.2	8.0	5.8	4.0	Possible unifacial fragment
242	B	Grid B-29	85.2	5.0	5.0	4.0	3 small fragments, unifacial(?)
51	B	Grid B-107	2000+	30.0	20.0	14.0	Bifacial fragment
60	B	Grid B-120	2000+	25.0	24.0	16.0	Unifacial fragment
65	B	Grid B-137	65.8	3.0	3.0	2.0	Unifacial fragment
169	B	Test Unit I, 30-40 cm	121.2	3.2	4.0	3.0	Unifacial fragment
152	A	Test Unit IV, 0-10 cm	2000+	38.0	15.0	5.0	Unifacial fragment
149	A	Test Unit IV, 40-50 cm	53.0	--	--	--	Unifacial fragment
352	A	Test Unit V, 20-30 cm	206.7	--	--	--	Unifacial fragment
259	A	Test Unit V, 30-40 cm	33.0	5.5	3.5	0.6	Unifacial fragment
336	A	Test Unit VI, surface	2000+	35.0	20.0	10.0	Unifacial fragment
337	A	Test Unit VI, surface	2000+	26.0	30.0	10.0	Unifacial fragment, fits #152
338	A	Test Unit VI, surface	2000+	38.5	13.0	9.5	Unifacial fragment, not pecked
343	A	Test Unit VI, surface	693.0	14.5	11.5	11.0	Unifacial fragment
249	A	Test Unit VII, surface	323.2	7.4	4.2	4.7	Unifacial fragment
267	A	Test Unit VII, 0-10 cm	914.2	14.0	9.5	6.5	Unifacial fragment
268	A	Test Unit VII, 0-10 cm	232.0	7.0	5.0	7.0	Unifacial fragment, may fit #267
250	B	Test Unit VIII, surface	145.6	6.7	5.6	2.7	Unifacial fragment
335	B	Test Unit IX, 30-40 cm	2000+	29.0	19.0	11.0	Unifacial, 50% complete
344	B	Test Unit XI, surface	1305.5	17.1	14.5	8.0	Unifacial, pecked
340	B	Test Unit XI, 0-5 cm	174.8	7.8	6.7	2.5	Unifacial fragment

() = Broken specimen dimension

MISCELLANEOUS ECOFACTS

The assemblage contains a variety of ecofactual material, both organic and non-organic. Organic materials include a single, recent coprolite from test unit I (10-20 centimeters), probably produced by a coyote. A number of charcoal samples were also obtained, although no significant concentrations were noted and quantities are so low as to preclude obtaining reliable radiocarbon dates.

Inorganic ecofacts consist primarily of fire-affected rock and quartzite cobble fragments. Fire-affected rock was analyzed to assess atmospheric conditions of firing, as previously described in Section IV (Analysis) of this report. Table 26 presents the distribution of fire-affected rock for the surface collections, Table 27 depicts the specimens recovered in test excavation units, and Table 28 is a summary of findings by stratum.

A vast majority of the fire-affected rock in this assemblage has consistent internal blackening. Assuming that this attribute is related to firing in a reducting atmosphere, it is probable the rocks were fired in buried roasting pits rather than in surface hearths. An interesting pattern is seen in Table Z. The surface of Stratum B has far more fire-affected rock than Stratum A, while the reverse is true for the subsurface assemblage. This may be related to differences in the degree of disturbance or deflation of the site soils.

A considerable quantity of quartzite cobble fragments was also recovered from SBr-3801. These cobbles are locally available in exposed strata of the nearby Jackhammer Formation, yet are not a naturally occurring component of the site's substrate. The quartzite is a relatively high-quality material, with a reddish cortex and a tan to white interior. It is marginally flakable, but does not have a true conchoidal fracture. It is difficult to determine whether breakage of some of the angular specimens was caused by natural or human agency, although the cobbles appear to associate with recognizable cultural materials within the site, and artifacts (e.g., mano #282 and hammerstone #406) were recovered which are made of this material.

Table 29 depicts the occurrence of the quartzite cobble fragments recovered. Stratum B has a significantly higher quantity of these cobbles on the surface than A, while roughly equal amounts were recovered from the subsurface. If the quartzite is a naturally occurring constituent of the site, a homogeneous distribution would be expected. As with fire-affected rock, the higher frequency on the surface in Stratum B may be a reflection of erosion, disturbance, and/or deflation.

Table 26
FIRE-AFFECTED ROCK FROM SURFACE COLLECTION GRIDS

KEY

Rock Type
1 = Granodiorite
2 = Granite
3 = Sandstone
4 = Shale
5 = Quartzite
6 = Rhyolite

Degree of Blackening
1 = Extreme, very black
2 = Moderate
3 = Light
4 = Very light

Quality of Blackening
1 = Consistent throughout
2 = Inconsistent

Exfoliation
1 = Present
2 = Not present

Grid	Total Count/ Total Weight	Specimen Weight (gm)	Rock Type	Degree of Blackening	Quality of Blackening	Exfoliation
A-21	1 (500.8)	500.8	1	1	1	2
A-184	2 (157.6)	45.3	1	2	1	2
		112.3	1	1	1	2
B-7	5 (287.8)	61.4	5	2	1	2
		82.2	5	1	1	2
		76.9	1	3	1	2
		55.8	1	2	1	2
		11.5	1	2	1	2
B-17	12 (1693.6)	540.8	1	1	1	2
		248.5	1	4	2	2
		423.7	1	1	1	2
		77.2	1	1	1	2
		64.6	1	1	1	2
		108.7	1	3	1	2
		42.1	1	2	1	2
		24.9	1	2	1	2
		44.7	1	2	1	2
		34.6	1	2	1	2
		12.2	3	1	1	2
		71.6	5	1	1	2
B-37	6 (1119.8)	185.1	1	2	1	1
		443.7	1	3	1	2
		132.4	1	1	1	2
		221.2	1	1	1	2
		48.5	1	1	1	2
		88.9	5	2	1	2

Table 26
FIRE-AFFECTED ROCK FROM SURFACE COLLECTION GRIDS
(continued)

Grid	Total Count/ Total Weight	Specimen Weight (gm)	Rock Type	Degree of Blackening	Quality of Blackening	Exfoliation
B-47	12 (735.4)	28.4	5	1	1	2
		147.9	1	2	1	2
		96.8	1	3	1	2
		80.1	1	2	1	2
		60.0	1	2	1	2
		86.2	1	2	1	2
		51.0	1	1	1	2
		69.1	1	2	1	2
		30.8	1	1	1	2
		22.9	1	1	1	2
		59.9	1	2	1	2
		2.3	1	1	1	2
B-57	6 (386.2)	192.3	1	4	1	2
		63.9	1	1	1	1
		87.5	6	4	1	2
		22.3	1	3	1	2
		11.3	1	1	1	2
		8.9	1	1	1	2
B-64	3 (225.1)	0.1	5	1	1	2
		56.7	1	2	1	2
		168.3	1	2	1	1
B-77	2 (302.2)	298.8	1	2	1	2
		3.4	1	2	1	2
B-86	3 (659.9)	282.3	3	3	1	2
		252.7	1	3	1	2
		124.9	1	1	1	2
B-87	3 (112.8)	59.1	1	3	1	2
		48.4	1	2	1	1
		5.3	1	2	1	2
B-120	6 (1185.6)	381.9	1	3	1	2
		480.0	1	2	1	2
		35.3	1	3	1	1
		89.0	1	2	1	2
		93.8	1	3	1	2
		105.6	1	2	1	2
B-127	5 (2209.3)	284.2	1	2	1	2
		40.3	1	4	1	2
		1235.0	1	3	1	2
		564.6	1	3	1	2
		85.2	1	2	1	2

Table 27
FIRE-AFFECTED ROCK FROM TEST EXCAVATION UNITS

KEY

Rock Type
1 = Granodiorite
2 = Granite
3 = Sandstone
4 = Shale
5 = Quartzite
6 = Rhyolite

Degree of Blackening
1 = Extreme, very black
2 = Moderate
3 = Light
4 = Very light

Quality of Blackening
1 = Consistent throughout
2 = Inconsistent

Exfoliation
1 = Present
2 = Not Present

Test Unit	Level (cm)	Specimen Weight (gm)	Rock Type	Degree of Blackening	Quality of Blackening	Exfoliation
I	0-10	--	--	--	--	--
	10-20	66.4	1	3	1	2
	20-30	14.1	1	1	1	1
		42.6	1	2	1	2
	30-40	--	--	--	--	--
	40-50	8.2	1	2	1	2
II	0-10	147.6	1	1	1	2
	10-20	--	--	--	--	--
	20-30	--	--	--	--	--
IV	0-10	761.4	1	4	1	2
		492.9	1	4	1	2
		385.0	1	3	2	2
		337.2	1	1	1	2
		261.1	1	2	1	2
		33.7	3	3	1	2
		13.9	3	1	1	2
	10-20	123.8*	1	1	1	2
		216.3	1	3	2	2
		1093.1	1	4	1	2
		298.1	1	1	1	2
		218.3	1	3	1	2
		79.6	1	4	1	2
		252.9	1	4	1	1
		60.1	1	2	1	2
		461.5	1	3	1	1
		225.3	1	1	1	2
		162.1	1	2	1	2
		70.0	3	1	1	2

Table 27
FIRE-AFFECTED ROCK FROM TEST EXCAVATION UNITS
(continued)

Test Unit	Level (cm)	Specimen Weight (gm)	Rock Type	Degree of Blackening	Quality of Blackening	Exfoliation
		104.0	1	3	1	2
		6.5	1	4	1	2
		20.7	3	2	1	2
	20-30	44.8	3	2	1	2
		31.9	1	1	1	2
		352.2	1	3	2	2
		139.4	1	3	2	2
		112.4	1	1	1	2
		159.9	1	2	1	2
		80.9	1	3	1	2
		356.4	1	4	1	2
		51.9	1	2	1	2
		32.6	3	2	1	2
		97.5	2	3	1	2
		91.9	1	4	1	2
		85.3	1	3	1	1
		132.2	1	4	1	2
		88.7	1	3	1	2
		128.0	1	2	1	2
	30-40	16.7	1	1	1	2
V	0-10	--	--	--	--	--
	10-20	--	--	--	--	--
	20-30	206.0	1	3	1	2
		442.4	1	2	1	2
VI	0-10	--	--	--	--	--
	10-20	81.3	1	1	1	2
VII	0-10	161.5	1	3	1	2
		49.7	1	3	1	1
		82.6	1	3	1	2
		46.0	1	1	1	2
		57.9	1	4	1	2
		22.0	3	1	1	2
		56.9	1	4	1	2
		21.5	1	4	1	2
		40.4	1	3	1	2
		34.1	1	4	1	2
		35.8	1	4	1	2
		5.5	1	4	1	2
		7.7	3	1	1	2
		4.7	3	2	1	2
		3.8	1	1	1	2
		719.6	1	4	1	2

Table 27
FIRE-AFFECTED ROCK FROM TEST EXCAVATION UNITS
(continued)

Test Unit	Level (cm)	Specimen Weight (gm)	Rock Type	Degree of Blackening	Quality of Blackening	Exfoliation
		423.1	1	4	1	2
		139.3	1	1	1	2
		163.9	1	1	1	2
		308.8	1	1	1	2
		108.4	1	1	1	2
		85.4	1	3	1	2
		13.2	5	2	1	2
		12.7	3	1	1	2
		93.5	1	2	1	2
		44.3	1	2	1	2
	10-20	--	--	--	--	--
	20-30	58.8	5	3	1	2
VIII	0-5	80.5	5	2	1	2
	5-10	182.1	1	4	1	2
		69.7	3	1	1	2
		39.9	3	2	1	2
		32.7	1	3	1	2
		24.3	3	1	1	2
		38.2	5	1	1	2
		180.8	5	1	1	2
		58.5	3	2	1	2
	10-20	285.6	3	1	1	2
		235.1	1	3	1	2
		58.6	5	1	1	2
		38.7	1	4	1	2
		55.8	1	2	1	2
IX	0-5	--	--	--	--	--
	5-10	--	--	--	--	--
	10-20	--	--	--	--	--
	20-30	13.4	3	2	1	2
	30-40	272.9	1	4	1	2
		17.4	1	1	1	2
		22.5	1	2	1	2
		301.4	4	1	1	2
X	0-10	517.1	1	1	1	2
		392.4	1	3	1	2
		369.3	1	3	1	2
		524.2	1	1	1	2
	10-20	14.7	3	2	1	2

*15 fragments

Table 28
FIRE-AFFECTED ROCK BY STRATUM

STRATUM A

Surface Collection Grids:

Grid	Count	Weight (gm)
A-21	1	500.8
A-184	2	157.6
SUBTOTAL	3	658.4
Average Weight:		219.5

Test Excavation Units:

Test Unit	Count	Weight (gm)
IV	39	7,680.2
V	2	648.4
VI	1	81.3
VII	27	2,801.1
SUBTOTAL	69	11,211.0
Average Weight:		162.5
TOTAL	72	11,869.4

STRATUM B

Surface Collection Grids:

Grid	Count	Weight (gm)
B-7	5	287.8
B-17	12	1,693.6
B-37	6	1,119.8
B-47	12	735.4
B-57	6	386.2
B-64	3	225.1
B-77	2	302.2
B-86	3	659.9
B-87	3	112.8
B-120	6	1,185.6
B-127	5	2,209.3
SUBTOTAL	63	8,917.7
Average Weight		141.6

Test Excavation Units:

Test Unit	Count	Weight (gm)
I	4	131.3
II	1	147.6
III	14	1,380.5
IX	5	627.6
X	1	14.7
SUBTOTAL	25	2,301.7
Average Weight:		184.1
TOTAL	88	11,219.4

Site Totals: 160 23,088.8 gm
Site Average Weight: 144.3 gm

Table 29
QUARTZITE COBBLES AND COBBLE FRAGMENTS BY STRATUM

STRATUM A

Surface Collection Grids:

Grid	Count	Weight (gm)
A-3	1	11.8
A-5	2	90.4
A-21	1	84.0
A-24	1	39.0
A-31	1	2.6
A-32	1	86.4
A-34	1	73.6
A-36	1	106.6
A-44	2	8.0
A-56	2	68.4
A-67	2	1.2
SUBTOTAL	15	570.0
Average Weight		38.0

Test Excavation Units:

Test Unit	Count	Weight (gm)
IV	10	625.8
V	1	0.4
VI	2	61.6
VII	1	59.4
SUBTOTAL	14	747.2
Average Weight		53.4

TOTAL	29	1,317.2

STRATUM B

Surface Collection Grids:

Grid	Count	Weight (gm)
B-2	1	6.0
B-7	1	17.6
B-17	1	33.8
B-22	2	82.0
B-29	3	211.2
B-31	5	59.2
B-47	4	181.2
B-80	5	738.8
B-86	2	7.8
B-108	1	8.0
B-116	1	2.8
B-117	3	14.2
B-120	1	75.4
SUBTOTAL	30	1,438.0
Average Weight		47.9

Test Excavation Units:

Test Unit	Count	Weight (gm)
I	3	323.2
II	2	119.6
VIII	9	181.4
XII	2	48.8
SUBTOTAL	16	673.0
Average Weight		42.1

TOTAL	46	2,111.0

Site Totals: 75 3,428.2 gm
Average Weight: 45.7 gm

HISTORIC MATERIALS

As previously noted, site SBr-3801 has been subjected to a variety of impacts, primarily disturbance from off-road vehicle activities and camping. This has resulted in a scatter of recent trash throughout the site area. Table 30 lists the historic materials recovered from the site--primarily subsurface--during the current examination. Additional historic items were also observed elsewhere on the surface of the site, including beverage bottles and cans, motorcycle parts, and large fragments from a military aerial tow target which probably transgressed from one of the nearby military reservations.

All of the historic materials recovered in this examination represent relatively recent recreational use of the area. There is also some contamination of the subsurface aspect of the deposit, although this condition appears to be limited and confined to more shallow portions of the site.

FAUNAL ASSEMBLAGE EVALUATION[1]

Faunal remains occur throughout SBr-3801 and were recovered in all testing procedures--surface collection grids (Table 31), surface scrapes (Table 32), and test excavation units (Table 33). The recovered bone is primarily small and fragmented, as seen in notation of their weights. The most substantial clusters of faunal material occur in surface collection grid B-71 and in the 0-10 centimeter level of test unit VIII. Bone is somewhat more frequent in Stratum B.

Table 32
FAUNAL REMAINS FROM SURFACE SCRAPES

Catalog No.	Provenience	Count	Weight
074	A-174, SW quarter	1	0.2 gm
080	B-86, SE quarter	12	0.6 gm
082	B-86, NE half	4	0.4 gm
TOTAL		17	1.2 gm

The faunal inventory was packaged and shipped to Dr. Lois Lippold, professor of physical anthropology at San Diego State University, for analysis and evaluation. Preliminary findings of Lippold's analysis are presented below.

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[1]Prepared by Dr. Lois Lippold, San Diego, California.

Table 30
HISTORIC MATERIALS

Catalog No.	Provenience	Description
202	Grid A-35, surface collection	Glass shard
367	Grid B-77, soil sample	Glass shard
85	Test Unit I, 0-10 cm	Aluminum foil pieces
86	Test Unit I, 0-10 cm	Glass shard
297	Test Unit VIII, 0-5 cm	Glass shard
298	Test Unit VIII, 0-5 cm	Skeet target fragment
313	Test Unit IX, 10-20 cm	Cigarette filter
329	Test Unit XII, 0-5 cm	Aluminum pop top
387	Test Unit XII, soil sample, 0-30 cm	Glass shard

Table 31
FAUNAL REMAINS FROM SURFACE COLLECTION GRIDS

Catalog No.	Provenience	Count	Weight (gm)
003	A-19	2	2.0
206	A-25	3	5.4
159	A-31	7	0.2
011	A-54	2	1.0
008	A-44	4	1.6
013	A-74	2	0.2
016	A-104	3	0.2
018	A-114	1	0.4
369	A-144, soil sample	1	0.2
025	A-174	1	0.2
027	A-184	1	0.4
373	A-184, soil sample	1	0.2
029	A-194	1	0.2
SUBTOTAL		29	12.2
233	B-18	1	2.0
046	B-67	1	0.2
048	B-77	2	0.4
071	B-97	20	4.6
230	B-102	3	0.2
050	B-107	4	0.2
389	B-107, soil sample	1	0.2
236	B-108	6	0.2
246	B-116	1	2.0
054	B-117	8	0.2
372	B-117, soil sample	2	0.2
058	B-120	9	0.6
062	B-127	6	1.0
064	B-137	4	0.2
067	B-147	2	0.2
370	B-147, soil sample	2	0.2
SUBTOTAL		72	12.6
164	C-85	1	7.6
TOTAL		102	32.4

Table 33

FAUNAL REMAINS FROM TEST EXCAVATION UNITS

Test Unit	Grid	Count (Weight in grams) 0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-70 cm	Total
V	A-8	0	1 (0.2)	6 (1.0)	3 (2.0)	5 (0.4)	--	--	15 (3.6)
IV	A-31	19 (1.6)	21 (1.2)	50 (1.6)	37 (2.0)	31 (0.8)	--	--	158 (7.2)
VII	A-37	5 (4.0)	5 (4.0)	37 (1.2)	1 (0.2)	--	--	--	48 (9.4)
VI	A-45	*5 (0.2)	13 (4.0)	1 (0.2)	*48 (2.0)	*4 (0.4)	14 (0.4)	1 (0.2)	86 (7.4)
XI	B-6	0	0	0	--	--	--	--	0
X	B-18	1 (0.2)	0	0	0	0	--	--	1 (0.2)
IX	B-49	0	0	5 (0.2)	0	0	42 (2.6)	127 (6.8)	**174 (9.6)
XII	B-65	*1 (0.2)	0	--	--	--	--	--	1 (0.2)
I	B-97	*4 (0.4)	*5 (0.4)	10 (0.6)	28 (1.8)	31 (1.4)	--	--	78 (4.6)
VIII	B-109, B-110	80 (12.4)	20 (1.8)	*17 (0.6)***	--	--	--	--	115 (14.6)
II	B-120	*27 (1.8)	7 (0.4)	0	--	--	--	--	34 (2.2)
III	C-85	0	0	0	0	0	0	1 (7.6)	1 (7.6)
TOTALS		142 (20.8)	72 (12.0)	124 (5.2)	117 (8.0)	71 (3.0)	56 (3.0)	129 (14.6)	711 (66.6)

*Includes material from soil sample

**60-90 cm

***Test probe: 0-30 cm, 2 (0.4)

Comparative collections at Fauna Consultants, San Diego State University (Zoology and Anthropology departments), San Diego Natural History Museum, and Page Museum in Los Angeles were used to identify the material, when possible, to the generic or specific level. A total of 830 specimens was examined. Of these, 139 (19 percent by count) were identified to genus and/or species. Even if unidentifiable, all specimens provided some information as many small fragments could be identified to general class (mammal, bird, etc.). All elements were examined for evidence of burning or butchering and were separated, counted, and weighed. Fragments were placed into major class categories, such as mammal (large or small), bird, reptile, or amphibian. There exists the possibility that some faunal elements were deposited naturally as determination of intrusive bone within the assemblage is difficult.

Nine species of vertebrates were identified in the SBr-3801 faunal assemblage (Table 34). Mammals are the most frequent group, comprising 97 percent of the elements identified, 90 percent of the minimum number of individuals (MNI) present, and 99 percent of the estimated pounds of muscle and tissue meat available (Table 35).

More than 80 percent of the identified elements are either hare or woodrat. When hare is combined with identified rodent species, 95.4 percent of all identified elements are included. Direction of the animal resource exploitation appears to have been toward small-mammal resident species.

Bighorn sheep, two species of birds, and one reptile are the other genera represented in the assemblage. The bighorn sheep, identified from a calcaneum fragment and two teeth, afforded approximately 80 percent of the estimated pounds of available muscle and tissue. One must consider whether the bighorn sheep was used for food or some other purpose. The recovered specimens probably represent food items as the calcaneum fragment shows some limited evidence of butchering suggestive that the sheep was dismembered with tissue and tendon still present. The fauna may have been brought to the site fully dressed and butchered. Quail, hawk, and lizard contributed very little to the food resources as identified in the present sample.

Distribution according to depth (Table 36) suggests a concentration of faunal remains in the upper levels of the site (surface to thirty centimeters). Hare and woodrat are the most frequently identified species, being found in almost all levels.

Specimens examined indicate that hare, gopher, ground squirrel, and woodrat were butchered and cooked at the site. Bighorn sheep, on the other hand, were probably butchered elsewhere and only selected pieces returned to the site. Table 37 depicts the

Table 34
FAUNAL SPECIES IDENTIFIED FROM 4-SBr-3801

Genus/Species	Common Name
Mammals:	
Lepus californicus	Black-tailed hare
Neotoma lepida	Desert woodrat
Peromyscus eremicus	Cactus mouse
Thomomys bottae	Botta pocket gopher
Ammospermophilus leucurus	Antelope ground squirrel
Ovis canadensis	Bighorn sheep
Birds:	
Lophortyx californicus	California quail
Buteo sp.	Hawk
Reptiles:	
Uma sp.	Fringe-toed lizard

Table 35
IDENTIFIED VERTEBRATES

Genus/Species	No. of Elements	Percentage	MNI	Percentage	Estimated pounds of meat*	Percentage
Mammals:	136	97.84	27	90.00	124.5	99.44
Lepus californicus	53	38.13	3	10.00	9.0	7.19
Neotoma lepida	61	43.88	20	66.66	14.0	11.18
Peromyscus eremicus	8	5.76	--	--	--	--
Thomomys bottae	9	6.47	2	6.66	1.0	0.80
Ammospermophilus leucurus	2	1.44	1	3.33	0.5	0.40
Ovis canadensis	3	2.16	1	3.33	100.0	79.87
Birds:	2	1.44	2	6.66	0.7	0.56
Lophortyx californicus	1	0.72	1	3.33	0.2	0.16
Buteo sp.	1	0.72	1	3.33	0.5	0.40
Reptiles:	1	0.72	1	3.33	--	--
Uma sp.	1	0.72	1	3.33	--	--
TOTALS	139	100.00	30	99.99	125.2	100.00

*Based on identified genera/species dressed weight (see White in Wing and Brown 1979).

Table 36
IDENTIFIABLE VERTEBRATE DISTRIBUTION BY DEPTH*

Genus/Species	Surface	0-10 cm	10-20 cm	20-30 cm	30-40 cm	40-50 cm	50-60 cm	60-90 cm	Total
Lepus californicus	13	2	3	4	4	6	5	16	53
Neotoma lepida	3	44	6	0	3	5	0	0	61
Peromyscus eremicus	0	0	1	3	1	2	0	1	8
Thomomys bottae	2	1	0	0	0	1	1	4	9
Ammospermophilus leucurus	0	0	0	0	0	0	0	2	2
Ovis canadensis	0	1	1	1	0	0	0	0	3
Uma sp.	1	0	0	0	0	0	0	0	1
Large mammal, unburned	8	9	4	2	0	16	3	0	42
Large mammal, burned	7	0	0	0	6	0	0	0	13
Small mammal, unburned	93	50	52	92	82	23	44	50	486
Small mammal, burned	5	12	5	5	2	0	1	1	31
TOTAL	132	119	72	107	98	53	54	74	709

*Excluding birds.

occurrence of various identifiable elements for Lepus californicus and Neotoma sp.

Examination of specimens of Lepus californicus suggests an interesting and characteristic pattern of element breakage. Mandibles and broken maxillas, scapular heads, proximal humeri, distal radii (burned), distal femurs, and calcaneums indicate a specific butchering pattern probably related to bone marrow extraction. This pattern seems to have produced a large number of fragments and indicates that a substantial number of the small mammal unburned fragments (SMUB) represent butchered hare. This category (SMUB) is the largest single class of faunal remains obtained and constitutes 69 percent of the remains (see Table 36).

The distribution of woodrat remains is also interesting because this species was identified primarily from mandible, maxilla, and tooth fragments. The low representation of other woodrat elements is potentially due to a bone-destructive technique associated with food preparation. Ethnographic accounts indicate the whole animal was pounded to paste, with various seeds and berries often added, then eaten raw (Bean 1974). Rats were occasionally cooked in their skins directly on coals (Kroeber 1925) or encased in clay and baked (Bean 1974).

Based on criteria of thickness and degree of burning, several fragments of bone possibly attributable to Homo sapiens were identified. These bones were recovered from surface collections in Stratum A from the following collection grids: A-25 (catalog number 206), A-114 (#18), A-54, (#11), A-184 (#27), and test unit II (#108).

One specimen is definitely human. This bone is in good condition even though it appears to have been burned in a very hot fire. Based upon morphological features, the bone was identified as part of a sub-adult human femur. Criteria upon which this identification is based are as follows: maximum width, 33.5 millimeters; maximum height, 27.5 millimeters; greatest thickness, 2.5 millimeters; least thickness, 1.5 millimeters; and weight, 9.8 grams.

The fragment is the proximal end of a left femur. The entire head and articulating surface are intact with a medium to deep fovea capitis femoris. Approximately one-third of the femoral neck remains attached to the head. A structurally normal amount of cancellous bone is apparent on the interior of the fragment.

Epiphyseal closure on the head of the femur is in stage 3. The epiphysis is starting to fuse on the posterior superior margin, but is as yet unfused in other areas. Stewart and McKern (1957) find cases of this type of nonunion up to twenty years.

Table 37
COMPARISON OF IDENTIFIABLE ELEMENTS
FOR LEPUS SP. AND NEOTOMA SP..

Lepus sp.

Element	Count
Molar	11
Phalange	10
Maxilla	9
Radius	5
Humerus	3
Tibia	3
Femur	2
Ulna	2
Scapula	2
Mandible	2
Occipital	1
Talus	1
Metapodial	1
Incisor	1
Total	53

Neotoma sp.

Element	Count
Mandible	37
Molar	19
Maxilla	5
Total	61

Krogmen (1962) reports fusion of the femoral head to occur between sixteen and seventeen years. Based on both authors, an age range of between sixteen and twenty years is estimated for the specimen. Due to the lack of epiphyseal closure (union), any attempt at determination of sex would be premature.

The faunal remains from SBr-3801 suggest short-term, seasonal occupation. The low number of species identified and relatively low biomass represented could have supported a single-family unit for only a week or more. Owl Canyon was probably a camp site occupied by small groups or single families on their yearly round.

As previously mentioned, there is no direct evidence of seasonality in the faunal assemblage. Of interest, however, is the fact that there are no juveniles or sub-adult elements in the *Lepus californicus* assemblage. In California the breeding season for this species is from December to September, with a main peak in April and May (Orr 1940). The gestation period is forty-three days (Verner and Bass 1980). If it is assumed that capture and exploitation of *Lepus californicus* was not selective toward adults, then site occupation must have been during some period when the relative frequencies of sub-adult/juvenile individuals was low. Typically, this would be in late fall or winter.

SECTION VI

INTERPRETATIONS

The cultural deposits at Owl Canyon site SBr-3801 have been subjected to two independent investigations since their discovery in November of 1979. Emergency data recovery measures implemented by BLM (Sutton 1981) and the Cornerstone Research program have resulted in recovery and analysis of a roughly 26 percent sample of the more substantial aspects of the resource's surface aspect. Subsurface inspection (limited to the current project) has not been as extensive, with only 0.24 percent of the subsurface dimensions having been analyzed. The resource is identified as part of the cultural pattern associated with indigenous occupation of the Mojave Desert region during the mid to late Milling Horizon period. It is apparent that the site was occupied on a seasonal basis--possibly over many years--by small bands of people, perhaps in the fall.

The flaked lithic assemblage recovered during this project is quite similar to the finds of Sutton's 1979 investigation. The flaking waste assemblage reflects secondary reduction, biface reduction, trimming, and probable resharpening processes, with a surprising paucity of tool forms.

It is notable that far fewer flaked lithic artifacts were recovered during this investigation as compared to Sutton's effort (1981). Where this examination resulted in an assemblage of 1,717 flaked stone items, Sutton retrieved a total of 5,639 (Sutton 1981:16-28). Given the extreme difference in sample size between the recent work and that undertaken in 1979 (20.4 percent versus 5.8 percent, respectively), the difference in assemblages of flaked lithic artifacts deserves further consideration. A number of explanations may be advanced. Perhaps, as Sutton suggests (1981:34-38), the 1979 investigation focused on areas of intense aboriginal activity, areas which far exceeded activity levels for other portions of the site. Alternatively, it may be that the area inspected by Sutton was more highly disturbed and churned--diffusing cultural refuse from original subsurface strata and splaying them across the surface--than the majority of the total site area. Subsurface evidence throughout the site (particularly Stratum A) discloses that significant amounts of cultural debris remain to be analyzed. Unfortunately, subsurface inspection was limited to less than a 1 percent sample, and further excavation would be necessary to continue this line of inquiry.

The small number of tool forms in the combined assemblages from site SBr-3801 also deserves explanation. It is suspected that relic hunting may have occurred at the site, depleting the surface assemblage of the latter class of specimens. For example, most bifaces and projectile points were recovered from subsurface contexts, and subsurface excavation was a relatively limited aspect of this investigation in terms of area examined. The tools that were recovered tend to be informal (e.g., utilized flakes, edge-damaged flakes) or fragmented (bifaces), forms which would probably be overlooked by many relic hunters.

If relic hunting is not the cause of flaked lithic tool rarity, then other explanations are possible. Site occupants may have curated their "stylistically significant" tool forms, or these tool forms may not have played an important role in site function.

One of the more interesting aspects of the flaked lithic assemblage is that 85 percent of the artifacts are of chalcedony or crypto-crystalline silicate material. This closely parallels Sutton's findings (1981:Appendix 3) where 95 percent of the flake stone categories were of crypto-crystalline silicate materials. There is considerable variability within this rock class. The term chalcedony as applied in this project includes such diverse materials as chert, "petrified palm root," agate, jasper, and opal, which all occur in different colors, textures, clarity, and quality. This variation suggests lithic exploitation at a variety of sources, with perhaps some materials obtained through trade. No systematic scheme presently exists for typing various chalcedonies and objectively matching specimens with their source. Future research in this direction could prove valuable in assessing economic exchange systems, movement of groups within given areas, and delimitation of culturally/temporally significant factors concerning lithic selection.

The groundstone assemblage follows a common pattern for this region of the Mojave Desert. Manos are relatively rare within the recovered materials and those that do occur tend to be either highly stylized or quite informal. The presence of well-shaped specimens suggests that manos were valued and curated. If a curated mano was not in the portable tool kit, any suitable local rock of convenient size was probably used "as is."

Although most of the metate specimens are fragments, it is readily apparent that they tend to be slab type, stylistically informal, and composed of locally occurring material (granodiorite, sandstone). It is not possible to determine precisely what products were being ground, although it is likely that hard seeds and small mammals were being processed on the metates.

Osteological evidence includes both food refuse and human remains. Although postulated on the discovery of only a single fragment, the presence of burned human bone supports the assumption that activities associated with cremation and burial are a part of the indigenous cultural pattern that affected development of site SBr-3801.

Food refuse suggests that inhabitants of this site collected locally available mammals and other vertebrates as proteinaceous food resources. A predisposition for hare and woodrat is supported by the osteological assemblage. Based on the relative frequencies of sub-adult/juvenile individuals to adult individuals of *Lepus californicus* (hare), the assemblage points to site occupation or occupations during late fall or winter months.

Dating the occupation of SBr-3801 remains tenuous. The obsidian hydration data for the site (Sutton 1981) are interesting in that rim measurements generally correspond to a series of measurements obtained from SBr-4449, a recently excavated site in Drinkwater Basin on Fort Irwin (Norwood, Bull and Rosenthal 1981). Rim measurements on twenty-five specimens from SBr-4449 vary between 4.6 and 6.2 microns, with an average of 5.36 microns. These specimens were not submitted for trace element analysis, although visual characteristics suggest they were from the Coso source (Norwood, Bull and Rosenthal 1981). Two associated radiocarbon dates for the site are 1040 ±50 B.P. and 1540 ±70 B.P. Obsidian occurred in same-level provenience with the radiocarbon dated material; however, the degree of site disturbance is such that there may be no direct correspondence. A hydration rate of 240.7 years per micron is derived for this region by averaging these measurements and radiocarbon dates.

Assuming it is valid to apply this rate for Coso material recovered from SBr-3801 (Sutton 1981:Table 4), a maximum date of occupation of 2431 years B.P. (UCLAOHL #6159) and a minimum date of 1155 years B.P. (UCLAOHL #6164) are obtained. If all measurements on Coso material from SBr-3801 are averaged, a figure of 6.7 microns is derived. In applying the rate of 240.7 years per micron, an average date of occupation for the site is 1612.7 years B.P. This would place the Owl Canyon occupation somewhat earlier than that at SBr-4449. However, Sutton's obsidian specimens were recovered from the surface and may have been subjected to accelerated hydration. In order to more fully evaluate occupation dates, an additional array of obsidian specimens has been submitted for analysis from the current investigation. Based on the variation thus far observed in the obsidian hydration measurements, it is suggested that sporadic occupation occurred over a relatively long period of time.

Not enough material was recovered from this examination for a meaningful radiocarbon date. While an average date might be gained by combining charcoal from a number of levels and units, it would not result in increased dating accuracy. It is possible that additional research might uncover more concentrated areas of charcoal deposition within the site, particularly in Stratum A. Sufficient charcoal might be obtained through specialized flotation techniques.

The occurrence of ceramics at SBr-3801 is notable as it suggests relatively late occupation. However, it is also notable that ceramics are quite rare at the site. Only four small sherds were recovered from the combined BLM and Cornerstone Research investigations. The obsidian hydration data and other temporal indicators suggest occupation at a time prior to local manufacture and proliferation of ceramics in the Mojave region. The specimens recovered may therefore represent trade items from the east, where ceramics appeared earlier as part of southwestern florescence.

To discover potential differences in intersite function, comparisons were calculated between flakes/debitage and other classes of cultural material in Stratum A and Stratum B. Three basic assumptions were made prior to these comparisons. First, it was assumed that major classes of cultural material generally associate with particular functions and activities (i.e., flakes=stoneknapping, milling=food preparation). The second assumption was that differences in intersite function will be reflected by differential ratios of the various cultural material classes between strata. Third, if no differences are detected, functions are assumed to have been relatively similar in both Strata A and B. The exercise of comparing ratios proves little and no statistical reliability is claimed. However, the observed pattern is an interesting one in that differences between Strata A and B do become apparent.

Comparisons were made by examining ratios between flakes/debitage, the most common form of cultural material, and other classes. Ratios were calculated to compensate for differences in absolute frequencies and recovery techniques for Strata A and B. Calculations were based on the occurrence of each 100 flakes in each strata to the occurrence of specimens in other classes. The ratios determined for Stratum A were then compared with those for Stratum B.

The least variation between strata was found between flakes/debitage and milling tools. There are 84.6 flakes for every milling tool in Stratum A and 78.4 flakes for every milling tool in Stratum B, which represents a 7.9 percent difference. This suggests that flaking functions and milling-related functions co-occur in roughly equal proportions in each stratum.

For each non-bifacially flaked lithic tool, 94.0 flakes occur in Stratum A and 107.8 in Stratum B, a 14.7 percent difference. For each biface and projectile point, 169.2 flakes occur in Stratum A and 143.7 in Stratum B, a 17.7 percent difference. The ratio is slightly higher for thermally fractured rock: Stratum A, 11.8; Stratum B, 9.8; a 20.4 percent difference.

The most notable variation is flake/bone and flake/quartzite cobble fragment ratios. For flake/bone, the ratio is 2.5 in

Stratum A and 1.8 in Stratum B, a 38.9 percent difference. For flake/quartzite cobble fragments, the ratio is 29.2 in Stratum A and 18.7 in Stratum B, a 56.1 percent difference.

Disproportionate occurrences in the flake/quartzite cobble fragment and flake/bone ratios suggest differential activity, albeit the function of the cobble fragments is unknown. The disproportionate occurrence in the flake/bone ratio may imply that relatively more animal preparation and consumption was occurring than stoneknapping in Stratum A. However, it must be noted that Stratum B is the more disturbed. Because of this disturbance, one would expect a higher ratio in Stratum B due to breakage, but this is not the case. Differential cultural practices may be reflected, and the fact that dramatic differences (over 25 percent) do not occur in the ratios for other classes of materials is very important. Statistical approaches to analysis remain necessary to explicate the significance of these apparent differences.

It is suggested that from a functional point of view, variance noted is reflective of differing functional emphases between strata. Temporal control will be necessary to determine whether patterns are temporally or culturally significant.

Combining the various lines of evidence recorded during the current study, two of the three defined site area strata appear to contain significant deposits--Stratum A and Stratum B. No significant materials were recovered during investigations in Stratum C. For the total assemblage, Stratum B contains the largest population of surface materials; flaking waste and fire-affected rock are good examples. However, the limited evidence from subsurface dimensions discloses the presence of greater numbers of flaking waste and fire-affected rock in the substrate of Stratum A. Other artifact classes (e.g., faunal remains, quartzite cobble fragments) not strongly represented in the surface sample of Stratum A do occur in the substrate at frequencies that closely relate to surface data of Stratum B. Based on these observations, it is apparent that Stratum A has a higher degree of integrity than does Stratum B.

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APPENDIX A

Flaked Lithic Observation Codes
Glossary of Terms

FLAKE OBSERVATIONS

Organization______________________ Station Number______________

Project______________________ Processing Dates______________

Site Number______________________ Recorder______________

Catalog No. /__/__/__/__/ 1 2 3 4

Class Code /__/__/ 5 6

Admin. Code /__/ 7

Provenience Code /E/__/__/__/__/N/__/__/__/__/ 8 9 10 11 12 13 14 15

Depth Code /__/__/__/ 16 17 18

Study Segment /__/__/ 19 20

/__/ 21 1=in situ 2=dislocated

Length (cm) /__/__/.__/ 22 23 24

Width (cm) /__/__/.__/ 25 26 27

Thickness (cm) /__/__/.__/ 28 29 30

Weight (gm) /__/__/__/__/.__/ 31 32 33 34 35

Lithic Material /__/__/ 36 37

VENTRAL FACE

Striking Platform

Thickness (mm) /__/__/__/ 38 39 40

Width (mm) /__/__/__/ 41 42 43

Condition /__/ 44

Fabricator Contact Area

Length (mm) /__/__/__/ 45 46 47

Width (mm) /__/__/__/ 48 49 50

Condition /__/ 51

Eraillure

Length (mm) /__/__/__/ 52 53 54

Width (mm) /__/__/__/ 55 56 57

Termination /__/ 58

/__/ 59 Platform Preparation

/__/ 60 Mass Form Code

/__/ 61 Distal Termination

/__/ 62 Compression Rings

/__/ 63 Fissures

/__/ 64 Bulb of Applied Force

(62–64: 0=no, 1=yes)

/__/ 65 Iron Oxide

/__/ 66 Manganese Oxide

/__/ 67 Patination

(65–67: 0=none, 1=light, 2=medium, 3=heavy)

DORSAL FACE

Cortex Percentage /__/__/__/ 68 69 70

Previous Flake Removals

	Polar Reference	Termination Code
1	/__/__/ 71 72	/__/ 73
2	/__/__/ 74 75	/__/ 76
3	/__/__/ 77 78	/__/ 79
4	/__/__/ 80 81	/__/ 82
5	/__/__/ 83 84	/__/ 85

/__/ 86 Dissections 0=not observed 1=mesial 2=medial 3=transverse

/__/ 87 Iron Oxide

/__/ 88 Manganese Oxide

/__/ 89 Patination

(87–89: 0=none, 1=light, 2=medium, 3=heavy)

/__/ 90 Meniscus Lens 0=no 1=yes

/__/ 91 Natural Cracks/Facets 0=no 1=yes

/__/__/ 92 93 Total Flake Removals

CORE OBSERVATIONS

Organization______________________________ Station Number______________

Project__________________________________ Processing Dates____________

Site Number______________________________ Recorder__________________

Catalog No.	Class Code	Admin. Code	Provenience Code	Depth Code
/__/__/__/__/	/__/__/	/__/	/E/__/__/__/__/N/__/__/__/__/	/__/__/__/
1 2 3 4	5 6	7	8 9 10 11 12 13 14 15	16 17 18

Study Segment	1=in situ 2=dislocated	Length (cm)	Width (cm)	Thickness (cm)	Weight (gm)
/__/__/	/__/	/__/__/.__/	/__/__/.__/	/__/__/.__/	/__/__/__/__/.__/
19 20	21	22 23 24	25 26 27	28 29 30	31 32 33 34 35

Lithic Material
/__/__/
36 37

0=none, 1=light, 2=medium, 3-heavy

Total Flake Removals	Cortex Percentage	Iron Oxide	Manganese Oxide	Patination	Patterning Code
/__/__/__/	/__/__/	/__/	/__/	/__/	/__/__/
38 39 40	41 42	43	44	45	46 47

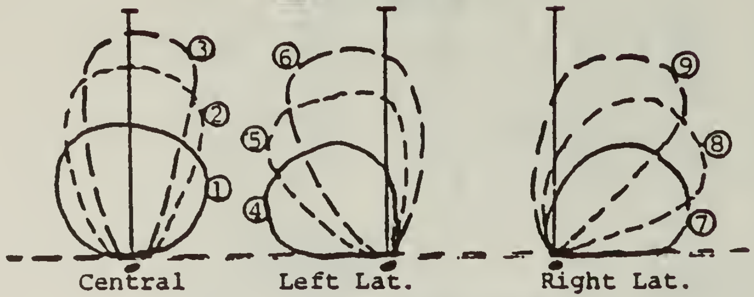
Predominant Five Flake Removals

0=no, 1=yes (Compression Rings through Natural Cracks/Facets)

	Platform Preparation	Termination	Compression Rings	Fissures	Bulb of Applied Force	Meniscus Lens	Natural Cracks/ Facets
1	/__/ 48	/__/ 49	/__/ 50	/__/ 51	/__/ 52	/__/ 53	/__/ 54
2	/__/ 55	/__/ 56	/__/ 57	/__/ 58	/__/ 59	/__/ 60	/__/ 61
3	/__/ 62	/__/ 63	/__/ 64	/__/ 65	/__/ 66	/__/ 67	/__/ 68
4	/__/ 69	/__/ 70	/__/ 71	/__/ 72	/__/ 73	/__/ 74	/__/ 75
5	/__/ 76	/__/ 77	/__/ 78	/__/ 79	/__/ 80	/__/ 81	/__/ 82

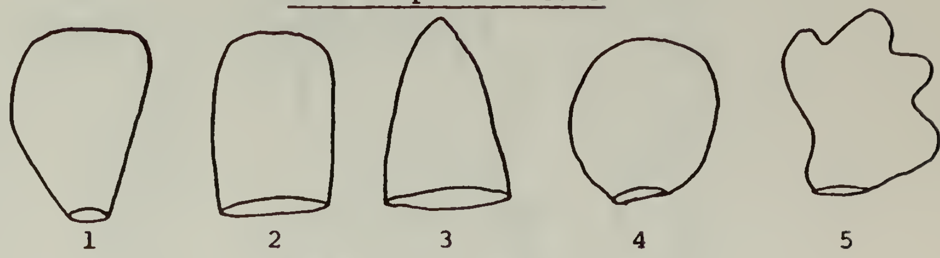
TEMPLATE KEY FOR FLAKED LITHIC OBSERVATION CODES

Mass Direction (generalized)



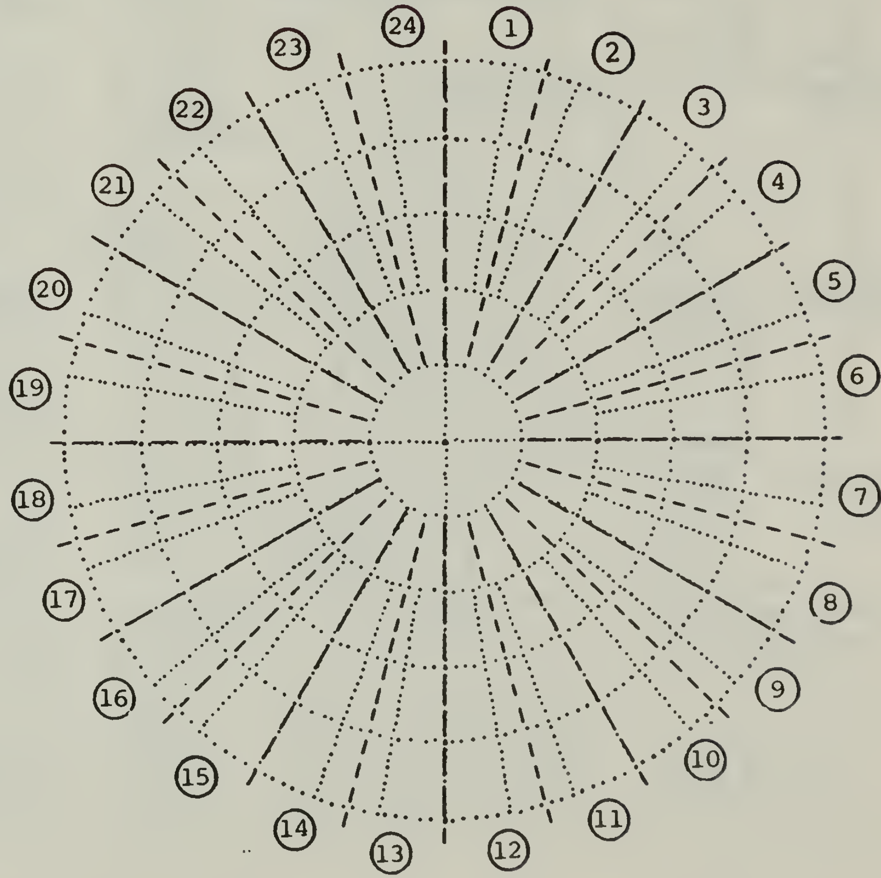
(Viewed from ventral face)

Mass Proportion Code



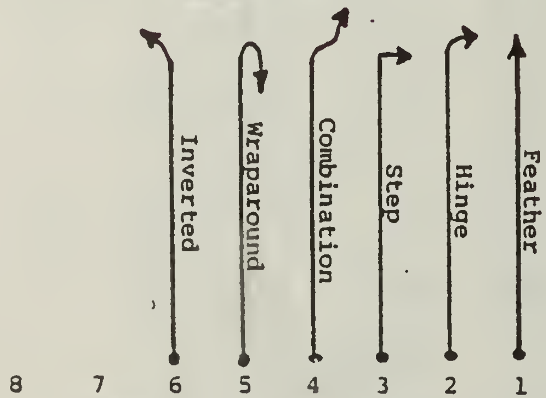
(Viewed from ventral face)

Polar Reference Code

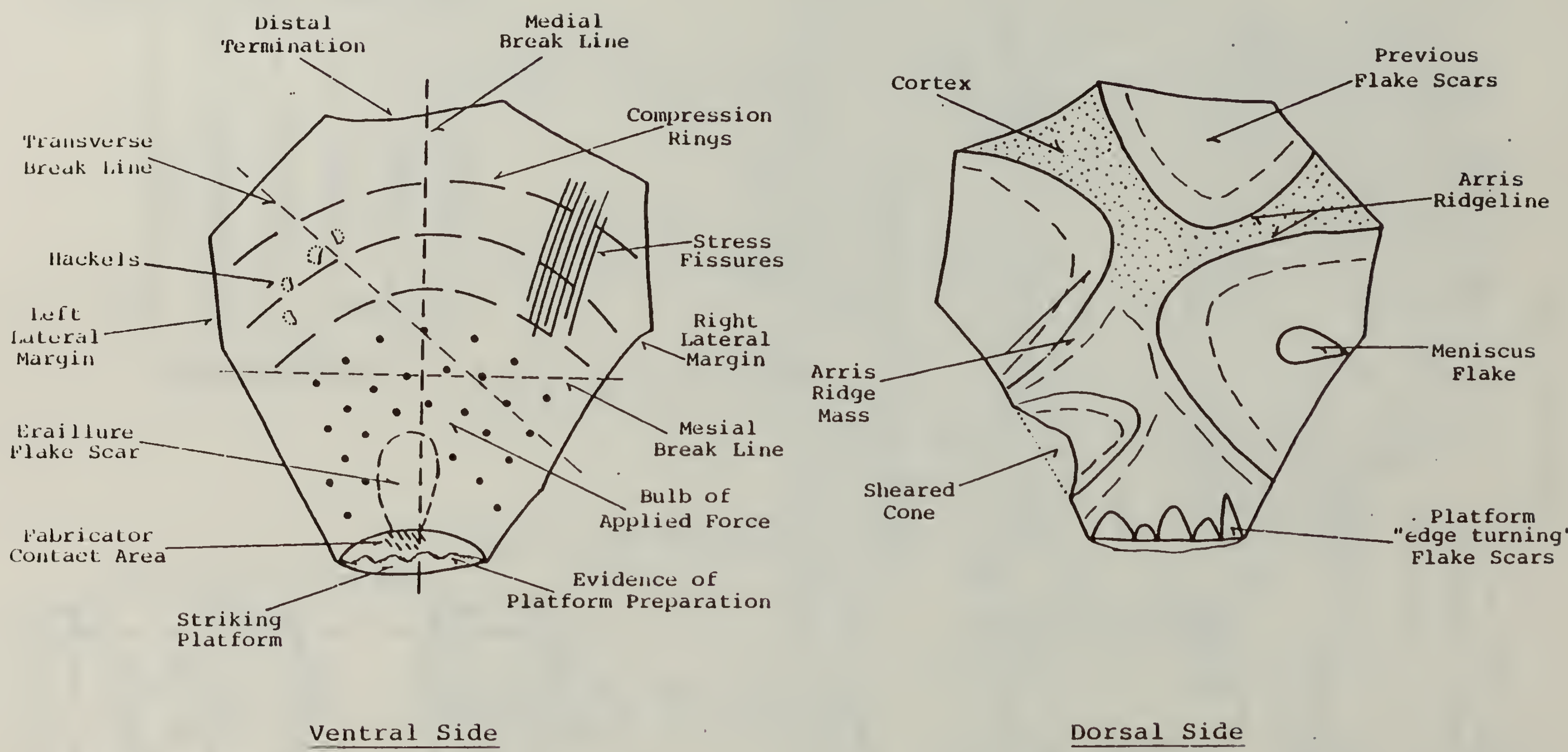


(Determined from dorsal face centered with platform to bottom)

Termination Code



(viewed with ventral side to left)



Stylistic Representation of Flaked Lithic Nomenclature

GENERAL GLOSSARY OF TERMS

Arris (Ridge, Crest). Arris refers to the raised ridge between two negative flake scars. It is theorized that arris ridges channel energy and their configurations therefore influence the direction of flake removal (Crabtree 1972:56, 89). The attribute is observed on the dorsal face of a flake.

Bulb of Applied Force. This attribute occurs on the ventral face of a flake at the proximal end and is seen as a "swelling" on the contour of the flake face. Bulb formation follows the laws of physics and is a remnant of Hertzian cone energy propagation. Bulbs of applied force are formed by both percussion and pressure flaking, although bulb development may vary with flaking technique. Well-developed bulbs tend to be characteristic of hard-hammer percussion, while soft-hammer and pressure flaking techniques result in less pronounced bulb formation (Crabtree 1972:48).

Combination Termination. This flake termination occurs when a flake begins to hinge fracture at its distal end, but has sufficient force to carry through with the direction of breakage changing toward a more feathered configuration (see feather termination).

Compression Rings. These are concentric ripple marks which radiate from the point of force on the ventral face of a flake. They can be either positive or negative and are indicative of the lines of force applied in fracturing stone. They are generally more pronounced in specimens produced with hard-hammer fabricators (Crabtree 1972:52).

Cone of Force (Hertzian Cone). The formation of a cone results when force is applied to isotropic materials, such as siliceous rock. When force is applied vertically to a flat surface, the force dissapates in a conical fashion. The apex of the cone will be truncated in proportion to the surface contacted by the fabricator, and each flake is a portion of a cone of force (Crabtree 1972:54).

Cortex. Cortex is the natural external rind on the surface of rock that has been exposed to weathering or chemical alteration (Crabtree 1972:56).

Edge Turning (Beveling). Edge turning is a technique used in platform preparation. It is accomplished by removal of small multiple flakes (using either pressure or percussion) on a marginal edge. The technique strengthens the edge and provides for removal of flakes in a more controlled manner (Crabtree 1972:95).

Eraillure Flake. An erraillure is an irregular flake that often forms between the bulb of applied force on a flake and the bulbar scar which remains on the core. The eraillure usually adheres to the core and leaves no scar on the core. The dorsal side on an eraillure has no compression rings, but the ventral surface has compression rings that match those left on the bulbar scar surface (Crabtree 1972:60).

Fabricator. This term refers to any of the tools used to apply force to an objective piece in the stoneknapping process. Included are hammerstones, antler or hardwood billets and batons, punches, and other pressure flaking tools (Crabtree 1972:62).

Fabricator Contact Area. The point of contact is that area of forceful contact between the fabricator and striking platform. This point imparts all the dissapated force to the rest of the stone in the flaking process. Fabricator contact points often have characteristic impact damage reflecting the force applied and the type of fabricator used (Crabtree 1972:84).

Feather Termination. Feather terminations fracture cleanly along the lines of the flake, ventral plane, or plane of fracture. The margins and distal end of a feathered flake are very sharp and reflec correct application of force in terms of intensity and direction (Crabtree 1972:64).

Fissures. This attribute is observable on the ventral face of a flake. Fissures consist of minute linear radii that usually originate along the margins of flakes and are directed toward the fabricator contact point. Fissures are crests and troughs on the surface of a specimen and are evidence of stress. The presence of fissures is often characteristic of flakes removed using a hard-hammer percussion technique (Crabtree 1972:64).

Grinding. This technique is used in platform preparation. By grinding the platform, core top, or margins of a core, more control can be achieved in the flaking process. Proper grinding can strenthen edges and weaken planate surfaces to avoid step flaking and shattering. An abrasive material such as sandstone can be used to prepare platforms by grinding (Crabtree 1972:68).

Hinge Termination (Fracture). Hinge fractures occur at the distal end of a flake. The fracture prevents the flake from running its full length to the proposed termination point and terminates a flake at right angles to its longitudinal axis. The resulting break is usually rounded or blunt (Crabtree 1972:68).

Inverted Termination. This type of breakage is the exact opposite of a hinge fracture. Inverted termination is probably most often caused by the direction of force following the contour of the core and into the objective work piece before detaching.

Lip. A lip is a projecting overhang along the edge of a striking platform's ventral face. This projection is thought to be closely associated with the application of soft-hammer percussion techniques (Crabtree 1972:74).

Meniscus Flake (Lens). This type of flake is the opposite of an eraillure flake. A meniscus flake normally has a convex surface on one side and a concave surface on the opposing side (Crabtree 1972:76).

Objective Work Piece. The work piece is that piece of stone that is the recipient of the applied force. The objective work piece is shaped and fashioned into the desired implement stage of refinement.

Patination (Patina). Patination is a chemical alteration on the stone's surface formed by varying natural processes (Crabtree 1972:80). This characteristic has been used as a criteria for relative dating of assemblages based on the assumption that greater degrees of patination are related to greater age.

Perverse Fracture. A perverse fracture is "A helical, spiral, or twisting fracture initiated at the edge of an objective piece" (Crabtree 1972:82). Such fractures may be caused by natural flaws, excessive application of force, or attempts to remove an excessive mass. Certain production errors (i.e., step fractures) may produce more mass than applied force can overcome and the energy is then deflected into and through the mass of the work piece (Crabtree 1972:82).

Platform Preparation. Platform preparation is one of several special techniques used on the portion of a striking platform intended to receive the applied force. Platform preparation techniques include grinding, polishing, faceting, and beveling (edge turning) (Crabtree 1972:84). The purpose of the techniques is to strengthen the platform in order to facilitate removal of larger flakes in a more controlled fashion than might be possible otherwise. Evidence of platform preparation will occur on the dorsal edge of a flake's striking platform.

Polar Reference. This attribute refers to the orientation of negative flake scars on the dorsal surface of a flake. Assuming there are negative flake scars on the dorsal face of a specimen, the orientation of the four most prominent scars is measured on a polar coordinate template and assigned a best fit within fifteen degrees. The flake is centered while measuring these angles. Assessment of orientation of flake removal scars permits evaluation of how the specimens were being reduced in terms of utilization of one or more striking platform systems. Flake scar orientation is an indication of the type of core the flakes were being derived from, the methods of tool fabrication, and the tool forms being manufactured.

Polishing. Polishing is one platform preparation technique in which a relatively fine-grained abrasive is used to strengthen the platform (see platform preparation). Polishing may also indicate use wear (Crabtree 1972:84).

Primary Flake (Decortical). A primary flake is a flake with a high percentage of cortex remaining on its dorsal surface.

Secondary Flake. A secondary flake is a flake with no cortex on its dorsal surface.

Serrating. Serrating is indenting the flake edges by alternating flake removals or repeating notches at regular intervals along an edge. The result of these techniques is a saw-like edge (Crabtree 1972:90).

Sheared Cone. This term is applied to certain varieties of negative flake scars on the dorsal face of a flake. These scars result from flake removals that did not originate from the same striking platform as the specimen under consideration. The negative flake scars form low, indented areas on the dorsal face. The configuration of these scars is an influential factor in determining the shape and thickness of flakes.

Step Termination (Fracture). Step terminations are characterized by a "flake scar that terminates abruptly in a right angle break at the point of truncation" Crabtree 1972:93). Such terminations are caused by either a dissipation of force or collapse of the flake during removal.

Striking Platform. The striking platform is the surface area that receives the necessary force for flake detachment (Crabtree 1972:84). The platform is not to be confused with the fabricator contact area, a more limited concept referring only to a small portion of the striking platform on flakes which receives the actual impact force.

Termination (Distal). This term refers to that portion of a flake opposite the striking platform. Variability occurs in how rock responds to the force applied, and the termiantion type is a measure of the flaking skill and efficiency. Many of the termination types can be considered knapping mistakes in the sense that they are inefficient and/or wasteful in reducing stone. Termination type also reflects how the force was being applied relative to the striking platform. In theory, the desired "goal" is for flake removals to result in feather terminations. Termination types are assigned by viewing a specimen in cross section and assigning the flake to a best fit termination according to a template.

Wraparound Termination. This type of termination is like a hinge fracture in the quality of its roundness. The fracture is created by the plane of force going into the stone and then returning part way up the dorsal face of the flake. An outrepasse flake is a special form of wraparound termination where a flake runs across the entire surface of a biface and removes a portion of the opposite edge or margin (Crabtree 1972:80).

APPENDIX B

Palynological Study

Palynological Studies of an Archaeological Stone Ring:
Stoddard Valley, California

by

Richard H. Hevly

Department of Biological Sciences
Northern Arizona University

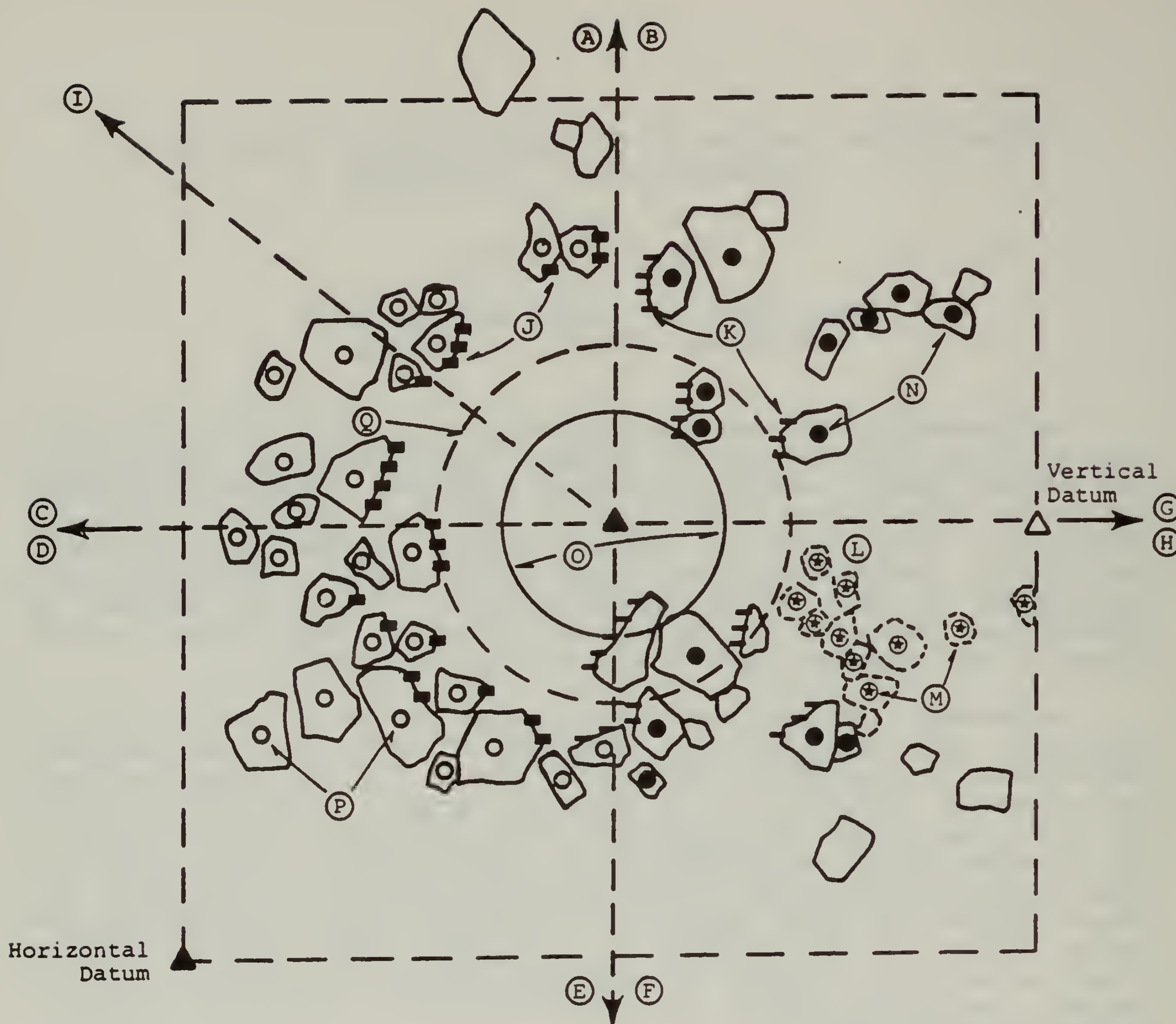
Scattered throughout the high desert of southern California are enigmatic archaeological features constructed of cobbles from the desert floor that form various circular designs or figures. Little is known about their age or function. Several such features have been noted in Stoddard Valley southwest of Barstow, California. Pollen studies of one such structure (SBr-2288) were undertaken as part of an archaeological mitigation project by Cornerstone Research to determine if pollen data might provide clues to the function and/or age of such structures.

Seventeen samples, each consisting of two to three cups of sediment, were collected in February of 1981 from the proveniences shown in Figure 1. From each sample 150 ml of sediment was dry screened (coarse) into a 1000 ml beaker. Distilled H_2O (200 ml) was mixed with the sediment. Concentrated HCl was added to the mixture until no further reaction occurred. The mixture was then stirred thoroughly and after standing for sixty seconds, was passed through a finer screen. By this procedure (Funkhouser and Evitt 1956), it is possible to eliminate the coarsest organic fraction on the screens, as well as a major fraction of the inorganic materials which are sedimented to the bottom of the beaker and discarded.

The pollen-rich fraction was separated from the fluid by centrifugation and washed with hot distilled water to remove cations which form colloidal precipitates. Following centrifugation to remove the water, the sediment was treated with HF for five to ten minutes to remove remaining silicates. The sediment was successively washed in hot distilled water, hot dilute HCl, hot distilled water, cold 5 to 8 percent HNO_3, and hot distilled water and separated from each fluid fraction by centrifugation to remove any colloids which had formed.

The sediment was next acetolyzed to remove the acid-soluble organics, following techniques described by Gray (1965). The pollen-rich residue was washed successively in cold distilled water, hot 5 to 7 percent KOH, and cold distilled water until the fluid was clear to remove alkali-soluble humics.

Two drops of acid and alkali-resistant residue with concentrated pollen were mounted on a microscope slide, using glycerol with basic fuchsin and a #0, 20-30 mm coverslip. Pollen was



A=Sample from surface four meters north of feature

B=Sample from subsurface (-10 cm) four meters north of feature

C=Sample from surface four meters west of feature

D=Sample from subsurface (-10 cm) four meters west of feature

E=Sample from surface four meters south of feature

F=Sample from subsurface (-10 cm) four meters south of feature

G=Sample from surface four meters east of feature

H=Sample from subsurface (-10 cm) four meters east of feature

I=Sample from base of plants at 15-meter radius around feature

■ J=Sample from windrow beneath stone elements in west half of feature

– K=Sample from windrow beneath stone elements in east half of feature

L=Sample from soil buildup at base of creosote bush

⊛ M=Sample from beneath subsurface stone elements at -5 and -10 cm

● N=Sample from beneath stone elements in east half of feature

O=Sample from subsurface interior of feature at -10 cm

○ P=Sample from beneath stone elements in west half of feature

Q=Sample from surface interior of feature

Sample plan to collect pollen soil from Feature 19 identified using standard reference keys and illustrations, as well as a reference collection of pollen types common to the Southwest. Pollen was counted using a mechanical stage permitting the observation of contiguous fields of vision in non-overlapping rows. At least 200 pollen grains were counted from each sample and since some pollen types (e.g., Cheno-Ams and Compositae) were extremely abundant, a second 100-grain count was prepared excluding these types to determine if changes in the proportions of other pollen types were being obscured by restraint of the major pollen types (Double-fixed Sum Technique of Mehringer and Haynes, 1965).

Pollen was recovered from all samples (Figure 2). Eight of nine surface samples yielded 1,500 pollen, or more than 1,000 pollen per drop. Pollen quality was generally good to excellent as measured by the percentage of broken pine pollen; however, the subsurface samples exhibited 5 to 10 percent more breakage than did the surface samples. A total of thirty different pollen types were recovered, including types such as PAP (= Picea, Abies and Pseudotsuga), Riparian tree, and aquatic herb pollen, which are somewhat unexpected in desert pollen samples and may well represent long-distance transport types whose appearance is accentuated by poor local pollen production (Solomon 1976).

The most abundant pollen types are Compositae (Asteraceae or Sunflower family) and Cheno-Ams (Chenopodiaceae or the Goosefoot family) (e.g., saltbush and lambs quarter types) and Amaranthus (pigweed of the Amaranthaceae), followed closely by the Gramineae (Poaceae or Grass family). Other types commonly encountered include Artemesia (sagebrush), Quercus (oak), Ephedra (mormon tea), and Eriogonum (wild buckwheat). Other less commonly encountered types are Liliaceae (Lily family including Yucca), Cactaceae (Cactus family including Opuntia), Polemoniaceae (Phlox family including Gilia), Malvaceae (Mallow family including Sphaeralcea), Onagraceae (evening primrose family including Oenothera), Anacardiaceae (Sumac family including Rhus), Zygophyllaceae (Caltrop family including Larrea), Leguminosae (Bean or Pea family including Dalea and Prosopis), Rhamnaceae (Buckthorn family including Rhamnus), Labiatae (mint family including Salvia), Rosaceae (Rose family including Coleogyne), Umbeliferae (Carrot family), Boraginaceae (Borage family) and Cruciferae (mustard family). These types can all be found in the desert areas near Barstow, California today (Benson 1954).

The range of variation of the various pollen proportions in the surface samples provides an indication of the current pollen rain in the study area. The variation noted is minor and may be largely random or could reflect varying proximity to pollen sources. No significant variation can be observed within or without the stone ring. Subsurface samples in the first 200-grain count exhibit a range of proportions similar to those observed in the surface samples. However, in the second 100-grain pollen count excluding Cheno-Ams and major Compositae types, two differences of subsurface and surface samples may be noted (Figure 3). While pollen of Gramineae varies greatly from sample to sample, a significantly higher proportion of this pollen type is found within the rock circle subsurface sample. This is indicative of close proximity to grass plants and possibly indicative of prehistoric gathering for food or other utilitarian purposes (Balls 1965).

The second trend which can be noted is the occurrence of generally higher proportions of Ephedra pollen in the majority of subsurface samples as compared to the surface samples, both within and without the rock circle. This phenomenon is therefore not very likely to have been related to the prehistoric occupation, but may instead reflect a change in the local density of mormon tea plants, their proximity to the site, or at least their pollen production.

The initial questions leading to the palynological study of sediments from this site cannot be very satisfactorily answered. The environment during occupation was like the present, and therefore one may conclude that the age of this site is post Pleistocene (less than 10,000 years B.P.). The function of the site is not really discernible from the pollen data; however, if any plants were utilized here, they included grass, possibly for food or other utilitarian purpose (e.g., matting as if used for a sleeping ring).

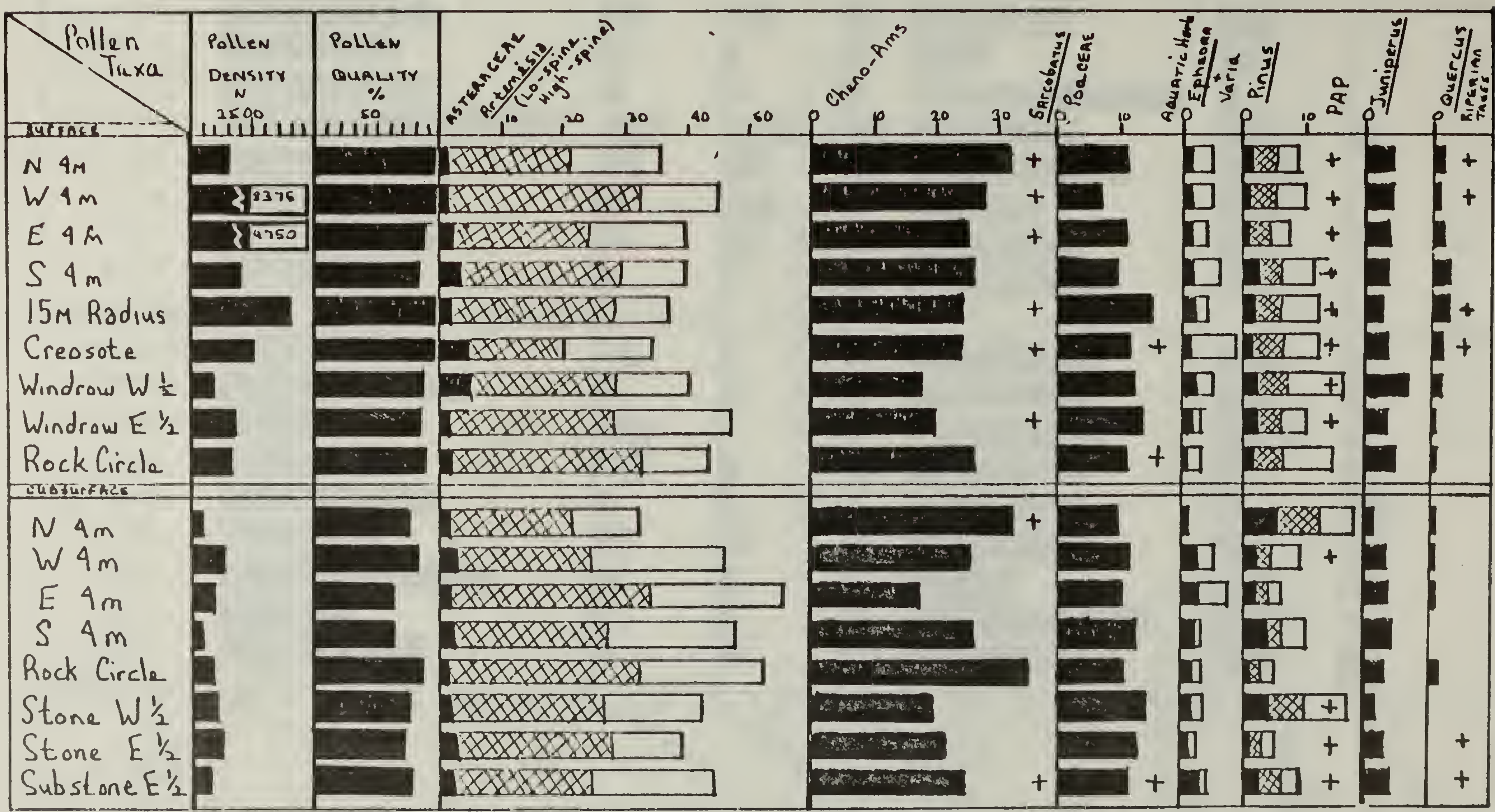


Figure 1
Pollen density quality and composition (200 grain count)

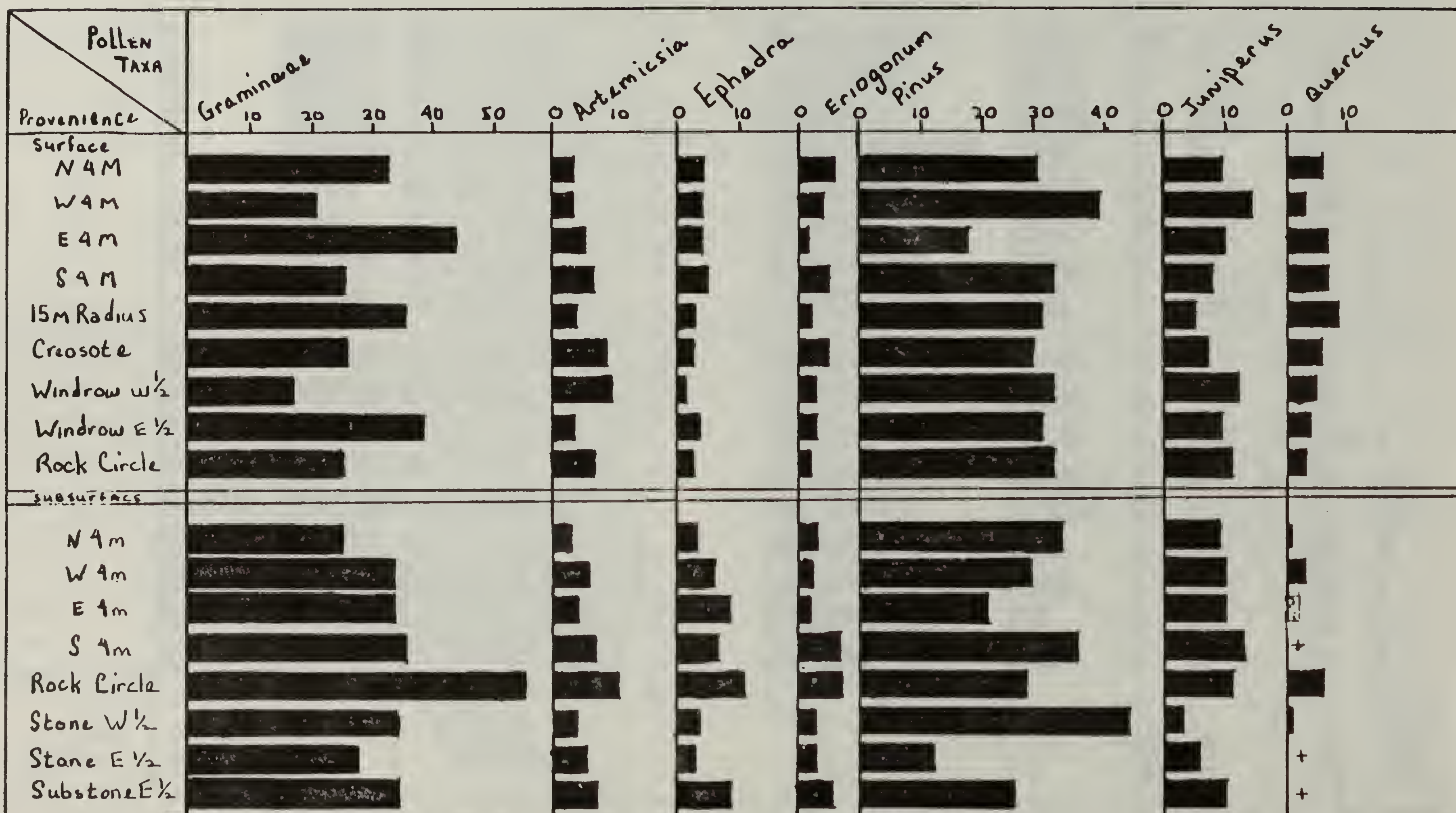


Figure 2
Pollen composition excluding Cheno-Ams, Low and High Spine Compositae

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APPENDIX C

Ethnobiological Overview

APPENDIX C

ETHNOBIOLOGICAL OVERVIEW*

The following overview was drawn from various ethnobotanical sources and details uses of plants and animals for all aspects of aboriginal daily life, including medicines, food, clothing, house construction, weaponry, and ceremonies. The list of species was obtained from a Bureau of Land Management floral listing of the Stoddard Valley area and from a palynological study conducted by Dr. Richard H. Hevly of soils collected from a rock ring site in Stoddard Valley (SBr-2288) (see Appendix C). Dr. Hevly's report did not include specific species identification for the recovered material, although he did provide the taxa. This review has incorporated the species from the BLM listing and all species within the taxa from Dr. Hevly's study which are common to the area and have been known to be used by aboriginal populations. References containing the specific ethnobotanical information are indicated for each species discussed.

Agavaceae Family

Yucca baccata (Fleshy-fruited Yucca). The green pods of this yucca were an important food resource for the early inhabitants. The pods were eaten raw or roasted, dried, ground, and made into cakes, which were sun-dried and stored for winter consumption. A soap was made from the roots and was used in the ceremonial wedding hair washings. The leaves were utilized in the manufacture of basketry, cloth, and sandals (Jaeger 1978).

Yucca brevifolia (Joshua Tree). Fibers of the Joshua tree were used to manufacture sandals and nets. Blossoms of this plant were eaten as a food source. The flowers are sweet when young, but become bitter with maturity. They were parboiled with salt up to three times and eaten immediately or dried in the sun for later consumption (Bean and Saubel 1972).

Yucca schidigera (Mohave Yucca, Spanish Dagger). Jaeger (1978) reports that the fruit of this common yucca was widely utilized by the aboriginal population, but does not specify methods of preparation.

Amaranthaceae Family

Amaranthus fimbriatus (Pigweed). The seeds from this flora were used to make mush. They were left on the spikes until needed and then threshed, parched, and ground into flour. The leaves of the plant were either eaten as greens or used as potherbs (Bean and Saubel 1972).

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*Compiled by Fran E. Buck

Suaeda Torreyana ramosissima (Inkweed, Iodine Weed). According to Jaeger (1978), a black dye was extracted from this plant and was used in art work.

Anacardiaceae Family

Rhus trilobata (Basketweed). The basketweed was a versatile resource in the aboriginal culture. The berries, having a lemon taste, were eaten fresh, ground into flour and added to soup, or soaked in water to make a beverage. The berries were also used as a restorative for inactive stomachs (Romero 1954:63). Stems of this shrub were used in the manufacturing of baskets (Bean and Saubel 1972).

Boraginaceae Family

Amsinckia tessellata (Fiddle-neck). Fiddle-neck was an important source of greens which was eaten fresh with salt (Zigmond 1981).

Cactaceae Family

Echinocereus Engelmannii (Hedgehog Cactus). The buds of this cactus were gathered by women with a pair of short sticks and could be eaten raw, but had a bitter taste. The bitterness was decreased by parboiling the buds several times, with salt added to the water to enhance the flavor. Once parboiled, the buds could be eaten or sun dried and stored for later use. The buds could also be steamed. For the latter method, a pit was dug and a mesquite fire started in the bottom of the pit. When the wood was reduced to coals, rocks were added and covered with damp sand and leaves and the buds were placed on the leaves and covered with another layer of leaves and sand. Another fire was then built on the top layer of sand and the buds were steamed for several hours. Flavor of the cooked buds has been compared to the taste of artichoke. Mature flowers could also be eaten, although the taste of these was more bitter than the bud. Flowers were prepared in the same manner as buds, and cooked flowers are said to taste like brussels sprouts (Bean and Saubel 1972).

Opuntia acanthocarpa (Buckhorn Cholla). Fruit from this cactus was gathered and eaten fresh or dried and stored for later consumption. Ashes from the stems of the cholla were applied to cuts and burns to facilitate healing (Bean and Saubel 1972).

Opuntia basilaris (Beavertail). This cactus was considered a most desirable food resource by the aboriginal inhabitants. The buds were collected and cooked in much the same manner as hedgehog cactus. The young joints were cut into small pieces and boiled and eaten as greens or mixed with other foods, and the seeds were ground into mush (Bean and Saubel 1972; Jaeger 1978).

Opuntia ramosissima (Pencil Cactus). Bean and Saubel (1972) state that fruits of the pencil cactus were eaten fresh or dried for later consumption. The stalks were boiled in soups or dried and stored.

Chenopodiaceae Family

Atriplex canescens (Wingscale, Hoary Saltbush). The seeds of this saltbush were ground into meal by the desert Indians. The roots and blossoms were also ground, moistened with saliva, and applied to ant bites (Jaeger 1978).

Atriplex lentiformis (Saltbush). The seeds of this flora were gathered with seed beaters and collected in baskets, then parched and ground into flour to make mush or cakes. The leaves and roots were crushed and used as soap. This plant was also used to relieve nasal congestion by inhaling the steam of the crushed plant. In addition, the leaves were either chewed fresh or dried and smoked to relieve head colds (Bean and Saubel 1972).

Chenopodium californicum (Goosefoot, Pigweed). The aboriginal utilization of this species included food, soap, and medicine. The seeds were parched and ground into a flour. Roots were grated on a rock and used as soap. Sometimes the leaves were used for the same purpose, although they were not considered as effective as the root. A decoction was made by boiling the entire plant and was used to relieve stomach disorders (Bean and Saubel 1972). The sap was used to make gum and also a strong anti-helmenthic medicine (Bean and Saubel 1972).

Chenopodium Fremontii (Goosefoot). Large quantities of this species were gathered and ground into flour for cakes (Bean and Saubel 1972).

Compositae Family

Artemisia californica (California Sagebrush). This sagebrush was considered a valuable medicinal plant among the aboriginal people. It was primarily consumed as a tea to induce menstrual activity, assure a comfortable childbirth and rapid post-natal recovery, and alleviate menopause trauma. This tea was also given to infants one day after birth to flush their system. In addition, fresh leaves were chewed or dried and smoked to relieve colds and were used in the sweathouse for a variety of other cures (Bean and Saubel 1972).

Artemisia ludoviciana (Sagebrush, Wormwood). This sagebrush was employed primarily as a utilitarian resource. According to Barrows (1900), the plant was used for the roofs and walls of houses and almost exclusively for the construction of granaries. Barrows (1900) and Kroeber (1925) report that the shoots of the sagebrush were employed in the manufacturing of arrow shafts. Merrill (1923) states that the stems of this plant were utilized for weaving baskets.

Artemisia tridentata (Big Sagebrush). According to Jaeger (1978), the seeds of this sagebrush were gathered and ground into meal. A solution was made from the leaves of the plant and used by aboriginal inhabitants as a hair tonic, eye wash, antiseptic for wounds, and remedy for colds.

Baccharis viminea (Mule-fat, Seep Willow). This tree is common along water courses and in wet areas and had four primary uses (Bean and Saubel 1972). A solution was made from the leaves and used as an eye wash and as a preventative for baldness. The leaves and stems of this tree were boiled and the solution was used by females as a hygienic agent. The limbs and branches were also used in the constructin of houses (Bean and Saubel 1972).

Cirsium Drummondii (Thistle). According to Bean and Saubel (1972), the buds at the base of the thistle were eaten. However, methods of perparation are not remembered.

Chrysothamnus nauseosus (Rabbit Brush). A tea was made from the twigs of this shrub and used to relieve chest pains, coughs, and toothaches (Barrows 1900; Bean and Saubel 1972).

Encelia farinosa (Brittle-bush, Incienso). This shrub was used as a medicinal agent. The blossoms, leaves, and stems were boiled to make a decoction that was used to relieve the pain of toothaches. Gum was extracted from the shrub and heated and applied to the chest to relieve pain (Bean and Saubel 1972).

Eriophyllum confertiflorum (Long-stemmed Eriophyllum). The woolly hairs of the stems of this flora were used medicinally for the treatment of rheumatism. They were rolled into small balls and placed on the afflicted parts and set on fire. The counter-irritation of the inevitable blisters was said to ease the pain of rheumatism (Jaeger 1978).

Grindelia squarrosa (Gum Plant). Palmer (1878:652) reports that a decoction was made from this plant and used externally to cure colds.

Haplopappus acradenius. James (1960) states that this shrub was used medicinally to cure colds and sore throats. The roots were cut into small pieces and boiled in water and the patient drank the liquid at hourly intervals as a remedy for colds. The leaves were soaked in boiling water and the patient knelt over the steaming liquid with a blanket over his head until the sore throat was relieved. Chase (1919:75) reports that a poultice was made from the boiled leaves and applied to sores.

Haplopappus Palmeri. Barrows (1900) states that the leaves and twigs of this shrub were applied to swollen limbs and also aided in reducing the possibility of infections from cuts. Horses were sometimes washed with an infusion made from this shrub to repell insects (Bean and Saubel 1972).

Helianthus annuus (Sunflower). Bean and Saubel (1972:76) report that the sunflower was a popular aboriginal food resource throughout the United States. The seeds were gathered, dried, and then ground and mixed with other seeds for flour.

Lasthenia glabrata (Gold Fields). The seeds of this plant were gathered by women and parched and ground into flour (Bean and Saubel 1972).

Layia glandulosa (White Tidy Tips). The seeds of this flora were gathered and prepared in the same manner as gold fields. Sometimes the flour was mixed with other ground seeds and made into mush (Bean and Saubel 1972).

Palafoxia linearis (Spanish Needles). According to Bean and Saubel (1972:98), this herb was used as a source of yellow dye.

Solidago californica (California Goldenrod). An infusion was made from this compositae and used as a hair rinse and medicinally as a feminine hygiene agent (Bean and Saubel 1972).

Taraxacum californicum (Dandelion). Dandelion stems and leaves were reportedly eaten by aboriginal peoples; however, methods of preparation are not known (Bean and Saubel 1972).

Cruciferae Family

Descurainia pinnata (Tansy-mustard, Pepper Grass). Bean and Saubel (1972) report that the leaves and ground seeds of this plant were used as a spice in soups and corn and medicinally as a remedy for stomach ailments. Barrows (1900) reports that the ground seeds were cooked in a large quantity of water and flavored with salt.

Lepidium nitidum (Peppergrass). A solution made from the leaves of this plant was used as a hair wash and as a preventative of baldness (Bean and Saubel 1972). Romero (1954) also reports that another species of peppergrass, L. epitalum, was used as a reducing tea.

Nasturtium officinale (Water-cress). This common aquatic perennial was eaten fresh in salads or cooked like spinach (Bean and Saubel 1972). It was also eaten with salt as a cure for liver ailments (Romero 1954).

Stanleya pinnata (Desert Plume). According to Jaeger (1978), the young leaves of the desert plume were eaten as greens. They were brought to a boil, strained, and boiled again in fresh water. This method of preparation was employed because the plant contains a percentage of poisonous selenium and the Indians claimed that if the greens were not boiled a second time in fresh water, they would become sick.

Streptanthus inflatus (Squaw Cabbage). According to Jaeger (1978), the Indians as well as pioneer women made a stew by boiling the young stems of this plant with meat. He further states that the stems were eaten as greens.

Ephedraceae Family

Ephedra nevadensis (Mormon Tea). Tea, made from the stems of this gymnosperm, was considered to be both a beverage and a medicine and was used by prehistoric peoples as well as early historic immigrants. The seeds were ground and prepared as a mush (Bean and Saubel 1972). Medicinal usage of the plant included cures for stomach and kidney ailments, a remedy for syphilis and gonorrhea, and a purifier of the blood. However, if taken for prolonged periods, it is said to be bad for the system (Chase 1919; Palmer 1878; Romero 1954; Bean and Saubel 1972).

Fagaceae Family

Quercus dumosa (Scrub Oak), Quercus chrysolepis (Canyon or Maul Oak). The acorn is said to be the most reliable and desirable undomesticated food resource of the New World (Bean and Saubel 1972). The acorns were gathered from October to November in a combined effort of men, women, and children. The men would climb the trees and knock the acorns to the ground with a long stick, while the women and children collected the fallen crop of nuts in carrying baskets. The husk was removed from the nut by placing it on a flat rock with a small indentation and hitting it with a smaller rock. Once the acorns were dried, they were ground in a mortar with a pestle and then leached in baskets or in a sand pit lined with grass, leaves, or other fibrous materials to remove the tannic acid.

The fine-ground meal was used to make acorn bread, which was baked in hot coals for several hours. The coarser meal was used to make a mush, which, if properly cooked, will jell to a consistency much like custard. The acorns and meal could be stored for a year or more.

The oak tree also provided additional valuable resources. Medicinal solutions were made by mixing oak ashes with water or by soaking the bark in water and were employed as healing agents. Romero (1954) reports that various color-fast dyes were produced from the bark, and a preservative used in the tanning of buckskin was also made from this bark. He states that the leaves from the oak were utilized as mattress bedding.

Dried, unhusked acorns were strung to make necklaces, and games were devised by women and children with the acorn. The dried wood provided an excellent source of firewood. Acorns and acorn meal were also used as a trade item and as payment for special services.

Geraniaceae Family

Erodium cicutarium, E. trichapis (Storksbill, Filaree, Clocks). This plant was a favorite potherb, but could be eaten raw or preserved for a short period (Bean and Saubel 1972).

Gramineae Family

Distichlis spicata divaricata (Salt Grass). Although this salt grass was not used as a food resource, it was used as a secondary source of salt. Two methods were employed for obtaining the salt from the plant. Usually the salt was gathered from the ashes of the burnt plant, but sometimes the salt was obtained by threshing the detached plant (Bean and Saubel 1972).

Hilaria rigida (Galleta Grass). According to Munz (1972), galleta grass is the most valuable forage grass of the desert. This material was employed in the manufacturing of baskets, seed beaters, mats, sandals, bags, and ropes (Johnston 1973).

Muhlenbergia rigens (Deer-grass). According to Bean and Saubel (1972:89), the stalk of this plant was employed in the manufacturing of basketry. The stalk was used as the foundation around which the coils were wrapped.

Oryzopsis hymenoides (Indian Ricegrass). The seeds of Indian ricegrass were exploited as a food staple (Heizer and Elsasser 1980; Crampton 1974; Zigmond 1981). The plants were cut, tied in bunches, and burned to gather the seeds, then pounded into meal and eaten dry (Zigmond 1981).

Panicum Urvilleanum (Panic Grass). The seeds from this grass were gathered, singed, and boiled for several hours to make a gruel (Bean and Saubel 1972).

Phragmites communis (Common Reed). The common reed was employed in the manufacturing of cordage, which was used for weaving carrying nets and hammocks for babies (Barrows 1900). The culm of the plant was used as a shaft for arrows. In addition, a flute was made from this plant, as well as splints to aid the heeling of broken bones (Barrows 1900). Zigmond (1981) also reports that the reeds were used as a pipe for smoking tobacco and that "at birth the navel cord is cut with the sharp edge of a split reed" (Zigmond 1981:49).

Hydrophyllaceae Family

Nama demissum (Nama). The seeds of this flora are dried, pounded, and boiled into a mush (Zigmond 1981).

Phacelia crenulata (California Phacelia). An infusion is made from the roots of this plant and employed medicinally for the relief of stomach ailments, coughs, and colds (Zigmond 1981).

Labiatae Family

Salvia sp. (Sage). According to Bean and Saubel (1972), seeds of this plant were parched in baskets with hot stones and ground into flour that was used to make mush or as a flavoring in other mushes. These seeds were also used to cleanse the eyes of foreign objects. A solution made of crushed leaves of this plant mixed with water was used as a hair shampoo, dye, and hair straightener. A poultice made from fresh crushed leaves was used as an underarm deodorant, particularly by men preparing to go hunting to eliminate human body odor (Bean and Saubel 1972).

Leguminosae Family

Astragalus sp. (Locoweed, Rattle Weed). Barrows (1900) reports that at least one species of the locoweed was employed as a spice in foods. The pods were pounded and then mixed with beans or other food staples (Bean and Saubel 1972).

Lathyrus laetiflorus (Wild Pea). Bean and Saubel (1972:84) state that this plant was used as a food resource, although the plant parts used were not remembered.

Prosopis juliflora glandulosa (Mesquite). Jaeger (1978:96) reports that the mesquite bean pod was an excellent source of nutrition for the Indians. The pod is often infested with a weevil; nevertheless, the pod and weevil were ground into a fine powder, packed into a basket in layers with a sprinkling of water, and buried in sand exposed to the hot sun. The baking process required several hours. Jaeger (1978) also states that the bark of the mesquite was pounded and rubbed until it became soft and was used as diapers for babies and shirts for women. The wood and roots of the tree provided an excellent source of firewood.

Prosopis pubescens (Screw Bean). The bean pods of the screw bean tree were eaten raw or ground into meal. The hard wood of this tree provided an excellent source of fuel for cooking and warmth (Jaeger 1978). It was also used in the construction of houses and sometimes for bows. The roots and bark of this tree were said to have medicinal value (Bean and Saubel 1972).

Loasaceae Family

Mentzelia involucrata (Blazing-star). According to Bean and Saubel (1972), the seeds extracted from this flora were parched and ground into flour for mush. The children enjoyed throwing the leaves of this plant at one another since they stick to the body are hard to remove (Zigmond 1981:41).

Malvaceae Family

Malva sp. (Mallow, Cheeses, Cheeseweed). The seeds of the mallow were eaten fresh and were said to be a pleasant condiment-like food (Bean and Saubel 1972:88).

Onagraceae Family

Oenothera clavaeformis (Evening Primrose). Evening primrose was gathered and eaten as greens. A parasitic caterpillar (Cerlerio lineata, two-lined sphinx moth) was collected from the plant, the head was cut off, the insides were cleaned, and the caterpillar was boiled, parboiled, or dried in the sun. The flavor of this caterpillar is said to be like that of pork rinds (Bean and Saubel 1972).

Oenothera deltoides (Dune Primrose, Bird Cage). The larvae of the Celerio lineata were also gathered from this plant, as mentioned above for the evening primrose. Further exploitation of this primrose species is not discussed (Jaeger 1978).

Polygonaceae Family

Eriogonum sp. (Buckwheat). Buckwheat was used by the aboriginal people to cure a variety of ailments. A black tea made from the leaves was drunk as a cure for headaches, stomach disorders, an inhibitor against dysmenorrhea, and as a physic. A decoction was made from the white flowers and was said to be used as an eye wash and drunk to flush out the intestines. The older plants were most desirable for medicinal purposes. The shoots and seeds served as food staples.

Eriogonum inflatum (Desert Trumpet). The stems of this desert flora were sometimes used as pipes by the aboriginal inhabitants (Zigmond 1981). Zigmond also states that the seeds were pounded into meal and eaten dry or mixed with water (Zigmond 1981).

Rhamnaceae Family

Ceanothus sp. (California Lilac, Wild Lilac). According to Bean and Saubel (1972), the only aboriginal use for California lilac was as firewood.

Condalia Parryi (Crucillo, Wild Plum). The fruit that grows on this shrub was eaten raw or dried and ground into flour. The seeds of the fruit were also utilized--they were ground into flour and leached (Bean and Saubel 1972).

Rhamnus sp. (Buckthorn, Cascara). The edible berry of the buckthorn was steeped in water to produce a laxative or tonic. Romero (1954:21) states that the bark was stripped off the plant, dried, ground, and used as a cure for constipation.

Rosaceae Family

Adenostoma fasciculatum (Chamise, Greasewood). Chamise provided an abundant source of construction material. The stems were employed in the construction of arrows and ramadas and were an excellent source of firewood. The leaves and branches of this shrub were boiled and the solution used to combat infection. The gum obtained from a scale insect on the chamise was used as an adhesive for manufacturing arrows and attaching baskets to mortars (Bean and Saubel 1972).

Adenostoma sparsifolium (Ribbonwood, Red Shank, Ribbon Bush). This tree was utilized as a food source, for medicines, clothing, building materials, and to produce the tip for arrows. The seeds provided a supplement to the total diet. Medicinal uses included cures for ulcers, colds, chest ailments, stomach ailments, open wounds, and relief of arthritis. A poultice was also applied to saddle sores on horses. Ribbonwood was a most desirable source of firewood for roasting because of the intense heat of the fire. Women's shirts were made of the fibrous material that was stripped off the bark (Bean and Saubel 1972). Barrows (1900:50) reports that ribbonwood was used for the tip of two-piece arrow shafts, and the flexible branches were employed as housing material or fashioned into throwing sticks.

Heteromeles arbutifolia (California Holly, Toyon, Christmas-berry). According to Hicks (1963), the California holly was not a highly regarded food source, although Balls (1965) reports that the berry of this shrub was eaten raw or roasted by the California Indians.

Prunus sp. (Stone Fruits). Bean and Saubel (1972) report that the fruit from several species of this plant was eaten raw or sun-dried for later consumption. They also state that the pits from the fruit were ground and used as a meal or used to make tortilla-like food.

Solanaceae Family

Lycium Andersonii (Box-thorn). The berries from this shrub were either eaten fresh or dried and stored for later use. When needed, the dried berries were ground into flour and mixed with water or boiled into a mush (Bean and Saubel 1972). Zigmond (1981) also states that the juice was squeezed from the berries and drunk.

Umbelliferae Family

Apiastrum angustifolium (Wild Celery). Bowers (1888) reports that wild celery provided a small seasonal food source in wet years, but does not detail preparation methods (Bean and Saubel 1972).

Perideridia Gairdneri. Saunders (1914) and Munz (1968) both report that the tuberous roots of this plant were an important food source for the Indians of the Southwest, who ate the root raw or cooked.

Zygophyllaceae Family

Larrea divaricata (Creosote Bush), Larrea tridentata (Creosote Bush, Greasewood). According to Krochmal, Paur, and Duishberg (1954:4), Indian usage of creosote was as diversified as current use of penicillin. A medicinal tea was made from the stems and leaves of the creosote to cure a variety of disorders, including colds, chest infections, bowel complaints, stomach cramps associated with delayed menstruation, and cancer; heavy doses of this tea were used to induce vomiting (Bean and Saubel 1972). Bean and Saubel (1972:83) also report that leaves of the plant were boiled or heated and the steam inhaled to relieve congestion, an activity which frequently occurred in a specially constructed sweathouse.

In addition to medicinal teas, solutions, poultices, and powders were made from creosote to heal open wounds and burns, draw out poisons, prevent infections, and as a cure for rheumatism. Various preparations of creosote were also applied to swollen limbs caused by poor blood circulation (Bean and Saubel 1972:23; Jaeger 1978). An infusion was made from the creosote as a hair wash to suppress dandruff and as an effective disinfectant and body deodorizer (Romero 1954:37). Barrows (1900:79) records the use of creosote as a remedy for consumption and also says it was given to horses with colds, distemper, or a runny nose. In addition to medicinal usage, the creosote provided an excellent source of firewood, "burning as well when green as when dry . . ." (Bean and Saubel 1972; Zigmond 1981:162). A gum extracted from the leaves of this bush was also used to mend broken pottery and to waterproof baskets (Zigmond 1981).

Faunal Species

Ovis canadensis (Bighorn Sheep, Mountain Sheep). Bean (1974) states that mountain sheep, being a very difficult and dangerous animal to hunt with their natural habitat in the higher, more precarious slopes, were always hunted by adult males. Many hours were spent stalking or maneuvering the sheep into range of the hunters. If possible, the hunters would hide in blinds located at watering holes and shoot the sheep with bows and arrows. Heizer and Elsasser (1980) also mention that various tricks might be used to attract the sheep to an area or the animals might be driven past ambushing hunters.

The animals were partially butchered where killed and then transported to the village (Bean 1974). In a general discussion of game animal usage, Bean (1974) states that all of the animal's meat was used. The meat was boiled, roasted, or cut into strips and dried. The marrow and blood were also consumed, although the blood might be cooked and stored for later use. The hides were tanned and used in a variety of ways, such as blankets, clothing, ritual regalia, or arrow quivers. The bones were often used for tools, including awls, needles, pins, daggers, and spear points (Heizer and Elsasser 1980).

Lepus californicus (Jackrabbit), Sylvilagus audubonii (Cottontail). According to Sparkman (1908), rabbits were probably the principal animal food resource. These animals were either hunted with the bow and arrow or trapped with nets and snares. A curved throwing stick was sometimes employed in the killing of rabbits, particularly if they were in motion (Sparkman 1908). This animal was boiled on hot coals or baked in earth ovens. Sometimes after baking, the meat and bones were pounded in a mortar and either eaten at that time or stored for later consumption (Sparkman 1908). Young boys were encouraged to eat the eyes of the rabbit because they were said to make them good hunters (Shipek 1970). Kroeber (1925) and Rector, Swenson and Wilke (1979) note that blankets were made from the pelts of rabbits.

Neotoma fuscipes (Woodrat). According to Sparkman (1908), woodrats were a most desirable food source. The nest was set on fire to drive the animal out or the nest was overturned and the animal was killed with the bow and arrow or a stick. The woodrat was broiled on coals and eaten (Sparkman 1908).

Lizard Species, Tortoise (Gopherus agassizi). Kroeber (1925) and Bean (1974) state that lizards and tortoises were exploited by the early inhabitants of the area. The lizards were abundant in early spring. They were generally captured by women and children with hooked sticks or trapped and clubbed to death (Bean 1974). The desert tortoise was captured and roasted and the shell was used in the manufacturing of household utensils and rattles (Bean 1974).

Serpentes (Snakes). Heizer and Elsasser (1980) state that snakes were generally not eaten and may have been considered bad for the health. However, Bean (1974) states that although a less desirable food than lizards, several species of snakes were eaten, with the favorite being the rattlesnake (Crotalus ssp.). Such poisonous snakes were caught by men experienced in their handling and were boiled or roasted.

Lophortyx sp. (Quail). Quail was the most important and desirable game bird (Bean and Smith 1978). It was hunted with the bow and arrow or at night with fire. The latter method was accomplished by setting fire to the dry stems of cholla cactus to attract the quail and they were knocked down with sticks when they flew toward the light (Sparkman 1908). Sparkman also notes that during prolonged periods of cold, rainy weather, flying abilities of the quail were greatly impaired. Under these conditions, young boys could easily run down and catch the birds. Like the woodrat, this fowl was broiled over hot coals and eaten (Sparkman 1908). The eggs of the quail were also eaten by the aboriginal peoples (Sparkman 1908).

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
SPRING:				
Gathering and processing blossoms, roots, bulbs, seeds, and stems	Women	*Lasthenia glabrata* (gold fields)	May, June	Food staple
	Women	*Layia glandulosa* (white tidy tips)	June	Food staple
	Women, children	*Taraxacum californicum* (dandelion)	April, May, June	Food staple
	Women, children	*Eriophyllum confertiflorum* (long-stemmed eriophyllum)	April, May, June	Medicinal
	Women, children	*Eriogonum* sp. (buckwheat)	April, May, June	Food staple Medicinal
	Women	*Yucca brevifolia* (Joshua tree)	April, May	Food staple Utilitarian
	Women	*Yucca baccata* (fleshy-fruited yucca)	April, May	Food staple Utilitarian
	Women	*Echinocereus Engelmannii* (hedgehog cactus)	April, May, June	Food staple
	Women	*Opuntia acanthocarpa* (buckhorn cholla)	April, May, June	Food staple
	Women	*Opuntia basilaris* (beavertail)	March, April, May, June	Food staple
	Women, children	*Malva* sp. (mallow, cheeseweed)	March, April, May, June	Food staple
	Women, children	*Rhus trilobata* (basketweed)	May, June, July	Food staple Medicinal Utilitarian

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
	Women, children	Larrea sp. (creosote)	April, May	Medicinal Utilitarian
	Women, children	Streptanthus inflatus (squaw cabbage)	April, May	Food staple
	Women, children	Descurainia pinnata (tansy-mustard, pepper grass)	April, May, June	Food staple Medicinal
	Women, children	Nasturtium officinale (water-cress)	April, May June	Food staple Medicinal
	Women, children	Erodium sp. (storksbill, filaree, clocks)	March, April	Food staple
	Women, children	Oryzopsis hymenoides (Indian ricegrass)	April, May June	Food staple
	Women, children	Lycium Andersonii (box-thorn)	May, June	Food staple
	Women	Yucca schidigera (Mohave yucca, Spanish dagger)	April, May	Food staple
	Women	Opuntia ramosissima (pencil cholla)	April, May	Food staple
	Women, children	Mentzelia involucrata (blazing-star)	April, May,	Food staple
Trap rodents, lizards, and other small animals	Women, children (generally)	Rodentia (desert rodents)	Seasonal	Food staple
	Women, children (generally)	Lacentilia (lizards)	Seasonal	Food staple
	Women, children (generally)	Serpentes (snakes)	Seasonal	Food staple

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
SUMMER:				
Gathering and processing seeds, bulbs, roots, etc.	Women, children	*Atriplex lentiformis* (saltbush)	July, August	Food staple Medicinal
	Women, children	*Lasthenia glabrata* (gold fields)	June, July	Food staple
	Women	*Layia glandulosa* (white tidy tips)	June, July, August	Food staple
	Women, children	*Taraxacum californicum* (dandelion)	June, July	Food staple
	Women, children	*Amaranthus fimbriatus* (pigweed)	August	Food staple
	Men	*Muhlenbergia rigens* (deer-grass)	June, July, August	Utilitarian
	Generally women, sometimes men	*Ephedra nevadensis* (Mormon tea)	July, August	Food staple Medicinal
	Women, children	*Lycium Andersonii* (box-thorn)	June, July, August	Food staple
Extended hunting expeditions	Men	*Ovis canadensis nelsonii* (bighorn sheep)	Seasonal	Food staple Utilitarian
FALL:				
Gathering and processing seeds, roots, tubers, etc.	Women, children	*Atriplex lentiformis* (saltbush)	September	Food staple Utilitarian
	Women, children	*Helianthus annuus* (sunflower)	Seasonal	Food staple

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
	Women, children	Artemisia tridentata (big sagebrush)	September	Food staple Medicinal
Stored food resources for winter	Communal effort	Quercus dumosa (scrub oak)	October, November	Food staple Medicinal
	Women, children	Eriogonum sp. (buckwheat)	September	Food staple Medicinal
	Women, children	Prosopis juliflora glandulosa (mesquite)	September, October	Food staple Utilitarian
	Women, children	Rhamnus sp. (buckthorn)	September, October	Medicinal
	Women, children	Salvia sp. (sage)	September	Food staple Utilitarian
	Women, children	Eriogonum sp. (buckwheat)	June, July, August	Food staple Medicinal
	Women, children	Malva sp. (mallow, cheeseweed)	June, July, August	Food staple
	Women, children	Rhus trilobata (basketweed)	June, July	Food staple Utilitarian
	Women, children	Larrea sp. (creosote)	June, July, August	Medicinal Utilitarian
	Women, children	Prosopis pubescens (screw bean)	June, July, August	Food staple Medicinal Utilitarian
	Women, children	Astragalus sp. (locoweed)	August	Food staple

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
	Women, children	Condalia Parryi (wild plum)	mid-August	Food staple
	Women, children	Rhamnus sp. (buckthorn)	August	Medicinal
	Women, children	Salvia sp. (sage)	July, August	Food staple Utilitarian
	Women, children	Adenostoma sparsifolium (ribbonwood)	July, August	Food staple Medicinal Utilitarian
	Women, children	Prunus sp. (stone fruits)	June, July, August	Food staple
	Women, children	Heteromeles arbutifolia (California holly)	September, October, November	Food staple
	Women, children	Prunus sp. (stone fruits)	September, October	Food staple
	Women, children	Atriplex canescens (wingscale, hoary saltbush)	September	Food staple Medicinal
	Women, children	Mentzelia involucrata (blazing-star)	September, October	Food staple
Communal rabbit drives	Entire village	Sylvilagus audubonii (cottontail)	Seasonal	Food staple Utilitarian
	Entire village	Lepus californicus (jackrabbit)	Seasonal	Food staple Utilitarian
Major social activities of year	Entire village		Seasonal	Social interactions Reciprocity

HYPOTHETICAL MODEL OF SUBSISTENCE AND ACTIVITY PATTERNS IN THE STODDARD VALLEY AREA

Activity	Labor Division	Flora/Fauna	Gathering Period	Use
WINTER:				
Gathering and processing stems, twigs, etc.	Women, children	Eriogonum sp. (buckwheat)	February, March	Food staple Medicinal
	Women, children	Malva sp. (mallow, cheeseweed)	February, March	Food staple
	Women, children	Heteromeles arbutifolia (California holly)	December, January, February	Food staple
	Women, children	Erodium cicutarium (storksbill)	January, February	Food staple
Trap rodents, lizards, and other small animals	Women, children (generally)	Rodentia (desert rodents)	Seasonal	Food staple
	Women, children (generally)	Lacentilia (lizards)	Seasonal	Food staple
	Women, children (generally)	Serpentes (snakes)	Seasonal	Food staple
Survival by whatever means possible	Communal effort		Seasonal	

Based on ethnographic data provided by the following authors: Bean (1978), Bean and Saubel (1972), Davis, (1965), Heizer and Elsasser (1980), Jaeger (1978), Shipek (1970), Zigmond (1981).

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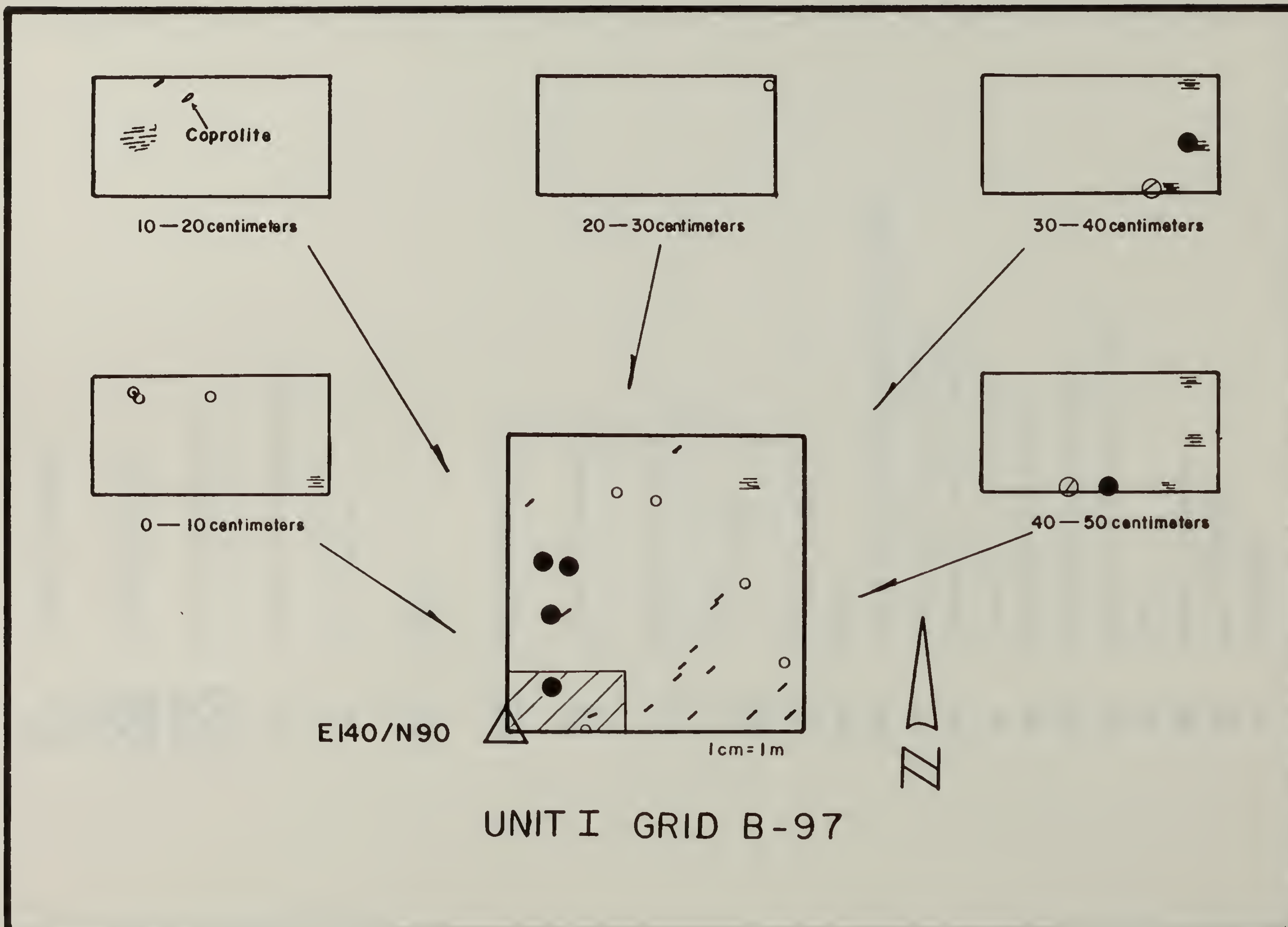
APPENDIX D

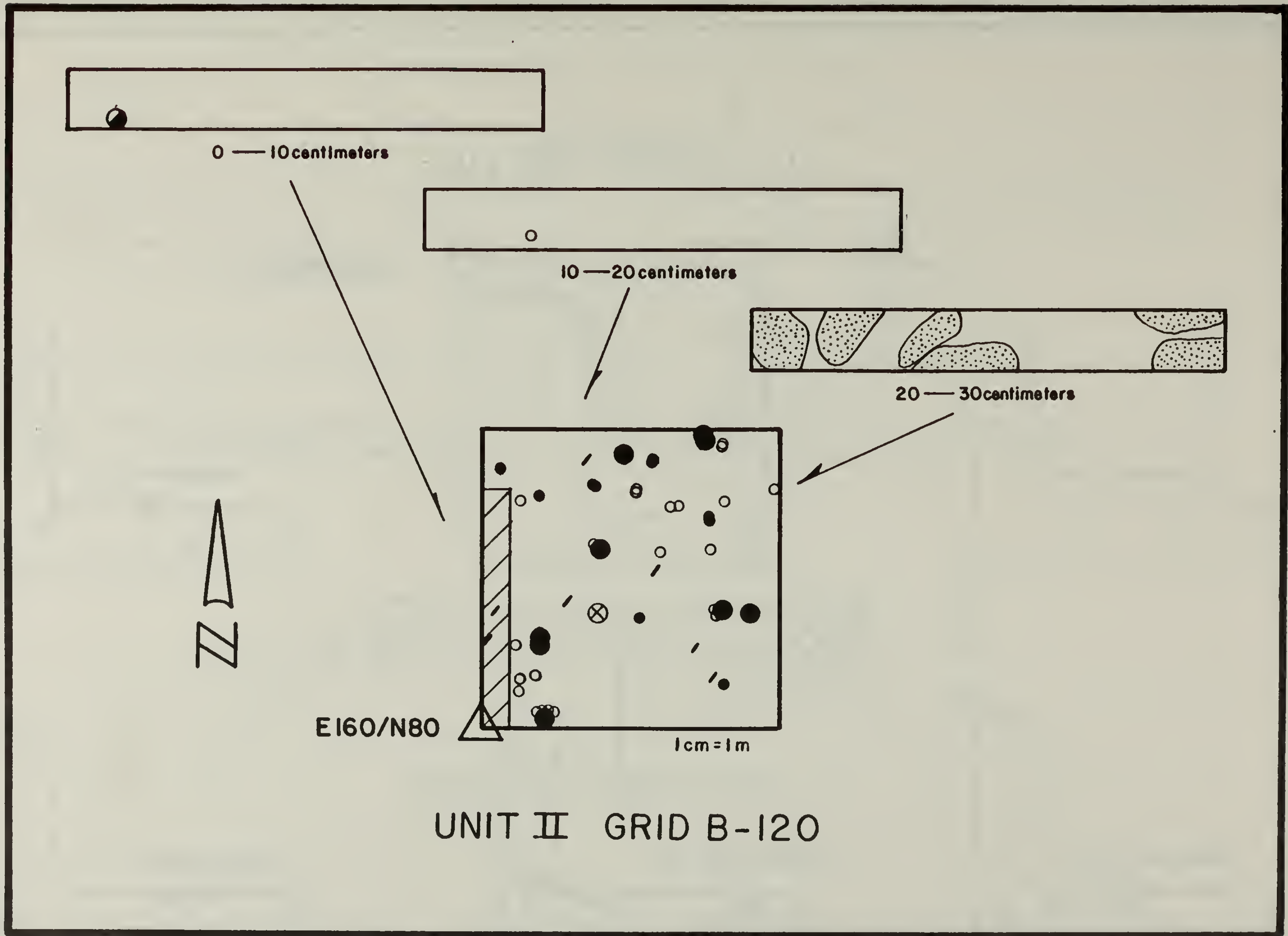
Test excavation unit plan views

LEGEND

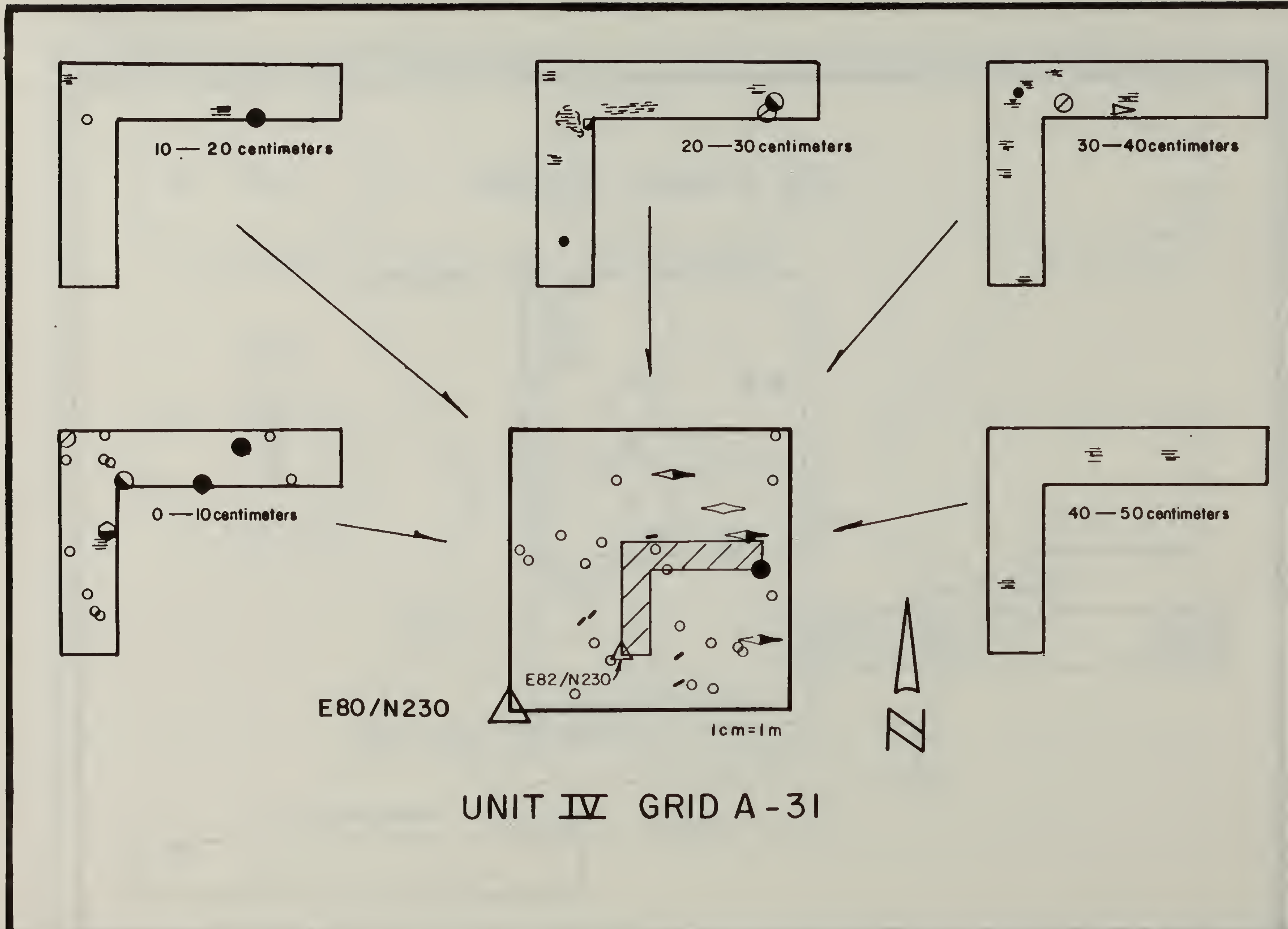
- Flake
- Debitage
- Core fragment
- Metate fragment
- Mano
- Unmodified quartzite cobble
- Other unmodified stone
- Fire-affected rock
- Osteological material
- Projectile point (complete)
- Projectile point fragment
- Use-modified flake/typological blade
- Biface
- Historic debris
- Galleta grass
- Indian rice grass
- Rodent disturbance
- Charcoal/ash lens
- Roots
- Soil sample
- Provenience datum point
- Unit configuration
- Unexcavated area
- Granitic bedrock



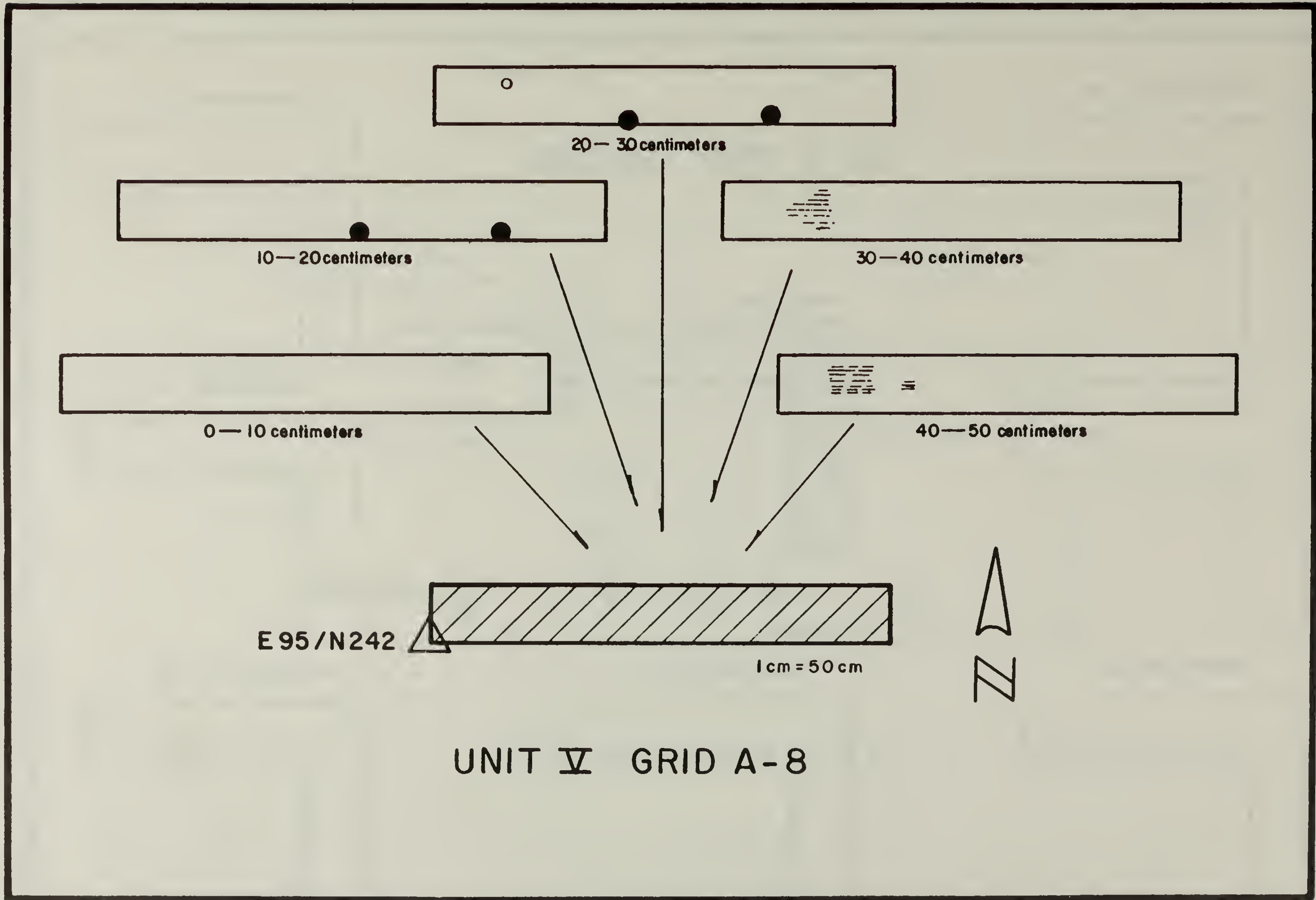
Plan view of unit I showing in situ artifacts recovered and features observed during the investigation.



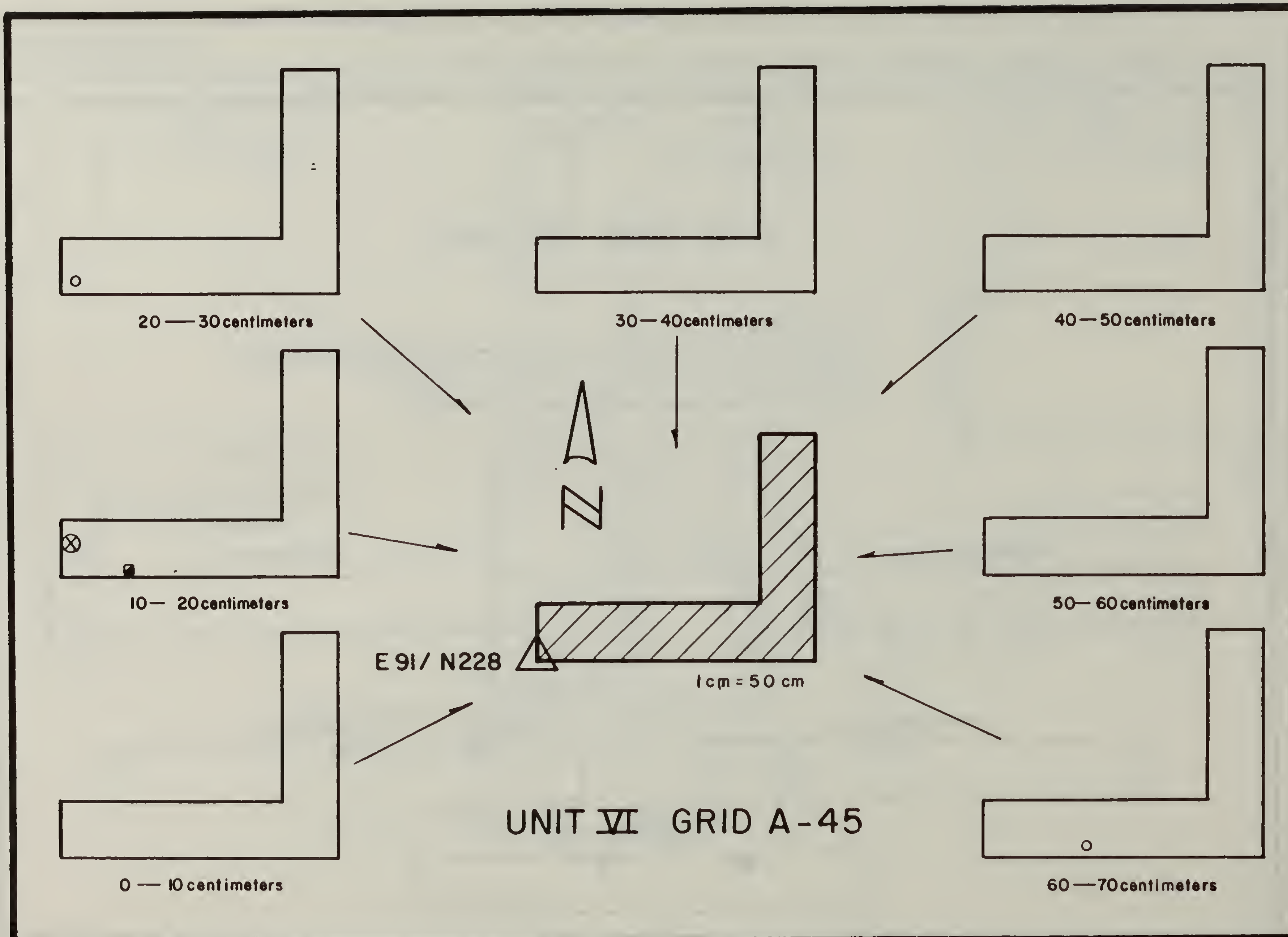
Plan view of unit II showing in situ artifacts recovered and features observed during the investigation.



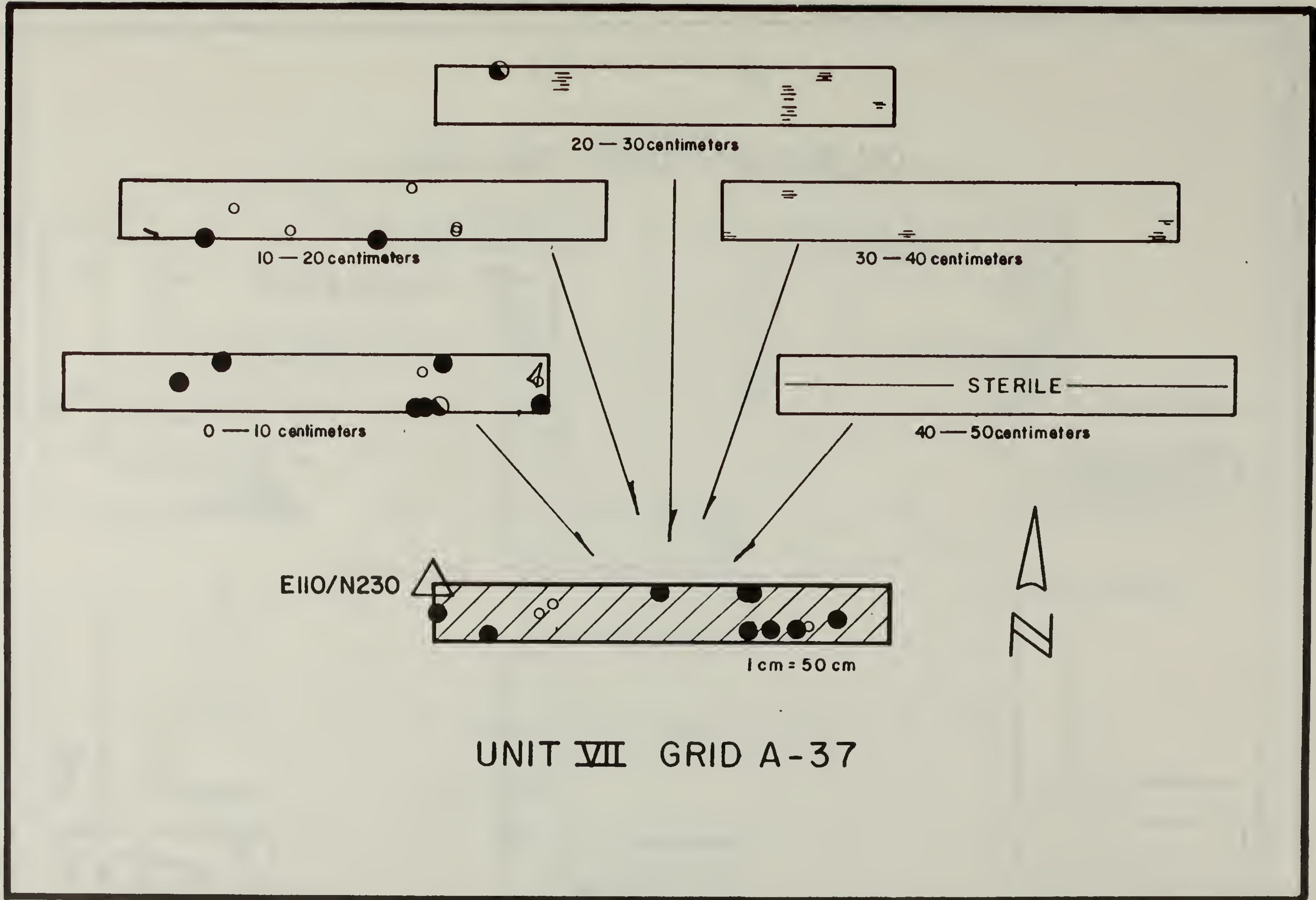
Plan view of unit IV showing in situ artifacts recovered and features observed during the investigation.



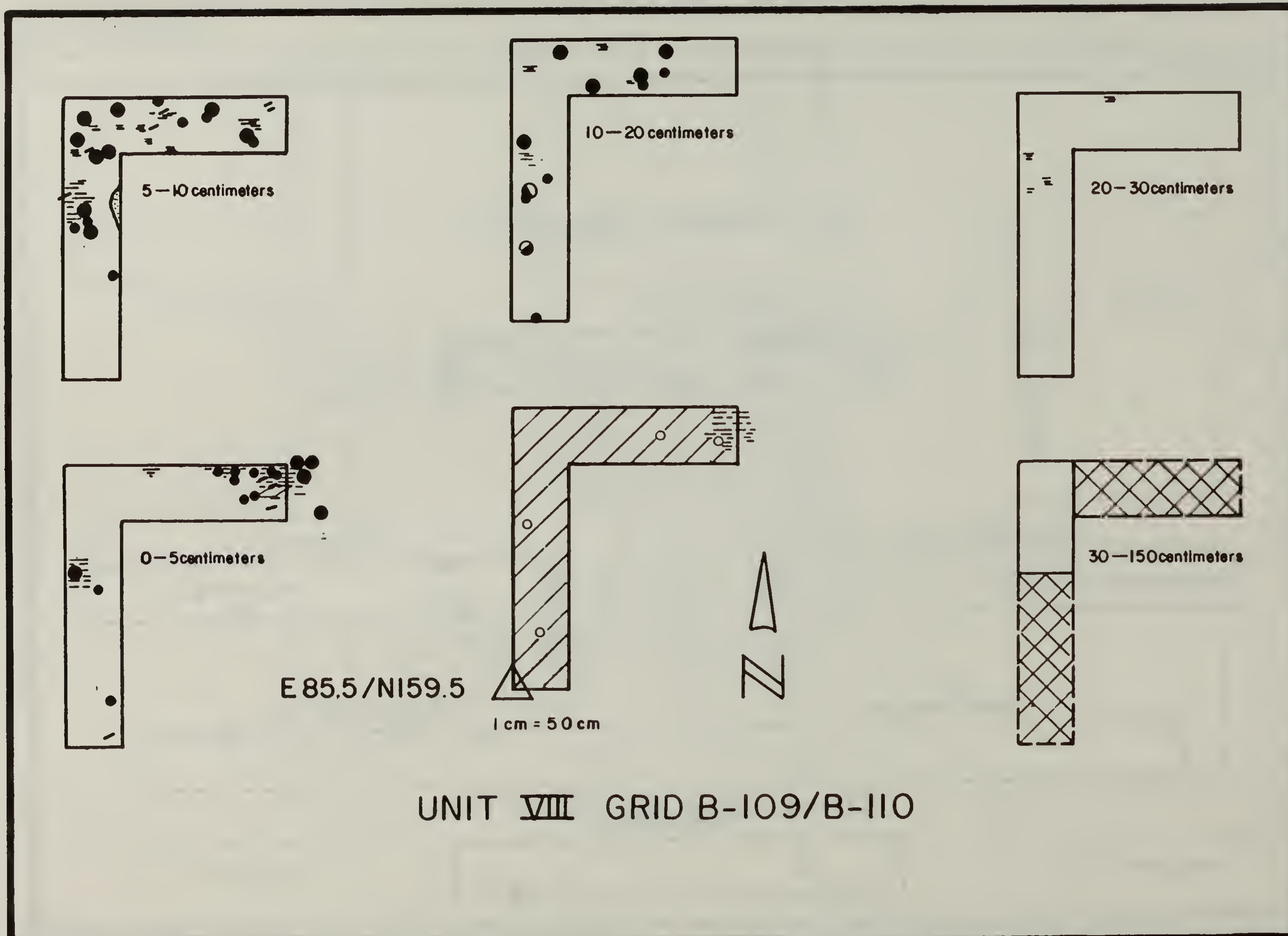
Plan view of unit V showing in situ artifacts recovered and features observed during the investigation.



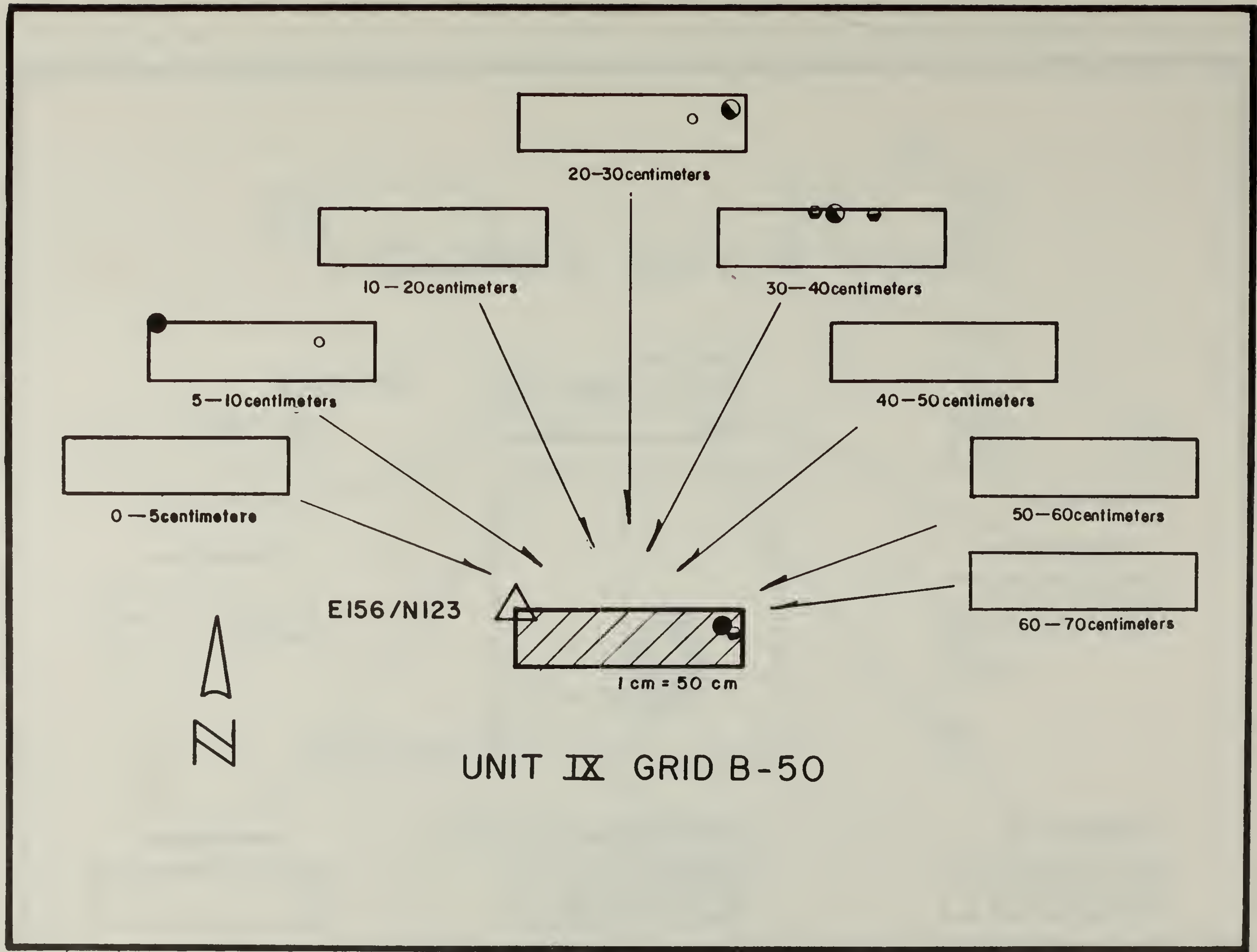
Plan view of unit VI showing in situ artifacts recovered and features observed during the investigation.



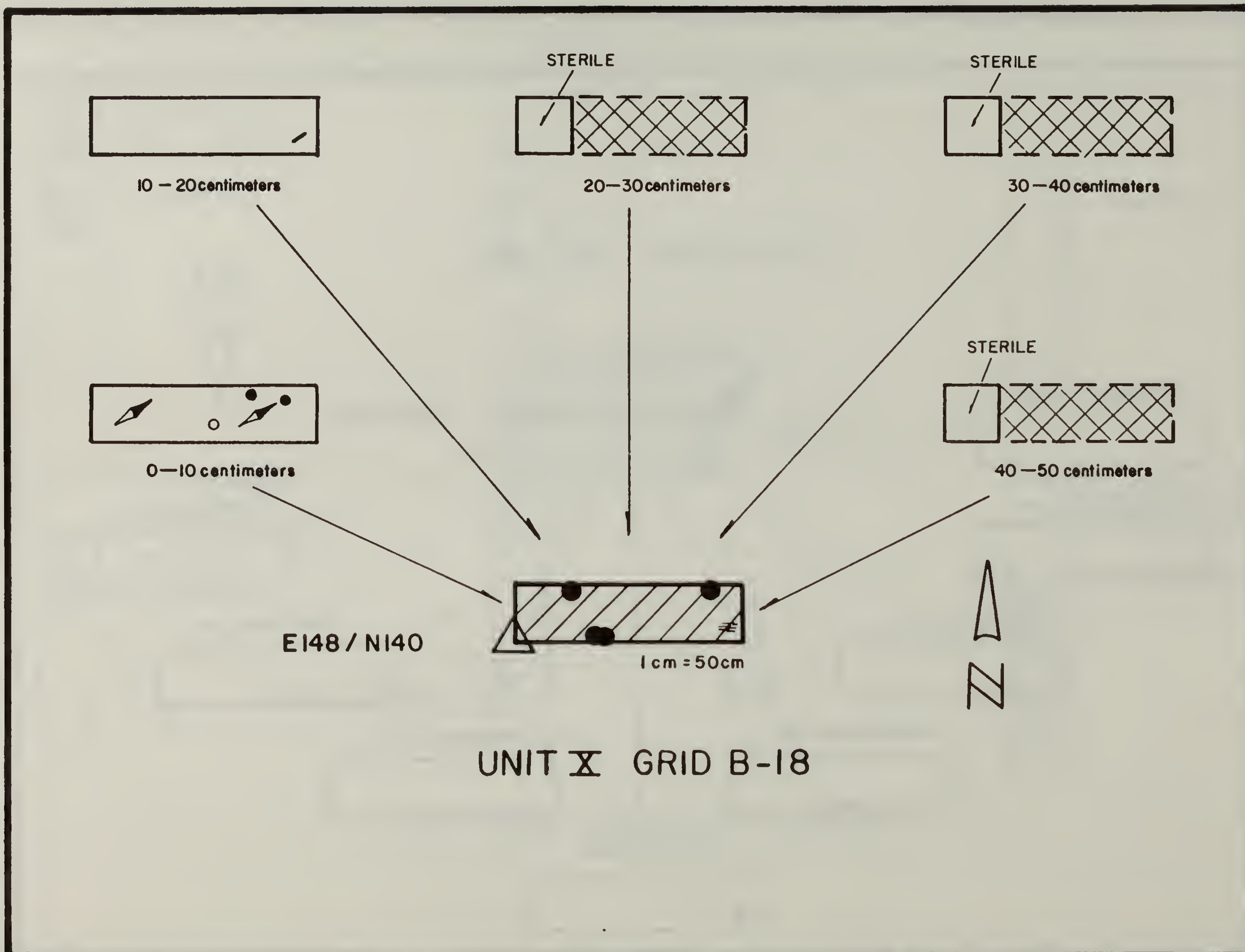
Plan view of unit VII showing in situ artifacts recovered and features observed during the investigation.



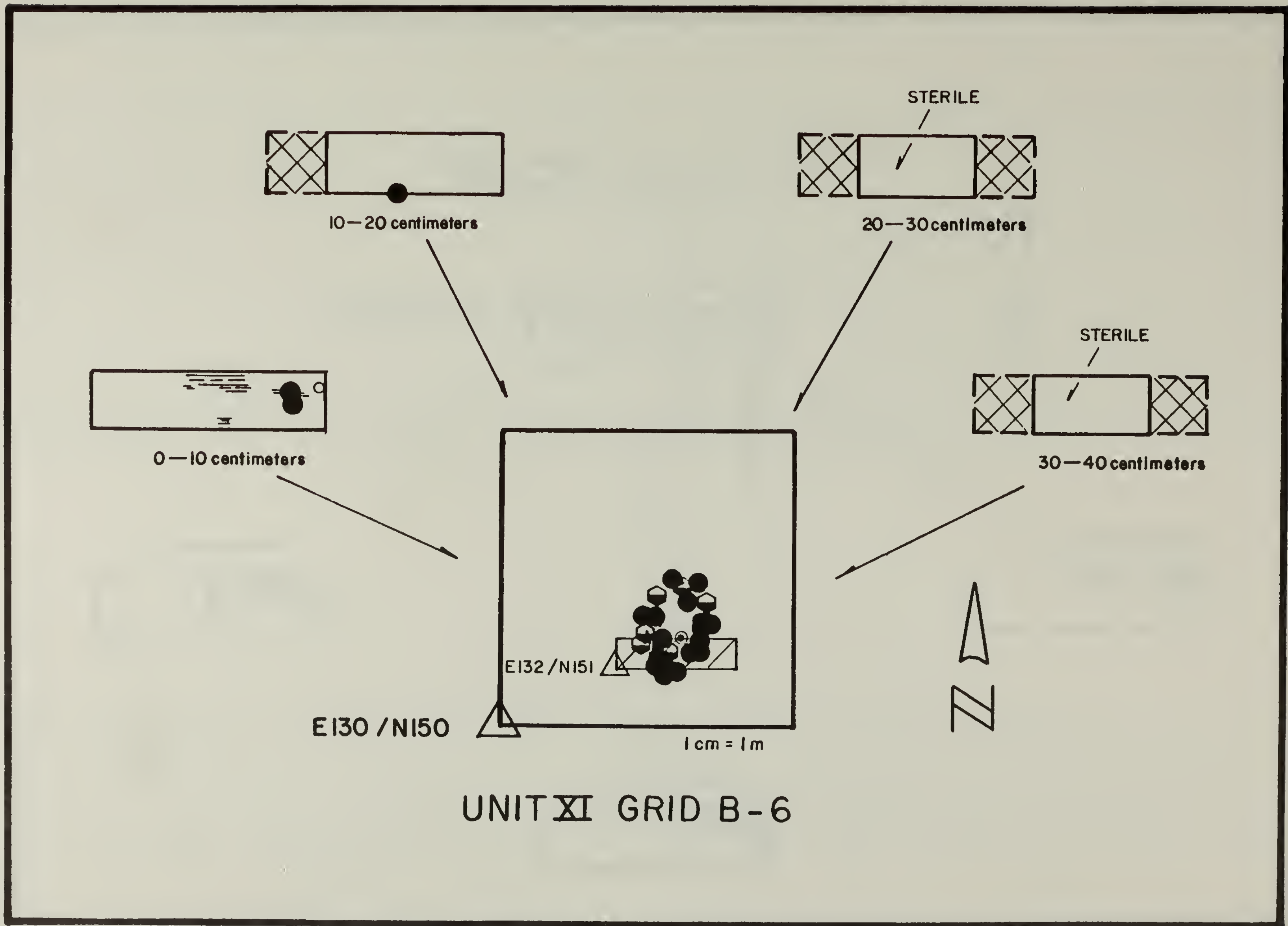
Plan view of unit VIII showing in situ artifacts recovered and features observed during the investigation.



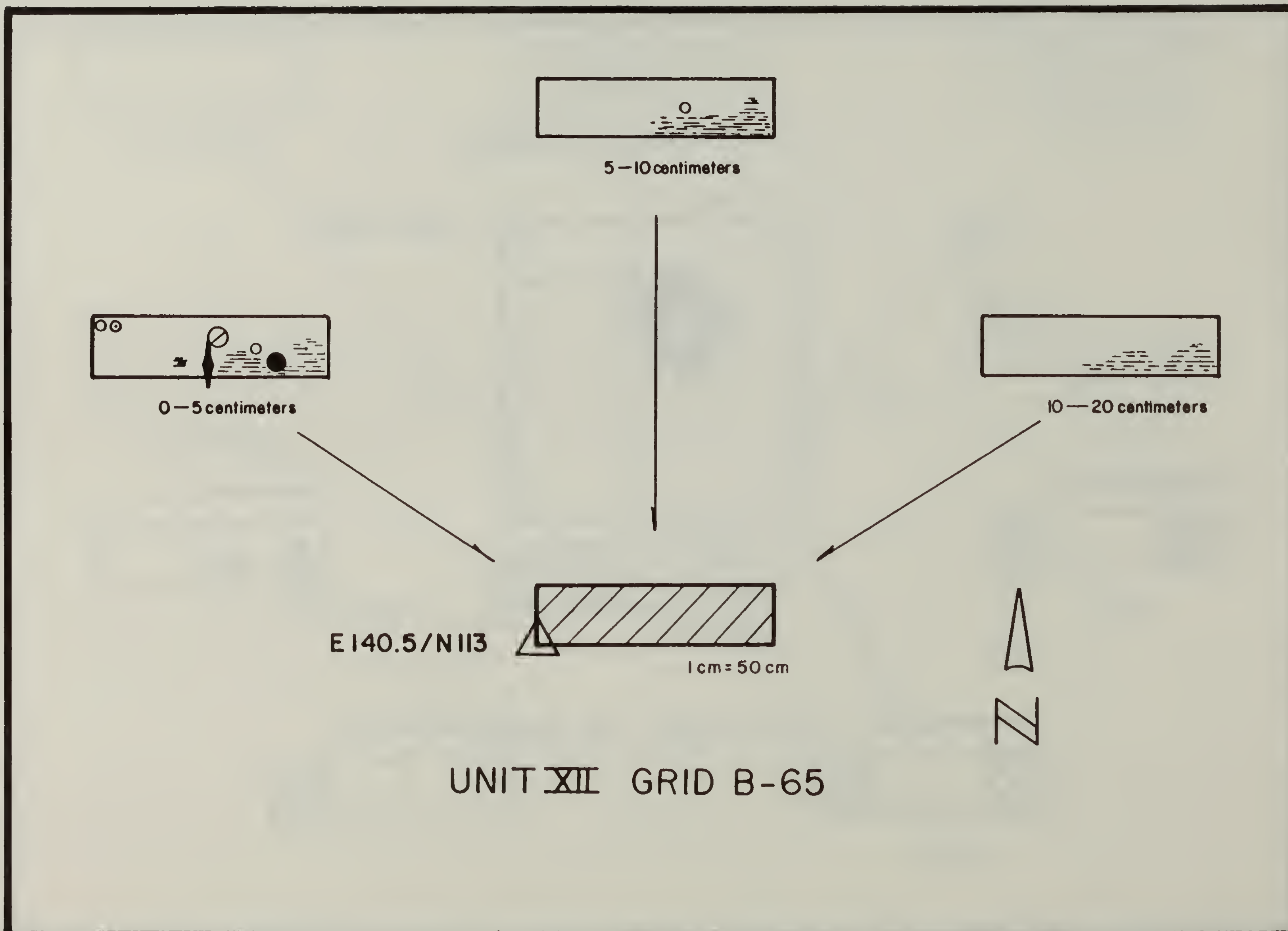
Plan view of unit IX showing in situ artifacts recovered and features observed during the investigation.



Plan view of unit X showing in situ artifacts recovered and features observed during the investigation.



Plan view of unit XI showing in situ artifacts recovered and features observed during the investigation.



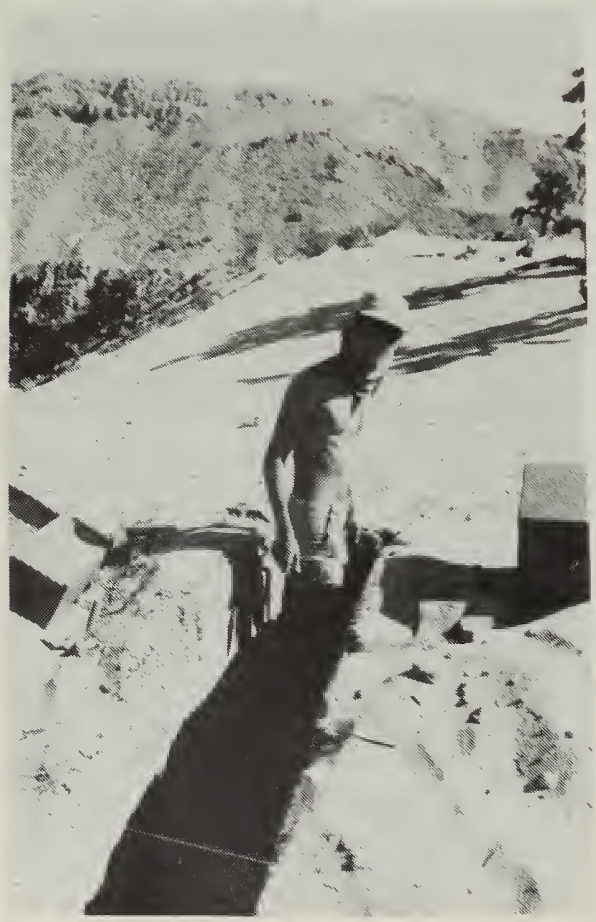
Plan view of unit XII showing in situ artifacts recovered and features observed during the investigation.

APPENDIX E

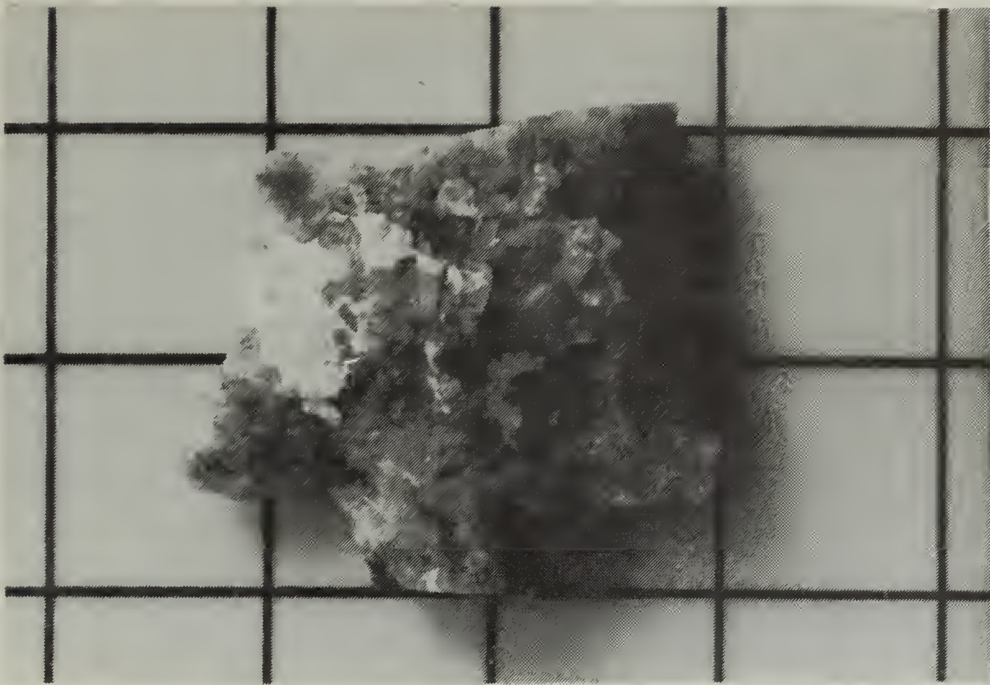
Photograph Record, 4-SBr-3801

Photograph 1: This view is toward the southwest across the most southerly two-thirds of site SBr-3801. The site is comprised of prehistoric cultural refuse within the top one meter of dune sands (center) found at the head of Owl Canyon (upper right hand corner). Steep sandy slopes along the southeast boundary of the site (left portion) have become a popular hill climb area for recreational off-road vehicle use. The micro environment of dune sands atop Miocene and Mesozoic rock supports a Joshua tree woodland community which is absent in the rocky formations of the Mud Hills (view across the breadth of photograph), but prevalent in the high desert valleys immediately to the south.

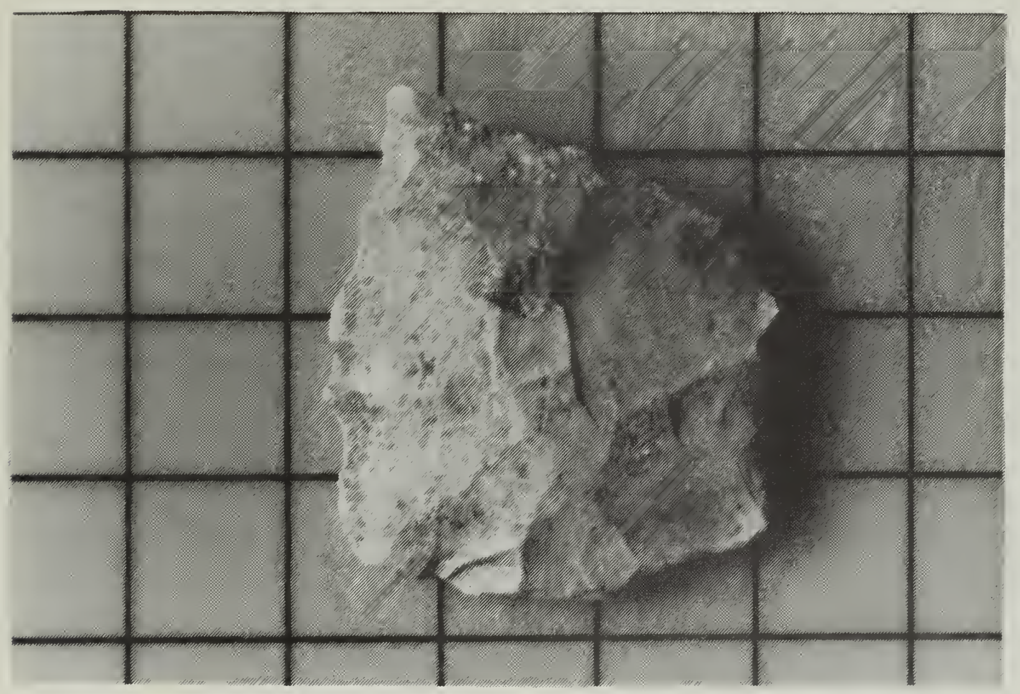
Photograph 2: Recreational off-road vehicle users are frequent visitors to SBr-3801, particularly during cooler months. Weekdays are no exception, as evidenced in this photograph taken on a Wednesday in March 1981. Visible in the center of the photograph are test excavation unit II and the screened soils, which attracted a fair amount of attention from recreational enthusiasts. A disgruntled archaeologist observing the damage to this and other areas of excavation is visible in the top central portion of the photograph.



Photograph 3: Working conditions at SBr-3801 required some protective measures to limit negative effects of blowing sands on days when winds were active. This technician, Joe Vogel, uses a full-face shroud, glasses, and ball cap to protect face and lungs while excavating waist-deep in sand along the site's eastern boundary in test excavation unit III.

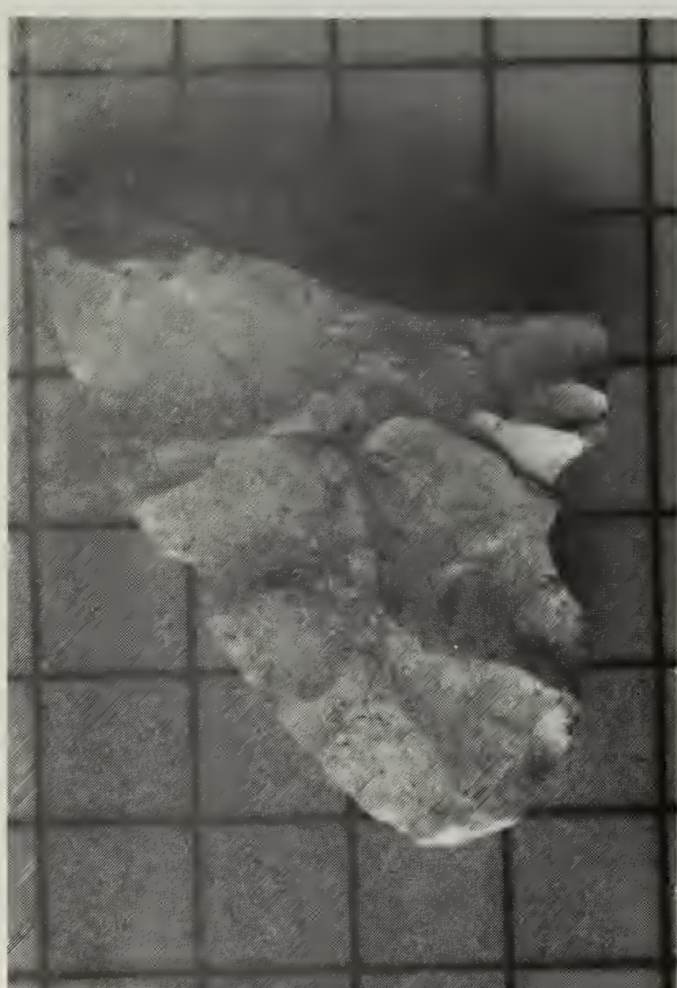


Photograph 4: The projectile point base shown in this photograph (catalog no. 161) was recovered from the surface of SBr-3801 in collection grid A-31. Made of chalcedony and weighing approximately 2.6 grams, the fragment has been identified as an Eastgate contracting stem type. Grid size is 1 sq. cm.

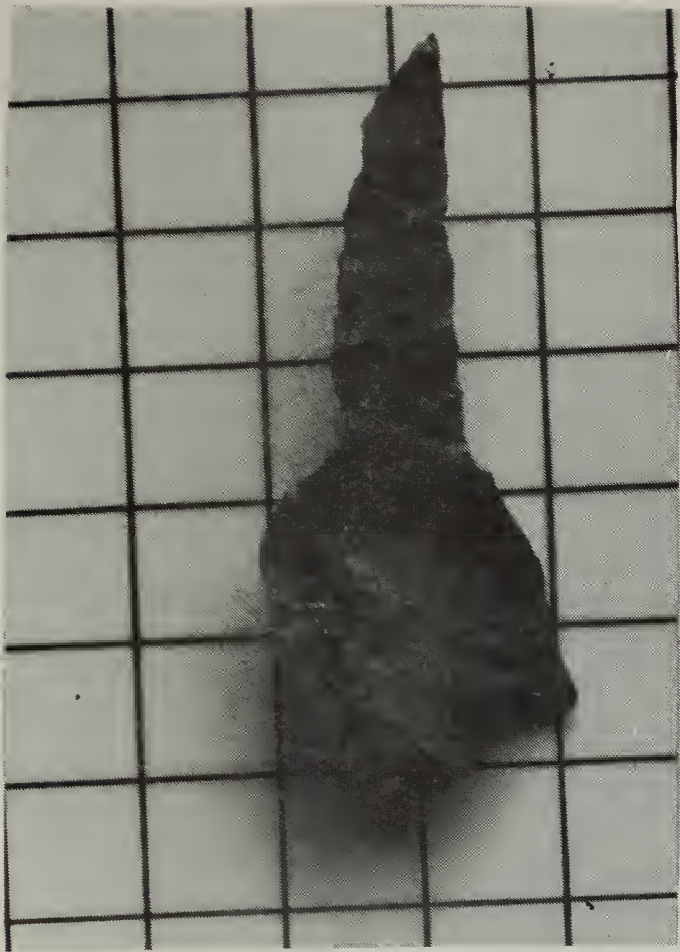


Photograph 5: This basal projectile point fragment (catalog no. 156) recovered from the surface of SBr-3801 has been tentatively classified as a Saratoga Springs type. The point was manufactured from low-grade chalcedony, as evidenced by numerous impurities and pourous zones on the surface. Grid size is 1 sq. cm.

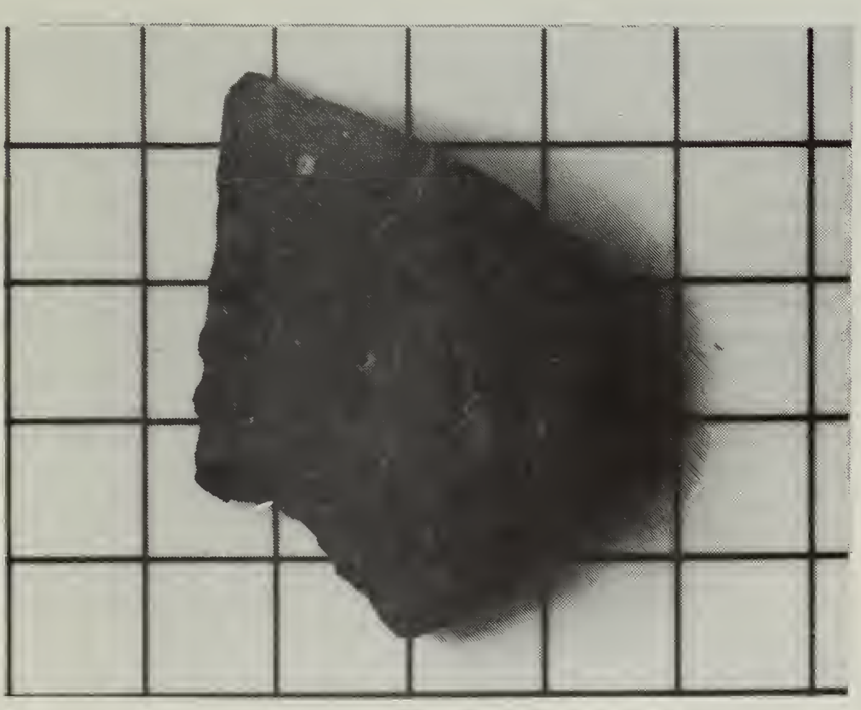
Photograph 6: A good example of the artifact class "typological blade" is shown in this dorsal view of a chalcedony flake recovered from the surface of SBr-3801. Note the arris or ridge from previous flake removals which guided the stoneknapper's force to remove a thin, parallel-sided flake whose lenth is (at minimum) twice the width. This length-width ratio is diagnostic for identifying a flake as a typological blade. Grid size is 1 sq. cm.



Photograph 7: This photograph of a fragmented leaf-shaped biface shows several important steps (and at least one failure) in the process of biface reduction. Flake scars on the surface overlap near the median width and proceed from undulating, uneven lateral edges. Major concavities on both lateral edges suggest that as work proceeded to refined stages, the workpiece lacked sufficient mass to support flake removals. Mesial fracture associated with end shock phenomenon is posited for the failure of this workpiece. Grid size is 1 sq. cm.



Photograph 8: This view is of the ventral surface of a bifacially worked, flake-based tool made of chalcedony. The pointed tip is modified on both sides for use as a drill or awl. Grid size is 1 sq. cm.



Photograph 9: This basal projectile point fragment (catalog number 142) was recovered from 30-40 centimeters in test excavation unit IV. Manufactured of basalt, the base has been tentatively classed as an Eastgate contracting stem type. Grid size is 1 sq. cm.

Photograph 10: Simple flake-based tools recovered from SBr-3801 include the category "utilized flake." The example shown in this photograph is made from chalcedony and the dorsal side shows evidence of previous flake removals, straightened lateral working edges, and some edge damage presumed to have resulted from use. Grid size is 1 sq. cm.

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